ASSOCIATION OF SEED SCIENTISTS OF NIGERIA (ASSN)

"MINNA 2019"

Proceedings of the 5th Annual Conference

THEME:

"SEED SECURITY: A VERITABLE TOOL FOR FOOD SUFFICIENCY IN A SUSTAINABLE AGRICULTURE"

DATE: 4TH - 7TH AUGUST, 2019

EDITED BY:

GANA, A. S. TSADO, E. K. SALAUDEEN, M. T. IBRAHIM, H.
TOLORUNSE, K. D. BELLO, L. Y. SAIDU, A.

EFFECTS OF CORN EARWORM (*Helicoverpazea*) ON THE YIELD OF SELECTED MAIZE (*Zea mays*L.) VARIETIES

*[1]Oyewale, R.O, [1]Abdulsalam, S. A.[1]Bello, L. Y., [1]Salaudeen, M. T.,[1]Ibrahim, H. M and [2]Idowu, G. A.
[1]Department ofCrop Production, Federal University of Technology, Minna, Niger state, Nigeria.
[2]National Agricultural Seed Council, Abuja, Nigeria
*Corresponding author, e-mail-r.oyewale@futminna.edu.ngphone no. 08069532552

ABSTRACT
An experiment was carried out at Department of Crop Production nursery, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna main Campus, GidanKwano during the month of March to June 2016, to determine maize variety that are tolerant to infestation of maize earworm (*Helicoverpazea*). Four maize varieties (Across98, NoMa1212, Oba super II and Dangwari) were screened for resistance to maize earworm. The treatments were fitted into completely randomized design (CRD). Data such as, cob number, damage and grain weight were collected and subjected to analysis of variance (ANOVA) using the SAS institute (2002-2003) version 9.1 with compatibility of 32 byte operating system. The result showed that the level of infestation of corn earworm differs among the four maize varieties with Across98 recorded less damage, cob number and higher number of grain weight,but on the other hand, Dangwari and NoMa1212 were noted to have greater damage, less number of cobs and less grain yield. Hence, Across98 and Oba super II maize varieties are recommended.

Keyword: *Helicoverpazea,* Across98, NoMa1212, Oba super II and Dangwari

INTRODUCTION
Maize (*Zea mays* L.) belongs to the family of grasses (Poaceae). It is cultivated globally, being one of the most important cereal crops worldwide (Ammani*et al.*, 2011). In Nigeria, and indeed in most of Sub-SaharanAfrica, maize derives socio-economic importance from its value as staple food item (contributing to household food security), animal feed, agro-industrial and trade, thus growing the economy and alleviating poverty (Nwankwo, *et al.*, 2014). Nigeria is Africa's largest producer of maize; production traverses diverse agro-ecological zones (from the rainforest to the Northern Guinea Savanna). The annual increase in the rate of output is largely attributable to expansion of expanse of land being cultivated (Okweche, *et al.*, 2014). Yield-detrimental factors include non-use or inefficient application of improved production technology, non-existent or low-level plant health management skill, low capital outlay and inefficient resource utilization.Maize is one of the important grains in Nigeria, not only on the basis of number of farmers that engaged in its cultivation, but also in its economic value, as it is cultivated in the rainforest and the derived savanna zones of Nigeria (Iken and Amusa, 2004). In Ghana, maize is the first among the cereal crops grown. The crop is cultivated across the entire ecological zones of Ghana. Ashanti region, which is around the forest zone, is one of the leading regions where the crop is cultivated twice in a year, i.e., the major season being from April – July and the minor season from August- November. The corn earworm (*Helicoverpazea*) is a major pest of most types of corn found in rainforest and derived savanna of Nigeria. It is

responsible for a large percentage of grade-out corn in this province. Earworms feed almost exclusively on the tips of the ears, which leaves no visible damage to the husk or the leaves of the plant but grains on the cob. The earworm has a wide host range and feeds on many cultivated crops and weeds (Kalan, 2009).The objectives of the study were to;identify the effect of corn earworm on the yield of maize varieties andobtain the best variety that resists the infestation of corn earworm.

