THE JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE
Volume 7, Number 5, 2001, pp. 405–515
Mary Ann Liebert, Inc.

ORIGINAL PAPERS

Therapeutic Plants of Ayurveda: A Review of Selected Clinical and Other Studies for 166 Species

SARAH KHAN M.S., M.P.H., C.N.S., and MICHAEL J. BALICK, Ph.D.

ABSTRACT

This paper reports on the results of a literature survey involving 166 different species of plants used in the Ayurvedic pharmacopoeia, based on a sampling of the literature available to us. We found a wide range of clinical and other *in vivo* studies for many of the plant-based therapies utilized in the Ayurvedic system. Of the 166 plants investigated, 72 (43%) had at least one or more human studies and 103 (62%) had one or more animal studies. These results appear to contradict the generally held notion that herbal remedies used in non-Western systems of botanical medicine have not been evaluated in human or *in vivo* trials. Some of these studies are not always as large or methodologically rigorous as clinical studies reported in major medical journals. Indeed, a critical assessment of the research according to the standards of evidence-based medicine would eliminate many of these studies for lack of rigor according to criteria of randomization, sample size, adequacy of controls, etc. However, the studies do suggest which species might be appropriate for larger and better-controlled trials in the future. Accordingly, a synopsis of the plants, their therapeutic applications, and their clinical or experimental evaluations is presented.

INTRODUCTION

Non-Western healing systems that utilize botanical medicines are often criticized because of a supposed paucity of *in vivo* studies to support the safety and efficacy of individual plants or plant mixtures. For example, Barrett et al. (1999) state that therapies outside the medical mainstream suffer from a dearth of research and critical evaluation. From a biomedical paradigm, rigorous studies include those that provide randomized controlled data on efficacy as well as information on toxicity, dosage, method of use, and adverse reactions. Few herbals or other references available to practitioners of botanical medicine contain information about, or citations of, clinical trials or related studies. At the same time, billions of people around the world have studied and utilized ancient medical systems such as Ayurveda (translated as the "science of life") for centuries.

To evaluate the availability of studies on plants used in Ayurveda, we conducted a search in two databases as well as other sources of information, using a list of 166 species that are important to this system of medicine.

Institute of Economic Botany, The New York Botanical Garden, Bronx, NY.

MATERIALS AND METHODS

The research was conducted between January 1996 and January 2000. The databases searched were MEDLINE® and NAPRALERT. In addition, we collected literature on traditional medicine and searched two Indian journals not included in MEDLINE: *Aryavaidyan* and the *Indian Journal of Medical Research*. These publications were selected, based on their availability to us, as examples of Indian journals that report on studies of plants and their treatment of disease. There are many other Indian journals that contain a great deal of valuable information; however, they were not accessible to us—we expect that, if access to this type of traditional knowledge can be facilitated in some way, much more information of interest could be located. In this paper, we only consider those studies that include individual plants or mixtures of plants consistent with the philosophy of Ayurveda. We did not include six species that have been reported on in many journals, in both human and animal studies: *Allium sativum* L., *Cannabis indica* Lam., *Digitalis purpurea* L., *Papaver somniferum* L., *Rauwolfia serpentina* L., and *Zingiber officinalis* Roscoe. However, we did include these species in the calculation of percentage of animal and human trials of the 166 Ayurvedic medicinal plants.

RESULTS AND DISCUSSION

Summary of human studies

A summary of the human studies and the species included in the plant mixtures are presented in Table 1: Ayurvedic Plants and Human Studies. The disease categories listed in Table 1 are graphically depicted in Figure 1 as breakdown into eleven disease categories for the 166 plants (minus the six species already documented) with human studies. The disease categories include: antimicrobial; antimutagens; cardiovascular; dermatology; *Diabetes mellitus*; gastrointestinal; liver dysfunction; nervous system; pain/inflammation; renal/blood/immune system; and other. There are a total of 145 effects based on the 66 human studies. In a few instances, when one plant demonstrated more than one effect, i.e., reduction of both blood glucose and triglyceride levels, the effect was counted in both the cardiovascular and *Diabetes mellitus* categories. For the sake of comparison, Figure 2 represents a breakdown of drugs used in the U.S. pharmacopoeia according to treatment category based on the work of Paul Cox (1994).

Table 2 is a detailed list of all the plants, organized by genus and species, with the family names. Information on common Sanskrit and English names is also presented, as well as mention of the plant part used, preparation and dosage used in the study, design, model and sample size when known, results (negative and positive), and the original reference that was examined. Forty-three percent (43%) (a total of 72) of the species in Table 2 contain reference to one or more studies with humans and 62% (a total of 103) of the species listed in this table contain reference to at least one animal trial. Careful examination of the studies revealed a variation in sample size, quality of research, and presentation of results. However, there is a great deal of interesting information contained in these studies, representing a significant accumulation of evidence supporting the efficacy of plant therapies used in Ayurveda. Although the table is quite long and detailed, there are a number of plants exhibiting impressive therapeutic effects in humans. At the same time, this *corpus* of information serves to point the way to species that deserve further study, both in animal models and at the clinic. Toward this end, we suggest the adoption of "Good Botanical Practices" (Balick, 1999) with properly collected, vouchered materials used to produce the phytotherapies under study. This is the only way that reproducibility of results can be assured, should further testing be warranted.

CONCLUSIONS

Plants have long been the principal tools of traditional medical systems. Although ancient in origins, many traditional medical paradigms and their pharmacopoeias have evolved into quite sophisticated healing systems, using thousands of plants and other natural materi-

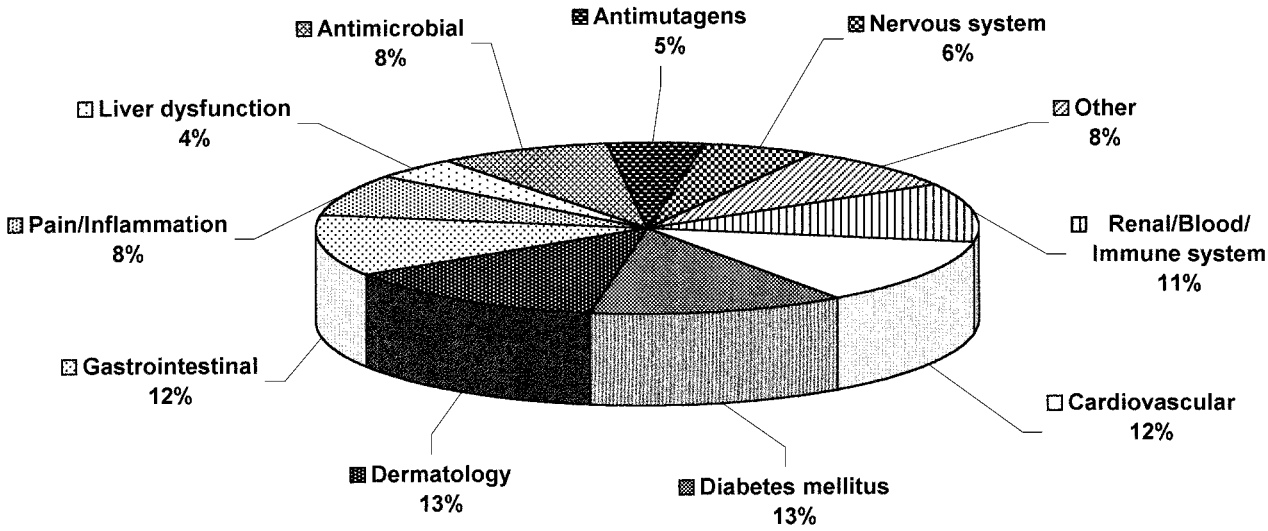

FIG. 1. Ayurvedic medicinal plant uses, classified according to the treatment categories. (Based on human studies, $n = 66$).

als such as minerals and animal products. In many parts of the world, traditional medicine is still used to provide the major part of primary health care. The World Health Organization has estimated that the majority of the world's population depends on botanical medicines for basic health care needs (Akerele, 1985). Reasons for this include the fact that these local systems are culturally acceptable, cheaper for many conditions as compared to biomedicine, and efficacious in many of the circumstances in which they are used.

In a recent editorial in the *New England Journal of Medicine*, the editors cautioned against the use of herbal medicines as "a reversion to irrational approaches to medical practice" (Angell and Kassirer, 1998). In this paper, we have attempted to dispel the all-too-commonly held notion that no clinical or other evidence exists to support the use of plants used in traditional medical systems. We acknowledge that some of the studies are not as rigorous as desired because of resource or other limitations. However, the work described in this review can serve to help guide future studies by pointing out promising therapies, and thus research avenues, for specific conditions. In the case of Ayurvedic medicine, Indian journals, often re-

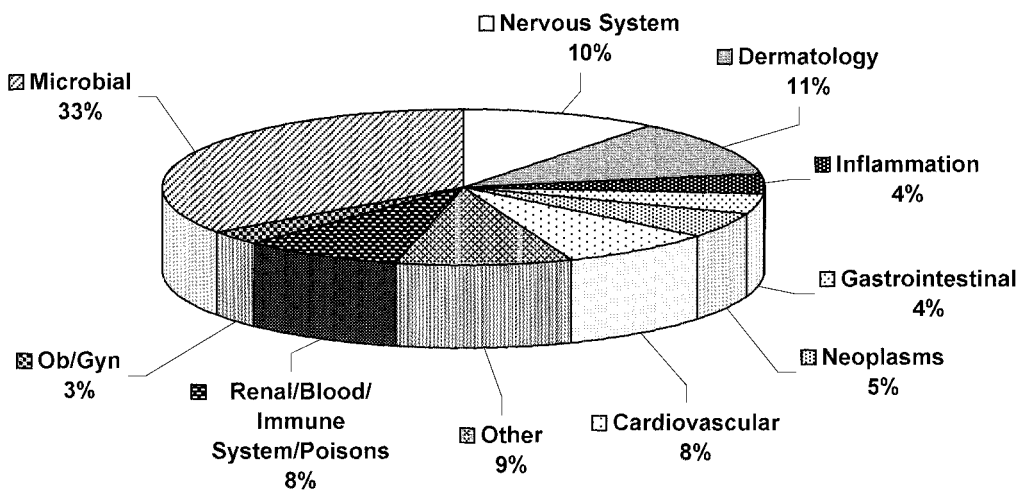

FIG. 2. U.S. Pharmacopoeia drug uses, classified according to the treatment categories. From Cox, 1994.

gional or those published by individual research centers, are rich in experimental studies as well. This exercise has also pointed out the need for access to such publications, via greater international cooperation involving information exchange.*

This study has been limited by our own access to information and there are numerous additional journals that contain information on plants and complex mixtures of plants prepared according to traditional formulations used in the Ayurvedic medical system. We have undertaken this task in the hope that some of the initial studies presented may help to direct research on plants deserving of more intensive evaluation as clinical therapies.

ACKNOWLEDGMENTS

We are grateful to Scott Gerson, M.D., Ph.D., medical director of the National Institute of Ayurvedic Medicine, Brewster, NY, for providing us with a listing of the species of Ayurvedic medicinal plants discussed in this paper. We would like to thank the following: the NAPRALERT staff for providing information on clinical trials, The New York Botanical Garden Library (for interlibrary loans); Jennifer Cooper of Nature's Herbs for providing references on some of the plants; The Asian Economic Botany Fund of The New York Botanical Garden (for funding travel and SK salary); and The New York Botanical Garden Institute of Economic Botany, Bronx, NY, staff and interns: Jan Stevenson, Kate Armstrong (1998 Everett Public Service Intern), Kelvin Chan (volunteer), with special thanks to Rebekka Stone (Research Assistant), and Roberta Lee M.D. We would also like to express our gratitude to Gerry Bodeker, Ed.D., for his thoughtful comments on the piece, and to Jackie Wootton, M.Ed., and Kim Jobst, M.A., D.M., M.R.C.P., M.F.Hom.

We are also grateful to The Philecology Trust and The Metropolitan Life Foundation for their generous support of Michael Balick's research program in ethnomedicine.

*The Foundation for the Revitilization of Local Health Traditions (www.frlht-india.org) founded by Darshan Shankar in 1991 is one such pioneering organization dedicated to the conservation of Indian biodiversity and local health traditions and cultures.

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Barrett B, Kiefer D, Rabago D. Assessing the risks and benefits of herbal medicine: An overview of scientific evidence. Altern Ther Health Med 1999;5(4):40–49.

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Address reprint requests to:
Michael J. Balick, Ph.D.
The New York Botanical Garden
Bronx, NY 10458

E-mail: mbalick@nybg.org

APPENDIX to
Therapeutic Plants of Ayurveda
Tables 1 and 2 and Illustrations

Aegle marmelos	Irritable bowel syndrome
	Shigellosis
Allium cepa	Colic
	Hyperlipidemia
	Scar treatment
	Stomach carcinoma
Aloe barbendensis	Antidiabetic
	Burn wounds
	Psoriasis
Andrographis paniculata	Common cold (2×)
	Fever, sore throat
	Hepatocellular jaundice
	Pyuria, hematuria
	Stenosis, restenosis
	Viral hepatitis
Areca catechu	*Diphyllobothrium latum* infection
	Inflammatory bowel disease
Artemisia vulgaris	Postoperative blood loss, bacteriuria
Asparagus racemosus	Calculi on kidney, urinary bladder
	Gastric emptying
Azadirachta indica	Congestive heart failure
	Mosquito repellant (2×)
	Scabies
	Vaginal contraceptive
	Vitiligo
Bacopa monnieri	Irritable bowel syndrome
Boerhavia diffusa	Congestive heart failure
Boswellia serrata	Ulcerative colitis
	Osteoarthritis
	Rheumatoid arthritis
Butea monosperma	Giardiasis
	Worm infestations, *Ascaris lumbricoides*
Capsicum annuum	Cluster headaches (2×)
	Diabetic neuropathy (2×)
	Herpes zoster
	Herpetic neuralgia (3×)
	Local stump pain due to amputation
	Post herpetic neuralgia (2×)
	Postmastectomy pain syndrome
	Small fiber function
Carum carvi	Obstipation
Cedrus deodara	Congestive heart failure
Cocos nucifera	Coronary heart disease
	Immunotherapy
	Oral rehydration therapy
Cuminum cyminum	*Diabetes mellitus*
Curcuma longa	Cancerous lesions (external)
	Gastric ulcers
	Osteoarthritis
	Scabies
	Serum lipid peroxides (decrease)
	Urinary mutagens (decrease)
Cyperus rotundus	Intestinal metaplasia, atypical hyperplasia of gastric mucosa
Daucus carota	Inhibition of endogenous nitrosation
	Malignant mesothelioma
	Metabolic parameters (no adverse changes)
	Oxidation in copper-oxidized LDL (decrease)
	Risk of vulvar cancer (decrease)
Dolichos biflorus	Binding to healthy oral mucosa
Embelia ribes	*Acne vulgaris*
	Worm infestation, *Ascaris lumbricoides*
Emblica officinalis	Gastrointestinal disease
	Serum cholesterol levels
	Viral hepatitis
Eugenia jambolana	Decreases in mean blood sugar values
Foeniculum vulgare	Chronic nonspecific colitis

Glycyrrhiza glabra	*Acne vulgaris*
	Chronic duodenal ulcers (2×)
	Chronic hepatitis
	Hyperkalemia in *Diabetes mellitus*
Gossypium herbaceum	Male antifertility (3×)
Gymnema sylvestre	Mean blood sugar values (decrease) (2×)
	Serum lipids (decrease)
	Sweetness perception (decrease)
Holarrhena antidysenterica	Facial acne
Hydrocotyle asiatica	Shigellosis
Linum usitatissimum	N-3 fatty acids (increase)
	Postprandrial glucose (decrease)
Mallotus philippensis	Worm infestations, *Ascaris lumbricoides*
Moringa oleifera	Perceived pain relief, accelerated expulsion of worms
Mucuna pruriens	Parkinson's disease
Myristica fagrans	Calculi in kidneys and urinary bladder
Nardostachys jatamansi	Facial acne
Nelumbo nucifera	Hyperlipidemia
Ocimum sanctum	Non-insulin dependent *Diabetes mellitus*
Oryza sativa	Oral rehydration therapy
Paederia foetida	Shigellosis
Peucedanum graveolens	Vitamin A/β-carotene content
Picrorhiza kurrooa	Bronchial asthma
	Congestive heart failure
	Viral hepatitis
	Vitiligo
Piper longum	Bioavailability of certain drugs (increase)
	Disappearance of *Giardia lamblia*
Piper nigrum	No damage to human gastric mucosa
Pueraria tuberosa	Migraine headaches
Raphanus sativus	No adverse effects to metabolic parameters
Rheum emodi	Prevent chronic renal failure
Ricinus communis	Binding of healthy oral mucosa
Rubia cordifolia	Cardiac function
Salvadora persica	Peridontal disease
Santalum album	Facial acne
	Urinary tract infection
Saussurea lappa	Reduced frequency of angina
Sesamum indicum	Warts
Strychnos nux-vomica	Nonketotic hyperglycemia
Swertia chirata	Decrease in mean blood sugar values
Tamarindus indica	Bioavailability of drugs (increase) (2×)
	Decrease pain, accelerated expulsion of worms
Taraxacum officinale	Chronic colitis
Tephrosia purpurea	Decrease in mean blood sugar values
Terminalia arjuna	Severe refractory heart failure
	Stable angina pectoris
Terminalia bellirica	*Acne vulgaris*
Terminalia chebula	*Acne vulgaris*
	Congestive cardiac failure
Tinospora cordifolia	Calculi on kidney or urinary bladder
	Congestive heart failure
	Management of obstructive jaundice
Tribulus terrestris	Calculi on kidney and urinary bladder
	Remission of angina pectoris
Trigonella foenum-graecum	Hypolipidemic effect (2×)
	Postprandial glucose levels (decrease)
	Total cholesterol, LDL, VLDL, triglycerides (decrease)
Valeriana jatamansi	Infantile rotavirus enteritis
	Mild hypnotic action
	Mild insomnia, decrease sleep latency
	Sleep quality
Withania somnifera	Calculi on kidney and urinary bladder
	Osteoarthritis
	Psychomotor performance
	Rheumatoid arthritis

LDL, low-density lipoprotein cholesterol; VLDL, very low-density lipoprotein cholesterol.

TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA*

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Acorus calamus L. ACORACEAE Vacha Sweet Flat	Alcoholic extract of dried rhizomes: 1 kg coarse powder	Rats	Decrease in severity of maximum electric shock induced seizures in rats was demonstrated.	Martis G, et al. Neuropharmacological activity of *Acorus calamus* L. Fitoterapia LXII, 1991;4:331–337.
Acorus calamus	Ethanolic extract of *Acorus calamus* rhizomes. Hot extract distillation 3× pooled, concentrated and dried	Rats, mice	Extract has shown sedative, analgesic, moderately hypotensive and respiratory qualities.	Vohora SB, et al. Central nervous system studies on an ethanol extract of *Acorus calamus* L. rhizomes. J Ethnopharm 1990;28:53–62.
Aegle marmelos (L.) Corrêa RUTACEAE Bilua Bael tree	Dried unripe fruit powder of *Aegle marmelos*; dried powder plant of *Hydrocotyle asiatica*; dried powder *of Poederia foetida*	Randomized, double-blind, clinical trial: 82 men with shigellosis	Treatment of shigellosis with these plants did not show any clinical improvement or bacteriological cure as compared to ampicillin.	Haider R, et al. Evaluation of indigenous plants in the treatment of acute shigellosis. Trop Geogr Med 1991;43(3):266–270.
Aegle marmelos	Methanolic extract of root bark *Aegle marmelos* 100 mg/mL	Mice	Extract inhibited the spontaneous beating rate of cultured mouse myocardial cells by approximately 50%.	Kakiuchi N, et al. Effects of constituents of Beli (*Aegle marmelos* L.) on spontaneous beating and calcium-paradox of myocardial cells. Planta Med 1991;57(1):43–46.
Aegle marmelos	Ayurvedic preparation: *Aegle marmelos* and *Bacopa monnieri*	Clinical trial, randomized controlled: 169 patients with irritable bowel syndrome	In 57 patients, Ayurvedic preparation was effective in 64.9%, while standard therapy (with clidinium bromide, chlordiazepoxide, isaphaghulla) in 60 patients was useful 78.3%. Long-term follow-up showed both forms of therapy were no better than placebo in limiting the relapse.	Yadav SK, et al. Irritable bowel syndrome: therapeutic evaluation of indigenous drugs. Indian J Med Res 1989;90:496–503.
Aegle marmelos	Plants lacking pyrrolizidine alkaloids: *Aegle marmelos, Hemidesmus indicus, Terminalia chebula, Withania somnifera*	Feeding trials in rats	To test toxicity of plants, plants produced hepatic lesions that included central vein abnormalities. *Terminalia chebula* and *Withania somnifera* produced marked renal lesions.	Arseculeratne SN, et al. Studies of medicinal plants of Sri Lanka. Part 14: Toxicity of some traditional medicinal herbs. J Ethnopharm 1985;13(3):323–335.

Aegle marmelos	Aqueous decoctions of *Aegle marmelos, Momordica charantia, Salacia reticulata*	Laboratory animals	All plants demonstrated significant hypoglycemic effect in their ability to decrease the fasting blood glucose level and improve glucose tolerance. *Momordica charantia* had the highest effect while *Salacia reticulata* had the lowest.	Karunanayake EH, et al. Oral hypoglycemic activity of some medicinal plants of Sri Lanka. J Ethnopharm 1984;11(2):223–231.
Alangium salviifolium (L.f.) Wangerin ALANGIACEAE Ankola Sage leaves	Extracted with n-hexane, ethyl acetate and methanol. Allspice, basil, bay leaves, cardamom seed, cinnamon, cumin, dill seed, dry ginger, ginger, horseradish, marjoram, oregano, parsley, pink pepper, red pepper, rosemary, sage, tarragon, thyme, turmeric, white pepper	Mice extract examined on TPA-induced ear edema	Sage is a potent inhibitor of TPA-induced mouse ear edema. Antitumor promoting activity guided the separation of the relatively active spices and led to the isolation of ursolic acid from sage. All plants were highly potent inhibitors of TPA-induced mouse ear edema.	Okuyama T, et al. Studies on cancer biochemoprevention of natural resources: X. + inhibitory effect of spices on TPA-enhanced 3H-choline incorporation in phospholipids of C3h10T1/2 cells and on TPA-induced mouse ear edema. Chin Pharm J 1995;47(5):421–430.
Allium cepa L. ALLIACEAE Palandu Onion	*Allium cepa* intake	Mailed questionnaire: 272 mothers: infants = 273	To assess relationships among components of the maternal diet and presence of colic symptoms among exclusively breast-fed infants. Study revealed initial evidence that maternal intake of onions during exclusive breast-feeding is associated with colic symptoms in young infants.	Lust KD, et al. Maternal intake of cruciferous vegetables and other foods and colic symptoms in exclusively breast-fed infants. J Am Dietetic Assoc 1996;96(1):46–48.
Allium cepa	*Allium cepa* and *Allium sativum* consumption	Netherlands Cohort Study on diet and cancer: *n* = 120,852 men and women 55–69 years	Strong inverse association between onion consumption and stomach carcinoma.	Dorant E, et al. Consumption of onion and reduced risk of stomach carcinoma. Gasterolenterology 1996;110(1):12–20.
Allium cepa	Aqueous extracts of *Allium cepa* or *Allium sativum* administered orally or intraperitoneally, daily for 4 weeks	Rats	Garlic and onion can be ingested frequently in low doses without any side effects, and can still produce a significant antithrombotic effect.	Bordia T, et al. An evaluation of garlic and onion as antithrombotic agents. Prostaglandins Leuko Essent Fatty Acids 1996;54(3):183–186.

(*continued*)

TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Allium cepa	Contractubex gel (Mertz + Co., D-Frankfurt/Main), containing 10% onion extract, 50 U sodium heparin/g of gel and 1% allantoin	Clinical trial: 38 children with scar formation after thoracic surgery. Contract-ubex-treated and 27 untreated compared.	In Contractubex group, evaluation of therapeutic result was "good" and "very good" in 84% of cases as compared to 59% of untreated cases. In treated group, scar size was markedly lower, quicker paling, and conversion to hypertrophic or keloidal scars was less frequent. Scar specific effects of Contractubex persisted after the end of treatment.	Maragakis M, et al. Possibilities of scar treatment after thoracic surgery. Drugs Under Exp. Clin Res 1995;21(5):199–206.
Allium cepa	S-methyl cysteine sulphoxide (SM-CS) isolated from onion. Oral administration daily at a dose of 200 mg/kg body weight for 45 days	Alloxan-diabetic rats	Administration of SM-CS significantly controlled blood glucose, lipid serum and altered the activities of liver hexokinase, glucose 6-phosphatase and HMG CoA reductase toward normal. Effects of SM-CS were comparable to those of glibenclamide and insulin.	Kumari K, et al. Antidiabetic and hypolipidemic effects of S-methyl cysteine sulfoxide isolated from *Allium cepa* Linn. Ind J Biochem Biophysics 1995;32(1):49–54.
Allium cepa	*Allium cepa, Allium sativa, Brassica oleracea, Cucurbita ficifolia, Cuminum cyminum, Cucumis sativus, Lactuca sativa, Opuntia streptacantha, Phaseolus vulgaris, Psidum guajava, Spinacea oleracea*	27 healthy rabbits	Tolbutamide, *Cucurbita ficifolia, Phaseolus vulgaris, Opuntia streptacantha, Spinacea oleracea, Cucumis sativus,* and *Cuminum cyminum* significantly decreased the area under the glucose tolerance curve and the hyperglycemic peak. *Brassica oleracea, Allium cepa* and *Allium sativum* only decreased the hyperglycemic peak. The glycemic decreases caused by *Psidum guajava, Brassica oleracea* and *Lactuca sativa* were not significant.	Roman RR, et al. Antihyperglycemic effect of some edible plants. J Ethnopharm 1995;48(1):25–32.
Allium cepa	Oral administration of onion sulfoxide amino acids	Alloxan-diabetic rats	Diabetic condition characterized by glucose intolerance, weight loss, depletion of liver glycogen improved compared to rats treated with glibenclamide and insulin.	Sheela CG, et al. Anti-diabetic effects on onion and garlic sulfoxide amino acids in rats. Planta Medica 1995;61(4):356–357.

Allium cepa	*Allium cepa* aqueous extract given to mice for 3 months at a dose of 100 mg/kg in the drinking water	Mice	A significant increase in the weight of testes and epididymus of the treated animals was observed. Sperm count was significantly increased, supporting an aphrodisiac potential. *Allium cepa* did not show an estrogenic or antiestrogenic activity and was devoid of spermatotoxic potential.	Al-Bekairi AM, et al. Toxicity studies on *Allium cepa,* its effect on estradiol treated mice and on epididymal spermatozoa. Fitoterapia LXII, 1991;4:301–306.
Allium cepa	Ether extract of *Allium cepa*	Albino rats	Extract significantly prevented an increase in serum cholesterol and triglyceride levels, caused by an atherogenic diet. The extract provided significant protection against atherogenic diet-induced atherosclerosis.	Lata S, et al. Beneficial effects of *Allium sativum, Allium cepa* and Commiphora mukul on experimental hyperlipidemia and atherosclerosis—A comparative evaluation. J Postgrad Med 1991; (3):132–135.
Allium cepa	10–10,000 mg *Allium cepa* oil and *Allium sativum* oil, applied 3× per week	Mice	The tumor yield and incidence of phorbol-myristate-acetate promotion were inhibited in a dose-dependent manner over the range of 10–100,000 μg of onion oil. Garlic oil was also inhibitory but was less effective.	Belman S. Onion and garlic oil inhibit tumor production. Carcinogenesis 1983;4(8):1063–1065.
Allium cepa	Extracted onion or garlic juice or equivalent of ether-extracted essential oils: administered 4 randomly different days during 1 week	Human trial: 10 healthy subjects	Onion and garlic had a significant protective action against fat-induced increases in serum cholesterol and plasma fibrinogen and a decrease in coagulation time and fibrinolytic activity.	Bordia A, et al. Effect of the essential oils of garlic and onion on alimentary hyperlipidemia. Atherosclerosis 1975;21(1):15–19.
Aloe barbadensis Mill. ASPHODELACEAE Kumari Aloe vera	*Aloe barbadensis* a polysaccharide fraction extract. Mice administered oral dose of 10 mg followed with 16 days of treatment at 50 mg per mouse	Rats and mice	Benzo[a]pyrene-DNA adduct formation was significantly inhibited in various organs ($p < 0.001$) when mice were pretreated with aloe. These results suggest a chemoprotective effect.	Kim HS, Lee BM. Inhibition of benzo[a]pyrene-DNA adduct formation by *Aloe barbadensis* Miller. Carcinogenesis 1997;18(4): 771–776.
Aloe barbadensis	*Aloe vera* juice prepared from aloe gel. 1 tablespoon 2× per day for at least 2 weeks	Placebo-controlled and single-blind trial: 50 men, 22 women with diabetes	Blood sugar levels and triglyceride levels were decreased significantly. When given *Aloe vera* juice.	Yongchaiyudha SV, et al. Antidiabetic activity of *Aloe vera* L. juice. I. Clinical trial in new cases of diabetes mellitus. Phytomed 1996;3(3):241–243.

(*continued*)

TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Aloe barbadensis	*Aloe vera* gel versus no treatment	Phase III double-blind randomized trial. Trial 1: 194 women; Trial 2: 108 women	Dermatitis scores were virtually identical on both treatment arms during both the trials. This dose schedule of an *Aloe vera* gel does not protect against radiation.	Williams MS, et al. Phase III double-blind evaluation of an aloe vera gel as a prophylactic agent for radiation-induced skin toxicity. Int J Radiat Oncol, Biol, Physics 1996;36(2):345–349.
Aloe barbadensis	*Aloe vera* extract cream 0.5%, 100 g of placebo or active ingredient 3× daily for 5 consecutive days per week (maximum 4 weeks)	Double-blind, placebo-controlled, study: 60 patients with psoriasis	Patients with slight to moderate chronic plaque-type psoriasis were treated. By the end of the study, 25/30 (83.3%) were cured compared to 2/30 (6.6%) in the placebo group, Psoriasis and Area and Severity Index score decreased to a mean of 2.2.	Syed TA, et al. Management of psoriasis with Aloe vera extract in a hydrophilic cream: A placebo controlled, double-blind study. Trop Med Int Health 1996;1(4): 505–509.
Aloe barbadensis	CARN 750 is a polydispersed β (1,4)-linked acetylated mannan isolated from *Aloe barbadensis*	Myelosup-pressed (7 Gy) C57BL/6 mice	Subcutaneous administration significantly increased splenic and peripheral blood cellularity, as well as hematopoietic progenitors in spleen and bone marrow (hematopoietic augmentation).	Egger SF, et al. Hematopoietic augmentation by a beta-(1,4)-linked mannan. Cancer Immunol Immunother. 1996;43(4):195–205.
Aloe barbadensis	*Aloe vera* gel	Clinical and histologic study: 27 patients with partial thickness burns	Patients were treated with *Aloe vera* gel compared with vaseline gauze. The aloe treated-group healed significantly faster in 11.98 days whereas petroleum jelly-treated group healed in 18.19 days ($p < 0.002$)	Visuthikosol V, et al. Effect of Aloe vera gel to healing of burn wound and clinical and histologic study. J Med Assoc Thailand 1995; 78(8):403–409.
Aloe barbadensis	Topical application of 0.167–1.67% aloe gel after each irradiation	Mice	Topical application of gel improved UV-induced immune suppression by a mechanism that does not involve DNA damage or repair.	Strickland FM, et al. Prevention of ultraviolet radiation-induced suppression of contact and delayed hypersensitivity by *Aloe barbadensis* gel extract. J Invest Dermatol 1994; 102(2):197–204.
Aloe barbadensis	Ethanol or water extracts of powdered plant material: *Adhatoda vasica, Abrus precatorius, Acacia arabica, Aloe barbadensis, Anethum sowa, Apium petroselinium, Banbusa*	Rats orally dosed for 10 days	Aqueous or 90% ethanol extracts of the plants were studied in rats for 10 days after insemination with special reference to effects of fetal development. Leaf extracts of *Moringa oleifera* and *Adhatoda vasica* were 100% abortive at doses	Nath D, et al. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. J Ethnopharm 1992; 36:147–154.

	arundensis, Blepharis edulis, Butea monosperma, Hibiscus rosa-sinensis, Lepidum sativum, Mesua ferrea, Moringa oleifera, Mucuna pruriens, Raphanus sativus, Sida cordifolia, Trachyspermum ammai		equivalent to 175 mg/kg starting dry material. Only the flowers of *Acacia arabica* and *Hibiscus rosa-sinensis* appeared to lack teratologic potential at the doses tested.	
Aloe barbadensis	Acemannan, the USAN accepted name for the long-chain polydispersed β-(1,4)-acetylated polymannose with interspersed o-acetylated groups, extracted from *Aloe barbadensis.* 1 mg/mL solution either as a 1 dose or repeated at 4-day intervals for 8 doses by IV or IP routes	Mice, rats, and dogs	No significant signs of intoxication and no deaths occurred in animals treated with the single injection of Acemannan at dosages of 80 mg/kg IV or 200 mg/kg IP in mice, 15 mg/kg or 50 mg/kg IP in rats, and 10 mg/kg IV or 50 mg/kg IP in dogs.	Fogleman RW, et al. Toxicologic evaluation of injectable acemannan in the mouse, rat and dog. Vet Hum Toxicol 1992;34(3):201–205.
Aloe barbadensis	*Aloe barbadensis*, Acemannan, long chain polydispersed β (1,4)-linked mannan polymers with random O-acetyl groups given IP	Mice: murine sarcoma cells subcutaneously implanted.	Sarcomas grew in 100% of the control animals and resulted in mortality in 20–46 days depending on the number of cells implanted; 40% of animals treated with Acemannan survived.	Peng SY, et al. Decreased mortality of Norman murine sarcoma in mice treated with immunomodulator, Acemannan. Mol Biother 1991;3(3):79–87.
Aloe barbadensis	Gastric administration of water, tolbutamide or a plant preparation	Rabbits	Results showed that tolbutamide and studied plants, except *Aloe barbadensis*, decreased significantly the area under the glucose tolerance curve, in relation to the water control group.	Roman-Ramos R, et al. Experimental study of the hypoglycemic effect of some antidiabetic plants. Arch Invest Med (Mex) 1991;22:87–93.
Aloe barbadensis	Exudate of *Aloe barbadensis* leaves and bitter principle. Administered orally, 500 mg/kg. The bitter principle was administered IP, 5 mg/kg	Alloxan-diabetic mice	Hypoglycemic effects of aloe on serum glucose levels were insignificant whereas the bitter principle was highly significant and extended over a period of 24 hours. The maximum decrease in plasma glucose level was observed at day 5 in both cases.	Ajabnoor MA. Effect of aloes on blood glucose levels in normal and alloxan diabetic mice. J Ethnopharm 1990;28(2):215–220.
Alpinia galanga (L.) Sw. ZINGIBERACEAE Malayavacha Java galangal	Ethanolic extract of *Alpinia galanga* rhizomes. Minimum effective dose was 125 mg/kg body weight	Mice	*Alpinia galanga* treatment significantly decreased the effect of induced micronucleated polychromatic erythrocytes (MPE) without altering cytotoxicity. Biochemical changes caused by MPE in the liver were also significantly inhibited.	Qureshi S, et al. Effect of *Alpinia galanga* treatment on cytological and biochemical changes induced by cyclophosphamide in mice. Int J Pharmacog 1994;32(2):171–177.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Alpinia galanga	Ethanolic extract of *Alpinia galanga* at a dose of 500 mg/kg	Rats	Significant decrease in the intensity of mucosal damage was gastric observed. *Alpinia galanga* produced a significant decrease in gastric secretion in pylorus ligated rats and a highly significant cytoprotective effect against induced cytodestruction.	Al-Yahya MA, et al. Gastric antisecretory, antiulcer and cytoprotective properties of ethanolic extract of *A. galanga* Willd in rats. Phytother Res 1990; 4(3):112–114.
Alpinia galanga	Ethanolic extract of rhizomes of *Alpinia galanga* and *Curcuma longa*. Acute dosages 0.5, 1.0, and 3 g/kg body weight. Chronic dosage 100 mg/kg per day	Mice	Toxicities studies were done. No significant mortality compared to controls was noted. The gain in weights of sexual organs and increased sperm motility and sperm counts were observed in both groups These changes were highly significant in the *Alpinia galanga*-treated group. Both extracts failed to show any spermatotoxic effects.	Qureshi S, et al. Toxicity studies on *Alpinia galanga* and *Curcuma longa*. Planta Med 1992;58(2):124–127.
Ananas comosus (L.) Merr. BROMELIACEAE Ananas Pineapple	Bromelain, a proteolytic extract obtained from pineapple stems	Piglets	Administration of bromelain can inhibit Enterotoxigenic *Escherichia coli* (ETEC) receptor activity in vivo and may be useful for prevention of K88+ ETEC-induced diarrhea.	Mynott TL, et al. Oral administration of protease inhibits enterotoxigenic *Escherichia coli* receptor activity in piglet small intestine. Gut 1996;38(1): 28–32.
Ananas Comosus	Enzyme fractions derived from the stem of pineapple	12 rats with full thickness skin burns	Results indicate debridement (the removal of unhealthy tissue) of the injury could be effected rapidly (within 4 hours). Pineapple has potential as a nonsurgical debriding agent.	Rowan AD, et al. Debridement of experimental full-thickness skin burns of rats with enzyme fractions derived from pineapple stems. Burns 1990;16(4):243–246.
Andrographis paniculata (Burm.f.) Nees ACANTHACEAE Kirta King of Bitters	Kan Jang, herbal extract principle ingredient is *Andrographis paniculata*, approximately 2 tablet per day of 100 mg each	Randomized double-blind study; 107 healthy volunteers all approximately 18 years old	No significant difference in the occurrence of colds between the study group and the placebo control. In the third month, there was a significant decrease in the occurrence of cold in the study group compared to the placebo.	Caceres DD, et al. Prevention of common colds with *Andrographis paniculata* dried extract. A pilot double blind trial. Phytomedicine 1997;4(2):101–104.

