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Pre and Post Emergencies Damping off in Cotton

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Abstract: Survey was conducted to provide objective of study damping off susceptibility in cotton genotypes. Experimental design was 9×2 factorial arranged in a Randomized Complete Block. The factor A was cotton genotypes and the factor B was fungicide (with carboxin Thiram and without it). Seedling damping off was recorded 10, 20 and 30 days after planting. Post emergencies damping off disease was ranked 0 to 3 degrees 20 days after planting. Data were analyses with MSTATC computer program. Results were showed Crema treatment with Carboxin Thiram was the least damping off 10 days after planting. Also, Carboxin Thiram treatment had the most damping off 20 days after planting in oultan genotype. Oultan genotypes × control interaction was the most post emergencies damping off (53%).

Key words: Cotton, damping off, fungicide

INTRODUCTION

Seedling diseases are major problem in cotton production areas. Seedling disease can be caused by one or multiple microorganisms especially fungi. These pathogens have damage include on plant dead, re-planting and late maturity. Damping off is one of the most important diseases in Iran where cotton is grown. This disease is caused seed rotting, seedling damping-off and decreasing cotton production. If seed wasn't fungicide treatment, disease was epidemic in cold and moisture soil.

The most common soilborne fungi associated with seedling damping off include *Rhizoctonia solani*, *Pythium* sp. and *Fusarium* sp. have been reported to be involved with damping off seedling in Gorgan^[1].

Breeding for resistance has had only limited success for controlling seedling diseases. Small but significant differences in the susceptibility of upland cultivars to *Pythium* have been demonstrated^[2] and shown to be heritable^[3]. Similarly, small levels of resistance to *Rhizoctonia* have been demonstrated in cultivars of *G. barbadense*^[4]. Variation in susceptibility to *Pythium* and *Rhizoctonia* also was found among more than 200 accessions *G. arboreum* and *G. herbaceum*, but these species were generally more susceptible than the *G. hirsutum* control cultivar^[5]. Poswal *et al.*^[6] concluded that heritability for resistance in cotton to *Pythium* and *Rhizoctonia* was low, but it could be detected and was polygenically inherited. The MAR

(Multi-Adversity Resistance) cultivars developed at Texas A and M University have improved resistance to seed deterioration and a shortened period of susceptibility to seedling diseases because of their low temperature adaptation. These cultivars generally give better stands and suffer less damage from seedling pathogens than most other cultivars^[7].

In Egypt, some success has been achieved in selecting resistant individual from an inoculated population, but this work was conducted with *G. barbadense*^[4,8].

Wheeler *et al.*^[9] introduced G49, G50 and G53 lines that were resistance to *P. ultimum* and *R. solani*.

Resistance to root rot caused by *R. solani* is found to be associated with high terpenoid content in hypocotyls^[10]. The most common control method is seed treatment with fungicide. The north of Iran has cold and moisture soil, so, fungicide can not completely control damping off. It is needed that cotton genotypes and fungicide combine to control disease. This research was conducted to study cotton genotypes (*G. hirsutum*) reaction to damping off.

MATERIALS AND METHODS

The nine genotypes of cotton and Carboxin Thiram were tested in Karkandeh Cotton Research Station, North of Iran, in 2004. Soil of station was infested with the damping off fungi. The experimental design was 9×2 factorial arranged in a Randomized Complete Block with

4 replications. Treatments were 9 genotypes and 2 levels of fungicide. Cotton genotypes were Sahel, Bakhtegan, Oultan, Crema, 43259, Deltapine 25, Deformeh leaf, Mehr, Smooth leaf. Factor B was Carboxin Thiram [without fungicide (control) and 5 g kg⁻¹ seed]. Each plot consisted of 4 rows which were 11 m long and 80 cm wide with a hill-to-hill distance of 20 cm within the rows with 5 seeds/hill. All the recommended cultural practices like weed and insect control, hoeing and fertilizer application were standard for production of cotton in Karkandeh, Iran. The number of emergencies hill and emergencies plant number in each hill were recorded the first, second and third account (10, 20 and 30 days after planting, respectively). Damping off percent was calculated with formula:

$$\text{Damping off} = \frac{(\text{Emergencies hill No.} \times \text{emergencies plant No. in each hill})}{\text{total of hill No.}}$$

Also, post emergencies damping off was recorded 20 days after planting. Post emergencies damping off was

ranked (0 = immunity to 3 = dead plant). Statistical analysis were performed on the damping off data. The analysis of variance was carried out by using the statistical method adopted by Gomez and Gomez^[1]. The significant means were separated by Duncan's Multiple Range (DMR) test at $\alpha = 5\%$ using MSTATC Computer programs.

