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The Entomofauna of Two Medicinal Euphorbiacae in Southwestern Nigeria

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Abstract: Insects associated with *Jatropha curcas, and Acalypha wilkesiana,* have been identified. Insects found on the plants parts include Diptera, Hymenoptera, Coleoptera, Orthoptera, Lepidoptera, Dictyoptera, Homoptera and Isoptera. The diptera, Hymenoptera and Lepidoptera are pollinators, The coleoptera and Homoptera are folivores while the Dictyoptera is a predator. The species richness, diversity index and the similarly index between the paired plant species were also calculated. The results of similarity and diversity indexes were influenced by the weather, which fluctuated during the period of study (July to November). The Hymenoptera was the most abundant order on *Acalypha wilkesiana,* accounting for 30.5%. Coleoptera was found to be most occurring on *Jatropha curcas* with 39.5% abundance.

Key words: Entomofauna, medicinal plants, similarityindex, species richnees, Euphorbiacea.

INTRODUCTION

Medicinal plants are of great importance to man as alternative for medicinal purposes. In fact, the indigenous medicinal plants form important components of the natural wealth of Nigeria. Many indigenous plants have been in the use of common man since time in memorial for curing various ailments and thus lessening human suffering without the actual knowledge of the active ingredients which causes relief[8].

Jatropha curcas, Linn of family Euphorbiaceae commonly called pig-nut and *Lapalapa* locally. *Acalypha wilkesiana,* Mull.Arg of family Euphorbiaceae, commonly called Red acalypha and *Popose pupa* locally[9].

Jatropha curcas Linn. of family *Euphorbiaceae*. It is commonly called Physic nut, Purging nut or pig nut. It is called *botuje* or *lapalapa* in Yoruba, *Olulu-idu* in Igbo, *dazugu* in Hausa and *okofo* in Akoko-Edo[9].

It is a monoeciuous shrub or small tree up to 6-8m high; bark pale brown, papery, peeling slash exudes a copious watery latex, soapy to touch but soon becoming brittle and brownish when dry; branches glabrous, ascending, stout[7].

Leaves alternate, palmate, petiolate, stipulate; stipules minute; petiole 2-20cm long, blade 3-7 lobed, 12.5-18cm long, 11-16cm wide, lobes acute or shortly acuminate at the apex, margins entire or undulating, leaf base deeply cordate, glaborous or only pubescent on the nervous below, basal nerves 7-9, prominent, venation reticulate[7].

Emmanuel and Gabriel (1996) reported that it is used to cure jaundice. The leaves are ground to a thin material, shea butter is added to ground leaves. The mixture is used to rub anybody suffering from measles[13].

The fresh latex of the plant is applied to ringworm, bleeding wounds, eczema, itch, scabies and decayed teeth. A decoction of the leaves is used as a remedy for fevers and a mouthwash for strengthening the gums. The poultice of the leaves is applied over ulcers, boils and abscesses to promotes suppuration, as galactagogue, it is applied to the breasts of nursing mothers. The ash of the leaves or their hot infusion is used for extracting guinea-worms[9].

The seed owe their purgative property to the oil they contain (31-37 percent). In Gabon 1-2 washed seeds are sufficient to act as purgative, if larger doses are used they may prove to be dangerous and act as an irritation. The seeds were formerly exported from the Cape Verde Islands to Portugal and the "curcas" or purging oil from them is a drastic purgative. It is an ingredient in the oily extract known in Hausa as *"Kufi"* which is used as a rubifacient for rheumatism and for parasitic skin conditions[7].

"Five seeds are wasted and crushed and given as an active purgative. The oil extract from the seeds is locally used in skin diseases like eczema, herps, itch and sores. The decoction of the root is used for skin diseases, convulsion, whitlow and black tongue. The herbalists use this plant leaves to prepare sacrifice for those whose are being troubled by witches/wizards. They also use the plant to carve out clubs as directed by *Ifa* oracle[9].

The Okpameri people of Bendel State and Kwara State use the leaf sap to stop gum bleeding. They also rub the sap on gums of the infants to promote teething. Leaves are pounded along with palms nuts for rectal anemia. Twigs are chewed for cleaning teeth[9].

Acalypha wilkesiana, Mull. Arg. belongs to the family Euphorbiaceae. Its parts used for medicinal

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purpose are the leaves, and young twigs. *A. wilkesiana* contains chemical constituents like sesquiterpenes, monoterpenes, triterpenoids and polyphenols[9].