Andrographis paniculata	Kanjang tablets, standardized *Andrographis paniculata* extract	Controlled, double-blind pilot study: 50 patients	A decrease of the subjective symptoms and duration of symptoms of the common cold were significantly reduced ($p < 0.025$)	Melchior J, et al. Controlled clinical study of standardized *Andrographis paniculata* extract in common cold—a pilot trial. Phytomedicine 1996/1997;3(4):315–318.
Andrographis paniculata	Aqueous extract of *Andrographis paniculata.* Chronic IP infusions by osmotic pumps	Spontaneously hypertensive rats and Wistar-Kyoto rats	Dose-dependent hypotensive effect on systolic blood pressure was studied. Plasma angiotensin-converting enzyme activities as well as kidney thiobarbituric acid level were significantly decreased in extract-treated versus controls.	Zhang CY, Tan BK. Hypotensive activity of aqueous extract of *Andrographis paniculata* in rats. Clin Exp Pharm Phys 1996;23(8):675–678.
Andrographis paniculata	*Adrographis paniculata*	Dog model	Findings indicate that *Andrographis paniculata* may decrease the negative effects of ischemic reperfusion (by decreasing the harmful effects of free-radical damage).	Guo ZL, et al. An experimental study of the mechanism of *Andrographis paniculata* Nees(APN) in alleviating the Ca(2+)-overloading in the process of myocardial ischemic reperfusion. J. Tongji Med Univ 1995;15(4):205–208.
Andrographis paniculata	*Andrographis paniculata* tablets (250 mg), 4 tablets tid 25 patients given cotrimoxazole 2 tablets bid, 25 patients received norfloxacin 200 mg bid	Clinical trial: 100 patients with renal stones and normal renal function	Results show that post Extracorporeal Shock Wave Lithotripsy (ESWL) pyuria and hematuria in patients receiving *Andrographis paniculata* were reduced to 0.69 and 0.55 compared to pre-ESWL value. Authors conclude *Andrographis paniculata* is beneficial for post-ESWL urinary tract infection.	Muangman V, et al. The usage of *Andrographis paniculata* following Extracorporeal Shock Wave Lithotripsy (ESWL). J Med Assoc Thailand 1995;78(6):310–313.
Andrographis paniculata	Extract of *Andrographis paniculata*	Clinical trial: patients with stenosis	Extract can significantly alleviate atherosclerotic stenosis and restenosis after experimental angioplasty. A 4-week follow-up showed dilated iliac arteries in control group all had severe restenosis, but *Andrographis paniculata*-treated group had no or only mild restenosis occur.	Wang DW, Hua YZ. Prevention of atherosclerotic arterial stenosis and restenosis after angioplasty with *Andrographis paniculata* nees and fish oil. Chinese Med J (English Ed) 1994;107(6):464–470.
Andrographis paniculata	*Andrographis paniculata* 3 g/d or 6 g/d for 7 days or Paracetamol	Randomized, double-blind study: 152 adults with pharyngo-tonsillitis	Efficacy of paracetamol or high dose of *Andrographis paniculata* was significantly more effective than low dose of *Andrographis paniculata* at day 3 in terms of the relief of fever and sore throat.	Thamlikitkul V, et al. Efficacy of *Andrographis paniculata*, Nees for pharyngotonsillitis in adults. J Med Assoc Thailand 1991;74(10):437–442.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Andrographis paniculata	Andrographolide, a diterpene, isolated from *Andrographis paniculata*	Rats	*Andrographis paniculata* exhibited strong choleratic action when administered IP. The substance induced an increase in bile flow and a change in physical properties of bile secretion.	Tripathi GS, Tripathi YB. Choleretic action of Andrographolide obtained from *Andrographis paniculata* in rats. Phytother Res 1991;5:176–178.
Andrographis paniculata	A mixture of *Andrographis paniculata* and *Emblica officinalis*	Human trial: 35 patients hepatitis B^+, hepatitis B^-, and post-hepatitis syndrome	Herbal mixture was administered to patients with Hepatitis B^+, B^-, and post hepatitis syndrome. The mixture demonstrated efficacy in reducing clinical symptoms, improving liver function, and albumin.	Ramji, et al. Effect of Kalmegha and Amlaki compound on viral hepatitis (Koshtha-Shakhashrita Kamala) Aryavaidyan 1992;5(3): 164–169.
Andrographis paniculata	Decoction of *Andrographis paniculata* of 60 ml/ day (equivalent to 40 g of crude drug) in 3 divided doses. Average treatment 23+/− 4 days	Human trial: 60 patients with hepato-cellular jaundice	Hepatocellular jaundice was monitored. Yellow color of the conjunctiva improved 100%, tender hepatic enlargement decreased in 96% within 20 days of treatment. Loss of appetite in 100% was improved after 4–5 days. Several tests were highly significant after treatment: serum bilirubin, alkaline phosphatase, serum transferase.	Tomar GS, Singh RN. Treatment of hepatocellular jaundice with Kalmegh (*Andrographis paniculata*). Aryavaidyan 1990;11(3–3):156–162.
Andrographis paniculata	Alcohol extract of *Andrographis paniculata*	Guinea pigs and rabbits	Extract exhibited significant antidiarrheal activity against *Escherichia coli* enterotoxins in animal models.	Gupta S, et al. Antidiarrhoeal activity of diterpenes of *Andrographis paniculata* (Kal-Megh) against *Escherichia coli* enterotoxin in *in vivo* models. Int J Crude Drig Res 1990;(4):273–283.
Andrographis paniculata	*Andrographis paniculata* leaf extract and andrographolide	Rats	Repeated administration of leaf extract positively effected microsomal drug metabolizing enzyme systems of the rat liver (hepatic microsomal anilinehydroxylase, *N*-demethylase, and *O*-demethylase enzymes).	Choudhury BR, et al. *In vivo* and *in vitro* effects of Kalmegh (*Andrographis paniculata*) extract and andrographolide on hepatic microsomal drug metabolizing enzymes. Planta Med 1987;53: 135–140.

Apium graveolens L. UMBELLIFERAE Ajmoda Celery	Aqueous celery extract administered intraperitoneally	Rats	Serum cholesterol concentration was significantly decreased ($p < 0.05$) compared to controls. Celery extract was effective in preventing the rise of cholesterol level in rats.	Tsi D, Tan BK. Effects of celery extract and 3-N-butylphthalide on lipid levels in genetically hypercholesterolaemic (RICO) rats. Clin Exp Pharmacol Physiol 1996;23(3):214–217.
Apium graveolens	Methanolic extract of the seeds of *Apium graveolens* and *Hygrophila auriculata*	Rats with paracetamol-induced liver damage	A significant hepatoprotective activity of the methanolic extract of the seeds of both plants was reported.	Singh A, Handa SS. Hepatoprotective activity of *Apium graveolens* and *Hygrophila auriculata* against paracetamol and thioacetamide intoxication in rats. J Ethnopharm 1995;15;49(3):119–126.
Apium graveolens	Aqueous celery extract: 2 groups fed high fat diets, 1 group also fed aqueous celery extract	Wistar rats	At the end of 8 weeks, a significant decrease was found in total serum cholesterol, LDL cholesterol, and triglyceride concentrations.	Tsi D, et al. Effects of a aqueous celery (*Apium graveolens*) extract on lipid parameters of rats fed a high fat diet. Planta Med 1995;61(1): 18–21.
Apium graveolens	From celery seed oil, 3-n-butylphthalide, sedanolide, and p-mentha-2,8-dien-1-ol were tested	Mice with benzo[a] pyrene-induced tumorigenesis	After treatment with compounds, tumor incidence was decreased from 68% to 30% and 11%. A reduction in tumor multiplicity of 67% and 83% was observed with 3-n-butylphthalide and sedanolide. Data indicate both were active in tumor inhibition.	Zheng GQ, et al. Chemoprevention of benz-[a]pyrene-induced forestomach cancer in mice by natural phthalides from celery root seed oil. Nutr Cancer 1993;19(1):77–86.
Apium graveolens	80% ethanolic extract of *Achillea santolina, Apium graveolens, Matricaria chamomilla, Myrtus communis, Withania somnifera* and Acetylsalicylic acid used as standard drug.	Rats with carrageenan-induced paw edema	Results showed that the plants possessed varying degrees of anti-inflammatory activity in the following descending order: *Withania somnifera, Apium graveolens, Achillea santolina, Matricaria chamomilla, Myrtus communis.*	Al-Hindawi MK, et al. Anti-inflammatory activity of some Iraqi plants using intact rats. J Ethnopharm 1989;26(2):163–168.
Areca catechu L. PALMAE Pooga Areca nut	Betel nut chewing	Mailed questionnaire, 223 patients with inflammatory bowel disease	116 responses to questionnaire compared to healthy members of the community. It appears that smoking and betel nut chewing reduce the risk of developing ulcerative colitis	Lee CN, et al. Betel nut and smoking. Are they both protective in ulcerative colitis? A pilot study. Arquivos de Gastroenterol 1996;33(1):3–5.
Areca catechu	Betel nut chewing	Controlled clinical trial: 40 oral cancer; 40 tobacco chewers; 40 healthy individuals	A significant increase in mitomycin C (MMC)-induced sister chromatid exchange (SCE)/cell values were observed among oral cancer patients (betel nut chewers) as compared to healthy nonchewer controls.	Trivedi AH, et al. Elevated mutagen susceptibility in cultured lymphocytes of oral cancer patients. Anticancer Res 1995;15(6B): 2589–2592.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Areca catechu	Betel quid chewing consisting of betel leaf, areca quid, catechu and slaked lime (without tobacco)	Human trial: 5 volunteers	Reactive oxygen species, OH radical, are formed in the human oral cavity during betel quid chewing and may be implicated in the genetic damage that has been observed in oral epithelial cells of chewers.	Nair UJ, et al. Ortho- and metatyrosine formation from phenylalanine in human saliva as a marker of hydroxyl radical generation during betel quid chewing. Carcinogenesis (Oxford) 1995;16(5):1195–1198.
Areca catechu	Chewing and smoking habits and oral submucous fibrosis (OSF)	Case-controlled clinical trial: 157 cases and 157 controls	Increased risk of oral submucous fibrosis was observed for areca nut chewing. When the habit was practiced alone, appeared to have highest risk followed by "paan" with or without tobacco. Daily consumption rates appeared to be more important with respect to risk than lifetime duration of habit.	Maher R. Role of areca nut in the causation of oral submucous fibrosis: a case-control study in Pakistan. J Oral Pathol Med 1994; 23(2):65–69.
Areca catechu	Areca nut powder added to feed	Mice	Areca nut decreased mace-induced increases in hepatic glutathione-S-transferase and sulphhydryl levels and elevated further increases in the levels of cytochrome b5 and P-450.	Singh A, Rao AR. Modulatory effect of areca nut on the action of mace (*Myristica fragrans*, Houtt) on the hepatic detoxification system in mice. Food Chem Toxic 1993;31(7): 517–521.
Areca catechu	Oral habits	Retrospective study: 143 men and women with oral squamous carcinoma	Analyses confirmed an association between nut chewing and cheek cancer. The data showed that areca nut habit with or without tobacco use is important in the development of oral squamous carcinoma.	van Wyk CW, et al. The areca nut chewing habit and oral squamous cell carcinoma in South African Indians. A retrospective study. South African Med J 1993;83(6): 425–429.
Areca catechu	Areca nut decoction	Case study	A case study demonstrated the effectiveness of areca nut decoction in the treatment of *Diphyllobothrium latum* infection	Fu HH, et al. Areca nut in the treatment of diphyllobothrium latum infection: Report of a case study. Chin Med J 1951;69: 407–409.

Artemisia vulgaris L. COMPOSITAE Nagadamni Mugwort	Infusion: *Urtica dioica, Hypericum performatum, Matricaria recutita, Plantaginis majoris, Herba millefolii, Betula, Artemisia vulgaris, Fragaria vesca*	Human trial: 22 patients post-prostate adenomectomy	An herbal infusion used to irrigate the bladder after prostate adenomectomy reduced post operative blood loss, bacteriuria, prevented hemorrhagic and purulent inflammation.	Davidov MI, et al. Postadenomectomy phytoperfusion of the bladder. Urologiya I Nefrologiya 1995;0(5): 19–20.
Asparagus racemosus Willd. ASPARAGACEAE Shatauari Asparagus	*Asparagus racemosus, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera*	Mice	All plants significantly inhibited the carcinogen ochratoxin-induced suppression of chemotactic activity and the production of interleukin-1 and tumor necrosis factor-α by macrophages.	Dhuley JN. Effect of some Indian herbs on macrophage functions in ochratoxin A treated mice. J Ethnopharm 1997;58(5):15–20.
Asparagus racemosus	1 capsule 3× per day with lukewarm water containing: *Asparagus racemosus*, 50 mg; *Bergenia ligulata*, 100 mg; *Eclipta alba*, 100 mg; *Myristica fragrans*, 10 mg; *Tinospora cordifolia*, 100 mg; *Tribulus terrestris*, 50 mg; *Withania somnifera*, 50 mg	30 patients with calculi on kidneys, ureters, or bladders	The herbal combination was found to alleviate not only pain but also in its ability to slowly disintegrate both calcium-oxalate and calcium carbonate crystals in a span of 72 hours and complete discharging of crystals within 15–30 days. Complete discharge occurred in greater than 80% of the patients.	Karnick CR. Clinical evaluation of composite Ayurvedic drugs, on calculi, in the kidney and the urinary bladder. Aryavaidyan 1992;6(2):104–108.
Asparagus racemosus	2 g powdered root of *Asparagus racemosus* compared to standard treatment of 10 mg tablet metoclopramide	Clinical crossover study: 8 normal healthy male volunteers	Basal gastric emptying t1/2 was 159.9 that was reduced by *Asparagus racemosus* to 101 ($p < 0.001$) and by metoclopramide to 85.3 ($p < 0.001$). *Asparagus racemosus* and metoclopramide did not differ significantly in their effect.	Dalvi SS, et al. Effect of *Asparagus racemosus* (Shatavari) on gastric emptying time in normal healthy volunteers. J Postgrad Med 1990; 36(2):91–94.
Asparagus racemosus	*Asparagus racemosus, Tinospora cordifolia,* glucan and lithium for 15 days	Mice	When compared with control groups, all four drugs prevented, to varying degrees, leucopenia. Both indigenous plants were potent immunostimulants with effects comparable to lithium and glucan.	Thatte UM, Dahanukar SA. Comparative study of immunomodulating activity of Indian medicinal plants, lithium carbonate and glucan. Methods Find Exp Clin Pharmacol 1988;10(10):639–644.
Azadirachta indica A. Juss. MELIACEAE Arishta Neem	Purified neem extracts, orally delivered	Rats, baboons, and monkeys	Pregnancy was terminated (with oral neem) successfully in rodents and primates with no significant side effects	Talwar GP, et al. Induced termination of pregnancy by purified extracts of *Azadirachta indica* (Neem): Mechanisms involved. Am J Reprod Immunol 1997;37(6):485–491.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Azadirachta indica	Leaf powder of *Azadirachta indica*	Male albino rats	Results suggest a possible reversible antiandrogenic property of the leaves.	Joshi AR, et al. Effect of *Azadirachta indica* leaves on testis and its recovery in albino rats. Indian J Exp Biol 1996;34(11):1091–1094.
Azadirachta indica	Neem oil in mixed in coconut oil (1%–4%)	Controlled field study: exposed body parts of human volunteers	Results revealed 81%–91% mosquito repellant action during 12-hour period of observation from bites of anopheline mosquitoes.	Mishra AK, et al. Use of neem oil as a mosquito repellent in tribal villages of Mandla district, Madhya Pradesh. Indian J Malariol 1995; 32(3):99–103.
Azadirachta indica	Neem cream	Controlled field study: exposed body parts of human volunteers	Application of neem cream to exposed body parts showed 78%, 89%, and 94.4% protection against Aedes, Culex, and Anopheles mosquitoes, respectively. Significant difference was observed between neem cream-treated and untreated group for Aede mosquitoes.	Dua VK. Repellent action of neem cream against mosquitoes. Indian J Malariology 1995;32(2):47–53.
Azadirachta indica	*Azadirachta indica, Boerhavia diffusa, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosanthes dioica, Zingiber officinale.* Extracted in 80% aqueous alcohol ethanol. 1% stock solution used to prepare dilutions. Oral or subcutaneous administration	Mice with septicemia from *Salmonella typhi*	Infected mice were prophylactically administered postinfective, preinfective, single and multiple doses of extract and had a significant therapeutic effect in reducing septicemia.	Sohni YR, et al. Prophylactic therapy of *Salmonella typhi* septicemia in mice with a traditionally prescribed crude drug formulation. J Ethnopharm 1995;45:141–147.
Azadirachta indica	Extracts of neem leaves	Rats	Neem dose dependently decreased gastric ulcer severity in rats ubjected to stress and also decreased ethanol provoked gastric mucosal damage.	Garg GP, et al. The gastric antiulcer effects of the leaves of the Neem tree. Planta Med 1993;59:215–217.

Azadirachta indica	*Azadirachta indica* and *Curcuma longa* paste	Pilot study: 814 patients with scabies	In 97% of the cases, a cure of scabies was obtained within 3–15 days of treatment.	Charles V, Charles SX. The use and efficacy of *Azadirachta indica* ADR ("Neem") and *Curcuma longa* ("Turmeric") in scabies: A pilot study. Trop Geogr Med 1992;44: 178–181.
Azadirachta indica	A decoction of the following herbs: *Azadirachta indica, Boerhaavia diffusa, Cedrus deodara, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosantes lobata; Inula raceomosa* 2 g, 8 hourly; *Commiphora mukul,* 1/2 g 8 hourly; *Urgenic indica* 100 mg 8 hourly	14 cases of congestive heart failure	All patients were given the decoction and *Urgenic indica*. Patients with ischemic heart disease, cardiomyopathy and cor pulmonale were given powder of *Inula racemosa*, while patients with rheumatic heart disease were given *Commiphora mukul*. After 2 weeks of treatment all 10 patients were cured completely, 2 had bradycardia and 2 were refractory.	Sati RB, Sharma RK. Management of congestive cardiac failure with certain Ayurvedic drugs. Aryavaidyan 1990;4(2):123–126.
Azadirachta indica	Group I: *Azadirachta indica* powder 4 g/3× day, Paste of *Abrus precatorius*, and *Plumbago zeylanica* applied externally Group II: Powder of *Phyllanthus emblica*, *Acacia catechu* and seeds of *Psoralea corylifolia* 4 g/3× day	Random trial: 60 patients with vitiligo	Encouraging improvement in treating vitiligo (appearance of white patches on the skin) was noted in both groups.	Nair RP, et al. Clinical evaluation of Ayurvedic preparations in vitiligo. J Res Ayur Siddh 1987;VIII(1–2): 30–38.
Azadirachta indica	Neem oil applied with an applicator	Human and animal trial: rats, rhesus monkeys, humans	Used intravaginally, neem was 100% effective in preventing pregnancy in subjects.	Sinha KC, et al. Neem oil as a vaginal contraceptive. Indian J Med Res 1984;79:131–136.
Bacopa monnieri (L.) Pennell SCROPHULARIACEAE Brahmi Brahmi	Ayurvedic preparation of *Aegle marmelos* and *Bacopa monnieri* for 6 weeks versus standard therapy of clidinium bromide, chlordiazepoxide, and isaphagulla	Double-blind, randomized trial: 169 patients with irritable bowel syndrome (IBS)	Ayurvedic preparation was effective in 64.9% whereas standard therapy was useful in 78.3%. Placebo patients improved 32.7%. Therapy was particularly beneficial in the diarrhea-predominant form of IBS.	Yadav SK, et al. Irritable bowel syndrome: therapeutic evaluation of indigenous drugs. Indian J Med Res Sect A-Infect Dis 1989;90: 496–503.
Bacopa monnieri	Constituents of *Bacopa monnieri* aqueous suspension of bacosides A and B	Rats	Bacosides appeared to have a significant effect on mental retention capacity of rats by improving responses.	Singh HK, et al. Effect of Bacosides A and B on avoidance responses in rats. Phyto Res 1988;2(2):70–75.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Bacopa monnieri	Aqueous suspension of an alcoholic extract of *Bacopa monnieri* (40 mg/kg orally) for 3 or more days	Rats	In Shock-Motivated Brightness-Discrimination Reaction, the treated group showed significant better acquisition, improved retention, and delayed extinction. In Active Conditioned Flight Reaction, animals showed a significant shorter reaction time than controls in flight reaction.	Singh HK, Dhawan BN. Effect of *Bacopa monniera* Linn. (brahmi) extract on avoidance responses in rat. J Ethnopharm 1982;5(2):205–214.
Boerhavia diffusa L. NYCTAGINACEAE Punarnaua Spreading hogweed	Aqueous or powder root of *Boerhavia diffusa*. Aqueous extract (2 ml/kg) of roots	Rats	Extract exhibited marked protection of a majority of serum parameters. Aqueous form had more hepatoprotective effect than powder. This may be due to better absorption of the liquid through gastrointestinal tract.	Rawat AK, et al. Hepatoprotective activity of *Boerhaavia diffusa* L. roots—A popular Indian ethno-medicine. J Ethnopharm 1997;56(1): 61–66.
Boerhavia diffusa	*Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, Terminalia chebula, Zingiber officinale*. Dried and pulverized plants extracted in ethanol together and individually. Metronidazole administered as standard therapy	Golden hamsters with hepatic amoebiasis	Formulation had a maximum cure rate of 73% as a dose of 800 mg/kg per day in hepatic amoebiasis. The average degree of infection to 1.4 compared to 4.2 for controls was reduced.	Sohni YR, Bhatt RM. Activity of a crude extract formulation in experimental hepatic amoebiasis and in immunomodulation studies. J Ethnopharm 1996;54(2–3):119–124.
Boerhavia diffusa	*Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, Terminalia chebula, Zingiber officinale* Dried and pulverized plants extracted in ethanol together and individually. Metronidazole administered as standard therapy	Rats with caecal amoebiasis	Formulation had a curative rate of 89% with average degree of infection (caecal amoebiasis) (ADI) reduced to 0.4 in a group dosed with 500 mg/kg per day as compared with ADI of 3.8 for controls.	Sohni YR, et al. The anti-amoebic effect of a crude drug in formulation of herbal extracts against Entamoeba histolytica *in vitro* and *in vivo*. J Ethnopharm 1995;45(1):43–52.

Boerhavia diffusa	*Azadirachta indica, Boerhavia diffusa, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosanthes dioica, Zingiber officinale.* Extracted in 80% aqueous alcohol ethanol. 1% stock solution used to prepare dilutions. Oral or subcutaneous administration	Mice with septicemia from *Salmonella typhi*	Infected mice were prophylactically administered postinfective, preinfective, single, and multiple doses of extract and had a significant therapeutic effect in reducing septicemia.	Sohni YR, et al. Prophylactic therapy of *Salmonella typhi* septicemia in mice with a traditionally prescribed crude drug formulation. J Ethnopharm 1995;45:141–147.
Boerhavia diffusa	Ethanolic extract of *Boerhavia diffusa* Daily dose of 250 mg/kg	Pregnant albino rats during period of gestation	Extract was found to be devoid of any teratogenic effect as litter size and survival rate of fetuses were same as the control and no fetal anomaly could be detected.	Singh A, et al. An experimental evaluation of possible teratogenic potential in *Boerhaavia diffusa* in Albino rats. Planta Med 1991;57(4): 315–316.
Boerhavia diffusa	Alcoholic extract of whole plant of *Boerhavia diffusa*. 500 mg/kg at 48, 24, and 2 hours before and 6 hours after CC14 administration	Rats and mice	Extract exhibited hepatoprotective activity against induced hepatoxicity, and showed an increase in normal bile flow suggesting a strong choleretic activity. No signs of toxicity with an oral dose up to 2 g/kg.	Chandan BK, et al. *Boerhaavia diffusa:* A study of its hepatoprotective activity. J Ethnopharm 1991;31(3): 299–307.
Boerhavia diffusa	A decoction of the following herbs: *Azadirachta indica, Boerhaavia diffusa, Cedrus deodara, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosantes lobata, Inula racemosa* 2 g, 8 hourly; *Commiphora mukul,* 1/2 g 8 hourly; *Urgenic indica* 100 mg, 8 hourly	14 cases of congestive heart failure	All patients were given the decoction and *Urgenic indica*. Patients with ischemic heart disease, cardiomyopathy and cor pulmonale were given powder of *Inula racemosa,* while patients with rheumatic heart disease were given *Commiphora mukul*. After 2 weeks of treatment all 10 patients were cured completely, 2 had bradycardia, and 2 were refractory.	Sati RB, Sharma RK. Management of congestive cardiac failure with certain Ayurvedic drugs. Aryavaidyan 1990;4(2):123–126.
Boswellia serrata Roxb.ex Colebr. BURSERACEAE Shallaki Indian olibanum	*Boswellia serrata* gum resin preparation. Dosage of 350 mg 3× per day for 6 weeks or as a control sulfasalazine (1 g 3× per day)	Controlled clinical trial	Patients suffering from ulcerative colitis, all parameters tested improved after treatment, the results being similar to controls: 82% treated went into remission, for the sulfasalazine-treated group 75%.	Gupta I, et al. Effects of *Boswellia serrata* gum resin in patients with ulcerative colitis. Eur J Med Res 1997;2(1):37–43.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Boswellia serrata	H15, a special extract of the gum resin of *Boswellia serrata* 3×2 or 3×3 tablets as a 400 mg extract.	Controlled clinical trial: 260 patients with rheumatoid arthritis	The extract was effective in reducing symptoms of rheumatoid arthritis in 50%–60% of patients involved. There was a significant reduction in swelling and pain compared to the placebo.	Etzel R. Special extract of *Boswellia serrata* (H15) in the treatment of rheumatoid arthritis Phytomedicine 1996;3(1):91–94
Boswellia serrata	Boswellic acids	Rats	Boswellic acids were found to possess significant anti-inflammatory and complement-inhibitory activities.	Kapil A. Effect of Boswellic acids on complement in adjuvant- and carrageenan-induced inflammation. Inflammopharmacology 1994;2: 361–367.
Boswellia serrata	Acetyl-boswellic acids (ac-BA) isolated from gum resin of *Boswellia serrata*	Mice treated with galactos-amine endotoxin to induce hepatitis	Mice were given the extract 1 hour before administration with galactosamine/ endotoxin. The extract significantly reduced serum enzyme activities. The extract's protection was interpreted in terms of its ability to inhibit the formation of leukotrienes.	Safayhi H, et al. Protection by boswellic acid against galactosamine/endotoxin-induced hepatitis in mice. Biochem Pharmacol 1991;41(10): 1536–1537.
Boswellia serrata	*Withania somnifera* root 450 mg; *Boswellia serrata* Oleo gum resin 100 mg; *Curcuma longa* rhizome 50 mg; and Zinc complex 50 mg	Double-blind, placebo-controlled trial: 42 patients	Osteoarthritis patients were randomly allocated to receive the placebo or the herbomineral formulation. A significant drop was noted in the severity of pain ($p < 0.001$) and disability score ($p < 0.05$)	Kulkarni RR, et al. Treatment of osteoarthritis with a herbal formulation: a double-blind, placebo-controlled, cross-over study. J Ethnopharm 1991; 33(1–2):91–95.
Boswellia serrata	Alcoholic extract of salai guggal was prepared as a fine homogenized suspension in 2% gum acacia and administered orally	Rats and mice	To study cellular and humoral immune responses and leucocytes migration, oral administration of the extract strongly inhibited antibody production and cellular responses, inhibited the infiltration of polymorphonuclear leucocytes, and decreased the volume of pleural exudate.	Sharma ML, et al. Effect of salai guggal ex-*Boswellia serrata* on cellular and humoral immune responses and leucocyte migration. Agents Actions 1988;24(1–2):161–164.
Boswellia serrata	Alcoholic extract of salai guggal	Rats and mice	The extract displayed marked anti-inflammatory activity in carrageenan-induced edema in rats and mice. It was equally effective in adrenalectomised rats.	Singh GB, Atal CK. Pharmacology of an extract of salai guggal ex-*Boswellia serrata*, a new non-steroidal anti-inflammatory agent. Agents Actions 1986;18(3–4):407–412.

Butea monosperma (Lam.) Taub. LEGUMINOSAE Palasa Bastard teak	Pippali Rasayana, an Ayurvedic drug prepared from *Butea monosperma* stems and leaves and *Piper longum* dried fruits. Administered orally at 1 g PO 3× per day for 15 days	Controlled clinical trial: 25 patients with giardiasis; 25 controls	Complete disappearance of *Giardia lamblia* from stools in 23/25 (92%) patients resulted. Symptoms of ill health, abdominal discomfort, presence of mucus, pus cells and red blood cells significantly reduced. Spontaneous recovery in 20% of the cases was recorded in the placebo control group	Agarwal AK, et al. Management of giardiasis by a herbal drug 'Pippali Rasayana': A clinical study. J Ethnopharm 1997;56(3):233–236.
Butea monosperma	Pippali Rasayana prepared from *Butea monosperma* stems and leaves and *Piper longum* dried fruits administered orally	Two groups of mice with a control	Mice infected with *Giardia lamblia* trophozoites that were treated with the herbal formula produced up to 98% recovery from the infection.	Agarwal AK, et al. Management of giardiasis by an immunomodulatory herbal drug Pippali rasayana. J Ethnopharm 1994;44(3):143–146.
Butea monosperma	Ethanol or water extracts of powdered plant material: *Adhatoda vasica, Abrus precatorius, Acacia arabicva, Aloe barbadensis, Anethum sowa, Apium petroselinium, Banbusa arundensis, Blepharis edulis, Butea monosperma, Hibiscus rosa-sinensis, Lepidum sativum, Mesua ferrea, Moringa oleifera, Mucuna pruriens, Raphanus sativus, Sida cordifolia, Trachyspermum ammai*	Rats orally dosed for 10 days	Aqueous or 90% ethanol extracts of the plants were studied in rats for 10 days after insemination with special reference to effects of fetal development. Leaf extracts of *Moringa oleifera* and *Adhatoda vasica* were 100% abortive at doses equivalent to 175 mg/kg starting dry material. Only the flowers of *Acacia arabica* and *Hibiscus rosa-sinensis* appeared to lack teratologic potential at the doses tested.	Nath D, et al. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. J Ethnopharm 1992;36:147–154.
Butea monosperma	Crude powder mixture of equal parts of: *Ailanthus excelsa, Butea monosperma, Embelia ribes, Erythrina indica, Mallotus philippensis, Orxylum indicum*	75 patients with various worm infestations	The cure rate in group A was 80%, group B treated with mebendazole was 92%, and group C was 76%. Cure rate showed negative *Ascaris lumbricoides* ova in stool report for three consecutive days.	Sarma BP, Ojha D. The management of Gandupada krimi (*Ascaris lumbricoides*) with indigenous drugs. Aryavaidyan 1992;5(3):170–172.
Butea monosperma	Alcoholic suspension of *Butea monosperma* seeds. Dose of 175 and 359 mg/kg body weight	Albino rats	At the two doses, *Butea monosperma* showed abortifactant activity 38.46% and 65.78%, respectively. In cases where pregnancy continued, birth defects were noticed 61.54% and 34.22%, respectively.	Seth IN, et al. Teratological evaluation of seed suspension of *Butea monosperma* in rats. Fitoterapia 1990;LXI(6):547–550.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Butea monosperma	Butin isolated from seeds of *Butea monosperma*. Oral administration to rats at 5, 10, and 20 mg per rat day 1–5 of pregnancy	Adult female rats	Anti-implantation activity in 40%, 70%, and 90% of the treated animals resulted. At lower doses, there was a dose-dependent termination of pregnancy and a decrease in the number of implantation sites.	Bhargava SK. Estrogenic and postcoital anticonceptive activity in rats of butin isolated from *Butea monosperma* seed. J Ethnopharm 1986;18(1):95–101.
Capsicum annuum L. SOLANACEAE Katuvira Spanish Pepper	Rats fed the following plants for 8 weeks: *Brassica* species, *Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rats	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine and *Zingiber officinale* prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary *Cuminum cyminum, Trigonella foemum-graecum, Brassica* species and *Ferula foetida* brought about decreases in the levels of phosphatases and sucrase. The positive influences of a good number of spices on terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.
Capsicum annuum	Intranasal capsaicin	Double-blind, placebo-controlled trial	Patients with cluster headaches received intranasal capsaicin and experienced a significant decrease in headache severity relative to controls.	Marks DR, et al. A double-blind placebo controlled trial of intranasal capsaicin for cluster headache. Cephalalgia 1993;13(2): 114–116.
Capsicum annuum	Topically applied capsaicin 0.075% cream	Randomized vehicle-controlled trial: 143 patients	All efficacy variables: related to herpetic neuralgia showed a significant improvement at nearly all time points throughout the study for both patient groups: reduction in pain,	Watson CPN, et al. A randomized vehicle-controlled trial of topical capsaicin in treatment of postherpetic neuralgia. Clin Ther 1993;15(3):510–526.

		with chronic post-herpetic neuralgia	or changes in pain severity, pain relief, and functional capacity scale.	
Capsicum annuum	0.075% capsaicin cream. Applied 4× per day for 8 weeks	Double-blind, vehicle-controlled study	Capsaicin cream was applied topically to areas of pain in patients with diabetic neuropathy. The cream produced significant relief for patients compared to those receiving a nonactive cream.	The Capsaican Study Group. Treatment of painful diabetic neuropathy with topical capsaican: a multicenter double-blind, vehicle-control-led study. Arch Int Med 1991;151(11):2225–2229.
Capsicum annuum	Nasal capsaicin	Human trial: 16 cluster headache patients	Cluster headache patients (11/16) experienced cessation of headaches after treatment with capsaicin solution in the nostril of the same side of the headache. Another 2 patients experienced 50% reduction in pain.	Raloff J. Hot prospects for quelling cluster headaches. Sci News 1991; 13:20–21.
Capsicum annuum	0.025% capsaicin cream	Double-blinded controlled trial: 10 subjects	The study indicates 0.025% capsaicin is a safe topical agent with demonstrable clinical effects on small fiber function but not on large fiber or autonomic function.	Walker FO, Lewis SF. Somesthetic and electrophysiologic effects of topical 0.025% capsaicin in man. Reg Anesth 1990;15:61–66.
Capsicum annum	Capsaicin cream 0.025% 4× daily	Case study: 47-year-old diabetic with below the knee amputation	After amputation, severe pain developed in both stumps. Application of capsaicin relieved the pain completely after day 7 with no local irritation. On stopping the cream, pain returned after 2 days.	Rayner HC, et al. Relief of local stump pain by capsaicin cream, Lancet 1989;25:1276–1277.
Capsicum annuum	Spice principles: capsaicin, curcumin, piperine. Plants: *Brassica, Cinnamomum zeylanicum, Cuminum cymimum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.
Capsicum annuum	Capsaicin cream or placebo treated for a 6-week period	Double-blind controlled trial: 32 patients with chronic post-herpetic neuralgia	Significant increased relief in capsaicin-treated group compared with vehicle was observed for all efficacy variables. After 6 weeks, 80% of capsaicin-treated patients, experienced some pain relief.	Bernstein JE, et al. Topical capsaicin treatment of chronic postherpetic neuralgia. J Am Acad Dermatol 1989;21:265–270.

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Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Capsicum annuum	Capsaicin cream, 0.025%	2 case studies	Male, 67 years old, with *Diabetes mellitus* presented with pain in the outer aspects of left thigh. Capsaicin treatment 3× per day resulted in total relief of dysesthesias within 5 days. Male, 57 years old, with diabetic neuropathy was treated with capsaicin 4× per day. Within 2 weeks he stated pain was relieved to a much greater extent.	Ross DR, Varipapa RJ. Treatment of painful diabetic neuropathy with topical capsaicin. N Engl J Med 1989;321(7):474–475.
Capsicum annuum	Topical 0.025% capsaicin	Human trial: 18 patients with post-mastectomy pain syndrome	After a variety of treatment approaches (to reduce pain) were unsatisfactory, 12 of the 14 patients completing treatment with capsaicin showed improvement after 4 weeks and 8 (57%) were judged to be good or excellent responses.	Watson CP, et al. The post-mastectomy pain syndrome and the effect of topical capsaicin. Pain 1989;38:177–186.
Capsicum annuum	Topical 0.025% capsaicin	Human trial: 33 patients with post-herpetic neuralgia	39% entering the trial achieved at least a good result and 55% were improved or better; 56% of the 23 patients completing the study had good or excellent pain relief after 4 weeks; 78% of the 23 noted at least some improvement in pain.	Watson CP, et al. Post-herpetic neuralgia and topical capsaicin. Pain 1988;33:333–340.
Capsicum annuum	Capsaicin cream, 0.025%. Standard therapy included 1.5 mL betamethasone sodium phosphate, 1.5 mL triamcinolone acetonide	Case study	Healthy male, 66 years old, presented with herpes zoster. After 18 months of standard treatment, subject initiated capsaicin treatment. Discomfort decreased within 2 days (4× per day application). Four weeks after initiating treatment, patient awoke with no pain.	Hawk RJ, Millikan LE. Treatment of oral postherpetic neuralgia with topical capsaicin. Int J Dermatol 1988;27(5):336.
Carum carvi L. UMBELLIFERAE Krishnajira Caraway	For obstipation, a combination of *Rhamus frangula, Citrus aurantium, Carum carvi*. For main disease: a combination of *Symphitum officinalis* and *Calendula officinalis*	Human trial: patients with duodenal ulcer or gastroduo-denitis, all with obstipation	The laxative herb combination was effective in 100% of the patients. Daily defecation in 90.6% of patients and every second day defecation was obtained 9.4% of the patients.	Matev M, et al. Use of an herbal combination with laxative action on duodenal peptic ulcer and gastroduodenitis patients with a concomitant obstipation syndrome [Bulgarian]. Vutr Boles 1981;20(6):48–51.

