OCCURRENCE AND DISTRIBUTION OF MAIZE STEM BORERS IN SOME SELECTED LOCAL GOVERNMENT AREAS OF NIGER STATE, NIGERIA

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ABSTRACT

Maize is one of the cereal crops cultivated for food, feed and as industrial raw materials. Stem borers have been the most damaging group of insect pests in maize cultivation worldwide.Feeding by borer larvae on maize plants usually results in crop losses as a consequence of death of the growing point (dead heart), early leaf senescence, reduced translocation, lodging and direct damage to the ears. To ascertain this, a survey of maize stem borers was conducted in selected Local Government Areas (LGAs) of Niger state (Bida, Bosso, Chanchaga, Gbako, Paikoro, Wushishi) from June to August 2017. Threefarms were surveyed in each LGAs for stem borer larvae, the larvae obtained were caged differently based on LGAs and reared to adults, then taken to Insect Museum atDepartment of Crop protection,Ahmadu Bello University, Zaria, Kaduna State for identification. The results showed that species of Sesamiacalamistiswere found to be prevalent in the maize fields in the sixLGAs of Niger state. Also result of Analysis revealed that Gbako local government area had the highest incidence and severity of maize borer infestation.

Key words: Survey, stem borers, larvae, species, maize

INTRODUCTION

Maize (*Zea mays* L.) is a cereal crop in the family Poaceae. It is perhaps the most completely domesticated of all cereals (Okwechee*et al*., 2012) and essentially a crop of warm countries with adequate soil moisture (Okwechee*et al*., 2012). It originated from South America where it was taken to all parts of the world (Gonzalez, 2001). Modern maize is considered to have evolved from Teosinte (God's corn) than from early Mesoamerican maize called Chapalote or a Tripacum species (Brenneman, 2001). Maize is an important cereal crop with high economic value after wheat and rice in the world including Pakistan (Bukhsh*et al.* 2012). It has short growing season and is drought resistant that make it very easy to grow everywhere in different climatic conditions of the world (Amin 2011). Due to its highest yield potential among the cereals it is known globally as queen of cereals. The largest producer of maize is United States of America (USA) contributing about 35% of the total world maize production. It is known as mother grain of Americans and it is the driver of the US economy. In USA, EU, Canada and other developed countries, maize is used mainly to feed animals directly or sold to feed industry and as raw material for extractive fermentation industries. In Latin America and Africa the main use of maize is for food while in Asia it is used for food and animal feed. In fact in many countries it is the basic staple food and an important ingredient in the diets of people. Globally, it has been estimated that approximately 21% of the total grain produced is consumed as food. Maize is the third most important food grain in India after wheat and rice. In India, about 28% of maize produced is used for food purpose, about 11% as livestock feed, 48% as poultry feed, 12% in wet milling industry (for example starch and oil production) and 1% as seed (AICRP on Maize, 2007).

The major species of stem borers associated with maize in Nigeria are the maize stalk borer, *Busseolafusca*Fuller (Noctuidae), the pink stalk borer, *Sesamiacalamistis*Hampson (Noctuidae), the millet stem borer, *Acigonaignefusalis*Hampson (Pyralidae) and the Africa sugarcane borer, *Eldanasaccharina*Walker (Pyralidae) (Balogun and Tanimola, 2001). Others of less importance are the spotted stalk borer (*Chilopartellus*Swinehoe. Pyralidae),*C. orichalcociliella, C. suppressalis,*and the ear borer (*Mussidianigrivenella*Pyralidae) (Khan, *et al.,* 2001).*Busseolafusca*larvae feed on the aboveground parts of the grass hosts, causing economically important yield losses to crops such as

maize. Feeding and tunnelling by *B. fusca*larvae can result in the destruction of the growing point (resulting in "deadhearts"), early leaf senescence, interference with nutrient and metabolite translocation resulting in malformation of the grain, stem break-age, plant stunting, and direct damage to ears (Kfir*et al*., 2002).

The severity and nature of stem borer damage depend upon the borer species, the number of larvae feeding on the plants and the plant reaction to the borer feeding. The occurrence of maize stem borers affect the crop throughout the growth stages from seedling to maturity, The objective of research work was to determine the occurrence and distribution of stem borers and identification of various borers in the survey fields. The information thereby obtained would be useful for developing resistant maize varieties, and information on the distribution pattern of different stem borers species in the study area.

MATERIALS AND METHODS

Study Sites and Sampling Technique

Six (6) local government areas were selected for the study in Niger state, namely; Bida, Bosso, Chanchaga, Gbako. PaikoroandWushishi.Niger state is in the Southern Guinea Savanna of Nigeria, with Geographical Positioning System (GPS) co-ordinates of (Latitude 9.52335N, and Longitude 6.44791E).

