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EVALUATION OF GARLIC GENOTYPES AGAINST THRIPS

M.M. HOSSAIN[1*], K.M. KHALEQUZZAMAN[1], M.A. WADUD[1], M.B. SARKER[1] AND R.N. AHMED[2]

[1]Spices Research Centre, BARI, Shibganj, Bogra, Bangladesh and [2]UAO, DAE, Atghoria, Pabna, Bangladesh.

*Corresponding author & address: Md. Motaher Hossain, E-mail: ripon01_src@yahoo.com
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ABSTRACT

Hossain MM, Khalequzzaman KM, Wadud MA, Sarker MB, Ahmed RN (2014) Evaluation of garlic genotypes against thrips. *Int. J. Expt. Agric.* 4(4), 1-4.

The field experiment was conducted at SRC, Bogra during Rabi season of 2013-14 to test the performance of garlic genotypes against thrips. Fifteen different garlic genotypes (GC001, GC005, GC0012, GC0013, GC0017, GC0018, GC0024, GC0027, GC0028, GC0029, GC0030, GC0031, GC0034, GC0035 and GC0036) along with BARI Garlic 1 and 2 were evaluated against thrips. Out of fifteen genotypes, GCO34 recording less than 8.29 thrips per plant and higher bulb yield (9.78 t/ha) was characterized as highly resistant. Genotypes GC0013, GC0028 and GC0030 recorded higher thrips population of more than 13.41 thrips per plant and lower bulb yield (4.07, 4.52 and 2.68 t/ha, respectively) were grouped into highly susceptible.

Key words: *evaluation, garlic genotypes, thrips, yield*

INTRODUCTION

Garlic (*Allium sativum* L.) is the second most important spice crop in Bangladesh. The total production of garlic in Bangladesh is 3.88 lakh metric tons against the estimated demand of 3.42 lakh metric tons (AIS 2012). It is mostly used for culinary purposes and as a condiment for different food items. The raw garlic can also be used in the manufacturing of powder, paste, oil and dehydrated garlic etc. Besides these, it is also well known for having numerous valuable medicinal properties. The average world production of garlic is 18.20 t/ha (FAO 2008). But in Bangladesh the average yield of garlic is 4.40 t/ha (BBS 2010), which is very low as compared to the world production. Many factors affecting the production and productivity of garlic, of which infestation of insect pests is major one. Of the various insect pests, Thrips (*Thrips tabaci* Lindman) is a serious and major biological constraint in garlic production causing heavy economical loss, if infestation starts at bulb initiation stage (Patel and Patel, 2012). Thrips prefers to feed on newly emerged leaves in the center of neck, therefore, majority of thrips are found at the base of the youngest leaves in the lower center of the neck. In case of severe infestation, the bulbs remain undersized and distorted (Butani and Verma, 1976). The pest *Thrips tabaci* is responsible for curling of leaves, low yield, and poor quality of bulbs. Leaf curling reduces the activity of photosynthesis and thus reduces the crop yield. According to Changela (1993), losses of 15.35to 46.82% in garlic bulb yield was recorded due to infestation of this pest. The repeated application of synthetic insecticides has resulted in development of insecticide resistance in pest populations (Natarajan and Chidambaram, 1986; Mahrotra and Phokela, 1992). Resistant varieties provides insect control without any additional cost, acts as preventive measure against buildup of insect with other method of pest control and are free from environmental pollution problems (Atwal and Dhaliwal, 1999). From the above facts, the study was designed to screen out different resistant/tolerant genotypes or cultivars of garlic against thrips.