Cassia fistula L. LEGUMMINOSAE Araghada Indian laburnum	Aqueous fraction of leaves of *Cassia fistula*. Dosages of 300, 500, and 100 mg/kg	Mice	*Cassia fistula* produced a significant decrease in glycemia and in the glucose tolerance test.	Avella E, et al. Evaluation of traditional medicine: Effects of *Cajanus cajan* L. and of *Cassia fistula* L. on carbohydrate metabolism in mice [Spanish]. Rev Med Panama 1991;16(1):39–45.
Cassia fistula	Legume *Cassia fistula*	Albino rats	Administration of *Cassia fistula* produced a significant decrease in blood and liver total lipids. Brain, spleen, kidneys and heart followed a similar trend but with moderate effect. Blood, liver, kidneys, spleen and heart total cholesterol significantly decreased. The level of triglycerides was markedly improved.	el-Saadany SS, et al. The biochemical role and hypocholesterolaemic potential of the legume *Cassia fistula* in hypercholesterolaemic rats. Nahrung 1991;35(8):807–815.
Cassia fistula	Whole seed powder of *Cassia fistula*	Rat, golden hamster and humans	*Cassia fistula* was found to be amoebicidal, cysticidal, and cured experimental caecal amoebiasis, hepatic amoebiasis and intestinal amoebiasis of humans.	Shukla SC, Das SR. Cure of Amoebiasis by seed powder of *Cassia fistula*. Int J Crude Drug Res 1988;26(3):141–144.
Cedrus deodara (Roxb. ex D. Don) G. Don PINACEAE Devadaru Deodar	Extracts of *Cedrus deodara* and *Pongamia glabra*. Charmil in the twin formulations of gel and ointment	Rabbits	Extract was tried against mixed infestations of *Psoroptes cuniculi* (ear canker) and *Notoedres cati* (mange) in a colony of laboratory rabbits. Two applications, 1 week apart, cured the rabbits completely.	Sangwan AK, et al. Clinical efficacy of a herbal gel and ointment (Charmil) against mange in rabbits. Indian Vet J 1994;71(9):925–927.
Cedrus deodara	A decoction of the following herbs: *Azadirachta indica, Boerhaavia diffusa, Cedrus deodara, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosantes lobata, Inula racemosa* 2 g, 8 hourly; *Commiphora mukul*, 1/2 g 8 hourly, *Urgenic indica* 100 mg, 8 hourly	14 cases of congestive heart failure	All patients were given the decoction and *Urgenic indica.* Patients with ischemic heart disease, cardiomyopathy and cor pulmonale were given powder of *Inula racemosa,* while patients with rheumatic heart disease were given *Commiphora mukul.* After 2 weeks of treatment all 10 patients were cured completely, 2 had bradycardia, and 2 were refractory.	Sati RB, Sharma RK. Management of congestive cardiac failure with certain Ayurvedic drugs. Aryavaidyan 1990;4(2):123–126.
Cedrus deodara	Himachalol identified as the major antispasmodic constituent in the wood of *Cedrus deodara*	Cat	Intragastric administration of himachalol or papaverine (100 mg/kg) produced equal inhibition of induced spasm of the intestine, lasting about 2 hours, but the himachalol had a faster onset of action.	Kar K, et al. Spasmolytic constituents of *Cedrus deodara* (Roxb.) Loud: pharmacological evaluation of himachalol. J Pharm Sci 1975;64(2): 258–262.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Cinnamomum zeylanicum Blume LAURACEAE Twak Cinnamon	Aqueous and chloroform extracts *Cinnamomum zeylanicum* 70 mg/kg	Rats	Pregnant female rats treated with both extracts presented an increased number of resorptions. A nonsignificant number of abnormalities were observed in live fetuses.	Pellegatti-Lemonica I, Borro-Macedo AMR. Abortive and/or embryo-fetotoxic effect of *Cinnamomum zeylanicum* leaf extracts in pregnant rats. Fitoterapia 1994;65(5):431–434.
Cinnamomum zeylanicum	*Brassica, Cinnamomum zeylanica, Cuminum cyminum, Zingiber officinale*	Rats	These plants did not show any cholesterol decreasing effect when included in the normal and hypercholesterolemia-inducing diet at about fivefold normal human intake level.	Sambaiah K, Srinivasan K. Effect of cumin, cinnamon, ginger, mustard and tamarind in induced hyper-cholesterolemic rats. Nahrung 1991; 35(1):47–51.
Cinnamomum zeylanicum	*Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.
Clitoria ternatea L. LEGUMINOSAE Aparajita Butterfly pea	Alcoholic extract of *Clitoria ternatea*	Rodents	No abstract available	Kulkarni C, et al. Effect of alcoholic extract of *Clitoria ternatea* Linn. on central nervous system in rodents. Indian J. Exp Biol 1988;26(12):957–960.
Cocos nucifera L. PALMAE Narikela Coconut plant	Hemicellulose and cellulose fiber from *Cocos nucifera*	Rats	The results indicate that hemicellulose rich fiber from *Cocos nucifera* showed a decrease concentration of total cholesterol, LDL and VLDL and an increase in HDL, while cellulose rich *Cocos nucifera* fiber showed no significant alteration.	Sindhurani JA, Rajamohan T. Hypo-lipidemic effect of hemicellulose component of coconut fiber. Indian J Exp Biol 1998;36(8):786–789.
Cocos nucifera	Coconut kernal	Animals	Coconut kernal, thus reduced the mutagenic and carcinogenic effect of chili and 1,2-dimethylhydrazine, respectively.	Nalini N, et al. Histopathological and lipid changes in experimental colon cancer: effect of coconut kernal (*Cocos nucifera* Linn.) and (*Capsicum annum* Linn.) red chili powder. Indian J Exp Biol 1997;35(9):964–971.

Cocos nucifera	Coconut and coconut oil	Clinical Trial: 32 coronary heart disease patients and 16 matched healthy controls.	Consumption of coconut or coconut oil was found to be similar in both groups. The groups did not differ in the fat, saturated fat and cholesterol consumption. The result imply no specific role for coconut or coconut oil in the causation of coronary heart disease in this set of patients.	Kumar PD. The role of coconut and coconut oil in coronary heart disease in Kerala, south India. Trop Doct 1997;27(4):215–217.
Cocos nucifera	Diet consists of tubers, fruit, coconut, fish, and vegetables with a negligible influence of western food and alcohol	Human Trial: 151 subsistence horticultur-alists, 20–86 years	*o*-3 fatty acids and linoleic acid showed potentially beneficial effect with lipo- and apolipo-proteins. Relations of palmitic acid to serum lipids may be explained in terms of endogenous fat synthesis at a low-fat intake, rather than reflecting its relative intake.	Lindeberg S, et al. Lipoprotein composition and serum choleserol ester fatty acids in nonwesternized Melanesians. Lipids 1996;31(2): 153–158.
Cocos nucifera	Source of monounsaturated fatty acids: olive oil; Source of saturated fatty acids: butter Expt A; lard Expt B; coconut oil Expt C; and butter or lard Expt D	Rabbits	These findings do not support the view that replacement of dietary saturated fat with olive oil has a major impact on the development of atherosclerosis in addition to that accounted for by changes in plasma cholesterol levels.	Nielsen LB, et al. Replacement of dietary saturated fat with mono-unsaturated fat: effect on atherogenesis in cholesterol-fed rabbits clamped at the same plasma cholesterol level. Br J Nutr 1995;74(4):509–521.
Cocos nucifera	Low-fat chow diet or one enriched with 10% hydrogenated coconut oil, corn oil, linseed oil or sardine oil	Rats	Whereas saturated fatty acids are proarrhythmic, diets enriched with n-6 or n-3 polyunsaturated fatty acids both exert antiarrhythmic effects.	Isensee H, Jacob R. Differential effects of various oil diets on the risk of cardiac arrhythmias in rats. J Cardiovasc Risk 1994; 1(4):353–359.
Cocos nucifera	Hydrogenated coconut oil and salmon oil	Rats	Compared with rats fed hydrogenated coconut oil diets, those fed salmon oil diets had enhanced LDL-HDL1 and HDL2-3 but lower VLDL total apolipoproteins.	Bouziane M, et al. Changes in fatty acid compositions of total serum and lipoprotein particles, in growing rats given protein-diets deficient with either hydrogenated coconut or salmon oils as fat sources. Br J Nutr 1994; 71(3):375–387.
Cocos nucifera	*Cocos nucifera* pollen extract immunotherapy (CPE-IT)	Clinical Trial: 96 patients allergic to *Cocos nucifera* pollen	The clinical status of the patients measured by the symptom-medication scores demonstrated that *Cocos nucifera* pollen-allergic patients had significant ($p < 0.005$) clinical improvement after CPE-IT compared to placebo treatment.	Karmakar PR, et al. Placebo-controlled immunotherapy with *Cocos nucifera* pollen extract. Int Arch Allergy Immunol 1994;103(2): 194–201.
Cocos nucifera	200 g consumed 12 or 24% sesame oil or coconut oil diets or a control diet (14% corn oil) ad libitum for 4 weeks	Rats	There were no differences among groups in the distribution of cholesterol and oleic acid either in the lymph lipoproteins or in the lipid classes.	Satchithanandam S, et al. Coconut oil and sesame oil affect lymphatic absorption of cholesterol and fatty acids in rats. J Nutr 1993;123(11): 1852–1858.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Cocos nucifera	Young coconut water	Human trial	Young coconut water can be used with early refeeding as a home glucose electrolyte oral rehydration solution in early stages of mild diarrheal disease. It should not be used in patients with severe cholera, or with those who are dehydrated and/or in whom renal function is impaired.	Adams W, Bratt DE. Young coconut water for home rehydration in children with mild gastroenteritis. Trop Geogr Med 1992;44(1–2): 149–153.
Cordia myxa L. BORAGINACEAE Sleshmataka Sebesten plum	Petroleum ether and alcohol extracts of *Cordia francisci, Cordia myxa* and *Cordia serratifolia* leaves	Rats	Results obtained showed extracts have a significant analgesic, antiinflammatory and antiarthritic activity in the rat.	Ficarra R, et al. Leaf extracts of some *Cordia* species: analgesic and anti-inflammatory activities as well as their chromatographic analysis. Farmaco 1995;50(4):245–256.
Coriandrum sativum L. UMBELLIFERAE Dhanyaka Coriander	Plants include: leaves of *Agrimonia eupatoria, Alchemilla vulgaris,* bulbs of *Allium sativum, Chelidonium majus, Convallaria majalis,* seeds of *Coriandrum sativum, Eucalyptus globulus,* roots of *Glycyrrhiza glabra,* dried berries of *Juniperus communis, Medicago sativa, Rubus fraticosus*	Mice	Treatment with *Agrimonia eupatoria, Medicago sativa, Coriandrum sativum, Eucalyptus globulus* and *Juniperus communis* reduced the level of hyperglycemia during development of streptozotocin diabetes in mice. This was associated with reduced polydipsia (except *Coriandrum sativum*) and a reduced rate of weight loss (except *Agrimonia eupatoria*).	Swanston-Flatt SK, et al. Traditional plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice. Diabetologia 1990;33(8):462–464.
Crocus sativus L. IRIDACEAE Kumkana Saffron	Liposome encapsulation of saffron	Mice	Saffron effectively enhanced antitumor activity towards Sarcoma-180 and Ehrlich ascites carcinoma solid tumors. Significant inhibition in the growth of these tumors was observed compared with controls.	Nair SC, et al. Effect of saffronon thymocyte proliferation, intracellular glutathione levels and its anti-tumor activity. Biofactors 1992; 4(1):51–54.
Crocus sativus	Topical application of *Crocus sativus* and *Nigella sativa* extracts; *Crocus sativa*: Oral dose	Mice	Topical application inhibited 2-stage initiation/promotion skin carcinogenesis. Oral administration restricted tumor incidence to 10%	Salomi MJ, et al. Inhibitory effects of *Nigella sativa* and saffron (*Crocus sativus*) on chemical carcinogenesis in mice. Nutrition

	of 100 mg/kg weight; IP dose; *Nigella sativa* IP 100 mg/kg weight		compared with 100% in 20-methylcholanthrene (MCA)-treated controls. Both *Nigella sativa* and *Crocus sativus* restricted tumor incidence to 33.3% and 10%, respectively, compared with 100% in MCA-treated controls	Cancer 1991;16(1):67–72.
Crocus sativus	Saffron extracted with ethanol (95%) and purified. Dose of 200 mg/kg weight	Mice	Oral administration of saffron increased the lifespan of sarcoma-180, Ehrlich ascites Carcinoma and Dalton's lymphoma ascites tumor bearing mice to 111%, 83.5%, and 112.5%, respectively.	Nair SC, et al. Antitumor activity of saffron (*Crocus sativus*). Cancer Lett 1991;1;57(2):109–114.
Cuminum cyminum L. UMBELLIFERAE Jeeraka Cumin seed	*Allium cepa, Allium sativa, Brassica oleracea, Cucurbita ficifolia, Cuminum cyminum, Cucumis sativus, Lactuca sativa, Opuntia streptacantha, Phaseolus vulgaris, Psidum guajava, Spinacea oleracea*	27 healthy rabbits	Tolbutamide, *Cucurbita ficifolia, Phaseolus vulgaris, Opuntia streptacantha, Spinacea oleracea, Cucumis sativus,* and *Cuminum cyminum* decreased significantly the area under the glucose tolerance curve and the hyperglycemic peak. *Brassica oleracea, Allium cepa* and *Allium sativum* only decreased the hyperglycemic peak. The glycemic decreases caused by *Psidum guajava, Brassica oleracea* and *Lactuca sativa* were not significant.	Roman RR, et al. Antihyperglycemic effect of some edible plants. J Ethnopharm 1995;48(1):25–32.
Cuminum cyminum	Rats fed for 8 weeks the following plants: *Brassica* species, *Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rats	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine and *Zingiber officinale* prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary *Cuminum cyminum, Trigonella foenum-graecum, Brassica* species and *Ferula foetida* brought about decreases in the levels of phosphatases and sucrase. The positive influences of a good number of spices on terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.

(*continued*)

TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Cuminum cyminum	*Alternanthera sessilis, Cuminum cyminum, Curcuma longa, Ferula asafoetida, Ocimum sanctum, Moringa oleifera, Papaver somnifera, Piper longum, Sylanum nigrum*	Mice and rats	*Cuminum cyminum* seeds, *Ocimum sanctum* leaves, *Papaver somnifera* seeds significantly inhibited neoplasia alone. These plants may prove to be valuable anticarcinogens.	Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxic 1992;30(11):953–956.
Cuminum cyminum	*Brassica, Cinnamomum zeylanica, Cuminum cyminum, Zingiber officinale*	Rats	These plants did not show any cholesterol decreasing effect when included in the normal and hypercholesterolemia-inducing diet at about fivefold normal human intake level.	Sambaiah K, Srinivasan K. Effect of cumin, cinnamon, ginger, mustard and tamarind in induced hypercholesterolemic rats. Nahrung 1991; 35(1):47–51.
Cuminum cyminum	Two capsules of 450 mg/each: *Coccinia indica, Cuminum cyminum, Eugenia jambolana, Gymnema sylvestre, Momordica charantia, Phyllanthus niruri, Swertia chirata, Tephrosia purpurea*	20 case studies with *Diabetes mellitus*	Administration of the herbal mixture led to significant decreases in mean blood sugar values.	Karnick CR. A clinical trial of a composite herbal drug in the treatment of Diabetes mellitus (Madhumeha). Aryavaidyan 1991;5(1):36–46.
Cuminum cyminum	Cumin seeds	Swiss mice	Cumin seeds increased the glutathione-S-transferase activity by more than 78% in stomach, liver and esophagus, high enough to be considered protective agents against carcinogenesis. Glutathione levels were also significantly increased in the three tissues.	Aruna K, Sivaramakrishnan VM. Plant products as protective agents against cancer. Indian J Exp Biol 1990;28(11):1008–1011.

Cuminum cyminum	Spice principles: capsaicin, curcumin, piperine. Plants: *Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.
Cuminum cyminum	Petroleum ether, alcohol, and aqueous extracts of cumin seeds	Female albino rats	The alcoholic extract of *Cuminum cyminum* seeds showed 100% antifertility effect at a dose of 150 mg/kg.	Garg SK. Antifertility screening of plants—Effect of four indigenous plants of early pregnancy in female albino rats. Indian J Med Res 1976;64(8):1133–1135.
Cuminum cyminum	*Cuminum cyminum* and *Nigella sativa* powders	Mature female albino rats	*Cuminum cyminum* has a proliferative action on the breast tissue but no galactogogue (increase in milk yield of lactating mother) action.	Agrawalaa IP, et al. Galactogogue action of *Cuminum cyminum* and *Nigella sativa*. Ind J Med Res 1968; 56(8):841–844.
Curcuma longa L. ZINGIBERACEAE Haridra Turmeric	Hydrochloric acid extracts of *Curcuma longa*. Equivalent daily dose of 20 mg curcumin	Human trial: health humans	A significant decrease in the levels of serum lipid peroxides was demonstrated.	Ramirez-Bosca A, et al. Antioxidant curcuma extracts decrease the blood lipid peroxide levels of human subjects. Age 1995;18(4): 167–169.
Curcuma longa	Rats fed for 8 weeks the following plants: *Brassica* species, *Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rats	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine and *Zingiber officinale* prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary *Cuminum cyminum, Trigonella foenum-graecum, Brassica* species and *Ferula foetida* brought about decreases in the levels of phosphatases and sucrase. The positive influences of a good number of spices on terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Curcuma longa	*Curcuma longa* 1.5 g/day for 30 days	Clinical trial: smokers, nonsmokers as controls	*Curcuma longa* significantly reduced urinary excretion of mutagens in smokers. In non-smokers there was no change.	Kalpagam P, et al. Effect of turmeric on urinary mutagens in smokers. Mutagenesis 1992;7(2):107–109.
Curcuma longa	Ethanolic extract of rhizomes of *Alpinia galanga* and *Curcuma longa.* Acute dosages 0.5, 1.0, and 3 g/kg body weight. Chronic dosage 100 mg/kg per day	Mice	Toxicities studies were done. No significant mortality compared to controls was noted. The gain in weights of sexual organs and increased sperm motility and sperm counts were observed in both groups. These changes were highly significant in the *Alpinia galanga*-treated group. Both extracts failed to show any spermatotoxic effects.	Qureshi S, et al. Toxicity studies on *Alpinia galanga* and *Curcuma longa*. Planta Med 1992;58(2):124–127.
Curcuma longa	*Azadirachta indica* and *Curcuma longa* paste	Pilot study: 814 patients with scabies	In 97% of the scabies cases, a cure was obtained within 3–15 days of treatment.	Charles V, Charles SX. The use and efficacy of *Azadirachta indica* ADR ('Neem') and *Curcuma longa* ('Turmeric') in scabies: A pilot study. Trop Geogr Med 1992:44: 178–181.
Curcuma longa	*Alternanthera sessilis, Cuminum cyminum, Curcuma longa, Ferula asafoetida, Ocimum sanctum, Moringa oleifera, Papaver somnifera, Piper longum, Sylanum nigrum*	Mice and rats	*Cuminum cyminum* seeds, *Ocimum sanctum* leaves, *Papaver somnifera* seeds significantly inhibited neoplasia alone. These plants may prove to be valuable anticarcinogens.	Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxic 1992;30(11):953–956.
Curcuma longa	*Withania somnifera* root, 450 mg, *Boswellia serrata* Oleo gum resin, 100 mg; *Curcuma longa* rhizome 50 mg; and zinc complex, 50 mg	Double-blind, placebo-controlled trial: 42 patients	Osteoarthritis patients were randomly allocated to receive the placebo or the herbomineral formulation. A significant drop was noted in the severity of pain ($p < 0.001$) and disability score ($p < 0.05$).	Kulkarni RR, et al. Treatment of osteoarthritis with a herbal formulation: a double-blind, placebo-controlled, cross-over study. J Ethnopharm 1991;33(1–2): 91–95.

Curcuma longa	Spice principles: capsaicin, curcumin, piperine. Plants: *Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulatd the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J. Biochem Biophys 1989;26(4):254–258.
Curcuma longa	50% extract of *Curcuma longa* and *Nardostachys jatamansi* (whole plant)	Rats	The extracts increased HDL-/total cholesterol ratio and also caused a significant decrease in the ratio of total cholesterol/phospholipid. *Curcuma longa* exhibited better cholesterol and triglyceride decreasing activity than *Nardostachys jatamansi.*	Dixit VP, et al. Hypolipidaemic effects of *Curcuma Longa* L and *Nardostachys jatamansi*, DC in triton-induced hyperlipidaemic rats. Indian J Physiol Pharmacol 1988;32(4):299–304.
Curcuma longa	Ethanolic extract *Curcuma longa* and an ointment of curcumin	Human trial: 62 patients with external cancerous lesions	A decrease in smell (90%) and in itching in almost all cases was noted. Dry lesions were observed in 70%, and 10% had a decrease in lesion size and pain.	Kuttan R, et al. Turmeric and curcumin as topical agents in cancer therapy. Tumori 1987;73:29–31.
Curcuma longa	1-phenyl-1-hydroxy-N-pentane, a synthetic derivative of *Curcuma longa*	Human and animal trial: Fasting dogs and humans	Both plasma and secretin concentration and pancreatic bicarbonate output increased significantly. Suggests usage for subjects with achlorhydria, severe hyposecretory state, or total gastrectomy.	Chew WY, et al. Effect of 1-phenylpentanol on release of secretin and exocrine pancreatic secretion in dogs and humans. Gastroenterology 1983;84(6): 1578–1584.
Curcuma zedoaria (Christm.) Roscoe ZINGIBERACEAE Shati Round zedoary	Seven isolated compounds from 8 *Curcuma zedoaria* extracts. Oral and subcutaneous administration	Mice	Extracts significantly inhibited stress ulcer formation in restrained and water-immersed mice. Suggests a potent inhibition of acute experimental gastric ulcers.	Watanabe K, et al. Antiulcer activity of extracts and isolated compounds from zedoary (gajutsu) cultivated in Yakushima (Japan). Yakugaku Zasshi 1986;106(12):1137–1142.
Curcuma zedoaria	Powder from dried subterranean stem *Curcuma zedoaria.* Oral administration of the powder	Mice, rats	Powder significantly inhibited the intestinal transit of charcoal in mice and significantly increased the bile secretion in rats and slightly inhibited the stomach secretion in rats.	Hatsuyo M, et al. Pharmacological effects of the powder from *Curcuma zedoaria* Roscoe on the gastro-intestinal tract of experimental animals. Yakugaku Zasshi 1984;104(6):640–643.
Curcuma zedoaria	Flour prepared from rhizomes of *Curcuma zedoaria*	Rats, chicks	The high-protein flour proved highly toxic to 5-week-old rats and caused 100% mortality within 6 days when	Latif MA, et al. Toxicity of shoti (Indian arrowroot: *Curcuma zedoaria*) for rats and chicks.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
			given 320 g/kg diet.	Br J Nutr 1979;41(1):57–63.
Cyperus rotundus L. CYPERACEAE Mustaka Nutgrass	Xiao Wei Yan Powder: Mixture of several herbs including *Bletilla striata, Caesalpinia sappan, Cyperus rotundus, Glycyrrhiza oralensis, Hedyotis diffusae, Paeonia alba, Smilax glabrae, Taraxacum mongolicum.* Oral dose 5–6 g tid	Randomized controlled trial: 138 with intestinal metaplasia, 104 with atypical hyperplasia	After 2–4 months administration, total effective rate of intestinal metaplasia and atypical hyperplasia was 91.3% and 92.16%, respectively. The placebo groups were 21.3% and 14.46%, respectively. Animal experiments revealed no toxic side effect.	Liu XR, et al. Treatment of intestinal metaplasia and atypical hyperplasia of gastric mucosa with xiao wei yan powder [Chinese]. Chung-Kuo Chung Hsi i Chieh Ho Tsa Chih 1992;12(10):580, 602–603.
Cyperus rotundus	β-sitosterol, IP dose 160 and 320 mg/kg oral dose 320 mg/kg. Carrageenan-induced edema, cotton pellet implant and Brewer's yeast induced pyrexia in rats	Rats, mice	β-sitosterol was found to possess potent anti-inflammatory activity, similar to hydrocortisone and oxyphen-butazone. β-sitosterol was also orally effective against induced edema and possessed antipyretic activity similar to acetyl-salicyclic acid.	Gupta MB, et al. Anti-inflammatory and antipyretic activities of β-sitosterol. J Med Plant Res 1980;39:157–163.
Datura metel L. SOLANACEAE Dhattura Thornapple	Datura seed extract 1.2 mg/kg IP	Albino rats	Treatment caused an increase in activity of brain lipid peroxidase and catalase. Datura caused a decrease in the activity of f-diphosphate aldolase and g-6-phosphate dehydrogenase enzyme that are related with glucose metabolism.	Hasan SS, Kushwaha AKS. Chronic effect of Datura seed extract on the brain of albino rats. Japan, J Pharmacol 1987;44:1–6.
Daucus carota L. UMBELLIFERAE Garijara Carrot	Petroleum ether extract and fraction 5 (fatty acids) of carrot seeds	Mice	The extract arrested the normal estrus cycle and caused a significant decrease in the weight of ovaries. Cholesterol and ascorbic acid content in ovaries were significantly increased due to the treatment with extract and fraction 5 (fatty acids) of carrot seeds.	Majumder PK, et al. Anti-steroidal activity of the petroleum ether extract and fraction 5 (fatty acids) of carrot (*Daucus carota* L.) seeds in mouse ovary. J Ethnopharm 1997;57(3):209–212.

Daucus carota	Carrot consumption	Hospital-based case-controlled trial: 94 with malignant mesothelioma and 64 controls	Dietary intake and mesothelioma incidence was studied. The results support the hypothesis that pro-vitamin A or β-carotene-containing fruits and vegetables may decrease mesothelioma.	Muscat JE, Huncharek M. Dietary intake and the risk of malignant mesothelioma. Br J Cancer 1996; 73(9):1122–1125.
Daucus carota	Carrot extract	Mice	Pretreatment with carrot extract on carbon tetrachloride-induced acute liver damaged mice decreased increased serum enzymes levels significantly.	Bishayee A, et al. Hepatoprotective activity of carrot (*Daucus carota* L.) against carbon tetrachloride intoxication in mouse liver. J Ethnopharm 1995;47(2):69–74.
Daucus carota	Vitamin-free drink for 3 weeks then vitamin-rich drink of orange juice (145 mg vitamin C) and carrot juice (16 mg β-carotene)	Human trial: 15 normo-lipidemic cigarette smokers with no vitamin supplements	Vitamin-rich food supplements significantly increased plasma levels of beta carotene. Malondialdehyde, one end product of oxidation, was significantly lower in copper-oxidized LDL after vitamin supplementation.	Abbey M, et al. Dietary supplementation with orange and carrot juice in cigarette smokers lowers oxidation products in copper-oxidized low-density lipoproteins. J Am Diet Assoc 1995;95(6):671–675.
Daucus carota	Carrot consumption	Case-control trial	Risk of vulvar cancer was inversely related to green vegetables and carrot consumption. Data indicated the risk of vulvar cancer was related to a number of nutritional and dietary factors.	Parazzini F, et al. Selected food intake and risk of vulvar cancer. Cancer 1995;1;76(11):2291–2296.
Daucus carota	Water, green pepper, pineapple, tomato, strawberry, carrot, and celery juices: 46 mg per 100 mL in ascorbic acid by addition of distilled water or ascorbate	Controlled clinical trial: 16 men	After consumption of a diet low in nitrate and ascorbic acid (18 days). Carrot significantly inhibited N-nitrosoproline formation relative to controls. Results demonstrated that carrot juice has ability to inhibit endogenous nitrosation than would be expected based solely on ascorbate content.	Helser MA, et al. Influence of fruit and vegetable juices on the endogenous formation of N-nitrosoproline and N-nitrosothiazolidine-4-carboxylic acid in humans on controlled diets. Carcinogenesis 1992;13(12):2277–2280.
Daucus carota	Carrots and *Raphanus sativus* tops 75 g/d for as long as 28 days	Human trial	Consumption of plant products (radish and carrot tops) for as long as 28 days did not produce any adverse changes in protein, fat, and carbohydrate metabolic parameters examined.	Sivuk AK. Effect of plant products of nutrition (radish and carrot tops) on various indicators of metabolism in humans [Russian]. Kosm Biol Aviakosm Med 1989; 23(2):56–59.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Daucus carota	Twelve plants used for the traditional treatment of diabetes administered as decoctions or infusions for 28 days *Agaricus bisporus, Anacardium occidentale, Arctum lappa, Catharanthus roseus, Daucus carota, Humulus lupulus, Ilex guayusa, Salvia officinale, Sambucus nigra, Taraxacum officinale, Trigonella foenum-graecum, Urtica dioica*	Mice	Of the 12 plants, *Agaricus bisporus* and *Ilex guayusa* showed potential antidiabetic effect.	Swanston-Flatt SK, et al. Glycemic effects of traditional European plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice. Diabetes Res 1989;10(2):69–73.
Dolichos biflorus L. LEGUMINOSAE Kulitha Horse gram	Lectins: *Arachis hypogaea, Dolichos biflorus, Glycine max, Lotus tetragonolobus, Ricinus communis, Ulex europaeus*, concanavalin A, wheat germ	Controlled human trial: 11 with normal oral mucosa, 5 with leukoplakia with dysplasia, 12 with oral mucosal squamous cell carcinoma	*Dolichos biflorus, Glycine max, Lotus tetragonolobus, Ricinus communis, Ulex europaeus* showed very strong to strong binding in healthy oral mucosa but no or very weak binding in squamous cell carcinoma. Other lectins investigated may be used as probes to determine the dysplastic and malignant status of the oral mucosal epithelium.	Mazumdar S, et al. Binding pattern of eight different lectins in healthy subjects and patients with dysplastic and malignant lesions of the oral cavity. Int J Oral Maxillofacial Surg 1993;22(5): 301–305.
Dolichos biflorus	Varying extracts of *Acrostichum aureum, Adhatoda vasica, Citrulus colocynthus, Codonopsis ovata, Dolichos biflorus,*	Female albino rats	All the plants showed marked but varied inhibition of pregnancy and anti-implantation activity.	Prakash AO, et al. Anti-implantation activity of some indigenous plants in rats. Acta Eur Fertil 1985;16(6):441–448.

	Ferule orientalis, Juniperus communis, Kigelia pinnata, Lepidum capitum, Nerium odoratum, Pueraria tuberosa, Punica granatum, Randia dumetorum, Rubus ellipiticus, Ruta graveolens			
Eclipta alba (L.) Hassk. COMPOSITAE Bhringaraj Bhringaraj	*Eclipta alba, Ocimum sanctum, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera.* Doses: 100, 200 mg/kg PO 1× per day for 28 days	Hyperglycemic rats	The herbal formulation had little effect on blood sugar concentrations but doses induced a dose-related decrease in streptozotocin (STZ) hyperglycemia and attenuation of SZT induced a decrease in islet superoxide dismutase activity in euglycemic rats.	Bhattacharya SK, et al. Effect of Trasina, an Ayurvedic herbal formulation on pancreatic islet superoxide dismutase activity in hyperglycemic rats. Indian J Exp Biol 1997;35(3):297–299.
Eclipta alba	Ethanol/water (1:1) extract of *Eclipta alba*	Rats	*Eclipta alba* significantly counteracted induced inhibition of the hepatic microsomal drug metabolizing enzyme amidopyrine N-demethylase and membrane bound G-6-phosphatase.	Saxena AK, et al Hepatoprotective effects of *Eclipta alba* on subcellular levels in rats. J Ethnopharm 1993;40(3):155–161.
Eclipta alba	1 capsule 3× per day with lukewarm water containing: *Asparagus racemosus* 50 mg, *Bergenia ligulata* 100 mg, *Eclipta alba* 100 mg, *Myristica fragrans* 10 mg, *Tinospora cordifolia* 100 mg, *Tribulus terrestris* 50 mg, *Withania somnifera* 50 mg	30 patients with calculi on kidneys, ureters, or bladders	The herbal combination was found to alleviate not only pain but also slowly disintegrated both calcium-oxalate and calcium carbonate crystals in a span of 72 hours and complete discharging of crystals within 15–30 days. Complete discharge occurred in greater than 80% of the patients.	Karnick CR. Clinical evaluation of composite Ayurvedic drugs, on calculi, in the kidney and the urinary bladder. Aryavaidyan 1992;6(2):104–108.
Eclipta alba	*Eclipta alba* air dried and powdered. Oral dose of powder of 500, 1000, and 1500 mg/kg per day	Rats	*Eclipta alba* was found to counteract an increase of liver weight, hepatic lipid peroxidation, liver γ-glutamyl transpeptidase, serum alanine transferase activities, and serum alanine phosphatase. Impaired serum A/G ratio in induced CCL4 hepatic intoxication was normalized by treatment. *Eclipta alba* showed anti-inflammatory activity.	Chandra T, et al. Effect of *Eclipta alba* on inflammation and liver injury. Fitoterapia 1987;LVIII(1):23–32.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Elephantopus scaber L. COMPOSITAE Gojihiva Prickly leaves	Water extracts derived from the entire plants of *Elephantopus scaber, Elephantopus mollis,* and *Pseudoelephantopus spicatus*	Rats with induced acute hepatic damage	After treatment with crude extract, results indicated that the serum glutamate-oxalate-transaminase levels caused β-D-galactosamine and acetominophen to decrease significantly.	Lin CC, et al. The evaluation of hepatoprotective effects of Taiwan folk medicine 'Teng-Khai-U'. J Ethnopharm 1995;45(2):113–123.
Elephantopus scaber	Decoction of dried *Elephantopus scaber* subspecies *oblanceolata, Elephantopus mollis* and *Pseudoelephantopus spicatus*	Male Wistar albino rats with CCL4 induced hepatotoxicity	The acute increase of serum transaminase can be significantly reduced when treating with *Elephantopus scaber*. Hepatic fatty metamorphosis and necrosis of central lobule were improved by treatment.	Lin CC, et al. The pharmacological and pathological studies on Taiwan folk medicine (VI): The effects of *Elephantopus scaber* subsp. *oblanceolata, E. mollis* and *Pseudo-elephantopus spicatus.* Am J Chinese Med 1991;XIX(1):41–50.
Elephantopus scaber	Aqueous and hydroalcoholic extracts of whole plant of *Elephantopus scaber.* Dose: 0.3–6 g/kg IP	Mice, rats	Both extracts induced writhing, loss of muscle tone, ataxia, prostration and death. Both reduced brewer's yeast-induced hyperthemia but when given orally did not affect it. Aqueous extract reduced intestinal transit time while the hydroalcoholic extract increased it. Given IV, blood pressure and heart rate were reduced.	Poli A, et al. Preliminary pharmacologic evaluation of crude whole plant extracts of *Elephantopus scaber*. Part I: in vivo studies. J Ethnopharm 1992;37:71–76.
Elephantopus scaber	*Elephantopus scaber* 7.5 g per 100 mL and *A. speciosa* 0.8 g per 100 mL	Controlled human trial: 10 healthy volunteers and controls	To evaluate the potential diuretic effect of two natural substances, 10 volunteers and the effects were compared to those of a placebo. No effect on electrolytes or renal function parameter was observed for *Elephantopus scaber.*	Laranja SM, et al. Evaluation of acute administration of natural products with potential diuretic effects, in humans. Memorias do Instituto Oswaldo Cruz 1991;86(Suppl 2): 237–240.
Elettaria cardamomum (L.) Maton ZINGIBERACEAE Elachhoti Cardamom	Oil extracted from *Elettaria cardamomum* seeds. Doses of 175 and 280 mL/kg and indomethacin 30 mg/kg	Male albino rats, mice	Comparative study of seed extract and indomethacin against acute induced planter edema proved to be marked. Extract produced 50% protection against the writhing induced by IP administration of a 0.02% solution of p-benzoquinone.	al-Zuhair H, et al. Pharmacological studies of cardamom oil in animals. Pharmacol Res 1996;34(1–2):79–82.