The leaf extract has antibacterial and antimicrobial activity. The leaf decoction is used for the treatment of gastrointestinal disorders and fungal infection particularly *impetigo contagiosa* and *Tinea versicolour* which affect the back, chest and axillae of many babies in Nigeria[9].

Another remedy popular for treatment skin disease in general in Nigeria is leaf of *Acalypha wilkesiana* for which scientific evidence in support of the traditional use has been documented[1].

Diversities of organisms (both pests and non pests) are associated with most of these plants, According to earlier works, they could either be defoliators, visitors, predators of other species or they are pollinators.

Banjo and Ogunbowale[2] revealed that insects associated with the Nigerians Velvet Tamarind (*Dialium quineense*, Willd) were Twelve species in which the coleopterans, dipterans and hemipteranswere foliovorous, the hymenopterans (*Apis* spp.) were pollinators, isopterans fed on the root and bark of the plant while the Dyctyopterans were mainly predators on other insects.

Banjo *et al*.[3], reported that insects associated with the agroecosystems of the spindle and globuse forms of pepper plant (*Capsicum* spp.) were Orthopterans (most abundant order), Dictyoptera Diptera and Coleoptera. Their similarity index signified that they were very similar in abundance and their diversity index showed that they had low diversity and that few species were abundant.

The aim of this work is to identify the insects that affect these plants due to their various usages in nutrition, ethnopharmacy, pest control and some other usages. It is also important in order to enhance the planting, breeding and cultivation and conservation of these valuable products.

MATERIALS AND METHODS

Sites were selected for the investigation of insects associated with *Jatropha curcas and Acalypha wilkesiana* The locations are in Ago-Iwoye ($6^0\,48^1$N, $3^0\,50^1$E) and Oru-Ijebu (about 3km E of Ago-Iwoye) both within the rainforest region of Western Nigeria.

The sample collection was carried out fortnightly, starting from the July 2004 to November 2004 which span the rainy season and early dry season. Determination of number of insects was done by direct counting[3].

Ten plants of each species were observed with at most 10 plants per site for each of the plants species. Insects were picked off leaves, flowers, fruits, and stem (branches) by means of hand picking or net. Digging to top-soil up to 1 inch and then observe and count insects found there in collected those of the roots.

The collected insect specimens were preserved 70% alcohol in clean specimen bottles

Each preserved specimen was then tagged with information such as:

Source: Date, Plant number and Plant Species

Identification of the insect specimens collected from the plants were carried out at:

- The Entomology Department of the Cocoa Research Institute of Nigeria (CRIN), Idi Ayunre, Ibadan, Nigeria.
- Entomology Department of the Forestry Research Institute of Nigeria (FRIN), Jerico, Ibadan, Nigeria.

The diversity index was calculated using the formular[4].

$$D = \frac{\sum\left[n_i\left(n_i - 1\right)\right]}{N\left(N - 1\right)}$$

where, ni = Individual of each species caught,
N = Total Individual of all species caught and
D = Diversity index.

This was used to know the level of dissimilarity of the plants used and this is to know the degree of similarity in taxonomic categories represented between the pair.

Morisita's index of similarity was used to calculate the similarity index between each paired group of the plants used[12].

$$C\lambda = \frac{2\sum n_1 n_2}{\left(\lambda_1 + \lambda_2\right) N_1 N_2}$$

Where, $\lambda_1$and λ_2 = squares of total number of individuals in sample 1 and 2 respectively, n_1 = number of individuals of species in sample 1 and n_2 in sample 2.
N_1, N_2 = Total number of individuals in sample 1 and 2 respectively.

The graphs of population dynamics were also plotted for orders of insect using the mean number of insect collected in each month against the months of collection.

RESULTS AND DISCUSSIONS

Jatropha curcas: Dipteran population went up in August and reduced through September, October and November.

Hymenopteran also increased between July and August, reduced in September and increased in October and reduced again in November.

Coleopteran reduced in number from August, increased in September and then reduced towards November.

Orthopteran population was found to reduce gradually from July to September and maintained zero for October and November. (Fig. 1).