MATERIALS AND METHODS

The study was conducted at Spices Research Centre, Shibganj, Bogra during Rabi season of 2013-14. The experiment was laid out in a randomized complete block design (RCBD) with three replications. Fifteen different garlic genotypes (GC001, GC005, GC0012, GC0013, GC0017, GC0018, GC0024, GC0027, GC0028, GC0029, GC0030, GC0031, GC0034, GC0035 and GC0036) along with BARI Garlic 1 and 2 were evaluated against thrips. The unit plot size was 3 m x 1.2 m. The spacing was 10 cm x 10 cm. In addition, 5 t/ha of cow dung, N_{100} P_{54} K_{166} S_{20} kg/ha were applied in the experimental field. The entire quantity of cow dung, P, K, S and ½ of N was applied during land preparation. The rest of N was applied in to equal splits at 25 and 50 days after planting (DAP) (Anonymous 2010). The cloves were planted on November 15, 2013. Weeding was done at 25, 50 and 75 DAP. To control purple blotch disease the crop was sprayed three times with Rovral 50WP@2 g/litre of water at 35, 45 and 55 DAP. Three irrigations were done at 10-20 days interval during vegetative growth stage. Irrigation was stopped before 20 days of crop maturity. The crop was harvested on March 24, 2014. The whole experimental plot was kept free from spraying of any insecticides. Thrips population was counted at seven days interval starting from the first appearance of infestation. Number of thrips (both nymphs and adults) was recorded from 20 randomly selected plants in each plot by keeping a white paper below the plant and then shaking the plants with finger. The tested genotypes were also grouped into four categories of resistance *viz.*, highly resistant, resistant, susceptible and highly susceptible based on number of thrips per plant. For the grouping purpose, mean value of individual genotype ($\overline{Xi}$) was compared with mean value of all genotypes ($\overline{X}$) and standard deviation (sd) following the modified scale adopted by Patel *et al.* (2002). The retransformed data were used for computation of $\overline{Xi}$, $\overline{X}$ and sd in case of this parameter. The scale was used for categorizing different genotypes as under.

Category of resistance	Scale for resistance
Highly Resistant (HR)	$\overline{Xi} < \overline{X}$ - sd
Resistant (R)	$\overline{Xi} > \overline{X}$- sd < $\overline{X}$
Susceptible (S)	$\overline{Xi} > \overline{X} < (\overline{X}$+ sd)
Highly Susceptible (HS)	$\overline{Xi} > (\overline{X}$+ sd) < ($\overline{X}$ + 2 sd)

Here, $\overline{X}$ = Mean value of all genotype, $\overline{Xi}$ =Mean value of individual genotype, sd =Standard deviation and n= No. of genotypes

$$Sd=\sqrt{\frac{\in(x-\bar{x})^2}{n-1}}$$

Data on yield were also recorded immediately after crop harvest. The recorded data were analyzed and mean values were adjusted and separated by DMRT according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Performance of different garlic genotypes against thrips and yield of garlic

Results on performance of different garlic genotypes against thrips population and yield contributing character of garlic are presented in Table 1. The differences among the genotypes were significant for all parameters. Among the different genotypes, GC0034 resulted significantly lowest thrips population (6.97 thrips/plant) as compared to rest of the genotypes which was supported the findings of Srivastava *et al. (*2005). Srivastava *et al.* (2005) reported that the garlic genotype G-282 had the lowest incidence of thrips. Significantly the highest thrips population (15.18, 14.10 and 15.96 thrips/plant) were recorded from the garlic genotype GC0013, GC0028 and GC0030, respectively. There was no significant difference among these three genotypes. But Patel and Patel (2012) found that the garlic genotype AGS-05-7-2, AGS-06-16 and AGS-06-19 showed the higher thrips incidence. On the other hand, significantly the tallest plant (79.80 cm) was recorded from the genotype GC0034 which exhibited the lowest thrips population. The maximum bulb diameter (3.98 cm) was found from the genotype GC0034 followed by GC0017 (3.62 cm) and GC0036 (3.72 cm). However, the minimum bulb diameter (2.85 cm) with maximum thrips population (15.96 thrips/plant) was observed in GC0030 genotype which supported the findings of Bortoli and Castellane (1990). Bortoli and Castellane (1990) reported that thrips population significantly negatively correlated with bulb diameter. It indicated that as bulb diameter increases, the thrips population decreases and vice versa. On the other hand, the highest bulb yield (9.78 t/ha) was obtained from the genotype GC0034 followed by GC0036 (9.47 t/ha) and the lowest yield (2.68 t/ha) was obtained from the genotype GC0030.

