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Evaluation of Some Sorghum Genotypes for the Susceptibility to Sorghum Head Bug *Eurystylus* Sp (Hemiptera; Miridae) in the Blue Nile State, Sudan

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ABSTRACT

The change from traditional to new high-yielding sorghum cultivars with shorter crop maturity cycles and more compact head types, increase panicle insect problems over all the world. The study was designed to evaluate different sorghum genotype for the sorghum head bugs susceptibility. The experiment was conducted at the Blue Nile State, Damazin Research Station Farm, during the 2013/2014, 2014/2015 and 2015/2016 cropping seasons, respectively. The Design used was randomized complete block design (RCBD) and consisted of four replications. Plot size was 7x 5 m², spacing 0.80 m between rows and 10 cm within rows. Two counts were done at milk and soft dough stages to determine head bug density / panicle. Generally compact heads genotypes, Wad Ahmed, Um Benain, showed the highest number of bugs and Mehaireba and Botana (loose and semi-compact heads) was recorded the lowest number of head bugs.

Keywords: *Sorghum, Compact, Head bugs, Genotypes, Panicle.*

INTRODUCTION

Sorghum is the fourth most important world cereals crop following wheat, rice, and maize. It is a staple food in the drier part of Africa, china and India. Sorghum is a cereal grain crop mostly grown in Africa, Asia and Central America. Nigeria and Sudan contribute nearly half of the sorghum production in Africa (Thabit, 2015).

Panicle feeding insects cause yield loss and reduction in grain quality. Forty-two panicle feeding insect pests have been recorded in Africa (Ratnadass and Ajayi, 1995). Miridae head bugs are important pests of sorghum in Asia and Africa, and it has gave attention in recent years as an economic pest of sorghum, that causes severe yield losses wherever they are found (Showemimo, 2005**).** The damage of head bugs starts as soon as the panicle emerges from the boot leaf, the nymphs and adults suck the sap from the developing grain and occasionally on tender parts of the sorghum panicle (Sharma *et al*. 1992a).. Head bug damage create quantitative and qualitative losses and thereby leading to a loss of over 80% of the crop, however, if damage is done at early stages of grain development, it could result in total crop failure (Ajayi and Tabo,1995).

MATERIALS AND METHODS

The experiment was conducted in the Blue Nile State, Damazin Research Station Farm during seasons 2013/14, 2014/15 and 2015/16, 13 sorghum genotypes for the first season and 16 sorghum genotypes in the second and third seasons (local and improved) Wad Ahmed, Tabat, Butana, Bashaeir, Arfa Gadamak, Um Benean, Mehearibа, Karamaka, Mogod, Wad Akar, kolum, Torkash, Wad Yapis, ICSV93075, BS.D6 and Edo 16.dw was used with the different panicle type compact, semi-compact and loose head were sown on 14, 19 and 27 July, during the first, second and third season respectively. The Design used was randomized complete block design (RCBD) and consisted of four replications. Plot size was 7x 5 m², spacing 0.80 m between rows and 10 cm within rows. Two counts were done at milk and soft dough stages. Five panicles were randomly selected from each plot covered using a polyethylene bag and shaken vigorously to dislodge all head bugs on it. Insects collected were taken to the laboratory and kept in a refrigerator for hours to make them immobile and head bugs number per head were counted. For the grain yield, two middle rows were harvested from each plot and their yield was converted to ton/fed.

Data collected were transformed to appropriate transformation whenever it was necessary and analyzed using Analysis of Variance (ANOVA) and Duncan Multiple Range Test (DMRT) to separate means.

THE RESULTS

Season 2013/2014

From the results obtained (Table 1) there were significant differences between the tested genotypes in number of head bugs/panicle in the first and second counts. The highest number of bugs/panicle was recorded on (Mogod, ICSV93075, Karamaka, Wad Ahmed, Um Benain, Arfa Gadamak, Wad Akar,…) and the Lowest was recorded on (Mehearibа, Basheir, Botana and Tabat) in the two counts. There were significant differences in grain yield the highest yield recorded by Wad Akar followed by Botana (Table 1).