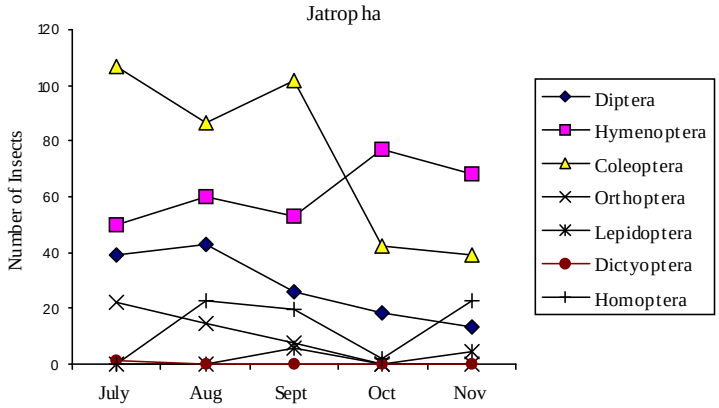

Fig. 1: Population Fluctuation of Insects on jatropha curcas.

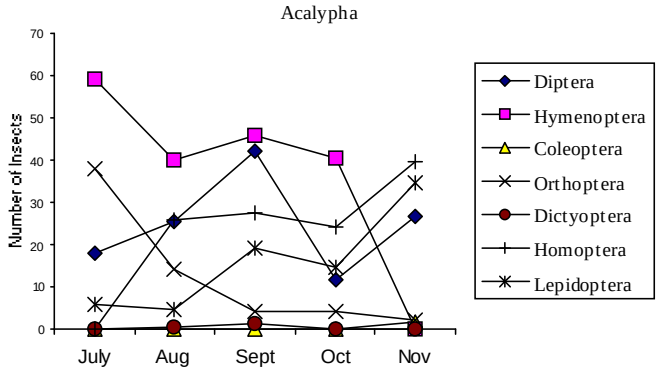

Fig. 2: Population Fluctuation of Insects on Acalypha wilkesiana.

Lepidopteran on *Jatropha* emerged in September, reduced to zero in October and also increased in November.

The Dictyopteran were very scarce, so they only existed in July and retained zero throughout.

Homopteran population rose in August from zero in July, decreased through October and then increased again in November. (Fig. 1).

Acalypha wilkesiana: Dipteran population increased from July to September, reduced in October and increased again in November.

Hymenopteran on the other hand reduced from July to August, increased in September, and reduced to zero in November.

Coleopteran were also found to be absent from July to October and later emerged in November.

Orthopteran population reduced steadily from July to November.

Lepidopteran reduced from July to August, increased in September, reduced in October and then increased in November.

Dictyopteran population emerged from scratch in August, increased in September and dropped to zero in October and November.

Homopteran emerged from scratch in August, increased in September, reduced in October and later increased in November. (Fig. 2).

Relative abundance: The Coleoptera was found to be the most abundant on *Jatropha curcas* followed by Hymenoptera, Diptera, Homoptera, Orthoptera, Lepidoptera and lastly Dictyoptera. (Fig. 3).

On *Acalypha wilkesiana*, the Hymenoptera was the most abundant followed by Diptera, Homoptera, Lepidoptera, Orthoptera, Dictyoptera and Coleoptera. (Fig. 4).

Species richness: Species richness on *Jatropha curcas* was; 2 for Diptera, 3 for Hymenoptera, 2 for Coleoptera, 2 for Orthoptera, 1 for Lepidoptera, 1 for Dictyoptera and 2 for Homoptera. (Table 1).

Species richness of Diptera was 2, Hymenoptera was 2, Coleoptera was 1, Orthoptera was 3, Lepidoptera was

Table 1: Diversity of insect species caught on *Jatropha curcas*.

Insect	Sum	Mean	S.D.	SE of mean	Diversity index	Species richness
1. Diptera					0.503	2
Musca spp.	146	14.6	9.8229	3.1063		
Diptera unidentified	120	12	12.49	3.9497		
2. Hymenoptera					0.97	3
*Formica*spp.	610	61	26.7748	8.4669		
Dorylus nigricarp	7	0.7	1.4944	0.4726		
Hymenoptera unidentified	2	0.2	0.4216	0.1333		
3. Coleoptera					0.976	2
Ootheca mutabilis	739	73.9	36.8011	11.6375		
Coleoptera unidentified	9	0.9	1.8529	0.5859		
4. Orthoptera					0.566	2
Aspidiotus sp.	22	2.2	6.957	2.2		
Orthoptera unidentified	49	4.9	9.3149	2.9456		
5. Lepidoptera unidentified	36	3.6	5.3375	1.6879		1
6. Dictyoptera						1
Sphodromantis lineola	1	0.1	0.3162	0.1		
7. Homoptera					0.79	2
Aphis cracivora	18	1.8	5.6921	1.8		
Homoptera unidentified	134	13.4	11.8715	3.7541		
N = 10	1,893	189.3				13

Table 2: Diversity of insect species caught on *Acalypha wilkesiana*.

