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Screening of different maize Cultivars against maize shootfly and red pumpkin beetle at Peshawar

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Abstract
The present study aimed to screen out different maize cultivars against maize shootfly and red pumpkin beetle at Peshawar was conducted at Agronomy Research Farm (ARF), The University of Agriculture, Peshawar (UAP), Pakistan during 2015. Seven maize cultivars, namely Azam, Jalal, Babar, Pahari, Iqbal, Climax 3055 and Climax 30M62 were tested. The overall mean density of maize shootfly and red pumpkin beetle were found statistically non-significant on the seven tested maize cultivars. However, highest overall mean density of shoot fly was recorded (0.46 flies plant^{-1}) each on Babar, Pahari and Iqbal while lower (0.41 flies plant^{-1}) on Climax 3055, Climax 30M62 and Jalal while Red pumpkin beetle overall mean density was found maximum of 1.10 beetles plant^{-1} on Pahari while lower of 0.98 beetles plant^{-1} on C-3055. On the basis of lower incidence of insect pests, all of the seven tested maize cultivars are recommended for cultivation during spring season at Peshawar.

Keywords: Shootfly, Red Pumpkin Beetle, Maize cultivars, Population dynamics

1. Introduction
Corn, usually called "maize" (*Zea mays* L.) (family Poaceae) is an annual, cross pollinated, Kharif crop. Zea, makai, corn, jovar and silk corn, etc. are other synonyms used to recognize maize. Corn provides food for humans, feed for animals particularly poultry and livestock and raw materials for various industries, hence it is a multipurpose crop [1]. Maize is worldwide distributed crop [2]. It is the fourth largest grown crop in Pakistan after wheat, cotton and rice. After wheat and rice, maize occupies third position among the world's most important cereal crops, but second after wheat in Khyber Pakhtunkhwa province [3]. Classification of maize occurs on the basis of grains structure. Popcorn, flint, pod, dent, sweet and flour are major types of maize [4].
In Pakistan, the total area under maize cultivation in 2013-14 was more than one million hectares and it yielded 3.5 million metric tons. The total area contribution of Khyber Pakhtunkhwa province under maize was 56 percent which contributed 63 percent of the total production [5]. Maize is mostly grown in Haripur, Swabi, Mardan, Malakand, Charsadda, Peshawar, D.I. Khan, Kohat and Bannu districts of Khyber Pakhtunkhwa [6]. In Pakistan, the most dependable, profitable and staple crop after potato is maize [7].
There are many factors which are responsible for low yield of maize [8] among which insect pests are major ones. During the initial growth phase, corn crop is more susceptible to the insect damage particularly up to 30 percent losses can be caused by the soil insects which may necessitate the replanting of the crop. Maize germinating seeds and seedlings are damaged by other insect pests such as cutworms, wireworm, false wireworms, black field earwigs, maize stem borer and beetles such as African black beetle. Traditional methods such as spraying in furrows and various other agronomic practices at the time of sowing are also very effective [9]. Invertebrate insect pests that attack the maize crop at the development and maturity stages include corn aphid, green vegetable bug, corn earworm, red shouldered leaf beetle, common army worm, maize leaf hopper, two-spotted spider mite, maize weevil and thrips [10]. To control specific pests, selective pesticides have been developed [11].

2. Materials and Methods

The research was conducted at the Agronomy Research Farm of The University of Agriculture Peshawar, during 2015. RCB design was used to carry out the experiment. There were three replications and each replication had seven treatments (Climax 30M62, Climax 3055, Babar, Iqbal, Azam, Jalal and Pahari). Separate experimental units were used to sow each maize cultivar. During March 2015, these maize cultivars were sown in lines. Buffer zone of one meter was kept between the replications and a half meter between the treatments for isolation. Size of the whole experimental field was 24 m × 11 m which was divided into 21 sub-plots each with an area of 3 m × 3 m. Row to row and plant to plant distance were kept 75 cm and 25 cm, respectively. Standard agronomic practices were adopted in the field throughout the maize growing season. The experimental field was left open for natural infestation of insect pests. Data was recorded on weekly basis from germination till the maturity of cultivars. The details of the experiments were as following:

Insect pest data collection for maize cultivars screening

To check the comparatively resistant and susceptible responses of maize cultivars, the experimental field was observed thoroughly at weekly intervals for insect pests infestation on upper, middle and lower portion of the plant. Maize shoot fly and red pumpkin beetle data were recorded as number plant^{-1} on randomly selected 6 plants per treatment. The collected specimens of Shootfly and red pumpkin beetles were killed with the help of killing jar and then properly pinned in the insect collection box and were deposited at the Insect Museum, Department of Entomology, UAP.