Elettaria cardamomum	Cardamom seeds extracted with n-hexane, ethyl acetate and methanol	Mice	Each extract was examined for antitumor-promoting activity. Cardamom seed was a highly potent inhibitor of induced mouse ear edema.	Okuyama T, et al. Studies on cancer biochemoprevention of natural resources: X. + inhibitory effect of spices on TPA-enhanced 3H-choline incorporation in phospholipids of C3H10T1/2 cells and on TPA-induced mouse ear edema. Chinese Pharmaceut J 1995;47(5):421–430.
Elettaria cardamomum	Dried powder mixture containing *Areca catechu* nut, catechu, lime, *Elettaria cardamomum* and flavoring agents used in preparation of 'pan'	Controlled human trial: pan-consuming and healthy nonconsuming controls	All three cytogenic endpoints demonstrated a statistically significant increase among the 'pan masala' consumers as compared with the non-consuming controls.	Dave BJ. Cytogenic studies reveal increased genomic damage among 'pan masala' consumers. Mutagenesis 1991;6(2):159–163.
Embelia ribes Brum. f. MYRSINACEAE Vidanga Vidanga	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory (blackheads and other comedones) lesions. The mechanisms of action remain unknown.	Paranjpe P. Evaluation of topical applications of herbal formulations in acne vulgaris: A single-blind randomized comparative study. J Med Aromatic Plant Sci 1997;19: 414–418.
Embelia ribes	Embelin (isolated from dried berries of *Embelia ribes*) 50 mg and 100 mg/kg per day orally for 20 days	Male albino rats	When embelin was administered to rats, significant tumor regression and prolonged survival time was revealed	Chitra M, et al. Protective action of embelin against lipid peroxidation on tumour bearing rats. Fitoterapia 1994;65(4):317–321.
Embelia ribes	Crude powder mixture of equal parts of: *Ailanthus excelsa, Butea monosperma, Embelia ribes, Erythrina indica, Mallotus philippensis, Orxylum indicum*	75 patients with various worm infestations	The cure rate in group A was 80%, group B treated with mebendazole was 92%, and group C was 76%. Cure rate showed negative *Ascaris lumbricoides* ova in the stool report for 3 consecutive days.	Sarma BP, Ojha D. The management of Gandupada krimi (*Ascaris lumbricoides*) with indigenous drugs. Aryavaidyan 1992;5(3):170–172.
Embelia ribes	Oral administration of embelin 75 mg/kg, daily for 15 and 30 days	Adult male rats	Embelin administration caused a significant increase in the uptake of D-glucose, L-alanine, L-leucine, and calcium in small intestine segments. The authors suggested that embelin works at the metabolic level on the growth of intestines and possibly the number and divisions of epithelial cells.	Gupta S, et al. Effects of embelin, a male antifertility agent, on absorptive and digestive functions of rat intestine. J Ethnopharm 1991;33:203–212.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Embelia ribes	Embelin administered subcutaneously 20 mg/kg or by gastric gavage of 75 mg/kg for 15 or 30 days	Male albino rats	After administration, significant impairment in lipid metabolism in testis, liver, brain, kidneys and changes in liver function test parameters was noted. These results may explain the antifertility/anti-spermatogenic effects in animals.	Gupta S, et al. Reversible changes in lipid metabolism in testis and other tissues induced by embelin. Fitoperapia 1990;LXI(4):297–305.
Embelia ribes	Embelin administered subcutaneously 20 mg/kg body weight for 15 and 30 days	Male albino rats	Embelin reveals significant impairment in carbohydrate metabolism in the primary and secondary reproductive tissues.	Gupta S, et al. Inhibition of reproductive tissue carbohydrate metabolism and reversibility of the effects of embelin, a plant benzoquinone of antifertility potential. Fitoterapia 1990;LXI(2): 133–143.
Embelia ribes	Embelin 20 mg/kg body weight per day, daily for 15 and 30 days	Male rats	Embelin caused an increase in the uptake of D-glucose, L-alanine, L-leucine, and calcium in the small intestine segments. Treatment also caused a significant increase in the microsomal g-6-phosphatase and the cytosolic enzyme, lactate dehydrogenase.	Gupta S, et al. Changes in glucose/ amino acid/calcium uptake and brush-border membrane-associated enzymes in rat small intestine after the administration of embelin (plant benzoquinone), and antifertility agent. J Nutr Sci Vitaminol 1990;36:153–164.
Embelia ribes	*Embelia ribes* dry berry powder and extracted with n-hexane. Potassium embelate 200 mg per 10 mL/kg and 400 mg per 10 mL/kg	Rats, mice	Lack of any adverse effects, high therapeutic index, and absence of the abstinence syndrome confers a long-term safety on potassium embelate for use as an analgesic compared to morphine.	Atal CK, et al. Non-narcotic orally effective, centrally acting analgesic from an Ayurvedic drug. J Ethnopharm 1984;11:309–317.
Embelia ribes	Embelin administered at 50 and 100 mg/kg	Rats	Impeded ability to impregnant was demonstrated. Embelin provoked anti-implantation activity when administered and also reduced significantly the number of implantations ($p < 0.01$)	Prakash AO. Antifertility investigations on embelinan oral contraceptive of plant origin. Part I-Biological properties. Planta Med J Med Plant Res 1981;41:259–266.

Emblica officinalis Gaertn. EUPHORBIACEAE Amla Emblic myrobala	*Emblica officinalis* fresh juice 5 mL/kg body weight for 60 days	Atherogenic rabbits	Serum cholesterol, triglycerides, phospholipid and LDL levels were reduced by 82%, 66%, 77%, and 90%, respectively. The tissue lipid levels showed a significant decrease following *Emblica officinalis* juice administration. Aortic plaques were regressed.	Mathur R, et al. Hypolipidaemic effect of fruit juice of *Emblica officinalis* in cholesterol-fed rabbits. J Ethnopharm 1996;50:61–68.
Emblica officinalis	A mixture of *Andrographis paniculata* and *Emblica officinalis*	Human trial: 35 patients hepatitis B^+, hepatitis B^-, and post-hepatitis syndrome	Herbal mixture was administered to patients with Hepatitis B^+, B^-, and post hepatitis syndrome. The mixture demonstrated efficacy in reducing clinical symptoms, improving liver function and albumin.	Ramji, et al. Effect of Kalmegha and Amlaki compound on viral heptitis (Koshtha-Shakhashrita Kamala) Aryavaidyan 1992;5(3):164–169.
Emblica officinalis	Dried fruit of *Emblica officinalis*	Human trial: 18 patients with gastro-intestinal tract disease	Objective improvement in mean values of the free and total acid concentration were gradually reduced both in fasting and stimulated states ($p = 0.01$)	Sharma PK, et al. Clinical evaluation of amalaki churna in the treatment of amlapitta. Aryavaidyan 1990;4(2):120–122.
Emblica officinalis	Haritaki: *Terminalia chebula, Emblica officinalis, Terminalia bellirica*	Rabbits	When cholesterol was fed to all groups, cholesterol levels were significantly reduced in the 3 treatment groups than in the control group. The same was true for reduction in cholesterolemia.	Thakur CP, et al. The Ayurvedic medicines Haritaki, Amla and Bahira reduce cholesterol-induced atherosclerosis in rabbits. Int J Cardiology 1988;21(2):167–175.
Emblica officinalis	*Emblica officinalis* raw fruit for 28 days	Controlled human trial: 15 normal and 20 hyper-cholesterolemic subjects	Treatment with *Emblica officinales* reduced cholesterol in both normal and hypercholesterolaemic subjects. After 2 weeks withdrawal from fruit, total cholesterol level of the hypercholesterolemic subjects increased significantly almost to initial levels.	Jacob A, et al. Effect of the Indian gooseberry (amla) on serum cholesterol levels in men aged 35–55 years. Eur J Clin Nutr 1988;41(11):939–944.
Eugenia jambolana Lam. MYRTACEAE Blackberry	Extract of jaman pulp from the fruit of *Emblica jambolana* and extracts of bark of *Ficus benghalensis*	Rats	*Emblica jambolana* pulp showed hypoglycemic effect. *Ficus benghalensis* bark extract caused reduction in blood sugar level. Oral administration of the extracts resulted in enhancement in serum insulin levels in normoglycemic and diabetic rats.	Achrekar S, et al. Hypoglycemic activity of *Eugenia jambolana* and *Ficus benghalensis:* mechanism of action. In Vivo 1991;5(2):143–147.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Eugenia jambolana	Two capsules of 450 mg each: *Coccinia indica, Cuminum cyminum, Eugenia jambolana, Gymnema sylvestre, Momordica charantia, Phyllanthus niruri, Swertia chirata, Tephrosia purpurea*	20 case studies with *Diabetes mellitus*	Administration of the herbal mixture led to significant decreases in mean blood sugar values.	Karnick CR. A clinical trial of a composite herbal drug in the treatment of *Diabetes mellitus* (Madhumeha). Aryavaidyan 1991;5(1):36–46.
Eugenia jambolana	Oleanolic acid (C3-0H48O3), isolated from flowers of *Emblica jambolana* administered for 60 days	Male albino rats	The extract decreased fertilizing capacity without any significant changes in body weight or reproductive organ weights. The extract arrested spermatogenesis but did not cause any abnormality to spermatogenic cells, Leydig interstitial, and Sertoli cells.	Rajasekaran M, et al. Antifertility effect in male rats of oleanolic acid, a triterpene from *Eugenia jambolana* flowers. J Ethnopharm 1988;24(1): 115–121.
Ferula foetida Bunge) Regel UMBELLIFERAE Hingu Asafoetida	Rats fed for 8 weeks the following plants: *Brassica* species, *Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rats	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine and *Zingiber officinale* prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary *Cuminum cyminum, Trigonella foenum-graecum, Brassica* species and *Ferula foetida* brought about decreases in the levels of phosphatases and sucrase. The positive influences of a good number of spices on terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.

Ferula foetida	*Alternanthera sessilis, Cuminum cyminum, Curcuma longa, Ferula asafoetida, Ocimum sanctum, Moringa oleifera, Papaver somnifera, Piper longum, Sylanum nigrum*	Mice and rats	*Cuminum cyminum* seeds, *Ocimum sanctum* leaves, and *Papaver somnifera* seeds significantly inhibited neoplasia alone. These plants may prove to be valuable anticarcinogens.	Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxic 1992;30(11):953–956.
Ferula foetida	Cuminum cyminum seeds, *Papaver somnifera* seeds, *Ferula foetida, Curcuma longa,* kandathipili, *Azadirachta indica* flowers, manathakkali leaves, drumstick leaves, *Ocimum sanctum* leaves and ponnakanni leaves	Swiss mice	All these plants, leaves, and herbs increased glutathione-S-transferase activity by more than 78% in the stomach, liver and esophagus, high enough to be considered protective agents against carcinogenesis.	Aruna K, Sivaramakrishnan VM. Plant products as protective agents against cancer. Indian J Exp Biol 1990;28(11):1008–1111.
Ferula foetida	*Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.
Ferula foetida	*Piper nigrum* powder in doses of 0.2, 0.4 g/h and *Ferula foetida* in doses of 0.1, 0.2, and 0.4 g/h on different days	Human trial: 20 healthy human volunteers	Results showed *Piper nigrum* powder does not damage the human gastric mucosa, whereas *Ferula foetida* does, based on the rate of exfoliation of the surface epithelial cells of human gastric mucosa.	Desai HG, Kalro RH. Effect of black pepper and asafoetida on the DNA content of gastric aspirates. Ind J Med Res 1985;82(1):325–329.
Ficus benghalensis L. MORACEAE Vata Banyan tree	Dimethoxy ether of leucopelargondin-3-0-alpha-L rhamnoside from bark of the *Ficus benghalensis* (100 mg/kg orally)	Rats	Administration of the extract showed about a 12% hypoglycemic action in normal rats. The results indicate an insulin-sparing action of the leucopelargonin, if used in combination with insulin.	Cherian S, Augusti KT. Insulin sparing action of leucopelargonidin derivative isolated from *Ficus benghalensis* Linn. Indian J Exp Biol 1995;33(8):608–611.
Ficus benghalensis	Dimethoxy ether of leucopelargondin-3-0-alpha-L rhamnoside isolated from the bark of *Ficus benghalensis* (100 mg/kg oral administration)	Diabetic dogs	The compound showed significant hypoglycemic and serum insulin increased action in normal and moderately diabetic dogs (induced by alloxan) during a period of 2 hours.	Augusti KT, et al. Effect of leucopelargonin derivatives from *Ficus benghalensis* Linn. on diabetic dogs. Indian J Med Res 1994;99:82–86.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Ficus benghalensis	Extract of jaman pulp from the fruit of *Emblica jambolana* and extracts of bark of *Ficus benghalensis*	Rats	*Emblica jambolana* pulp showed hypoglycemic effect. *Ficus benghalensis* bark extract caused reduction in blood sugar level. Oral administration of the extracts resulted in enhancement in serum insulin levels in normoglycemic and diabetic rats.	Achrekar S, et al. Hypoglycemic activity of *Eugenia jambolana* and *Ficus benghalensis:* Mechanism of action. In Vivo 1991;5(2):143–147.
Ficus benghalensis	Isoproteinous diets containing 1% cholesterol and 10% fiber derived from *Cappers deciduas, Ficus religious, Ficus glomeration, Ficus benghalensis,* and *Prsopsis cinceria* were fed for 40 days	Weanling rats	The effect of incorporation of whole plants parts in feed intake, weight gain, feed efficiency ratio (FER), dry matter digestibility (DMD), and true protein digestibility (TPD) was studied. Inclusion did not effect weight gain significantly but all other parameters were influenced to a varying extent. Foods rich in lignin had relatively lower FER, DMD, and TPD whereas cellulose and pectin-rich foods had an increased DMD and TPD.	Agawam V, Chatham BM. Effect of feeding some plant foods as source of dietary fibre on biological utilisation of diet in rats. Plant Foods Hum Nutr 1989;39(2):161–167.
Ficus benghalensis	Dietary fiber content of *Capparis decidua, Ficus benghalensis, Ficus glomerata, Ficus religiosa,* and *Prsopsis cinceria* varied from 38.5% to 55.7%	Rats	Dietary fiber from these plants foods fed at 10% dietary level induced an increased resistance to hyperlipidemia than cellulose. The dietary fiber influenced total lipids, cholesterol, triglycerides, and phospholipids of the liver to varying extents.	Agarwal V, Chauhan BM. A study of composition and hypolipidemic effect of dietary fibre from some plant foods. Plant Foods Hum Nutr 1988;38(2):189–197.
Ficus religiosa L. MORACEAE Aswatha Sacred fig	Isoproteinous diets containing 1% cholesterol and 10% fiber derived from *Capparis decidua, Ficus religiosa, Ficus glomerata, Ficus benghalensis,* and *Prsopsis cinceria* were	Weanling rats	The effect of incorporation of whole plants parts in feed intake, weight gain, FER, DMD, and TPD was studied. Inclusion did not effect weight gain significantly but all other parameters were influenced to a varying extent. Foods rich in lignin had relatively lower FER, DMD, and TPD whereas cellulose and pectin-	Agarwal V, Chauhan BM. Effect of feeding some plant foods as source of dietary fibre on biological utilisation of diet in rats. Plant Foods Hum Nutr 1989;39(2):161–167.

	fed for 40 days		rich foods had an increased DMD and TPD.	
Ficus religiosa	Dietary fiber content of *Capparis decidua, Ficus benghalensis, Ficus glomerata, Ficus religiosa,* and *Prsopsis cinceria* varied from 38.5% to 55.7%	Rats	Dietary fiber from these plants foods fed at 10% dietary level induced an increased resistance to hyperlipidemia than cellulose. The dietary fiber influenced total lipids, cholesterol, triglycerides, and phospholipids of the liver to varying extents.	Agarwal V, Chauhan BM. A study of composition and hypolipidemic effect of dietary fibre from some plant foods. Plant Foods Hum Nutr 1988;38(2):189–197.
Foeniculum vulgare Mill. UMBELLIFERAE Satupuspa Fennel	Ethanolic extracts of *Foeniculum vulgare* fruit. Short-term doses 0.5, 1.0, and 3 g/kg; long-term dose was 100 mg/kg per day	Mice	The extracts caused no significant acute or chronic mortality as compared to controls.	Shah AH, et al. Toxicity studies in mice of ethanol extracts of *Foeniculum vulgare* fruit and *Ruta chalepensis* aerial parts. J Ethnopharm 1991;34(2):167–172.
Foeniculum vulgare	Aqueous extracts of *Foeniculum vulgare* leaves that were lyophilized and boiled	Pentobarbital-anaesthetized rats	Intravenous administration of the extract produced a significant dose-related reduction in arterial blood pressure, without affecting the heart rate or respiratory rate. The non-boiled aqueous extract showed very little hypotensive activity.	Abdul-Ghani AS, Amin R. The vascular action of aqueous extracts of *Foeniculum vulgare* leaves. J Ethnopharm 1988;24:213–218.
Foeniculum vulgare	Oral administration of acetone extract of *Foeniculum vulgare* seeds for 15 days	Male and female rats	In male rats, total protein concentration was found to be significantly decreased in testes and vas deferens, and increased in seminal vesicles and prostate gland. In female rats, the extract led to vaginal cornification and estrus cycle.	Malini T, et al. Effect of *Foeniculum vulgare* Mill. seed extract on the genital organs of male and female rats. Indian J Physiol Pharmacol 1985;29(1):21–26.
Foeniculum vulgare	Herb combination of *Calendula officinalis, Foeniculum vulgare, Hypericum perforatum, Melissa officinalis, Taraxacum officinale*	Human trial: 24 patients with chronic nonspecific colitis	As a result of the treatment, spontaneous and palpable pains along the large intestine disappeared in 95.83% of the patients by the 15th day of their admission to the clinic and treatment with herbal combination.	Chakurski I, et al. Treatment of chronic colitis with an herbal combination of *Taraxacum officinale, Hipericum perforatum, Melissa officinalis, Calendula officinalis* and *Foeniculum vulgare* [Bulgarian]. Vutr Boles 1981;20(6):51–54.
Glycyrrhiza glabra L. LEGUMINOSAE Yashtimadhu Licorice	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory (blackheads and other comedones) lesions. The mechanisms of action remain unknown.	Paranjpe, P. Evaluation of topical applications of herbal formulations in acne vulgaris: A single-blind randomized comparative study. J Medicinal Aromatic Plant Sci 1997; 19:414–418.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Glycyrrhiza glabra	Chinese medicine formula of: *Paeoniae lactiforae* root, *Astralagus, Cinnamomum zeylanicum, Glycyrrhiza glabra, Fructus jujubae, Saccharum granorum*	Rats	Rats were injected with this formula to observe blood pressure changes. The formula had an effect on the Fourier components of the blood pressure wave similar to the linear combination of the three herb groups when used separately.	Wang WK, et al. Collective effect of a Chinese formula—A study of xiao-jian-zhong-tang. Am J Chin Med 1995;23(3–4):299–304.
Glycyrrhiza glabra	Glycyrrhizine: 150 mg/d	Human trial: 8 non-insulin-dependent *Diabetes mellitus* (NIDDM) patients	Glycyrrhizine in low doses on hyperkalemia NIDDM patients showed the mean serum potassium concentration to decrease significantly to 4.4 mEq/L with 150 mg/d.	Murakami T, Uchikawa T. Effect of glycyrrhizine on hyperkalemia due to hyporeninemic hypoaldosteronism in *Diabetes mellitus.* Life Sci 1991;53(5):63–68.
Glycyrrhiza glabra	Plants include: leaves of *Agrimonia eupatoria, Alchemilla vulgaris,* bulbs of *Allium sativum, Chelidonium majus, Convallaria majalis,* seeds of *Coriandrum sativum, Eucalyptus globulus,* roots of *Glycyrrhiza glabra,* dried berries of *Juniperus communis, Medicago sativa, Rubus fraticosus*	Mice	Treatment with *Agrimonia eupatoria, Medicago sativa, Coriandrum sativum, Eucalyptus globulus* and *Juniperus communis* reduced the level of hyperglycemia during development of streptozotocin diabetes in mice. This was associated with reduced polydipsia (except *Coriandrum sativum*) and a reduced rate of weight loss (except *Agrimonia eupatoria*).	Swanston-Flatt SK, et al. Traditional plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice. Diabetologia 1990;33(8):462–464.
Glycyrrhiza glabra	Glycyrrhizin	Randomized controlled trial: 88 patients with chronic hepatitis	Results showed improvement of liver function. For both acute and chronic cases in the short-term, glycyrrhizin showed statistically significant improvement.	Su X, et al. Clinical and laboratory observation on the effect of glycyrrhizin in acute and chronic viral hepatitis. J Trad Chin Med 1984;4(2):127–132.

Glycyrrhiza glabra	Deglycyrrhizinized licorice or placebo	Controlled clinical trial: 96 patients with gastric ulcers	After 4 weeks, no difference was found in gastric ulcers between the placebo and treatment group.	Bardshan KD, et al. Clinical trial of deglycyrrhizinised liquorice in gastric ulcer. Gut 1978;19:779–782.
Glycyrrhiza glabra	Comparison of Cimetidine and deglycyrrhizinized licorice	Randomized double-blind trial: 30 patients with duodenal ulcers	Both are effective in the treatment of duodenal ulcers.	D'Imperio N, et al. Double-blind trial in duodenal and gastric ulcers: Cimetidine and deglycyrrhizinized liquorice. Acta Gastro-Enterologica Belgica XLI 1978; 427–434.
Glycyrrhiza glabra	Deglycyrrhizinized licorice	Retrospective survey: 32 patients with chronic duodenal ulcer history.	Healing of the ulcerations was observed in all patients. After 16 weeks, 78% had endoscopic evidence that the ulceration had healed.	Larkworthy W, Holgate PFL. Deglycyrrhizinized liquorice in the treatment of chronic duodenal ulcer. Practitioner 1975;215:787–792.
Gossypium herbaceum L. MALVACEAE Karpas Indian cotton	Gossypol compound isolated from seed, stem or root of *Gossypium herbaceum*	Double-blind clinical trial: 64 gossypol and 74 placebo	A male antifertility drug was tested and a 92% efficacy rate was achieved. The incidence of fatigue, decreased libido, and gastrointestinal disturbance of the two groups showed no statistical difference.	Liu G, et al. Trial of Gossypol as a male contraceptive. In Gossypol: A Potential Contraceptive for Men. Segal S, Ed. New York: Plenum Press, 1985:9–16.
Gossypium herbaceum	Gossypol acetic acid	Female rats	Gossypol acetic acid at a higher dose (80 mg/kg) could interrupt early pregnancy in female rats. Prolonged administration (30 mg/kg) led to atrophy of the rat endometrium.	Lei HP, et al. Studies of Gossypol on the female. In: Adv Chinese Med Materials Res. Chang, H.M. et al. Eds. World Scientific, Philadelphia, 1985:639–645.
Gossypium herbaceum	Gossypol 20 mg/d for 3 months	Human trial: 5 men	Gossypol had a profound effect on spermatogenesis that was fully reversible after termination of treatment. Infertility lasted 4–6 months.	Frick J, Danner, C. 1985. Effect of Gossypol on human testicular function: Evaluation of seminal and hormonal parameters. In: Gossypol: A Potential Contraceptive for Men. Segal S, Ed. Plenum Press, NY, 1985;17–23.
Gossypium herbaceum	20 mg/d gossypol monacetic acid for 4 months; then 60 mg weekly for 4–6 months	Human trial: 12 men	Gossypol inhibited spermatogenesis in men at a dose level that in the short-term treatment appears to be free of side effects.	Coutinho EM, et al. Biphasic action of Gossypol in men. In Gossypol: A Potential Contraceptive for Men. Segal S, Ed. New York: Plenum Press, 1985;25–31.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Gymnema sylvestre (Retz.) Schult. ASCLEPIADACEAE Meshasringi Gurmar	*Gymnema sylvestre* extract 120 mg/kg per day	Rats	*Gymnema sylvestre* extract did not improve insulin resistance in streptozotocin-induced diabetic rats.	Tominaga M, et al. Effects of seishin-renshiin and *Gymnema sylvestre* on insulin resistance in streptozotocin-induced diabetic rats. Diabetes Res Clin Pract 1995;29(1):11–17.
Gymnema sylvestre	Two capsules of 450 mg each: *Coccinia indica, Cuminum cyminum, Eugenia jambolana, Gymnema sylvestre, Momordica charantia, Phyllanthus niruri, Swertia chirata, Tephrosia purpurea*	20 case studies with *Diabetes mellitus*	Administration of the herbal mixture led to significant decreases in mean blood sugar values.	Karnick CR. A clinical trial of composite herbal drugs in the treatment of Diabetes mellitus (Madhumeha). Aryavaidyan 1991;5(1):36–46.
Gymnema sylvestre	Peptide isolated from *Gymnema sylvestre* leaves. Dosage: peptide at a concentration more than $1 \times 10^{(-6)}$ M	Rats	Inhibitory effect on the sweet responses appeared after treating tongue surface with *Gymnema sylvestre* peptide.	Imoto T, et al. A novel peptide isolated from the leaves of *Gymnema sylvestre*—I. Characterization and its suppressive effect on the neural responses to sweet taste stimuli in the rat. Comp Biochem Physiol A 1991;100(2):309–314.
Gymnema sylvestre	GS4 an extract from leaves of *Gymnema sylvestre*. 400 mg/d 18–20 months as supplement to conventional drug therapy of glibenclamide or tolbutamide	Human trial: 22 type II patients with diabetes	During GS4 supplementation, a significant decrease in blood glucose, glycosylated hemoglobin and plasma proteins was noted. Conventional drug dose could be decreased; 23% (5/22) discontinued completely conventional drug therapy.	Baskaran K, et al. Antidiabetic effect of a leaf extract from *Gymnema sylvestre* in non-insulin-dependent diabetes mellitus patients. J Ethnopharm 1990;30(3):295–300.
Gymnema sylvestre	GS4 an extract from leaves of *Gymnema sylvestre*. 400 mg/d	Controlled human trial: 27 patients with insulin-dependent *Diabetes mellitus*—treated group and nontreated group	Insulin requirements decreased with fasting blood glucose, as did glycosylated hemoglobin and plasma proteins, and serum lipid levels.	Shanmugasundaram ER, et al. Use of *Gymnema sylvestre* leaf extract in the control of blood glucose in insulin-dependent diabetes mellitus. J Ethnopharm 1990;30(3):281–294.

Gymnema sylvestre	GS3 and GS4 extracts from *Gymnema sylvestre* leaves	Streptozotocin rats	Herbal therapy appears to bring about blood glucose homeostatis.	Shanmugasundaram ER, et al. Possible regeneration of the islets of Langerhans in streptozotocin-diabetic rats given *Gymnema sylvestre* leaf extracts. J Ethnopharm 1990;30(3):265–279.
Gymnema sylvestre	GS4 extracted from *Gymnema sylvestre* leaves 1 g/kg body weight	Non diabetic and streptozocin-induced mildly diabetic rats.	Results suggest usefulness of *Gymnema sylvestre* in the treatment of certain classes of non-insulin dependent *Diabetes mellitus*.	Okabayashi Y, et al. Effect of *Gymnema sylvestre*, R.Br. on glucose homeostasis in rats. Diabetes Res Clin Pract 1990;9(2):143–148.
Gymnema sylvestre	Powdered leaves of *Gymnema sylvestre*	Rats	*Gymnema sylvestre* protected the animals from low blood glucose levels seen in rats receiving beryllium nitrate alone.	Prakash AO, et al. Effect of feeding *Gymnema sylvestre* leaves on blood glucose in beryllium nitrate treated rats. J Ethnopharm 1986;18(2):143–146.
Gymnema sylvestre	Oral application of *Gymnema sylvestre* extracts	Clinical trial factorial design: 118 human volunteers	Sweetness perception of the load was reduced in 50% of the subjects by oral application of the extract. Less total and sweet calories were consumed by those with a reduced sweetness perception.	Brala PM, Hagen RL. Effects of sweetness perception and caloric value of a preload on short term intake. Physiol Behav 1983;30(1):1–9.
Hemidesmus Indicus (L.) W.T. Ation ASCLEPIADACEAE Sariva Indian Sasaparilla	Plants lacking pyrrolizidine alkaloids: *Aegle marmelos, Hemidesmus indicus, Terminalia chebula, Withania somnifera*	Feeding trials in rats	All plants produced hepatic lesions that included central vein abnormalities. *Terminalia chebula* and *Withania somnifera* produced mark renal lesions.	Arseculeratne SN, et al. Studies of medicinal plants of Sri Lanka. Part 14: Toxicity of some traditional medicinal herbs. J Ethnopharm 1985;13(3):323–335.
Hemidesmus indicus	Air dried roots of *Hemidesmus indicus* simple distillation with water	Mice	*Hemidesmus indicus* was tested on mice infected with *M. leprae*. The drug may cause a delay in multiplication of organisms in the mouse foot pads.	Gupta PN. Anti-leprotic action of an extract from "Anantamul" (*Hemidesmus Indicus* R. Br.). Lepr. India 1981;53(3):354–359.
Holarrhena antidysenterica (Roxb. Ex Fleing) Wall. Ex. A. DC. APOCYNACEAE Kutaja Kurchi tree	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each of the three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory (blackheads and other comedones) lesions. The treatment preparations' mechanisms of action remain unknown.	Paranjpe P. Evaluation of topical applications of herbal formulations in acne vulgaris: A single-blind randomized comparative study. J Med Aromatic Plant Sci 1991;19: 414–418.
Holarrhena antidysenterica	Ethanol extract of *Holarrhena antidysenterica*	Mice	*Holarrhena antidysenterica* appeared to stimulate phagocytic function while inhibiting the humoral component of the immune system.	Atal CK, et al. Immunomodulating agents of plant origin. I: Preliminary screening. J Ethnopharm 1986; 18(2):133–141.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Holarrhena antidysenterica	Bark powder of *Holarrhena antidysenterica* in three divided doses of 4 g for 15 days	Clinical trial: 11 patients with intestinal amoebiasis and giardiasis	Effects of *Holarrhena antidysenterica* is not thoroughly atoxic and may lead to several subjective symptoms and hypotension.	Chaturvedi GN, Singh KP. Side effects of a traditional indigenous drug-Kutaja (*Holarrhena antidysentirica*). Letter to the editor: Indian J Physiol Pharmacol 1983;255–256.
Holarrhena antidysenterica	Plants screened for pyrrolizidine alkaloids *Crotalaria verrucosa, Holarrhena antidysenterica,* and *Cassia auriculata*	Rats	Feeding trials produced liver lesions and histopathology in the lungs and kidneys compatible with the action of pyrrolizidine alkaloids.	Arseculeratne SN, et al. Studies on medicinal plants of Sri Lanka: Occurrence of pyrrolizidine alkaloids and hepatotoxic properties in some traditional medicinal herbs. J Ethnopharm 1981;4(2):159–177.
Hydrocotyle asiatica L. UMBELLIFERAE Zupha Hyssop	Dried upripe fruit powder of *Aegle marmelos*, dried powder plant of *Hydrocotyle asiatica*; dried powder of *Poederia foetida*	Randomized double-blind clinical trial: 82 men with shigellosis	Treatment with all these plants did not show any clinical improvement or bacteriological cure as compared to ampicillin.	Haider R, et al. Evaluation of indigenous plants in the treatment of acute shigellosis. Trop Georgr Med 1991;43(3):266–270.
Hygrophila auriculata (Schumach.) Heine ACANTHACEAE Kokilaksha, Talmakhana	Methanolic extract of the seeds of *Apium graveolens* and *Hygrophila auriculata*	Rats with paracetamol-induced liver damage	A significant hepatoprotective activity of the methanolic extract of the seeds of both plants was reported.	Singh A, Handa SS. Hepatoprotective activity of *Apium graveolens* and *Hygrophila auriculata* against paracetamol and thioacetamide intoxication in rats. J Ethnopharm 1995;49(3):119–126.
Juniperus communis L. CUPRESSACEAE Hapusa Juniper berry	Juniper decoction at dosage of 250 mg/kg and 125 mg/kg	Normoglycemic and streptozotocin diabetic rats.	Juniper decoction reduced glycemic levels in normoglycemic rats. Administration to diabetic rats for 24 days resulted in a significant decrease both in blood glucose levels and in the mortality index, as well as the prevention of loss of body weight.	Sanchez de Medina F, et al. Hypoglycemic activity of juniper "berries". Planta Med 1994;60(3): 197–200.
Juniperus communis	Plants include: leaves of *Agrimonia eupatoria, Alchemilla vulgaris,* bulbs of *Allium sativum, Chelidonium majus, Convallaria majalis,* seeds of *Coriandrum*	Mice	Treatment with *Agrimonia eupatoria, Medicago sativa, Coriandrum sativum, Eucalyptus globulus* and *Juniperus communis* reduced the level of hyperglycemia during development of streptozotocin diabetes in mice. This was associated with reduced	Swanston-Flatt SK, et al. Traditional plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice. Diabetologia 1990; 33(8):462–464.

	sativum, *Eucalyptus globulus*, roots of *Glycyrrhiza glabra*, dried berries of *Juniperus communis*, *Medicago sativa*, *Rubus fraticosus*		polydipsia (except *Coriandrum sativum*) and a reduced rate of weight loss (except *Agrimonia eupatoria*).	
Juniperus communis	Varying extracts of *Acrostichum aureum*, *Adhatoda vasica*, *Citrulus colocynthus*, *Codonopsis ovata*, *Dolichos biflorus*, *Ferule orientalis*, *Juniperus communis*, *Kigelia pinnata*, *Lepidum capitum*, *Nerium odoratum*, *Pueraria tuberosa*, *Punica granatum*, *Randia dumetorum*, *Rubus ellipticus*, *Ruta graveolens*	Female albino rats	All the plants showed marked but varied inhibition of pregnancy and anti-implantation activity.	Prakash AO, et al. Anti-implantation activity of some indigenous plants in rats. Acta Eur Fertil 1985;16(6): 441–448.
Linum usitatissimum L. LINACEAE Uma Linseed	Ground raw flaxseed 50 g/d for 4 weeks	Human trial: healthy female volunteers	Authors conclude that up to 50 g high-α-linolenic acid flaxseed/day is palatable, safe, and may be nutritionally beneficial in humans by increasing n-3 fatty acids in plasma and erythrocytes and by decreasing postprandial glucose responses.	Cunnane SC, et al. High alpha-linolenic acid flaxseed (*Linum usitatissimum*): some nutritional properties in humans. Br J Nutr Mar;1993;69(2):443–3.
Linum usitatissimum	Freeze-dried extracts of *Calendula officinalis*, *Hypericum perforatum* *Linum usitatissimum*, *Matricaria chamomilla*, *Plantago lanceolata*, *Symphytum officinale*	Wistar albino rats	*Linum usitatissimum* and *Symphytum officinale* did not inhibit inflammation but they did suppress the leukocyte infiltration at the third and fourth hour of the induced inflammation. *Calendula officinalis*, *Hypericum perforatum*, *Matricaria chamomilla*, and *Plantago lanceolata* suppressed both inflammatory effect and leukocyte infiltration.	Shipochliev T, et al. Anti-inflammatory action of a group of plant extracts [Bulgarian]. Vet Med Nauki 1981; 18(6):87–94.
Luffa cylindrical M. Roem. CUCURBITACEAE Dhamargara Sponge gourd	Two glycoproteins with a molecular weight of 28,000 and 28,500 isolated from seeds of *Luffa cylindrica*	Mice	The proteins were capable of inducing midterm abortion in mice, inhibiting protein synthesis in a cell-free system and suppressing thymidine uptake by human choriocarcinoma cells.	Ng TB, et al. Two proteins with ribosome-inactivating, cytotoxic and abortifactant activities from seeds of *Luffa cylindrica* Roem (Cucurbitaceae). Biochem Int 1992; 27(2):197–207.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Luffa cylindrica	Bryonolic acid isolated from the cultured cells of *Luffa cylindrica*. Administered to rats IP 600 mg/kg	Rats, mice	Bryonolic acid inhibited homologous passive cutaneous anaphylaxis more strongly than glycyrrhetinic acid from licorice. Bryonolic acid showed little toxicity and no visible side effects on mice.	Tanaka S, et al. Anti-allergic effect of bryonolic acid from *Luffa cylindrica* cell suspension cultures. Planta Med 1991;57(6):527–530.
Mallotus philippensis (Lam.) Muell. EUPHORBIACEAE Kampilla Rottlera	Dried powder fruit of *Mallotus philippensis* (250, 375, 500 and 750 mg/kg compared to fenbendazole [10 mg/kg])	Goats	*Mallotus philippensis* fruit is not effective in eliminating direct life-cycle gastrointestinal nematodes in goats.	Jost CC, et al. Kamala (*Mallotus philippensis*) fruit is ineffective as an anthelminthic against gastro-intestinal nematodes in goats indigenous to Balochistan, Pakistan. Small Ruminant Res 1996;20(2): 147–153.
Mallotus philippensis	Crude powder mixture of equal parts of: *Ailanthus excelsa, Butea monosperma, Embelia ribes, Erythrina indica, Mallotus philippensis, Orxylum indicum*	75 patients with various worm infestations	The cure rate in group A was 80%, group B treated with mebendazole was 92%, and group C was 76%. Cure rate showed negative *Ascaris lumbricoides* ova in the stool report for 3 consecutive days.	Sarma BP, Ojha D. The management of Gandupada krimi (*Ascaris lumbricoides*) with indigenous drugs. Aryavaidyan 1992;5(3):170–172.
Mentha arvensis L. LABIATAE Puthea Corn mint	Petroleum ether and benzene chromatographic fraction of the petroleum ether extract of *Mentha arvensis* leaves	Mice	Interruption of nidation occurred at 5 mg per mouse per day. A statistically significant decrease in the alkaline and acid phosphatase content of the uterus on day 12 postcoitum was noted. Benzene and chloroform were ineffective in altering alkaline and acid phosphatase.	Garg P, et al. Alteration in the uterine phosphatase of the mouse after administration of contragestative dose of chromatographic fraction of petroleum ether extract of mint (*Mentha arvensis*) leaves. J Advanced Zoology 1995;16(2):85–87.
Mentha arvensis	Essential oils of *Artemisia nelagrica, Caesulia axillaris, Chenopodium ambrosioides, Cymbopogon citratus, Mentha arvensis*	Guinea pigs	Five essential oils by formulation of ointments were able to cure experimental ringworm in guinea pigs within 7–12 days. Artemisia oil was found to be the most effective essential oil.	Kishore N, et al. Fungitoxicity of essential oils against dermatophytes. Mycoses 1993;36(5–6):211–215.

