EFFECT OF CASSAVA VARIETIES ON OVIPOSITION AND DEVELOPMENT OF LARGER GRAIN BORER-*Prostephanus truncatus* HORN (COLEOPTERA: BOSTRICHIDAE)

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ABSTRACT

The influence of cassava varieties on the developmental biology of Prostephanus truncatus (Horn) was investigated. This beetle was reared on flour varieties of cassava, namely: Danwari, Nwugo, Aburu-Asua and Anti-Ota. More eggs were laid in Danwari (132.0 ± 6.1 egg) than in other cassava variety. The least number of eggs laid was in Nwugo ($118.3_{+-4.5)}$ in No-choice experiment. In Free-choice test, the highest number of eggs was recorded in Aburu-Asua (64.0 ± 1.7 eggs) and the lowest (41.6 ± 3.1 eggs) on Anti-Ota. The average total developmental period in, Aburu-Asua, Nwugo, Danwari and Anti-Ota were 32.5 ± 0.4, 30.6 ± 0.2, 28.5 ± 0.1 and 34.7 ± 0.1 days respectively. The low oviposition preference for Nwugo was attributed to the presence of oviposition deterrents in this variety, which might have protected it against the beetle attack.

Keywords: Cassava, Oviposition, Larger grain borer, Coleoptera, Bostrichidae

INTRODUCTION

Cassava (*Manihot esculentus* Kantz) is native to Latin America and was introduced into Africa during the last part of the 16th century, and adapted quickly into the traditional tropical African farming systems (Hahn *et al.*, 1980). In Nigeria, cassava production and utilization have increased tremendously in 2005, following the present government initiative on cassava production and utilization. Mpumechi (1993) observed that over 160 million people in sub-saharan Africa have cassava as their staple food.

Ingram and Humphries (1972) reported that cassava can be processed into dried products in a variety of ways in different parts of the tropical world, according to local needs, taste and traditions in order to retain a steady supply of food as well as service a trading system all the year round. IITA (1987) stressed that cassava tuber can be made into dry chips directly from tubers of low cyanide content otherwise varieties of medium cyanide content can be used for chips production by passing the flour through a dough-making and frying preprocess. Cassava flour can be used in baking industries for bread, biscuit and also serve as major component in compounding livestock feeds. A number of varieties are available as *fufu, garri, tapioca* and starch, while tubers from cassava cultivars considered sweet can be eaten simply boiled or baked (Dufour, 1987).

Inspite of Nigeria's position as the world largest producer of cassava, yet some factors militates against its production. It is observed that apart from disease, insect pest is a major biological constraint in cassava production and storage. Parker and Booth (1979) reported that cassava chips are heavily infested during sun drying and when in store by a number of stored product pests including the larger grain borer- *Prostephanus truncatus*. (GASGA, 1993)

It is against this background that this study was conducted on the oviposition preference and development of *Proptephanus truncatus* a cassava product pest on these cassava varieties – Danwari, Nwugo, Aburu-Asua and Anti-Ota. It is hoped that this study will add to our knowledge of this noxious pest on the cassava varieties under study, as the result will help to advice farmers on the most resistant varieties of cassava to cultivate.

MATERIALS AND METHODS

Clean, uninfected samples of cassava were heat-sterilized in an oven at 104^0C for one hour to make sure that there was non-contamination before any treatment. Insect colonies were raised by infesting the sterilized cassava chips in 150ml glass jar with 30 pairs of *Prostephanus truncatus* obtained from the infested cassava chips from Awka market. The glass jar was covered with fine nylon net held in place by a rubber band. The nylon net prevented the escape of the insects and at the same time permitted adequate aeration of the cassava chips. The set up was kept in the laboratory at the fluctuating temperatures of 25 ± 3^0C and relative humidity of 75 ± 5%. New generations of *Prostephanus truncatus* were raised from this stock and used for subsequent experiments.

Effect of Cassava Variety on Oviposition: No-choice and Free-choice experiments were conducted in studying oviposition on cassava chips by *Prostephanus truncatus*. In the No-choice test, five pairs of sexually mature adults were confined in Petri-dish containing 10g of Danwari. Nwugo, Aburu-Asua and Anti-Ota chips. There were four replicates per cassava cultivars. The cassava chips were examined daily under a dissecting microscope for eggs and the number found was recorded over a period of 21 days. In the Free-choice test, fresh tubers of the four cassava cultivars were processed into dry cassava

chips by the methods described by Ingram and Humphries (1972).

Ten pairs of 14 days old adults of *Prostephanus truncatus* were confined with equal size of cassava chips of the four cultivars in a Petri-dish that has been portioned with paraffin wax in to four equal compartments. Each cassava chips was placed at equidistant positions from the centre of the Petri-dish. Four treatment replicates were set up. The cassava chips were examined daily and egg counts made for a period of 14 days after which they were replaced after each day's observation.

Effect of Cassava Variety on Egg Incubation and Beetle Development: Five grams (5g) of cassava flour of each variety were weighed into Petri-dishes in four replicates per cassava variety. Newly emerged adult of *Prostephanus truncatus* were sexed according to Shires and McCarthy (1976) and paired beetles of opposite sexes were introduced into Petri-dish and covered with fine nylon net held in place by a rubber band. Each Petri-dish was observed daily for the number of eggs laid for a period o f 10 days using a binocular microscope. Developmental period of *Prostephanus truncatus* was studies on each cassava variety using one-day old larvae collected from sets of incubated eggs. Each larva was transferred into a separate Petri-dish containing 5g of cassava flour of the desired cassava variety and covered with fine nylon net held tightly in place by a rubber band. The number of days taken to complete development to adult was recorded and the numbers of larval molts were also noted.

