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A Study on Some Vitamins and Minerals Content of Wheat Flour Samples Commonly Sold Within Kano Metropolitant

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Abstract: ***Vitamin A, C and some minerals were analysed in five (5) different samples of wheat flour that are commonly found in Kano metropolis. Out of the five samples only Golden penny were found with the lowest concentration of Vitamin A content, all the rest are within the normal range(375 - 1300µg/kg). The Vitamin C content in the five (5) wheat flour samples showed that Supreme had lowest concentration of vitamin C(13.80mg/kg) and Golden penny had the highest (92.40mg/kg), the rest are within the normal range(30 - 95mg/kg). The concentration of Zn is significantly higher in Honey well(4.50mg/kg) and Dangote(4.33mg/kg) then the rest. The concentration of Cu is higher in Golden penny(0.59mg/kg) and BUA(0.42mg/kg), the rest are below the range. Higher concentration of Fe in Golden penny(3.72mg/kg) and Honey well (3.12mg/kg)then the rest. Higher concentration of Mg in Golden penny (30.08mg/kg) and BUA (29.96mg/kg). The concentration of Na , K, Ca, Mn, was higher in Golden penny then the other samples. Therefore Golden penny contain significant amount of mineral elements and Supreme as such can be used as nutritionally sources.***

Keywords: Vitamin A, Vitamin C, Mineral element and wheat flour

1. Introduction

Wheat is a cereal grain, originally from the Levant region of the Near East but now cultivated worldwide. In 2010, world production of wheat was 651 million tons, making it the third most-produced cereal after maize and rice. Widespread consumption of cereal grains began in the Middle East about 10,000 years ago, when agriculture first began. It was then that wheat was first planted and cultivated.

Today, thousands of varieties of wheat are grown throughout the world, most requiring fertile soil and a temperate climate. Several locations in North America have ideal conditions for growing high-quality wheat, including the mid western United States and the southern prairie region of Canada. Other major wheat growing countries include China, India, France, and Russia.

Wheat is more popular than any other cereal grains for its use in baked goods, its popularity stems from the gluten that forms when flour is mixed with water. Without gluten, raised bread is hard to imagine. Wheat is also preferred because of its mild, nutty flavor. Those factors account for wheat being the most widely grown cereal grain in the world. Wheat kernels are the seeds of the wheat plant, and they are the part of the plant that is milled into flour. Since cereal grains are in the grass family, wheat kernels can be thought of as a type of grass seed. In fact, when a field of wheat starts to grow, it looks like lawn grass.
White flour—the ground endosperm—contains mostly starch, yet other components naturally present in white flour affect its properties. The main components in white flour are shown below, with approximate percentages provided in parentheses. Of these, the two key components are starch and protein. Starch makes up the bulk of flour (68–76 percent). Even bread flour, considered "low" in starch, contains more starch than all other components combined. Starch is present in flour as small grains or granules. Some starch granules are damaged during the milling process or when flour is stored under damp conditions.

When this happens, a very small amount of starch is broken down by amylase into sugars that are readily fermented by yeast. The amount of sugars naturally present in flour (less than 0.5 percent) is rarely high enough for proper yeast fermentation, which is why most yeast dough formulae include at least some sugar or a source of amylase.

Chunks of protein (6–18 percent) act as the cement that holds starch granules in place in the endosperm. Together, glutenin and gliadin, the gluten-forming proteins, make up about 80 percent of the proteins in the endosperm. Other proteins in white flour include enzymes, such as amylase, protease, and lipase.

Moisture in flour typically ranges from 11–14 percent. When moisture content rises above 14 percent, flour is susceptible to fungus and mold growth, flavor changes, enzyme activity, and insect infestation. For these reasons, flour must be stored properly, covered and in a cool, dry place (Figoni, 2003).

Vitamins A (in the form of beta-carotene), C, and E function as antioxidants, which are vital in countering the potential harm of chemicals known as free radicals. If these chemicals remain unchecked they can make cells more vulnerable to cancer-causing substances. Free radicals can also transform chemicals in the body into cancer-causing agents. Environmental pollutants, such as cigarette smoke, are sources of free radicals.

