

Genetic diversity of honey producing plants under changing climate in Southern Nigeria: Need for conservation to improve food security and livelihood option

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Abstract

This study was conducted at Southern Nigeria from 2010 to 2011 periods of honey producing seasons. Five honey samples from three states in Southern Nigeria were evaluated palynologically after acetolysis to determine their pollen spectrum. Results showed 56 honey plants belonging to 32 families with Anacardiaceae contributing (22.08%), Caesalpiniaceae (31.16%), Euphorbiaceae (26.02%) while Papilionaceae contributed (20.74%). Predominant honey plants were *Anacardium occidentale* L, *Ageratum conyzoides* L, *Daniella oliveri* (Rolfe) Hutch & Dalz., *Alchornea cordifolia* Muell, Arg, *Trichilia* spp. and *Elaeis guineensis* Jacq. Apart from *A. occidentale* and *E. guineensis* which are cultivated others are foraged from the wild. Policy makers and indeed beekeepers should embark on extensive propagation, afforestation, and conservation of these predominant honey plants to improve food security and reduce hidden hunger.

Key words: Acetolysis, food, honey plants, livelihood, security, Southern Nigeria

Résumé

Cette étude a été menée dans le sud du Nigeria de 2010 à 2011 lors des saisons de production du miel. Cinq échantillons de miel provenant de trois Etats du sud du Nigeria ont été évalués palynologiquement après acétolyse afin de déterminer leur spectre pollinique. Les résultats ont montré 56 plantes mellifères appartenant à 32 familles avec les Anacardiaceae contributifs (22,08%), les Caesalpiniaceae (31,16%), les Euphorbiaceae (26,02%), tandis que les Papilionaceae contribués (20,74%). Les plantes mellifères prédominantes étaient *Anacardium occidentale* L, *Ageratum conyzoides*L, *Daniella oliveri* (Rolfe) Hutch & Dalz., *Alchornea cordifolia* Muell, Arg, *Trichilia* spp. et *Elaeis guineensis*Jacq. En dehors d'*A. occidentale* et *E. guineensis* qui sont cultivées, d'autres sont recherchées dans la nature. Les décideurs politiques et même les apiculteurs doivent se lancer dans une vaste propagation, le reboisement et la conservation de ces plantes mellifères

prédominantes pour améliorer la sécurité alimentaire et réduire la faim cachée.

Mots clés: acétylyse, aliments, plantes mellifères, moyens de subsistance, sécurité, sud du Nigeria

Background

Honeybee's health and survival are dependent on biotic factors such as the availability of plant genetic resources, their ability to blossom, and other abiotic factors. Today, the density and survival of these plant genetic resources are threatened by the vicious impact of climate change and environmental degradation. These highlight the potential risks for our natural and agricultural biodiversity through lack of pollination, and the repercussions these are having on food security and human nutrition (Ratnieks and Carreck, 2010). Identification and conservation of these predominant honey plants becomes thus imperative.

Literature Summary

Pollen is the dietary supplement that bees introduce into their hive to feed the colony in times of food scarcity. They contain all the nutrients required by the human body and are enormously rich in proteins, vitamins, minerals, beneficial fatty acids, carotenoids, and bioflavonoids which have anti-viral and antibacterial properties. It is also helpful in lowering cholesterol, stabilising and strengthening blood capillaries (Krell, 1996). Jones and Bryant (2004), reported that pollen found in honey is used to determine honey's type and the floral sources.

Various (2010) stressed that the production of honey is an eco-friendly activity that encourages good agricultural practices, biodiversity conservation, promoting sustainable use of natural resources, environmental quality and human health. It has been recognised that a lack of food and particularly the dearth of pollen, within intensively farmed agricultural landscapes and degraded environment as a result of anthropogenic activities have actually contributed to the loss of plant species which honey bees forage for pollen.

Study Description

Honey samples were sourced from five locations within Southern Nigeria: Iboko, Isieke, Ezzamgbo, Ibagwa and Obudu cattle ranch. Ten (10) grams of each of the samples were weighed out with the aid of Microwa 7720, diluted with 35ml of warm sulphuric acid solution, centrifuged for 5 minutes at 2000 revolutions per minute (RPM), decanted and later washed with 5mls of distilled water. Thirty- five (35ml) of glacial acetic anhydride together with 1ml of dilute sulphuric acid solution

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Table 1. Pollen content of the five honey samples from Southern Nigeria (10 g in %).

