Species compositions and relative abundance of insect pest associated with some stored cereal grains in selected markets of Maiduguri metropolitan.

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Abstract: A survey was conducted from November 2005 to 2006 to determine the species composition and frequency of occurrence of insect pests associated with stored cereal grains in some selected markets in Maiduguri metropolis Borno state- Nigeria. Random sampling methods were used in selecting traders in the markets for the survey. Samples of 1kg of maize, Millet, Sorghum and rice were taken from the stock with the traders for analysis and insect infestation determination. Insect species identified with the grains and their relative abundance in percentages are; *Tribolium castaneum* Herbst 30.9%, *Sitophilus* spp 27.4%, *Rhizopertha dominica* (Fab) 15.2%, *Trogoderma granarium* (Everts) 11.9% and *Cryptolestes* spp (Stephens) 14.7%. The result also indicates that *T. castaneum* and *Sitophilus* spp were more prevalent. The species preference to different grain types in the order *T. castaneum* was dominant in maize and Millet; *Sitophilus* species were dominant in Maize and sorghum, and *Rhizopertha dominica* being the dominant species in Rice.
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Key words: Species compositions, relative abundance, stored cereals, Maiduguri metropolitan, *Tribolium castaneum, Sitophilus* spp, *Rhizopertha dominica, Trogoderma granarium, Cryptolestes* spp

Introduction

Cereal crops are important sources of food for man and his animals. In some parts of the world, cereals provide more than 70% of the energy in human diets (Kumar and Okoronko, 1991; Olomi, 1995). Cereals are however, susceptible to insect pest infestation both in the field and in the store (Adedire and Ajayi, 1996; Ofuye and Lale, 2001; Obeng-Ofori, 2008).

Infestation by insect pest in storage and consequent damage and loss that result from it poses a major threat to global food security especially in resource poor nations (Obeng-Ofori, 2008). Majority of insect pests of stored cereal are cosmopolitan and polyphagus in their feeding behavior (Ofuye and Lale, 2001). This always compounds the food loss problem as it tends to increase the incidence and seriousness of attack.

The abundance of stored cereal insects pests in any locality is to some extent determined by prevailing climatic conditions and grain types stored; and always greater in the tropical storage environment (Hill and Waller, 1990). The attack by insect pests on stored cereals is very critical to food security, because it occurs at points where there is no possibility of compensation (Lale, 1995; Adedire and Ajayi, 1996; Obeng-Ofori, 2008). Informed and timely control strategy is therefore crucial to reduce such unwanted losses.

The knowledge of pest spectrum, distribution and relative seasonal abundance is very vital in implementing any pest management strategy in the stored product environment (Lale, 2002) especially, using the integrated pest management fashion (Don-Pedro, 1989; Obeng-Ofori, 2008). Information on major insect pest associated with stored grain in this part of the country is lacking in literature. This study was designed with the objectives of elaborating information on the biodiversity, distribution and relative abundance of the insects pests infesting stored cereals grains in Maiduguri markets.

Materials and Methods

Study site: the study was carried out from January-December 2006 in three different markets (Baga road, Custom and Monday market) in Maiduguri metropolis In Borno state –Nigeria. Maiduguri lies within the latitudes of $11^0$51'N, $13^0$14'N and longitude $10^0$0'E and $13^0$40'E. The shares a common border internationally with Tchad and Cameroun Republic.

Sampling protocols: Four (4) different types of cereal grains namely; Maize, Sorghum, Millet and rice were obtained from traders stores at each of the selected sites. In each market selected, traders were randomly choosen for sampling purposes. From each selected trader, one (1) Kg of the produce were taken

as sample from bagged produce. The samples were collected with a spear sampler at the middle, top and bottom portion of the bags as described by Hangstrum and Subramanyam (2000). The samples were taken to the Crop Protection laboratory at the universityof Maiduguri and sieved to collect the insect present. Live and dead insects were collected, placed in 100ml capacity bottles filled with 90% alcohol and kept for further identification. Insects were sorted according to species and counted for each in each case noting the number.

Data analysis

Types and number of insects collected from the study were subjected to descriptive statistics of mean and percentages (%).

Result and Discussion

The results table 1-3 for the three markets showed that *T. castaneum* and *Sitophilus* spp appeared to be more abundant species. On the overall basis *T. casteneum* has 30.1%, 31% and 32% in Monday, Custom and Baga markets respectively. This therefore implies that *T. castaneum* and *Sitophilus* spp are the most abundant and prevalent primary and secondary pests of most cereals grains in the study area.

Table 4 indicated that maize is more susceptible to insect pests infestation than any of the cereals grains under study. The Table showed that maize has 54..4%, Sorghum 26.2%, Millet 17.2% and Rice 2.2% of relative abundance of infestation. This shows there is some degree of differential susceptibility of the grains to the species found during the survey as the all grains are normally jointly stored in the same store.