Statistical analysis

Each recorded data was analyzed statistically by using Statistix 8.1 Software and Fisher Protected Least Significance Difference Test was used for the separation of means at 5% level of significance [12].

Table 1: Experimental Layout

R1		R2		R3
Azam (OPV)		Climax 3055 (hybrid)		Iqbal (OPV)
Babar (hybrid)		Jalal (OPV)		Pahari (OPV)
Pahari (OPV)		Climax 30M62 (hybrid)		Babar (hybrid)
Climax 3055 (hybrid)		Azam (OPV)		Jalal (OPV)
Iqbal (OPV)		Babar (hybrid)		Climax 3055 (hybrid)
Climax 30M62 (hybrid)		Pahari (OPV)		Azam (OPV)
Jalal (OPV)		Iqbal (OPV)		Climax 30M62 (hybrid)

OPV: Open Pollinated Varieties

3. Results

3.1. Population density of Maize Shootfly

The results in Table 2 showed that mean density of shoot fly was non-significantly different on the seven maize cultivars in week 1. In week 2 mean density of the fly was significantly higher (0.34 flies plant^{-1}) on Azam and Pahari (0.32 flies plant^{-1}) and lower (0.19 flies plant^{-1}) on C-30 M62 and C-3055 (0.21 flies plant^{-1}). Mean density of the fly in week 3 was non-significantly different on the maize cultivars. In week 4 mean density of the fly was significantly higher of 0.74, 0.69 and 0.67 flies plant^{-1} on Iqbal, Jalal and C-3055 and lower of 0.53 and 0.55 flies plant^{-1} on Babar and Azam, respectively. Mean density of the fly in week 5 was significantly higher (0.78 flies plant^{-1}) on Pahari and lower (0.64 flies plant^{-1}) on C-3055. In week 6 mean density of the fly was significantly higher of 0.71 and 0.70 flies plant^{-1} on Babar and Pahari and lower of 0.57, 0.59 and 0.61 flies plant^{-1} on C-3055, Jalal and C-30M62, respectively. Mean density of the fly was non-significantly different on the seven maize cultivars in week 7-11. Also, overall mean density of the fly was non-significantly different on the seven maize cultivars, where it was higher of 0.46 flies plant^{-1} each on Babar, Pahari and Iqbal and lower of 0.41 flies plant^{-1} on C-3055, C-30M62 and Jalal.

3.2. Population density of Red pumpkin beetle (*Aulacophora faveicollis):*

The results in Table 3 showed that the mean density of red pumpkin beetles was significantly higher (0.69 beetle plant^{-1}) on Pahari and Babar (0.67 beetle plant^{-1}) and lower (0.52 beetle plant^{-1}) on C-30M62 and C-3055 (0.55 beetle plant^{-1}) in week 1. Mean density of the red pumpkin beetle was non-significantly different on the seven maize cultivars in week 2-6. In week 7 mean density of red pumpkin beetles was significantly higher (1.45 beetles plant^{-1}) on Pahari and Babar (1.44 beetles plant^{-1}) and lower (1.31 beetles plant^{-1}) on C-3055 and C-30M62 (1.35 beetles plant^{-1}). In week 8 mean density of the red pumpkin beetles was significantly higher of 1.07, 1.03 and 0.99 beetle plant^{-1} on Pahari, Babar and Azam and lower of 0.89 and 0.92 beetle plant^{-1} on C-30M62 and C-3055, respectively. In week 9 mean densities of the red pumpkin beetles was significantly higher of 0.68 and 0.67 beetle plant^{-1} on Babar and Pahari and lower of 0.55, 0.57 and 0.6 beetles plant^{-1} on C-3055, C-30M62 and Jalal, respectively. Mean density of the red pumpkin beetles was non-significantly different on the seven maize cultivars in week 10 and 11. Also, overall mean density of the red pumpkin beetles was non-significantly different on the seven maize cultivars, where it was higher of 1.10, 1.08 and 1.06 beetles plant^{-1} each on Pahari, Babar and Azam while lower of 0.98 and 099 beetles plant^{-1} on C-3055 and C-30M62.

