

The Economic Implication of *Cylas Spp.* and Rot Organisms Infestations on the Marketability of Sweet Potato (*Ipomoea batatas L.*) in Three Markets in Maiduguri Metropolis, Borno State, Nigeria

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ABSTRACT

This survey is carried out in three markets (Monday, Gaboru, Custom) in Maiduguri Metropolis of Borno State, Nigeria. The aim is to determine the economic implication of *Cylas spp.* infestation on the quality and marketability of *Ipomoea batatas*. Ten wholesale stores and ten retail sellers were randomly selected for the survey in each market. The means for each of the ten marketers were determined after one month of the survey. The results show that *Ipomoea batatas* infestation began from the field since the tubers selected were removed from the sacks in the full view of the authors. The infestation holes of *Cylas spp.* when observed show that the holes were not fresh but mostly sealed with long dead tissues, which were smelly and cranky. Each infested tuber observed had no more than two *Cylas spp.* Each of the infested tubers was rendered useless due to other secondary infestations from rot micro-organism (fungus, bacteria), which make the tubers to become soft, rotten and smelly. The infections rendered the infested tubers unmarketable due to poor tuber quality. This cause losses to the sellers and buyers as well since facial observations could not detect the bad tubers before buying. There is the need to establish food processing industry to utilise the excess tubers and this could go a long way in encouraging the farmers to produce more and both whole-sellers and retailers will also benefit. The survey have highlighted and brought to open the problems faced by farmers from harvesting high quality tubers and traders from selling high quality tubers of the *Ipomoea batatas*.

Keywords: *Ipomoea batatas*, *Cylas spp.*, Infestation, Tuber quality, Marketability,

INTRODUCTION

Ipomoea batatas (L.) Lam. is commonly known as sweet potato and a dicotyledonous vine belonging to the Family Convolvulaceae. This family have up to fifty genera and over 1000 species and only *Ipomoea batatas* has large amount of starch, sweet testing, tuberous and it is an important root vegetable (Hills, 1983; Pulsegrove, 1991; Woolfe, 1992). Mutton, Jones, Paterson and Boswell (1985), report that *Ipomoea batatas* originated from Central America and probably from the Yucatan Peninsula of Mexico and Mouth of the Orinolo River in Venezuela. This probably spread to S. America by 2500 BC (Zhang Santos and Prevett, 1998). It is the 3rd important root crop after cassava (*Manihot spp.*)

and yam (*Dioscorea spp*) and fourth as protein source (FAO 1984). Cooked *Ipomoea batatas* can be white, yellow, red, orange, purple or brown in colour, while fresh one takes similar colour (Tindal 1983). Only three countries of Africa (Nigeria, Cameroun and Burkina Faso) cultivated over 1500 ha of land of the crop (FAO, 1984). The production is still expanding due to its food and cash values accrued by the farmers in these countries. In Nigeria, the crop is mostly produced in the Northern States (Mutama and John, 1990).

Although, tuber crop is expected to have fewer pests, yet *Ipomoea batata* is seriously attacked by one or more pest, which causes heavy losses during storage. *Cylas spp.* particularly *C. fomicarius* causes heavy storage loss in the dry season. *Cylas puncticollis* and *C. brunneus* commonly found in Uganda cause loss in the rainy season. Our concern is the *C. formicarius*, which causes storage loss and reduce marketability and value of the tubers. This pest can cause from 20-50% tuber losses on storage through secondary infection by rot organisms which enter through the feeding holes of the *Cylas spp.* The pest life cycle is a complete metamorphoses (egg-larva-pupa-adult), thus causing heavy loss due to the feeding of the two stages (larvae and adults) (Jansson, Lecrone, Ganler and Smart, 1993). According to Eberhard (1973) and Libby (1968), there is positive relationship between weevil density, vine damage and tuber damage. These weevils tunnel the tubers and subsequently allowing the entry of rot organisms. Causing from 5-95% damage. The longer the crop stays un-harvested the more the damage and this will increase in the store (Allard, Cock and Ranji, 1991, Amalin and Chijoy, 1995).

Damage are symptomized by yellowing, cracking and wilting of vines and sometimes with holes. Tunnels are also very common on tubers after being pulled out of the soil, which appears spongy, brownish and blackish (Eberhard, 1973). Generally, control is by cultural methods which include planting un-infested vines, crop rotation, burning of dead plant materials left in the field. Others are early planting which reduce infestation and by removing alternative hosts, for example, the Convolvulaceae Family through constant weeding as phytosanitary measure. Insecticidal spray can also be used to protect harvested tubers in stores (Jansson, Lecrone, Ganler and Smart, 1990), application of soil chemicals (Sib, 2004 and Talerkar, 1991) and the use of nematodes, for example, *Stainernema spp.*, *Caspopcapsae spp.* (Nematode:Nematidae) and *Teterorhabditis bacteriophaza* (Nematode: Heterorhabditidae), which penetrate soil and tubers to kill the larvae of *Cylas spp.* (Jansson, Lecrone, Ganler and Smart, 1993). *Cylas spp.* is a very destructive pest in the production of *Ipomoea batatas* in this region. Apart from rendering the tubers unmarketable, it also causes complete loss of tubers to rot organisms. This study therefore, is to examine the economic implication of infestation by *Cylas spp.* on stored *Ipomoea batatas* tubers in three markets in Maiduguri.