MATERIALS AND METHODS

The experiment was conducted at Nursery and Horticulture garden of the School of Agriculture and Agricultural Technology, Federal University of Technology, GidanKwano, Niger State, within the period of March to June, 2016. Minna lies on the Latitude 9°41^{I}N, 6°30^{I}E and altitude of between 200 - 300 m above the sea level in the Southern guinea savanna zone of Nigeria(NMLH, 2002).

The seeds used for the study were obtained from the Crop production laboratory, Federal University of Technology Minna, Niger State. The maize varieties were;(NoMa 1212, Oba super II, Across98 and a Dangwari. The experimentbags were arranged in a completelyrandomizeddesign (CRD), with three replications. A total of 12 bags were used. Each of the bags was filled up with top soil incorporated with organic manure (cow dung). Seeds of the four varieties were sown manually which wassubsequently thinned to 2 plants per stand Five (5) weeks after seedling emergence, the plants were infested with the eggs of corn earworm which were gotten from the store where maize grains were stored. The first weeding was done manually at three weeks after seedling emergence and the subsequent weeding was carriedout at seven and eleven week.

Data Collection

The sampling technique used in sampling earworm was destructive sampling, every harvested cobs from each plot was plied (ear) and all plants in each plot were inspected for symptoms of earworm attack (dead heart, leaf damage, frass and bored holes) and counted as damage and used to estimate percentage earworm damage, Leaves of each plant were checked for sign of earworm exit holes.. Percentage earworm infestation in plants varieties per plot was then calculated. The larvae first sighted on the leaves were pictured and is shown on the plate for identification.

Data were collected on number of Cob per variety:Five (5) cobs were plucked at random and the number of grains in 2-3 rows was thencounted and their mean average was estimated and multiplied by the number of rows on the cob. The mean number of grains per cob for each treatment was later calculated using the formula shown below.

Mean average $=\sum x/n$

The grain from cobs that had reached physiological maturity were harvested and left to dry on the trial site so that moisture would be reduced to dry weight and weighed by using weighing balance. The results from each row were used to evaluate the grain weight.

The data collected were subjected to the analysis of variance (ANOVA) using SAS procedures (SAS Institute, version 9.1.3 2002-2003). The treatment means were separated using the least significant difference (LSD) at 0.05 level of probability.

RESULTS

Theeffect of corn earworm infestation on the number of cob among the varieties is presented in Table1. Significant ($p \leq 0.05$) differences among maize varieties were observed, Across98 had the highest number of cob compared to Oba super II and Dangwari at 8 WAS. The various infestation effects as well as the interaction between the presence of the insect larvae on the maize varieties showed significant ($P \leq 0.05$) differences in the production of number of cob among the varieties. At 10 WAS, Across98 similarly recorded highest significant ($p \leq 0.005$) difference compare to Dangwariand NoMa1212, but not significant difference from Oba super II. At 13 WAS, effect of corn earworm infestation (Table 2) was examined on grain weight of different maize varieties, Across98 had the highest grain weight and significant ($p \leq 0.05$) difference from other maize varieties. There was also significant ($p \leq 0.005$) difference between Dangwari and Oba super II and NoMa1212 with Across98 recorded the highest number of grain weight. Effect of corn earworm infestation on maize damage (table 3),at 6 WAS, Across98 had the lowest damage effect of the corn earworm which was significantly ($p \leq 0.005$) different from other maize varieties. Dangwarivariety recorded the highest damage among all other varieties. Similar trend occurred at 8 WAS, Dangwari variety recorded highest and significantly ($p \leq 0.005$) different among other varieties with Across98 having the lowest damage, but there was no significant difference among other varieties. On the other hand, there was significant ($p \leq 0.005$) differencebetween Dangwari and Across98 at 10 WAS with Dangwari recorded highest damage of infestation while the Across98 recorded lowest damage of corn earworm infestation.