Table 2: Mean weekly density of shoot fly plant^{-1} on seven maize cultivars during 2015.

Treatment	Mean density of shoot fly in week no.											Overall Mean
	1 21-April	2 28-April	3 5-May	4 12-May	5 19-May	6 26-May	7 2-Jun	8 9-Jun	9 16-Jun	10 23-Jun	11 30-Jun	
Azam	0.24	0.34 a	0.47	0.55 c	0.73 abc	0.63 ab	0.66	0.59	0.41	0.37	0.33	0.44
Babar	0.22	0.29 abc	0.49	0.53 c	0.76 ab	0.71 a	0.64	0.57	0.51	0.4	0.37	0.46
Pahari	0.26	0.32 ab	0.52	0.57 bc	0.78 a	0.7 a	0.63	0.53	0.43	0.38	0.35	0.46
C-3055	0.14	0.21d	0.43	0.67 a	0.63 d	0.57 b	0.59	0.49	0.45	0.42	0.31	0.41
Iqbal	0.2	0.24 cd	0.55	0.74 a	0.69 bcd	0.65 ab	0.57	0.55	0.49	0.44	0.41	0.46
C-30M62	0.16	0.19 d	0.45	0.65 ab	0.67 cd	0.61 b	0.55	0.51	0.47	0.36	0.29	0.41
Jalal	0.18	0.26 bcd	0.41	0.69 a	0.65 cd	0.59 b	0.61	0.47	0.39	0.35	0.32	0.41
LSD value	ns	0.0763	ns	0.0906	0.0829	0.0885	ns	ns	ns	ns	ns	ns

Means in rows and columns followed by different letters are significantly different at 5% level of significance (LSD test).
ns = Non-significant.

Table 3: Mean weekly density of red pumpkin beetle plant^{-1} on seven maize cultivars during 2015.

Treatment	**Mean density of red pumpkin beetle in week no.**											**Overall Mean**
	1 14-April	**2 21-April**	**3 28-April**	**4 5-May**	**5 12-May**	**6 19-May**	**7 26-May**	**8 2-Jun**	**9 9-Jun**	**10 16-Jun**	**11 23-Jun**	
Azam	0.61 abcd	1.24	1.56	1.97	1.74	1.85	1.41 ab	0.99 abc	0.64 abc	0.46	0.2	1.06
Babar	0.67 ab	1.26	1.55	1.98	1.79	1.87	1.44 a	1.03 ab	0.68 a	0.48	0.23	1.08
Pahari	0.69 a	1.27	1.57	2.01	1.77	1.89	1.45 a	1.07 a	0.67 ab	0.49	0.26	1.10
C-3055	0.52 d	1.18	1.47	1.89	1.69	1.78	1.31 c	0.92 cd	0.55 d	0.36	0.11	0.98
Iqbal	0.57 bcd	1.22	1.53	1.91	1.71	1.83	1.4 ab	0.94 cd	0.63 abc	0.4	0.19	1.03
C-30M62	0.55 cd	1.16	1.49	1.88	1.67	1.79	1.35 bc	0.89 d	0.57 cd	0.39	0.15	0.99
Jalal	0.64 abc	1.2	1.51	1.94	1.73	1.82	1.38 abc	0.96 bcd	0.6 bcd	0.43	0.17	1.03
LSD value	0.1082	ns	ns	ns	ns	ns	0.0723	0.0841	0.0762	ns	ns	ns

Means in rows and columns followed by different letters are significantly different at 5% level of significance (LSD test).
ns = Non-significant.

