



## Original Research Article

### Microbial flora and nutritional composition of adult Palm - Wine Beetle (*Rhychophorus phoenicus*)

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#### A B S T R A C T

#### Keywords

Adult Palm - Wine Beetle, *Rhychophorus phoenicus*, Microbial flora, nutritional composition

The nutritional composition and microbial flora of adult *Rhychophorus phoenicus* were examined. The heterotrophic bacterial, fungal and coliform counts of the skin were  $9.20 \times 10^5$ cfu/ml,  $7.30 \times 10^5$ cfu/ml and  $5.30 \times 10^5$ cfu/ml, respectively while the gut had counts of  $1.83 \times 10^7$ cfu/ml,  $3.60 \times 10^6$ cfu/ml and  $4.20 \times 10^6$ cfu/ml for the same parameters. The skin microbial flora isolated from the weevil were *Acinetobacter* sp, *Bacillus* sp, *Klebsiella* sp, *Pseudomonas* sp, *Saccharomyces* sp, *Serratia* sp and *Staphylococcus* sp. while the gut contained *Bacillus* sp, *Enterobacter* sp, *Serratia* sp and *Staphylococcus* sp. All the bacterial and fungal isolates were normal saprophytes usually associated with palm-wine and not known to cause disease. The nutritional composition revealed a high moisture content (56.82%) followed by crude protein at 32.71%. Total carbohydrate, fat, fibre and ash were at 0.88%, 4.17%, 8.59% and 0.98%, respectively. The result for the weevil without the outer chitin followed a similar trend but consistently lower in values except for fat and total carbohydrate at 9.15% and 1.69%, respectively. *Rhychophorus phoenicus* is recommended as a protein supplement in the diet of communities where protein is expensive or scarce.

#### Introduction

Many parts of the world use insects as human food and the use of insects as food is becoming more attractive, constituting an emerging new area of research. The use of insects or their larvae as food is not new as several workers have reported (Amadi, *et al.*, 2005, Ohiokepehai *et al.*, 1996, Ekraene and Igeleke, 2007, Simpanya, *et al.*, 2000).

Adult palm wine weevil, *Rhychophorus phoenicus* is a delicacy in some parts of the South Eastern Nigeria. Previous works on *Rhychophorus phoenicus* were on its larva (Ekraene and Igeleke, 2007; Okaraonye and Ikewuchi, 2008; Wachukwu *et al.*, 2002; Oliverira *et al.*, 1976). Most of these studies had concentrated on the nutritional

composition and microbiology of the larvae. The weevil is a delicacy in some parts of Rivers State, usually roasted after removing the hard chitinous wing and eaten. There is a dearth of information on the nutritional composition of the adult weevil because the larvae are preferred in place of the adult weevil. The weevil is normally harvested from palm wine by palm wine tappers. In fresh palm wine the weevils remain in a state of stupor as a result of intoxication by the alcohol in palm wine. Thirty to forty minutes after removal from the palm wine and exposure to air the effect of alcohol wears and they fly off. Little is known about this amazing insect as a food source.

This study was, therefore, undertaken to examine the nutritional composition and microbial flora of the weevil.

## **Materials and Methods**

### **Materials**

Live adult weevils were collected from a Palm-wine tapper in Agbonchia in Eleme Local Government Area of Rivers State, Nigeria. The weevils were transported to the laboratory in fresh palm-wine and used immediately or after twenty-four hour storage in a refrigerator. The microbiological media used were nutrient agar, MacConkey agar and Sabourouds agar.

### **Microbiological analyses**

Initial tenfold serial dilutions of whole weevil and the internal contents were prepared

### **Chemical analyses for nutritional composition**

Proximate analyses for moisture, protein (N x 6.25), ash, fibre and fat were carried out

according to AOAC (1990) methods (moisture: 43.287; protein: 2.057; fibre: 14.004 and fat: 7.062). Total available carbohydrate was analysed using the Clegg Anthrone method (Osborne and Voogt, 1978). Chemical analyses were performed on whole weevil and whole weevil with the hard chitin wing removed. All analyses were in quadruplet.