Table 1. Performance of different garlic genotypes against thrips population and yield contributing character of garlic

Acc. No	Mean no. of thrips/plant	Plant height (cm)	Bulb diameter (cm)	Bulb weight (g)	Bulb yield (t/ha)
GC001	11.18bc	73.40a	3.21bc	17.67bc	7.36ab
GC005	9.69cd	75.47a	3.35abc	19.00abc	8.15ab
GC0012	9.70cd	75.30a	3.32bc	18.67abc	7.94ab
GC0013	15.18a	60.63bc	2.94c	11.00d	4.07de
GC0017	8.90cd	78.37a	3.62ab	21.00ab	9.21ab
GC0018	10.90bc	73.43a	3.22bc	17.67bc	7.37ab
GC0024	9.60cd	75.57a	3.40abc	19.33abc	8.42ab
GC0027	10.70bc	73.70a	3.23bc	18.00bc	7.48ab
GC0028	14.10ab	70.67ab	3.07bc	14.33cd	4.52cde
GC0029	9.57cd	77.23a	3.42abc	20.33abc	8.51ab
GC0030	15.96a	59.77c	2.85c	10.67d	2.68e
GC0031	10.01cd	73.93a	3.29bc	18.33bc	7.71ab
GCOO34	6.97d	79.80a	3.98a	24.67a	9.78a
GCOO35	11.31bc	73.00a	3.17bc	17.00bc	6.87abc
GCOO36	8.77cd	78.70a	3.72ab	21.00ab	9.47a
BARI Garlic 1	9.02cd	77.60a	3.48abc	20.33abc	8.89ab
BARI Garlic 2	11.58bc	73.00a	3.44abc	17.00bc	6.26bcd
CV (%)	13.41	6.15	7.61	13.18	15.50

Mean followed by the same letter (s) in the same column do not differ significantly from each other at 5% level by DMRT

Relationship between mean number of thrips/plant and plant height under garlic genotypes

The relationship between mean number of thrips/plant and plant height under garlic genotypes are presented in Fig. 1. Plant height was negatively correlated with thrips population in garlic genotypes. The regression equation was y = 97.63-2.240x and correlation coefficient was r = -0.9507**. The figure indicates that plant height was increased with the decrease of thrips population. An observation is compatible with those of Patel and Patel (2012) who observed that plant height was significantly and negatively correlated with thrips population.

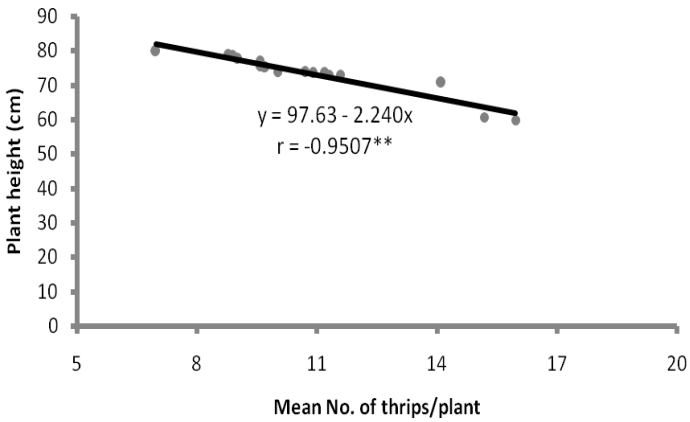

Fig. 1. Relationship between mean no. of thrips/plant and plant height under garlic genotypes

Categorization of garlic genotypes for their susceptibility to thrips population

The different genotypes of garlic were also grouped into four different categories of resistance *viz*., highly resistant, resistant, susceptible and highly susceptible are presented in Table 2. Genotype GC0034 showed less than 8.29 thrips per plant as highly resistant. Genotypes GC005, GC0012, GC0017, GC0024, GC0029, GC0031, GC0036 and BARI Garlic 1 resulted thrips population less than 10.85 but more than 8.29 per plant were grouped into resistant. Genotypes GC001, GC0018, GC0027, GC0035 and BARI Garlic 2 were found susceptible by recording thrips population more than 8.29 but less than 13.41 per plant. Genotypes GC0013, GC0028, and GC0030 recording thrips population more than 13.41 but less than 15.97 per plant were grouped into highly susceptible.

