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Comparative Analysis of Proximate Composition and Minerals Elements of Honey Productions in Some Selected Local Government of Kwara State, Nigeria

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ABSTRACT
Use of honey is gaining ground worldwide as people are getting aware of the high nutritional values and its beneficial health effects. This study was carried out to compare the proximate compositions and the mineral contents of honey produced from selected local governments in Kwara State, Nigeria. The parameters were analyzed using standard methods of Association of Official Analytical Chemists. The results showed that the highest moisture content (21.03%) of honey samples was from Ilorin South LGA, the highest ash content (0.66%) was from Asa LGA, the highest protein contein (0.45%) from Moro LGA, the Fat content (0.09%) from Asa LGA and Ilorin West LGA was the highest respectively, and the highest Carbohydrate content (77.39%) was from Ilorin West LGA. The result indicated that the honey samples were of good quality. Honey in the studied Local Government areas are suitable for consumption due to their high quality.

Keywords: Honey, nutritional values, proximate compositions, mineral contents.

INTRODUCTION
Honey is a sweet, viscous food substance produced by bees and some related insects. Bees produce honey from the sugary secretions of plants (floral nectar) or other insects (aphid honeydew) through regurgitation, enzymatic activity and water evaporation. Honey is stored in wax structures called honeycombs (Agbagwa, Otokunefor & Peterside, 2011). Natural honey is one of the most widely sought products due to its unique nutritional and medicinal properties as a result of the different groups of substances it contains. Honey is a worldwide recognized natural food which has high nutritional value and many beneficial health promoting effects (Agunbiade, Arojojoye & Alao, 2012). It consists mainly of carbohydrates (at least 60% mass ratio), particularly reducing sugars such as fructose and glucose as fast energy source upon consumption. The minor components in honey include amino acids, vitamins, organic acids, minerals and various phytochemicals (Chua & Adnan, 2014).

Honey contains a variety of photochemical and other substances, such as organic acids, vitamins and enzymes, which may serve as a source for dietary antioxidants (Rebiai & Lanez, 2014). The major constituents of honey are nearly the same in all honey samples, however, the biochemical composition and physical properties of natural honeys varies greatly according to the plant species on which the bees foraged (Adeniyi *et al*., 2014). The composition and the quality of honey depend on many factors such as, climatic condition during production, nectar composition, agricultural practices and handling of honey during extraction and storage. Physicochemical characteristic of honey may also depend on the bee species as well as geographical origin (Oyeyemi, Kayode & Owolabi, 2015; Amril & Ladjama, 2013). Honey has a long history of human consumption, and is used in various foods and beverages as a sweetener and flavouring agent.

Honey is classified by the floral source of the nectar from which it was made. The quality of

honey is traceable to floral source and region of origin. Most commercially available honey is blended, that is mixture of two or more honeys differing in floral source, colour, flavour, density or geographic origin and its nutrition (Amril & Ladjama, 2013). The composition and quality of honey vary, depending on the climatic region, whether wet or dry, the environmental temperature, the type of botanical plant used to produce it, the honey bees species, the sugar composition, the treatment of honey during extraction, processing and subsequent storage conditions (Amril & Ladjama, 2013). Honey comes in a range of colours including white, amber, red, brown and almost black (Eleazu, Iroaganachi & Okoronkwo, 2013).

Furthermore, the properties of natural honeys also vary depending on the differences in climatic conditions and vegetation of the areas. Buba, Abubakar & Aliyu (2013), reported that natural honey is one of the most widely sought products due to its unique nutritional and medicinal properties, which are attributed to the influence of the different groups of substances it contains. Moisture content was found to be one of the important parameter that contribute immensely to the quality of honey as it affects its shelf life and processing characteristics (Bogdanov, 2009a, b). Moisture content also plays an important role in honey viscosity and savour (Kayode & Oyeyemi, 2014).