Family	Pollen Taxa	Ibo	Obu	Isk	Nsu	Ezz	
1	Acanthaceae	<i>Acanthus montanus</i> (Nees) T. Anders	-	-	24	-	-
2	Ampelidaceae	<i>Cissus quadrangularis</i> L	11.7	31.0	20.8	-	3.3
3	Ampelidaceae	<i>Cissus</i> spp	12.5	16	23.4	21.3	5.09
4	Anacardiaceae	<i>Spondias mombin</i> L.	34.2	11.0	28.4	35	14.5
5	Anacardiaceae	<i>Lannea acida</i> A. Rich	-	-	4.5	3.0	-
6	Anacardiaceae	<i>Anacardium occidentale</i> L	45.2	30.1	13.8	34.5	32.1
7	Annonaceae	<i>Isobelinia dokas</i> Craib & Stapf	-	-	22	-	-
8	Araliaceae	<i>Cussonia barteri</i>	15	-	-	15	10
9	Asteraceae	<i>Ageratum conyzoides</i> L	45	21	34	17.4	45
10	Bombacaceae	<i>Bombas buonopozense</i> P.Beauv	32.1	21.5	37	14	21
11	Cesalpiniaceae	<i>Senna hirsuta</i> L	3.2	2.5	4.9	21.2	2.5
12	Caesalpinaceae	<i>Daniella oliveri</i> (Rolfe) Hutch & Dalz.	12.9	54.7	45.6	48.2	38.1
13	Caesalpinaceae	<i>Brachystegia eurycoma</i> Harms	20.4	23.1	16.5	2.4	4.0
14	Caesalpinaceae	<i>Senna occidentalis</i> (L.) Link	17.2	12.1	9.38	28	20.1
15	Caesalpinaceae	<i>Dialium guineense</i> Willd	10.9	23.5	9.8	8.0	7.2
16	Caricaceae	<i>Carica papaya</i> L	2.5	-	2.5	3.8	1.5
17	Cochlospermaceae	<i>Cochlospermum planchonii</i> Hook. F.	20.1	2.3	2.7	21.9	23.4
18	Combretaceae	<i>Terminalia glaucoscens</i> Planch & Benth.	12.2	30	16.5	17.8	14.5
19	Combretaceae/Melastomataceae		14.3	2.4	6.7	-2.4	2.6
20	Curcubitaceae	<i>Luffa cylindrical</i> M. J. Roem	4	2.6	1	-	1
21	Ebenaceae	<i>Diospyros mespilliformis</i> Hochst. ex ADC.	8.2	11.3	12	20.2	11.2
22	Euphorbiaceae	<i>Bridelia micrantha</i> (Hochst.) Baill	3	10	-	12	4
23	Euphorbiaceae	<i>Securinea virosa</i> (Roxb ex Willie) Baill.	6.8	10.4	-	5.1	-
24	Euphorbiaceae	<i>Manihot esculenta</i> Crantz	-	-	1.1	2.5	1.6
25	Euphorbiaceae	<i>Phyllanthus muellerianus</i> (O. Ktze) Exell.	-	-	12.5	-	-
26	Euphorbiaceae	<i>Alchornea cordifolia</i> Muell, Arg.	54	45	84.7	45	65
27	Euphorbiaceae	<i>Hymenocardia acida</i> Tul.	1.1	2.8	2.6	1.6	2.1
28	Irvingiaceae	<i>Irvingia wombolu</i> Okafor ex Baill	23.4	43.7	11.3	13.0	30.1
29	Loganiaceae	<i>Anthocleista vogelii</i> A. Chev.	12.0	5.9	1.2	6.4	9.2
30	Ulmaceae	<i>Trema orientalis</i> L	-	2.0	-	-	-
31	Meliaceae	<i>Azadirachta indica</i> Juss.	12	-	3	7.9	4.2
32	Meliaceae	<i>Trichilia</i> spp	34	53	33.0	45.1	11.2
33	Mimosoideae	<i>Albizia zygia</i> (DC.) Macbr	10	10	10	20.1	13.4
34	Moraceae	<i>Milicia excelsa</i> (Welw) C.C	3.7	5.8	12	24.9	10.12
35	Leguminosae	<i>Parkia biglobosa</i> (Jacq) R. ex Don-H.C.	9.06	3.1	27	12.3	10
36	Leguminosae	<i>Entada abyssinica</i> Steud. Ex A. Rich	-	1.0	-	-	-
37	Olacaceae	<i>Olax subscorpioidea</i> Oliv.	-	20	-	-	13
38	Paoceae	<i>Elaeis guineensis</i> Jacq	46.2	68.5	72.0	59.9	58
39	Poaceae	<i>Andropogon gayanus</i> Kunth var. <i>gayanus</i>	-	8.9	52	-	-
40	Papilionaceae	<i>Erythrina senegalensis</i> D. C.	17.5	38.0	34.4	28.1	13.4
41	Papilionaceae	<i>Tephrosia bracteolata</i> Guill. & Perr	12.9	35.4	44	23.9	23.7
42	Papilionaceae	<i>Tephrosia purpurea</i> L	-	-	18.6	-	-
43	Papilionaceae	<i>Crotalaria retusa</i> Linn.	-	5.5	-	1.7	-
44	Proteaceae	<i>Protea madiensis</i> Oliv.	23.1	25.1	33.1	11	15.2
45	Ranunculaceae	<i>Clematis hirsuta</i> Guill & Perr.	35.3	23.2	26.4	21.2	14.8
46	Rhamnaceae	<i>Lasiodiscus mannii</i> Hook. F. var.	21.6	25.8	-	-	-
47	Rosaceae	<i>Parinari curatellifolia</i> Planch ex Benth	9.3	6	9.8	3.2	10.9
48	Rubiaceae	<i>Nauclea latifolia</i> Smith.	30.1	21.5	14.2	43.3	26.9
49	Rubiaceae	<i>Crossopteryx febrifuga</i> Afzil ex Benth	-	2.6	32.8	45	54
50	Rutaceae	<i>Zanthoxylum zanthoxyloides</i> (Lam.) Zepernichk	5.1	2.2	2	-	9.1
51	Sapindaceae	<i>Alliophylus africanus</i> P. Beauv.	38	-	34.8	-	-
52	Sapindaceae	<i>Paullinia pinnata</i> L	6.7	12	2.8	7.4	10
53	Sapindaceae	<i>Lecaniodiscus cupanioides</i> Planch. Ex Benth.	-	-	3.8	-	-
54	Sterculiaceae	<i>Treculia africana</i> Decne.	33	43.2	34.0	29	34
55	Ulmaceae	<i>Celtis intrifolia</i> Lam.	24.3	12.3	11.0	12	13.6
56	Verbenaceae	<i>Vitex doniana</i> Sweet.	-	-	2.9	-	-
	Unidentified		20	17	16	23	10
Total no of Pollen			912	1937	786	1324	592