The result also indicated all the insect species collected during the study are beetles from the order coleopteran. This agrees with the findings of Appert, 1987; De Lima, 1987; Hill and Waller, 1990; and Ofuye and Lale, 2001 who stated that stored cereal pests that are devastating are insects of the order coleopteran of which both the larvae and the adults does the damage. Others are lesser one of the order lepidopterans where the larvae are pestivorous. This partly explains why lepidoterous species could not be seen during the study because it's only the adults that were sieved from the grains and identification of the immature stages of insects is very difficult with reasonable degree of certainity (Ofuye and Lale, 2001 and Obeng-Ofori 2008). Two (2) (*T. castaneum* and *Cryptolestes* spp) out of the five species found are secondary pests while others are primary pest. Since the produce sample are grains, this findings is in line with the general believe that secondary pest are more prevalent on grains that are partly damaged by other species (primary pests) (Imura and Sinha, 1984; Meromick and Stocky, 1993; Xiaosong and Weston, 1995) or by harvesting operations and when the grains are further processed into its products (Odeyemi, 1989; Lale, 2001). The findings also indicate that both the traders and the farmers are prone to experience some serious loss in produce as Adedire and Ajayi, 1996 stated that infestation by some insect pests may commence from the field just before harvest and the weevils continues to reproduce and destroy the grains even in store.

The outcome of this study is very important in planning control as insect monitoring is an important component of pest management in stored products (Hangstrum and Subramanyam, 2000). Economic loss due to insect pest and unnecessary pest management expenses can be minimized or avoided using insect monitoring and decision-making tools such as economic thresholds, predictive models and expert systems to determine the best time to suppress pest populations (Obeng-Ofori, 2008). Similarly, information about the numbers of insects in the samples or the percentages of samples infested is essential in estimating the overall level of insect infestation in the commodity (Obeng-Ofori, 2008).

There is therefore an urgent need for a proactive enlightenment campaign directed towards both the farmers and traders in the study area as to the need to adopt integrated pest management strategies to halt the rate of increase in population of the various pest as one of the measure needed to guarantee food security for all people living in those marginal areas. Pest monitoring as means of pest forecasting should be especially encouraged among small holder farmers and traders alike as they are more prone to the impact of the devastating effect of the deleterious activities of the insect pest species.

Table 1: Mean Number of Insect of insects species on cereal grains in Monday market

Cereal grains	*Tribolium castaneum*	*Sitophilus spp*	*Rhizopertha dominica*	*Trogoderma granarium*	*Cryptelestis spp*	Total
Maize	22.4	19.4	16.6	13.8	1.4	23.6
Sorghum	9.4	10.6	3.0	1.4	8.8	33.2
Millet	7.6	4.8	1.4	1.2	8.2	23.2
Rice	0.8	0.8	1.0	0.6	0.4	3.6

Table 2: Mean numbers of insects species in custom park market

Cereal grains	*Tribolium castaneum*	*Sitophilus spp*	*Rhizopertha dominica*	*Trogoderma granarium*	*Cryptolestis spp*	Total
Maize	23.6	18.8	15.2	11.8	1.6	71.0
Sorghum	9.6	12.2	2.0	1.8	9.2	34.8
Millet	7.2	4.4	1.8	1.6	7.8	22.8
Rice	0.2	0.6	1.0	0.4	0.8	3.0

Table 3: Mean numbers of insects species in Baga road market

Cereal grains	*Tribolium castaneum*	*Sitophilus spp*	*Rhizopertha dominica*	*Trogoderma granarium*	*Cryptolestis spp*	Total
Maize	22.8	20.8	13.0	14.4	1.6	72.0
Sorghum	10.0	11.8	2.4	1.4	10.8	36.4
Millet	9.4	3.6	2.2	0.6	6.4	22.2
Rice	0.2	0.4	0.6	0.4	0.6	2.2

Table 4: The mean/percentage composition of insect pests of stored grains in the three markets surveyed.

Insect species	Cereal grains			
	Maize Mean (%)	Sorghum Mean (%)	Millet Mean (%)	Rice Mean (%)
T. Castaneum	22.9 (31.7)	9.7(27.9)	8.1(35.5)	0.4(13.3)
Sitophilus spp	19.7(27.2)	11.5(33.0)	4.3(18.9)	0.6(20.0)
R. dominica	14.9(20.6)	2.5(7.2)	1.8(7.9)	0.9(30.0)
T. granarium	13.3(18.4)	1.5(4.2)	1.1(4.8)	0.5(16.7)
Cryptolestes	1.5(2.1)	9.6(27.6)	7.5(32.9)	0.6(20.0)
Total	72.0(54.4)	34.8(26.2)	22.8(17.2)	3.0(2.2)
Grand total	132.6			

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