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EDIBLE ORTHOPTERAN AND LEPIDOPTERAN AS PROTEIN SUBSTITUTES IN THE FEEDING OF EXPERIMENTAL ALBINO RATS

R. F. Ogunleye* and O. T. Omotoso
DEPARTMENT OF ZOOLOGY,
UNIVERSITY OF ADO-EKITI, ADO-EKITI, NIGERIA.

ABSTRACT

Experiments was conducted on the use of *Zonocerus variegatus* (Orthopteran) and *Cirina forda* (Lepidopteran) as possible protein substitutes in the feeding of experimental albino rats in the laboratory. The result of the proximate composition of *C forda* and *Z variegatus* showed a high crude protein values of 49.70%, 48.6%; moisture content of 10.92% and 11.11% and Fat of 22.21% and 7.14% respectively. These compares favourably well with the result recorded for fish. The two insects have a considerably high amounts of potassium, calcium, phosphorus, sodium, magnessiun and Iron. There was an increase in the weights and lengths of rats fed with diets containing *C forda* and *Z variaegatus*. There were no significant differences in growth recorded for the experimental diets and the control at 5% level of probabjlity using fishers' least significant difference (LSD).

INTRODUCTION

The use of albino rats as experimental animals in institutions of higher learning and research institutes has become immense. This is because the anatomy as well as physiology of these animals in closely related to that of man and most of the chemical and biochemical experiments carried out with these animals often produce similar results with those conducted on man, hence, they serve as very good references point. There is therefore the need to pay special attention to the feeding of these animals so as to maintain their high population in our research laboratories.

Most of these animals have become adapted to omnivorous life under the laboratory conditions (Coastes *et al* 1996). Feeding of experimental rats in the laboratory requires the use of convectional feeds e.g growers' marsh; good parentage of which is made up of animal protein. Animal protein is very expensive in the tropics and most students could not afford to buy them in quantities large enough for compounding feeds to maintain their experimental rats. This protein, could however be replaced by a cheaper, more readily available protein – rich insects.

The larvae of *Cririna forda* (Lepidopters: Saturnidae) and Adults of *Zonocerus variagatus* (Orthoptera; Pyrgomorphidae) are common insects which are widely consumed by humans in the Northern as well as south western part of Nigerian. The protein value of *C forda* and *Z variegatus* have been found to be 64.49%, and 61.80% respectively (Ande. 2002); Ashiru 1988).

This work evaluates the use of these two insect species as possible protein substitutes for fish meal in convectional feeds.

MATERIALS AND METHODS

Dried processed samples of the caterpillars of *Cirina forda* where purchased at the Erekesan market in Akure, Ondo state of Nigeria.

The two insect samples were puluerised with the aid of mortal and pestle and sifted through a 20 mesh size sieve and kept in the refrigerator.

Two different experimental diets were compounded with *C forda* and *Z variegatus* as replacements for fish meal in a convectional Growers' marsh. Below is a table showing the composition of the two experimental diets and the control.

PROXIMATE ANALYSIS

In analyzing the proximate and mineral composition, 1.5g of the protein portion of the three diets (that is *C forda, Z variegates* for the experimental diets and dried samples of *Clarias gariepinus* (the specie of fish that was used for feed composition) for the control. This quantity was weighed into a 25ml test tube. Proximate analytical methods of A.O.A.C (1995) were employed for the Analysis.

***Correspondence Author: R. F. OGUNLEYE**

TABLE 1: COMPOSITION OF THE DIETS

Ingredients	Experimental Diet		Control Diet
	(A) *C. forda* (kg)	*(B) Z. variegatus*	Conventional feed (kg)
Maize	5.5	5.5	5.5
Soya meal	1.25	1.25	1.25
Groundnut cake	2.25	2.25	2.25
P.K.C	3.00	3.00	3.00
C/bran	1.5	1.5	1.5
B.D.G.	4.0	4.0	4.0
Olshell	2.3	2.3	2.3
Bone meal	0.5	0.5	0.5
Salt	0.1	0.1	0.1
Lysine	0.02	0.02	0.02
Methionine	0.025	0.025	0.025
Dried fish	Nil	Nil	2.0
Z. variegates	*Nil*	*0.5*	*Nil*
C. forda	0.5	Nil	Nil
F I nut	0.058	0.058	0.058

FEEDING TRIALS

Experimental rats were purchased at the Biochemistry department of the University of Ilorin.

Three groups of ten (10) weanling rats were kept in separate cages for the purpose of the experiment. The three groups were feed with each of the diets for a period of five weeks. Weights of the rats were taken with the aid of a beam balance separately prior to feeding with the experimental diets. Subsequent weight gains were measured on weekly basis. The lengths of the rats were also taken from snout to the tip of the tail both before they were fed and also on weekly basis after the commencement of the feeding experiments.