Table1. Effect of Corn Earworm on the Number of Cobs at 8 WAS and 10 WAS

Treatment	8WAS	10WAS
Across98	14.33a	54.56a
Oba superII	10.00ab	13.66ab
Dangwari	9.66b	10.00b
NoMa121	9.00b	11.00b
LSD	4.27	63.09

Means with the same letter in the same column are not significantly different by LSD at 0.05 level of probability
WAS = weeks after sowing

Table 2. Effect of corn earworm infestation on grain weight of maize varieties at 13 WAS

Treatment	13WAS (g)
Across98	150.56a
Oba superII	99.98b
NoMa1212	99.05b
Dangwari	61.93c
LSD	92.10

Means with the same letter in the same column are not significantly different by LSD at 0.05 level of probability
WAS=weeks after sowing

Table 3. Effect of Corn Earworm on damage to the maize varieties at different growth stages

Treatment	6 WAS	8 WAS	10 WAS
Dangwari	14.67a	15.33a	23.33a
NoMa1212	12.00ab	12.66bc	21.00a
Oba superII	10.67ab	10.66bc	15.33ab
Across98	8.33c	8.33c	9.33b
LSD	4.70	3.16	6.72

Means with same letter in the same column are not significantly different by LSD at 0.005 level of probability

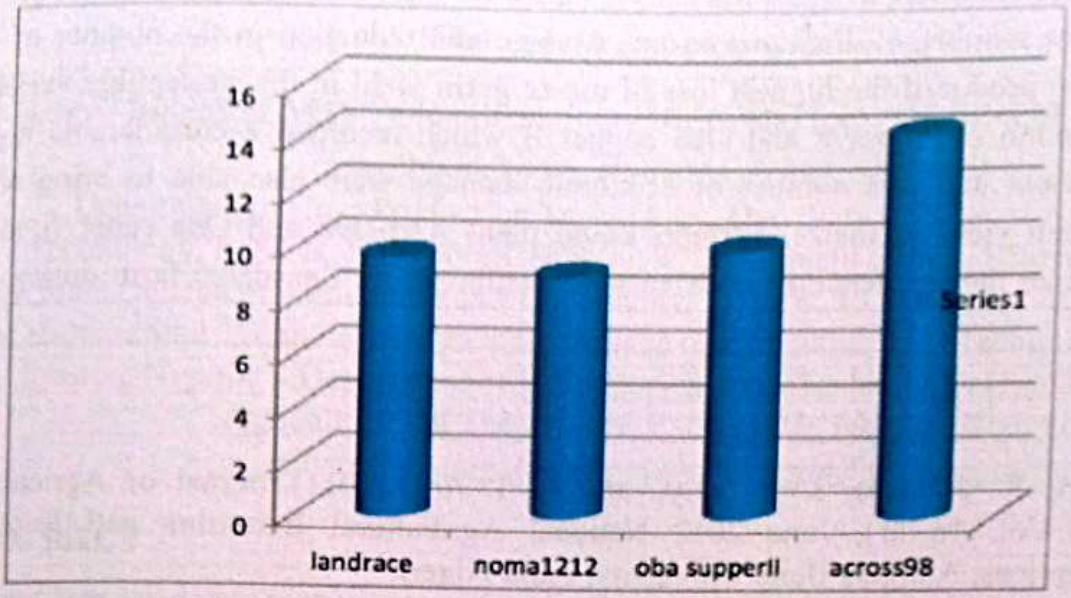

Fig 4.1.1 Mean comparison of various treatment for number of cob at 8 WAS

DISCUSSION

Corn earworm (*Helicoverpazea*) is found to be a major pest of most types of maize in northern Nigeria, because it feeds exclusively on the tips of the ears (OMAFRA, 1998). The result obtained from this study indicated that the effect were varied among the four varieties, and this might possibly be due to the fact that Across98 is a hybrid maize variety and its genome as well as the germplasm has confined immunity in it to resist the infestation of the *Helicoverpas*pphence influenced the production of cobs and more interestingly less larval population. Number of cobs per plant decreased with the increase in the number of larvae on the susceptible varieties except for Across98. This result confirmed the earlier findings of Asmare, *et al.* (2004) that cob production in maize plant increases by infestation of *Helicoverpazea*in hybrid maize but to some extent reduces in susceptible maize varieties. Oba super II showed a marginal increase over NoMa1212 and Across98 being the highest in both number of cobs and grain yield. The results suggest that the genomic and varietal characteristics are essential for favorable partitioning of dry matter between grain and other parts of maize plant. There were different colours of the species of *Helicoverpazea*observed on the field at 6 WAP ranging from green, black, and mixed black and white patches larvae. The predominant colour was the black followed by black and white patched with green colour species having the lowest population on the maize