Field survey was conducted in 6 selected maize growing local government areas (LGAs) of Niger state, Nigeria. In each local government, 3 farm sites were surveyed in 2017 cropping season. Maize stem borersseverity was determined by visual observation of holes on the maize plants, based on 9- point rating scale (Appendix1). The infested plants were selected randomly and the lepidopterans in their larval stage (stem borers) inside the infested plants were collected.

Rearing of Larvae

Wooden insect cages were made, measuring 25 by 50cm in diameter and 50cm of height. The cages were cleaned thoroughly and small quantityof moist top soil was evenly distributed in the cages, before the insects larvae were introduced into the cages. The collected insects from surveyed farm sites were put inside their designated cages for each LGAs. freshmaize leaves were put into their respective cages to feed on and then reared to adults.

Identification andClassification Techniques

The insects at their adult stage were taken out of their respective cages and were kept in different transparent plastic containers and labeled (for the different farms at which they were collected).The samples were taken to the insect laboratory (Insect Museum) of the Department of Crop Protection, Faculty of Agriculture Ahmadu Bello University (ABU), Zaria, Kaduna state for identification and classification by comparing with various existing species in the Insect Museum.

Data Analysis

The average infested plants, in each farm from various LGAs were converted into percent infestation. The data were subjected to Analysis of variance (ANOVA) using Minitab package. Significant levels of the ANOVA were tested at 5% probability level and where significant, means were separated using least significant difference (LSD).

RESULTS AND DISCUSSION

Incidence of stem borer infestation in selected local government area of Niger State

The results indicated that there were significant ($p \leq 0.05$) differences among the six local government areas surveyed in terms of incidence of stem borers infestation (Figure 1), GbakoLGA had the highest incidence (58.33) of stem borers which was significant different from Wushishi (12.00), Boso (13.33) and Paikoro (20.00), while Wushishi had the least incidence of stem borers but not significantly different from Bosso LGA.

Severity of stem borer infestation in selected local government area of Niger State

The severity of maize stem borers in six LGAs of Niger State were significant. GbakoLGAs had the highest severity (33.33) which was significantly different from that observed in Wushishi LGA which had the lowest severity (7.00). The stem borerseverity among other LGAs were not significantly.

Information from various farmers met on the farms during survey about the knowledge of the occurrence of stem borers was positive. They were aware of the presence and infestation of the pest, but no management strategy was attempt against it. The cropping system practiced by most farmers in the areas also making favourite breeding environment for the survival and infestation of stem borers because most farmers intercropped maize with sorghum, millet and pearl millet which serve as alternative host for some of stem borer species.

In this study, *S. calamistis*was the most predominant stem/stalk borer species. This agreed with the finding of Obhiokhenan*et al.* (2001) who reported higher percentage of *S. calamistis*in the mangroove and rain forest zones of Nigeria. Polaszek (1998) had earlier reported that *B. fusca, S. calamistis, C. partellus, E. saccharina*and *C. ignefusalis*were the most important and widely distributedlepidopterous stem borers in Nigeria. Similar observations have been made in studies carried out inSouth-western Nigeria by Balogun and Tanimola, 2001 who reported that the

major species of stem borers associated with maize in Nigeria are the maize stalk borer, *Busseolafusca*Fuller (Noctuidae), the pink stalk borer, *Sesamiacalamistis*Hampson (Noctuidae), the millet stem borer, *Acigonaignefusalis*Hampson (Pyralidae) and the Africa sugarcane borer, *Eldanasaccharina*Walker (Pyralidae). Ogunwolu (1987) further reported that the difference in population between the two borer species was due to the feeding habit of the borers.

CONCLUSION ANDRECOMMENDATION

The result of this study has shown that all the six LGAs surveyed for maize stem borers were positive but varied in terms of incidence and severity from one LGA to the other during the 2017 cropping season. Conventional identification carried out in the insect museum showed that *S. calamistis*was the most predominant stem/stalk borer species. The low yield of maize has been attributed to the infestation of various species of stem borers in Nigeria. Furthermore, the study will assist the maize growing farmers in Niger State to take precautionary measure against the occurrence of stem borers in their localities.

Farmers should be enlightened on maize stem borer management to prevent the borer damage on their field Improved resistance maize cultivars should be made readily available at subsidized rate for them. Further study should be conducted to ascertain the occurrence of stem borersannually.