Legend: Ibo = Ibiko, Obu = Obudu, Isk = Isieke, Nsu = Nsukka, Ezz = Ezzambo.

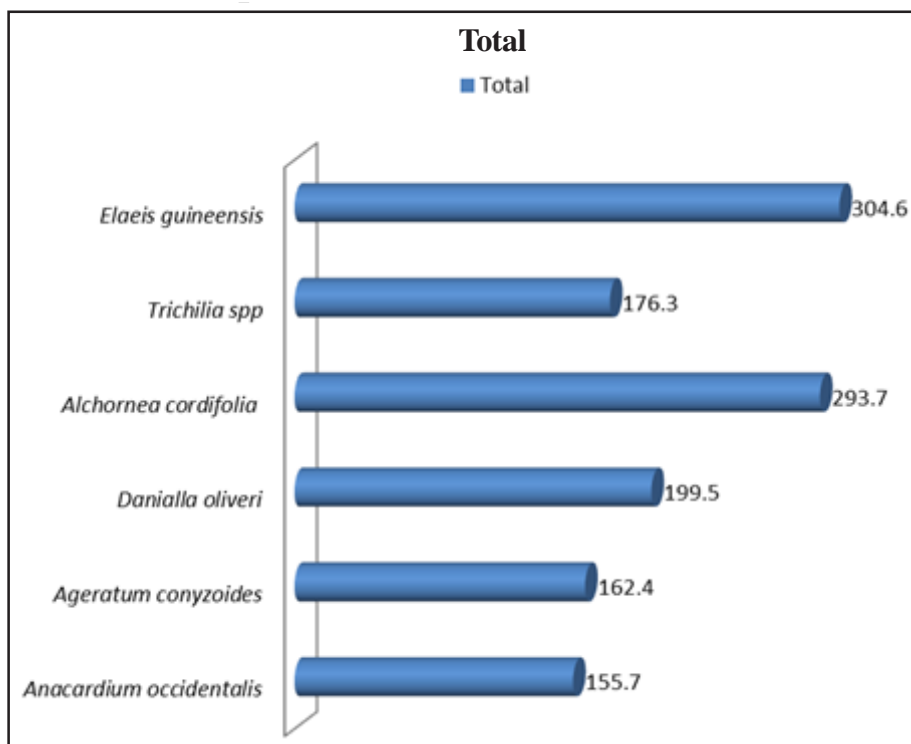


Figure 1. Predominant honey plants from the five samples.

were added, centrifuged and decanted to recover the precipitates. These were acetolysed using Erdtman (1971) acetolysis method of 9:1 (Con. sulphuric acid to acetic anhydride solutions). Four slides were randomly prepared and examined for pollen contents under a light microscope at x 40 magnification. The pollen count was based on the method recommended by Louveaux *et al.* (1978) and Jones and Bryant (2004). Photomicrographs of some major predominant honey plants were taken.

Research Application

We recorded fifty-sixty (56) honey plants belonging to thirty-two (32) families with four predominant families of Anacardiaceae (22.08%), Caesalpiniaceae (31.16%), Euphorbiaceae (26.02%) and Papilionaceae (20.74%) (Table 1) with *Anacardium occidentale* L, *Ageratum conyzoides* L, *Daniella oliveri* (Rolfe) Hutch & Dalz., *Alchornea cordifolia* Muell, Arg, *Trichilia* spp. and *Elaeis guineensis* Jacq. being predominant honey plants (Fig. 1).

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