field. At first inspection 6 WAS whorl feeding created ragged holes at the point of invasion on the stem, leaves and ears of the maize during silking. During this period of maize development, corn earworm was found to prefer dwelling on the ear especially during the period of silking and the ear was found brutally damage on most of the susceptible varieties in the course of feeding. The number of maize earworm larvae on the four varieties harvested from the

experiment differed, at 6 WAS, 8 WAS and subsequently 10 WAS.. The infestation did not only result in the highest number of *Helicoverpaspp*, damage and reduction in the number of cob production, but also produced the highest loss of maize grain yield in the susceptible varieties. However, the adoption of Acoss98 and Oba supper II which recorded a considerable higher amount of grain yield and less number of economic damage were also able to bring about increase in the grain yield of maize. Farmers could plant Across98 and Oba super II maize varieties to minimize the incidence of corn earworm outbreak on the maize farm during off-season production.

REFERENCES

Ammani, A.A., A. K. Ja'afaru, J. A. Aliyu and A. I. Arab.(2011).Journal of Agricultural Extension Vol. 16 (1), June 2012 National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria-Nigeria.

Aseidu, E. A., Sallah, P. Y.K. Twumasi-Afriyie, S and Obeng- Antwi, K., (2003). Characterization of quality protein maize (QPM) varieties. A paper presented at the Training Workshop on Quality ProteinMaize (QPM)Development and seed delivery system. Crops Research Institute (CRI) Kumasi. August 4-15. 2003.

Asmare Dejene., EmanaGetu, FerduAzerefegne and Amare Ayalew. (2014). Distribution and impact of Busseolafusca (Fuller) (Lepidoptera: Noctuidae) and Chilopartellus (Swinhoe) (Lepidoptera: Crambidae) *Journal of Entomology and Nematology* Vol. 6(1), pp. 1-13, January 2014 DOI: 10.5897/JEN2013.0078 ISSN 2006-9855 ©2014 *Academic Journals*http://www.academicjournals.org/JEN

Kalan.(2009).Plant health Australia. Contingency Plan – Corn earworm (Helicoverpazea)

Mandrioli M, Borsatti F, Mola L (2006). Factors affecting DNA preservation from museum-collectedlepidopteranspecimens.*EntomologiaExperimentalis Applicata*, 120:239-244.

Nwankwo, E. N,Egwuatu R. I, Okonkwo N.J and Boateng, B.A. (.2014). Screening of ten maize varieties Zea mays (L.) for resistance against *Prostephanustruncatus* (Horn)

Okweche, Simon Idoko and Umoetok, Sylvia B. A. (2014). The distribution of maize stem borers in cross river state, Nigeria. Department of Crop Science, Faculty of Agriculture, Forestry and Wildlife, P. M. B. 1115, University of Calabar, Nigeria. (623)