



A bibliometric study of *Embelia ribes*

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ribes

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289

Received 25 June 2007
Reviewed 31 July 2007
Accepted 9 August 2007

Abstract

Purpose – The study aims to present a bibliometric analysis of scientific output of the plant *Embelia ribes*, the aim being to offer an overview of research activity in this field and characterize its most important aspects.

Design/methodology/approach – A total of 332 articles were collected from following databases: Pub Med, Medicinal and Aromatic Plants Abstract, Indian Science Abstract and Biological Abstract. The searches were restricted to published articles and contain the terms *Embelia ribes* and *Vidanga*. The various analyses focus on growth of literature, authorship pattern, most prolific authors, core journals of the subject, most productive institutes and countries. Lotka's law and Bradford's law of scattering were applied to count the author productivity and core journals in the subject.

Findings – Most articles involved collaboration between two or three authors. Author productivity was not found exactly fit to Lotka's law with a value of $n = 2$. However, distribution of articles in different journals was found fit to Bradford's law of scattering with the distribution of $1:n:n^2$.

Originality/value – The paper offers an overview of research activity into the plant *Embelia ribes*.

Keywords Plant genetics, Research, Pharmaceutical products

Paper type Literature review

Introduction

The plant *Embelia ribes* is distributed throughout India, Malaya and South China. "Vidanga" is the alternate name of *Embelia ribes*. "Vidanga", one of the important ayurvedic drugs, is widely used in indigenous system of medicine as an anthelmintic, iterative and tonic since ancient times. "Vidanga" is also known by different names in different parts of the country. It is known as "birang" in Bengali, "vavading" in Gujarat and Maharashtra, "babarang", "baibidang" and "baibirang" in Hindi, "vaivalanga" and "vayavidang" in South India and "babang" in Pushtu language. The various regional names indicate their derivation from the Sanskrit name "Vidang" only (Mitra, 1995).

The drug and its various preparations have been mentioned in Ayurvedic Samhitas and the uses of this drug have been mentioned in Ayurvedic texts. Susrut recommended this drug for cough and also as an anthelmintic. He has also prescribed "Vidanga Rasayana" for longevity while Vagbhata mentioned this drug for a number of diseases such as leprosy, as an anthelmintic in ringworm and bulbous eruptions. The decoction of dried fruits is used for fevers, paste is applied for skin diseases, while the fruit in powdered form when taken with milk, followed by a purgative, has been one of the ancient remedies to eliminate tapeworms. This has been described a drug having anthelmintic activity on tapeworm infestation. It is also useful in flatulence, dyspepsia and ringworm infection of the skin. It was the best drug used for treating influenza (Kholkute and Munshi, 1977).



Present study was taken up to quantify and map the world scientific output in the area *Embelia ribes*, the aim being to offer an overview of research activity and to characterize its most important aspects and their evolution over the years.

Objectives of study

The specific objective of the present study addresses the following aspects:

- (1) Temporal evolution of number of publications.
- (2) Number of authors contributing each article and authorship pattern.
- (3) Author productivity through the application of Lotka's law and most prominent authors in the area of *Embelia ribes*.
- (4) Output of different journals with their rank and the application of Bradford's law as an indicator of the dispersion of scientific information.
- (5) Output of various institutions.
- (6) Output with respect to country.
- (7) Global distribution of journals.

Methods

The documents included in the present study were identified via the following databases:

- (1) PubMed (The National Library of Medicine (NLM))
- (2) *Medicinal and Aromatic Plants Abstract* (National Institute of Science Communication and Information Resources (NISCAIR))
- (3) *Indian Science Abstract* (National Institute of Science Communication and Information Resources (NISCAIR))
- (4) *Biological Abstract* (Thomson Scientific)

Citations were downloaded using EndNote-7 Software, developed by Thomson ISI Research Soft. Since the data were collected from various sources, 31 records were found as duplicates and were removed using EndNote's duplicate removal application.

The restrictions placed on the search concerned the following aspects:

- (1) Terminology: With the aim of covering all the available citations on *Embelia ribes*, the above mentioned databases were searched using the following terminology: "Embelia ribes" and "Vidanga".
- (2) Time Period: Given that the objective of the present study was to analyse all the journal articles published on, *Embelia ribes* the search was open and not limited to any time period.
- (3) Types of documents: Given the enormous of documents concerning *Embelia ribes* it was decided to limit this study to published journal articles. Therefore, books, proceedings, book reviews, etc. were all excluded.

Having applied the above restrictions a total of 332 articles were collected and data were then tabulated using SPSS 15.0. The coded variables were as follows: year of publication, number of authors contributing to the articles and institution to which they belong, the country of the institution, the journal in which the article was published and country which published journals on the subject.

