INTRODUCTION
Honey consists basically of a complex mixture of carbohydrates, especially glucose and fructose, organic acids, amino acids, minerals, vitamins, enzymes, pollens, and pigments (Schrammet al., 2003). It is a mixture of concentrated aqueous solution of inverted sugars and complex mixture of other saccharides, amino acids, proteins, organic acids, vitamins, minerals, Maillard reaction products and both enzymatic and non enzymatic antioxidants, including glucose oxidase, catalase, ascorbic acid, flavonoids, phenolic acids and carotenoid derivatives (Almamary et al., 2002; Gheldofand Engeseth, 2002). Its nutritional quality, medicinal, and sensory properties have attracted thousands of consumers (Carlos et al., 2009).

The honeybee (Apis mellifera) is the specie that produces large quantity of honey in Dange town, Sokoto State, Nigeria. Bees obtain all their nutritional components from nectar, pollen and water. Nectar is reduced to honey containing predominantly carbohydrates with very little protein, vitamins and minerals (Yaghoobi et al., 2008). Whiteland Doner (1980) reported that fully ripened honey consists of levulose/fructose (41%) and dextrose/glucose 35% and 22 others, which are more complex than the monosaccharides present in quite minute quantities. Of the 22 complex sugars, the oligosaccharides identified are maltose, isomaltose, maltulose, nigerose, turanose, kojibiose, laminarihiose, α, β-trehalose and gentiobiose. Ten trisaccharides are present: melezitose, maltotriose, 3-α-isomaltosylglucose1-ketose, panose, isomaltotriose and isomaltopentaose. Most of these sugars do not occur in nectar but may arise from enzymes added by honeybee during honey ripening or by chemical action in the concentrated acid sugar mixture of honey (Gheldof et al., 2002).

The presence of phytochemicals such as flavonoids and phenolic acids, may suggest the role of honey, along with fruits and vegetables, as a nutritional source of natural antioxidants responsible for protecting human health as was earlier reported (Gheldof et al., 2002; McKibben and Engeseth 2002; Schrammet al., 2003; Tonks et al., 2001 and Tonks et al., 2003). Its antibacterial, antiinflammatory, antioxidant and anticancer properties have been extensively discussed (Orsolic et al., 2005; Swellam et al., 2003; Blasa et al., 2006 and Board, 1972). Vitamin C and most of the vitamin B complex are present in variable amounts (Oszmianski and Lee, 1990). Apart from being a high-energy substance, honey has high digestibility, high acidity as well as high taste appeal. By this characteristic antioxidant property, honey when applied at 10% has been found to inhibit enzymatic browning in apple slices and grape juice (Khan, 1985). This study was designed to investigate the proximate composition and antioxidant properties of two varieties of honey samples obtained from Dange Shuni local government area of Sokoto State, being the predominant producer of honey around the Metropolis.

MATERIALS AND METHODS
Collection of the Sample
The two varieties of honey (dark amber and light amber) were obtained from Dange central market in Dange town, Sokoto State, Nigeria.
Proximate Chemical Composition and Trace Elements Estimation

Nutritional compositions of the two honey samples were estimated with standard techniques. Moisture content (AOAC, 1990), ash (Oyenuga, 1987), crude protein by Micro kjehdahl method (AOAC, 1990), crude lipid by Soxhlet method, crude fibre (AOAC method, 1990), carbohydrates (by difference), vitamin A (Lowry et al., 1983), vitamin C (Tillmans method, 1930) based upon the reduction of the dye (2,6-dichlorophenolindophenol) by an acid solution of ascorbic acid, determined by titration and vitamin E by colorimetric method (Lowry et al., 1983) based on the reduction of ferric ions to ferrous ions, which form red colour with dipirydyl. The ash solutions were prepared with wet digestion (Raganna, 1986).

The results were expressed as means ± standard deviations of three replicate determinations.

RESULTS AND DISCUSSION

The results of proximate composition (Table 1), shows that the values are expressed as means ± Standard Deviation (n=3), ND = Not Detected.

The small amount of ash content (0.55± 0.05 and 0.68 ± 0.11 %) also suggests that honey contains small amount of minerals like Ca, Mg, Fe, K, Na etc. These results are in consonance with reported values of 17.1% water, 82.4% carbohydrates, 38.5% fructose, 31% glucose and 12.9 % other sugars and 0.5% proteins, amino acids, vitamins, phenolic compounds, organic acids and multiple minerals, among other minority constituents (White and Doner1980; García et al., 1986; Garrett and Grisham, 2001 and Montenegro et al, 2003).

The concentrations of vitamins A, C and E as 4.08± 0.21, 2.22± 0.10 and 0.28± 0.03 mg/dl for light amber and 4.42± 0.06, 2.61± 0.11 and 0.26± 0.02 mg/dl for dark amber respectively, showed both honeys to contain relatively high amounts of vitamins A and C indicating possession of antioxidant properties by both samples, as well as good for maintenance of normal vision. This conforms to Satyanarayana and Chacrpani(2008) report, that honey contains high amounts of vitamin A.

On comparative basis, the study revealed that light amber honey contains more carbohydrates than dark amber honey while the latter contains more protein, lipid, moisture and more vitamins A and C than the former. This suggests dark amber honey to be better than light amber honey in terms of nutritional value as well as antioxidant potential.

Table 1: Proximate composition of the two honey varieties

<table>
<thead>
<tr>
<th>SAMPLES</th>
<th>PARAMETERS (% Composition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Ash</td>
</tr>
<tr>
<td>Light Amber</td>
<td>9.39± 0.15</td>
</tr>
<tr>
<td>Dark Amber</td>
<td>13.03± 0.47</td>
</tr>
</tbody>
</table>

The values are expressed as means ± Standard Deviation (n=3), ND = Not Detected

Table 2: Antioxidant vitamins contents of the two honey varieties

<table>
<thead>
<tr>
<th>SAMPLES</th>
<th>VITAMINS(mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIGHT AMBER</td>
<td>Vitamin A</td>
</tr>
<tr>
<td></td>
<td>4.08± 0.21</td>
</tr>
<tr>
<td>DARK AMBER</td>
<td>4.42± 0.06</td>
</tr>
</tbody>
</table>

The values are expressed as means ± Standard Deviation (n=3)

CONCLUSION

Both honeys are a good source of energy and natural antioxidants. Honey is therefore, considered to be a valuable food and medicinal material, that nourishes, heals as well as protects the body against certain diseases, with dark amber honey having more potentials than light amber.

REFERENCES