Table1. States and Local Government Areas where Farms were surveyed

LocalGovt Area	Location	Longitude (^{0}E)	Latitude (^{0}N)	Altitude (masl)
Bida	Bida	6.03996	9.11072	111
Bida	Bida	6.13219	9.21608	121
Bida	Seriki-fulani	6.18545	9.27320	89
Paikoro	Mabe	6.61370	9.43995	300
Paikoro	Jita	6.75539	9.40057	378
Paikoro	Kikamaria	6.59153	9.36360	277
Wushishi	Kaluko	6.15421	9.79919	137
Wushishi	Kompani	6.161	9.822	138
Wushishi	Garatu	6.43889	9.81108	122
Bosso	Gidankwano	6.44689	9.53126	207
Bosso	Futminna farm	6.43889	9.48563	206
Bosso	Lemu	6.44689	9.51707	213
Gbako	Kunkele	6.02759	9.40102	167
Gbako	Ndakama	6.03308	9.31362	138
Gbako	Mandella	6.02189	9.15765	148
Chanchaga	Bebeji	6.50680	9.58266	220
Chanchaga	Chanchaga	6.5127	9.59210	217
Chanchaga		6.53046	9.59737	226

(masl= metres above sea level)

ble2.Infestation of maize plant by stem borers.

cal GovtArea	Location	Hectares (m²)	Severity(%)	Incidence(%)
	Bida	3	3	7
	Bida	3	20	35

Bida	Bida	6	20	50
Paikoro	Seriki	2	30	20
Paikoro	Mabe	2	20	20
Paikoro	Jita	2	20	20
Wushishi	Kiria	1	10	20
Wushishi	Kaluko	1	10	20
Wushishi	Kompani	2	1	15
Bosso	Garatu	2	10	1
Bosso	GidanKwano	1	10	20
Bosso	Futminnafarm	3	35	30
Gbako	Lemu	2	70	40
Gbako	Maikunkele	1	55	30
Gbako	Ndakama	2	50	4
Chanchaga	Mandella	1	20	30
Chanchaga	Bebeji	1	50	30
Chanchaga	Chanchaga	1	10	35
				15

Table 3.Severity of Maize Stem Borer in selected government of Niger state

Local Governments	Means
Bida	30.00[a]
Paikoro	14.33[ab]
Wushishi	7.00[b]
Gbako	33.33[a]
Bosso	30.00[a]
Chanchaga	26.67[a]

Means with the same letter in the same column are not significantly different by LSD at 0.05 probability level.

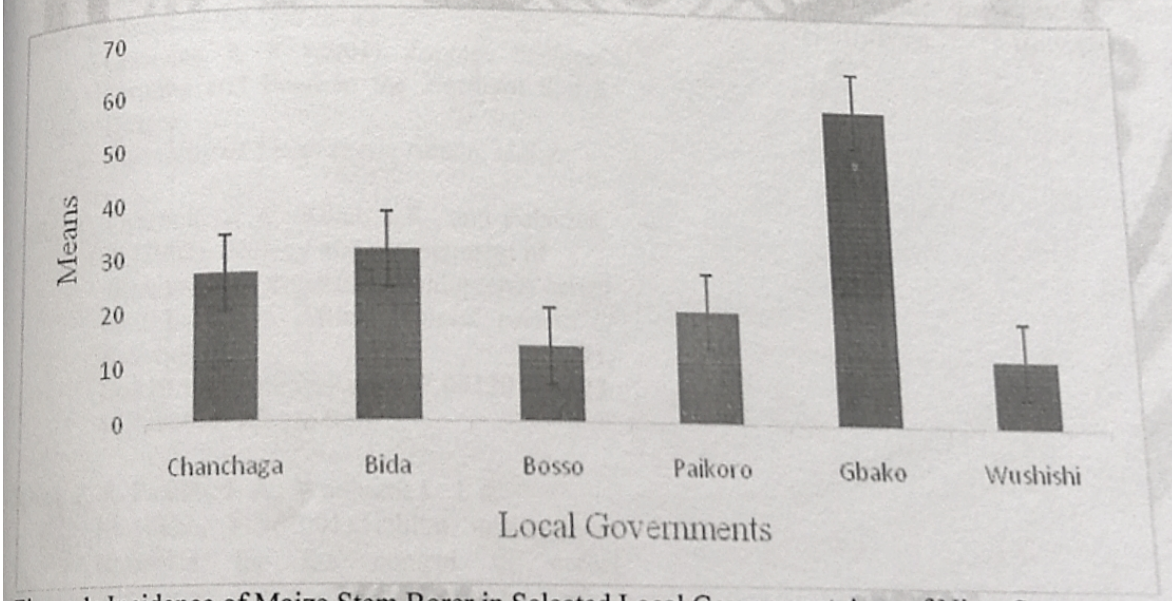

Figure 1: Incidence of Maize Stem Borer in Selected Local Government Area of Niger State

Appendix 1: Visual scoring scale used for assessing stem borer damage on maize plants

Visual rating of plant damage	Numerical score	Resistance reaction
Damage	0	Likely escape
Few pin holes	1	Highly resistant
Few short holes on few leaves	2	Resistant
Several short holes (<50%)	3	Resistant
Several leaves with short holes (>50%)	4	Moderately resistant
Elongated lesion on a few leaves	5	Moderately resistant
Elongated lesions on several leaves	6	Susceptible
Several leaves with long lesions or tattering	7	Susceptible

Severe tattering
Plant dying as a result of foliar damage
Source: CIMMYT, 1989

8	Highly susceptible
9	Extremely sensitive to damage

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