Mentha arvensis	50% ethanolic extract of *Mentha arvensis* leaves	Rats	Extract of *Mentha arvensis* has been found to decrease the fructose synthesis vesicles. As a result, the viability of spermatozoa seemed to be altered. Fertility revealed sterile matings until 30 days of last treatment.	Mathur R. Fructolysis effect of 50% ethanolic extract of *Mentha arvensis* Linn. (leaves) in seminal vesicles of rat. Acta Eur Fertil 1991;22(4):219–220.
Mentha arvensis	Fraction of *Mentha arvensis*	Rats	Subcutaneous administration of the uterotonic fraction to rats pregnant from day 1–10 caused a significant interruption in pregnancy.	Kanjanapothi D, et al. Postcoital antifertility effect of *Mentha arvensis*. Contraception 1981;24(5):559–567.
Mentha arvensis	Essential oils of *Mentha arvensis, Mentha piperita, Anethum sowa, Cymbogopon winterianus, Nardostachys jatamansi* and *Commiphora mukul*	Molds and fungus	These oils were fungistatic or fungicidal to one or the other molds, depending upon the concentrations.	Sarbhoy AK, et al. Efficacy of some essential oils and their constituents on few ubiquitous molds. Zentralbl Bakteriol [Naturwiss] 1978;133(7–8): 723–725.
Moringa oleifera Lam. MORINGACEAE Sigru Horseradish tree	Edible portions of *Moringa oleifera* and *Amaranthus tricolor*	6 male weanling albino rats	The extent of calcium absorption from *Moringa oleifera* and *Amaranthus tricolor* and milk was evaluated. Results revealed that calcium absorption and calcium retention from milk were significantly increased compared to *Moringa oleifera* and *Amaranthus tricolor*. The presence of oxalates inhibited intestinal absorption of calcium.	Pankaja N, Prakash J. Availability of calcium from kilkeerai (*Amaranthus tricolor*) and drumstick (*Moringa oleifera*) greens in weanling rats. Nahrung 1994;38(2):199–203.
Moringa oleifera	Leaf extracts of *Adansonia digitata, Calotropis procera, Moringa oleifera Tamarindus indica, Ziziphus jaozeiro*	Human trial: humans with guinea worms	Topical application resulted in users perceived relief of pain and accelerated expulsion of worms and healing process.	Fabiyi JP, et al. Traditional therapy of dracunculiasis in the state of Bauchi-Nigeria [French]. Dakar Med 1993;38(2):193–195.
Moringa oleifera	Hot water infusions of flowers, leaves, roots, seeds and stalks of bark of *Moringa oleifera*. Doses are expressed as equivalent of dried starting plant material	Rats with induced hindpaw edema	The seed infusion showed a significant inhibition of acetylcholine-induced contraction with an ED_{50} of 65.6 mg/mL bath concentration, inhibition of induced edema, and diuretic activity at 100 mg/kg.	Caceres A, et al. Pharmacologic properties of *M. oleifera* 2: Screening for antispasmodic, anti-inflammatory and diuretic activity. J Ethnopharm 1992;36(3):233–237.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Moringa oleifera	Ethanol or water extracts of powdered plant material: *Adhatoda vasica, Abrus precatorius, Acacia arabica, Aloe barbadensis, Anethum sowa, Apium petroselinium, Banbusa arundensis, Blepharis edulis, Butea monosperma, Hibiscus rosa-sinensis, Lepidum sativum, Mesua ferrea, Moringa oleifera, Mucuna pruriens, Raphanus sativus, Sida cordifolia, Trachyspermum ammai*	Rats orally dosed for 10 days	Aqueous or 90% ethanol extracts of the plants were studied in rats for 10 days after insemination with special reference to effects of fetal development. Leaf extracts of *Moringa oleifera* and *Adhatoda vasica* were 100% abortive at doses equivalent to 175 mg/kg starting dry material. Only the flowers of *Acacia arabica* and *Hibiscus rosa-sinensis* appeared to lack teratologic potential at the doses tested.	Nath D, et al. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. J Ethnopharm 1992;36:147–154.
Moringa oleifera	*Alternanthera sessilis, Cuminum cyminum, Curcuma longa, Ferula asafoetida, Moringa oleifera, Ocimum sanctum, Papaver somnifera, Piper longum, Sylamum nigrum*	Mice and rats	*Cuminum cyminum* seeds, *Ocimum sanctum* leaves, *Papaver somnifera* seeds significantly inhibited neoplasia alone. These plants may prove to be valuable anticarcinogens.	Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxic 1992;30(11):953–956.
Moringa oleifera	Biosynthetically and chemically related compounds isolated from the roasted seeds of *Moringa oleifera*	Albino mice	Based on mutagenicity tests in albino mice, structure-activity correlation studies that 4 (α-L-rhamnosyloxy) phenyl-acetonitrile, 4-hydroxy-phenylacetonitrile, and 4-hydroxyphenylacetamide exhibited mutagenic activity.	Villasenor IM, et al. Mutagens from roasted seeds of Moringa oleifera. Mutat Res 1989;224(2):209–212.

Moringa oleifera	Aqueous extract of *Moringa oleifera* roots	Ovariectomized rats	To assess the histologic effect of the antifertility mode of action it was found that the extract stimulated the uterine histoarchitecture by an increase in the height of luminal epithelium, well-developed glands, loose stroma, and rich vascularity. The cervix showed metaplastic changes. In the vagina, cornification was prominent, rugae increased, and stroma was loose.	Shukla S, et al. Histoarchitecture of the genital tract of ovariectomized rats treated with an aqueous extract of *Moringa oleifera* roots. J Ethnopharm 1989;25(3):249–261.
Moringa oleifera	Aqueous extract of *Moringa oleifera* roots	Female rats	Initial administration of *Moringa oleifera* stimulated the uterine structures, caused metaplastic changes in the cervical epithelium and provoked considerable cornification in the vaginal epithelium. At a later duration, significant inhibition in the histoarchitecture was observed. Biochemical observations and histologic findings correlated with anti-implantation action of the aqueous extract.	Shukla S, et al. Biochemical and physiological alterations in female reproductive organs of cyclic rats treated with aqueous extract of *Moringa oleifera* Lam. Acta Eur Fertil 1988;19(4):225–232.
Moringa oleifera	Aqueous extract of *Moringa oleifera* roots	Ovariectomized rats	The root was investigated for its estrogenic, antiestrogenic, progestational, and antiprogestational activities. The antifertility effect appears to be due to multiple attributes.	Shukla S, et al. Antifertility profile of the aqueous extract of *Moringa oleifera* roots. J Ethnopharm 1988;22(1):51–62.
Moringa oleifera	Aqueous extract of *Moringa oleifera* roots	Ovary of rat during early pregnancy	Treated rats remained in the cyclic conditions as newly formed corpora lutea were observed. Nontreated ovaries of control rats showed well developed corpora lutea. Several other features showed that the extract could not induce any histologic features in the ovary as observed in pregnancy.	Prakash AO. Ovarian response to aqueous extract of *Moringa oleifera* during early pregnancy in rats. Fitoterapia 1988;LIX(2):89–96.
Moringa oleifera	Aqueous extracts of the roots and bark of *Moringa oleifera* and *Moringa concacensis*	Female adult rats	Both extracts are effective in preventing implantation. Results also showed anti-implantation activity of *Moringa oleifera* root was consistent regardless of its time and place of collection.	Shukla S, et al. Anti-implantation efficacy of *Moringa oleifera* Lam. and *Moringa concacensis* Nimmo rats. Int J Crude Drug Res 1988;26: 29–32.

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Table 2. Plants Used in *Ayurvedic Pharmacopoeia* (Cont'd)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Moringa oleifera	Aqueous extract of *Moringa oleifera* roots	Pregnant rats	Administration of extract to pregnant rats could not stimulate the uterus that remained nonreceptive throughout the period of treatment, therefore, the fertilized eggs may not be welcomed by the unprepared uterus.	Prakash AO, et al. Uterine histo-architecture during pre- and post-implantation periods of rats treated with aqueous extract of *Moringa oleifera* Lam. Acta Eur Fertil 1987; 18(2):129–135.
Mucuna pruriens (L.) DC. LEGUMINOSAE Kapikachchha Cow-itch plant	Stable, standardized preparation from endocarp of *Mucuna pruriens* beans (HP-200)	Multicenter clinical trial: 60 with Parkinson's disease	Using the Unified Parkinson's Disease Rating Scale (UPDRS), a significant decrease in scores from baseline to the end of the 12-week study, indicated a significant improvement in their Parkinson's conditions.	Manyam BV, et al. An alternative medicine treatment for Parkinson's disease: Results of a multicenter clinical trial. J Altern Complement Med 1995;1(3):249–255.
Mucuna pruriens	Ethanol or water extracts of powdered plant material: *Adhatoda vasica, Abrus precatorius, Acacia arabica, Aloe barbadensis, Anethum sowa, Apium petroselinium, Banbusa arundensis, Blepharis edulis, Butea monosperma, Hibiscus rosa-sinensis, Lepidum sativum, Mesua ferrea, Moringa oleifera, Mucuna pruriens, Raphamus sativus, Sida cordifolia, Trachyspermum ammai*	Rats orally dosed for 10 days	Aqueous or 90% ethanol extracts of the plants were studied in rats for 10 days after insemination with special reference to effects of fetal development. Leaf extracts of *Moringa oleifera* and *Adhatoda vasica* were 100% abortive at doses equivalent to 175 mg/kg starting dry material. Only the flowers of *Acacia arabica* and *Hibiscus rosa-sinensis* appeared to lack teratologic potential at the doses tested.	Nath D, et al. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. J Ethnopharm 1992;36: 147–154.

Myristica fragrans Houtt. MYRISTICACEAE Jatiphalam Nutmeg	Ethanolic extract of *Myristica fragrans*. 500 mg/kg orally daily for 60 days	Albino rabbits and controls	Total cholesterol, LDL, triglycerides, and cholesterol were all significantly reduced. The extract also showed platelet antiaggregatory ability and a significant decrease in levels of total cholesterol in heart and liver.	Ram A, et al. Hypolipidaemic effect of *Myristica fragrans* fruit extract in rabbits. J Ethnopharm 1996;55(1): 49–53.
Myristica fragrans	*Myristica fragrans* seed extract	Hypercho-lesterolemic rabbits	The extract reduced serum and LDL cholesterol by 69.1% and 76.3%, respectively. Significant decrease in cholesterol/phospholipid ratio by 31.2% and an increase in the HDL-ratio. The extract prevented accumulation of cholesterol, phospholipid and triglyceride in the liver, heart and aorta. Extract dissolved atheromatous plaques of aorta by 70.9–76.5%. Fecal excretion of cholesterol and phospholipids were significantly increased.	Sharma A, et al. Prevention of hyper-cholesterolemia and atherosclerosis in rabbits after supplementation of *Myristica fragrans* seed extract. Indian J Physiol Pharmacol 1995; 39(4):407–410.
Myristica fragrans	Aril of the plant *Myristica fragrans.* Aqueous suspension at dose of 0.025 or 0.1 g per animal per day, administered by oral gavage to dams day 1 of lactation and continued for 14, 21 days	Mice progeny	The possible transfer of the active principle of mace through trans-mammary route and its ability to modulate hepatic xenobiotic metabolizing enzymes in the F1 progeny was studied. Only 14-day-old pups of dams receiving either mace dose showed significantly increased hepatic glutathione peroxidase levels.	Chabra SK, Rao AR. Transmammary modulation of xenobiotic metabolizing enzymes in liver of mouse pups by mace (*Myristica fragrans* Houtt.). J Ethnopharm 1994; 42(3):169–177.
Myristica fragrans	Aril of nutmeg. Dose of 0.5% or 1% mace	Mice	Modifying potential of areca nut on the induction of the hepatic detoxification system in mice by mace was studied. At 0.5% and 1% mace in the diet, areca nut reduced mace-induced increases in hepatic glutathione S-transferase and sulfhydryl levels and elevated further increases in levels of cytochrome b5 and P450.	Singh A, Rao AR. Modulatory effect of Areca nut in the action of mace (*Myristica fragrans*, Houtt) on the hepatic detoxification system in mice. Food Chem Toxicol 1993; 31(7):517–521.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Myristica fragrans	1 capsule 3× per day with luke warm water containing: *Asparagus racemosus,* 50 mg; *Bergenia ligulata,* 100 mg; *Eclipta alba,* 100 mg; *Myristica fragrans,* 10 mg; *Tinospora cordifolia,* 100 mg; *Tribulus terrestris,* 50 mg; *Withania somnifera,* 50 mg.	30 patients with calculi on kidneys, ureters or bladders	The herbal combination was found to alleviate not only pain but also slowly disintegrated both calcium-oxalate and calcium carbonate crystals in a span of 72 hours and complete discharging of crystals within 15–30 days. Complete discharge occurred in greater than 80% of the patients.	Karnick CR. Clinical evaluation of composite Ayurvedic drugs, on calculi, in the kidney and the urinary bladder. Aryavaidyan 1992;6(2):104–108.
Myristica fragrans	Aril of nutmeg. Oral administration of 10 mg per mouse per day for 7 days before and 90 days after carcinogen thread inserted	Mice with induced carcinogenesis in uterine cervix	Decline in the incidence of carcinomas was highly significant compared to controls.	Hussain SP, Rao AR. Chemopreventive action of mace (*Myristica fragrans,* Houtt) on methylcholanthrene-induced carcinogenesis in the uterine cervix in mice. Cancer Lett 1991;56(3):231–234.
Myristica fragrans	Aril of nutmeg. Animals received diet of 1% mace	Mice	A significant decline of skin papilloma incidence compared to controls was observed.	Jannu LN, et al. Chemopreventive action of mace (*Myristica fragrans*, Houtt) on DBMA-induced papillo-magenesis in the skin of mice. Cancer Lett 1991;56(1):59–63.
Myristica fragrans	Aril of nutmeg. 1% or 2% mace diet for 10 days	Mice	A significant increase in glutathione S-transferase activity and in acid soluble sulfhydryl groups in the liver was noted.	Kumari MV, Rao AR. Effect of mace (*Myristica fragrans,* Houtt) on cytosolic glutathione S-transferase activity and acid soluble sulfhydryl level in mouse liver. Cancer Lett 1989;15;46(2):87–91.
Nardostachys jatamansi (D. Don) DC. VALERIANACEAE Jatamansi Musk root	Each tablet contains 100 mg of alcoholic extract of root of *Rauwolfia serpentina*, 100 mg of rhizome powder of *Nardostachys jatamansi*	39 patients with insomnia	Preparation was evaluated for clinical efficacy and safety in insomnia by subjective and polysomnographic method. The preparation produced significant improvement in sleep parameters. The preparation did not	Rani PU, Naidu UR. Subjective and polysomnographic evaluation of a herbal preparation in insomnia. Phytomedicine 1998;5(4):253–257.

	and 100 mg aqueous extract of root, stem, leaf of *Tinospora cordifolia*; 2 tablets at bedtime for 21 days		produce any feeling of hangover or day time sleeplessness, 11 patients complained of mild epigastric distress after the test drug. It can be concluded the preparation had good hypnotic activity and can be used in insomnia.	
Nardostachys jatamansi	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each of three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory (blackheads and other comedones) lesions. The treatment preparations' mechanisms of action remain unknown.	Paranjpe P. Evaluation of topical applications of herbal formulations in acne vulgaris: A single-blind randomized comparative study. J Med Aromatic Plant Sci 1997;19: 414–418.
Nardostachys jatamansi	Alcoholic extract of the roots of *Nardostachys jatamansi*	Male albino Wistar rats	These data indicate an overall significant increase in the levels of central monoamines and inhibitory amino acids.	Prabhu V, et al. Effects of *Nardostachys jatamansi* on biogenic amines and inhibitory amino acids in the rat brain. Planta Med 1994;60(2):114–117.
Nardostachys jatamansi	50% extract of *Curcuma longa* and *Nardostachys jatamansi* (whole plant)	Rats	The extracts increased HDL-/total cholesterol ratio and also caused a significant decrease in the ratio of total cholesterol/phospholipid. *Curcuma longa* exhibited better cholesterol and triglyceride decreasing activity than *Nardostachys jatamansi.*	Dixit VP, et al. Hypolipidaemic effects of *Curcuma Longa* L and *Nardostachys jatamansi*, DC in triton-induced hyperlipidaemic rats. Indian J Physiol Pharmacol 1988;32(4):299–304.
Nardostachys jatamansi	Essential oils of *Mentha arvensis, Mentha piperita, Anethum sowa, Cymbogopon winterianus, Nardostachys jatamansi,* and *Commiphora mukul*	Molds and fungus	These oils were fungistatic or fungicidal to one or the other molds, depending on the concentrations.	Sarbhoy AK, et al. Efficacy of some essential oils and their constituents on few ubiquitous molds. Zentralbl Bakteriol [Naturwiss] 1978;133(7–8): 723–725.
Nardostachys jatamansi	Active principle of *Nardostachys jatamansi*	Rabbits, dogs, cats, mice	Antiarrhythmic action of *Nardostachys jatamansi* and quinidine were investigated. Compared on the electrocardiogram, *Nardostachys jatamansi* caused a decrease in the prolongation of refractory period and a decreased slowing of conduction, a distinct advantage over quinidine. *Nardostachys jatamansi* may be useful in cases of auricular flutter.	Arora RB, Madan BR. Antiarrhythmics. Part III. Antiarrhythmic activity of *Nardostachys jatamansi* (an Indian indigenous drug). Ind J Med Res 1956;44(2):259–269.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Nelumbo nucifera Gaertn. NELUMBONACEAE Kamal Sacred lotus	Methanolic extract of *Nelumbo nucifera* rhizome. Doses of 200, 300, or 400 mg/kg	Rats	The extract produced a significant dose-dependent decrease of normal body temperature and a yeast-provoked increase of body temperature. The effect produced was comparable with the antipyretic drug paracetamol.	Mukherjee PK, et al. Antipyretic activity of *Nelumbo nucifera* rhizome extract. Indian J Exp Biol 1996;34(3): 275–276.
Nelumbo nucifera	Methanolic extract of rhizomes of *Nelumbo nucifera*	Rats and mice	The extract was found to cause a reduction in spontaneous activity, a decrease in exploratory behavioral patterns, a decrease in muscle relaxant activity and it significantly potentiated the pentobarbitone induced sleeping time.	Mukherjee PK, et al. Studies on psychopharmacological effects of *Nelumbo nucifera* Gaertn. rhizome extract. J Ethnopharm 1996;54(2–3): 63–67.
Nelumbo nucifera	Methanolic extract of rhizomes of *Nelumbo nucifera*	Rats	The extract-treated animals showed significant inhibitory activity against castor oil induced diarrhea and inhibited significantly PGE-2 induced enteropooling in rats. It also showed significant decreases in gastrointestinal motility after a charcoal meal.	Mukherjee PK, et al. Antidiarrhoeal evaluation of *Nelumbo nucifera* rhizome extract. Indian J Pharmacol 1995;27(4):262–264.
Nelumbo nucifera	Decoction of *Crataegus cuneata, Nelumbo nucifera* and *Gynostemma pentaphylla*	Humans	The decoction produced a reduction of triglyceride and cholesterol.	La Cour B, et al. Traditional Chinese medicine in treatment of hyper-lipidaemia. J Ethnopharm 1995; 46(2):125–129.
Nelumbo nucifera	Powdered sun-dried flowers (test drug) and aqueous and alcoholic extracts of *Nelumbo nucifera*	Normal albino rabbits	Study of glucose tolerance curves shows that duration of hyperglycemia was notably reduced compared with controls. The extracts effects were comparable to that produced by 250 mg/kg of tolbutamide. The extracts significantly depressed hyperglycemia induced by adrenaline hydrochloride.	Huralikuppi AB, et al. Anti-diabetic effect of *Nelumbo nucifera* (Gaertn): Part I preliminary studies in rabbits. Phytother Res 1991;5(2):54–58.
Nelumbo nucifera	Air-dried flowers of *Nelumbo nucifera*	Normal rats, diabetic	Long-term administration of extracts did not produce sustained fall of fasting	Huralikuppi JC, et al. Antidiabetic effect of *Nelumbo nucifera* (Gaertn)

	finely powdered, aqueous and alcoholic extracts	rabbits	blood sugar levels although daily doses caused hypoglycemia as an acute effect. The extracts showed acute and chronic effects in suppressing hyperglycemia, but were less potent than standard drugs. The extract significantly improved glucose tolerance.	extract: Part II. Phytother Res 1991; 5:217–223.
Nelumbo nucifera	Nefereine, alkaloid extracted from the green seed embryo of *Nelumbo nucifera*. Dose of 1–10 mg/kg IV	Cats	The results indicate that neferine and quinidine have similar effects on heart electromechanical activity.	Li GR, et al. Effects of neferine on heart electromechanical activity in anaesthetized cats [Chinese]. Chung-Kuo Yao Li Hsueh Pao-Acta Pharmacologica Sinica 1990; 11:158–161.
Nyctanthes arbor-tristis L. OLEACEAE Parijata Night jasmine	Water soluble fraction of the ethanolic extract of *Nyctanthes arbor-tristis*. Varying doses of 1, 10, 50, and 100 μg	Mice	Oral administraton of the extract showed a consistent depletion of tumor necrosis factor-α (TNF-α) from the host plasma. The extract also reduced plasma interferon-γ level but the plasma immunoglobulin M (IgM) and immunoglobulin G (IgG) levels were not affected. The extract may be effective in clinical disorders in the management of TNF-α.	Paul BN, Saxena AK. Depletion of tumor necrosis factor-alpha in mice by *Nyctanthes arbor-tristis*. J Ethnopharm 1997;56(2):153–158.
Nyctanthes arbor-tristis	50% ethanolic extract of seeds, flowers and leaves of *Nyctanthes arbor-tristis*. Oral dose of 25 mg/kg per day for 7 days	Mice	Strong stimulation of antigen specific and nonspecific immunity was noted. Maximum activity found in seeds in which the active principle appeared associated with lipids. In flowers and leaves, the major activity was found in the aqueous fraction of the 50% ethanol extract.	Puri A, et al. Immunostimulant activity of *Nyctanthes arbor-tristis* L. J. Ethnopharm 1994;42(1): 31–37.
Nyctanthes arbor-tristis	Water-soluble portion of an ethanolic extract of leaves of *Nyctanthes arbor-tristis*	Rats	The extract exhibited significant aspirin-like antinociceptive activity but failed to produce morphine-like analgesia. The extract was also found to possess antipyretic activity and produced gastric ulcers.	Saxena RS, et al. Analgesic, antipyretic and ulcerogenic activity of *Nyctanthes arbor-tristis* leaf extract. J Ethnopharm 1987;19(2):193–200.
Nyctanthes arbor-tristis	Water-soluble portion of an ethanolic extract of the leaves of *Nyctanthes arbor-tristis*. Extract administered orally in doses ranging from 0.5 to 8.0 g/kg	Rats	The extract inhibited acute inflammatory edema induced in the hindpaw and significantly decreased acute inflammatory swelling on the knee joint. Acute and chronic phases of induced arthritis and the inflammation produced by immunologic methods were also significantly inhibited.	Saxena RS, et al. Study of anti-inflammatory activity in the leaves of Nyctanthes arbor tristis Linn. —An Indian medicinal plant. J Ethnopharm 1984;11(3):319–330.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Ocimum sanctum L. LABIATAE Tulsi Holy basil	Aqueous extract of the leaves of *Ocimum sanctum*	Mice	The extract administered with radiotherapy gave a higher stem cell survival rate ($p < 0.05$) compared to WR-2721 and radiotherapy. While WR-2721 had a toxic effect, *Ocimum sanctum* treatment showed no such effect.	Ganasoundari A, et al. Modification of bone marrow radiosensitivity by medicinal plant extracts. Br J Radiol 1997;70(834):599–602.
Ocimum sanctum	*Ocimum sanctum* fixed oil	Induced paw edema	*Ocimum sanctum* oil and linoleic acid were found to possess significant antiinflammatory activity.	Singh S, Majumdar DK. Evaluation of antiinflammatory activity of fatty acids of *Ocimum sanctum* fixed oil. Indian J Exp Biol 1997; 35(4):380–383.
Ocimum sanctum	Ethanolic extract of *Ocimum sanctum*	Rats	Treatment with the extract prevented changes in the plasma level of corticosterone induced exposure to both acute and chronic noise stress.	Sembulingam K, et al. Effect of *Ocimum sanctum* Linn on noise induced changes in plasma ticosterone level. Indian J Physiol Pharmacol 1997;41(2):139–143.
Ocimum sanctum	*Eclipta alba, Ocimum sanctum, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera.* Doses: 100, 200 mg/kg PO 1× day for 28 days	Hyperglycemic rats	The formulation had little effect on blood sugar concentrations but doses induced a dose-related decrease in streptozotocin (STZ) hyperglycemia and attenuation of STZ induced a decrease in islet superoxide dismutase activity in euglycemic rats.	Bhattacharya SK, et al. Effect of Trasina, an Ayurvedic herbal formulation on pancreatic islet superoxide dismutase activity in hyperglycaemic rats. Indian J Exp Biol 1997;35(3):297–299.
Ocimum sanctum	Leaf extract of *Ocimum sanctum*	Mice	*Ocimum sanctum* extract significantly reduced the generation of hydroxyl radical.	Ganasoundari A, et al. Protection against radiation-induced chromosome damage in mouse bone marrow by *Ocimum sanctum*. Mutat Res 1997;373(2):271–276.
Ocimum sanctum	*Ocimum sanctum* leaf powder	Diabetic rats	Observations indicate a significant hypoglycemic and hypolipidemic effect on diabetic rats.	Rai V, et al. Effect of Tulasi (*Ocimum sanctum*) leaf powder supplementation on blood sugar levels, serum lipids and tissue in diabetic rats. Plant Foods Hum Nutr 1997;50(1): 9–16.

Ocimum sanctum	Fixed oil of *Ocimum sanctum*	Induced paw edema in rats	Oil of *Ocimum sanctum* was found to possess significant anti-inflammatory activity against carrageenan- and other mediator-induced paw edema in rats.	Singh S, et al. Evaluation of anti-inflammatory potential of fixed oil of *Ocimum sanctum* (Holy basil) and its possible mechanism of action. J Ethnopharm 1996;54(1): 19–26.
Ocimum sanctum	Extract of *Ocimum sanctum*	Controlled single blind trial: humans	Results indicated a significant decrease in fasting postprandial blood glucose levels during treatment with holy basil leaves compared to treatment with placebo leaves.	Agrawal P, et al. Randomized placebo-controlled, single blind trial of holy basil leaves in patients with noninsulin-dependent *Diabetes mellitus*. Int J Clin Pharmacol Ther 1996;34(9):406–409.
Ocimum sanctum	Alcoholic extract of *Ocimum sanctum* leaves. 400 and 800 mg/kg body weight for 15 days	Mice	The extract significantly increased cytochrome P450 and glutathione S-transferase levels that are important in the detoxification of carcinogens as well as mutagens.	Banerjee S, et al. Modulatory influence of alcoholic extract of Ocimum leaves on carcinogen-metabolizing enzyme activities and reduced glutathione levels in mouse. Nutr Cancer 1996;25(2):205–217.
Ocimum sanctum	Water and aqueous ethanolic extract of *Ocimum sanctum*	Albino mice	The water extract was more radio-protective than the aqueous ethanolic extract and less toxic.	Devi PU, Ganasoundari A. Radio-protective effect of leaf extract on Indian medicinal plant *Ocimum sanctum*. Indian J Exp Biol 1995; 33(3):205–208.
Ocimum sanctum	Fresh leaves of *Ocimum sanctum* mixed as 1 g and 2 g in 100 g of diet for 4 weeks	Albino rats	Significant reduction in serum total cholesterol, triglycerides, phospho-lipid and LDL, and significantly increased HDL and total fecal sterol contents was observed.	Sarkar A, et al. Changes in the blood lipid profile after administration of *Ocimum sanctum* (Tulsi) leaves in the normal albino rabbits. Indian J Physiol Pharmacol 1994;38(4):311–312.
Ocimum sanctum	Ethanolic extract of *Ocimum sanctum* leaves. Topical administration	Mice with induced skin papilloma genesis	Significant reduction in tumor incidence, average number of tumors/tumor-bearing mice and cumulative number of papillomas was observed.	Prashar R, et al. Chemopreventive action by an extract from *Ocimum sanctum* on mouse skin papilloma-genesis and its enhancement of skin glutathione S-tansferase activity and acid soluble sulfydryl level. Anti-cancer Drugs 1994;5(5):567–572.
Ocimum sanctum	Alcoholic extract of *Ocimum sanctum* leaves administered orally	Diabetic rats	Marked lowering of blood sugar level in normal, glucose fed hyperglycemic and streptozotocin induced diabetic rats was noted. The extract potentiated action of exogenous insulin in normal rats.	Chattopadhyay RR. Hypoglycemic effect of *Ocimum sanctum* leaf extract in normal and strepto-zotocin diabetic rats. Indian J Exp Biol 1993;31(11):891–893.
Ocimum sanctum	Extract of *Ocimum sanctum*	Rats	The extract reduced ulcer index, free and total acidity on short-term and long-term administration.	Mandal S, et al. *Ocimum sanctum* Linn—A study on gastric ulceration and gastric secretion in rats. Ind J Physiol Pharmacol 1993;37(1): 91–92.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Ocimum sanctum	*Alternanthera sessilis, Cuminum cyminum, Curcuma longa, Ferula asafoetida, Moringa oleifera, Ocimum sanctum, Papaver somnifera, Piper longum, Sylanum nigrum*	Mice and rats	*Cuminum cyminum* seeds, *Ocimum sanctum* leaves, and *Papaver somnifera* seeds significantly inhibited neoplasia alone. These plants may prove to be valuable anticarcinogens.	Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxic 1992;30(11):953–956.
Ocimum sanctum	Ethanol extract of the leaves of *Ocimum sanctum*	Mice and rats	*Ocimum sanctum* extract was screened for its effect on the central nervous system. Haloperidol and sulpride, D2 receptor antagonists when given with *Ocimum* extract fully blocked the effect of the latter suggesting a possible D2 receptor mechanism for *Ocimum* extract.	Sakina MR, et al. Preliminary psychopharmacological evaluation of *Ocimum sanctum* leaf extract. J Ethnopharm 1990;28:143–150.
Ocimum sanctum	Methanol extract and an aqueous suspension of *Ocimum sanctum* leaves	Albino rats	The results of the study suggest a immunostimulant capability for *Ocimum sanctum* that may be contributory in explaining the adaptogenic action of the plant.	Godhwani S, et al. *Ocimum sanctum*—A preliminary study evaluating its immunoregulatory profile in albino rats. J Ethnopharm 1988;24:193–198.
Ocimum sanctum	Methanol and aqueous suspension of *Ocimum sanctum*	Rats and mice	Both extracts inhibited acute as well as chronic inflammation in rats. The anti-inflammatory response of 500 mg/kg of methanol extract and aqueous suspension was comparable to the response observed with 300 mg/kg of sodium salicylate.	Godhwani S, et al. *Ocimum sanctum:* An experimental study evaluating its anti-inflammatory, analgesic and antipyretic activity in animals. J Ethnopharm 1987;21:153–163.
Oryza sativa L. GRAMINEAE Sali Sali	*Oryza sativa*-water, *Eleusine coracana*-water, *Maranta arundinacea, Cocos mucifera*-water, WHO-oral rehydration solution (ORS)	Rat model of secretory diarrhea	All solutions either decreased cholera toxin-induced net water secretion (*Maranta arundinacea*) or reversed it to net absorption. *Eleusine coracana* water produced maximum net water absorption significantly greater than the WHO-ORS.	Rolston DD, et al. Food-based solutions are a viable alternative to glucose-electrolyte solutions for oral hydration in acute diarrhoea—Studies in a rat model of secretory diarrhoea. Trans R Soc Trop Med Hygiene 1990;84(1):156–159.

Oryza sativa	Water extract of *Oryza sativa* bran, IP administration	Mice	The extract significantly reduced the plasma sugar level. Fractionation and monitoring the activity of furnished 4 glycans, oryza-brans A, B, C, and D resulted. These polysaccharides exerted marked hypoglycemic effects in normal and induced hyperglycemic mice.	Hikino H, et al. Isolation and hypoglycemic activity of oryzabrans A, B, C, and D, glycans of *Oryza sativa* bran. Planta Med 1988;54:1–3.
Oryza sativa	Rice powder ORS compared to standard glucose-electrolyte	Controlled randomized trial; 50 male children	Rice powder oral rehydration solution is safe, effective, and an acceptable alternative to standard WHO glucose-electrolyte solution for the treatment of acute diarrhea in infants and children.	Mohan M, et al. Rice powder oral rehydration solution as an alternative to glucose electrolyte solution. Indian J Med Res 1988; 87:234–239.
Paederia foetida L. RUBIACEAE Pradarini Chinese flower plant	Butanol fraction of a methanol extract of the defatted leaves of *Paederia foetida*, 100 and 200 mg/kg IP injection daily for 7 days	Rats	The extract produced a significant inhibition of granulation tissue formation in cotton-pellet implanted rats, and inhibited the elevation of serum orosomucold levels. Results indicate a rational for the use of the extract to treat inflammatory disorders.	De S, et al. Investigation of the anti-inflammatory effects of *Paederia foetida.* J Ethnopharm 1994;43(1): 31–38.
Paederia foetida	Water soluble fraction of *Paederia foetida*	Rats and mice	Anti-inflammatory activity observed in induced edema in rats and mice, also in long-term models of adjuvant and formaldehyde arthritis.	Singh S, et al. Anti-inflammatory activity of *Paederia foetida.* Fitoterapia 1994;64(4):357–362.
Paederia foetida	Dried unripe fruit powder of *Aegle marmelos*; dried powder plant of *Hydrocotyle asiatica*; dried powder of *Paederia foetida.*	Randomized double-blind clinical trial: 82 men with shigellosis	Treatment with all these plants did not show any clinical improvement or bacteriological cure as compared to ampicillin.	Haider R, et al. Evaluation of indigenous plants in the treatment of acute shigellosis. Trop Geogr Med 1991;43(3):266–270.
Peucedanum graveolens (L.) C.B. Clarke UMBELLIFERAE Misroya, Satapushpi Indian dill	*Peucedanum graveolens* and *Chenopodium album* as a food source	Human consumption	Locally grown food was studied for its β-carotene content to prevent nutritional blindness. Women of west Rajasthan were interviewed to determine common dietary items. Of foods selected, only *Peucedanum graveolens* and *Chenopodium album* at 100 g provided RDA for a 1–3-year-old-child.	Desai S, et al. Compendium of dietary sources of vitamin A in the Thar desert. Indian J Ophthalmol 1992;40(4):106–108.
Picrorhiza kurrooa Royle ex. Benth. SCROPHULARIACEAE Katula, Katki, Kuru	*Asparagus racemosus, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera*	Mice	All plants significantly inhibited the carcinogen ochratoxin-induced suppression of chemotactic activity and the production of interleukin-1 and TNF-α by macrophages.	Dhuley JN. Effect of some Indian herbs on macrophage functions in ochratoxin A treated mice. J Ethnopharm 1997;58:15–20.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Picrorhiza kurrooa	*Eclipta alba, Ocimum sanctum, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera.* Doses: 100, 200 mg/kg PO 1× per day for 28 days	Hyperglyemic rats	Herbal formulation had little effect on blood sugar concentrations but doses induced a dose-related decrease in STZ hyperglycemia, and attenuation of STZ induced a decrease in islet superoxide dismutase activity in euglycaemic rats.	Bhattacharya SK, et al. Effect of Trasina, an Ayurvedic herbal formulation on pancreatic islet superoxide dismutase activity in hyperglycaemic rats. Indian J Exp Biol 1997;35(3):297–299.
Picrorhiza kurrooa	Picroliv (12 mg/kg, PO) an iridoid glycoside fraction of *Picrorrhiza kurrooa*	Rats	After exposure to alcohol, Picroliv reduced the degree of change in most of the parameters induced by alcohol.	Rastogi R, et al. Picroliv protects against alcohol-induced chronic hepatotoxicity in rats. Planta Med 1996;62(3):283–285.
Picrorhiza kurrooa	Picroside 1 and 2. *Picrorhiza kurrooa* root powder 375 mg 3× per day was given for 2 weeks (n = 15) or a matching placebo (n = 18)	Randomized double-blind placebo-controlled trial: patients with acute viral hepatitis	The present study has shown a biological plausibility of efficacy of *Picrorhiza kurrooa* as supported by clinical trial in viral hepatitis, hepatoprotection in animal model, and an approach for standardizing extracts based on picroside content.	Vaidya AB, et al. *Picrorhiza kurrooa* (Kutaki) Royle ex Benth as a hepatoprotective agent—Experimental & clinical studies. J Postgrad Med 1996;42(4):105–108.
Picrorhiza kurrooa	*Azadirachta indica, Boerhavia diffusa, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosanthes dioica, Zingiber officinale.* Extracted in 80% aqueous alcohol ethanol. 1% stock solution used to prepare dilutions. Oral or subcutaneous administration.	Mice with septicemia from *Salmonella typhi*	Infected mice were prophylactically administered postinfective, preinfective, single and multiple doses of extract and had a significant therapeutic effect in reducing septicemia.	Sohni YR, et al. Prophylactic therapy of *Salmonella typhi* septicemia in mice with a traditionally prescribed crude drug formulation. J Ethnopharm 1995;45:141–147.
Picrorhiza kurrooa	50% ethanolic extract *Picrorhiza kurrooa* doses ranged from 25–200 mg/kg	Experimental animals	The extract was found to stimulate cell-mediated and humoral components of the immune system as well as phagocytosis.	Sharma ML, et al. Immunostimulatory activity of *Picrorhiza kurrooa* leaf extract. J Ethnopharm 1994;41(3):185–192.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa*	Rats	Picroliv can reverse D-galactosamine- or thioacetamide-induced hepatic damage.	Dwivedi Y, et al. Perfusion with picroliv reverses biochemical changes induced in livers of rats

				toxicated with galactosamine or thiocetamide. Planta Med 1993; 59(5):418–420.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 25 mg/kg for 7 days	Rats	Picroliv was given to aflatoxin B1 toxicated rats, the majority of the biochemical and histological changes were significantly protected.	Dwivedi Y, et al. Picroliv protects against aflatoxin B1 acute hepatotoxicity in rats. Pharmacol Res 1993;27(2):189–199.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 10 mg/kg for 7 days	Mice	Picroliv significantly increased immunostimulant activity.	Puri A, et al. Immunostimulant activity of Picroliv, the iridoid glycoside fraction of *Picrorhiza kurrooa*, and its protective action against Leishmania donovani infection in hamsters. Planta Med 1992;58(6):528–532.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 12 mg/kg for 7 days	Rats	Significantly prevented biochemical changes in liver and serum of galactosamine-toxicated rats.	Dwidedi Y, et al. Picroliv and its components kutkoside and picroside I protect liver against galactosamine-induced damage in rats. Pharmacol Toxicol 1992;71(5):383–387.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 6–12 mg/kg	Rats	Pretreatment with picroliv prevented the hepatotoxic effect of paracetamol and galactosamine as evidenced by various biochemical and histopathologic observations.	Ansari RA, et al. Antihepatotoxic properties of picroliv and active fraction from rhizomes of *Picrorhiza kurrooa.* J Ethnopharm 1991;34: 61–68.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 25 mg/kg	Rats	When picroliv was administered with monocrotaline, alterations in most of the biochemical parameters along with histopathologic changes in liver caused by monocrotoline were prevented.	Dwivedi Y, et al. Picroliv protects against monocrotaline-induced hepatic damage in rats. Pharmacol Res 1991;23(4):399–407.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 1.5–12 mg/kg	Rats and guinea pigs	Picroliv showed a dose-dependent choleretic effect and possessed a marked anticholestatic effect against paracetamol- and ethynylestradiol-induced cholestasis. Picroliv was found to be more potent than silymarin.	Shukla S, et al. Choleretic effect of pricoliv, the principle of hepatoprotective *Picrorhiza kurrooa*. Planta Med 1991;57(1):29–33.
Picrorhiza kurrooa	Picroliv. Iridoid glycoside fraction of *Picrorhiza kurrooa* 12.5–12 mg/kg	Rats	Picroliv prevented most of the biochemical changes induced by thiocetamide in liver and serum. Picroliv was found to be comparable to silymarin.	Dwivedi Y, et al. Picroliv affords protection against thioacetamide-induced hepatic damage in rats. Planta Med 1991;57(1):25–28.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Picrorhiza kurrooa	A decoction of the following herbs: *Azadirachta indica, Boerhaavia diffusa, Cedrus deodara, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosantes lobata; Inula racemosa* 2 g, 8 hourly; *Commiphora mukul,* 1/2 g 8 hourly; *Urgenic indica* 100 mg, 8 hourly	14 cases of congestive heart failure	All patients were given the decoction and *Urgenic indica*. Patients with ischemic heart disease, cardiomyopathy and cor pulmonale were given powder of *Inula racemosa,* while patients with rheumatic heart disease were given *Commiphora mukul*. After 2 weeks of treatment, all 10 patients were cured completely, 2 had bradycardia, and 2 were refractory.	Sati RB, Sharma RK. Management of congestive cardiac failure with certain Ayurvedic drugs. Aryavaidyan 1990;4(2):123–126.
Picrorhiza kurrooa	Picrolex	Human trial: 30 patients, ages 6–42	Vitiligo causes pigmentary disfigurement of the skin due to defective functioning of melanocytes. All patients responded to treatment with picrolex except 3.	Bedi KL, et al. *Picrorhiza kurrooa*, an Ayurvedic herb, may potentiate photochemotherapy in vitiligo. J Ethnopharm 1989;27(3):347–352.
Picrorhiza kurrooa	Powdered tuberous root of *Picrorhiza kurrooa* 75 mg 2× per day	Prelminary clinical trial: 36 patients	*Picrorhiza kurrooa* in bronchial asthma showed that of 36 patients, 19 patients had good relief, 9 showed satisfactory relief, and 8 had no relief.	Rajaram D. A preliminary clinical trial of *Picrorhiza kurrooa* in bronchial asthma. Bombay Hosp J 1976;18(2):66–69.
Piper longum L. PIPERACEAE Pipali Long pepper	Pippali Rasayana an Ayurvedic drug prepared from *Butea monosperma* stems and leaves and *Piper longum* dried fruits. Administered at 1 g orally 3× per day for 15 days	Controlled clinical trial: 25 patients with giardiasis; 25 controls	Complete disappearance of *Giardia lamblia* from stools in 23/25 patients resulted. Symptoms of ill health, abdominal discomfort, presence of mucus, pus cells, and red blood cells was significantly reduced. Spontaneous recovery in 20% of the cases was recorded in placebo control	Agarwal AK, et al. Management of giardiasis by a herbal drug 'Pippali Rasayana': A clinical study. J Ethnopharm 1997;56(3):233–236.
Piper longum	Fruits of *Piper longum*, ethanol extract and piperine, a pure compound from the plant	Rat	The ethanolic extract and piperine cured 90% and 40% of rats with caecal amoebiasis, respectively.	Ghoshal S, et al. Antiamoebic activity of *Piper longum* fruits against Entamoeba histolytica in vitro and vivo. J Ethnopharm 1996;50(3): 167–170.