RESULTS AND DISCUSSION

The proximate composition of *C forda* and *Z variegatus* is presented in Table 2. The result shows an encouragingly high crude protein value of 49.70%, 48.65%, moisture content of 10.92% and 11.11% and fat of 22.21% and 7.14% respectively. These compared favourably well with the proximate composition recorded for fish. It is worthy to note that the protein values of the two insects are higher than that of the fish. This is a clear indication that *C forda* and *Z variegatus* could conveniently replace the fish meal in preparing convectional feeds. Ladeji *et al* (2003) recorded protein value of 66.3% for *Z variegates* collected in the northern part of Nigeria. The abundance of cowpea green fields on which the species of *Zonocerus* feed on in this area might account for the higher protein value recorded for these insects in the area. *C forda* like all animal sources Jay 1978) showed a high crude protein value. The mineral constituents in *C forda* and *Z variegatus* are as shown in Table 3. The two insects have a considerably high amount of potassium calcium and iron. According to Jay, 1978, the mineral profile in *C forda* confirmed that it could be a reliable source of essential minerals such as potassium, calcium, phosphorus, sodium magnesium and iron. Einhan *et al* 1988 reported that potassium intake has been found to lower blood pressure by antagonizing the biological effects of sodium. The consumption of 100g dry larva of *C forda* would provide 100%, 55% and 57% of the recommended Dietary Allowances of phosphorus, iron and zinc respectively (food and nutrition board 1980). The mineral constituent of *Z variegates* make it stands as a valuable source of essential minerals.

TABLE 2. PROXIMATE COMPOSITION OF *C forda* AND *Z variegates* COMPARED WITH DRIED FISH

Scientific name (common name)	*C fordai* (manimani) %	Z. Variegatus %	Dried Fish %
Moisture	10.92	11.11	68.1
Ash	6.45	4.76	1.2
Fat	22.21	7.14	8.66
Fibre	2.68	4.72	3.01
Protein	48.70	48.65	49.5

TABLE 3 MINERAL ANALYSIS OF *Cirina forda* and *Z variegates* MINERAL

Scientific common(name)	N %	P Ppm	K^+ ppm	Na^+ ppm	Ca^{2+} ppm	Mg^{2+} Ppm	Fe ppm
Cirina. Forda	7.952	3004	12096.77	2419.36	258.02	77.42	526
Sonocererus Variegatus	7.784	2338	12698.41	5079.37	317.46	38.10	395

The result is similar to what obtained in other edible insect species.

(Landry *et al* 1986), Finke *et al* 1985, 1989).

The result of the rat feeding trial is presented in Table 4. There was an increase in the growth rate of rats fed with diets containing *C forda* and *Z variegatus* consistently at the rate of > 10.0kg per week during the 5 weeks of investigation.

Analysis of variance revealed that there were no significant differences in the rats fed with the experimental diets and the control at 5% level of probability.

Table 5 shows the effects of the different diets on the total length of the rats. There is a consistent increase in the length of rats in all the diets and the control from the first to the fifth week. Rats fed with the diets containing *Z variegatus* performed better than that of *C forda*. However, apart from week 3 in which there in a significant Lower performance for the experiment with *C forda*; all other figures showed a non-significant different in length when compared with the control. It is worthy to note that week 4 with *Z variegatus* recorded a significant higher performance than the control diet.

TABLE 4: WEEKLY GROWTH (G) PATTERN OF RATS FED WITH DIETS CONTAINING *C forda, Z variegatus* AND CONTROL

	Mean Weight (g) of rats after Treatment				
	1st week	2nd week	3rd week	4th week	5th week
Z. variegatus	53.3±3.70 ns	79.0±4.00 ns	103.0±04.50 ns	126.0±3.10 ns	143.0±5.50 ns
C forda	50.0±2.70 ns	63.3±2.50 ns	90.0±6.00 ns	110.0±5.00	126.0±5.20 ns
Control	60.0±3.00	70.0±3.00	90.0±4.00	106.0±4.10	126.0±5.71

ns means significant at 5% level of probability when compared with control.

TABLE 5: WEEKLY LENGTH (CM) PATTERN OF RATS FED WITH DIETS CONTAINING *C forda, Z variegatus* AND CONTROL

	Mean Length (cm) of rats after Treatment				
	1st week	2nd week	3rd week	4th week	5th week
Z. variegatus	14.17±0.49 ns	16.50±1.32 ns	18.7±0.77 ns	19.00±1.00 ns	19.17±1.0 ns
C forda	12.50±0.5 ns	14.23±0.75 ns	15.83±1.04 s	17.17±1.26 ns	17.83±1.26 ns
Control	12.27±0.64	15.40±1.04	17.17±1.04	17.60±0.6	18.07±0.6

ns means not significant at 5% level of probability when compared with control.

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