4. Discussion
Current study revealed that densities of these insect pests peaked in the month of May. The differences in the present and earlier results might be due to variations in the time of sowing maize and agro-climatic differences. Sparks and Yates [13] stated that the change in the climatic conditions has greatly affected the agricultural systems along with the insect pests. In the present results densities of insect pests on the seven maize cultivars were lower than that reported by some earlier researchers like Sparks and Yates [13]; Mensah and Madden [14]; Dhillon *et al.* [15], which might be due to the fact that host plant resistance has played its role in suppressing insect pests populations.

5. Conclusion and Recommendations
The overall mean density of maize shootfly and red pumpkin beetle were found statistically non-significant on the seven tested maize cultivars. However, highest overall mean density of shoot fly was recorded (0.46 flies plant^{-1}) each on Babar, Pahari and Iqbal while lower (0.41 flies plant^{-1}) on Climax 3055, Climax 30M62 and Jalal while Red pumpkin beetle overall mean density was found maximum of 1.10 beetles plant^{-1} on Pahari while lower of 0.98 beetles plant^{-1} on C-3055. On the basis of above stated information, all of the seven tested maize cultivars are recommended for cultivation during spring season. Maize should be cultivated earlier in spring for lower incidence of insect pests. It is necessary to diversify new resistance basis in maize. Further parameters at different locations need to be studied.

6. References

1. Khaliq T, Mahmood T, Masood A. Effectiveness of farmyard manure, poultry manure and nitrogen for corn (*Zea mays*) productivity. Intern. J Agric Biol. 2004; 2:260-263.
2. Kumar D, Jhariya AN. Nutritional, Medicinal and Economical importance of Corn: A Mini Review. Res. J Pharmaceutical Sci. 2013; 2(7):7-8.
3. Arif M, Ali K, Munsif F, Ahmad W, Ahmad A, Naveed K. Effect of biochar, fym and nitrogen on weeds and maize phenology. Pak. J. Weed Sci. Res. 2012; 18(4):475-484
4. Smith AF. The Oxford Encyclopedia of Food and Drink in America. 2nd ed. Oxford: Oxford University, 2013.
5. Arain GN. Maiz (Corn) Cultivation in Pakistan. Manual Center Pivot Irrigation System, Valley Irrigation Pakistan (Private) Ltd., 2013.
6. Shah SR. Effect of seed priming on yield and yield component of maize. M.Sc. (Hons.) Agric. Thesis, Dept. Agron. The University of Agriculture Peshawar, Pakistan, 2007, 1-93.
7. Tariq M, Iqbal H. Maize in Pakistan-An overview. Kasetsart J Nat Sci. 2010; 44:757-763.
8. Shah STH, Ibni Zamir MS, Waseem M, Ali A, Tahir M, Khalid WB. Growth and Yield Response of Maize (*Zea mays* L.) to Organic and Inorganic Sources of Nitrogen. Pak. J Life Soc Sci. 2009; 7(2):108-111.
9. Hughes M. Maize – insect pests. The State of Queensland, Department of Primary Industries, Fisheries, 2006. Available online at http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/26_3645_ENA_HTML.htm

10. O'Gara F. Irrigated Maize Production in the top end of the northern territory: Production guidelines and research results. Department of Primary Industry, Fisheries and Mines, 2007. Available online at http://www.nt.gov.au/dpifm/content/file/p/Tech_Bull/TB326.pdf
11. Hertel K, Roberts K. Insect and mite control in field crops. State of New South Wales Department of Primary Industries, 2007. Available online http://www.dpi.nsw.gov.au/agriculture/field/field-crops/protection/insect-mite-crops
12. Steel RGD, Torrie JH. Principals and procedures of statistics: A biological approach. 2nd Ed. McGraw Hill Book Co. New York. 1980, 481.
13. Sparks TH, Yates TJ. The effect of spring temperature on the appearance dates of shootflies. 1883-1993. Ecography, 1997; 20:368-374.
14. Mensah LM, Madden AR. Shootfly on sweet maize. Maize abstracts. 1999; 1(1):373.
15. Dhillon MK, Sharma HC, Reddy BVS, Singh R, Naresh JS. Inheritance of resistance to sorghum shootfly, Atherigona soccata. Crop Sci. 2006; 46:1377-1383.