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CHEMICAL COMPOSITION OF BEAN WEEVIL (*Acanthoscelides obtectus*)

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ABSTRACT

Studies conducted on chemical composition of bean weevil (*Acanthoscelides obtectus*) revealed that a mg/100g dry matter sample of the weevil contains 34.14 ± 0.02% moisture, 38.94 ± 0.01% crude protein, 34.07 ± 0.03% crude fat, 12.00 ± 0.01% crude fibre, 8.00 ± 0.01% ash and 36.99 ± 0.01% carbohydrate, the results of the mineral composition showed that mg/100g dry water sample of bean weevil contains Ca (3.30 ± 0.01), Mg (1.0 ± 0.01), Na (0.01 ± 0.02), K (0.31 ± 0.02), P (0.022 ± 0.02), Zn (2.09 ± 0.02), Mn (1.60 ± 0.02), Cu (1.15 ± 0.01) and Fe (7.92 ± 0.01). The toxicants content of a mg/100g of the sample were 5.28 ± 0.01, 2.64 ± 0.01, 4.96 ± 0.01 and 3.30 ± 0.01 for total oxalate, HCN, tannins and phytate respectively. Hence bean weevil contains less amount of toxicants and high amount of vital nutrients required for healthy living.

KEY WORDS: Bean weevil, proximate composition, minerals, toxicants.

INTRODUCTION

Compositions of certain foods and delicacies have been one of the most common measures adopted by peasants in most African communities to improve their nutritional status. In Nigeria, insects and lesser animals including grasshopper, beetles, caterpillars, weevils, winged termites and other aquatic insects have played important part in the history of human nutrition where hundreds of species have been used as human food.

Ordinary, insects are not used as emergency food to ward off starvation but are included as a planned part of diet throughout the year or when seasonally available.

Reports indicate that insects are the main sources of proteins and fat (Florence, 1996) while some contain toxicants (Mche, 1987). In view of the persistent shortage of animal protein in most Nigeria diet, Pullet and Young (1980) reported the need to utilize insects as delicacies and other lesser-known animal proteins for dietary supplements.

Weevils like most insects are seen by many people as pests, because at the larva and adult stages the damage they cause to the bean contents is a combination of feeding and contamination.

The bean weevil, A. obtectus is a small wedge-shaped insect (0.2-03cm long). It belongs to the phylum; arthropoda, class; insecta and family; celeoptera *(Akinsanmi, 1980).* This species is light olive coloured and mottled with dark brown or grey reddish legs. The bean weevils are stored products granivores and typically infest various kinds of bean species particularly the species *Phaseolus vulgaris* where they live for most of their lives inside the seed feeding on the seeds and leaving perfectly round holes in the beans. This reduces the food value (Marer, 1991) as well as the germination potential of the seeds (Gill, 1975).

The study is significant in that the results of its findings have provided the needed information on the nutrient composition of bean weevil.

MATERIALS AND METHODS

A large quantity of the weevil was obtained by sieving the weevils from the infested bean *Phaseolus vulgaris* bought from a grain store in Ikot Ekpene Town Main Market in Ikot Ekpene Local Government Area of Akwa Ibom State, Nigeria.

The weevils were washed with clean water to remove the bean powder and allowed to dry in air, without exposing it to sunlight.

The sample was introduced into a hot air circulating oven (Gallenkamp hot box) at 60^0C for 24 hours and grounded into powder using blender (Gallenkamp, 220). The brown powdery sample obtained was stored in air tight container from which required quantities were scooped out for chemical determinations using AOAC (1975) methods.

Moisture was reported as the loss in known weight of the sample upon drying in a hot air circulating oven (Carbolyte hot box, model 530) at 60^0C for 24 hours. Ash was determined by incineration of known weight of the sample in muffle furnace at 55^0C for 24 hours. Crude fibre was determined by the acid and alkaline digestion method while crude protein was by Micro-kjeldahl procedure (AOAC, 1975).

Crude fat was determined by exhaustive extraction of known weight of the sample with petroleum ether (bp 40^0C – 60^0C) for 6 hours. Carbohydrate was obtained by the difference method (i.e by subtracting percentage crude protein, crude fibre, lipid and ash from 100%).

The mineral composition in the weevil was determined using AOAC (1975) method. The toxicants; HCN and phytate were determined by AOAC (1975) method while total oxalate and tannins were determined using methods of Dye (1956) and Burns (1971) respectively.