Insect	Sum	Mean	S.D.	SE of Mean	Diversity index	Species richness
1. Diptera					0.725	2
Musca spp.	47	4.7	4.4234	1.3988		
Diptera unidentified	240	24	16.4114	5.1897		
2. Hymenoptera					0.82	2
Formica spp.	323	32.3	20.2213	6.3945		
Dorylus nigricarp	35	3.5	4.5522	1.4395		
3. Coleoptera unidentified	3	0.3	0.675	0.2134		1
4. Orthoptera					0.506	3
Cantantops melanostictus	5	0.5	0.7071	0.2236		
Coryphosena stenoptera	59	5.9	10.6714	3.3745		
Orthoptera unidentified	27	2.7	4.2177	1.3337		
5. Lepidoptera unidentified	170	17	13.5974	4.2999		1
6. Dictyoptera					0.6	2
Periplanata americana	4	0.4	0.9661	0.3055		
Sphodromantis lineola	1	0.1	0.3162	0.1		
7. Homoptera					0.657	2
Aphis cracivora	57	5.7	14.3143	4.5266		
Homoptera unidentified	204	20.4	16.6146	5.254		
N = 10	1,175	117.5				13

1, Dictyoptera was 2 and Homoptera was 2 on *Acalypha wikesiana.* (Table 2)

Diversity index: On *Jatropha curcas*, the indices were; Diptera was 0.503, Hymenoptera was 0.97, Coleoptera was 0.976, Orthoptera was 0.566 and Homoptera was 0.79. (Table 1).

On *Acalypha wilkesiana*, the diversity indices of the insect orders were; Diptera was 0.725, Hymenoptera was 0.82, Orthoptera was 0.506,

