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# Pollen Characterization and Physicochemical Analysis of Six Nigerian Honey Samples; Test for Authenticity

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ARTICLE INFO	A B S T R A C T					
Research Article	Honey is a popular product consumed for its health benefits. It is an effective antimicrobial an antioxidant agent. Globally, palynological and chemical methods are among the means of authenticating honey quality, geographical origin and floral origin. Six honey samples from six					
Received : 31/03/2020 Accepted : 01/07/2020	Nigerian towns (Abi, Ikom, Lokpanta, Nsukka, Okigwe and Shaki) were subjected to the aforementioned tests. Eighty-six pollen taxa were recorded in all the samples. The richest sample with seventy-three taxa was from Nsukka, followed successively by Okigwe, Lokpanta, Shaki,					
Keywords: Honey Palynomorphs Nigeria Physicochemical methods Multifloral	Ikom and Abi samples with sixty-eight, sixty-seven, sixty-two, fifty-nine and fifty-seven pollen species respectively. The oil palm Elaeis guineensis pollen dominated the samples in different proportions except Shaki honey dominated by Acacia spp., The commonest plant family was Fabaceae (Caesalpinioideae, Mimosoideae, Papilionideae) with twenty-one taxa followed by Euphorbiaceae, Combretaceae, with four representatives and Rubiaceae with three taxa each. The physico-chemical analysis carried out were total moisture, total ash content, colour assessment, percentage of total solids, relative density, acidity, and Fischer's Test. The samples were found to concur with the international standards for honey.					
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### Introduction

Honey, a concentrated solution of a complex mixture of sugars dominantly fructose and glucose which is produced by honey bees Apis mellifera adansonii has been used by man for thousands of years both as a natural sweetener, source of energy, and a healing agent which suppresses disease causing agents (National Honey Board, 2002; Khalil et al., 2011; Aled et al., 2012; Maddocks et al., 2012; Nwankwo et al., 2014; Ng and Lim, 2015; Adeonipekun et al., 2016; Kaygusuz et al., 2016; Ng et al., 2017; Fatimah et al., 2018, 2019; Al-Kafaween et al., 2020). Furthermore, it contains macro and microelements such as water, carbohydrates, minerals, amino acids, organic acids, proteins. volatile substances. enzymes. phenolic compounds, together with other compounds necessary for normal human growth and development (Jasicka-Misiak et al., 2012; Cimpoiu et al., 2013). The hygroscopic nature of honey which enables dehydrating bacteria by decreasing the moisture of the environment had been reported. Again, the high sugar content and low PH of honey has been documented to hinder the growth of bacteria (Eswaran et al., 2015; Nishio et al., 2016). Nolan et al. (2019) had attributed the antimicrobial potential of honey to its different components such as high sugar contents, low pH, polyphenolic compounds, hydrogen peroxide, 1,2dicarbonyl compounds, and defensin-1. Good quality honey has been linked to the healing of injured intestinal mucosa as it stimulates the growth of new tissues and works as an anti-inflammatory agent (Kek et al., 2014). In addition, Afrin et al. (2017) had reported the ability of honey at low concentrations to inhibit colon cancer. Apart from these, honey also has the potential to serve as a natural food antioxidant (Saxena et al., 2010; Cimpoiu et al., 2013; Boukraâ, 2015). Nolan et al. (2019) who cited Esteraf-Oskouel and Najafi (2013), who highlighted the uses of honey in their review which included its use by the ancient Egyptians who had used it in embalmment, as a topical agent and for the dressing of wounds. Furthermore, the Greeks had used it also for wound healing, and a remedy for gout, pain, fever. In recent times, there has been high incidences of Diabetes mellitus which has promoted the use of natural honey in place of processed sugar and allied products. In Nigeria different honey samples are sold both in the open markets and supermarkets. These are sourced both from the wild and from apiaries. The quality of most of these honey samples need to be ascertained. Siddiqui et al. (2017) had reported that commercial honey is often adulterated or falsely labeled for economic gains. Presently no established standards exist for certifying the authenticity of these Nigerian honey samples.

Among the major ways of determining the botanical and geographical origin of honey is the assessment of its pollen content (Veitez, 1950; Anklam, 1988; Ghidini et al., 2008; Makhloufi et al., 2010; Jasicka-Misiak et al., 2012). In Nigeria, several authors have worked on different aspects of melissopalynology. The most popular published works are those of Afolabi (1974) and Sowunmi (1976) who set the pace for other researchers. In the last decade and half, honey studies in Nigeria has increase due to the global awareness about *Diabetes mellitus* (Ige and Modupe, 2010; Adeonipekun 2010, 2012; Agbagwa et al., 2011; Aina and Owonibi, 2011; Ayansola, 2012; Agwu et al., 2013; Olugbemi et al., 2013; Kayode and Oyeyemi, 2014; Ndife et al., 2017; Oyeyemi, 2017).

The use of palynological and physicochemical data in ascertaining how genuine or adulterated a honey sample is having been carried out and is still on in different parts of the world (Saxena et al., 2010; Anklam, 2010; Ramirez-Arriaga et al., 2011; Rateb and Hussein, 2012; Song et al., 2012; Cimpoiu et al., 2013; Jasicka-Misiak et al., 2012; Kek et al., 2014).

This present study was undertaken to enrich the published records of melissopalynological studies in Nigeria, assess the authenticity of honey from the rural areas of Nigeria and compare the results with those already reported from more urban areas like Lagos, Abuja etc and also infer whether their qualities fall within the international standards so as to pave way for export.

### **Materials and Methods**

### Honey Samples and Preparation

Six honey samples were sourced between July 2011 -October, 2011 from the open markets from six towns in six states in Nigeria viz: (Abi, Cross River State; Ikom in Akwa Ibom State; Lokpanta, Abia State; Nsukka, Enugu State, Okigwe, Imo State and Shaki, Oyo State). The honey samples were brought to the Biological laboratory of Redeemer's University and stored prior to preparation. The different honey samples were subjected to palynological and chemical analysis. Standard palynological preparation methods as outlined by Louveaux et al. (1978), with minor modifications after Low et al. (1989) were adopted. The acetolysis were after Erdtman (1969). The prepared slides were analyzed and five hundred pollen grains were counted per sample (de Novais and Absy 2013). The inherent pollen was identified using (Sowunmi 1973,1995; Bonnefille and Riollet, 1980; Willard et al., 2004; Gosling et al., 2013). In addition, fungal materials, charred Graminae cuticles, diatom frustules were all recorded as miscellaneous palynomorphs. These were not included in the total and percentage pollen calculations. Pollen types recorded per sample were classified (Table 1) as predominant pollen types (>45%), secondary pollen types (16-45%), important minor pollen types (3-15%) and minor pollen types (<3%)(Jasicka-Misiak, 2012; Rateb and Hussein, 2012; Schweizer et al., 2014; Sahney, et al., 2018). Photomicrographs (Figure 3 and 4) of the inherent palynomorphs were taken with a United binocular microscope with an inbuilt Motic-2 camera at the palynology laboratory of Earthprobe Nigeria Limited. The chemical analysis followed the International Honey standards (Bogdanov et al., 2009; IHC website) as no standards exist presently for Nigerian honey

### **Physico-Chemical Analysis**

The methods outlined in (Bogdanov and Martin, 2002; Bogdanov et al., 1999) were adopted as no standards exist presently for Nigerian honey. The different parameters investigated were i). Total Moisture (Refractometer Method) ii) Percentage of total solids, iii). Total Ash Content, iv). <sub>P</sub>H v). Relative Density, vi.) Acidity (% Gluconic Acid), vii). Colour assessment and viii). Fischer's Test.

All physicochemical parameters were done according to the harmonized International Honey Commission (Bogdanov et al.,2009: IHC website). An Abbe refractometer was used in determining the moisture content. Total Moisture (Refractometer Method).

Determination of total solids: the percentage total solid for each honey sample was determined using: Total solids (%) = 100-Moisture content

### **Total Ash Content**

Determination of total ash content:

An ash dish was initially heated in the electric furnace for 500°C, it was later removed, cooled in the desiccator at room temperature and weighed to 0.001g and the weight (m2) of the empty dish noted. The other procedure outlined by Bogdanov (2009), was followed through for the ashing process until a constant weight was got (m1). Finally, the proportion of ash WA in g/100g of honey was calculated using the formula:

WA = 
$$((m1 - m2) \div m0) \times 100$$
  
Where:

where:

m0 = weight of honey sample taken

m1 = weight of empty dish + ash

m2 = weight of empty dish

The answer is rounded to two decimal places

*Relative density:* Apparatus: specific gravity bottle, distilled water, water bath, honey sample

A clean and thoroughly washed specific gravity bottle was weighed and filled up with freshly boiled and cooled distilled water which has been maintained at  $27^{\circ}C \pm 1^{\circ}C$ . The water was removed and the bottle dried again and filled with the honey sample maintained at the sample temperature. The bottle was weighed again and the Relative density calculated thus:

Relative Density=
$$\frac{C-A}{B-A}$$

Where; C = Mass of the specific gravity bottle with honey in (g)

C = Mass of the specific gravity bottle with honey in (g)

A = Mass of the empty specific gravity bottle in (g)

B = Mass of the empty specific gravity bottle with water in (g)

Determination of pH; pH was measured using a <sub>P</sub>H meter, while the titrimetric method was employed in determining the total acidity.

*Determination of acidity:* The acidity is expressed as the percentage of gluconic acid.

*Colour determination:* The colour of the different honey samples, were determined, with the aid of a spectrophotometer (Spectronic 20 D). The procedure involved reading the absorbance of the honey against distilled water at a wavelength of 660 nm.

### Ficher's Test

Two g of the honey sample was dissolved in 10ml of water and extracted with 30ml ether in a separating funnel and the layer concentrated to 5ml. Later, 2ml of freshly prepared resorcinol solution was added, the mixture was shaken, and the colour noted. A cherry red colour appearing in a minute indicated the presence of commercially invert sugar. Yellow and other colours were insignificant.

# Statistical Analysis

Similarity and dissimilarity level (comparative analysis) between and among the samples from the different locations was determined by constructing a dendrogram (close neighbour analysis) with the physicochemical parameters using SPSS 23.0 (Figure 2).

# Results

## Melissopalynology

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The occurrences of the recovered palynomorphs for each honey sample are highlighted in Table 1a,b below. The richest sample with seventy-three taxa was from Nsukka, followed successively by Okigwe, Lokpanta, Shaki, Ikom and Abi samples with sixty-eight, sixty-seven, sixty-two, fifty-nine and fifty-seven pollen species respectively. The oil palm Elaeis guineensis pollen dominated the samples in different proportions except Shaki honey dominated by Acacia spp., The commonest plant family was Fabaceae (Caesalpinioideae, Mimosoideae, Papilionideae) with twenty-one taxa followed by Euphorbiaceae, Combretaceae, with four representatives and Rubiaceae with three taxa each. None of the dominant pollen was up to 45% in abundance. Hence all the honey sample s is multifloral. The percentage occurrences of the palynomorps recovered from each honey sample are highlighted below in Table 1a,b.