Data analysis

The analysis of the present study focused mainly on the frequencies and percentages of publications. In addition, however, the productivity of authors and journals was described using Lotka's law and Bradford's law of scattering, respectively.

Lotka's law (Lotka, 1926) states that the number of authors making n contributions is about $1/n^2$ of those making one contribution, where n is often nearly 2. The approximation is: the number of authors each contributing n articles is proportional to $1/n^2$. If 100 authors each produce one article in a given period, 25 authors produce each two articles, 11 produces each three etc. This law is often termed "the inverse square law of scientific productivity".

As an indicator of the dispersion of scientific output, Bradford (Bradford, 1934, 1948) proposed a model of concentric productivity zones with a decreasing information density. In other words, each zone or core contains a similar number of articles, but the number of journals in which these are published increases from one zone to the next according to the expression $I, n, n^2 \dots$; in this way, a group of journals dedicated more specifically to the subject of interest can be distinguished.

Year of publication

During the period of 124 years (1880-2004) a total of 332 articles were published on the subject. Growth rate till 1950s was quite constant with an average of one article in two years. During 1970s, 1980s and 1990s maximum number of articles were published with an average of eight articles in a year. Decade-wise growth is shown in more detail in Table I.

Number of authors

The number of authors contributing to each article ranged from one to nine: however, Figure 1 shows, 18.37 per cent have a sole author while 36.75 per cent have two authors. 24.4, 15.96 and 1.51 per cent articles were contributed by three, four and five authors, respectively. Articles with more than five authors account for 3.01 per cent of the total number of documents.

S. No. ^a	Year	No. of articles	%	CF ^b
1	1880-1890	4	1.20	4
2	1891-1900	2	0.60	6
4	1901-1910	1	0.30	7
6	1911-1920	1	0.30	8
9	1921-1930	3	0.90	11
10	1931-1940	12	3.61	23
12	1941-1950	5	1.50	28
14	1951-1960	9	2.71	37
16	1961-1970	32	9.63	69
18	1971-1980	81	24.39	150
21	1981-1990	80	24.09	230
22	1991-2000	79	23.79	309
24	2001-2004	23	6.92	332
	Total	332		

Notes: ^aSerial number; ^bcumulative frequency

Table I.
Year-wise distribution of
articles

Author productivity

A total of 773 authors contributed to the articles analyse. Table II shows the distribution of the number of articles published by each one of the authors, and reveals that whereas some authors contributed to as many as twenty-two articles others only contributed to one.

As can be seen, 73.86 per cent of authors only contributed to one article, those contributing to more than one, therefore, being much fever in number. Only three authors published ten or more studies.

Lotka's law has been applied to calculate the number of expected authors for a given number of published studies. Considering the fact that 571 authors have produced only one article each, the value of n can easily be derived. Putting the value of " n " as 2, the following results (Table III) has been derived.

Prolific authors

The most prolific authors of the subject *Embelia ribes* have been identified and ranked form greater to lesser contribution. There are only three authors published ten or more articles. The author with the greatest contribution in terms of research on *Embelia ribes* is A.O. Prakash contributing 22 articles, followed by Mathur and Das with 13 and 10 articles respectively. Next position occupied by Atal, Chander, Munshi and Venkateswarul with eight article each. It is interested to note that only 24 authors contributed 49.69 per cent of the total articles, whereas remaining 50.31 per cent

Table II.
Author productivity

Number of articles	Number of authors	Observed (%)
1	571	73.86
2	145	18.75
3	33	4.26
4	5	0.64
5	6	0.77
6	4	0.51
7	2	0.25
8	4	0.51
10	1	0.12
13	1	0.12
22	1	0.12

Table III.
Number of expected
authors derived with the
value of $n = 2$

Number of articles	Number of authors (observed)	Number of authors (expected)
1	571	571
2	145	143
3	33	63
4	5	35
5	6	23
6	4	16
7	2	11
8	4	9
10	1	6
13	1	3
22	1	1

articles were contributed by 749 authors. The contribution of the most prolific authors with scattering in total number of journals is shown in more detail in Table IV.

Core journals in the subject

The 332 articles analysed in the present study were published in 140 journals from various scientific fields. The most productive journals in terms of Embelia ribes are shown in more detail in Table V. As can be seen the journals that have published the most articles on Embelia ribes are the *Journal of Research in Indian Medicine, Yoga and Homeopathy, Indian Journal of Indigenous Medicines and Fitoterapia* accounting for 4.81, 4.51 and 4.21 per cent of the total number of publications, respectively. It has been observed that out of 332 articles published in 140 journals, 96 (29.35 per cent) articles were published in ten journals that may be considered as core journals in the subject Embelia ribes.