Data Analysis: The data were subjected to the analysis of variance (ANOVA) and the means separated by the least significant difference (LSD) test.

RESULTS

Effect of Cassava Variety on Oviposition: The mean number of eggs laid by *Prostephanus truncatus* over a period of 21 days in chips of each variety in the No-choice test is presented in table 1.

From the results Danwari has the highest number of eggs (132.0 ± 6.1) while Nwugo had the least (118. 3 ± 4.5). The difference was significant at the P = 0.5. Significant differences were not detected among Nwugo, Danwari and Anti-Ota or among Danwari, Anti-Ota and Aburu-Asua. In Free-choice test, the beetle preferred Aburu-Asua for oviposition (64.0 ± 1.7) to any other cassava variety (Table 1), Nwugo and Anti-Ota were not significantly different as suitable cassava for oviposition.

Effect of Cassava Variety on Egg Incubation and Development: The data obtained on the development of *Prostephanus truncatus* on four cassava varieties are presented in table 2. Egg incubation period ranged between 6.4 days in Aburu-Asua and 7.3 days in Nwugo. The larval period ranged between 20 days in Aburu-Asua and 24 days in Anti-Ota. There was no significant difference in larval developmental period in Danwari and Nwugo when the LSD test was used.

However, the larval period were significantly longer in both Aburu-Asua and Anti-Ota compared to other cassava varieties.

The pupa stage lasted from 3.1 days in Danwari to 6 days in Aburu-Asua (Table 2. LSD test at P = 0.05 showed a significant difference in the papal period obtained in Danwari from other varieties. The mean development period from egg to adult was significantly longer on Anti-ota than on other varieties.

DISCUSSION

The high number of eggs of *P. truncatus* recorded for the four cassava varieties in No-choice test showed that they were acceptable media for oviposition. This observation explains the high levels of *P. truncates* infestation recorded on dried cassava chips in Awka market by Akunne (1998). Based on the Free-choice experiment, it is apparent that Aburu-Asua cultivar is most preferred cassava for oviposition of this beetle species, while Anti-Ota is the least preferred medium. However, in the No-choice experiment, the beetle oviposited freely on Danwari, thus suggesting that this variety could be of ecological significance in the survival of the insect when its normal cassava is not available.

Table 1: Effect of cassava variety on oviposition by *Prostephanus truncatus*

Cassava variety	*Mean number of eggs	
	No-choice test	*Free-choice test*
Aburu-Asua	124.0 ± 2.6[a]b	64.0 ± 1.7[c]
Nwugo	118.3 ± 4.5[a]	46.0 ± 3.2[a]
Danwari	132.0 ± 6.1[b]	50.0 ± 2.5[b]
Anti- Ota	127.0 ± 3.7[a]b	41.6 ± 3.1[a]

** Each value represents mean ± standard error of the mean of four replications. Means followed by the same letter(s) are not significantly different at P = 0.05 according to Duncan's multiple range test.*

Table 2: Effect of cassava variety on duration of development of *Prostephanus truncatus*

Cassava species	* Development period (days)			
	Egg incubation	Larval	Pupal	Total
Aburu-Asua	6.4 ± 0.2[a]	20.1 ± 0.2[b]	6.0 1 ± 0.1[b]	32.5 ± 0.4[a]
Nwugo	7.3 ± 0.1[a]	18.6 ± 0.2[a]	5.02 ± 0.3[b]	30.06 ± 0.2[a]
Danwari	7. 4 ± 0.3[b]	18.0 ± 0.1[a]	3.1 ± 0.2[a]	28.5 ± 01[a]
Anti-Ota	6.2 ± 0.2[a]	24. 0 ± 0.1[c]	4.3 ± 0.1[b]	34.7 ± 01[b]

** Each value represents a mean ± standard error of the mean of four replications. Means followed by the same letter(s) are not significantly different at P = 0.05 according to Duncan's multiple range test.*

The significantly higher preference for Aburu-Asua and Danwari as oviposition media may be due to differences in the chemical composition of the various cassava cultivars as earlier observed by Okeke *et al.,* (1989). In the Free-choice test, the low preference of Anti-Ota was traced to its high cyanide content as reported by Dufour (1987). Similarly, Daramola (1981) reported that the least preferred oviposition medium by the kola nut weevil, *Balangastris kolae* contained high caffeine content. Therefore, the low egg output on Anti-Ota is indicative of the presence of some oviposition deterrents in this cassava cultivar. Furthermore, the high starch content of the cassava might affect the oviposition preference of the beetle. The observed differences in the development periods of *P. truncatus* in these cassava cultivars is also indicative of nutritional value differences of these cassava cultivar as reported by Okeke *et al*., (1989).

Similarly, Detmer *et al.* (1993) noted that high breeding capacity of *Prostephanus truncatus* on several woody varieties of cassava depends on their high starch content. It is not surprising therefore that there was a preponderance of the beetle species studied which suggests that these cassava varieties offered decreased cassava resistance hence the increase suitable media for the oviposition of *P. truncatus* in the varieties.

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