### **Microbial viable counts**

The method used was the 10-fold serial dilution method of Harrigan and McCance (1990). Two (2g) grams of whole beetle were aseptically transferred into 8 ml of sterile saline in a 50 ml conical flask. The flask was then shaken vigorously to dislodge the skin and microbial flora. Further 10-fold dilutions were carried out by adding 1.0 ml of the penultimate dilution to 9ml of fresh diluents. Finally 0.1 ml of an appropriate dilution were placed on dry nutrient agar, evenly spread with a sterile glass spreader and incubated at 30<sup>0</sup>C for 24 h. At the end of incubation, counts were performed for those dilutions which showed counts between 30 and 300 colonies (Anonymous, 1994). All counts were performed in duplicates and averages taken.

For the gut microbial count 1.0 g of the intestinal content were initially added to 9.0 ml of saline to give an initial dilution of 10<sup>-1</sup>. Subsequent procedure was carried out as for the skin.

Coliform and fungal counts were carried out similarly but the media were MacConkey agar and Sabraouds agar.

### **Isolation and identification of skin and gut microbes**

Representative colonies of the 10<sup>-1</sup> dilution of the skin and intestinal contents were

picked and sub-cultured several times onto nutrient agar until pure isolates/cultures were obtained. Such pure cultures were stored as frozen glycerol suspensions at -35°C (Wellington and Williams, 1978). These glycerol suspensions served as a means for long storage and as a source for fresh working cultures.

Isolates were identified according to the schemes of Cowan and Steel (1966) and Buchanam and Gibbons (1974). The tests employed included catalase test, growth on Mac Conkey agar, indole production, methyl-red, motility and oxidation/fermentation tests for fructose, glucose, maltose, mannitol and sucrose.

### Results and Discussion

The nutritional composition of the adult weevil is given in Table 1. Thus the weevil is high in moisture (56.82%) and moderately high in protein (32.71%). Fat was low and occurred at 4.17% with total carbohydrate at 0.88%. Ash was recorded at 0.98% and fibre at 8.59%. The result for the weevil without the outer chitin followed a similar trend but consistently lower in values except for fat and total carbohydrate at 9.15% and 1.69%, respectively. The microbial populations for the skin and gut were  $9.20 \times 10^5$ cfu/ml (total heterotrophs),  $7.30 \times 10^5$ cfu/ml (fungi) and  $5.30 \times 10^5$  (coliforms) for the skin and  $1.83 \times 10^7$  (total heterotrophs),  $3.60 \times 10^6$ cfu/ml (fungi) and  $4.20 \times 10^6$ cfu/ml (coiforms) for

the gut (Table 2). The microbial species isolated from the skin were *Acinetobacter* sp, *Bacillus* sp, *Klebsiella* sp, *Pseudomonas* sp, *Saccharomyces* sp, *Serratia* sp and *Staphylococcus* sp while the gut contained *Bacillus* sp, *Enterobacter* sp, *Serratia* sp and *Staphylococcus* sp. The microbial flora isolated from the skin of the weevil in this study was less diverse than those isolated by Okafor (2008). However, the microbial genera of the weevil found in this study were similar to those reported by Wachukwu, *et al.* (2002), for the larvae.

An interesting finding in this study was the isolation of yeast, *Saccharomyces* species which Okafor (2008) did not find. The isolation of yeast was not surprising as yeast is an important constituent of palm wine. There seems to be a dearth of the knowledge of the bacterial flora of the weevil until this study.

The nutritional composition revealed a high moisture content (56.82%) followed by crude protein at 32.71%. Total carbohydrate, fat, fibre and ash were at 0.88%, 4.17%, 8.59% and 0.98%, respectively. The result for the weevil without the outer chitin followed a similar trend but consistently lower in values except for fat and total carbohydrate at 9.15% and 1.69%, respectively. *Rhychophorus phoenicus* is recommended as a protein supplement in the diet of communities where protein is expensive or scarce.

**Table.1** Nutritional Compositions of *Rhychophorus phoenicus*

Parameter (%)	Adult Weevil	Adult Weevil without Chitin
Ash	0.98	0.58
Crude Protein	32.71	26.85
Fat	4.17	9.15
Fibre	8.59	6.40
Moisture	56.82	52.88
Total Carbohydrate	0.88	1.69

**Table.2** Microbial counts (cfu/g) of external and intestinal content of weevil

Part	Total Heterotrophic Count	Coliform Count	Fungal Count
Whole Weevil	$9.20 \times 10^5$	$5.30 \times 10^5$	$7.30 \times 10^5$
Internal Contents	$1.83 \times 10^7$	$4.20 \times 10^6$	$3.60 \times 10^6$

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