Table 1a: Percentage occurrences of the recovered pollen in the different honey samples. None of the samples fell within the dominant pollen type common in monofloral honeys. Nsukka, Okigwe and Shaki honeys fell within the secondary pollen due to the percentage occurrences of *Elaeis guineensis* with values above 16%

(10)         Honey Sample: Abi; Dominant pollen (DP) >45%: Nil; Secondary pollen (SP) <45%-16%: Nil           Elaeis guineensis Jacq         Terminalia spp. (2.8%), Bombax buonopozense P. Beuux. (2.8), Algeby, Marken and Secondary Delaw, Lews, L	(IMP) < 16% - 3%	Minor pollen <3%						
<ul> <li>Elaeis guineensis Jacq (9.6%),</li> <li>Financi kerstingii Elge,</li> <li>Forcearpus santalanoides LHer x DC. (2.9%), Brachystegia curycoma Harms (2%), Allophyllus gricanus P. Beaux, (2.8%), Musicanus P. Beaux, (2.8%), Musicanus P. Beaux, (2.9%), Solanum spp. (2.4%), Capacitanus P. Beaux, (2.9%), Molyhlus gricanus P. Beaux, (2.4%), Lanker acida (2.0%), Parinari Karshingi Engl. (2.6%), David Science acids (1.6%), David Science acid Acids (1.6%), Davi</li></ul>	(10/0 5/0	Honey Sample: Ahi: Dominant nollen (DP) \25%: Nil: Secondary nollen (SP) \25%. 16%: Nil						
<ul> <li>Bernstein (2009), Parinari kerstingü Egil.</li> <li>Parinari kerstingü Egil.</li> <li>Parinari kerstingü Fagil.</li> <li>Parinari Fagil.</li> <li< td=""><td>Flaris quineensis Jaca</td><td>Terminalia son (2.8%) Alcharnea son (2.6%)</td></li<></ul>	Flaris quineensis Jaca	Terminalia son (2.8%) Alcharnea son (2.6%)						
<ul> <li>Parinari kersingii Engl. (60%).</li> <li>Prerocarpus suntalanoides LHer ex DC. (2.0%). Brachystegia eurycoma Harms (2%), Allophyllus africanus P. Beaux. (1.6%), Anogeissus lectures pp. (1.6%). Spondiatums prevais Engl. (1.6%). Scooladium Sp. (1.6%). Callicarpa sp. (1.6%). Asteraccea (1.6%). Callicarpa sp. (1.6%). Asteraccea (1.6%). Callicarpa sp. (1.6%). Scooladium Sp. (1.6%). Callicarpa sp. (1.6%). Asteraccea (1.6%). Callicarpa sp. (1.6%). Scooladium Sp. Sp. (1.6%</li></ul>	(9.6%)	Mussanda spn. (2.8%). Nombae busic (2.9%). Solanum spn. (2.6%). Ansieum spn. (2.6%), Hennea geida (2.0%).						
<ul> <li>(6.0%), Anogeissus leiocarpus (DC) Guill &amp; Perr, (1.6%), Desmodium sp. (1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Rhizphora sp. (5.2%), Data (1.6%), Sapotaces sp. (1.6%), Sapotaces (1.6%), Sapotaces sp. (1.6%), Sapotaces sp. (1.6%), Sapotaces (1.6%),</li></ul>	Parinari kerstingii Engl	Production opp. (2007), (1) million of the experimental and the end of the end of the end of the experimental (2007), (2007) and (2007), (2007) and (2007), (2007) and (2007),						
<ul> <li>Rhizophora spp. (52%),</li> <li>Ceiba pentandru (Lim.)</li> <li>Gaetta (44%),</li> <li>Ruitozae sp. (40%),</li> <li>Dilz. (1.6%), Sapotaceae sp. (1.6%), Spondianthus preusii Engl. (1.6%), Olax sp. (16%), Sacoglotis gabonensis (Baill.)</li> <li>Urb. (1.4%), Milicia excelsa (Welv.) C.C.Berg. (1.4%), <i>Hyphaea tibaica</i></li> <li>Combretum spp.</li> <li>Combretum spp.</li> <li>(1.6%), Ananoa sp. (3%), Entanda abyssinica Steud. ex A.Rich. (3%), <i>Irvinga gabonensis</i> (Aubry-Lecomte ex</li> <li>Combretum spp.</li> <li>(1.6%), Ananoa sp. (3%), Entanda abyssinica Steud. ex A.Rich. (3%), <i>Irvingi gabonensis</i> (Aubry-Lecomte ex</li> <li>(3.6%), Protexidiate alexis (P.Beauv) Seem. ex Bureau (38%), Ludia gis p. (3%), Phyllamus reticulatus</li> <li>(3.0%), Pretra (4%), Dalbergia erasi (4%), Polygala sp. (4%), Conocarpus erecta L. (4%), Medinila mirabilis (Gilg)</li> <li>Paullinia pinnata Lim.</li> <li>(3.0%), Pretra (4%), Afaelia africana Sm. ex Pers. (2%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (2%), Gardenia imperialis</li> <li>(3.0%), Pretra (4%), Moricaria germanica (1.) Desv. (2%), <i>Iteraplera tetraptera</i> (5%), Morhonz buonopocense P. Beuv. (26%)</li> <li>Honey Sample: Knom: Dominant pollen (DP) &gt;45%: NII; Secondary pollen (SP) -45%; NIO</li> <li>(10.6%), Salara pp. (1.6%), Sacoglotis gabonensis (hult), Phylamus reticulatus</li> <li>(10.6%), Barlinia grandiflora (Yahb) Hutch. &amp; Dalz (2%), Brachystegia eurycoma Harms (1.6%), Lannea acida. A Rich.</li> <li>(1.6%), Salara pp. (1.6%), Sacoglotis gabonensis (hult), Photoecel and the sp. (2.4%), Milcia axysia</li> <li>(1.6%), Sacoard pp. (1.6%), Sacoglotis gabonensis (hult), Photoecel and Sp. (2.4%), Milcia axysia</li> <li>(1.6%), Sacoard pp. (1.6%), Jacoard pp. (1.6%), Stervateaepolis sp. (1.4%), Atlazia zygia (DC). JF</li> <li>Machide (1.2%), Anaceradiaecea sp. (1.6%), Lawing a gabonensis (Aubry-Lecomte ex O Rocke) Baill. (1.6%), Milicia axysia</li> <li>(1.6%), Sacoard pp.</li></ul>	(6.0%)	(16%) Anogeissus leiocarnus (DC) Guill & Perr (16%) Deemodium sn (16%) Berlinia grandiflora (Vahl) Hutch &						
<ul> <li>Ceiba pentandra (Lim.)</li> <li>Gaetta (14%),</li> <li>Urb. (14%), Pentaclethra macrophylla Benth. (14%), Milicia excelsa (Welw) C.C.Berg. (14%), Hyphaea tiebaica (Linn.) Mart. (15%), Prentaccidites sp. (15%), Albizia zygia (DC.) IF Macbride (1%), Asteraceae (1%), Callicarpa sp. (38%), Construction of the second system second system of the sex</li></ul>	Rhizophora  spn (5.2%)	Dalz (16%) Sanotacege so (16%) Sonotanthy previsi Engl (16%) Otras so (16%) Sacotaciti gabonensis (Baill)						
<ul> <li>Gaertin (14.4%),</li> <li>Ginn, Mart. (1%), Protectidites sp. (1%), Albizia zygia (DC.) IF Macbride (1%), Asteraceae (1%), Calilacarpa sp. (1%), Ananoa sp. (8%), Entanda abyssinica Steud. ex ARich. (28%), Aring gabonensis (Auby-Leconte ex Ororkej Baill (18), Newbouldia laevis (P. Beauv) Scen. ex Bureau (8%), Ladwigia sp. (8%), Phyllamus reticulatus of the sp. (2%), Asteraceae (1%), Calilacarpa sp. (1%), Ananoa sp. (8%), Symphonia globulifera tim, I. (28%), Triplochyton scleroxylon K. Schum (6%), Batis sp. (2%), Arisetia erasi (4%), Polysal sp. (4%), Concarpus erecta L. (4%), Mednilla mirabilits (Gilg) JacqFel (4%), Afzelia africana Sm. ex Pers. (2%), Damiellia oliveri (1606); Hutch, &amp; Dalz (2%), Gardenia imperialis K. Schum. (2%), Myricaria germanica (L) Desv. (2%), Terraptera (Schum, &amp; Thonn.) Taub. (2%), Milicia excelsa sp. (20%), Alcornea acida A. Rich. (2%), Parinari Schulfera Symphonia globulifera Simphonia globuligera symphonia g</li></ul>	Ceiba pentandra (Linn)	Lith (1.4%) Pentaclettra macronhylla Benth (1.4%) Milicia ercelsa (Welw) C.C.Berg (1.4%) Hyphaea tiphaica						
<ul> <li>Rutaceae spp. (4.0%),</li> <li>(1%), Amanoa sp. (8%), Entanda absistinca Steud. ex ARich. (8%), Irvirga gabonensis (Aubry-Lecomte ex Orocke)Baill. (18), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (8%), Ludwigia sp. (8%), Phyllantus reticulatus Poirt. (8%), Schimus pp. (8%), Symphonia globulifera Linn. (18%), Triplocyton scleroxyton sp. (20%), Alchorea spp. (20%), Individent a macrohylla Benth. (1%), Sacengatoris (28%), Phyllantus reticulatus Poirt. (8%), Soloname spp. (16%), Areira africa sp. (4%), Perios (18%), Polygala sp. (4%), Perios (18%), Phyllantus reticulatus Poirt. (8%), Soloname sp. (18%), Areira africa and sp. (20%), Alchorea spp. (20%), Indigofera Symphonia globulifera Unin. f. (2.4%), Muscaenda spp. (2.0%), Alchorea spp. (2.0%), Indigofera Symphonia globulifera (110, 16%), Irvirga gabonensis (Aubry-Lecomte ex O'Rorke) Baill. (1.6%), Mitragyna spp. (2.6%), Caba Procearpus Sp. (2.6%), Caba Procearpus Sp. (2.6%), Caba Scongtoris gabonensis (Baill.) Urb. (16%), Ladwigia spp. (1.4%), Albicia cytain sp. (2.6%), Alchorea spp. (2.0%), Indigofera Sp. (2.6%), Caba Anchride (2.5%), Saceglorits gabonensis (Baill.) Urb. (16%), Ladwigia spp. (1.4%), Mitcia axeeta (Welw.) C. C. Berg. (1%), Triplochyton scleroxylon K Schum (16%), Caliba calida Nici A scelas Procearpus Sp. (4%), Conderatum Sp. (4.6%), Conderatum Sp. (4.6%),</li></ul>	Gaertn (4.4%)	(Linn) Mart (1%) Protegoidites so (1%) Albizzig zvoja (DC) JE Machride (1%) Asteracege (1%) Calliagama sp						
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<ul> <li>(3.8%), Formata Linn, G. (3%), Schinus sp. (4%), Symphonia globulifera Linn. f. (8%), Triplochyton scleroxylon K. Schum (6%), Batis sp. Poullina ipinnata Linn, Gay, Arelia Giriga erasi (4%), Polygala sp. (4%). Concarpus erecta L. (4%), Medinilla mirabilis (Gilg) acqFel. (4%), Afelia Giriga erasi (4%), Polygala sp. (4%). Ferrogeneras erecta L. (4%), Medinilla mirabilis (Gilg) acqFel. (4%), Afelia Giriga erasi (4%). Polygala sp. (4%). Ferrogeneras erecta L. (4%), Medinilla mirabilis (Gilg) acqFel. (4%), Mynteae lotts L. (28%), Ferroarpus sp. (20%), Batis sp. (26%), Ferroarpus sp. (26%), Ferroarpus sp. (26%), Perroarpus sp. (26%), Perroarpus sp. (26%), Rabis actida A. Rich. (16%), Paullinia pinnata Linn. (16%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke) Baill. (16%), Mitragva spp. (26%), Ferroarpus sp. (26%), Ferroarpus sp. (26%), Formatice as pp. (48%), Cobar pp. (12%), Anaceraticecae sp. (4%), Anaecratiaceae sp. (4%), Anaecratiaceae sp. (4%), Cebb pernoarbus spus to (12%), Anaecratiaceae sp. (4%), Cobar pp. (12%), Anaecratiaceae sp. (4%), Cobar and sp. (26%), Formatice (11,0%), Paullinia pinnata Linn. (16%), Anaecratiaceae sp. (16%), Ladveija sp. (12%), Spondianthy preusi Engl. (12%), Anaecratiaceae sp. (4%), Consta engle Baill. (16%), Calacaenta Baill. (16%), Hyphaene itebatica (Linn.) Mart. (14%), Portacelabra macrophyla Benth. (1%), Calacaenta sp. (26%), Cerosta sp. (32%), Acacia sp. (32%), Acacia sp. (36%), Consta and Baill. (15%), Calacaenta Baill. (15%), Canae and Calaenta Sp. (26%), Ferencaenta Sp.</li></ul>	Combretum spp.	(17), Internet sp. (15), Landau appointed beed, of Internet (8%), Ludwiging geotennis (18), Development (18), Seven ex Bureau (8%), Ludwiging sp. (8%), Phylloritus reticulatus						