Bradford's distribution

After applying Bradford's law of scattering with respect to the variable "journal", three concentric zones were defined. The core or zone 1 contained 96 (32.78 per cent of the total) articles that were published in ten journals. The second zone contain 112 articles (35.42 per cent) published in a total of 36 journals. Finally, zone 3 consisted of 99 journals accounting for a total of 119 (31.79 per cent) articles.

According to Bradford's law, the number of journals following successively in the three zones should be in the ration of 1: $n:n^2$, while the ratio in each zone of the present is 10:36:99, which is nearly in accordance with the Bradford's distribution. The zone wise distribution of articles in different journals is shown Table VI.

S. No.	Authors	Rank	Number of articles	Number of journals
1	Prakash	1	22	10
2	Mathur	2	13	10
3	Das	3	10	6
4	Atal	4	8	5
5	Chander	4	8	5
6	Munshi	4	8	3
7	Venkateswarul	4	8	2
8	Ahmed	5	7	5
9	Guru	5	7	5
10	Gupta	6	6	3
11	Kanwar	6	6	3
12	Sanyal	6	6	3
13	Tewari	6	6	5
14	Chaturvedi	7	5	4
15	Chitra	7	5	3
16	Mishra	7	5	5
17	Rao	7	5	3
18	Sukumar	7	5	3
19	Vasudevan	7	5	3
20	Dixit	8	4	4
21	Maske	8	4	2
22	Purushothaman	8	4	3
23	Bhargava	8	4	2
24	Santhakumari	8	4	2
Total			165	99

Table IV.
Ranking of authors by
contribution and their
scattering in the journals

S. No.	Name of the journal	Country	Rank	No. of articles published
1	<i>Journal of Research in Indian Medicine, Yoga and Homeopathy</i>	India	1	16
2	<i>Indian Journal of Indigenous Medicines</i>	India	2	15
3	<i>Fitoterapia</i>	Italy	3	14
4	<i>Indian Journal of Experimental Biology</i>	India	4	13
5	<i>Indian Journal of Medical Research</i>	India	5	11
6	<i>Indian Journal of Pharmaceutical Science</i>	India	6	9
7	<i>Indian Veterinary Journal</i>	India	6	9
8	<i>Planta Medica</i>	Germany	6	9
9	<i>Pashudhan</i>	India	7	8
10	<i>Probe</i>	USA	8	7
11	<i>Journal of Ethnopharmacology</i>	UK	9	6
12	<i>Comparative Physiology and Ecology</i>	India	10	5
13	<i>Journal of Indian Chemical Society</i>	India	10	5
14	<i>Nagarjun</i>	India	10	5
15	<i>Bulletin of Medical and Ethnobotany Research</i>	India	11	4
16	<i>Current Science</i>	India	11	4
17	<i>Indian Veterinary Medical Journal</i>	India	11	4
18	<i>Journal of Economics and Taxonomic Botany</i>	India	11	4
19	<i>Journal of Scientific and Industrial Research</i>	India	11	4
20	<i>Ancient Science Life</i>	India	12	3
21	<i>Indian Drugs</i>	India	12	3
22	<i>Indian Journal of Arecanut, Spices and Medicinal Plants</i>	India	12	3
23	<i>Indian Journal of Pharmacology</i>	India	12	3
24	<i>Indian Journal of Physiology and Pharmacology</i>	India	12	3
25	<i>Journal of Chemical Society</i>	USA	12	3
26	<i>Journal of Food Science and Technology, India</i>	India	12	3
27	<i>Journal of Research in Ayurveda and Siddha</i>	India	12	3
28	<i>Journal of Veterinary and Animal Husbandry Research</i>	India	12	3
29	<i>Journal of Veterinary Parasitology</i>	Japan	12	3
30	<i>Photochemistry</i>	UK	12	3
31	<i>Tetrahedron</i>	UK	12	3
32	<i>Indian Journal of Veterinary Medicine</i>	India	12	3
33	<i>Phototherapy Research</i>	UK	12	3

Table V.
Ranking of the journals
by output

Zone	Number of journals	Number of articles
First	10	96
Second	36	112
Third	99	119
Total	140	327

Table VI.
Bradford's distributions
of articles in different
journals

Output of different institutions

An exhaustive analysis of the articles under study revealed that the various authors come from a wide range of institutions, including research institute, hospitals, colleges etc. However, the majority are attached to universities. Table VII shows the