Minerals are minute amounts of metallic elements that are vital for the healthy growth of teeth and bones. They also help in such cellular activity as enzyme action, muscle contraction, nerve reaction, and blood clotting. Mineral nutrients are classified as major elements (calcium, chlorine, magnesium, phosphorus, potassium, sodium, and sulfur) and

trace elements (chromium, copper, fluoride, iodine, iron, selenium, and zinc).

Vitamins and minerals are found in a wide variety of foods, but some foods are better sources of specific vitamins and minerals than others. For example, oranges contain large amounts of vitamin C and folic acid but very little of the other vitamins. Milk contains large amounts of calcium but no vitamin C. Sweet potatoes are rich in vitamin A, but white potatoes contain almost none of this vitamin. Because of these differences in vitamin and mineral content, it is wise to eat a wide variety of foods (WHO, 2000). Mineral are classified as major elements (calcium, chlorine, magnesium, phosphorus, potassium, sodium and sulphur) and trace elements (chromium, copper, fluoride, iodine, iron, selenium and zinc) (Worthington-Roberts, 2008). Vitamins and minerals not only help the body perform its various functions, but also prevent the onset of many disorders (Wardlaw, 1994).

Carotenoid pigments are present in white flour in extremely low amounts (1–4 parts per million). They provide the creamy, off-white color to unbleached flour. The carotenoid pigments in white flour are in the same family as betacarotene, the orange pigment in carrots (WHO, 2003).

2. Materials and Methods

2.1 Sample Collection

Five wheat flour samples were obtained from Sabon gari and Singer Markets of Kano State, The samples were produced by: Dangote flour mills, Bua flour mills, Supreme flour mills, Golden penny flour mills, Honeywell flour mills.

2.2 Sample Preparation

2.2.1 Determination of Vitamin A

The beta carotene was determined by pigment extraction according to the modified method of association of analytical chemist (AOAC, 1990). The absorbance of the extract was measured, using spectrophotometer at a wave length of 436nm and cuvette – containing petroleum ether (blank) used for calibration. The process was repeated 5 – 6 times for each sample and average values were recorded.
Bear – Lambert's law was applied to determine the beta carotene concentration in each sample and it states that:
A = ECL
Where A = Absorbance
E of B – Carotene = 1.25 x 104 g/L/cm
E = Extinction co – efficient
C = Average concentration
L = Path length (thickness of the cuvettes).
After the concentration of β – carotene was calculated, the vitamin A (retinol) was calculated by using the following.
6µg/L of β – carotene equivalent = 1µg/ L of retinol equivalent.
Therefore
xµg/L of β – carotene will be equivalent to = xµg/L/6
= xµg/L of retinol
= xmg/100cm3.
Where x = the value of β – carotene

2.2.2 Determination of Vitamin C (Ascorbic Acid)

The method used to determine ascorbic acid content of the samples was adopted from strove and makarova, 1989. A portion of the filtered against 0.001M of 2,6 – dichloropenolindophenol until the pink colour was obtained. The volume of the dye required (V) was required. The procedure was carried out in triplicate. The ascorbic acid concentration (a) in mg/kg was determined from the equation, (strove and makarova, 1989).

$$a = \frac{0.088v \times 100 \times 1000}{10b}$$

Where b is the weight of sample used in extracting in g.

2.2.3 Ashing of wheat flour.

Metal analysis always required ashing of the dried samples. Various techniques were tested for all procedure. Ashing with addition of HNO3 as reported by AOAC (1999) gave very satisfactory result and was adopted.

2.2.4 Metal Analysis

Total of 10 metallic elements were measured in the flour samples. Na, K and Ca were determined by flame photometry (AOAC, 1999), while Cu, CO, Ni, Mg, Mn, Fe, and Zn were determined using atomic absorption spectroscopy (ASS) (John and Van, 1980).