Piper longum	Rats fed for 8 weeks the following plants: *Brassica species, Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rat	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine, and ginger prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary cumin, fenugreek, mustard and asafoetida brought about decreases in the levels of phosphatases and sucrase. The positive influences of a good number of spices on these terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.
Piper longum	Pippali Rasayana prepared from *Butea monosperma* stems and leaves and *Piper longum* dried fruits administered orally	Two groups of mice with a control	Mice infected with *Giardia lamblia* trophozoites produced up to 98% recovery from the infection.	Agarwal AK, et al. Management of giardiasis by an immunomodulatory herbal drug Pippali rasayana. J Ethnopharm 1994;44(3):143–146.
Piper longum	Piperine, an active alkaloidal constituent of the extract from *Piper longum* and *Piper nigrum*	Mice	The principle exerted significant protection against induced hepatoxicity by decreasing both *in vitro* and *in vivo* lipid peroxidation, decreasing enzymatic leakage, and by preventing depletion of GSH and total thiols.	Koul IB, Kapil A. Evaluation of the liver protective of piperine, an active principle of black and long peppers. Planta Med 1993;59(5): 413–417.
Piper longum	*Alternanthera sessilis, Cuminum cyminum, Curcuma longa, Ferula asafoetida, Moringa oleifera, Ocimum sanctum, Papaver somnifera, Piper longum, Sylanum nigrum*	Mice and rats	*Cuminum cyminum* seeds, *Ocimum sanctum* leaves, and *Papaver somnifera* seeds significantly inhibited neoplasia alone. These plants may prove to be valuable anticarcinogens.	Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxic 1992;30(11):953–956.
Piper longum	Mixture of *Glycyrrhiza glabra, Terminalia chebula, Piper longum*	Rats	Duodenal ulcerated rats treated with the mixture recovered faster with concomitant increase in β-glucuronidase activity in the Brunner's gland.	Nadar TS, Pillai MM. Effect of Ayurvedic medicines on beta-glucuronidase activity of Brunner's glands during recovery from cysteamine induced duodenal ulcers in rats. Indian J Exp Biol 1989;27(11):959–962.

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Table 2. Plants Used in *Ayurvedic Pharmacopoeia* (Cont'd)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Piper longum	Spice principles: capsaicin, curcumin, piperine. Plants: *Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and pice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.
Piper longum	Either single oral dose (300 mg) of phenytoin alone or in combination with multiple doses of piperine	Crossover trial: 5 healthy volunteers	Results obtained revealed that a single daily dose of piperine for 7 days significantly reduced the absorption half-life, prolonged the elimination half-life, and produced a significantly higher area under the drug concentration curve of phenytoin in comparison to phenytoin alone.	Bano G, et al. Effect of piperine on pharmokinetics of phenytoin in healthy volunteers. Planta Med 1987;53:568–569.
Piper longum	*Piper longum, Piper nigrum,* and *Zingiber officinale*	Rats	Piperine increased the blood levels of vasicine by nearly 233%. Under the influence of piperine, the active principle of *Piper* species, sparteine blood levels increased more than 100%.	Atal CK, et al. Scientific evidence on the role of Ayurvedic herbals on bioavailability of drugs. J Ethnopharm 1981;4(2):229–232.
Piper nigrum L. PIPERACEAE Maricha Black pepper	Rats were fed the following plants for 8 weeks: *Brassica* species, *Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rats	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine and *Zingiber officinale* prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary *Cuminum cyminum, Trigonella foenum-graecum, Brassica* species, and *Ferula foetida* brought about decreases in the levels of	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.

			phosphatases and sucrase. The positive influences of a good number of spices on terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	
Piper nigrum	Piperine, an active alkaloidal constituent of the extract from *Piper longum* and *Piper nigrum*	Mice	The principle exerted significant protection against induced hepatoxicity by decreasing both *in vitro* and *in vivo* lipid peroxidation, decreasing enzymatic leakage, and by preventing depletion of GSH and total thiols.	Koul IB, Kapil A. Evaluation of the liver protective of piperine, an active principle of black and long peppers. Planta Med 1993;59(5): 413–417.
Piper nigrum	Piperine, safrol, and tannic acid constituents of *Piper nigrum*	Mice	Safrol and tannic acid were weak carcinogens compared with methyl-cholanthrene that was used as a carcinogenic control substance. Force feeding of d-limonene (a pepper terpenoid) reduced their carcinogenic activity, while force feeding of piperine (a black pepper alkaloid) was ineffective.	Wrba H, et al. Carcinogenicity testing of some constituents of black pepper (*Piper nigrum*). Exp Toxicol Pathol 1992;44(2):61–65.
Piper nigrum	Piperine, a major alkaloid isolated from *Piper nigrum*	Rats	The alkaloid potentiated pentobarbitone sleeping time, with peak effects at 30 minutes. Blood and brain levels were higher in piperine treated animals. Piperine-treated rats, treated long-term with phenobarbitone, significantly potentiated phenobarbitone sleeping time compared to controls.	Mujumdar AM, et al. Effect of piperine on pentobarbitone induced hypnosis in rats. Indian J Exp Biol 1990;28(5):486–487.
Piper nigrum	*Piper nigrum* fruit alcoholic extract	Albino rats	A dose-dependent statistically significant enhancement of the tissue-oxygen uptake was observed. The peroxidase activity in the thyroid tissue increased at the dose of 40 mg and 80 mg/kg. Plasma triiodothyronine and thyroxine levels were dose-dependent and significantly increased compared to controls.	Tripathi P, et al. Thyrogenic response of *Piper nigrum*. Fitoterapia 1989; LX(6):539–542.
Piper nigrum	Single oral dose (300 mg) of phenytoin alone or in combination with multiple doses of piperine	Crossover trial: 5 healthy volunteers	Results obtained revealed single daily dose of piperine for 7 days significantly decreased the absorption half-life, prolonged the elimination half-life, and produced a significantly higher area under the drug concentration curve of phenytoin in comparison to phenytoin alone.	Bano G, et al. Effect of piperine on pharmokinetics of phenytoin in healthy volunteers. Planta Med 1987;53:568–569.

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Table 2. Plants Used in *Ayurvedic Pharmacopoeia* (Cont'd)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Piper nigrum	*Piper nigrum* powder in doses of 0.2, 0.4 g/h and *Ferula foetida* in doses of 0.1, 0.2 and 0.4 g/h on different days	Human trial: 20 healthy human volunteers	Results showed *Piper nigrum* powder does not damage the human gastric mucosa, whereas *Ferula foetida* does based on the rate of exfoliation of the surface epithelial cells of human gastric mucosa	Desai HG, Kalro RH. Effect of black pepper and asafoetida on the DNA content of gastric aspirates. Ind J Med Res 1985;81:325–329.
Piper nigrum	*Piper longum, Piper nigrum* and *Zingiber officinale*	Rats	Piperine increased the blood levels of vasicine by nearly 233%. Under the influence of piperine, the active principle of *Piper* species, sparteine blood levels increased more than 100%.	Atal CK, et al. Scientific evidence on the role of Ayurvedic herbals on bioavailability of drugs. J Ethnopharm 1981;4(2):229–232.
Prunus amygdalus Batsch ROSACEAE Badama Almond	2.5 g almond seed and its proportionate fractions: 1.22 g defatted seed and 1.28 g oil	Albino rabbits	Rabbits showed a definite hypoglycemic action during the 2-month study.	Teotia S, Singh M. Hypoglycemic effect of *Prunus amygdalus* seeds in albino rabbits. Indian J Exp Biol 1997;35(3):295–296.
Prunus amygdalus	*Brassica rapa, Prunus amygdalus,* and *Zingiber officinale*	Animals	All these plants showed no toxicity during acute toxicity tests. All plant extracts significantly increased the sperm motility and sperm contents in the epididymides and vas deferens without producing spermatotoxic effect.	Qureshi S, et al. Studies on herbal aphrodisiacs used in Arab system of medicine. Am J Clin Med 1989; 17(1–2):57–63.
Pueraria tuberosa DC. LEGUMINOSAE Vidari Vidari	Butanol extracts of *Pueraria tuberosa*, Dose of 150 mg/kg administered for 6, 12, 18, and 24 days	Rats	The butanol extract appears to be generally safe in rats at these acute and subacute dosage regimens.	Shukla S. Toxilogical studies of *Pueraria tuberosa*, a potent anti-fertility plant. Int J Pharmacognosy 1995;33(4):324–329.
Pueraria tuberosa	Butanolic extracts of *Pueraria tuberosa*	Rats	Administration caused a significant increase in the glycogen contents, protein concentration, activity of acid and alkaline phosphatase and total cholesterol in the ovary, uterus, cervix, and vagina. Administration	Shukla S, et al. Butanolic extract of *Pueraria tuberosa* DC.: Physiological response in the genital tract of cyclic female rats. Phytother Res 1989;3(1):5–10.

			caused metaplastic changes in cervical epithelium with marked keratinization and provoked cornification in vaginal epithelium. These changes have been correlated with anti-implantation action of the butanolic extract.	
Pueraria tuberosa	Butanolic extracts of *Pueraria tuberosa*	Rats	Biochemical findings, supported by the histological observations, further confirm the extrogenic mode of action of the butanolic extract of *Pueraria tuberosa* in adult ovariectomized rats.	Shukla S, et al. Physiology and biochemistry of female genital tract of ovariectomized rats treated with butanolic extract of *Pueraria tuberosa.* Fitoterapia 1987;LVII(1):9–22.
Pueraria tuberosa	Tubers of *Pueraria tuberosa*	Rats, mice, and hamsters	Fractions of *Pueraria tuberosa* possessed significant estrogenic activity.	Prakash AO, et al. Contraceptive potency of *Pueraria tuberosa* D.C. and its hormonal status. Acta Eur Fertil 1985;16(1):59–65.
Pueraria tuberosa	Varying extracts of *Acrostichum aureum, Adhatoda vasica, Citrulus colocynthus, Codonopsis ovata, Dolichos biflorus, Ferule orientalis, Juniperus communis, Kigelia pinnata, Lepidum capitum, Nerium odoratum, Pueraria tuberosa, Punica granatum, Randia dumetorum, Rubus ellipticus, Ruta graveolens*	Female albino rats	All the plants showed marked but varied inhibition of pregnancy and anti-implantation activity.	Prakash AO, et al. Anti-implantation activity of some indigenous plants in rats. Acta Eur Fertil 1985;16(6): 441–448.
Pueraria tuberosa	Crude powder, petroleum ether and benzene and ethanolic extracts of *Pueraria tuberosa*	Rats	To study the contraceptive potency of the extract, petroleum ether and benzene extracts transformed the diestrus phase into a prolonged cornified stage and persisted until the last day of treatment. The crude powder and ethanolic extract also induced cornification but after day thirteen the cornified stage changed to the diestrus stage.	Mathur R, et al. Effect of *Pueraria tuberosa* DC on the oestrous cycle of adult rats. Acta Eur Fertil 1984; 15(5):393–394.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Pueraria tuberosa	100 mg pueraria for 2 years	Prospective cohort study: 53 patients with migraine headaches	Patients were treated with pueraria for 2 years. The overall effective rate (migraine symptoms reduced) was 83% without side effects.	Xiuxian G, Xiuqin L. Radix puerarie in migraine. Chin Med J 1979;92(4): 260–262.
Punica granatum L. PUNICACEAE Dadima Pomegranate	Varying extracts of *Acrostichum aureum, Adhatoda vasica, Citrulus colocynthus, Codonopsis ovata, Dolichos biflorus, Ferule orientalis, Juniperus communis, Kigelia pinnata, Lepidum capitum, Nerium odoratum, Pueraria tuberosa, Punica granatum, Randia dumetorum, Rubus ellipticus, Ruta graveolens*	Female albino rats	All the plants showed marked but varied inhibition of pregnancy and anti-implantation activity.	Prakash AO, et al. Anti-implantation activity of some indigenous plants in rats. Acta Eur Fertil 1985;16(6): 441–448.
Randia dumetorum (Retz.) Lam. RUBIACEAE Madana Emetic nut	Varying extracts of *Acrostichum aureum, Adhatoda vasica, Citrulus colocynthus, Codonopsis ovata, Dolichos biflorus, Ferule orientalis, Juniperus communis, Kigelia pinnata, Lepidum capitum, Nerium odoratum, Pueraria tuberosa, Punica granatum, Randia dumetorum, Rubus ellipticus, Ruta graveolens*	Female albino rats	All the plants showed marked but varied inhibition of pregnancy and anti-implantation activity.	Prakash AO, et al. Anti-implantation activity of some indigenous plants in rats. Acta Eur Fertil 1985;16(6): 441–448.

Raphanus sativus L. CRUCIFERAE Moolaka Radish	Semipurified dietary fiber (DF) from *Lagenaria siceraria, Raphanus sativus* and *Lentinus edodes,* continuously for a total of 7 weeks	Rats	The effects of the three dietary fiber preparations on fecal steroid excretions somewhat differed depending on the dietary factors. Further studies are warranted to examine if the intense response of the lithocholic/deoxycholic acid ratio to the tested dietary fiber preparations and fat in the present study will also be shown in other dietary fibers.	Sannoumaru Y, et al. Effects of semi-purified dietary fibers isolated from *Lagenaria siceraria, Raphanus sativus* and *Lentinus edodes* on fecal steroid excretions in rats. J Nutr Sci Vitaminol (Tokyo) 1996; 42(2):97–110.
Raphanus sativus	Ethanol or water extracts of powdered plant material: *Adhatoda vasica, Abrus precatorius, Acacia arabica, Aloe barbadensis, Anethum sowa, Apium petroselinium, Banbusa arundensis, Blepharis edulis, Butea monosperma, Hibiscus rosa-sinensis, Lepidum sativum, Mesua ferrea, Moringa oleifera, Mucuna pruriens, Raphanus sativus, Sida cordifolia, Trachyspermum ammai*	Rats orally dosed	Aqueous or 90% ethanol extracts of the plants were studied in rats for 10 days after insemination with special reference to effects of fetal development. Leaf extracts of *Moringa oleifera* and *Adhatoda vasica* were 100% abortive at doses equivalent to 175 mg/kg starting dry material. Only the flowers of *Acacia arabica* and *Hibiscus rosa-sinensis* appeared to lack teratologic potential at the doses tested.	Nath D, et al. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. J Ethnopharm 1992;36: 147–154.
Raphanus sativus	*Daucus carota* and *Raphanus sativus* tops 75 g/d for as long as 28 days	Human trial	Consumption of plant products (radish and carrot tops) for as long as 28 days did not produce any adverse changes in the protein, fat, and carbohydrate metabolic parameters examined.	Sivuk AK. Effect of plant products of nutrition (radish and carrot tops) on various indicators of metabolism in humans [Russian]. Kosm Biol Aviakosm Med 1989;23(2):56–59.
Rheum emodi Wallich POLYGONACEAE Amlauetasa Indian rhubarb	Chinese herbal drug, Rheum E and/or Captopril an angiotensin converting enzyme on chronic renal failure	Controlled clinical trial: 30 patients 12 controls	Albumin significantly increased during the follow-up period in treated patients, before more marked in both Rheum E and Rheum E + Captopril groups. It was concluded that long-term oral low-dose Rheum E is beneficial to chronic renal failure. The effect is better than that of Captopril. The regime of Rheume E and Captopril is a preferable choice in the long-term treatment for preventing progression.	Zhang JH, et al. Clinical effects of Rheum and Captopril on preventing progression of chronic renal failure. Chinese Med J 1990;103(10):788–793.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Ricinus communis L. EUPHORBIACEAE Eranda Castor oil plant	Leaves of *Ricinus communis*. Administered orally to 4 sheep at 20 g/kg, 4 sheep at 30 g/kg, 3 goats 30 g/kg, 35 g/kg, 3 sheep 40 g/kg	8 sheep and 6 goats	Clinical pathology in sheep was characterized by neuromuscular disturbances such as unsteady gait and slight instability. Three sheep that received 30 g/kg died. In goats, symptoms were discrete. All goats recovered. No significant macroscopic or microscopic alterations were seen in three sheep that died.	Bezerra MJG, Brito MF. Experimental poisoning of sheep and goats by the leaves *Ricinus communis* (Euphorbiaceae). Pesquisa Veterin Brasileira 1995;15(3):27–34.
Ricinus communis	0.5% *Ricinus communis* seed of 0.5% *Jatropha curcas* seed	Brown Hisex chicks	Symptoms, lesions, and changes in growth, hematology and clinical chemistry were investigated. High mortality and more severe changes occurred in chicks on *Ricinus* diet than *Jatropha* feed.	El-Badwi SMA, et al. Comparative toxicity of *Ricinus communis* and *Jatropha curcas* in Brown Hisex chicks. Deutche Tieraerztliche Wochenschrift 1995;102(2):75–77.
Ricinus communis	Lectins: *Arachis hypogaea, Dolichos biflorus, Glycine max, Lotus tetragonolobus, Ricinus communis, Ulex europaeus,* concanavalin A, wheat germ	Controlled human trial: 11 with normal oral mucosa, 5 with leukoplakia with dysplasia, 12 with oral mucosal squamous cell carcinoma	*Dolichos biflorus, Glycine max, Lotus tetragonolobus, Ricinus communis, Ulex europaeus* showed very strong to strong binding in healthy oral mucosa but no or very weak binding in squamous cell carcinoma. Other lectins investigated may be used as probes to determine the dysplastic and malignant status of the oral mucosal epithelium.	Mazumdar S. Binding pattern of eight different lectins in healthy subjects and patients with dysplastic and malignant lesions of the oral cavity. Int J Oral Maxillofacial Surg 1993;22(5):301–305.
Ricinus communis	Ricin: oral dosage of 30 mg/kg	Rats	Rats intoxicated orally with ricin showed clear signs of sickness and all died within 36 hours.	Ishiguro M, et al. Biochemical studies of oral toxicity of ricin. I. Ricin administered orally can impair sugar absorption by rat small intestine. Chem Pharm Bull 1983; 31(9):3222–3227.
Rubia cordifolia L. RUBIACEAE Manjista	An antitumor substance, RA-700, isolated from *Rubia akane* or *Rubia*	Clinical trial phase I: neoplastic	Changes in cardiac function were noted in both groups. Several cardiac parameters tended to be more extreme in group 2.	Yoshida F, et al. Study of cardiac function in first stage examination of RA-700. RA-700 Clinical Study

Indian madder	*cordifolia*.: group 1: injected once with RA-700; group 2: injected RA-700 for 5 consecutive days	patients	Because of the small sample, no relationship between the changes in cardiac function and injection doses of RA-700 can be made.	Group [Japanese]. Gan To Kagaku Ryoho 1994;21(2):199–207.
Rubia cordifolia	RA-700 isolated from *Rubia akane* or *Rubia cordifolia*: 0.2–1.4 mg/m^2 in single IV dose; 0.4–2.0 mg/m^2 in 5 day IV doses	Clinical trial phase I: 14 patients	The maximum tolerated dose was 1.4 mg/m^2 for the 5-day schedule administration.	Majima H, et al. Phase I Study of RA-700. RA-700 Clinical Study Group [Japanese]. Gan To Kagaku Ryoho 1993;20(1):67–78.
Rubia cordifolia	RA-700, a cyclic hexapeptide isolated from *Rubia cordifolia* was compared with deoxybouvardin and vincristine	Mice	The antitumor activity of RA-700 was similar to that of deoxybouvardin and vincristine against P388 leukemia.	Kato T, et al. Antitumor activity and toxicity in mice of RA-700, a cyclic hexapeptide. Anticancer Res 1987;7 (3 Pt B):329–334.
Rubia cordifolia	Cyclic hexapeptides (RA-VII, RA-V, RA-IV and RA-III) isolated from *Rubia cordifolia*	Mice	Studies showed peptides exhibited significant activity against leukemias and ascites tumors, P-388, L1210, B-16 melanoma and solid tumors, colon 38, Lewis lung carcinoma and Ehrlich carcinoma. RA-V had an especially potent effect on MM2 mammary carcinoma.	Itokawa H, et al. Isolation and antitumor activity of cyclic hexapeptides isolated from Rubis Radix. Chem Pharm Bull 1984;32(1):284–290.
Salvadora persica L. SALVADORACEAE Pilu Peelu	Extracts of *Salvadora persica*	Randomized controlled trial	(Abstract not available)	Quinlan R, et al. A study comparing the efficacy of a toothpaste containing extract of *Salvadora persica* with a standard fluoride toothpaste. NZ Soc Periodontal 1994;77:7–14.
Salvadora persica	Roots of the Arak tree, *Salvadora persica*	Comparative human study: 480 adults	The frequent use of 'Miswak' was associated with a lower need for periodontal care.	al-Khateeb TL, et al. Periodontal treatment needs among Saudi Arabian adults and their relationship to the use of the Miswak. Community Dent Health 1991;8(4): 323–328.
Salvadora persica	Extracts of *Salvadora persica*	Mice	Mice injected with *Salvadora persica* extracts showed a significant decrease in exploratory locomotor activity parameters.	Sulaiman MI, et al. Effects of *Salvadora persica* extracts on mice exploratory locomotion activities. J Ethnopharm 1986;17(3):263–268.
Santalum album L. SANTALACEAE Chandanam White Sandalwood	Sandal wood oil, 5% in acetone from *Santalum album*	Mice	Sandalwood oil treatment significantly reduced papilloma incidence by 67%, multiplicity by 96%, and induced ornithine decarboxylase activity by 70%. Oil may be an effective chemopreventive agent against skin cancer.	Dwivedi C, Abu-Ghazaleh A. Chemopreventive effects of sandalwood oil on skin papillomas in mice. Eur J Cancer Prev 1997;6(4):399–401.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Santalum album	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each of three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory (blackheads and other comedones) lesions. The treatment preparations' mechanisms of action remain unknown.	Paranjpe P. Evaluation of topical applications of herbal formulations in acne vulgaris: A single-blind randomized comparative study. J Medicinal Aromatic Plant Sci 1997;19:414–418.
Santalum album	Bangshil preparation contains: Asphaltum, 60 mg; *Balsamodendron mukul,* 40 mg; Ferrisulphuratum, 30 mg; Kasisa bhasma, 60 mg; *Bambu manna,* 12 mg; Tin Bhasma; Sandalwood oil, 5 mg	Human trial: 35 patients	Bangshil was administered to 35 patients to treat urinary tract infection. Bacteriologic cure was obtained in 88.9% and symptomatic relief in 82.4%.	Sharma BP, Goswami P. Urinary tract infection and its management by bangshil. Aryavaidyan 1995;8(4): 212–215.
Santalum album	*Santalum album* oil; Oral feeding each day with 5 and 15 μL sandalwood oil for 10 and 20 days	Swiss albino mice	A significant enhancement of glutathione-S-transferase activity and acid soluble sulphydryl levels was noted. The possible chemopreventive action of oil on carcinogenesis may be due to a blocking mechanism.	Banerjee S, et al. Modulatory influence of sandalwood oil on mouse hepatic glutathione S-transferase activity and acid soluble sulphydryl level. Cancer Lett 1993;68(2–3): 105–109.
Saraca indica L. LEGUMINOSAE Asoka Asoka tree	(-)-epicatechin, an extract from bark of *Saraca indica.* Topical application and oral administration of 100 mg/kg weight	Mice	Papilloma formation was inhibited by topical application of extract. Oral administration significantly restricted tumor growth.	Varghese CD, et al. Effect of asoka on the intracellular glutathione levels and skin tumor promotion in mice. Cancer Lett 1993;69(1):45–50
Saussurea lappa (Decne.) C.B. Clarke COMPOSITAE Kushtha Costus	*Saussurea lappa*-500 mg capsules 2× per day and *Pterocarpus marsupium* 100-mL decoction 2× per day both for 30 days	Human trial: 40 patients	A significant change in fasting blood sugar before versus after treatment with both plants was noted.	Singh DC, Sharma BP. Management of madhumeha (*Diabetes mellitus*) by indigenous drugs-bijayasar and kustha. Aryavaidyan 1990;4(1):21–23.

Saussurea lappa	*Saussurea lappa* and *Inula racemosa* crude root powder	Clinical study: 60 patients	In stable angina pectoris patients, *Saussurea lappa* reduced the frequency of angina (20%) but did not produce any other changes. *Inula racemosa* was shown to possess significant antianginal property. It lowered diastolic blood pressure, plasma cortisol, and catecholamines.	Dwivedi S, et al. Role of *Inula racemosa* and *Saussurea lappa* in management of Angina Pectoris. Int J Crude Drug Res 1989;27(4): 217–222.
Saussurea lappa	Several fractions *Saussurea lappa* root oil were investigated	Various animals	Some of lactone fractions and delactonized oil exhibit hypotensive, spamolytic and bronchodilatory effects; no antitussive activity was detected with any fraction but a slight diuretic property observed.	Gupta OP, Ghatak BJR. Pharmacological investigations on *Saussurea lappa* (Clarke). Indian J Med Res 1967;55(10):1078–1083.
Sesamum indicum L. PEDALIACEAE Tila Sesame	Rats fed a diet that differed only in their contents of sesamin: 0, 0.25, 0.5, 1.0, 2.0, and 4.0 g/kg	Rats	Sesamin-feeding significantly increased γ-tocopherol and γ/α-tocopherol ratios in plasma, liver, and lungs. Suggested bioavailability of γ-tocopherol is enhanced in phenol-containing diets compared with purified diets.	Kamal-Eldin A, et al. Sesamin (a compound from sesame oil) increases tocopherol levels in rats fed ad libitum. Lipids 1995; 30(6):499–505.
Sesamum indicum	Sesame flowers collected at dawn when dew on plant. Flowers rubbed on wart 3× per day	Case studies: 250 cases of common wart	Sesame flowers used to treat common wart. 228 cured and 22 improved (100% response rate). One-year follow-up of 217 resulted in an effective rate of 97.2%	Wang HT. Treatment of common wart with sesame flowers. Bull Chin Mat Med 1989;14(6):356.
Sida cordifolia L. MALVACEAE Bala Country mallow	Ethanol or water extracts of powdered plant material: *Adhatoda vasica, Abrus precatorius, Acacia arabica, Aloe barbadensis, Anethum sowa, Apium petroselinium, Banbusa arundensis, Blepharis edulis, Butea monosperma, Hibiscus rosa-sinensis, Lepidum sativum, Mesua ferrea, Moringa oleifera, Mucuna pruriens, Raphanus sativus, Sida cordifolia, Trachyspermum ammai*	Rats orally dosed	Aqueous or 90% ethanol extracts of the plants were studied in rats for 10 days after insemination with special reference to effects of fetal development. Leaf extracts of *Moringa oleifera* and *Adhatoda vasica* were 100% abortive at doses equivalent to 175 mg/kg starting dry material. Only the flowers of *Acacia arabica* and *Hisiscus rosa-sinensis* appeared to lack teratologic potential at the doses tested.	Nath D, et al. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. J Ethnopharm 1992;36:147–154.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Solanum nigrum L. SOLANACEAE Kakamachi Black nightshade	*Solanum nigrum* as a food	Controlled trial: 100 with esophageal cancer; 100 controls	Esophageal cancer patients with extensive inquiries into diet and social habits was studied. Significant risk factors found were use of *Solanum nigrum* as a food, smoking, and use of traditional medicines.	Sammon AM. A case-control study of diet and social factors in cancer of the esophagus in Transkei. Cancer 1992;69(4):860–865.
Solanum nigrum	*Solanum nigrum* (aerial parts) powder and its methanolic extract	Rats	*Solanum nigrum* reduced ulcer index significantly. The activity may be due to inhibition of acid and pepsin secretions and/or their *in vitro* ability to bind.	Akhtar MS, Munir M. Evaluation of the gatric antiulcerogenic effects of *Solanum nigrum*, *Brassica oleracea* and *Ocimum basilicum* in rats. J Ethnopharm 1989;27(1–2):163–176.
Strychnos nux vomica L. STRYCHNACEAE Kupilu Nux vomica	Crude alkoloid fraction of *Strychnos nux-vomica*.	Mice	Administration demonstrated antinociceptive effects of the alkaloid.	Cai B, et al. Processing of nux vomia. VII. Antinociceptive effects of crude alkaloids from seeds of *Strychnos nux vomica* in mice. Biol Pharm Bull 1996;19(1):127–131.
Strychnos nux vomica	Strychnine dose 0.32 mg/kg/d	Case studies: infant twins	Nonketotic hyperglycinemia was diagnosed. Therapy with strychnine resulted in a great reduction in CSF and plasma glycine levels, improvement in muscle tone, respiration, and ability to suck.	Warburton D, et al. Nonketotic hyperglycemia. Effects of therapy with strychnine. Am J Dis Childr 1980; 134(3):273–275.
Strychnos nux vomica	Strychnine nitrate daily dosage of 0.2–0.9 mg/kg	Case studies: 3 infants	Therapeutic failure probably indicated that strychnine treatment does not solve the therapeutic problems of severe forms of nonketotic hyperglycinemia.	von Wendt L, et al. Failure of strychnine treatment during the neonatal period in three Finnish children with nonketotic hyperglycinemia. Pediatrics 1980;65(6): 1166–1169.
Swertia chirata (Wall.) C.B. Clarke GENTIANACEAE Kirata tikta Chireta	*Swertia chirata* in doses of 20, 50, 100 mg/kg body weight	Albino rats	Hepatoprotective effect of *Swertia chirata* was studied. Treatment with *Swertia chirata* and CCl4 caused improvement at both biochemical and histopathologic parameters versus CCl4 treatment alone. The most effective dose was 50 mg/kg body weight.	Mukherjee S, et al. Hepatoprotective effect of *Swertia chirata* on rat. Ind J Exp Biol 1997;35(4):384–388.