Traditionally, honey has been used as a medicinal remedy for the treatment of wound, various ailments and diseases. The healing capacity of honey is strongly influenced by the physical and chemical properties of honey (Adenekan, Amusa, Okpezel & Owosibo, 2012; Nwankwo, Ezekoye & Igbokwe, 2014). Due to the vast importance of natural honey and its commercial values but limited availability, people tend to produce honey from cane sugar or try to adulterate natural honey by addition of other sugars, syrups or compounds to change its flavour or viscosity. This process is sometimes used as a method of deception where buyers are led to believe that the honey is pure and natural, and also to increase the quantity available in the market in order to make more money. This study was aimed at comparing the proximate composition and minerals elements of honey produced in selected local government of Kwara State, Nigeria.

MATERIALS AND METHODS

Study Area

The honey samples used for this study were obtained from different apiaries in six selected local government areas of Kwara State, Nigeria. Three different apiaries were randomly selected in each Local Government based on their level of honey production. These selected local governments were Asa Local Government, Ekiti Local Government, Ilorin East Local Government, Ilorin West Local Government, Ilorin South Local Government and Moro Local Government in Kwara State, Nigeria.

Kwara state is located between latitudes 80 05' and 100 05' north and longitudes 20 50' and 60 05' east. It has an area of about 32, 500 square kilometres. The state has 16 local Government Areas and according to the2006 national census had a total population of 2,365,353.This is made up of 1,193,783 males and 1,171,570 females. Majority of the people are involved in small scale farming **(**Federal Republic of Nigeria Official Gazette, 2009). This gives the state an average of 72.8 per square kilometres. Oyebanji (2000) put the State's urbanization level at 30%, indicating that majority of the people resides in rural areas. There is strong evidence of urban primacy in the state with Ilorin the State capital having a concentration of large part of the population and infrastructural facilities.

The climate of Kwara State is characterized by both wet and dry seasons. The rainy season begins towards the end of April and last till October while the dry season begins in November and ends in April. The temperature of Ilorin ranges from 33ºC to 35 ºC from November to January while from February to April; the value ranges between 34 ºC to 37 ºC. Days are very hot during the dry season. The total annual rainfall in the area ranges from 990.3mm to 1318mm. The rainfall in Ilorin city exhibits the double maximal pattern and greater variability both temporarily and spatially. The relative humidity at Ilorin city ranges from 75% to 88% from May to October, while in the dry season it ranges from35% to 80% (Ajibade & Ojelola, 2004). The topography is mainly plain lands to slight gentle rolling. The annual rainfall ranges between 1000mm and 1500mm. Average

temperature ranges between 30 and 350C (KWADP, 1996).

Data Collection and Analysis

Proximate analysis was used to evaluate the quality of the honey samples collected from the apiary farms in the selected six local government areas of Kwara State. The parameters analysed were the moisture content, protein content, fat content, ash content and carbohydrate content. The analysis followed the procedure recommended by the Association of Official Analytical Chemists (AOAC, 2005). The protein content was determined by Kjeldahl method based on the total nitrogen content from the AOAC Official Method. The fat content was determined by using acid hydrolysis method. The dietary fibres which consisted of the total, soluble and insoluble fibres of honey samples were determined while the moisture content was measured by placing 5ghoney samples in an oven set at 105°C for 18 hours. The same samples were further analysed for the ash content by calcinating them in a furnace (Carbolite CWF 1100, Keison Products, England) at 550^0C until constant weight following standard procedures by AOAC (1990). Carbohydrate value was estimated from the equation according to Charrondiere *et al*. (2004).