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RESULTS

(a) The results of proximate composition, mineral composition and toxicant level of bean weevil in mg/100g dry matter are presented in Table I, Table II and Table III respectively.

Table I: Proximate composition of bean weevil in mg/100g (Dry matter basis) %

Analysis	Composition
Moisture (w. w)	34.14 – 0.02
Ash	8.00 ± 0.01
Crude Fibre	12.00 ± 0.01
Crude Protein	38.94 ± 0.01
Crude Fat	34.07 ± 0.03
Carbohydrate	36.99 ± 0.01

Values are means of duplicate determination ± S. D

Table II: Result of minerals composition of bean weevil in mg/100g DM of sample

Element	Composition
Ca	3.30 ± 0.01
Mg	10.08 ± 0.01
Na	0.01 ± 0.02
K	0.13 ± 0.02
P	0.22 ± 0.02
Zn	2.09 ± 0.01
Mn	1.60 ± 0.02
Cu	1.15 ± 0.01
Fe	7.92 ± 0.01

All values are means of duplicate determination ± S.D

Table III: Result of toxicant level of bean weevil (mg/100g) dry matter

Toxicant	Composition
Total Oxalate	5.28 ± 0.01
HCN	2.64 ± 0.01
Tannins	4.96 ± 0.01
Phytate	3.30 ± 0.01

All values are of duplicate determination ± S.D

DISCUSSION

Results of the proximate composition in mg/100g dry matter of the bean weevil sample are represented in Table I. Moisture, crude protein and carbohydrate had higher values of 34. 14 ± 0.02%, 38.94 ± 0.01% and 36.99 ± 0.01 respectively. The value of crude fibre (12.00 ± 0.01%) was moderate while those for Ash (8.00 ± 0.04%) and crude fat (4.02 ± 0.03%) were relatively low.

The high protein content of the weevil confirms previous reports that various insects have good quality of protein. Florence (1996) reported that a mg/100g sample of dung beetle, termite and giant water beetle contain 17.2%, and 14.2% and 19.8% respectively. Arnold (1996) also reported that 100g of small grasshopper contained 20.6% protein while the large grasshopper contained 14.3%. the fat content of the weevil is also not quite different from those obtained for 100g red ant (3.5%), cricket (5.5%) and pupae of silk worm (5.6%) (Florence, 1996).

Fats do not only act as energy source when oxidized, they also contribute to palatability of the diet. Moisture has been known to be major component of cells and its content affect food stability and quality of other nutrients.

(c) The result of mineral composition of bean weevil in mg/100g dry matter of sample is reported in table II. Magnesium and iron had the highest values of 10.08mg ± 0.01 and 7.292 ± 0.01 respectively. The least values

0.01mg ± 0.02, 0.13mg ± 0.02 and 0.22 ± 0.02 were recorded for Na, K and P respectively. The sample is poor in macro nutrients especially Na, K, P, but rich in micro nutrients (Fe, Zn and Mn). Ca and Mg are present at a reasonable amount.

Arnold (1996) reported that 100g sample of termites, cricket and palm kernel weevil contain 35.5mg, 7.7mg and 13.1mg of iron respectively; indication that insects are rich sources of Fe. Like other insects weevils are good sources of calcium, occasioned by their possession of exoskeleton which is composed of calcium (Ebong, 1993).

(d) Table III reports the level of toxicants in bean weevil. The milligram per 100g dry matter of the weevil contain Total oxalates (5.28mg ± 0.01) HCN (2.64mg ± 0.01), Tannins (4.96 ± 0.01) and phytate (3.30mg ± 0.01). The levels of the toxicant are relatively low to raise alarm. For instance, the level of oxalate in the sample it too low to affect bioavailability of minerals like Fe, Mn, Zn, in the consumers. The quantity of HCN in the sample does not also pose any problem since small doses (0.5 – 3.5g) of HCN are detoxified to thiocyanide in mammals and excreted in the urine. Whereas tannins reduce digestibility and nutritive value of the food substance (Mitchell, 1980) phytate exhibits its antinutritional property when it chellates divalent ions and make them un-available (Murray, 1993).

CONCLUSION

From all indications the bean weevil is nutritious judging from the array of elemental composition. The high proximate profile also suggests that the bean weevil has high nutritive value just as the low toxicant levels present it as a delicacy which may not pose any problem to consumers. Hence the bean weevil can be used as alternative source of vital nutrients required for individual's well being.

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