Table1. *Mean number of sorghum head bugs / panicle, and yield for different sorghum genotypes, season 2013/ 2014.*

Genotype	Compactness	No. of bugs/panicle		Yield ton/fed
		1st count	2nd count	
Wad Ahmed	Compact	(4.8) 2.3 abc	(7.6) 2.8 a	0.70 ab
Tabat	Compact	(1.6) 1.4 d	(2.0) 1.6 def	0.86 ab
Botana	Loose	(2.2) 1.7 cd	(2.0) 1.6 def	0.91 ab
Basaheir	Loose	(2.9) 1.8 abcd	(3.4) 1.8 cdef	0.60 b
Arfa Gadamak	Compact	(2.5) 1.7 bcd	(2.9) 1.9 cdef	0.85 ab
Um Benain	compact	(5.4) 2.2 abcd	(4.2) 2.1 bcde	1.0 ab
Mehearibа	Loose	(1.6) 1.4 d	(1.9) 1.5 ef	0.73 ab
Karamaka	Loose	(6.0) 2.5 ab	(1.4) 1.4 f	0.74 ab
Mogod	Compact	(6.5) 2.6 a	(4.7) 2.3 abc	0.83 ab
Wad Akar	Compact	(4.1) 2.1 abcd	(4.2) 2.2 bcd	1.28 a
ICSV93075	Semi-compact	(6.2) 2.6 a	(3.4) 2.0 bcdef	0.87 ab
BS.D6	Semi-compact	(3.6) 2.0 abcd	(5.8) 2.5 ab	0.80 ab
Edo 16 dw	Semi-compact	(3.7) 2.0 abcd	(3.2) 1.9 bcdef	0.79 ab
SE±		0.27	0.19	0.18
C.V%		23.3	17.7	38.7

Means followed by the same letter (s) are not significantly different

Some data transformed to $\sqrt{x+0.5}$

Means in parenthesis are actual data

Season 2014/2015

The different sorghum genotypes showed a high significant difference in the first and second counts for head bug preference. Wad Acar, Wad Yapis, Wad Ahed, Arfa Gadamak, Um Benain, Torkash and Kolum had the highest number of bugs/ panicle in both counts.

Tabat, Bs. D.6, Boutana, Edo. 16 dw recoded the lowest number of bugs/panicle. The high yield was recorded by Wad Yapis, W. Ahmed, Tabat and ICSV 93075 (Table 2).

Table2. *Mean number of sorghum head bugs / panicle, and yield for different sorghum genotypes, season 2014/2015*

Genotype	Compactness	No. of bugs/panicle		Yield ton/fed
		1st count	2nd count	
Wad ahmed	Compact	12.0 ab	(2.8) 1.8 abc	(0.54) 1.02 ab
Tabat	Compact	7.3 cd	(1.2) 1.3 c	(0.50) 1.00 abc
Boutana	Loose	7.1 cd	(3.1) 1.7 abc	(0.32) 0.91 bcde
Bashair	Loose	6.4 d	(1.3) 1.3 c	(0.17) 0.82 cde
Arfa Gadamak	Compact	12.3 ab	(2.8) 1.7 abc	(0.29) 0.89 bcde
Um Benain	Compact	12.3 ab	(2.0) 1.6 bc	(0.13) 0.81 de
Mehearibа	Loose	5.6 d	(1.6) 1.4 bc	(0.21) 0.84 bcde
Karamaka	Loose	10.1 bc	(2.1) 1.5 bc	(0.20) 0.84 bcde
Mogod	Compact	11.5 ab	(6.8) 2.5 a	(0.26) 0.87 bcde
Wad Akar	Compact	14.3 a	(2.4) 1.6 bc	(0.50) 0.99 abc
ICSV 93075	Semi-compact	10.4 bc	(2.7) 1.8 abc	(0.50) 1.00 ab
Bs. D.6	Semi-compact	5.5 d	(1.7) 1.4 bc	(0.39) 0.94 bcde