<ul> <li>Pooceae (3.6%),</li> <li>Paullinia pinnata Linn.</li> <li>(3.0%),</li> <li>K. Schum. (2%), Myricaria germanica (1, 0) Desv. (2%), Tetrapleura tetraptera (3chum, &amp; Thom), Taub. (2%),</li> <li>Honey Sample: Ikom: Dominant pollen (DP) &gt;45% Nil; Secondarpus erecta L. (4%), Melinilla mirabilis (Gilg)</li> <li>Sumpleri Ikom: Dominant pollen (DP) &gt;45%, Nil; Secondarpus erecta L. (4%), More (2%),</li> <li>Honey Sample: Ikom: Dominant pollen (DP) &gt;45%, Nil; Secondarpus (2%), Bombax buonopozense P. Beuav. (2%),</li> <li>Symplonia globulifera Symphonia globulifera Linn. 1 (2.4%), Mussaenda spp. (2.0%), Alchorme aspp. (2.0%), Mitragra spp. (2.0%), Alchorme aspp. (2.0%), Mitragra spp. (1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Aubry-Lecomte ex O'Rorke) Baill. (1.6%), Mitragray as spp. (1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Baill) Urb. (1.6%), Ludwigia spp. (1.4%), Albizzia zygia (DC.) JF</li> <li>Macbride (1.2%), Anacardiaceae spp. (1%), Allophyllus articicaus P. Beuav. (1%), Pertocarpus synutis leiocarpus (DC) Guill &amp; Perr. (1.2%), Spontaeratis spp. (1.6%), Ladwigia spp. (1.6%), Autoria as exect (2.6%), Coorbinating spp. (3.6%), Ucex doniana Sweet (8%), Cocos nucifera (L) (6%), Bretroita spp. (4%), Philantus reticulatus Poir. (3.2%), Acacia spp. (5%), Ucay as spp. (4%), Addinica spp. (4%), Medinilla mirabilis (Gilg) JacqFel. (4%), Anacardiaceae spp. (1%), Triplochyton scleroxylon K. Schum (1%), Pertocarpus synutis Taub. (.6%), Desmodium spp. (.6%), Ucay as spp. (.6%), Ladwa as spp. (.6%), Ladwa as spp. (.6%), Ladwa as spp. (.6%), Raise sengelensis (Linn.) (.6%), Mitragray as spp. (.6%), Mitragray aspp. (.6%), Mitragray as spp. (.6%), Mitragray as spp. (.6%),</li></ul>	(3.8%)	Poir (%) Schung sp. (%) Symptonia globulifera Linn f (%) Triplochytan scleroxylan K Schum (6%) Batis sp.						
<ul> <li>Paullinia pimata Linu.</li> <li>(3.0%).</li> <li>Jacq-FéL (.4%), Afzelia africana Sm. ex Pers. (2%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (2%), Gardenia imperialis K. Schum. (2%), Myricaria germanica (L.) Desv. (2%), Terapleura tetraptera (Schum. &amp; Thonn.) Taub. (2%).</li> <li>Honey Sample: Kom; Dominant pollen (DP) &gt;4598. NII; Secondary pollen (OP) &gt;4598. NII</li> <li>Elaeis guineensis Jacq. (10.8%), Parinari and Elinia grandifora (Vah) Hutch. &amp; Dalz (2%), Bonbax buonopozense P. Beuav. (2.6%).</li> <li>K. Schum. (2%), Arogeissus leiocarpus santalanoides L'Her. ex DC. (2.8%), Bombax buonopozense P. Beuav. (2.6%).</li> <li>Krizophora spp. (3.6%), Paullinia pinnata Linn. (1.6%), Invinga gabonensis (Aubry-Lecomte ex O'Rorke) Bail. (1.6%), Mitrazyna spp. (1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Baill). Urb. (1.6%), Ludwigia spp. (1.2%), Molargyna gyp. (1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Baill). Urb. (1.6%), Ludwigia spp. (1.2%), Spontianthus preusit Engl. (1.2%), Anocetaspp. (1.5%), Calaicarpa spp. (15%), Calaicarpa spp. (15%), Calaicarpa spp. (15%), Mitci accelsa (Welw.) C. C. Berg. (1%), Triplochyton scleroxylon K. Schum (1%), Prentacidires spp. (10%), Phyllanuts reticulatus Poir. (3%), Vitex doniana Sweet (28%), Caros nucifera (L.) (6%), Eventacidires spp. (10%), Phyllanuts reticulatus Poir. (3%), Vitex doniana Sweet (28%), Caros nucifera (L.) (6%), Berulia granditis (Gig) JacqFél. (4%), Conocarpus erecta L. (4%), Dalbergia erasi (4%), Batis sp. (2%), Cassia senegalensis (Linn.) (2%), Myricaria germanica (L.) Desv. (2%), Newbouldia laevis (PB-eauv.) Seen. ex Bureau (2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil Secondary pollen (SP) &gt;45%. Nil Indigofera spp. (2%), Prencacing acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.4%), Anacardiaceae spp. (2.4%), Anacardiaceae spp. (2.4%), Anacardiaceae spp. (2.4%), Sopanianthan pollen (DP) &gt;45%: Nil Secondary pollen (SP) &gt;45%. Nil Indigofera usp. (4%), Seconda</li></ul>	Poaceae (3.6%).	(4%). Pieris (4%). Dalbergia erasi (4%). Polyeala sp. (4%). Conocarnus erecta L. (4%). Medinilla mirabilis (Gilg)						
<ul> <li>K. Schum. (2%), Myricaria germanica (L.) Desv. (2%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (2%).</li> <li>Honey Sample: Ikom; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &gt;45%: -16%: Nil</li> <li>Elaeis guineensis Jacq.</li> <li>(1.6%), Parinari</li> <li>(1.6%), Musicaria germanica (L.) Desv. (2%), Mussaenda spp. (2.0%), Alchornea spp. (2.0%), Indigofera spp. (3.6%),</li> <li>(1.6%), Destinia grandiffora (Vahl) Hutch. &amp; Dalz. (2.8%), Bombas buonopozense P. Beuav. (2.6%)</li> <li>Symphonia globulifera Symphonia globulifera Linn. (1.6%), Mussaenda spp. (2.0%), Alchornea spp. (2.0%), Berlinia grandiffora (Vahl) Hutch. &amp; Dalz. (2.8%), Caroches Baill. (1.6%), Mussagna spp. (1.6%), Solanum spp. (1.6%), Scooglottis gabonensis (Baill). Urb. (1.6%), Laurea acida A. Rich.</li> <li>Poaceae (4.2%), Ceiba pertuadra (Jinn.)</li> <li>Gaettn. (3.6%), Foroacpus spp. (1.6%), Solanum spp. (1.6%), Alcoragiaceae spp. (1%), Allophyllus africanus P. Beauv. (1%), Pentaclethra macrophylla Benth. (1%), Asteraceae (1%), Coula edulits Baill. (1%), Hyphaene tiebaica (Linn.) Mart. (1%), Calliacarpa spp. (1%), Milcia excelsa (Welw), C. C. Berg. (1%), Triplochyton seleroxylon K. Schum (1%), Pentacelithra macrophylla Benth. (1%), Cas%), Freminalia spp. (5%), Viex doniana Sweet (8%), Coors nucifera (L.) (.6%), Sterculia spp. (5%), Herocarpus sopausi (Taub. (1.6%), Medinilla mirabilis (Gilg) Jacq-Fél.</li> <li>(3.2%), Acais app. (2.8%), Perocarpus supauti and Linn. (2.9%), Lancea acida A. Rich.</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.3%), Perocarpus stantalanoides L'Her. ex DC. (2.6%), Hymencerafia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.9%), Combrutun spp. (2.6%), Spondianthus princial Linn. (2.9%), Paullina instantalina (2.9%), Lancea acida. A. Rich.</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil Secondary pollen (SP) &lt;45%-1</li></ul>	Paullinia pinnata Linn	Jaca - Fél (4%) Afzelia africana Sm ex Pers (2%) Daniellia oliveri (Rolfe) Hutch & Dalz (2%) Gardenia innerialis						
<ul> <li>Honey Sample: Ikom; Dominant pollen (DP) &gt;45%; Nil; Secondary pollen (SP) &lt;45%-16%; Nil</li> <li>Elaeis guineensis Jacq. (10.8%), Prerocarpus santalanoides LHer, ex DC. (2.8%), Bombax buonopozense P. Beuav. (2.6%), Reirocarpus spentaling arandiflora (Vahl) Hutch. &amp; Dalz. (2%), Mussaenda Spp. (2.0%), Alchorne aspp. (2.0%), Indigofera spp. (2.0%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (2%), Brachystegia eurycoma Harms (1.6%), Lannea acida A. Rich. (1.6%), Paullinia pinnata Linn. (1.6%), Lavingia gabonensis (Aubry-Leconte ex O'Rorke) Baill. (1.6%), Mitragyna spp. (2.0%), Bordinanthus preusii gabonensis (Mubry-Leconte ex O'Rorke) Baill. (1.6%), Mitragyna spp. (2.0%), Ceiba pentandra (Linn.)</li> <li>Gaettn. (3.6%), <i>Review Composition and Computed and C</i></li></ul>	(3.0%).	K. Schum, (2%), Myricaria germanica (L.) Desy. (2%), Tetrapleura tetraptera (Schum, & Thonn.) Taub. (2%).						
<ul> <li>Elaeis guineensis Jacq. (10.8%). Parinari kerstingi Engl. (5.6%). Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (2%), Mussaenda spp. (2.0%), Alchornea spp. (2.0%), Indiggera kerstingi Engl. (5.6%). Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (2%), Brachystegia eurycoma Harms (1.6%), Larnea acida A. Rich. (1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (2%), Brachystegia eurycoma Harms (1.6%), Mussaenda spp. (2.0%), Alchornea spp. (2.0%), Indiggera spp. (2.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (2%), Eventagia eurycoma Harms (1.6%), Musragina spp. (1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Aubry-Lecomte ex O'Rorke) Baill. (1.6%), Mutragyna spp. (1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Baill) Urb. (1.6%), Ludwigia spp. (1.4%), Albizzia zygia (DC.) JF Paocaee (2.2%), Ceiba pentandra (Linn.), Gaettn. (3.6%), Proteacidites spp. (1.6%), Solanum spp. (1.6%), Staccaga spp. (1.4%), Albizzia zygia (DC.) JF Paocaee (1.6%), Erbinotic syp. (1.6%), Staccaga spp. (1.6%), Staccaga spp. (1.6%), Staccaga spp. (1.6%), Phylanuta returalularus perinanta grandiacea spp. (1.6%), Lipaccaffica (Linn.), Matt. (1.6%), Lapaca spp. (6%), Cocos nucifera (Lin.) (6%), Viex doniana Sweet (.8%), Cocos nucifera (Li.) (.6%), Sterculia spp. (.6%), Phyllanuta retualularus (1.6%), Desmodium spp. (.6%), Lapaca spp. (.6%), Cocos nucifera (Li.) (.6%), Sterculia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél. (.4%), Anocardiaceae spp. (.2%), Cassia senegalensis (Linn.) (.2%), Myricaria germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%. Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (.2.8%), Areacaficaea esp. (.2.%), Assa senegalensis (Aubry-Lecomte ex O'Rorke)Baill. (.2.0%), Partocarpus santalanoides L'Her. ex DC. (.2.6%), Hyrneacardia Tul (2.4%), Musaenda Spp. (.4.%), Aracardiaceae esp. (.2.%), Aracardiaceae esp. (.2.%), Assa senegalenesis (Aubry-Lecomte ex O'Rorke)Baill. (.2.0%), Partocarpus s</li></ul>	(213,1)	Honey Sample: Ikom: Dominant pollen (DP) >45%: Nil: Secondary pollen (SP) <45%-16%; Nil						