3. Result

The result obtained revealed that Golden penny has the smallest value of the B- carotene content followed by BUA then Honeywell and Dangote, Supreme which has the highest value of β – carotene. While the concentration of Vitamin C from the samples indicate that Golden penny has highest concentration of Vitamin C and the Supreme with the least concentration as shown in table1.

Table 1: Concentration of Vitamin A and C analysed in wheat flour samples.

S/No	*Samples Names*	*Concentration of Vitamins A in µg/kg*	*Concentration of Vitamin C in mg/kg*
1.	Golden penny	178±0.05	30.80±0.66
2.	BUA	357±0.02	13.00±0.01
3.	Dangote	532±0.02	92.40±0.09
4.	Honeywell	485±0.03	74.80±0.01
5.	Supreme	846±0.01	88.00±0.02

Key: µg = microgram, mg = milligram, kg = kilogram, ± = standard error.

The concentration of the mineral elements found in wheat flour samples are given below. The elements are: Na, Ca, Co, Ni, Fe, Mg, Zn, Mn, K and Cu.

Table 2: Minerals element in (ppm) mg/kg content in the wheat flour samples

Samples	Na	K	Ca	Co	Zn	Mn	Cu	Ni	Fe	Mg
Golden penny	5.80± 0.6	7.11± 0.3	2.57± 0.1	0.69± 0.0	4.11± 0.4	0.74± 0.2	0.59± 0.1	3.08± 0.6	3.72± 0.4	30.08± 0.2
Honeywell	5.15±0.6	6.67±0.4	2.45±0.9	0.83±0.0	4.50±0.1	0.59±0.3	0.23±0.0	3.21±0.4	3.12±0.4	29.90±0.2
Dangote	5.79±0.6	6.59±1.6	2.19±0.1	0.73±0.2	4.33±0.3	0.60±0.0	0.23±0.0	2.31±0.2	3.04±0.4	29.61±0.4
Supreme	5.28±0.4	6.78±0.7	2.45±0.1	0.88±0.2	3.89±0.1	0.67±0.0	0.32±0.1	2.95±0.2	2.73±0.4	29.48±0.2
BUA	4.89±0.2	6.89±0.4	2.45±0.1	0.69±0.1	3.39±0.1	0.52±0.0	0.42±0.0	3.21±0.1	2.86±0.3	29.96±0.0

Key: Na = Sodium, K = Potassium, Ca = Calcium, Co = Cobalt, Zn = Zinc, Mn = Manganase, Cu = cupper, Ni = Nickel, Fe = Iron, Mg = Magnesium and ± Standard error, ppm = part per million.

4. Discussion

From the results obtained, Golden penny sample had the lowest concentration of B – carotene and Supreme wheat flour sample had the highest concentration while the rest are within the normal range. The results coincide with an analysis conducted in USA as reported by (Robert et al., 2000) were the value of vitamin A ranges from 375-1300µg/l.

Also the result indicates that the Golden penny sample had the highest Vitamin C concentration and Supreme flour samples with the lowest concentration. While the rest are within the range given where the supreme are below the reported range 30 – 95mg/kg (Robert et al., 2000).

Sodium, Calcium and Potassium are found highest in Golden penny and least in Dangote but slightly reduce of sodium at BUA. Their importance was discussed by (Alhassan, 2000) and (Food and Nutrition Board, 1997). Cobalt was found highest in Supreme flour and least in Golden penny and Zinc concentration where found highest in Honeywell and least in BUA and the importance was discussed by (Lee, 1999 and Alhassan, 2009).

Golden penny have the highest concentration of Cupper, manganese, iron and magnesium, supreme have a low concentration of iron and magnesium while Dangote have the least concentration of cupper and Nickel. BUA was found to have the lowest concentration of manganese.

5. Conclusion

From the result of the analyses carried out in this research work, it could be seen that all the wheat flour samples contain a significant amount of vitamin A precursor (i.e β - carotene), Vitamin C and some mineral elements, which could be therefore be nutritionally important for growth and development. Thus, the wheat flour is recommended as a nutrient source for consumers especially where vitamin A, iron and magnesium are needed.

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