METHOD

Three markets (Monday, Gaboru, Custom), were selected in Maiduguri from which ten whole-sale store and retail seller stores were each marked out for interview. Some samples were also bought and brought to the laboratory for dissection and further investigation on the *Cylas spp.* activities. Photographs were also taken to confer with the originality of the study. The interviews conducted were to serve as inference to the knowledge of the

respondents on the pest *Cylas spp.* and the time of their serious damage and infestation. It took three weeks to complete the first survey and the second survey took another three weeks. Data were collected on number of infestation holes, holes with *Cylas spp.* (dead or alive), price per bag of *Ipomoea batatas* and price per set of six tubers for retailers. The data captured in the six weeks survey were merged by the mean determined and used for the analysis. Dissecting the tubers in the laboratory was to remove *Cylas spp.* imbedded in the tubers and to determine their mean per tuber. Analysis was carried out using Analysis of Variance (ANOVA) and mean separated by Standard Error (SE) and Least Significant difference (LSD).

RESULTS AND DISCUSSION

Ipomoea batatas (sweet potato) is one of the root crops that make the diets of many families richer, delicious and tasty. The tubers inspected also had many signs of dry fungal infested skins, but few *Cylas spp.* infested holes. From this survey results, it is not certain whether it is the *Cylas spp.* that cause the highest losses or the secondary infection from rot organisms. However, it was observed that the two kinds of infestations cause the highest negative economic implication on the marketability of the commodity. Due to these infestations, the commodity is sold at a price that is cheaper than prices of other root crops belonging to the Family Convolvulaceae and even at a much larger quantity because of its shorter shelf life (perishability). Nevertheless, it is also observed that the many families in Maiduguri use the *Ipomoea batatas* to make various dishes, such as potages, flakes and fried flakes. On commercial scale it is fried for sell and with eggs for family diets and for children going to schools. Chips are made out of it, packaged and sold in business centres and markets, creating jobs for youths, women and commercial store holders.

It is a cash crop as shown in fig. 1 & 2 where business men and women are busy cashing from it and food crop as buyers buy from the sellers for domestic uses. Wholesale of these tubers is relatively cheaper than the wholesale cereals and legumes, because of its high rate of perishability during storage due to *Cylas spp.* infestation and secondary infection from rot organisms. These infestations can result in total losses if not protected. The low profitability, mean of N533.30 (15.7%) per bag for all the markets, cause many people not to venture into the business, in addition to the difficulty in storage than other cereal crops. Table 1 shows the mean whole-sale cost per polythene bag, selling price per bag, retail price per set of six tubers and profit accrued per bag after disposing a bag.

In all the three markets, there was no significant difference between the cost price, selling price, retail price per set of six tubers and the profit accrued per bag. The slight difference in these prices may have been due to the cost of transportation from whole-sellers markets to the retail selling points. Table 2 shows the mean number of infested holes per six tubers obtained from each market which were not significantly different ($P > 0.05$) from one another. This suggests that the tubers sold in the three markets were obtained from the same source and same whole-sale market. Table 3 shows the mean infested and *Cylas spp.* obtained from each market during the study period and showed no significant difference from one another. This also confirms that the *Ipomoea batatas* tubers sold in

these three markets came from the same source. Fig. 1 shows piles of sweet potato (*Ipomoea batatas*) bags displayed outside the whole-sale stores for prospective buyers to patronize. The stalking and arrangement shows a professional touch, grouped in a pile of fourteen bags each. Fig.2 shows retail sellers arranging tubers in sets displayed for buyers who only buy for domestic use. Behind each retailer are several bags of the *Ipomoea batatas* from which the tubers are removed for arrangement into sets. Fig. 3 shows two whole tubers with several entry holes made by the weevils. Three *Cylas spp.* emerged from the holes after emerging the tubers into warm water. Fig. 4 shows a dissected infested tuber with two *Cylas spp.* removed from it This suggests that a tuber can have more than one *Cylas spp.* attacking it.