<ul> <li>(10.8%), Parinari kerstingii Engl. (5.6%), Richard generatingi Carbon (1.2%), Parinari generatingi Carbon, Carbon, Parinari generatingi Carbon, Carbon, Parinari generatingi Carbon, Carbon, Parinari generatingi Carbon, Carbon, Parinari kerstingi Engl. (1.2%), Newolulia laring Carbon, Carbon, Parinari kerstingi Engl. (1.2%), Carbon, Parinari generatical sp. (6%), Carbon, Parinari generatical sp. (6%), Carbon, Parinari generatical carbon, Parinari kerstingi Engl. (1.2%), Newolulia laring pentandra (Linn.), Gaertn. (5.6%), Ratacacae sp. (1.2%), Newolulia laring pentandra (Linn.), Gaertn. (5.6%), Ratacacae sp. (1.2%), Parinali as pentandra (Linn.), Gaerta (1.6%), Sapotacae spp. (1.4%), Alcorara spp. (1.4%), Anancacae spp. (1.4%), Anancacaea spp. (1.4%), Anancacaea spp. (1.4%), Anacada</li></ul>	Elaeis guineensis Jacq.	Nympheae lotus L. (2.8%). Pterocarpus santalanoides L'Her, ex DC. (2.8%). Bombax buonopozense P. Beuay, (2.6%)						
<ul> <li>kerstingii Engl. (5.6%),</li> <li><i>Rhizophora</i> spp. (2.0%), <i>Berlinia grandiflora</i> (Vahl) Hutch. &amp; Dalz. (2%), <i>Brachystegia eurycoma</i> Harms (1.6%), <i>Lanea</i> acida A. Rich.</li> <li><i>Rhizophora</i> spp. (3.6%),</li> <li><i>Rutaceae</i> spp. (4.8%),</li> <li><i>Coloman</i> spp. (1.6%), <i>Socilarum</i> spp. (1.6%), <i>Socilarum</i> spp. (1.6%), <i>Socilarum</i> spp. (1.6%), <i>Anogeissus</i> leiocarpus (DC) Guill &amp; Perr. (1.2%), <i>Cyperaceaepollis</i> spp. (1.4%), <i>Albizizia zygia</i> (DC), JF</li> <li>Macbride (1.2%), <i>Anogeissus</i> leiocarpus (DC) Guill &amp; Perr. (1.2%), <i>Cyperaceaepollis</i> spp. (1.4%), <i>Albizizia zygia</i> (DC), JF</li> <li>Macbride (1.2%), <i>Anoacadiaceae</i> spp. (1%), <i>Allophyllus africanus</i> P. Beauv. (1%), <i>Pentaclethra macrophylla</i> Benth. (1%), <i>Asteraceae</i> (1%), <i>Coula eduils</i> Baill. (1%), <i>Hyphaene tiebaica</i> (Linn.) Mart. (1%), <i>Caliacarpa</i> spp. (1%), <i>Milicia excelsa</i> (Welw.) C. C. Berg. (1%), <i>Triplochyton scleroxylon</i> K. Schum (1%), <i>Pentaclethra macrophylla</i> Benth. (1%), <i>Jesnotainas</i> pp. (4%), <i>Coros nucifera</i> (L), (6%), <i>Sterculia</i> spp. (6%), <i>Herocarpus soyauxii</i> Taub. (6%), <i>Desmodium spp.</i> (6%), <i>Uapaca</i> spp. (6%), <i>Capsicum</i> spp. (4%), <i>Heroina pp.</i> (4%), <i>Medinilla mirabilis</i> (Gilg) Jaqc-Fél. (4%), <i>Conocarpus erecta</i> L. (4%), <i>Dalbergia erasi</i> (4%), <i>Batis</i> sp. (2%), <i>Cassia senegalensis</i> (Linn.) (2%), <i>Myricaria germanica</i> (L) Desv. (2%), <i>Pertocarpus santalanoides</i> L'Her. ex DC. (2.6%), <i>Hymenocardia acida</i> Tul (2.4%), <i>Mussaenda</i> spp. (2.4%), <i>Aacardiaceae</i> spp. (2.4%), <i>Pertocarpus santalanoides</i> L'Her. ex DC. (2.6%), <i>Hymenocardia acida</i> Tul (2.4%), <i>Mussaenda</i> spp. (2.4%), <i>Alcorrea</i> spp. (1.4%), <i>Anonacaea</i> (20%), <i>Combretum</i> spp. (2.0%), <i>Leonet acida</i> A. Rich. (2.0%), <i>Pentaclethra macrophylla</i> Benth. (1.8%), <i>Asteraceael</i> (1.6%), <i>Berlinia grandiflora</i> (Vahl) Hutch. &amp; Dalz. (1.6%), <i>Bombax buonopozense</i> P. Beuav. (1.6%), <i>Brachystegia eurycoma</i> Harms (1.6%), <i>Pertocarpus soyauxii</i> Taub. (1.6%), <i>Jennea acida</i> A. Rich. (2.0%), <i>Phyllantus reticulatus</i> Poir. (1.4%), <i>Anocardiaceae</i></li></ul>	(10.8%), Parinari	Symphonia globulifera Symphonia globulifera Linn. f. (2.4%), Mussaenda spp. (2.0%), Alchornea spp. (2.0%), Indigofera						
<ul> <li>Rhizophora spp. (3.6%),</li> <li>Ruizaceae spp. (4.8%),</li> <li>Poaceae (4.2%), Ceiba pertore are spp. (1.6%), Sacoglottis gabonensis (Aubry-Lecomte ex O'Rorke) Baill. (1.6%), Mitragyna spp. (1.6%), Solonum spp. (1.6%), Sacoglottis gabonensis (Baill) Urb. (1.6%), Ludwigia spp. (1.4%), Albizzia zygia (DC) JF</li> <li>Macbride (1.2%), Anacaisus pertore are spp. (1.5%), Alophyllus africanus P. Beauv. (1%), Pentaclethra macrophylla Benth. (1%), Calliacarpa spp. (1%), Miloita excelsa (Welw), C. C. Berg. (1%), Triplochyton scleroxylon K. Schum (1%), Pentaclethra macrophylla Benth. (1%), Calliacarpa spp. (1%), Milcia excelsa (Welw), C. C. Berg. (1%), Triplochyton scleroxylon K. Schum (1%), Proteacidites spp. (1%), Phyllantus reticulatus Poir. (3.4%), Comocarpus erecta L. (4%), Dalbergia erasi (4%), Batis sp. (2%), Cassia senegalensis (Ging) Jacq-Fél. (4%), Conocarpus erecta L. (4%), Dalbergia erasi (4%), Batis sp. (2%), Cassia senegalensis (Ging) Jacq-Fél. (4%), Conocarpus erecta L. (4%), Dalbergia erasi (4%), Batis sp. (2%), Persoarpus soyacti Taub. (5%), Persoarpus soyacti C. (2%), Newbouldia laevis (P. Beauv.) Seem. ex Bureau (2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (1.4%), Perocarpus soyacti Taub. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchormea spp. (1.4%), Annonaceae spp. (1.4%), Clome spp. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchormea spp. (1.4%), Annonaceae spp. (1.4%), Cubic accelar phylla agricanus P. Beauv. (1.6%), Barlinia gpinata Linn. (2.0%), Annonaceae spp. (1.4%), Alchormea spp. (1.4%), Cubic atore soyalor (1.4%), Annonaceae spp. (1.4%), Cubic atore activa a spp. (1.6%), Solanum spp. (1.6%), Solanu</li></ul>	kerstingii Engl. (5.6%),	spp. (2.0%), Berlinia grandiflora (Vahl) Hutch. & Dalz. (2%), Brachystegia eurycoma Harms (1.6%), Lannea acida A. Rich.						
<ul> <li>Rutaceae spp. (4.8%),</li> <li>Poaceae (4.2%), Ceiba pertandra (Linn.)</li> <li>Gaetru. (3.6%),</li> <li>Paeraadra (Linn.)</li> <li>Gaetru. (3.6%),</li> <li>Pterocarpus spp.</li> <li>(3.4%), Combretum spp.</li> <li>(3.4%), Combretum (3.5%), Acacia spp.</li> <li>(3.2%), Acacia spp.</li> <li>(3.2%), Acacia spp.</li> <li>(3.2%), Acacia spp.</li> <li>(3.2%), Acacia spp.</li> <li>(4.6%), Solanum spp.</li> <li>(1.6%), S</li></ul>	Rhizophora spp. (3.6%),	(1.6%), Paullinia pinnata Linn. (1.6%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke) Baill. (1.6%), Mitragyna spp.						
<ul> <li>Poaceae (4.2%), Ceiba pentandra (Linn.)</li> <li>Gaertn. (3.6%), <i>Patrocarpus</i> spp. (12%), <i>Anageissus leiocarpus</i> (DC) Guill &amp; Perr. (1.2%), <i>Cyperaceaepollis</i> spp. (1.2%), <i>Spondianthus preusii</i> Engl. (1.2%), <i>Anacardiaceae</i> spp. (1%), <i>Allophyllus africanus</i> P. Beauv. (1%), <i>Pentaclethra macrophylla</i> Benth. (1%), Asteraceae (1%), <i>Coula edulis</i> Baill. (1%), <i>Hyphaene tiebaica</i> (Linn.) Mart. (1%), <i>Celibaina Supe</i>. (1%), <i>Triplochyton scleroxylon</i> K. Schum (1%), <i>Proteacidites</i> spp. (1%), <i>Hyllantus reticulatus</i> Poir. (8%), <i>New douland asveet</i> (.8%), <i>Cocos nucifera</i> (L.) (.6%), <i>Sterculia</i> spp. (.6%), <i>Perocarpus soyauxii</i> Taub. (.6%), <i>Desmodium spp</i>. (.6%), <i>Uapaca</i> spp. (.6%), <i>Capsicum</i> spp. (.4%), <i>Medinilla mirabilis</i> (Gilg) Jacq-Fél. (.4%), <i>Conocarpus erecta</i> L. (.4%), <i>Calbergia erasi</i> (.4%), <i>Balis</i> sp. (.2%), <i>Cassia enegalensis</i> (Linn.) (.2%), <i>Myricaria</i> germanica (L.) Desv. (.2%), <i>Newbouldia laevis</i> (P.Beauv.) Seem. ex Bureau (.2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li><i>Indigofera</i> spp. (.2.%), <i>Paerocarpus santalanoides</i> L'Her. ex DC. (.2.6%), <i>Hymenocardia acida</i> Tul (2.4%), <i>Mussaenda</i> spp. (.2.4%), <i>Aateraceae</i> (1.6%), <i>Pertocarpus soyauxii</i> Taub. (.1.6%), <i>Sondianthus</i> preusii Engl. (1.4%), <i>Alchornea</i> spp. (1.4%), <i>Proteacarpus soyauxii</i> Taub. (.1.6%), <i>Sondianthus</i> preusii Engl. (1.4%), <i>Alchornea</i> spp. (.2.9%), <i>Conocarpus</i> sepatatione (.1.6%), <i>Sondianthus</i> spp. (.2.4%), <i>Anacardiaceae</i> spp. (.2.4%), <i>Combretum</i> spp. (.2.6%), <i>Hymenocardia acida</i> Tul (2.4%), <i>Mussaenda</i> spp. (.1.4%), <i>Ateraceae</i> (1.6%), <i>Berninaia grandifora</i> (Vahl) Hutch. &amp; Dalz. (1.6%), <i>Solanum</i> spp. (.6%), <i>Sopodianthus</i> preusii Engl. (1.4%), <i>Alchornea</i> spp. (1.4%), <i>Pritoplery on seleroxylon</i> K. Schum (1.2%), <i>Allophyllus africanus</i> P. Beauv. (1.2%), <i>Phyllantus reticulatus</i> poir. (.1.2%), <i>Phyllantus reticulatus</i> poir. (.1.2%), <i>Anogeissus</i> (.1.6%), <i>Sapotaceae</i> spp. (.6%), <i>Carpa procera</i> DC. (.1%), <i>Anageissus</i></li></ul>	Rutaceae spp. (4.8%),	(1.6%), Solanum spp. (1.6%), Sacoglottis gabonensis (Baill.) Urb. (1.6%), Ludwigia spp. (1.4%), Albizzia zygia (DC.) JF						
