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A COMPARATIVE STUDY ON THE CHEMICAL COMPOSITION OF HONEY

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ABSTRACT:- Honey is a substance made from nectar and sweet deposits from plants are gathered, modified and stored in the honey comb by the honey bees. In this case *Apis* species are of importance, due to the changes in viscosity, the consistency of the honey can be fluid, viscous or partly or entirely crystallized. Similarly, depending on the plant origin, the flavor, aroma, chemical composition and the count of pollen varies. No pollen or constituent particular to honey may be removed except where there are unavoidable circumstances in the removal of foreign inorganic or organic matter.

KEYWORDS: Honey, chemical composition and pollen.

INTRODUCTION:

Honey is produced by the honeybee and is a natural super-saturated sugar solution, which mainly composed of a complex mixture of sugars. Besides this, it is also contains minor constituents like protein enzymes (invertase, glucoseoxidase, catalase and phosphatise), amino and organic acids (gluconic acid, acetic acid), vitamins (ascorbic acid, niacin, flavonoids and carotenoid-like substances and minerals) and traces of lipids (Blasa *et al*., 2006). The composition of which depends on plant species visited by honeybee, the environmental, processing and storage conditions (Sudhanshi *et al*., 2010). Blossom or nectar honey is derived from the sugary excretion of some homopterous insects on the host plant or from the exudates of the plants (Abd El-Aleem, 2002).

Honey has been traditionally used as sweeteners in beverages and particularly for different purposes. It has a great potential to serve as alimentary supplement in medical therapies and a natural food without the addition of any substance in its elaboration (Azeredo *et al*., 2003). Nowadays, the concern and awareness on the use of artificial sweeteners and its cumulative consequences made the elites in Nigeria to use natural honey to sweetened their beverages, basically coffee and tea. This has consequently increased the demand for honey, especially in the urban areas and cities. This couple with the increasing population size made the honey breeders within the cities to tap from theincreasing demand for natural honey and expand their apiaries, in order to meet the market demand. Honey consumption had been reported to be effective at increasing the total plasma anti-oxidant and reducing capacity in human (Gheldof *et al*., 2003). In recent years, much attention has been centred on the use of natural dietary anti-oxidants as an effective protection against oxidative damage. Enzymes in honey serve as anti-oxidant by promoting the removal of oxygen (Oszmianski and Lee, 1990). Minor components of honey (i.e. enzymes) make it different from other substances, but some treatment like processing and prolonged storage usually reduce it enzymatic activity (Hudobro *et al*., 1995).

MATERIAL AND METHODS:-

The preparation of honey samples were performed according to the procedure described by Louveaux *et al.* (1978). Ten grams of honey were dissolved in 20 ml of distilled water. This mixture was then poured into centrifuge tube of 15 ml and centrifuged for about 5 min, at low speed. Distilled water was again added to the sediment, repeating the previous operation. The supernatant was decanted and stored in sterile pet bottles prior to further analyses. The moisture content was determined based on the refractometric method. In general, the refractive index increases with the increase in the solid content. The refractive indices of honey samples were measured at ambient temperature (25±20C) using the Abbe refractometer and the readings were further corrected for a standard temperature of 200C by adding the correction factor of 0.00023/0C. Moisture content was determined in triplicate and the percentage moisture content values corresponding to the corrected refractive index values were calculated using Wedmore's table (AOAC, 1990). The total solids of the

honey samples were measured by refractometry using Abbe hand-held refractometer and the results were expressed in 0Brix. All measurements were done at ambient temperature (25±20C) and the reading was corrected for a standard temperature of 200C by adding the correction factor of 0.00023/0C (AOAC, 1990). The total solid content (%) in the honey samples was calculated by using the formula described by Amin *et al*. (1999). Specific gravity was estimated by measuring refractive index (RI) using Abbere fractometer. For acidity (as formic acid), 10g honey was dissolved in 75 ml distilled water and titrated with 0.1N NaOH. The pH values were measured using a pH meter (Elico pH analyser, Elico Pvt Ltd., Mumbai) for a solution of honey prepared. The HMF content was determined the Winkler method described by Finola *et al*. (2007). Five grams of each of the samples were treated with a clarifying agent (Carrez), the volume was completed to 50ml and the solution was filtered. The absorbance of the filtrate was measured at 284 and 336nm against the aliquot treated with NaHSO3.