Total carbohydrate (g/100 g) = 100 – (water + ash +protein + fat + dietary fibre)

RESULTS

The results of proximate analysis for all honey samples gotten from apiaries in selected local government areas in Kwara State are presented in Table 1. The moisture content of honey samples from Aboto, Pampo and Ogbondoroko in Asa local government area are 19.5%, 19.8% and 19.7% respectively. The ash content was 0.65%, 0.67% and 0.66% respectively; the protein content were 0.44%, 0.43% and 0.42% respectively, this signified that the protein content of the honeys were 44mg, 43mg, and 42mg in 100g of honey; while the carbohydrate content was 77.41%, 75.15% and 76.50% respectively. It was observed that the fat content (0.09%) of all the honey samples from Asa local government area are the same.

Furthermore, the moisture content of honey samples from Eruku, Owa Atun and Koro in Ekiti local government area were 20.5%, 20.2% and 19.6% respectively; the ash content were 0.54%, 0.62% and 0.59% respectively; the protein content was 0.34%, 0.37% and 0.40% respectively, this signified that the protein content of the honeys were 34mg, 37mg and 40mg in 100g of honey. Also, the fat content was 0.08%, 0.08% and 0.07% respectively; while the carbohydrate content of the honey samples were 75.59%, 76.20% and 77.30% respectively.

Also, the moisture content of honey samples from Amado, Gbadamu and Sharagi in Ilorin East Local Government Area was 19.7%, 19.2% and 19.6% respectively. The ash content was 0.59%, 0.68% and 0.55%; the protein content was 0.41%, 0.46% and 0.47% respectively, this signified that the protein contents of the honey were 41mg, 46mg and 47mg in 100g of honey; the fat content was 0.09%, 0.07% and 0.08% respectively; while the carbohydrate content of the honey samples was 76.11%, 77.25% and 75.10% respectively.

The analysis of the honey samples collected from apiaries in Badari, Ogundele and Oshin (Ilorin West LGA) shows that the moisture content was 20.1%, 19.9% and 20.3% respectively. The ash content was 0.60%, 0.59% and 0.53% respectively; the protein content was 0.36%, 0.40% and 0.43% respectively. Also, the fat content was (0.09%) for all the locations while the carbohydrate content was 78.16%, 77.30% and 76.70% respectively. Honey samples collected from apiaries in Fufu, Iponri and Koko (Ilorin South LGA) show that the moisture content was 20.4%, 21.8% and 20.9% respectively. The ash content was 0.70%, 0.62% and 0.60% respectively; the protein content were 0.37%, 0.42% and 0.39% respectively. Also, the fat content was 0.08%, 0.07% and 0.08% respectively; while the carbohydrate content was 77.0%, 76.15% and 76.50% respectively. The moisture content of the honey samples collected at Ajanaku, Arobadi and Bode Saadu (Moro LGA) was 19.0%, 19.8% and 19.9% respectively. The ash content was 0.41%, 0.45% and 0.49% respectively. Also, the fat content was 0.07%, 0.09% and 0.09% respectively; while the carbohydrate content of the honey samples was

76.10%, 75.55% and 76.60% respectively (Table 1).

Table 1: Proximate composition of honey samples from selected apiaries in Kwara State

Apiary Farms	Moisture Content %	Ash Content %	Protein Content %	Fat Content %	Carbohydrate Content %
Asa LGA					
Aboto	19.5	0.65	0.44	0.09	77.41
Pampo	19.8	0.67	0.43	0.09	75.15
Ogbodoronko	19.7	0.66	0.42	0.09	76.50
Ekiti LGA					
Eruku	20.5	0.54	0.34	0.08	75.59
Owa Atun	20.2	0.62	037	0.08	76.20
Koro	19.6	0.59	0.40	0.07	77.30
Ilorin East LGA					
Amado	19.7	0.59	0.41	0.09	76.11
Gbadamu	19.2	0.68	0.46	0.07	77.25
Sharagi	19.6	0.55	0.47	0.08	75.10
Ilorin West LGA					
Badari	20.1	0.60	0.36	0.09	78.16
Ogundele	19.9	0.59	0.40	0.09	77.30
Oshin	20.3	0.53	0.43	0.09	76.70
Ilorin South LGA					
Fufu	20.4	0.70	0.37	0.08	77.00
Iponri	21.8	0.62	0.42	0.07	76.15
Koko	20.9	0.60	0.39	0.08	76.50
Moro LGA					
Ajanaku	19.0	0.54	0.41	0.07	76.10
Arobadi	19.8	0.62	0.45	0.09	75.55
Bode Saadu	19.9	0.66	0.49	0.09	76.60

Source: Field Survey, 2019.