<ul> <li>pentandra (Linn.)</li> <li>Gaertn. (3.6%),</li> <li><i>Pterocarpus</i> spp. (3.%), <i>Combertum</i></li> <li>(3.4%), <i>Combertum</i></li> <li>(3.2%), <i>Combretum</i></li> <li>(1.4%), <i>Combretum</i></li> <li>(1.6%), <i>Partaclethra</i></li> <li>(2.4%), <i>Anacardiaceae</i> spp. (1.4%), <i>Partaclethra</i></li> <li>(1.6%), <i>Partaclethra</i></li> <li>(1.4%), <i>Atcoraeae</i> spp. (1.4%), <i>Attonacaea</i> spp. (1.4%), <i>Combretum</i></li> <li>(1.6%), <i>Sopataceae</i> spp. (1.4%), <i>Attonacaea</i> spp. (1.4%), <i>Caliacapa</i> spp. (1.6%), <i>Sopataceae</i> spp. (1.4%), <i>Attanacaea</i></li> <li>(1.4%), <i>Combretum</i></li> <li>(1.4%), <i>Combretum</i></li> <li>(1.4%), <i>Combretum</i></li> <li>(1.4%), <i>Attanacaea</i></li> <li>(1.4%), <i>Attanacaeae</i></li></ul>	Poaceae (4.2%), Ceiba	Macbride (1.2%), Anogeissus leiocarpus (DC) Guill & Perr. (1.2%), Cyperaceaepollis spp. (1.2%), Spondianthus preusii						
<ul> <li>Gaertn. (3.6%), Prerocarpus spp.</li> <li>Gaertn. (3.6%), Prerocarpus spp.</li> <li>(3.4%), Combretum spp. (3.2%), Acacia spp. (3.2%), Acacia spp. (3.2%), Acacia spp. (3.2%), Acacia spp. (3.2%), Terminalia spp. (1.4%), Annonaceae spp. (1.4%), Terminalia spp. (1</li></ul>	pentandra (Linn.)	Engl. (1.2%), Anacardiaceae spp. (1%), Allophyllus africanus P. Beauv. (1%), Pentaclethra macrophylla Benth. (1%),						
<ul> <li>Pterocarpus spp. (3.4%), Combretum</li> <li>spp. (3.2%), Acacia spp. (3.2%), Acacia spp. (3.2%), Terminalia spp. (4%), Conocarpus erecta L. (4%), Dalbergia erasi (4%), Batis sp. (2%), Cassia senegalensis (Linn.) (.2%), Myricaria germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lamea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Solanum spp. (1.6%), Spondianthus reusii Engl. (1.4%), Achormea spp. (1.4%), Annonaceae spp. (1.4%), Culome spp. (1.4%), Crudia klainer Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.4%), Margele paniculata (Schumach) Engl. (1.9%), Curapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Cuprapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Cibia pentandra (Linn.) Gaertn. (5.6%), Rutaceae spp. (4.0%),</li> <li>Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (5%), Phyluntus reticulatus Poir. (5%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C. CBerg.a (6%), Proteacidites spp. (6%), Aceliacarpa spp. (4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (.2%), Vitex</li> </ul>	Gaertn. (3.6%),	Asteraceae (1%), Coula edulis Baill. (1%), Hyphaene tiebaica (Linn.) Mart. (1%), Calliacarpa spp. (1%), Milicia excelsa						
<ul> <li>(3.4%), Combretum spp. (3.2%), Acacia spp.</li> <li>(3.2%), Vitex doniana Sweet (.8%), Cocos nucifera (L.) (.6%), Sterculia spp. (.6%), Pterocarpus soyauxii Taub. (.6%), Desmodium spp. (.6%), Uapaca spp. (.6%), Capsicum spp. (.4%), Tephrosia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél.</li> <li>(.4%), Conocarpus erecta L. (.4%), Dalbergia erasi (.4%), Batis Sp. (.2%), Cassia senegalensis (Linn.) (.2%), Myricaria germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill (2.0%), Paullinia pinnata Linn. (2.0%), Combretum spp. (1.6%), Bombax buonopozense P. Beuav. (1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leicarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (.6%), Amaoa spp. (6%), Crotacidites spp. (6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C.C.Berg.a (6%), Proteacidites gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>	Pterocarpus spp.	(Welw.) C. C. Berg. (1%), Triplochyton scleroxylon K. Schum (1%), Proteacidites spp. (1%), Phyllantus reticulatus Poir.						
<ul> <li>spp. (3.2%), Acacia spp.</li> <li>(3.2%), Acacia spp.</li> <li>(3.2%), Terminalia spp.</li> <li>(3.2%), Estodium spp. (.6%), Uapaca spp. (.6%), Capsicum spp. (.4%), Tephrosia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél.</li> <li>(.4%), Conocarpus erecta L. (.4%), Dalbergia erasi (.4%), Batis sp. (.2%), Cassia senegalensis (Linn.) (.2%), Myricaria germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (2.0%), Paulinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Brainair kerstingii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cloeme spp. (1.4%), Hyphaene tiebaica (Linn.)</li> <li>Matt. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Sagotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carpar procera DC. (1%), Anageissus peicorarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Caphrosia spp. (1.6%), Amanoa spp. (6%), Capsicum spp. (.6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Wellw.) C. DC. (.4%), Sterculia exelsa (Welw.) C.C.Berg.a (6%), Proteacidites spp. (.6%), Afzeia afficara Sm. ex Pers. (.4%), Albizia zygia (DC.) JF Macbride (.4%), Polyalatus spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Sygium guineense (Willo) DC. (.4%), Sterculia spp. (.4%), Conocarpus sercta L. (.2%), Myricaria germanica (L.) Desv. (.2%), Vitex</li> </ul>	(3.4%), Combretum	(.8%), Vitex doniana Sweet (.8%), Cocos nucifera (L.) (.6%), Sterculia spp. (.6%), Pterocarpus soyauxii Taub. (.6%),						
<ul> <li>(3.2%). Terminalia spp.</li> <li>(.4%), Conocarpus erecta L. (.4%), Dalbergia erasi (.4%), Batis sp. (.2%), Cassia senegalensis (Linn.) (.2%), Myricaria germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).</li> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Bombax buonopozense P. Beuav. (1.6%), Parinari kerstingii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Clowen spp. (1.4%), Hyphaene tiebaica (Linn.) Gaettn. (5.6%), Rutaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Carapa procera DC. (1%), Anaoea spp. (.6%), Colospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelas (Welw.) C. CBerg.a (.6%), Proteacidites spp. (.6%), Azelia africana Sm. ex Pers. (.4%), Alizizia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (.2%), Vitx</li> </ul>	spp. (3.2%), Acacia spp.	Desmodium spp. (.6%), Uapaca spp. (.6%), Capsicum spp. (.4%), Tephrosia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél.						
(3.2%).       germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).         Honey Sample: Lokpanta; Dominant pollen (DP) >45%: Nil; Secondary pollen (SP) <45%-16%: Nil	(3.2%), Terminalia spp.	(.4%), Conocarpus erecta L. (.4%), Dalbergia erasi (.4%), Batis sp. (.2%), Cassia senegalensis (Linn.) (.2%), Myricaria						
<ul> <li>Honey Sample: Lokpanta; Dominant pollen (DP) &gt;45%: Nil; Secondary pollen (SP) &lt;45%-16%: Nil</li> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Bombax buonopozense P. Beuav. (1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleame spp. (1.4%), Crudia klainei Pierre (1.2%), Npyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beuav. (1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (1%), Cperaceaegollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (8%), Phyllantus reticulatus Poir. (8%), Amanoa spp. (6%), Cocloseprum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Forteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (.2%), Vitx</li> </ul>	(3.2%).	germanica (L.) Desv. (.2%), Newbouldia laevis (P.Beauv.) Seem. ex Bureau (.2%).						
<ul> <li>Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Bombax buonopozense P. Beuav. (1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.4%), Alchornea spp. (1.4%), Attraceae spp. (1.4%), Alchornea spp. (1.4%), Terminalia spp. (1.4%), Tertrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (8%), Phyllantus reticulatus Poir. (.8%), Amanoa spp. (.6%), Capsicum spp. (.6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C. Berga app. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitx</li> </ul>	H	Ioney Sample: Lokpanta; Dominant pollen (DP) >45%: Nil; Secondary pollen (SP) <45%-16%: Nil						
<ul> <li>spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Bombax buonopozense P. Beuav. (1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (1%), C. Occusernum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C.C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callaicarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>		Indigofera spp. (2.8%), Pterocarpus santalanoides L'Her. ex DC. (2.6%), Hymenocardia acida Tul (2.4%), Mussaenda						
<ul> <li>ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Bombax buonopozense P. Beuav. (1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afagele paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (8%), Phyllantus reticulatus Poir. (8%), Anonaoa spp. (1%), Crotolaria enters and angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C.C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callaicarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>		spp. (2.4%), Anacardiaceae spp. (2.2%), Poaceae (2.0%), Combretum spp. (2.0%), Irvinga gabonensis (Aubry-Lecomte						
<ul> <li>Elaeis guineensis Jacq. (1.6%), Parinari kerstingii Engl. (1.4%), Alchornea spp. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afgeale paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (8%), Phyllantus reticulatus Poir. (8%), Annona spp. (6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C.C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callaicarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>		ex O'Rorke)Baill. (2.0%), Paullinia pinnata Linn. (2.0%), Lannea acida A. Rich. (2.0%), Pentaclethra macrophylla						