RESULT& DISCUSSION:

Physico-chemical analysis carried out on the natural honey collected within some selected Local Government Area (LGA) in the three sampling site, showed that hydroxyl methyfurfural (HMF) were in the ranges of 51.5 to 53.1 (ppm), 43.8 to 45.2 (ppm) and 43.4 to 49.6 (ppm). The results indicated that all the honey samples were in agreement with Codex standards (≤65.0 ppm level) and but do not conform to EUC (EU) standards of ≤40.0 ppm level. However, values obtained in this study were extremely higher that the values (2.15-4.16 ppm) reported earlier by Azeredo *et al*. (2003) for honey samples of *Apis mellifera* of different floral origin but in agreement with the findings of Finola *et al*. (2007). The HMF content is an indicative of natural honey freshness (Terrab *et al*., 2002). Azeredo *et al*. (2003) gave likely reasons for the low values of HMF as; immediate analyses conducted on honey samples at reception, meaning that no samples were adulterated with commercial sugar or had been subjected to high temperature. From this point of view, majority of the samples analyzed are fresh, if the information given by the bee-breeders that supplied the honey used for the studies are genuine. However, the amount of HMF contained in these samples does not represent a sanitary risk. The reducing sugar values were in the range of 70.2 and 76.4% which were far higher than the minimum values specified by both the CAC and EUC (EU) which stands at ≥ 65.0. These values were however in line with the findings of Azeredo *et al.* (2003); hence it conforms to both standards. The higher values recorded for the reducing sugars may not be unconnected with the fact that, honey is actually a solution with a high concentration of sugars (Azeredo *et al.*, 2003).

All the honey collected from the three selected site were strongly acidic of which the honey sample at Abeokuta in the being the most acidic with pH value of 2.73 and followed by 3.73 at If in the same site. However, pH values obtained from other districts were not significantly different form one another ($p<0.05$) in terms of their acidity, which were in agreement with the previous findings by Azeredo *et al*. (2003) with mean pH values of 3.65. On the other hand, TTA values that were obtained from these honey samples were in the range of 0.62 to 1.63 mg formic acid/kg which was in line with the standards of the CAC and EUC. Though, these TTA values were in agreement and conform to standards but were not significantly different ($p<0.05$) within each selected site under consideration. Percent moisture in the analyzed honey samples ranged from 22.5 to 26.5%. This is above the ≤ 21% water, the maximum amount allowed by the International regulations (CAC, 1998 and EUC, 1996). Finola *et al*. (2007) had reported that the water content of natural honey depends on various factors, some of which are the harvesting season, degree of maturity reached in the hive and climatic factors. The maximum amount of water contained by honey is regulated for safety against fermentation. The ash content of the honey samples ranged from 3.45 to 4.56%. The ash contents of all the samples of honey were higher than the maximum limits for International regulations. This high dispersion observed in the honey's ash content may indicate that the harvest process and/or the beekeeping techniques used by the producers are non-uniform. However, it has also been proposed that the ash content of honey depends on the material collected by the bees during the foraging on the flora (Ojeda De Rodriguez *et al*., 2004).

Table 1: Physico-chemical Composition of Some Natural Honey

SAMLING SITE	HMF	RS	pH	TTA	MC	ASH
S-1	51.5 to 53.1	73.8 to 74.5	3.69 to 3.67	1.58 to 1.68	25.5 to 25.0	2.2 to 2.8
S-2	43.8 to 45.2	71.3to 70.2	2.73 to 3.73	0.64 to 0.62	22.5 to 24.5	1.8 to 1.2
S-3	43.4 to 49.6	72.1 to 76.4	3.74 to 3.69	0.63 to 0.73	26.5 to 22.5	2.4 to 1.4

HMF= hydroxymethyfurfural (ppm); RS = Reducing Sugar (%);TTA = Titratable Acidity (mg formic acid/kg); M.C = Moisture Content (%); Ash (%); SC = Sucrose (%).

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