Swertia chirata	Aqueous extract of *Swertia chirata* total xanthones prepared from plant aerial parts. Oral dose 50 mg/kg body weight	Rats	*Swertia chirata* exhibited significant antiinflammatory activity. *Swertia chirata* was found less effective compared with standard antiinflammatory drugs.	Islam CN, et al. Preliminary studies on the antiinflammtory effects of *Swertia chirata* in albino rats. Indian J Pharmacol 1995;27(1):37–39.
Swertia chirata	Ethanolic extract of *Swertia chirata*	Rats	The extract significantly reduced the intensity of gastric mucosal damage, produced a significant decrease in gastric secretion, and pretreatment significantly prevented induced gastric wall mucus depletion and restored the non-protein sulfhydryl content in glandular stomachs. The findings support the use of *Swertia chirata* for the treatment of gastric ulcer.	Rafatullah S, et al. Protective effect of *Swertia chirata* against indomethacin and other ulcerogenic agent-induced gastric ulcers. Drugs Exp Clin Res 1993;19(2):69–73.
Swertia chirata	Two capsules of 450 mg/each: *Coccinia indica, Cuminum cyminum, Eugenia jambolana, Gymnema sylvestre, Momordica charantia, Phyllanthus niruri, Swertia chirata, Tephrosia purpurea*	20 case studies with *Diabetes mellitus*	Administration of the herbal mixture led to significant decreases in mean blood sugar values.	Karnick CR. A clinical trial of a composite herbal drug in the treatment of *Diabetes mellitus* (Madhumeha). Aryavaidyan 1991;5(1):36–46.
Swertia chirata	95% ethanol extract and four fractions of *Swertia chirata*. Oral dose at 250 mg/kg	Rats	The optimum dose (250 mg/kg) produced a significant decrease of blood sugar in fed, glucose-loaded, and tolbutamide-pretreated animal models, but not in fasted rats.	Sekar BC, et al. Effect of different fractions of *Swertia chirayita* on the blood sugar level of albino rats. J Ethnopharm 1987;21:175–181.
Syzgium aromaticum (L.) Merr. & L.M. Perry MYRTACEAE Lavanga, Devapuspa Clove	Hot water extracts of *Geum japonicum, Rhus javanica, Syzgium aromaticum,* and *Terminalia chebula*	Mice	Anti-cytomegalovirus (CMV) activity *in vivo* was examined. *Geum japonicum, Syzygium aromaticum*, and *Terminalia chebula* significantly suppressed CMV yields in lungs of treated mice compared with water-treated mice.	Yukawa TA, et al. Prophylactic treatment of cytomegalovirus infection with traditional herbs. Antiviral Res 1996;32(2):63–70.
Syzygium aromaticum	*Geum japonicum, Rhus javanica, Syzgium aromaticum, Terminalia chebula,* Acyclovir, and/or herbal extract administered	Mice	Extracts showed significant antiherpes simplex virus type I activity. Extracts limited development of skin lesions and/or prolonged mean survival times of infected mice compared with both Acyclovir and the herbal extract alone.	Kurokawa M, et al. Efficacy of traditional herbal medicines in combination with acyclovir against herpes simplex virus type 1 infection in vitro and in vivo. Antiviral Res 1995;27(1–2):19–37.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Tamarindus indica L. LEGUMINOSAE Amlika Tamarind	Tamarindus fruit extract	Human trial: 6 healthy volunteers	A statistically significant increase in plasma levels of aspirin and salicyclic acid was noted when a meal containing tamarind fruit extract was administered with aspirin tablets taken under a fasting state.	Mustapha A, et al. Effect of *Tamarindus indica* L. on the bioavailability of aspirin in healthy human volunteers. Eur J Drug Met Pharm 1996;21(3):223–226.
Tamarindus indica	Tamarind seed polysaccharide	Mice	The results demonstrated that tamarind seed polysaccharide is not carcinogenic in B6C3F1 mice of either gender.	Sano M, et al. Lack of carcinogenicity of tamarind seed polysaccharide in B6C3F1 mice. Food Chem Toxicol 1996;34(5):463–467.
Tamarindus indica	Seeds of *Delonix regia, Cassia tora, Sesbania sesban, Crotalaria naragutensis, Tamarindus indica*	Mice and rats	Acute toxicity test of water extracts of the five legumes produced no visible side effects. Increased weights were a result as compared to controls fed distilled water. Similar results were obtained in prolonged toxicity screening.	Kadiri M, et al. Toxicological screening of some Nigerian wild legumes. Revista de Biologia Tropical 1995;44(1):269–274.
Tamarindus indica	Three Sudanese beverages Aradaib (*Tamarindus indica*) Karkadi (*Hibiscus sabdarifa*) and lemon (*Citrus limetta*) with 600 mg chloroquine	Human trial: healthy males	The results indicate a statistically significant decrease in the AUC and C_{max} of chloroquine as a result of a coadministration with *Tamarindus indica*. A parallel decrease in the drug's antimalarial efficacy might be expected.	Mahmoud BM, et al. Significant reduction in chloroquine bioavailability following coadministration with the Sudanese beverages Aradaib, Karkadi and Lemon. J Antimicrob Chemother 1994;33(5):1005–1009.
Tamarindus indica	Extracts leaves of *Adansonia digitata, Calotropis procera, Moringa oleifera Tamarindus indica, Ziziphus jaozeiro*	Human trial: humans with guinea worms	Topical application resulted in users perceived relief of pain, accelerated expulsion of worms, and a faster healing process.	Fabiyi JP, et al. Traditional therapy of dracunculiasis in the state of Bauchi-Nigeria [French]. Dakar Med 1993;38(2):193–195.
Tamarindus indica	*Brassica, Cinnamomum zeylanica, Cuminum cyminum, Zingiber officinale*	Rats	These plants did not show any cholesterol decreasing effect when included in the normal and hypercholesterolemia-inducing diet at about fivefold normal human intake level.	Sambaiah K, Srinivasan K. Effect of cumin, cinnamon, ginger, mustard and tamarind in induced hypercholesterolemic rats. Nahrung 1991; 35(1):47–51.

Tamarindus indica	*Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.
Taraxacum officinale Weber ex. F.H. Wigg. COMPOSITAE Dugha feni Dandelion	Herb infusions of *Verbena officinalis, Lithospermum officinale, Taraxacum officinale, Equisetum arvense, Aarctostaphylos uva ursi, Arctium lappa, Silene saxifraga*	Rats	Main urolithiasis risk factors were evaluated. Beneficial effects caused by herb infusions can be attributed to a disinfectant action, possibly to the presence of saponins.	Grases F, et al. Urolithiasis and phytotherapy. Int Urol Nephrol 1994;26(5):507–511.
Taraxacum officinale	Six kinds of Chinese traditional herbs	Scald mice	*Polygonum cuspidatum, Taraxacum officinale,* and *Oidenlandia diffusa* showed improved impaired immune function effects in scald mide. Effects varied according to the dosage of the drugs.	Luo, ZH. The use of Chinese traditional medicine to improve impaired immune functions in scald mice [Chinese]. Chung Hua Cheng Hsing Shao Shang Wai Ko Tsa Chih 1993;9(1):56–58.
Taraxacum officinale	Twelve plants administered as decoctions or infusions 28 days *Agaricus bisporus, Anacardium occidentale, Arctum lappa, Catharanthus roseus, Daucus carota, Humulus lupulus, Ilex guayusa, Salvia officinale, Sambucus nigra, Taraxacum officinale, Trigonella foenum-graecum, Urtica dioica*	Mice	Of the 12 plants used for the traditional treatment of diabetes, *Agaricus bisporus* and *Ilex guayusa* showed potential anti-diabetic effect.	Swanston-Flatt SK, et al. Glycaemic effects of traditional European plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice. Diabetes Res 1989;10(2):69–73.
Taraxacum officinale	Whole, dried, and powdered plants of *Portulaca oleracae* and *Taraxacum officinale*	Rabbits	Powders of both plants produced significant hypoglycemic effects in normal rabbits but not in alloxan-treated rabbits.	Akhtar MS, et al. Effects of *Portulaca oleracae* (Kulfa) and *Taraxacum officinale* (Dhudhal) in normo-glycaemic and alloxan-treated hyperglycaemic rabbits. JPMA J Pak Med Assoc 1985;35(7): 207–210.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species *family* *Common name (Sanskrit)* *Common name (English)*	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Taraxacum officinale	Herb combination of *Calendula officinalis, Foeniculum vulgare, Hypericum perforatum, Melissa officinalis, Taraxacum officinale*	Human trial: 24 patients with chronic nonspecific colitis	As a result of the treatment, spontaneous and palpable pains along the large intestine disappeared in 95.83% of the patients by the 15th day of their admission to the clinic and treatment with the herbal combination.	Chakurski I, et al. Treatment of chronic colitis with an herbal combination of *Taraxacum officinale, Hipericum perforatum, Melissa officinalis, Calendula officinalis* and *Foeniculum vulgare* [Bulgarian]. Vutr Boles 1981;20(6):51–54.
Tephrosia purpurea (L.) Pers. LEGUMINOSAE Sarapunkha Purple Tephrosia	Two capsules of 450 mg each: *Coccinia indica, Cuminum cyminum, Eugenia jambolana, Gymnema sylvestre, Momordica charantia, Phyllanthus niruri, Swertia chirata, Tephrosia purpurea*	20 case studies with *Diabetes mellitus*	Administration of the herbal mixture led to significant decreases in mean blood sugar values.	Karnick CR. A clinical trial of a composite herbal drug in the treatment of *Diabetes mellitus* (Madhumeha). Aryavaidyan 1991;5(1):36–46.
Terminalia arjuna (Roxb. Ex DC.) Wright & Arn. COMBRETACEAE Arjuna	50% ethanolic extract of *Terminalia arjuna* tree bark in doses of 100 mg/kg and 500 mg/kg compared to controls	Rabbits	Induced hyperlipidemic rabbits received the extract. A significant decrease in total cholesterol, LDL and LDL/HDL ratio was demonstrated. The extract did not adversely effect biochemical tests of liver, renal function, and hematologic parameters.	Ram A, et al. Hypocholesterolaemic effects of *Terminalia arjuna* tree bark. J Ethnopharm 1997;55(3): 165–169.
Terminalia arjuna	*Terminalia arjuna* bark 500 mg, 8 hourly	Clinical random-, ized controlled, double-blind trial: 12 with congestive heart failure, NYHA Class IV	*Terminalia arjuna* compared to placebo therapy was associated with improvement in symptoms and significant signs of heart failure. On long term evaluation (phase II), patient continued to show improvement in symptoms, signs, effort tolerance, and NYHA class.	Bharani A, et al. Salutary effect of *Terminalia arjuna* in patients with severe refractory heart failure. Int J Cardiol 1995;49(3):191–199.
Terminalia arjuna	Bark powder of *Terminalia arjuna*	Human trial: 15 stable and 5 unstable angina patients	Results suggest that monotherapy with *Terminalia arjuna* was fairly effective in patients with symptoms of stable angina pectoris. However, it has a limited role in unstable angina.	Dwivedi S, Agarwal MP. Anti-anginal and cardioprotective effects of *Terminalia arjuna*, an indigenous drug, in coronary artery disease. J Assoc Physicians India 1994;42(4):287–289.

Terminalia arjuna	*Terminalia arjuna* bark powder suspended in water in an oral dose of 250 mg/kg body weight 2× day	Rabbits	Rabbits receiving *Terminalia arjuna* along with a high cholesterol diet showed slower increase in total cholestrol, triglycerides and no change in HDL than rabbits receiving only a high cholesterol diet. Hypercholesterolemic rabbits receiving *Terminalia arjuna* showed more marked decreases in total cholesterol, triglycerides, and an increase in HDL than the hypercholesterolemic controls.	Tiwari AK, et al. Effect of *Terminalia arjuna* on lipid profiles of rabbits fed hypercholesterolemic diet. Int J Crude Res 1990;28(1):43–47.
Terminalia arjuna	50% aqueous ethanol, hexane and butanol and 2 flavones of *Terminalia arjuna* bark	Rats	The extracts showed resorptive activity but were devoid of antiimplantation activity.	Gupta DN, et al. Post coital contraceptive efficacy of *Terminalia arjuna* in albino rats. Fitoterapia 1980;LX(3):275–276.
Terminalia bellirica (Gaertn.) Roxb. COMBRETACEAE Vibhitaka, Bhaira Belleric myrobalan	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each of three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory and noninflammatory (blackheads and other comedones) lesions. The treatment preparations' mechanisms of action remain unknown.	Paranjpe P. Evaluation of topical applications of herbal formulations in acne vulgaris. A single-blind randomized comparative study. J Med Aromatic Plant Sci 1997;19: 414–418.
Terminalia bellirica	Haritaki: *Terminalia chebula, Emblica officinalis, Terminalia bellirica*	Rabbits	When cholesterol was fed to all groups, levels were significantly reduced in the three treatment groups than in the control group. The same was true for reduction in cholesterolemia.	Thakur CP, et al. The Ayurvedic medicines Haritaki, Amla and Bahira reduce cholesterol-induced atherosclerosis in rabbits. Int J Cardiology 1988;21(2):167–175.
Terminalia bellirica	Oil extract from kernels of *Terminalia bellirica*	Mice	Mice receiving either *Terminalia bellirica* oil or castor oil had usually loose stools whereas animals given coconut oil had normal stools. Results obtained with castor oil and treated group (*Terminalia bellirica*) were significant.	Dhar HL, et al. Studies on purgative action of an oil obtained from *Terminalia belerica*. Indian J Med Res 1968;57(1):103–105.
Terminalia chebula Retz. COMBRETACEAE Haritaki Chebulic Myrobalan	*Embelia ribes, Glycyrrhiza glabra, Holarrhena antidysenterica, Nardostachys jatamansi, Phyllanthus emblica, Santalum album, Terminalia bellirica, Terminalia chebula, Zingiber officinale*	Single-blind randomized comparative study: 49 adolescent to young adults with mild to moderate facial acne	Each of three treatment groups were administered different herbal mixtures. Successful treatments in groups A and B proved effective against both inflammatory (pimples) and noninflammatory (blackheads and other comedones) lesions. The treatment preparations' mechanisms of action remain unknown.	Paranjpe P. Evaluation of topical applications of herbal formulations in acne vulgaris: A single-blind randomized comparative study. J Med Aromatic Plant Sci 1997;19: 414–418.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Terminalia chebula	*Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, Terminalia chebula, Zingiber officinale.* Dried and pulverized plants extracted in ethanol together and individually. Metronidazole administered as standard therapy	Golden hamsters with hepatic amoebiasis	The formulation had a maximum cure rate of 73% at a dose of 800 mg/kg per day in hepatic amoebiasis, reducing the average degree of infection to 1.4 compared to 4.2 for controls.	Sohni YR, Bhatt RM. Activity of a crude extract formulation in experimental hepatic amoebiasis and in immunomodulation studies. J Ethnopharm 1996;54(2–3):119–124.
Terminalia chebula	Hot water extracts of *Geum japonicum, Rhus javanica, Syzygium aromaticum,* and *Terminalia chebula*	Mice	Anti-CMV activity *in vivo* was examined. *Geum japonicum, Syzygium aromaticum,* and *Terminalia chebula* significantly suppressed CMV yields in lungs of treated mice compared with water-treated mice.	Yukawa TA, et al. Prophylactic treatment of cytomegalovirus infection with traditional herbs. Antiviral Res 1996;32(2):63–70.
Terminalia chebula	*Geum japonicum, Rhus javanica, Syzygium aromaticum, Terminalia chebula,* Acyclovir and/or herbal extract administered	Mice	Extracts showed significant antiherpes simplex virus type I activity. Extracts limited development of skin lesions and/or prolonged mean survival times of infected mice compared with both Acyclovir and the herbal extract alone.	Kurokawa M, et al. Efficacy of traditional herbal medicines in combination with acyclovir against herpes simplex virus type 1 infection in vitro and in vivo. Antiviral Res 1995;27(1–2):19–37.
Terminalia chebula	*Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, Terminalia chebula, Zingiber officinale.* Dried and pulverized plants extracted in ethanol together and individually. Metronidazole administered as standard therapy	Rats with caecal amoebiasis	Formulation had a curative rate of 89% with average degree of infection (caecal amoebiasis) (ADI) reduced to 0.4 in a group dosed with 500 mg/kg per day as compared with ADI of 3.8 for controls.	Sohni YR, et al. The anti-amoebic effect of a crude drug in formulation of herbal extracts against Entamoeba histolytica *in vitro* and *in vivo*. J Ethnopharm. 1995;45(1):43–52.

Terminalia chebula	*Azadirachta indica, Boerhavia diffusa, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosanthes dioica, Zingiber officinale.* Extracted in 80% aqueous alcohol ethanol. 1% stock solution used to prepare dilutions. Oral or subcutaneous administration	Mice with septicemia from *Salmonella typhi*	Infected mice were prophylactically administered postinfective, preinfective, single, and multiple doses of extract and had a significant therapeutic effect in reducing septicemia.	Sohni YR, et al. Prophylactic therapy of *Salmonella typhi* septicemia in mice with a traditionally prescribed crude drug formulation. J Ethnopharm 1995;45:141–147.
Terminalia chebula	A decoction of the following herbs: *Azadirachta indica, Boerhaavia diffusa, Cedrus deodara, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosantes lobata; Inula racemosa* 2 g, 8 hourly; *Commiphora mukul*, 1/2 g 8 hourly; *Urgenic indica* 100 mg, 8 hourly	14 cases of congestive heart failure	All patients were given the decoction and *Urgenic indica*. Patients with ischemic heart disease, cardiomyopathy and cor pulmonale were given powder of *Inula racemosa*, while patients with rheumatic heart disease were given *Commiphora mukul*. After two weeks of treatment all 10 patients were cured completely, 2 had bradycardia, and 2 were refractory.	Sati RB, Sharma RK. Management of congestive cardiac failure with certain Ayurvedic drugs. Aryavaidyan 1990;4(2):123–126.
Terminalia chebula	Mixture of *Glycyrrhiza glabra, Terminalia chebula, Piper longum*	Rats	Duodenal ulcerated rats treated with the mixture recovered faster with concomitant increase in β-glucuronidase activity in the Brunner's gland.	Nadar TS, Pillai MM. Effect of Ayurvedic medicines on beta-glucuronidase activity of Brunner's glands during recovery from cysteamine induced duodenal ulcers in rats. Indian J Exp Biol 1989;27(11): 959–962.
Terminalia chebula	Haritaki: *Terminalia chebula, Emblica officinalis, Terminalia bellirica*	Rabbits	When cholesterol was fed to all groups, levels were significantly reduced in the three treatment groups than in the control group. The same was true for reduction in cholesterolemia.	Thakur CP, et al. The Ayurvedic medicines Haritaki, Amla and Bahira reduce cholesterol-induced atherosclerosis in rabbits. Int J Cardiol 1988;21(2):167–175.
Terminalia chebula	Three plants lacking pyrrolizidine alkaloids: *Aegle marmelos, Hemidesmus indicus, Terminalia chebula, Withania somnifera*	Feeding trials in rats	All plants produced hepatic lesions that included central vein abnormalities. *Terminalia chebula* and *Withania somnifera* produced mark renal lesions.	Arseculeratne SN, et al. Studies of medicinal plants of Sri Lanka. Part 14: Toxicity of some traditional medicinal herbs. J Ethnopharm 1985;13(3):323–335.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Tinospora cordifolia Miers MENISPERMACEAE Guduchi Guduchi	Each tablet contains 100 mg of alcoholic extract of root of *Rauwolfia serpentina*, 100 mg of rhizome powder of *Nardostachys jatamansi,* and 100 mg aqueous extract of root, stem, leaf of *Tinospora cordifolia*; 2 tablets at bedtime for 21 days	39 patients with insomnia	Preparation was evaluated for clinical efficacy and safety in insomnia by subjective and polysomnographic method. The preparation produced significant improvement in sleep parameters. The preparation did not produce any feeling of hangover or day time sleeplessness, 11 patients complained of mild epigastric distress after the test drug. It can be concluded the preparation had good hypnotic activity and can be used in insomnia.	Rani PU, Naidu UR. Subjective and polysomnographic evaluation of a herbal preparation in insomnia. Phytomedicine 1998;5(4):253–257.
Tinospora cordifolia	*Eclipta alba, Ocimum sanctum, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera.* Doses 100, 200 mg/kg PO 1× per day for 28 days	Hyperglycemic rats	The herbal formulation had little effect on blood sugar concentrations but doses induced a dose-related decrease in STZ hyperglycemia and attenuation of STZ induced a decrease in islet superoxide dismutase activity in euglycaemic rats.	Bhattacharya SK, et al. Effect of Trasina, an Ayurvedic herbal formulation on pancreatic islet superoxide dismutase activity in hyperglycaemic rats. Indian J Exp Biol 1997;35(3):297–299.
Tinospora cordifolia	*Asparagus racemosus, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera*	Mice	All plants significantly inhibited the carcinogen ochratoxin-induced suppression of chemotactic activity and the production of interleukin-1 and tumor necrosis factor or TNF-α by macrophages.	Dhuley JN. Effect of some Indian herbs on macrophage functions in ochratoxin A treated mice. J Ethnopharm 1997;58:15–20.
Tinospora cordifolia	*Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, Terminalia chebula, Zingiber officinale.* Dried and pulverized plants extracted in ethanol together and individually. Metronidazole administered as standard therapy	Golden hamsters with hepatic amoebiasis	The formulation had a maximum cure rate of 73% at a dose of 800 mg/kg per day in hepatic amoebiasis, reducing the average degree of infection to 1.4 compared to 4.2 for controls.	Sohni YR, Bhatt RM. Activity of a crude extract formulation in experimental hepatic amoebiasis and in immunomodulation studies. J Ethnopharm 1996;54(2–3):119–124.

Tinospora cordifolia	*Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, Terminalia chebula, Zingiber officinale.* Dried and pulverized plants extracted in ethanol together and individually. Metronidazole administered as standard therapy	Rats with caecal amoebiasis	Formulation had a curative rate of 89% with average degree of infection (caecal amoebiasis) (ADI) reduced to 0.4 in a group dosed with 500 mg/kg per day as compared with ADI of 3.8 for controls.	Sohni YR, et al. The antiamoebic effect of a crude drug in formulation of herbal extracts against Entamoeba histolytica *in vitro* and *in vivo*. J Ethnopharm 1995;45(1):43–52.
Tinospora cordifolia	*Azadirachta indica, Boerhavia diffusa, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia, Trichosanthes dioica, Zingiber officinale.* Extracted in 80% aqueous alcohol ethanol. 1% stock solution used to prepare dilutions. Oral or subcutaneous administration	Mice with septicemia from *Salmonella typhi*	Infected mice were prophylactically administered postinfective, preinfective, single, and multiple doses of extract and had a significant therapeutic effect in reducing septicemia.	Sohni YR, et al. Prophylactic therapy of *Salmonella typhi* septicemia in mice with a traditionally prescribed crude drug formulation. J Ethnopharm 1995;45:141–147.
Tinospora cordifolia	Alcoholic extracts of the roots of *Tinospora cordifolia*	Rats	In rat brains, *Tinospora cordifolia* was found to possess normalizing activity against stress-induced changes in norepinephrine, dopamine, 5-hydroxytryptamine and 5-hydroxyindoleacetic acid levels.	Sarma DNK, et al. Effect of *Tinospora cordifolia* on brain neurotransmitters in stressed rats. Fitoterapia 1995; 66(5):421–422.
Tinospora cordifolia	*Tinospora cordifolia*	Rats	Treatment with *Tinospora cordifolia* indicated a significant improvement in Kupffer cell function and a trend towards normalization.	Nagarkatti DS, et al. Modulation of Kupffer cell activity by *Tinospora cordifolia* in liver damage. J Postgrad Med 1994;40(2):65–67.
Tinospora cordifolia	*Tinospora cordifolia* 16 mg/kg per day orally	Randomized controlled trial: 30 with malignant obstructive jaundice	Septicemia did not occur in the treated group as opposed to 50% in the untreated group. Postoperative survival rate was 40% versus 92.4% in untreated versus treated group, respectively. *Tinospora cordifolia* appeared to improve surgical outcome by strengthening host defenses.	Rege N, et al. Immunotherapy with *Tinospora cordifolia*: a new lead in the management of obstructive jaundice. Indian J Gastroenterol 1993;12(1):5–8.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Tinospora cordifolia	Aqueous alcoholic, and chloroform extracts of leaves of *Tinospora cordifolia*. Dose: 50, 100, 150, and 200 mg/kg body weight	Alloxan-diabetic rabbits	The extract exerted a significant hypoglycemic effect in normal and alloxan-treated rabbits. *Tinospora cordifolia* had an insulin-like action and can significantly decrease blood glucose but not total lipid levels in normal and alloxan-treated rabbits.	Wadood N, et al. Effect of *Tinospora cordifolia* on blood glucose and total lipid levels of normal and alloxan-diabetic rabbits. Planta Med 1992;58(2):131–136.
Tinospora cordifolia	1 capsule 3× per day with luke warm water containing: *Asparagus racemosus*, 50 mg; *Bergenia ligulata,* 100 mg; *Eclipta alba,* 100 mg; *Myristica fragrans*, 10 mg; *Tinospora cordifolia*, 100 mg, *Tribulus terrestris,* 50 mg; *Withania somnifera*, 50 mg	30 patients with calculi on kidneys, ureters, bladders	The herbal combination was found to alleviate not only pain but also slowly disintegrated both calcium-oxalate and calcium carbonate crystals in a span of 72 hours and complete discharging of crystals within 15–30 days. Complete discharge occurred in greater than 80% of the patients.	Karnick CR. Clinical evaluation of composite Ayurvedic drugs, on calculi, in the kidney and the urinary bladder. Aryavaidyan 1992; 6(2):104–108.
Tinospora cordifolia	Pretreatment of mice with *Tinospora cordifolia*	Mice	Pretreatment with *Tinospora cordifolia* or gentamicin decreased mortality in mice injected with *E. coli* from 100% in controls to 17.8% and 11.1%, respectively. Pretreatment significantly improved bacterial clearance as well as improved phagocytic and intracellular bactericidal capacities of neutrophils in *Tinospora cordifolia* treated group.	Thatte UM, et al. Immunotherapeutic modification of *Escherichia coli* peritonitis and bacteremia by *Tinospora cordifolia*. J Postgrad Med 1992;38(1):13–15.
Tinospora cordifolia	A decoction of the following herbs: *Azadirachta indica, Boerhaavia diffusa, Cedrus deodara, Picrorhiza kurrooa, Terminalia chebula, Tinospora cordifolia,*	14 cases of congestive heart failure	All patients were given the decoction and *Ugenic indica*. Patients with ischemic heart disease, cardiomyopathy and cor pulmonale were given powder of *Inula racemosa,* while patients with rheumatic heart disease were given *Commiphora mukul.* After 2 weeks of treatment all 10 patients were cured	Sati RB, Sharma RK. Management of congestive cardiac failure with certain Ayurvedic drugs. Aryavaidyan 1990;4(2):123–126.

	Trichosantes lobata; Inula racemosa 2 g, 8 hourly; *Commiphora mukul*, 1/2 g 8 hourly; *Urgenic indica* 100 mg, 8 hourly		completely, 2 had bradycardia, and 2 were refractory.	
Tinospora cordifolia	Water extract of *Tinospora cordifolia* 100 mg/kg for 7 days	Rats	The extract improved cellular immune functions. Mortality rate following *E. coli* infection was reduced. The study showed cholestasis resulted in immunosuppression and indicated a need for an immunomodulator to manage obstructive jaundice.	Rege NN, et al. Modulation of immunosuppression in obstructive jaundice by *Tinospora cordifolia*. Indian J Med Res 1989;90:478–483.
Tinospora cordifolia	*Asparagus racemosus, Tinospora cordifolia*, glucan and lithium for 15 days	Mice	When compared to control groups, all four drugs prevented, to varying degrees, leucopenia. Both indigenous plants were potent immunostimulants with effects comparable to lithium and glucan.	Thatte UM, Dahanukar SA. Comparative study of immunomodulating activity of Indian medicinal plants, lithium carbonate and glucan. Methods Find Exp Clin Pharmacol 1988;10(10):639–644.
Tinospora cordifolia	Various extracts of *Tinospora cordifolia*	Rats and rabbits	Oral administration of alcoholic extracts caused a decrease in fasting blood sugar in rabbits and rats. Daily administration increased the glucose tolerance in albino rats.	Gupta SS, et al. Anti-diabetic effects of *Tinospora cordifolia*. Part I. Effect on fasting blood sugar level, glucose tolerance and adrenaline induced hyperglycaemia. Indian J Med Res 1967;55(7):733–745.
Tribulus terrestris L. ZYGOPHYLLACEAE Gokshura Small caltrops	*Tribulus terrestris* polysaccharides	Mice	*Tribulus terrestris* polysaccharides had no mutagenic effect on mice, but protected chromosome and DNA from induced damage.	Liu Q, et al. A study of the protective effects of *Tribulus terrestris* polysaccharide on genetic damage. Zhonggu Zhongyao Zazhi-China J Chinese Mater Med 1995;20(7):427–429, 449.
Tribulus terrestris	Aqueous extract of *Tribulus terrestris*	Male rats	Metabolism of oxalate was studied. *Tribulus terrestris* administration produced a significant decrease in urinary oxalate excretion, and a significant increase in urinary glyoxylate excretion compared to sodium glycolate fed animals.	Sangeeta D, et al. Effect of *Tribulus terrestris* on oxalate metabolism in rats. J Ethnopharm 1994;44(2): 61–66.
Tribulus terrestris	Ethanolic extract of fruits of *Tribulus terrestris*	Albino rats	*Tribulus terrestris* showed significant dose-dependent protection against uroliths induced by glass bead implantation in albino rats.	Anand R, et al. Activity of certain fractions of *Tribulus terrestris* fruits against experimentally induced urolithiasis in rats. Indian J Exp Biol 1994;32(8):548–552.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Tribulus terrestris	1 capsule 3× per day with luke warm water containing: *Asparagus racemosus,* 50 mg; *Bergenia ligulata,* 100 mg; *Eclipta alba,* 100 mg; *Myristica fragrans,* 10 mg; *Tinospora cordifolia,* 100 mg; *Tribulus terrestris,* 50 mg; *Withania somnifera,* 50 mg	30 patients with calculi on kidneys, ureters, or bladders	The herbal combination was found to alleviate not only pain but also in slowly disintegrating both calcium-oxalate and calcium carbonate crystals in a span of 72 hours and complete discharging of crystals within 15–30 days. Complete discharge occurred in greater than 80% of the patients.	Karnick CR. Clinical evaluation of composite Ayurvedic drugs, on calculi, in the kidney and the urinary bladder. Aryavaidyan 1992;6(2):104–108.
Tribulus terrestris	Dried plant material of *Tribulus terrestris, Ipomoea lonchophylla* and *Abelmoschus ficulneus*	Pregnant ewes and their fetuses	The incidence of fetal breathing movements was significantly reduced and did not show a normal day-night variation in treated groups compared to controls. Results indicated plants may contain substances that affect functional development of fetal brain. Although ingestion did not appear to affect the outcome of pregnancy.	Walker D, et al. Some effects of feeding *Tribulus terrestris, Ipomoea Ionchophylla* and the seed of *Abelmoschus ficulneus* on fetal development and the outcome of pregnancy in sheep. Reproduc Fertility Dev 1992;4(2):135–144.
Tribulus terrestris	Saponin of *Tribulus terrestris*	Controlled clinical trial: 406 cases angina pectoris; 67 treated as controls	The total efficacious rate of remission angina pectoris was 82.3%. It was higher than the control group with a significant total effective rate (TER) of 67.2%. The TER of ECG improvement (52.7%) was even higher than that of the control group (35.8%).	Wang B, et al. 406 cases of angina pectoris in coronary heart disease treated with saponin of *Tribulus terrestris* [Chinese]. Chung Hsi Chieh Ho Tsa Chih 1990;10:85–87.
Tribulus terrestris	Extract of the fruits of *Tribulus terrestris*	Anaesthetized dogs	Ether extract produced diuresis and increased creatinine renal clearance that suggests an increased glomerular filtration rate. The aqueous extract of the fruits produced no significant effect.	Singh RCP, Sisodia CS. Effect of *Tribulus terrestris* fruit extracts on chloride and creatinine renal clearances in dogs. Indian J Physiol Pharmacol 1971;15:93–96.

Trigonella foenum-graecum L. LEGUMINOSAE Medhika Fenugreek	Isocaloric diets without and with fenugreek for 7 and 24 weeks. Dose 25 g fenugreek seed powder	Controlled clinical trial: 60 NIDDM subjects	Ingestion of fenugreek seed powder resulted in a significant reduction of total cholesterol, LDL, VLDL and triglyceride levels. The results indicated the beneficial effect of fenugreek seeds in diabetic subjects.	Sharma RD, et al. Hypolipidaemic effect of fenugreek seeds: A chronic study in non-insulin dependent diabetic patients. Phytotherapy Res 1996;10:332–334.
Trigonella foenum-graecum	Rats fed for 8 weeks the following plants: *Brassica* species, *Capsicum annum, Cuminum cyminum, Curcuma longa, Ferula foetida, Piper longum, Piper nigrum, Trigonella foenum-graecum, Zingiber officinale*	Rat	Common spices or their active principles were examined for their possible influence on the digestive enzymes of intestinal mucosa. Dietary curcumin, capsaicin, piperine and *Zingiber officinale* prominently enhanced intestinal lipase activity and also the disaccharidases sucrase and maltase. Dietary *Cuminum cyminum, Trigonella foenum-graecum, Brassica* species and *Ferula foetida* brought about decreases in the levels of phosphatases and sucrase. The positive influences of a good number of spices on terminal enzymes of the digestive process could be an additional feature of species that are generally well recognized to stimulate digestion.	Platel K, Srinivasan K. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int J Food Sci Nutr 1995;47(1):55–59.
Trigonella foenum-graecum	Extract of at least 90% of steroid saponins from the seed of *Trigonella foenum-graecum* 12.5 mg/d per 300 g weight	Normal and diabetic rats	These saponins significantly enhanced food consumption and motivation to eat, and reduced plasma cholesterol level in rats.	Petit PR, et al. Steroid saponins from fenugreek seeds: Extraction, purification, and pharmacological investigation on feeding behavior and plasma cholesterol. Steroids 1995; 60(10):674–680.
Trigonella foenum-graecum	Powder of *Trigonella foenum graecum* seeds, methanol extract, and residue remaining after methanol extraction	Normal and diabetic model rats	The extract and residue had significant hypoglycemic effects when fed simultaneously with glucose.	Ali L, et al. Characterization of the hypoglycemic effects of *Trigonella foenum graecum* seed. Planta Med 1995;61(4):358–360.
Trigonella foenum-graecum	Fenugreek seeds: unroasted and roasted powdered seeds, low-dose: 2 g/kg, high-dose: 8 g/kg	Normal and alloxan-induced diabetic rats	Both unroasted and roasted forms produced a significant reduction in total cholesterol, triglyceride, LDL and VLDL in normal rats, decreased their raised levels, and increased HDL in diabetic rats.	Kholsa P, et al. Effect of *Trigonella foenum graecum* (Fenugreek) on serum lipids in normal and diabetic rats. Indian J Pharmacol 1995;27(2): 89–93.
Trigonella foenum-graecum	*Trigonella foenum-graecum* administered at 2 and 8 g/kg dose orally	Normal and alloxan-induced diabetic rats	A significant dose-related decrease in blood glucose both in the normal as well as diabetic rats, and an hypoglycemic effect was observed.	Kholsa P, et al. Effect of *Trigonella foenum graecum* (Fenugreek) on blood glucose in normal and diabetic rats. Indian J Physiol Pharmacol 1995;39(2):173–174.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Trigonella foenum-graecum	Fenugreek seed extract administered orally 10 and 100 mg/day per 300 g weight	Male Wistar rats	The results showed long-term oral administration of fenugreek extract significantly increased food intake and the motivation to eat. The extract also induced hyperinsulinemia and hypocholesterolemia.	Petit P, et al. Effects of a fenugreek seed extract on feeding behaviour in the rat: Metabolic endocrine correlates. Pharmacol Biochem Behav 1993;45(2):369–374.
Trigonella foenum-graecum	Ethanolic extract from defatted fenugreek seeds; 30 or 50 g ethanolic extract/kg for a 4-week period	Hypercholesterolemic rats	Reductions in plasma cholesterol levels ranged from 18%–26% and a tendency for lower concentrations of liver cholesterol was observed.	Stark A, Madar Z. The effect of an ethanol extract derived from fenugreek (*Trigonella foenum-graecum*) on bile acid absorption and cholesterol levels in rats. Br J Nutr 1993;69(1):277–287.
Trigonella foenum-graecum	100 g debittered fenugreek powder for 20 days	Clinical study: 10 hyperlipidemic	Ingestion resulted in a significant decrease in the serum total cholesterol, LDL, VLDL, and triglyceride levels. HDL levels were not altered but the ratio with total cholesterol and LDL and VLDL were significantly increased.	Sharma RD, et al. Hypolipidaemic effect of fenugreek seeds. A clinical study. Phytother Res 1991;5:145–147.
Trigonella foenum-graecum	Fenugreek seed powder (100 g). In 2 equal doses at lunch and dinner for 10 days	Randomized controlled trial: 10 insulin-dependent (type I) diabetics	The fenugreek diet significantly decreased fasting blood sugar and improved the glucose tolerance test. Serum total cholesterol, LDL and VLDL and triglycerides were also significantly reduced.	Sharma RD, et al. Effect of fenugreek seeds on blood glucose and serum lipids in type I diabetes. Eur J Clin Nutr 1990;44(4):301–306.
Trigonella foenum-graecum	*Brassica, Cinnamomum zeylanicum, Cuminum cyminum, Ferula foetida, Tamarindus indica, Trigonella foenum-graecum, Zingiber officinale*	Rats	These plants generally stimulated liver microsomal cytochrome P450-dependent aryl hydroxylase. *Cuminum cyminum, Zingiber officinale,* and *Trigonella foenum-graecum* also stimulated the levels of cytochrome P450 and b5, *Cuminum cyminum* and *Tamarindus indica* stimulated N-demethylase activity.	Sambaiah K, Srinivasan K. Influence of spices and spice principles on hepatic mixed function oxygenase system in rats. Indian J Biochem Biophys 1989;26(4):254–258.