<ul> <li>Elaeis guineensis Jacq. (1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.6%), Spondianthus preusii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leicoarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (.8%), Phyllantus reticulatus Poir. (.8%), Annona spp. (.6%), Capsicum spp. (.6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Mistoris spp. (.6%), Coclespermum planchonii Hook f. (.6%), Milicia excelsa (Welw.) C. C.Berg, a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callaicarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>		Benth. (1.8%), Asteraceae(1.6%), Berlinia grandiflora (Vahl) Hutch. & Dalz. (1.6%), Bombax buonopozense P. Beuav.						
<ul> <li>Elaeis guineensis Jacq. (11.6%) Parinari kerstingii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.) Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (.8%), Phyllantus reticulatus Poir. (.8%), Amanoa spp. (.6%), Capsicum spp. (.6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Mistoris spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.), C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callaicarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>		(1.6%), Brachystegia eurycoma Harms (1.6%), Pterocarpus soyauxii Taub. (1.6%), Solanum spp. (1.6%), Spondianthus						
<ul> <li>Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Crudia klainei Pierre (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1.2%), Sapotaceae spp. (1.2%), Sapotaceae spp. (1.2%), Nymphea lotus L. (1%), Olax spp. (1%), Carapa procera DC. (1%), Anogeissus leicoarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (.8%), Phyllantus reticulatus Poir. (.8%), Amanoa spp. (.6%), Capsicum spp. (.6%), Coclosperum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.), C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Myrtaceae spp. (.4%), Callaicarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>	Elaeis guineensis Jaca.	preusii Engl. (1.4%), Alchornea spp. (1.4%), Annonaceae spp. (1.4%), Cleome spp. (1.4%), Hyphaene tiebaica (Linn.)						
<ul> <li>kerstingii Engl. (7.0%), Ceiba pentandra (Linn). Gaertn. (5.6%),</li> <li><i>Rutaceae</i> spp. (4.0%).</li> <li>(1.2%), <i>Phyllantus reticulatus</i> Poir. (1.2%), <i>Triplochyton scleroxylon</i> K. Schum (1.2%), <i>Allophyllus africanus</i> P. Beauv. (1.2%), <i>Sapotaceae</i> spp. (1.2%), <i>Afraegle paniculata</i> (Schumach.) Engl. (1%), <i>Carapa procera</i> DC. (1%), <i>Anogeissus</i> <i>leiocarpus</i> (DC) Guill &amp; Perr. (1%), <i>Nymphea lotus</i> L. (1%), <i>Olax</i> spp. (1%), <i>Tephrosia</i> spp. (1%), <i>Cyperaceaepollis</i> spp. (1%), <i>Khaya senegalensis</i> (Desv.) A. Juss. (1%), <i>Mitragyna</i> spp. (.8%), <i>Phyllantus reticulatus</i> Poir. (.8%), <i>Amanoa</i> spp. (.6%), <i>Capsicum</i> spp. (.6%), <i>Coclosperum planchonii</i> Hook f. (.6%), <i>Desmodium spp.</i> (.6%), <i>Dissotis</i> spp. (.6%), <i>Entadrophragma angolense</i> (Welw.) C. DC. (.6%), <i>Ximenia americana</i> Linn. (.6%), <i>Milicia excelsa</i> (Welw.), C. C.Berg.a (.6%), <i>Proteacidites</i> spp. (.6%), <i>Afzelia africana</i> Sm. ex Pers. (.4%), <i>Albizzia zygia</i> (DC.) JF Macbride (.4%), <i>Polygala</i> spp. (.4%), <i>Sacoglottis gabonensis</i> (Baill.) Urb. (.4%), <i>Syzygium guineense</i> (Willd.) DC. (.4%), <i>Sterculia</i> spp. (.4%), <i>Myrtaceae</i> spp. (.4%), <i>Calliacarpa</i> spp. (.4%), <i>Conocarpus erecta</i> L. (.2%), <i>Myricaria germanica</i> (L.) Desv. (. 2%), <i>Vitex</i></li> </ul>	(11.6%) Parinari	Mart. (1.4%), Terminalia spp. (1.4%), Tetrapleura tetraptera (Schum, & Thonn.) Taub. (1.4%), Crudia klainei Pierre						
<ul> <li>(7.0%), Ceiba pentandra (Linn.) Gaertn. (5.6%), <i>Rutaceae</i> spp. (4.0%).</li> <li>(1.2%), Sapotaceae spp. (1.2%), Afraegle panculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (1%), Nymphea lotus L. (1%), Olax spp. (1%), Tephrosia spp. (1%), Cyperaceaepollis spp. (1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (.8%), Phyllantus reticulatus Poir. (.8%), Amanoa spp. (.6%), Capsicum spp. (.6%), Coclospermum planchonii Hook f. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.), C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél. (.4%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (.4%), Crotolaria retusa L. (.4%), Myrtaceae spp. (.4%), Callaicacrpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>	<i>kerstingii</i> Engl.	(1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv.						
<ul> <li>pentandra (Linn.) Gaertn. (5.6%),</li> <li><i>Rutaceae</i> spp. (4.0%).</li> <li><i>Rutaceae</i> spp</li></ul>	(7.0%), Ceiba	(1.2%), Sapotaceae spp. (1.2%), Afraegle paniculata (Schumach.) Engl. (1%), Carapa procera DC. (1%), Anogeissus						
<ul> <li>Gaertn. (5.6%), <i>Rutaceae</i> spp. (4.0%).</li> <li>(1%), <i>Khaya senegalensis</i> (Desv.) A. Juss. (1%), <i>Mitragyna</i> spp. (.8%), <i>Phyllantus reticulatus</i> Poir. (.8%), <i>Amanoa</i> spp. (.6%), <i>Capsicum</i> spp. (.6%), <i>Coclospermum planchonii</i> Hook f. (.6%), <i>Desmodium spp</i>. (.6%), <i>Dissotis</i> spp. (.6%), <i>Entadrophragma angolense</i> (Welw.) C. DC. (.6%), <i>Ximenia americana</i> Linn. (.6%), <i>Milicia excelsa</i> (Welw.) C.C.Berg.a (.6%), <i>Proteacidites</i> spp. (.6%), <i>Afzelia africana</i> Sm. ex Pers. (.4%), <i>Albizzia zygia</i> (DC.) JF Macbride (.4%), <i>Polygala</i> spp. (.4%), <i>Sacoglottis gabonensis</i> (Baill.) Urb. (.4%), <i>Syzygium guineense</i> (Willd.) DC. (.4%), <i>Sterculia</i> spp. (.4%), <i>Medinilla mirabilis</i> (Gilg) JacqFél. (.4%), <i>Daniellia oliveri</i> (Rolfe) Hutch. &amp; Dalz (.4%), <i>Crotolaria retusa</i> L. (.4%), <i>Myrtaceae</i> spp. (.4%), <i>Calliacarpa</i> spp. (.4%), <i>Conocarpus erecta</i> L. (.2%), <i>Myricaria germanica</i> (L.) Desv. (. 2%), <i>Vitex</i></li> </ul>	pentandra (Linn.)	leiocarpus (DC) Guil & Perr. (1%), Nymphea loius L. (1%), Olax spp. (1%), Tephrosia spp. (1%), Cyperaceaepouls spp.						
<ul> <li>Rutaceae spp. (4.0%).</li> <li>(.6%), Capsicum spp. (.6%), Cociospermum planchonii Hook I. (.6%), Desmodium spp. (.6%), Dissotis spp. (.6%), Entadrophragma angolense (Welw.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excelsa (Welw.) C.C.Berg.a (.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél. (.4%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (.4%), Crotolaria retusa L. (.4%), Myrtaceae spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>	Gaertn. (5.6%),	(1%), Khaya senegalensis (Desv.) A. Juss. (1%), Mitragyna spp. (.8%), Phyllantus reticulatus Poir. (.8%), Amanoa spp.						
<ul> <li>Entdarophragma angolense (WelW.) C. DC. (.6%), Ximenia americana Linn. (.6%), Milicia excetsa (WelW.) C.C.Berg.a</li> <li>(.6%), Proteacidites spp. (.6%), Afzelia africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala</li> <li>spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%),</li> <li>Medinilla mirabilis (Gilg) JacqFél. (.4%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (.4%), Crotolaria retusa L. (.4%),</li> <li>Myrtaceae spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex</li> </ul>	Rutaceae spp. (4.0%).	(.6%), Capsicum spp. (.6%), Coclospermum planenonii Hook I. (.6%), Desmoaium spp. (.6%), Dissoits spp. (.6%),						
(.6%), Proteaciaties spp. (.6%), Afzeita africana Sm. ex Pers. (.4%), Albizzia zygia (DC.) JF Macbride (.4%), Polygala spp. (.4%), Sacoglottis gabonensis (Baill.) Urb. (.4%), Syzygium guineense (Willd.) DC. (.4%), Sterculia spp. (.4%), Medinilla mirabilis (Gilg) JacqFél. (.4%), Daniellia oliveri (Rolfe) Hutch. & Dalz (.4%), Crotolaria retusa L. (.4%), Myrtaceae spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex		Entaarophragma angolense (Welw.) C. D.C. (0%), ximenia americana Linn. (.0%), Milicia excelsa (Welw.) C.C.Berg.a						
spp. (4%), Sacogiotits gabonensis (Bain.) Uto. (4%), Syzygium guineense (Wind.) DC. (4%), Sterculta spp. (4%), Medinilla mirabilis (Gilg) JacqFél. (4%), Daniellia oliveri (Rolfe) Hutch. & Dalz (4%), Crotolaria retusa L. (4%), Myrtaceae spp. (4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (.2%), Vitex		(.0%), rroteactures spp. (.0%), Afzena africana sm. ex Pers. (.4%), Albizzia zygia (DC.) JF MacDride (.4%), Polygala						
Medanula mirabilis (chig) Jacqrei. (.4%), Damenia oliveri (Rolle) Huich. & Daiž (.4%), Crotolaria retusa L. (.4%), Myrtaceae spp. (.4%), Calliacarpa spp. (.4%), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex		spp. (+70), sacogionis gauonensis (Baini, Oto. (+70), szygium guineense (Willd.) DC. (-470), Sterculta Spp. (-476), Madiai animetria (Gila) Loog Ed. (-40), Denialita citarri (Dafés) Utable & Dafa (-40), Cartinita Spp. (-476),						
Myriaceae spp. (470), Canacarpa spp. (470), Conocarpus erecta L. (.2%), Myricaria germanica (L.) Desv. (. 2%), Vitex		meaning minapris (Ong) sacq-ret. (470), Damenia onvert (Kone) Hutch. & Datz (476), Crotolaria retusa L. (476), Myrtaoga spo (46), Calliagarna spo (46), Canagarna screta I. (26), Myriagaria garmaniag (1) Desy. (26), Vicen-						
doniana Sweet (2%) Vernonia spp. (2%)		doniana Sweet (2%) Vernonia spp. (.470), Conocurpus erectu L. (.270), Myricuru germanicu (L.) Desv. (. 270), Vitex						