Table 2. Categorization of different genotypes of garlic for their susceptibility to thrips

Category of resistance	**Scale**	**Genotypes ($\overline{Xi}$)**	
Based on population of thrips/plant : $\overline{X}$ = 10.85 and sd = 2.56			
Highly resistant	$\overline{Xi}$ **< 8.29**	GC0034	(6.97)
Resistant	$\overline{Xi}$ **> 8.29 < 10.85**	GC005	(9.69)
		GC0012	(9.70)
		GC0017	(8.90)
		GC0024	(9.60)
		GC0029	(9.57)
		GC0031	(10.01)
		GC0036	(8.77)
		BARI Garlic 1	(9.02)
Susceptible	$\overline{Xi}$ **> 10.85 < 13.41**	GC001	(11.18)
		GC0018	(10.90)
		GC0027	(10.70)
		GC0035	(11.31)
		BARI Garlic 2	(11.58)
Highly susceptible	$\overline{Xi}$ **> 13.41 < 15.97**	GC0013	(15.18)
		GC0028	(14.10)
		GC0030	(15.96)

CONCLUSION

From the above study, it may be concluded that the genotype GC0034 recorded the lowest thrips population and higher bulb yield was characterized as highly resistant. Genotypes GC0013, GC0028 and GC0030 recorded higher thrips population and lower bulb yield were grouped into highly susceptible.

REFERENCES

Agriculture Information Service (AIS) (2012) Khamarbari. Farmgate, Dhaka, Bangladesh.

Anonymous (2010) Garlic Production Technology. Spices Production Technology Manual. Spices Research Centre, BARI, Shibgonj, Bogra, pp. 17-18.

Atwal AS, Dhaliwal GS (1999) Agricultural Pests of South Asia and Their Management. Kalyani Publishers, pp. 70.

BBS (2010) Statistical Year Book of Bangladesh, p. 135.

Bortoli SA, Castellane PD (1990) Reaction of garlic genotypes to attack by *Thrips tabaci. Horticultura Brasileira*, 8(1), 19-21.

Butani DK, Verma S (1976) Insect pest of vegetables and their control; onion and garlic. *Pesticides*, 10(11), 33-35.

Changela NB (1993) Bionomics, population dynamics and chemical control of thrips (*Thrips tabaci* L.) on garlic. M. Sc. (Agri.) thesis submitted to Gujarat Agricultural University, Sardarkrushinagar, pp. 82-83.

FAO (2008) World Crop Production, p. 135.

Gomez KA, Gomez AA (1984) Statistical Procedures for Agricultural Research. 2nd ed., Intl. Rice Res. Inst., John Willy and Sons, New York, Chichester, Brisbane, Toronto, Singapore, pp. 187-240.

Mahrotra KN, Phokela A (1992) Pyrethroid resistance in *Heliothis armigera* Hub.V. Response of population in Punjab cotton. *Pesticide Research Journal*, 4, 59–61.

Natarajan K, Chidambaram P (1986) Resurgence of sucking pests and foliar diseases. Presented at the biennial workshop of the AICCIP held at Hyderabad from 21 to 24 January 1986.

Patel IS, Prajapati BG, Patel GM, Pathak AR (2002) Response of castor genotypes to castor semi looper. *Achaea janata (Fab.) J. Oilseeds Res*., 19(1), 153.

Patel PB, Patel JJ (2012) Susceptibility of different garlic genotype/cultivers to Thrips (*Thrips tabaci* L.). *AGRES – An International e-Journal*, 1(3), 256-262.

Srivastava KJ, Tiwari BK, Sharma RC, Chauhan KPS (2005) Evolution of different advanced lines against stemphylium blight, purple blotch and thrips insect pest of garlic. *NHRDF Newsletter,* 25(1), 10-12.