DISCUSSION

The moisture content in the investigated honey samples from the selected local government areas in Kwara State ranged from 19.50% to 21.03%. These were similar to the results of Ajao, Idowu, Obembe, (2013) who previously reported a range of 19.26% to 22.09% for honey samples in Kware State, Nigeria. Also, Adeniyi *et al*. (2014) reported the moisture content of 19.93% and 20.14% respectively for bitter and sweeter honey samples from Ondo State, Nigeria. Oyeyemi *et al*., (2015) reported the mositute content of 20.50% and 21.78% respectively for honey samples in Ado Ekiti, Ekiti State, Nigeria.

Furthermore, the ash content of the honey samples ranged from 0.57% to 0.66%. This is in agreement with the findings of Oyeyemi *et al*., (2015) reported the ash content of honey samples analysed as 0.58% and 0.44%, respectively. This is corroborated with the previous works of Adenekan *et al*. (2010) and Buba *et al.* (2013) that reported a range of 0.12 to 0.50% and 0.37 to 0.54% respectively for some Nigerian honey samples. But this result is not in agreement with the findings of Ndife, Kida & Makarfi, (2014) which reported the ash content of honey samples range of 1.18% to 1.73% respectively. Codex Alimentarium Commission Standard (2014) proposed not more than 0.6% ash content for normal honey. The results for the honey samples were within the acceptable ash content range of international standard values for honey as reported by CAC (2001). The crude protein contents estimated were between 0.37% and 0.45%. Oyeyemi *et al*., (2015) reported the crude protein of honey samples in Ekiti State as 6.25% and 5.65% respectively. These values were relatively lower compared with the value range of 1.43-2.72% reported by Agunbiade *et al*. (2012). The crude fat content for the honey samples also ranged from 0.076% to

0.09%. The low crude fat content in the honey samples indicated that they contain very little quantity of crude lipid and are thus not considered as adequate sources of lipid. Ndife *et al.* (2014) reported a range of fat value of 0.01% to 0.03%, in comparison study with an imported U.S.A, honey, which were lower than the obtained value while, reported value (0.01% to 0.50%) and lower compared to Leticia (2013) reported value of between 0.37% and 0.39%. The results of this study showed that the honey samples contained between 76.15% and 77.38% of carbohydrate. Oyeyemi *et al*., (2015) reported the honey samples in Ekiti State, Nigeria contained 66.04% and 62.27% of carbohydrate respectively. The values were comparatively lower than the value range of 77.60% to 86.20% reported for honey samples from six states in North-eastern Nigeria by Buba *et al.* (2013).

CONCLUSION

The honey samples evaluated were from six selected Local Government Areas of Kwara State, Nigeria. The physicochemical parameters analyzed were within the range of international standard. Generally, the high carbohydrate, protein and low crude fat contents in the honey samples irrespective of their sources together with appreciable amount of vital mineral elements confirm their nutritional quality and support their utilization in various food products. The honey samples were of good quality and standard. Honey in the studied Local Government areas are suitable for consumption due to their high quality.

REFERENCES

Adenekan, M.O., Amusa, N.A., Okpezel, V.E. & Owosibo, A.O. (2012). Nutritional and microbiological composition of honey samples obtained from Ogun State, Southwestern Nigeria. *European Journal of Sustainable Development*, 1(2): 271-286.