Table 1b: Percentage occurrences of the recovered pollen in the different honey samples. None of the samples fell within the dominant pollen type common in monofloral honeys. Nsukka, Okigwe and Shaki honeys fell within the secondary pollen due to the percentage occurrences of *Elaeis guineensis* with values above 16%

Important minor pollen (IMP) <16%-3%	Minor pollen <3%				
Honev	Sample: Nsukka; Dominant pollen (DP)>45%: Nil; Secondary pollen (SP) <45%-16%: Elaeis euineensis Jaca, (16%)				
Lannea acida A. Rich. (8.4%), Parinari kerstingii Engl. (5.0%), Rutaceae spp. (4.8%), Combretum spp. (3.6%).	<ul> <li>Poaceae (2.8%), Acacia spp. (2.6%), Terminalia spp. (2.4%), Anacardiaceae spp. (2.4%), Indigofera spp. (2.4%), Tephrosia spp. (2.0%), Ceiba pentandra (Linn.) Gaertn. (2.0%), Anacardiaceae spp. (2.4%), Indigofera spp. (2.4%), Tephrosia spp. (2.0%), Ceiba pentandra (Linn.) Gaertn. (2.0%), Paullinia pinnata Linn. (2.0%), Sapotaceae spp. (1.6%), Entadrophragma angolense (Welw.) C. DC. (1.6%), Crudia klainei Pierre (1.6%), Bombax buonopozense P. Beuav. (1.6%), Syzygium guineense (Willd.) DC. (1.6%), Ludwigia spp. (1.2%), Pentaclethra macrophylla Benth. (1.2%), Albizzia zygia (DC.) JF Macbride (1.0%), Vernonia spp. (1.0%), Annonaceae spp. (1.0%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.0%), Cassia senegalensis (Linn.) (1.0%), Cyperaceaepollis spp. (1.0%), Brachystegia eurycoma Harms (1.0%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (1.0%), Gardenia imperialis K. Schum. (1.0%), Hymenocardia acida Tul (1.0%), Myrtaceae spp. (1.0%), Khaya senegalensis(1.0%), Asteraceae (.8%),Mussaenda spp. (.8%), Phyllantus reticulates Poir. (.8%), (.6%), Olax spp. (1.0%) Prosopis africana (Guill. &amp; Perr.) Taub. (.6%), Proteacidites spp. (.6%), Sacoglottis gabonensis (Baill.) Urb. (.6%), Solanum spp. (.6%), Triplochyton scleroxylon K. Schum (.6%), Sumenia americana Linn. (.6%), Spondianthus preusii Engl. (.6%), Dissotis spp. (.4%), Afelia africana Sm. ex Pers. (.4%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (.4%), Calliacarpa spp. (.4%), Capsicum spp. (.4%), Cuola edulis Baill.(.4%), Delonix regia (Boj. ex Hook) Raf. (.4%), Entanda abyssinica Steud. ex A.Rich. (.4%), Hyphaene tiebaica (Linn.) Mart. (.4%), Medinilla mirabilis (Gilg) JacqFél. (.4%), Milicia excelsa (Welw.) C.C.Berg. (.4%), Myricaria germanica (L.) Desv (4%), Nymphea lotus L. (.4%), Pterocarpus santalanoides(.4%), Pterocarpus soyauxii Taub. (.4%), Vitex doniana Sweet (.4%), Amanoa spp. (.2%), Coclospermum planchonii Hook f. (.2%), Carapa procera DC. (.2%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (.2%), Concoarpus erecta L (.2%), Sterculia spp</li></ul>				
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	globulifera Linn. f. (.2%), Tetrapleura tetraptera (Schum. & Thonn.) Taub. (.2%).				
Honey S	ample: Okigwe; Dominant pollen (DP) >45%: Nil; Secondary pollen (SP) <45%-16%: Elaeis guineensis Jacq. (23.6%)				
Parinari kerstingii Engl. (6.4%), <i>Ceiba</i> pentandra(Linn.) Gaertn. (5.2%).	<ul> <li>Bombax buonopozense P. Beuav. (2.6%), Nympheae lotus L. (2.4%), Paullinia pinnata Linn. (2.4%), Brachystegia eurycoma Harms (2.0%), Combretum spp. (2.0%), Indigofera spp. (2.0%), Lannea acida A. Rich. (2.0%), Rutaceae spp. (2.0%), Pterocarpus santalanoides L'Her. ex DC. (2.0%), Amanoa sp. (1.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (1.6%), Cleome spp. (1.6%), Crudia klainei Pierre (1.6%), Olax spp. (1.6%), Pterocarpus soyauxii Taub. (.4%), (1.6%), Solanum spp. (1.6%), Albizzia zygia (DC.) JF Macbride (1.4%), Alchornea cordifolia (Schum. &amp; Thonn.) Mull. Arg (1.4%), Annonaceae spp. (1.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (1.4%), Vernonia spp. (1.4%), Carapa procera DC (1.2%), Irvinga gabonensis (Aubry-Lecomte ex O'Rorke)Baill. (1.2%), Mitragyna spp. (1.2%), Phyllantus reticulatus Poir. (1.2%), Triplochyton scleroxylon K. Schum (1.2%), Allophyllus africanus P. Beauv. (1%), Asteraceae (1%), Pentaclethra macrophylla Benth. (1%), Polygala spp. (1%), Afraegle paniculata (Schumach.) Engl. (.8%), Ludwigia spp. (.8%), Spondianthus preusii Engl. (.8%), Terminalia spp. (.8%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (.8%), Poaceae (.8%), Sapotaceae spp. (.8%), Cyperaceaepollis spp. (.8%), Antiarias africana Engl. (.6%), Dissotis spp. (.6%), Desmodium spp. (.6%), Hymenocardia acida Tul. (6%), Khaya senegalensis (.6%), Calliacarpa spp. (.4%), Cocos nucifera (L.) (.4%), Coula edulis Baill. (.4%), Coclospermum planchonii Hook f. (.4%), Medinilla mirabilis (Gilg JacqFél. (.4%), Symphonia globulifera Linn. f. (.4%), Schinus spp. (.2%), Sacoglottis gabonensis (Linn.) (.2%), Conocarpus erecta (.2%), Myricaria germanica (L.) Desv. (.2%), Proteacidites spp. (.2%), Sacoglottis gabonensis (Baill.) Urb. (.2%), Ximenia americana Linn. (.2%).</li> </ul>				
Honey S	ample: Shaki: Dominant pollen (DP) >45%: Nil: Secondary pollen (SP) <45%-16%: Acacia spp. (22.8%)				
Tephrosia spp. (11.2%), Parinari kerstingii Engl. (7.6%); Ceiba pentandra (Linn.) Gaertn. (4.0%), Combretaceae (4.0%), Poaceae (3.2%), Isoberlinia doka Craib & Stapf (3.0%), Bombax buonopozense P. Beuav(3.0%).	<ul> <li>Brachystegia eurycoma Harms (2.2%), Rutaceae spp. (2.0%), Terminalia spp. (2.0%), Lannea acida A. Rich. (2.0%), Heliotropium spp. (2.0%), Cassia senegalensis (Linn.) (2.0%), Paullinia pinnata Linn. (2.0%), Khaya senegalensis (1.6%), Crudia klainei Pierre (1 %), Entadrophragma angolense (Welw.) C. DC. (1%), Gardenia imperialis K. Schum. (1%), Hymenocardia acida Tul (1%), Indigofera spp. (1%), Proteacidites spp. (1%), Pterocarpus santalanoides(1%), Sterculia spp.(1%), Syzygium guineense (Willd.) DC. (1%), Vernonia spp. (1%), Capsicum spp. (.8%), Triplochyton scleroxylon Triplochyton scleroxylon K. Schum (.8%), Afzelia africana Sm. ex Pers. (.6%), Albizzia zygia (DC.) JF Macbride (.6%), Berlinia grandiflora (Vahl) Hutch. &amp; Dalz. (.6%), Myrtaceae spp. (.6%), Cyperaceaepollis spp. (.6%), Crotolaria retusa L. (.6%), Cleome spp. (.6%), Myrtaceae spp. (.6%), Cyperaceaepollis spp. (.6%), Afraegle paniculata (Schumach.) Engl. (.4%), Anacardiaceae spp. (.4%), Annonaceae spp.(.4%), Antarias africana Engl. (.4%), Asteraceae(.4%), Coula edulis Baill. (.4%), Daniellia oliveri (Rolfe) Hutch. &amp; Dalz (.4%), Desmodium spp. (.4%), Dissotis spp. (.4%), Schinus spp. (.4%), Elaeis guineensis Jacq.(.4%), Tetrapleura tetraptera (Schum. &amp; Thonn.) Taub. (.4%), Vitex doniana Sweet (.4%), Allophyllus africanus P. Beauv. (.2%), Anogeissus leiocarpus (DC) Guill &amp; Perr. (.2%), Calliacarpa spp.(.2%), Cocos nucifera (L. (.2%), Dalbergia erasi(.2%), Entanda abyssinica Steud. ex A.Rich. (.2%), Ludwigia spp. (.2%), Mussaenda</li> </ul>				