Trigonella foenum-graecum	*Trigonella foenum-graecum* seed for 4 weeks	Male rats	Daily oral treatment with *Trigonella foenum-graecum* significantly decreased the quantity of calcium oxalate deposited in the kidneys thus supporting its use in Saudi folk medicine.	Ahsan SK, et al. Effect of *Trigonella foenum-graecum* and *Ammi majus* on calcium oxalate urolithiasis in rats. J Ethnopharmacol 1989;26(3):249–254.
Trigonella foenum-graecum	Twelve plants used for the traditional treatment of diabetes administered as decoctions or infusions for 28 days *Agaricus bisporus, Anacardium occidentale, Arctum lappa, Catharanthus roseus, Daucus carota, Humulus lupulus, Ilex guayusa, Salvia officinale, Sambucus nigra, Taraxacum officinale, Trigonella foenum-graecum, Urtica dioica*	Mice	Of the 12 plants, *Agaricus bisporus* and *Ilex guayusa* showed potential antidiabetic effect.	Swanston-Flatt SK, et al. Glycaemic effects of traditional European plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice. Diabetes Res 1989; 10(2):69–73.
Trigonella foenum-graecum	Powdered fenugreek seed (15 g) soaked in water	Controlled clinical trial: 21 individuals with non-insulin dependent *Diabetes mellitus* (NIDDM)	Powdered fenugreek seed significantly decreased subsequent postprandial glucose levels. The plasma insulin also tended to be decreased in NIDDM but without a statistical difference. Fenugreek had no effect on lipid levels 3 hours after the meal tolerance test.	Madar Z, et al. Glucose-lowering effect of fenugreek in non-insulin dependent diabetics. Eur J Clin Nutr 1988;42:51–54.
Trigonella foenum-graecum	Subfraction "a" contains the testa, endosperm and fibers of *Trigonella foenum-graecum*	Alloxan-diabetic dogs	When the extract was added to insulin treatment, it resulted in a clear decrease of hyperglycemia and glycosuria accompanied by a decrease of the high plasma glucagon and somatostatin levels.	Ribes G, et al. Antidiabetic effects of subfractions from fenugreek in diabetic dogs. Proc Soc Exp Biol Med 1986;182(2):159–166.
Trigonella foenum-graecum	Fenugreek	30 rats	Addition of fenugreek seeds during pregnancy and lactation did not have any beneficial effect on growth of pups over and above that seen in control groups.	Mital N, Gopaldas T. Effect of fenugreek (*Trigonella foenum graecum*) seed based diets on the lactational performance in albino rats. Nutr Reports Int 1986; 33(3):477–484.
Trigonella foenum-graecum	Defatted fractions of fenugreek seeds	Dogs	The fraction decreased the basal blood glucose level, plasma glucagon, somatostatin levels, and decreased the orally induced hyperglycemia.	Ribes G, et al. Effects of fenugreek seeds on endocrine pancreatic secretions in dogs. Ann. Nutr Metab 1984;28(1):37–43.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Trigonella foenum-graecum	Fractions of fenugreek seed	Dogs	Addition of fenugreek fraction to the food of diabetic hypercholesterolemic dogs caused a significant decrease in cholesterolemia, and a decrease in hyperglycemia. The defatted portion of fenugreek seed induced an hypocholesterolemic effect.	Valette G, et al. Hypocholesteroaemic effect of fenugreek seeds in dogs Atherlosclerosis 1984;50(1):105–111.
Trigonella foenum-graecum	Stems, leaves and seeds of *Trigonella foenum-graecum* were extracted for 3 days with water, acetone, and by soxhlet 70°C	Normal, alloxan-, and cadmium-treated rats	Trigonella acetone extract appeared to act at the cellular level to produce its hypoglycemic effects on normal rats or those treated with cadmium or alloxan.	Ghafghazi T, et al. Antagonism of cadmium and alloxan-induced hyperglycemia in rats by *Trigonella foenum graecum*. Pahlavi Med J 1977;8(1):14–25.
Valeriana jatamansi Jones VALERIANACEAE Indian squill Tagara Indian valerian	450 or 900 mg of an aqueous extract of valerian root	Random double-blind study: volunteers with mild insomnia	There was a significant decrease in sleep latency with 450 mg valerian compared to placebo. The higher dose of valerian produced no further improvement in sleep latency.	Leathwood PD, Chauffard F. Aqueous extract of valerian reduces latency to fall asleep in man. Planta Med 1985;2:144–148.
Valeriana jatamansi	Valerenic acid, isolated from *Valeriana officinalis* Dose at IP 0.1 mL per 20 g body weight	Mice	The extract affected rotarod and traction performance of mice similar to the effect of pentobarbital with chlorpromazine and diazepam as reference substances. It was con-concluded that valerenic acid had specific central nervous depressant properties.	Hendriks H, et al. Central nervous depressant activity of valerenic acid in the mouse. Planta Med 1985;1:28–31.
Valeriana jatamansi	Aqueous extract (450 and 900 mg) of valerian root	Human trial: 18 healthy subjects (10 slept at home; 8 slept at laboratory)	Both doses reduced perceived sleep latency and wake time after sleep onset. In the lab only higher doses tested, no significant differences from placebo were obtained. Results indicated aqueous extract exerted mild hypnotic action.	Balderer G, Borbely AA. Effect of valerian on human sleep. Psychopharmacology 1985;87: 406–409.

Valeriana jatamansi	Decoction of *Valeriana jatamansi*; Group A treated with *Valeriana jatamansi*; group B control with vitamins; group C standard allopathic treatment	Randomized trial: 74 with rotavirus enteritis (under 2 years)	Within 72 hours cessation of diarrhea in groups A, B, C, were 73.9%, 41.67%, and 56.25%, respectively. Return to normal temperature was 90.64%, 60%, and 92.30%, respectively, suggesting antipyretic effect of *Valeriana jatamansi.*	Chen S, et al. Infantile rotavirus enteritis treated with herbal *Valeriana jatamansi* (VJ). J Trad Chin Med 1984;4(4):297–300.
Valeriana jatamansi	Extract of valerian root	Double blind randomized trial: 128 volunteers	Valerian produced a significant improvement in sleep quality and the effect was most marked in poor sleepers, smokers and habitual coffee drinkers. In contrast, sleep latency, night awakenings, dream recall and somnolence next day were relatively unaffected.	Chauffard F, et al. Detection of mild sedative effects: valerian and sleep in man. Experientia 1981;37:622.
Vanda roxburghii R. Br. ORCHIDACEAE Rasna Rasna	Glycoside crystals obtained from roots of *Vandra roxburghii* Dose of 20 mg/kg	Rats	*Vanda roxburghii* had no effect on acute reaction following formaldehyde injection but effectively prevented development of secondary proliferative changes in the ankle joint and other small joints.	Prasad DN, Achari G. A study of anti-arthritic action of *Vanda roxburghii* in albino rats. J Indian Med Assoc 1966;46(5): 234–239.
Viola odorata L. VIOLACEAE Banaphsha Wild violet	Hexane, chloroform and water-soluble extracts of *Artemisia absinthium, Viola odorata, Melia azadirachta,* and *Fumaria parviflora*	Rabbits	Significant oral antipyretic activity was exhibited by extracts of *Artemisia absinthium, Viola odorata, Melia azadirachta,* and *Fumaria parviflora* comparable to aspirin. No obvious toxic effects were noted for any plant extracts.	Khattak SG, et al. Antipyretic studies on some indigenous Pakistani medicinal plants. J Ethnopharm 1985;14(1):45–51.
Vitis vinifera L. VITACEAE Draksha Grapes	D-glucaric acid dietary sources include grapes and lettuce, for example	Rats	The D-glucarates reduced total serum cholesterol in rats by up to 14% ($p < 0.05$) and lowered LDL by up to 35% ($p < 0.05$), but had no effect on HDL.	Walaszek Z, et al. D-glucaric acid content of various fruits and vegetables and cholesterol-lowering effects of dietary D-glucarate in the rat. Nutr Res 1996;16(4):673–681.
Vitis vinifera	*Vitis vinifera* seeds purified and enriched fraction; Procyanidines: dose 2 mg/kg for 3× per day for 6 days	Rats	The extract inhibited the carrageen-induced hind paw edema. These compounds also inhibited the dextran-induced edema 4 hours after the development of the process.	Zafirov D, et al. Antiexudative and capillaritonic effects of procyanidines isolated from grape seed (*Vitis vinifera*). Acta Physiol Pharmacol Bulg 1990;16(3);50–54.
Withania somnifera (L.) Dunal SOLANACEAE Ashwagandha Winter cherry	Aqueous suspension of root extract of 100 mg/kg *Withania somnifera*	Stress-induced rabbits and mice	Simultaneous oral administration of *Withania somnifera* prevented the rise in lipid peroxidation in rabbits and mice.	Dhuley JN. Effect of ashwagandha on lipid peroxidation in stress-induced animals. J Ethnopharm 1998;60:173–178.

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TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Withania somnifera	*Asparagus racemosus, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera*	Mice	All plants significantly inhibited the carcinogen ochratoxin-induced suppression of chemotactic activity and the production of interleukin-1 and TNF-α by macrophages.	Dhuley JN. Effect of some Indian herbs on macrophage functions in ochratoxin A treated mice. J Ethnopharm 1997;58: 15–20.
Withania somnifera	*Withania somnifera* root extract	Mice	The extract attenuated the development of tolerance to the analgesic effect of morphine. Also uppressed morphine-swithdrawal jumps, a sign of dependence to opiate.	Kulkarni SK, Ninan I. Inhibition of morphine tolerance and dependence by *Withania somnifera* in mice. J Ethnopharm 1997;57(3): 213–217.
Withania somnifera	*Eclipta alba, Ocimum sanctum, Picrorhiza kurrooa, Tinospora cordifolia, Withania somnifera.* Doses: 100, 200 mg/kg PO 1× per day for 28 days	Hyperglyemic rats	The herbal formulation had little effect on blood sugar concentrations but doses induced a dose-related decrease in STZ hyperglycemia and attenuation of STZ induced a decrease in islet superoxide dismutase activity in euglycaemic rats.	Bhattacharya SK, et al. Effect of Trasina, an Ayurvedic herbal formulation on pancreatic islet superoxide dismutase activity in hyperglycaemic rats. Indian J Exp Biol 1997;35(3):297–299.
Withania somnifera	75% methanolic extract of *Withania somnifera*	Mice	The extract was found to significantly decrease total white blood cell count and reduce leucopenia induced by sublethal doses of gamma radiation.	Kuttan G. Use of *Withania somnifera* L. Dunal as an adjuvant during radiation therapy. Indian J Exp Biol 1996;34(9):854–856.
Withania somnifera	Roots of *Withania somnifera*	Mice	A significant modulation of immune reactivity was observed as was immunostimulatory activity.	Ziauddin M, et al. Studies on the immunomodulatory effects of Ashwagandha J. Ethnopharm 1996;50(2):69–76.
Withania somnifera	Withaferin A, a steroidal lactone from *Withania somnifera*	Mice	Withaferin A was effective in inhibiting growth of Ehrlich ascites tumor in mouse.	Sharada AC, et al. Antitumor and radiosensitizing effects of withaferin A on mouse Ehrlich ascites carcinoma in vivo. Acta Oncol 1996;35(1):95–100.
Withania somnifera	Withaferin A, a steroidal lactone from *Withania somnifera*	Mice	Withaferin A inhibited tumor growth and increased tumor free survival in a dose-dependent manner.	Devi PU, et al. In vivo growth inhibitory and radiosensitizing effects of withaferin A on mouse Ehrlich ascites carcinoma. Cancer Lett 1995;95(1–2):189–193.

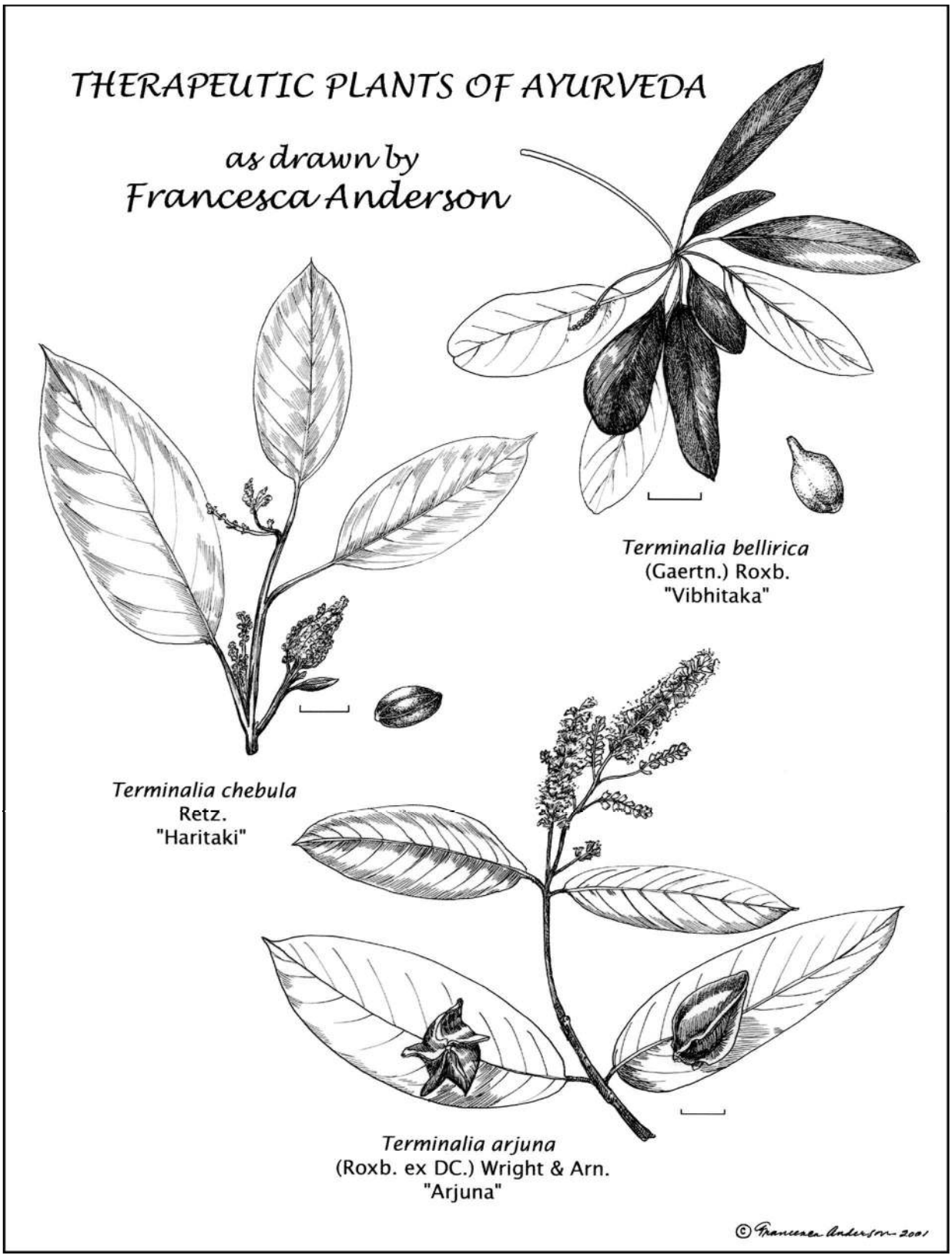
Withania somnifera	Aqueous extract of powdered root of *Withania somnifera*	Mice	*Withania somnifera* showed significant antistress activity and significant anabolic activity.	Grandhi A, et al. A comparative pharmacological investigation of Ashwagandha and Ginseng. J Ethnopharm 1994;44:131–135.
Withania somnifera	Alcohol extract from roots of *Withania somnifera*	Mice and rats	LD_{50} calculated as 1260 mg/kg body weight for 30 days resulted in no mortality or changes in peripheral blood constituents.	Sharada AC, et al. Toxicity of *Withania somnifera* root extracts in rats and mice. Int J Pharmacog 1993;31(3):205–212.
Withania somnifera	Alcoholic root extract of *Withania somnifera*	Mice	The extract had a tumor inhibiting effect, acted as a radiosensitizer, and heat enhanced these effects.	Devi PU, et al. Antitumor and radiosensitizing effects of *Withania somnifera* (Ashwagandha) on a transplantable mouse tumor, Sarcoma 180. Indian J Exp Biol 1993;31:607–611.
Withania somnifera	1 capsule 3× per day with luke warm water containing: *Asparagus racemosus,* 50 mg; *Bergenia ligulata,* 100 mg; *Eclipta alba,* 100 mg; *Myristica fragrans,* 10 mg; *Tinospora cordifolia*, 100 mg; *Tribulus terrestris,* 50 mg, *Withania somnifera,* 50 mg	30 patients with calculi on kidneys, ureters, or bladders	The herbal combination was found to alleviate not only pain but also slowly disintegrated both calcium-oxalate and calcium carbonate crystals in a span of 72 hours and complete discharging of crystals within 15–30 days. Complete discharge occurred in greater than 80% of the patients.	Karnick CR. Clinical evaluation of composite Ayurvedic drugs, on calculi, in the kidney and the urinary bladder. Aryavaidyan 6(2):1992;104–108.
Withania somnifera	Methanolic fraction of aerial parts of *Withania somnifera*	Rats	Anti-inflammatory activity retained in the extract and was comparable to that of a 5 mg/kg dose of hydrocortisone sodium succinate.	Al-Hindawi MK, et al. Anti-granuloma activity of Iraqi *Withania somnifera* J Ethnopharm 1992;37:113–116.
Withania somnifera	Withaferin A	Rats	Treatment with Withaferin A against CCl4 induced hepatotoxicity possessed significant protective effect. Withaferin A was shown to be as effective as hydrocortisone dose per dose.	Sudhir S, Budhiraja RD. Comparison of the protective effect of Withafferin 'A' and hydrocortisone against CCL4 induced hepatoxicity in rats. Indian J Physiol Pharmacol 1992; 36(2):127–129.
Withania somnifera	*Withania somnifera* root, 450 mg; *Boswellia serrata* Oleo gum resin 100 mg; *Curcuma longa* rhizome 50 mg; and zinc complex, 50 mg	Double-blind, placebo-controlled trial: 42 patients	Osteoarthritis patients were randomly allocated to receive the placebo or the herbomineral formulation. A significant drop was noted in the severity of pain ($p < 0.001$) and disability score ($p < 0.05$)	Kulkarni RR, et al. Treatment of osteoarthritis with a herbal formulation: A double-blind, placebo-controlled, cross-over study. J Ethnopharm 1991;33(1–2):91–95.

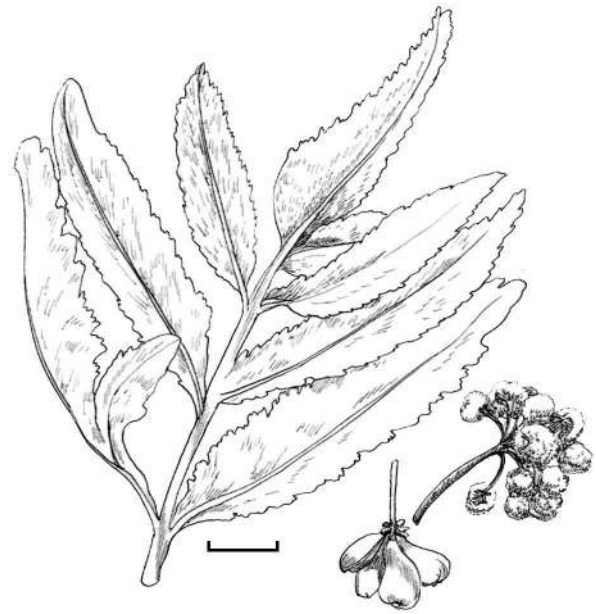
(*continued*)

TABLE 2. PLANTS USED IN *AYURVEDIC PHARMACOPOEIA* (CONT'D)

Genus, species family Common name (Sanskrit) Common name (English)	*Plant part used, preparation, and dosage*	*Design and model*	*Results*	*References*
Withania somnifera	*Withania somnifera* root powder extract. Dose 250 mg 2× per day for 40 days	Double-blind, placebo-controlled clinical trial: 30 healthy male and females	*Withania somnifera* was superior in effect to ginseng root powder relative to baseline performance, integrated sensory-motor function, and auditory reaction. Both *Withania somnifera* and *Panax ginseng* groups performed statistically better compared to placebo in mental arithmetic and motor function.	Karnick CR. A double-blind, placebo-controlled clinical study on the effects of *Withania somnifera* L. and *Panax ginseng* extracts on psycho-motor performance in healthy Indian volunteers. Indian Med 1991;3(2,3):1–5.
Withania somnifera	80% ethanolic extract of *Achillea santolina, Apium graveolens, Matricaria chamomilla, Myrtus communis, Withania somnifera* and acetylsalicylic acid used as standard drug	Rats with carrageenan-induced paw edema	Results showed that the plants possessed varying degrees of antiinflammatory activity in the following descending order: *Withania somnifera, Apium graveolens, Achillea santolina, Matricaria chamomilla, Myrtus communis.*	Al-Hindawi MK, et al. Anti-inflammatory activity of some Iraqi plants using intact rats. J Ethnopharm 1989;26(2):163–168.
Withania somnifera	Three plants lacking pyrrolizidine alkaloids: *Aegle marmelos, Hemidesmus indicus, Terminalia chebula, Withania somnifera*	Feeding trials in rats	All plants produced hepatic lesions that included central vein abnormalities. *Terminalia chebula* and *Withania somnifera* produced marked renal lesions.	Arseculeratne, et al. Studies of medicinal plants of Sri Lanka. Part 14: Toxicity of some traditional medicinal herbs. J Ethnopharm 1985;13(3):323–335.
Withania somnifera	Powdered dried root of *Withania somnifera*	Human trial: 63 patients	The extract was effective in a number of acute rheumatoid arthritis cases and in some with chronic rheumatoid arthritis with acute exacerbations.	Bector NP, et al. Role of *Withania somnifera* L. (Ashwagandha) in various types of arthropathies. Ind J Med Res. 1968;56(10):1581–1583.

TPA, tissue plasminogen activator; HMG CoA, hydroxymethyl glutaryl coenzyme A; USAN, United States Adopted Names; IV, intravenously; IP, intraperitoneally; ED_{50}, median effective dose; PGE_2, prostaglandin E_2; GSH, glutathione; CSF, AUC, C_{max}, LD_{50}, median lethal dose; bid, twice daily; tid, three times daily.

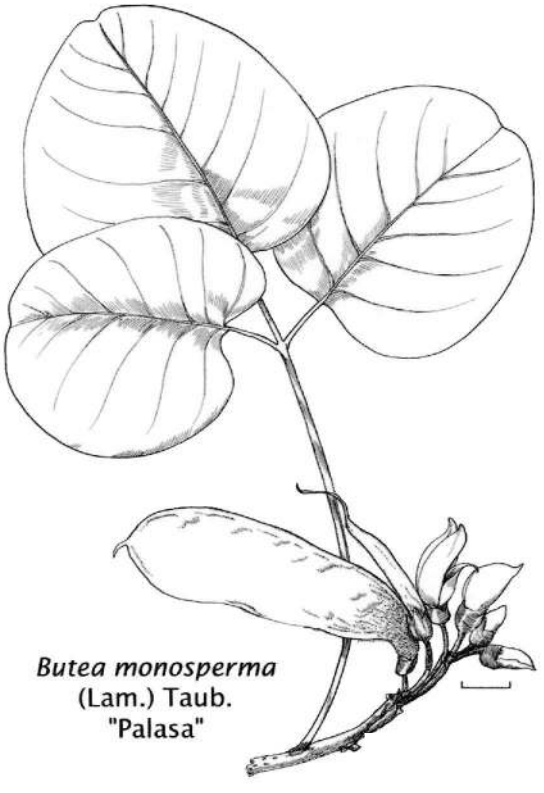

THERAPEUTIC PLANTS OF AYURVEDA
as drawn by
Francesca Anderson
Terminalia bellirica
(Gaertn.) Roxb.
"Vibhitaka"
Terminalia chebula
Retz.
"Haritaki"
Terminalia arjuna
(Roxb. ex DC.) Wright & Arn.
"Arjuna"
©Francesca Anderson-2001



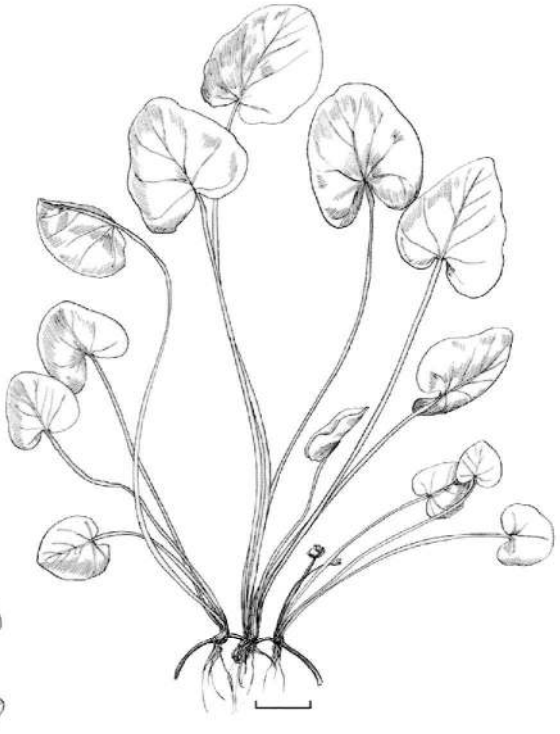
Ferula foetida (Bunge) Regel
"Hingu"

Swertia chirata (Wall.) C.B. Clarke
"Kirata tikta"

Embelia ribes Burm.f.
"Vidanga"

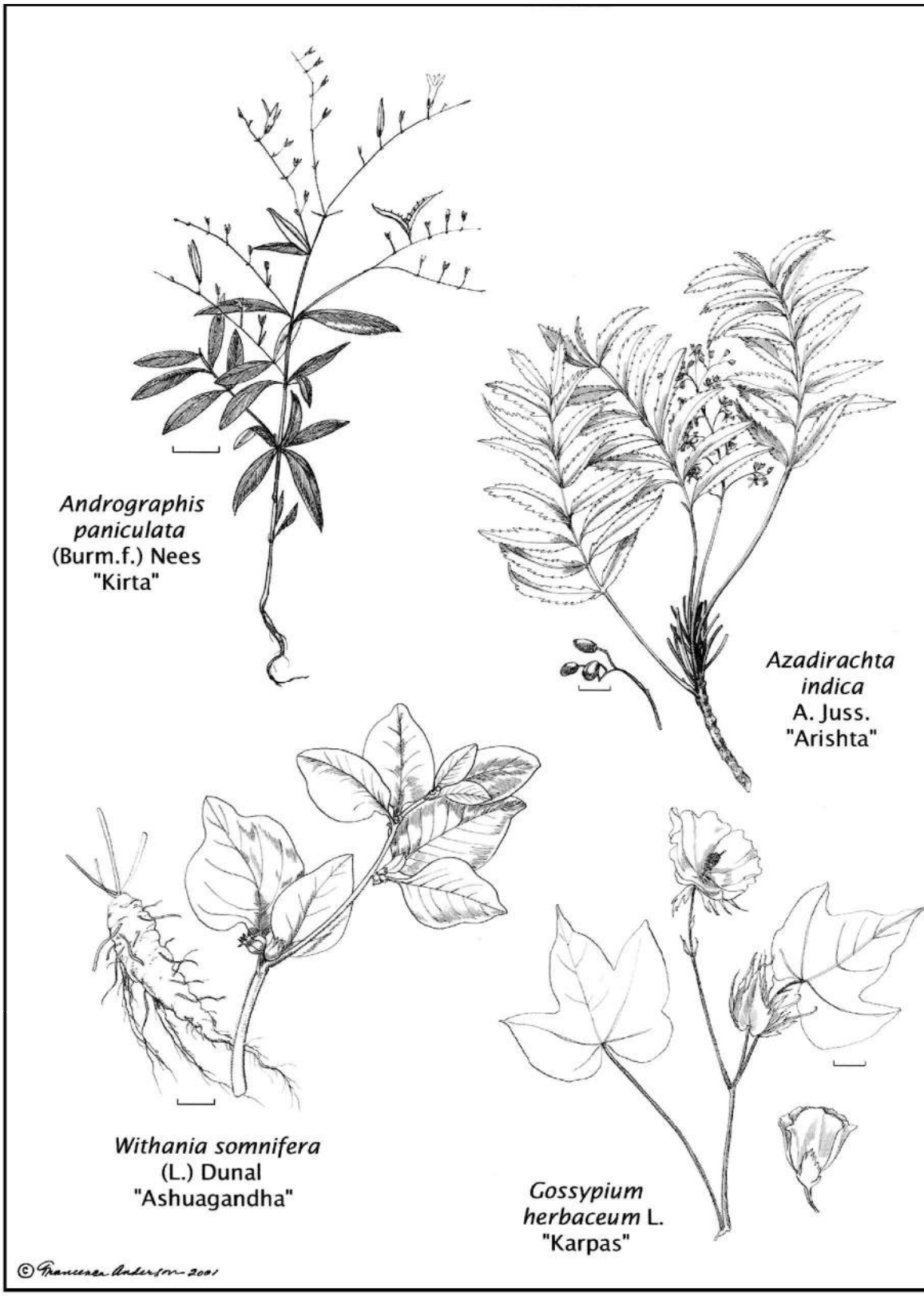


Butea monosperma
(Lam.) Taub.
"Palasa"



Centella asiatica (L.) Urb.
"Mandukparni"

Clitoria ternatea L. "Aparajita"


Andrographis paniculata (Burm.f.) Nees "Kirta"
Azadirachta indica A. Juss. "Arishta"
Withania somnifera (L.) Dunal "Ashuagandha"
Gossypium herbaceum L. "Karpas"
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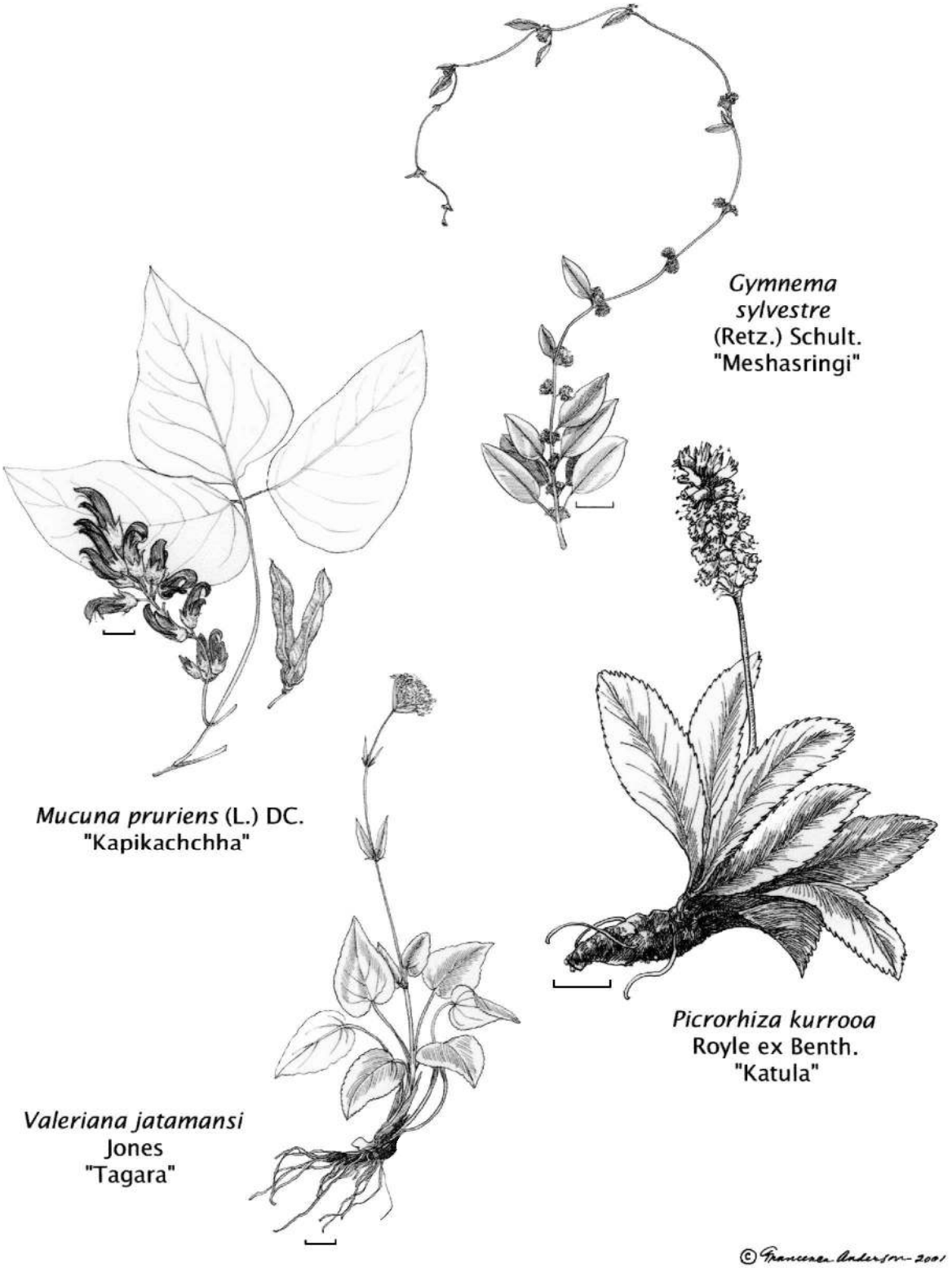
Gymnema sylvestre (Retz.) Schult. "Meshasringi"
Mucuna pruriens (L.) DC. "Kapikachchha"
Picrorhiza kurrooa Royle ex Benth. "Katula"
Valeriana jatamansi Jones "Tagara"
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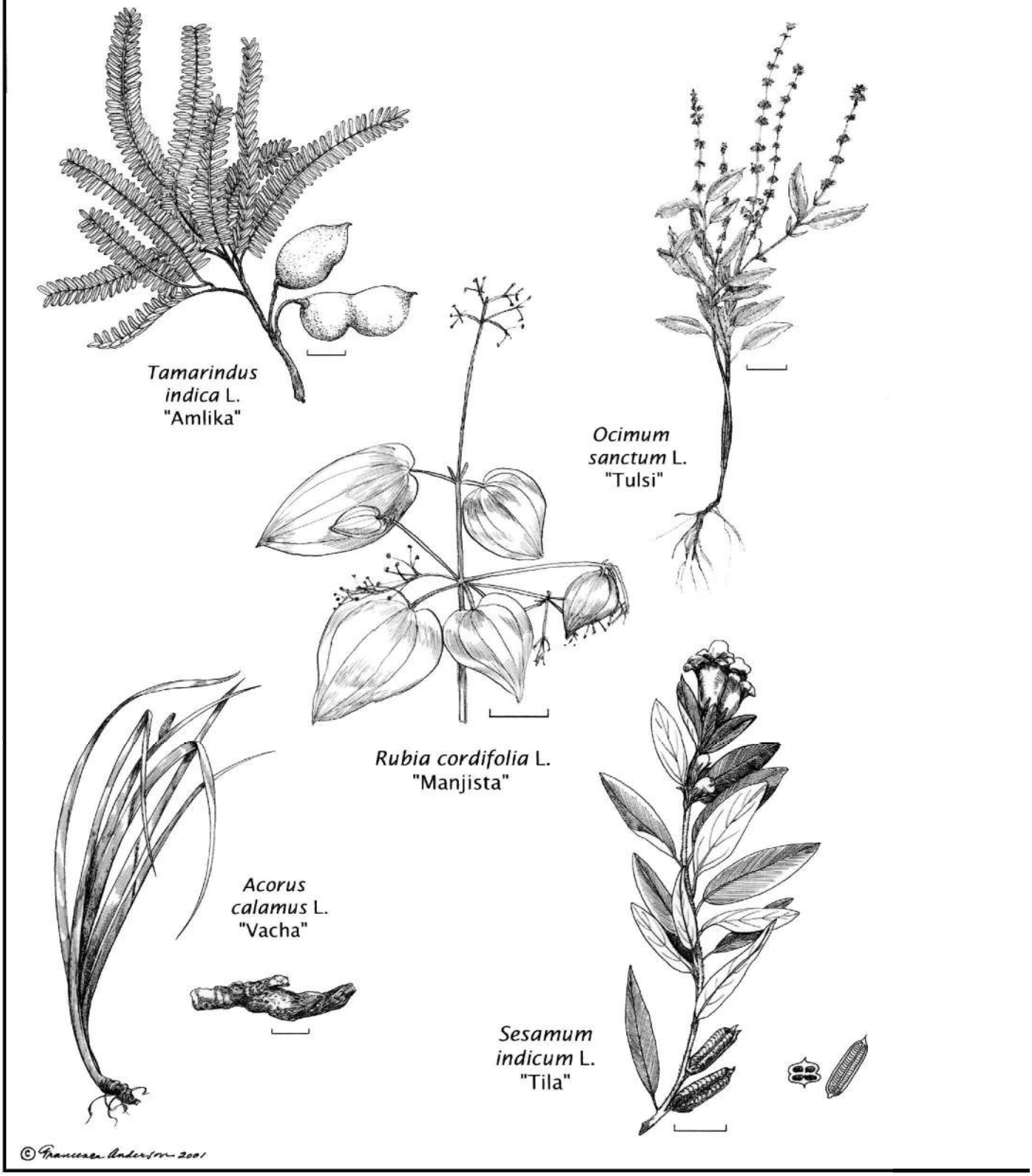
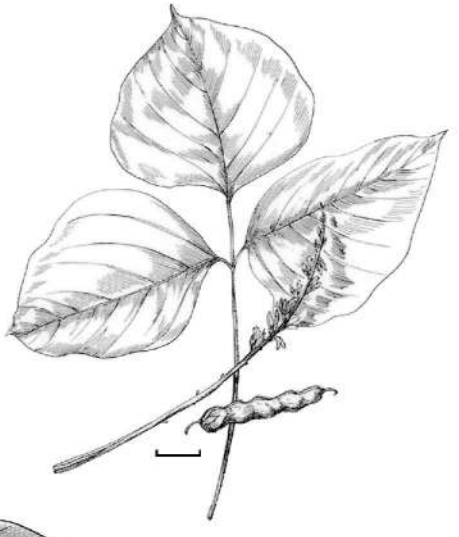
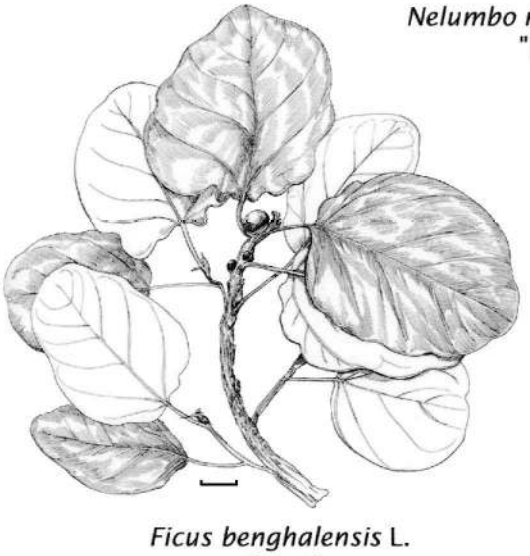

Tamarindus indica L.
"Amlika"
Ocimum sanctum L.
"Tulsi"
Rubia cordifolia L.
"Manjista"
Acorus calamus L.
"Vacha"
Sesamum indicum L.
"Tila"
© Francesca Anderson 2001

Mallotus philippensis (Lam.) Muell.
"Kampilla"



Pueraria tuberosa DC.
"Vidari"

Nelumbo nucifera Gaertn.
"Kamal"



Ficus benghalensis L.
"Vata"

Holarrhena antidysenterica (Roxb. ex Fleming) Wall. ex A. DC.
"Kutaja"