Adeniyi, K.A., Daudu, O.A.Y., Abubakar, A., Ismail, A.D., Busari, M.B., Abdulsalami, H. & Usman, O.K.A. (2014). Comparative analysis of the proximate and nutritional compositions of Nigerian bitter and sweet honey from Apis mellifera. *International Journal of Scientific and Research Publications*, 4(11): 2-4.

Agbagwa, O.E., Otokunefor, T.V., & Peterside, F.N. (2011). Quality assessment of Nigeria honey and Manuka honey. *J. Microbiol. Res*., 1(3): 20-31.

Agunbiade, S.O., Arojojoye, O.A. & Alao, O.O. (2012). Evaluation of some biochemical microbiological and physic-chemical properties of Moroccan honey. *Int.J. Agric. Biol*, 7(5):773- 776.

Ajao, A.M., Idowu, A.B., & Obembe, A. (2013). Comparative proximate and chemical analysis of feral and artificially reared bee honey samples from two ecological zones in Nigeria. *Journal of Environmental Conservation Research*, 1(3): 53-58

Amril, A, & Ladjama, A. 2013. Physicochemical characterization of some multifloral honeys from honeybees Apis mellifera collected in the Algerian Northeast. *African Journal of Food Science*, 7(7):168-173.

A.O.A.C., (2005): The Association of Official Analytical Chemist. 18th Marylad. AOAC International. William Harwitz (Ed). 200p.

Bogdanov, S. (2009a). Physical properties of honey, In: Book of Honey. Chapter 4. Bee Products Science

Bogdanov, S. (2009b). Honey composition In: Book of Honey, Chapter 5, Bee product Science.

Buba, F., Abubakar, G., & Aliyu, S. (2013). Analysis of Biochemical Composition of Honey Sample from NorthEast Nigeria. *International Journal of Scientific and Research Publications*, 4(11): 1-4

Chua, L.S., & Adnan, N.A. (2014). Biochemical and nutritional components of selected :honey samples. *Acta Sci. Pol., Technol. Aliment*, 13(2):169-179.

Codex Alimentarius Commision (2001). Draft revisal standard for honey Codex Alimentarius Commission, FAO, Rome, Alinorm, 25, 19-26

Eleazu, C.O., Iroaganachi, M. & Okoronkwo, J. (2013). Determination of the physico-chemical composition, microbial quality and free radical scavenging activities of

some commercially sold honey samples in Aba, Nigeria: The effect of varying colours. *International Journal of Biomedical Research, 4*(1): 32 - 41.

Kwara State Agricultural Development Project (KWADP) (1996). Agronomic Survey Report, KWADP, Ilorin.

Leticia, M.E. (2013) Comparative study of the physicochemical and palynological characteristics of honey from Melipona subnitida and Apis Mellifera. *International J of Food Science and Technology*, 48: 1698-1706.

Ndife, J., Abioye, L., & Dandago, M. (2014). Quality assessment of Nigerian honeys sourced from different floral locations. *Nigerian Food Journal*, 32(2): 48-55.

Nwankwo, C.M., Ezekoye, C.C. & Igbokwe, S.O. (2014). Phytochemical screening and antimicrobial activity of apiary honey produced by honey bee (Apis mellifera) on clinical strains of Staphyloccus aureus, Escherichia coli and Candida albicans. *African Journal of Biotechnology*.;13(23):2367-2372.

Oyebanji, J. O. (2000). "Kwara State" in A. B. Mamman, J.O. OyebanjiandS. W. Petters (eds.) Nigeria: A People United, A Future Assured, Volume 2,Survey of States. Federal Ministry of Information. Abuja.

Oyeyemi, S.D., Kayode, J., & Owolabi, M.O. (2015). Comparative nutritional studies on honey samples in Ado Ekiti, Ekiti State, Nigeria. *Donnish Journal of Medicinal Plant Research*, 2(2):016-020

Rebiai, A. & Lanez, T., 2014. Comparative study of honey collected from different flora of Algeria. *Journal of Fundamental and Applied Sciences*, 6(1):48-55.