# Physicochemical Analysis

Table 2. Results of the different physic-chemical tests on the different honey samples

Parameters	Abi	Ikom	Lokpanta	Nsukka	Okigwe	Shaki
Relative Density	1.40	1.39	1.39	1.38	1.37	1.38
Total Ash	0.59	2.40	1.78	2.00	1.82	0.20
$P_{\rm H}$	3.49	6.14	6.18	6.71	6.24	3.49
Acidity	0.18	0.07	0.17	0.07	0.17	0.24
Colour	А	LA	LA	А	LA	А
Moisture content	18.8	18.9	19.0	18.9	18.8	19.0
Total solids (%)	81.20	81.10	81.00	81.10	81.20	81.00
Fischer's Test	CRC	Ν	CRC	Ν	CRC	CRC

A: Amber; LA: Light amber; CRC: Cherry red colour; N: Negative



Figure 1. Map of Nigeria showing the location of the Sources of the Honey Samples



Figure 2. Comparative Dendrogram of the chemical parameters

### Discussion

The presence of abundant pollen taxa (Tables 1) attests to the good quality of the analysed honey samples (Selvaraju et al., 2019; Rodopoulou et al., 2018; Shubharani et al., 2012). The pollen content of the current Nsukka honey closely resembled those of Njokuocha and Ekweozor (2007) in being multifloral. Again, most of the pollen recorded for Nsukka, Lokpanta and Okigwe all in south eastern Nigeria especially Elaeis guineensis, Parinari kerstingii, Hymenocardia acida /Combretum Alchornea cordifolia, Daniellia oliveri, spp., Melastomataceae: Dissotis sp., closely resembled those they recovered. Majority of these same pollen were later reported by Njokuocha (2019) from his study of seven honey samples from seven towns in three local governments areas of Anambra state south eastern Nigeria. A critical analysis of the recovered pollen clearly reflected the dominant vegetation and nectar sources of the honey bees. For the Okigwe and Lokpanta sample from south eastern Nigeria Samples from Okigwe and Lokpanta which are closely located, showed over 95% similarity (Figure 2), possibly due to similarity in flora which is dominantly rainforest with elements of derived savanna due to over cultivation and high population density, the pollen assemblage contained Ceiba pentandra, Pentaclethra macrophylla, Pterocarpus santalanoides, P. soyauxii (common vegetables in the south east) Irvinga gabonensis, Berlinia grandiflora and Alchornea cordifolia, with common fungal spores, Charred Graminae Cuticle and rare *Poaceae*. The comparative analysis of the samples from the different locations revealed an interesting trend (Figure 2).

Abi and Shaki honeys showed 75% similarity, while Ikom and Nsukka samples showed 62% similarity. However, honeys from Ikom and Nsukka had some inherent qualities that differed from the other four samples. Furthermore, savanna pollen characterized the Shaki honey which appeared slightly similar to the results of Ige and Modupe (2010) from Abuja. *Acacia* spp. pollen dominated the assemblage possibly from the *Acacia* trees which are common around the Shaki-Ogbomosho area. Other pointers to the savanna vegetation were *Cassia senegalensis, Khaya senegalensis, Combretum* spp., *Parinari kerstingii, Tephrosia* spp., *Terminalia* spp., *Isoberlinia doka, Bombax buonopozense, Sterculia* sp., *Hymenocardia acida, Gardenia imperialis, Heliotropium* spp., among others.

The moderate records of fungal elements and Charred Graminae cuticles indicated savanna fires and preponderance of fungal elements in the air. The common recovery of *Ceiba* pollen further attest to its being a common source of nectar for honeybees in Nigeria just as (Ramirez-Arriaga et al. 2011) had reported from Mexico.

Generally, the common records of Elaeis guineensis and other forest species in these samples contrasts the reports of Adekanmbi and Ogundipe (2009) and Adeonipekun (2012) who reported the preponderance of Asteraceae and other pollen in the Lagos and Ibadan samples they studied. These differences could have arisen from the fact that these samples from the rural areas reflected the more closed forest canopies compared to Lagos and Ibadan where the main vegetation cover had been cleared for construction and other developmental purposes. The results of the present study further revealed the common occurrence of *Elaeis guineensis* pollen in Nigerian honey samples just as (Afolabi, 1974; Njokuocha and Ekweozor, 2007; Ige and Modupe, 2010) had all reported. Moreover Njokuocha (2019) had reported a 43.45% *Elaeis guineensis* for the Nsukka honey samples. This is close to 45%, the acceptable quantity for branding unifloral honey samples (Jasicka-Misiak et al. 2012). Should the percentage of *Elaeis guineensis* exceed 45%, then such honey sample will be branded as oil palm honey. Selvaraju et al. (2019) had reported the preponderance of pollen of oil palm Elaeis guineensis and coconut Cocos nucifera in honey samples from the west coast of Malaysia.

The results of the melissopalynological assessment coupled with the results of the Physico-chemical analysis (and Table 2). These values for the relative density conformed to international standards. Total ash: The ash content of the honey samples were measured by incinerating 3g of each honey overnight at 550°C in a furnace (Carboline, Sheffield, U.K.) until a constant weight is reached (Stefan 2009). The PH values of the six samples which ranged from 3.49 to 6.71 (Table 2), revealed that they were all acidic which concurs with the assertion of Saxena et al. (2010) that honey is normally acidic no matter where it came from. However, the Abi and Shaki samples with pH of 3.49 were more acidic than those with values above 6.0 for the Ikom, Lokpanta, Okigwe, and Nsukka with the highest value of 6.71. According to Khalil et al., (2012) the Abi and Shaki samples were fresh compared to the rest as pH values between 3.4 and 6.1 indicated freshness of honey. However, higher acidic values suggest possible fermentation of sugars into organic acids. They pointed out that pHinfluences honey texture, stability and shelf life.



Figure 3. Photomicrographs of some selected palynomorphs recovered from the Nigerian honey samples Names of the palynomorphs

A. Bombacaceae: Ceiba pentandra (Linn.) Gaertn. B. Asteraceae C. Fabaceae: Albizzia zygia (DC.) JF Macbride D. Sterculiaceae: Afraegle paniculata (Schumach.) Engl. E. Fabaceae: Tephrosia spp. F. Arecaceae: Elaeis guineensis Jacq. G. Sapotaceae: Delonix regia (Boj. ex Hook) Raf. H. Fabaceae: Berlinia grandiflora (Vahl) Hutch. & Dalz. I. Boraginaceae: Heliotropium spp. J. Fabaceae: Afzelia africana Sm. ex Pers. K. Chrysobalanaceae: Parinari kerstingii Engl. L. Rutaceae: Citrus sp. M. Guttiferae: Symphonia globulifera Linn. f. N. Meliaceae: Khaya senegalensis (Desv.) A. Juss. O. Bombacaceae: Bombax buonopozense P. Beuav. P. Polygalaceae: Polygala spp. Q. Annonaceae spp. R. Fabaceae: Brachystegia eurycoma Harms S. Anacardiaceae: Lannea acida A. Rich. T. Fabaceae - Isoberlinia doka Craib & Stapf Scale bars: 10µm



Figure 4. Photomicrographs of some selected palynomorphs recovered from the Nigerian honey samples Names of the palynomorphs A. Asteraceae B. Cyperaceae C. Arecaceae: Elaeis guineensis Jacq. D. Arecaceae: Hyphaene tiebaica (Linn.) Mart. E. Rubiaceae: Mussaenda spp. F. Euphorbiaceae sp. G. Rutaceae: Citrus sp. H. Rhizophoraceae: Rhizophora sp. I. Olalaceae: Ximenia americana Linn. J. Nympheaceae: Nymphea lotus L. K. Vitex doniana Sweet L. Melastomataceae: Dissotis sp. M. Cleome sp. N. Meliaceae-Khaya senegalensis (Desv.) A. Juss. O. Cochlospermaceae: Coclospermum planchonii Hook f. P. Combretaceae: Combretum spp. Q. Fabaceae-Papilionoideae: Heliotropium cf. cliffordiana R. Celtis sp. S. Terminalia sp. T. Chrysobalanaceae: Parinari kerstingii Engl. Scale bars: 10µm

#### Acidity

The colours which ranged from Amber to light amber especially for the samples from Abi, Nsukka, and Shaki denotes good quality as lighter colours are caused by over mixing with water or other materials (White, 1975, Crane,1980).

The moisture contents which ranged from 18.8% to 19.0% agreed with the reports of Saxena *et al.* (2010), from India in which the moisture content of six out of the seven samples they studied ranged from 17.2% to 21.6%. Khalil et al., (2012) had also documented moisture contents which ranged between 11.59-14.13% for four honey samples from Algeria. These values they pointed out were below the maximum prescribed limit for moisture content according to Codex standard for honey (Saxena *et al.* 2010). Khalil et al., (2012) had reported ( $\leq$  20%) as the limit of the International quality regulations (Codex Alimentarius, 2001). They further asserted the importance of water content for the shelf life of honey in storage. High levels of water encourages fermentation due to osmotolerant yeasts.

The result of the total solids which ranged between 81% for Lokpanta and Shaki to 81.20% for Okigwe and Abi fell within the Codex Alimentarius (2001) and European Union Standard Reports (2001). This implies that that the honeys have not undergo further processing as all the organic and inorganic contents were still intact (Kayode and Oyeyemi, 2014). The total solids were highest in the Abi and Okigwe samples with values of 81.20%, followed successively by 81.10% for the Ikom and Nsukka samples while the lowest values of 81.00 were obtained for the Lokpanta and Shaki samples. These results fell within the acceptable range indicating that the samples were not subjected to further processing (Khalil et al. (2012).

### Conclusion

The honey samples were all multifloral as no single species had values above 45%. The pollen contents point to the geographical origin of the honey as they reflected different vegetation zones of Nigeria. Those from Southeastern Nigeria were dominated by rainforest species (E. guineensis, Bombax, Ceiba, etc while those from the derived savanna and savanna regions were dominated by savanna species (Acacia spp., Combretum spp., Terminalia spp., Khaya senegalensis, and Tephrosia spp.). The Nsukka samples yielded an admixture of rainforest and some savanna species which is characteristic of a derived savanna due to over cultivation in the area possibly brought about by high population density. Chemical analysis revealed that the honey samples were of moderately good quality when compared to international standard and their acidic PH values reveals that they are unadulterated and have potentials to stay long as suggested by Lawal et al. (2009).

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