Table 1: Mean whole-sale price per a full polythene bag of *Ipomoea batatas* in three markets

Parameter	Monday	Gamboru	Custom	SE	LSD	P=0.05
Cost price/bag	2980.00a	2830.00a	2950.00a	91.974	188.72	P>0.05
Selling price/bag	3520.00a	3460.00a	3410.00a	157.97	324.13	P>0.05
Price/set	90.00a	103.50a	102.00a	14.589	29.94	P>0.05
Profit/bag	610.00a	660.00a	460.00b	29.94	204.19	P>0.05

Table 2: Mean infested holes per set of six tubers of *Ipomoea batatas* in the three markets

Market	Pieces/set	infested Hole/set
Monday	6.00	0.90a
Gamboru	6.00	0.70a
Custom	6.00	1.00a
Mean	6.00	0.87
SE	0.948	0.105
LSD	5.907	0.215

Table 3: Mean infested holes and *Cylas spp.* per hole of *Ipomoea batatas* from the three markets

Parameter	Monday Market	Gamboru market	Custom market	SE	LSD	P=0.05
Infested hole	0.117a	0.116a	0.183a	0.105	0.215	P>0.05
<i>Cylas spp.</i>	0.250a	0.116a	0.183a	0.143	0.293	P>0.05

Mean with same letters are not significantly different.



Fig. 1: *Ipomoea batatas* whole-seller displaying twenty eight polythene bags filled with the commodity for prospective customers to buy. Photo: Dr. H. A. Sharah



Fig. 2: *Ipomoea batatas* retail sellers displaying their commodities for customers to patronise.
Photo: Dr. H. A. Sharah



Fig. 3: Infested *Ipomoea batatas* showing entry holes and symptoms of fungal infestations and three dead *Cylas* spp. removed from the infested tubers.

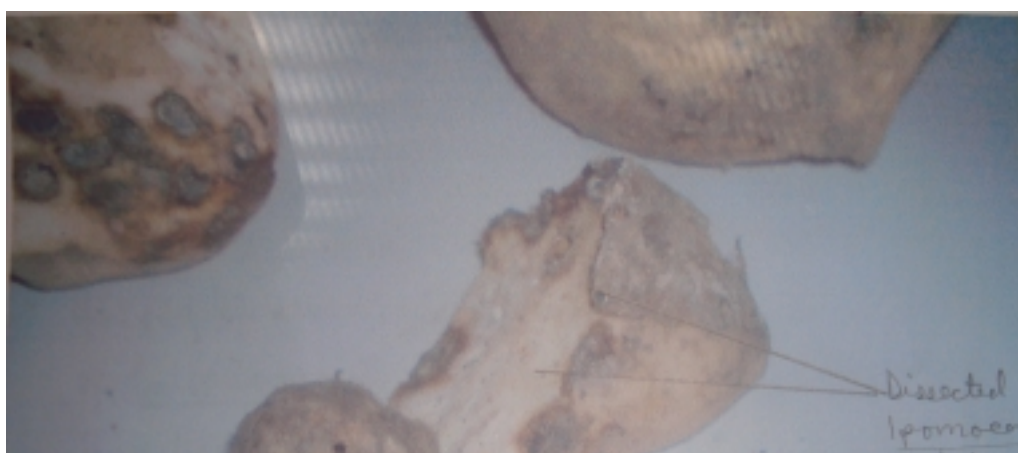


Fig. 4: Dissected *Ipomoea batatas* and fungus infested symptoms on the tubers showing dry skin and two dead *Cylas* spp. removed from the infested tubers.

CONCLUSION

Cylas spp. and rot organisms are very destructive pests in the production of *Ipomoea batatas* in Maiduguri in Borno State. Apart from rendering the tubers unmarketable, they also causes complete loss of tubers. This study therefore, studied the economic implication of infestation by *Cylas spp.* and rot organisms on stored *Ipomoea batatas* tubers in three markets in Maiduguri. The excessive heat in Maiduguri, make it very difficult to store *Ipomoea batatas* due to dehydration, sprouting, drying and rotting. This is why the *Cylas spp.* removed from the dissected tubers were all dead. Perspective of *Ipomoea batatas* production would be bleak if the problems highlighted are not tackled headlong and properly. Many farmers who could not have ready markets for their produce will one day abandon the crop for another promising one. The survey have highlighted and brought to open the problems faced by farmers from harvesting high quality tubers and traders from selling high quality tubers of the *Ipomoea batatas*. With regard to the *Cylas spp.* pest infestation, it showed that despite the intolerable hot weather condition and poor storage facilities, the pest could still thrive and survive and its pest control activities are very vital in the production, storage and marketability of *Ipomoea batatas* in the three markets. There is the need to establish food processing industry to utilise the excess tubers and this could go a long way in encouraging the farmers to produce more and both whole-sellers and retailers will also benefit.

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