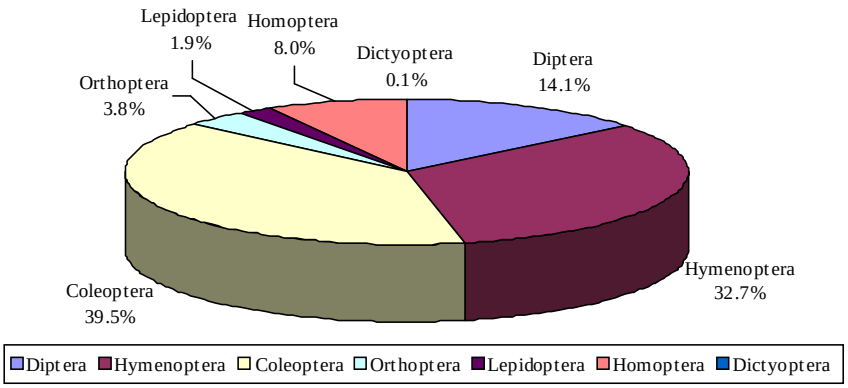

Fig. 3: Pie chart showing insects relative abundance on *jatropha curcas*

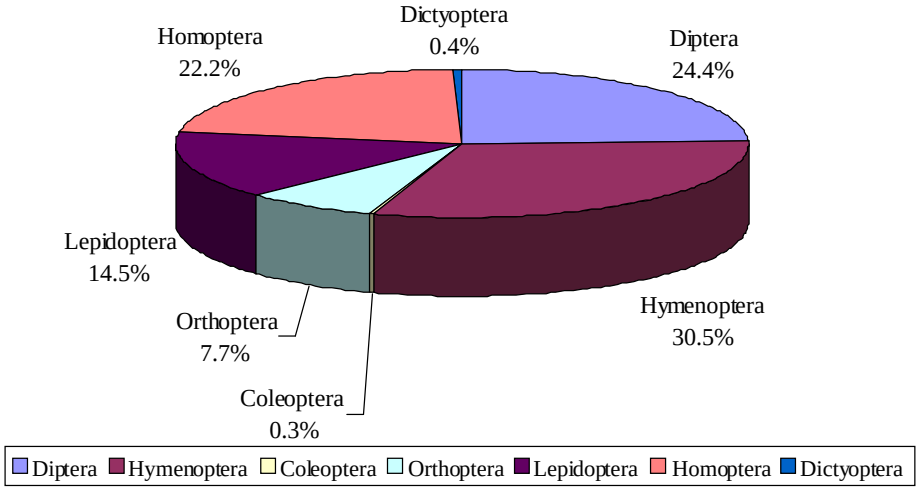

Fig. 4: Pie chart showing insects relative abundance on *acalypha wilkesiana*

Dictyoptera was 0.6 while Homoptera was 0.657. (Table 2).

Banjo *et al*.[3], also used the Simpson's diversity index to determine the species diversity within each order of insect found on two varieties of *Capsicum frutescens*. For Orthoptera, Sombo was 0.45 and Atawewe was 0.48;Heteroptera,Sombo was 0.3 and Atawewe was 0.6; Coleoptera, Sombo was 0.41 and Atawewe was 0.50 and Diptera, Sombo was 0.34 while Atawewe was 0.30. They summarized that all the orders have low diversity and that few species were dominant.

There were 13 species found on *Jatropha curcas* which belonged to 7 orders of insect. They had percentage abundance of Diptera (14.1%), Hymenoptera (32.7%), Coleoptera (39.5%), Orthoptera (3.8%), Lepidoptera (1.9%), Dictyopptera (0.1%), and Homoptera (8.0%) respectively. The Dipterans were nectivores, Hymenopterans were majorly visitors while the most important pest *Ootheca metabilis* of order Coleoptera fed on the leaves, flowers and sometimes the bark. Gubitz, *et al*.,[10] said "Pests and beneficial arthropods in physic nut (*Jatropha curcas* L., Euphorbiaceae) plantations in Nicaragua were presented. The key pest was *Pachycoris klugii* Burmeister (Heteroptera: Scutelleridae), which damages the developing fruit. Second most frequent true bug was *Leptoglossus zonatus* (Dallas) (Het.: Coreidae). Twelve further species of true bugs also feed on physic nut. Other pests included the stem borer *Lagocheirus undatus* (Voet) (Coleoptera: Cerambycidae), grasshoppers, leaf eating beetles and caterpillars as well as leaf hoppers. Among the beneficial insects pollinators, predators and parasitoids were found". Those found here were quite different from Gubitzetal 1997 in Nicaragua because they are found in different ecological zones.

Acalypha wilkesiana, number of insect species found was 13 from 7 orders. These include; Diptera (24.4%), Hymenoptera (30.5%), Coleoptera (0.3%), Orthoptera (7.7%), Lepidoptera (14.5%), Dictyoptera (0.4%) and Homoptera (22.2%). The most frequent being Hymenoptera. The most important were Orthopteran which fed on the leaves, some Lepidopteran found on the stems and Homopteran which was not identified but occurred mostly at the root was whitish and almost flightless was also suggested to be visitor.

Idowu and Sonde[11], revealed that the grasshopper (Zonocerus variagatus) found on *Acalypha* feed mostly on the foliages, although it provide the lowest nutritional requirement to the insect. However Zonocerus variagatus was not found in *Acalypha* during the period of study this may be as a result of what Chapman[5], opined that insects develop only within a limited range of temperature which is characteristic of the species and they are killed by temperature outside this range. This could be the case of this study because we noticed that the fluctuation of temperature owing to the rapid changing seasonal condition was responsible for the population reduction, wiping out some species and also increasing of some species.

Conclusions: Medicinal plants have various usages which cannot be overemphasized.

The insects that were associated the two plants was found to be diversed and this was due to the morphology and the chemical constituent(s) of the plants and also the weather condition.

The insects were either defoliators, visitors, pollinator or predators of other insects. For now and the effect of the defoliators are minimal. The trend would definitely change by the time these plants are planted in commercial scale in large hectrage and what seems to be minor pests now and new pest problem may arise. Future work in the entomofauna of these plants as their hectrage increases because of the use of these plants is alternate medicine is vital hence a periodic phytosanitry conditions of this plant is important to nip in bud any upsurge of pests.

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