Institution	Rank	Number of articles	%
Jiwaji University, Gwalior	1	26	7.83
Banaras Hindu University, Varanasi	2	21	6.33
Govind Ballabh. Pant University of Agriculture and Technology, Pantnagar	3	16	4.82
Captain Srinivasa Murthi Drug Research Institute for Ayurveda, Madras	4	13	3.92
Punjab University, Chandigarh	5	12	3.61
Central Food Technological Research Institute, Mysore	6	11	3.31
Institute of Research in Reproduction, Mumbai	6	9	2.71
Andhra University, Visakhapatnam	7	7	2.11
Nagpur Veterinary College, Nagpur	7	7	2.11
Medical College Trivandrum and Regional Research Institute, Trivandrum	8	5	1.51
University of Madras, Chennai	8	5	1.51
Regional Research Laboratory, Jammu Tawi	8	5	1.51
All India Institute of Medical Sciences, New Delhi	9	4	1.20
College of Veterinary Science and Animal Husbandry cum Livestock Research Institute, Rajendranagar	9	4	1.20
Bharathiar University, Coimbatore	9	3	0.90
India Agriculture Research Institute, New Delhi	9	3	0.90
LM College of Pharmacy, Ahmedabad	9	3	0.90

Table VII.
Most productive
institutions

organizations, which have published the most articles on the subject of *Embelia ribes* (institutions with fewer than three articles were not considered here).

The organizations with the highest productivity are the Jiwaji University and Banaras Hindu University, institutions involved in a total of 26 (7.83 per cent) and 21 (6.32 per cent) articles, respectively. These are followed by the scientific output of the Pant University of Agriculture and Technology, the Captain Srinivasa Murthi Drug Research Institute for Ayurved and the Panjab University, whose output ranges from 16 to 12 articles and accounts for 11.74 per cent of the total number of publications.

Countries

In studying this variable, countries were ranked from greater to lesser productivity, taking into account that authors from different countries may contribute to the same article. Number of articles in the journals with respect to particular country is shown in Table VIII. The country with the greatest output in terms of research on *Embelia ribes* is the India (63.86 per cent), followed by USA and UK, with a total of 29 (8.73 per cent)

Country	Number of articles	%
India	212	63.86
USA	29	8.73
UK	29	8.73
Japan	19	5.72
Italy	14	4.22
Germany	12	3.62
Others	17	5.12

Table VIII.
Most productive
countries

articles each. Next come Japan (5.72 per cent), Italy (4.22 per cent) and Germany, the remaining countries publishing a total of 17 documents between them, accounting for 10.6 per cent of output.

Global distribution of journals

As pointed out that a total of 332 articles were published in 140 journals. The most productive countries in terms of number of journals are shown in Table IX. As can be seen, 57.14 per cent journals on the subject *Embelia ribes* have been published from India, followed by USA and UK with the 16 and 14 journals, respectively, accounting 21.42 per cent of the total number of journals. Remaining 40 (28.57 per cent) journals have been published from 11 countries.

Discussions and conclusion

Throughout this study, an analysis of scientific output on the subject of *Embelia ribes* has been carried out in terms of frequencies and publications. Taking specific objectives into account the following conclusions can be drawn:

- (1) Interest in the subject of *Embelia ribes* grew considerably during last quarter of the 20th century, particularly since 1980s, 1990 and 2000s.
- (2) Lotka's Law have been applied to count the productivity of authors with a value of $n = 2$, indicating that there a few, highly productive authors and great majority who contribute only occasionally to *Embelia ribes* research.
- (3) The number of authors contributing to each article range from one to nine, however, most articles involved collaboration between two or three authors. There is only one paper that contributed by maximum nine authors.
- (4) Prakash is the most prolific author contributing 22 articles, which were published in ten journals. It is noted that half of the literature on the subject was contributed by 24 authors, whereas remaining 50 per cent contributed by 749 authors.
- (5) After applying Bradford's law of scattering the 140 journals obtained were distributed into three zones. The core zone contained ten most productive journals

Country	Number of journals	%
India	80	57.14
USA	16	11.42
UK	14	10.00
Japan	13	9.38
Germany	3	2.14
Pakistan	2	1.42
China	2	1.42
Switzerland	2	1.42
Netherlands	2	1.42
France	1	0.71
Spain	1	0.71
Austria	1	0.71
Jamaica	1	0.71
Kenya	1	0.71

Table IX.
Global distribution of
journals

publishing 99 articles on the subject. According to Bradford's law of scattering this distribution fits $1:n.n^2$, such that the most peripheral zone should contain a greater number of journal titles than was obtained in present study.

- (6) Analysis of the institutions to which the authors contributing to the 332 articles belong showed that the majority are attached to universities. However, the most productive organizations were the Jiwaji University and Banaras Hindu University.
- (7) Although the authors contributing to the articles collected originating from 16 different countries, most output (91.26 per cent) was distributed across only five countries, the most productive being the India, which participated in 63.85 per cent of the publications studied.
- (8) Analysis of the global distribution of journals shows that 15 countries publishing journals that included articles on the subject *Embelia ribes*. India is the leader publishing 80 journals; followed by USA and Germany with 15 and 14 journals, respectively; the rest 21 journals are being published in 12 countries.

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