Edo. 16 dw	Semi-compact	4.4 d	(1.1) 1.2 c	(0.08) 0.76 e
Kolum	Compact	11.0 ab	(2.7) 1.8 abc	(0.42) 0.96 bcd
Torkash	Compact	12.0 ab	(4.4) 2.2 ab	(0.38) 0.93 bcde
Wad Yapis	Compact	13.5 ab	(2.5) 1.7 abc	(0.89) 1.14 a
SE		1.2	0.29	0.06
C.V%		21.4	29.8	11.2

Means followed by the same letter (s) are not significantly different

Some data transformed to $\sqrt{x+0.5}$

Means in parenthesis are actual data

Season 2015/2016

From the results obtained there was a significant difference between the genotypes in number of head bugs/head in the first and second counts. Significant differences were found between genotypes in number of bugs/panicle and the results are shown in (Table 3). In the first count the highest number of bugs/panicle was recorded on Wad Ahmed followed by Mogod, Torkash and Wad Yapis, and the lowest bugs/panicle was recorded on Karamaka followed by Basheir, BS. D6 and Edo 16 dw. In the second count, the highest number of head bugs was recorded on Um Benain followed by Mogod, Kolum and Wad Ahmed and the lowest was recorded on Karamaka followed by Boutana and Mehearibа (Table 3).

Wad Acar significantly gave the highest yield followed by KCSV93075, BS.D6 and Wad Ahmed (Table 3)

Table3. *Mean number of sorghum head bugs / panicle and yield for different sorghum genotypes, season 2015/2016*

genotype	Compactness	No. of bug/panicle		Yield ton/fed
		1st count	2nd count	
Wad Ahmed	Compact	12.3 a	14.1 bc	1.5 abc
Tabat	Compact	7.2 bc	8.4 fgh	1.4 abc
Boutana	Loose	6.1 c	6.8 gh	1.5 abc
Basaheir	Loose	4.3 c	9.6 efg	1.0 de
Arfa Gadamak	Compact	6.7 bc	10.3 def	1.1 de
Um Benain	Compact	9.3 ab	17.7 a	1.1 de
Mehearibа	Loose	4.9 c	6.9 gh	1.2 cd
Karamaka	Loose	4.2 c	6.4 h	0.9 cd
Mogod	Compact	11.6 a	16.1 ab	1.1 de
Wad Akar	Compact	9.5 ab	10.7 def	1.7 a
KCSV93075	Semi-compact	5.9 c	9.5 efg	1.6 abc
BS.D6	Semi-compact	4.9 c	9.9 efg	1.6 abc
Edo 16 dw	Semi-compact	4.9 c	7.4 fgh	0.6 f
Kolum	Compact	9.7 ab	14.2 bc	1.2 cd
Torkash	Compact	10.9 a	12.2 cde	1.1 de
Wad Yapis	Compact	10.7 a	13.4 bcd	1.3 bcd
LSD		2.9	3.3	0.31
C.V%		23.4	17.9	14.6

Means followed by the same letter (s) are not significantly different

Discussion

Generally the developed compact-panicle, short-duration cultivars evaluated had a higher population of head bugs, however, the variety Kramaka which is loose panicle type had a high number of head bugs This is in agreement with Leuschner (1995) who reported that outbreaks of head bugs in southern and eastern Africa are mainly associated with newly developed compact-panicle, short-duration cultivars (120-130 days).

From the results obtained there were significant difference between the genotypes in number of head bugs/head in the first and second counts, the highest number was recorded on improved compact and semi-compact heads (Mogod, ICSV93075, Wad Ahmed, Um Benain, Arfa Gadamak, Wad Akar,…). This results is in agreement with Ajayi, *et. al*., (2001) who reported that head bug incidence was generally higher on improved compact sorghum cultivars.

The lowest head bugs/panicle were recorded on the semi-compact and loose panicle genotypes,

e.g., (Mehearibа, Basheir and Botana)in the two counts. Tadesse (1986) reported that loose heads of traditional cultivars had a fewer head bugs, aphids and bollworm. Sharma and lopez(1992) reported, resistant genotypes have long glumes and cover the grain over a period of 20 days after flowering, compared with 6-8 days in the susceptible controls CSH I, CSH 5, and CSH 9.

Traditional landrace sorghums in eastern and southern Africa flower in 150 days or more. Anthesis occurs after the peak of the rains, and since the grain matures under declining rainfall and humidity, these conditions do not favor head bugs development. Lower head bug populations are, also, associated with loose-panicle types (traditional landrace sorghums) Nwanze (1985).

Summary and Conclusion

- Generally the compact headed genotypes, (Wad Ahmed, Um Benain), showed the highest number of bugs. However, the variety Kramaka which is loose panicle type had a high number of head bugs.
- The lowest number of head bugs was recorded on loose and semi-compact head, (Mehearibа, Basheir and Botana)

References

[1] Ajayi, O. and Tabo, R. (1995). Effect of crop management practices on *Eurystylus immaculatus* on Sorghum. Panicle Insect Pests of Sorghum and Pearl Millet, Proceedings of an International Consultative Workshop 4-7 Oct 1993 ICRISAT Sahelian Center . International Crop Research Institute for The Semi-Arid Tropic, Patancheru, 502 324, India, P. 233 – 236

[2] Ajayi, O., Sharma H. C., Tabo R., Ratnadass A. and Doumbia Y. O.(2001). Incidence and distribution of the sorghum head bug, *Eurystylus oldi* Poppius (Heteroptera: Miridae) and other panicle pests of sorghum in West and Central Africa. Insect Sci. Applic. Vol. 21, No. 2, 2001, pp. 103-111

[3] Leuschner, K. (1995). Insects pests of sorghum in Eastern and Southern Africa.. In: Panicle insects of sorghum and pearl millet: Proceedings of an International Consultative Workshop, 4-7 October 1993, ICRISAT Sahelian Centre, Niamey, Niger (Nwanze, K.F., & Youm, O., Eds.). Patancheru 502 324, Andhra Pradesh, India: International Crop Research Institute for the Semi-Arid Tropics. Pages 49-56.

[4] Nwanze, K.F. (1985). Sorghum insect pests in West Africa. Proceeding of International Sorghum Entomology Workshop, 15-21 July 1984. Texas A & M. University, U.S.A. pp: 37-43

[5] Ratnadass, A. and Ajayi, O. (1995). Panicle insect pests of sorghum in West Africa. Pages 29-38. In: Panicle insects of sorghum and pearl millet: Proceedings of an International Consultative Workshop, 4-7 October 1993, ICRISAT Sahelian Centre, Niamey, Niger International Crop Research Institute for the Semi-Arid Tropics. Pages 29-38.

[6] Sharma, H.C., and Lopez, V.F. (1992). Screening for plant resistance to sorghum head bug, *Calocoris angustatus* Leth. Insect Science and its Application 13:315-325.

[7] Sharma, H.C., Doumbia, Y.O. and Diorisso, N.Y. (1992). A head cage technique to screen sorghum for resistance to Mirid head bug, *Eurystylus immaculatus* Ohd. in West Africa. Insect Science and its Application 13: 417-427

[8] Showemimo, F. A. (2005). Genetic expression of *Eurystylus oldi* (Poppius) resistance in two Sorghum crosses, Department of Plant Science Institute for Agricultural Research. P.M.B. 1044. Ahmadu Bello University. Samaru, Zaria, Tropical and Subtropical Agro-ecosystems, 5 (2005): 75 – 78.

[9] Tadesse A. (1986). Major insect problem on sorghum in Ethiopia and strategies for their control. Pages 216 – 238 in proceeding of fourth regional workshop on sorghum and millet improvement in Eastern Africa 5 – 12 Jul. 1986

[10] Thabit A. H.(2015). Economics of Sorghum Production under Traditional Farming Systemin Nyala Governate of South Darfur State, Sudan. ARPN Journal of Science and Technology. P 74.

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