RESULTS AND DISCUSSION

The analysis of variance was carried out on first, second and third account, post emergencies damping off, 1, 2 and 3 degrees (Table 1). Crema genotypes \times Carboxin Thiram and Crema \times control were the most damping off 10 days after planting (97 and 98.7%, respectively). Also, Bakhtegan \times Carboxin Thiram was the least damping off in the first account (28%). Crema treatment with fungicide was the least effective for damping off control (98.7-97 = 7.8%) in 10 days after planting (Table 2). Deltapine 25, 43259 and Mehr genotypes treatment with Carboxin Thiram were the most effective in damping off

Table 1: Damping-off data analysis of variance

Source	df	Mean square						
		1st account	2nd account	3rd account	1st degree	2nd degree	3rd degree	Post emergencies damping off
Replication	3	18. 579Ns	284. 022Ns	229. 278Ns	0. 116**	0. 052Ns	0. 226Ns	0. 152Ns
Genotypes	8	2856. 938**	1112. 7**	1127. 476**	0. 017Ns	0. 070**	0. 331**	1. 006**
Fungicide	1	3192. 818**	16453. 85**	15401. 987**	0. 060*	0. 066Ns	7. 776**	9. 823**
Genotypes *fungicide	8	92. 215Ns	93. 936Ns	119. 268Ns	0. 005Ns	0. 013Ns	0. 114Ns	0. 22Ns
Error	51	123. 923	113. 245	138. 221	0. 011	0. 024	0. 085	0. 18
CV (%)		21. 58	18. 21	19. 53	11. 73	15. 67	19. 43	17. 86

*, ** and Ns were significant in $\alpha = 0. 05$, significant in $\alpha = 0. 01$ and non- significant, respectively

Table 2: Genotypes \times fungicide interaction data means of damping off separated by DMRT

Genotypes \times fungicide	1st account	2nd account	3rd account	1st degree	2nd degree	3rd degree	Post emergencies damping off
Sahel \times control	60. 7BC	77. 9ABC	79. 3ABC	4. 7AB	7. 7AB	31. 4ABC	43. 8AB
Sahel \times Carboxin Thiram	52. 5BCDE	44. 2D	51. 0DE	5. 5A	7. 5AB	8. 8EF	21. 9DEF
Smooth leaf \times control	46. 8CDEF	69. 1BC	68. 9BCD	2. 8AB	3. 8ABC	33. 5AB	40. 2ABC
Smooth leaf \times Carboxin Thiram	33. 7FG	36. 6D	39. 4E	3. 1AB	6. 1AB	6. 2F	15. 4DEF
Oultan \times control	66. 2B	84. 1AB	85. 2AB	2. 6AB	8. 8A	41. 6A	53. 0A
Oultan \times Carboxin Thiram	50. 2BDCEF	42. 7D	45. 8E	5. 5A	7. 1AB	9. 9EF	22. 5CDEF
Crema \times control	98. 7A	94. 2A	94. 8A	1. 8B	0. 3C	9. 9EF	12. 0F
Crema \times Carboxin Thiram	97. 0A	78. 5ABC	81. 1ABC	3. 5AB	3. 3BC	4. 8F	11. 6F
Bakhtegan \times control	41. 1DEFG	65. 0C	63. 4CD	2. 0B	3. 8ABC	33. 6AB	39. 4ABC
Bakhtegan \times Carboxin Thiram	28. 1G	36. 9D	38. 4E	3. 3AB	6. 6AB	13. 1DEF	23. 1CDEF
Deltapine25 \times control	56. 7BCDE	63. 1C	67. 8BCD	2. 4AB	3. 4ABC	25. 0ABCD	30. 8BCD
Deltapine25 \times Carboxin Thiram	35. 3EFG	30. 7D	35. 4E	3. 4AB	5. 7AB	4. 5F	13. 6EF
Defomeh leaf \times control	44. 7CDEFG	65. 1C	65. 5CD	2. 9AB	4. 4ABC	32. 5AB	39. 8ABC
Defomeh leaf \times Carboxin Thiram	38. 3DEFG	38. 0D	41. 4E	3. 4AB	5. 5AB	9. 7EF	18. 6DEF
43259 \times control	55. 0BCD	76. 1BC	78. 6ABC	2. 1B	3. 2BC	40. 0A	45. 3AB
43259 \times Carboxin Thiram	35. 9EFG	44. 6D	42. 7E	3. 2AB	4. 8ABC	16. 2CDEF	24. 2CDEF
Mehr \times control	54. 3BCD	67. 5BC	69. 7BCD	2. 3AB	4. 2ABC	22. 2BCDE	28. 7BCDE
Mehr \times Carboxin Thiram	32. 4FG	37. 8D	34. 8E	2. 3AB	4. 1ABC	10. 3EF	16. 7DEF

Within columns, numbers followed by the same letter are non significantly different. 1st, 2nd and 3rd account is damping off 10, 20 and 30 days after planting, respectively. 1, 2 and 3 degrees are post emergencies damping off 20 days after planting (0 = immunity to 3 = dead plant)

control in the first account. Differential responses were found in the different hybrid progenies to different selection pressures^[12].

Interaction between genotypes and fungicide were studied for damping off 20 days after planting. Crema × control had the most damping off (94.2%). The least damping off was consisted in Sahel × Carboxin Thiram (44.2%), Smooth leaf × fungicide (36.6%), Oultan × fungicide (42.7%), Bakhtegan × fungicide (36.9%), Deltapine 25 × fungicide (30.7%), Deformeh leaf × fungicide (38%), 43259 × fungicide (44.6%) and Mehr × fungicide (37.8%) (Table 2). The Carboxin Thiram was the most damping off 20 days after planting in Oultan genotypes (84.1-42.7 = 41.4%) (Table 2). Crema × control interaction was the most the third account of damping off (94.8%) (Table 2).

The least damping off in the third account was Sahel × fungicide, Smooth leaf × fungicide, Oultan × fungicide, Bakhtegan × fungicide, Deltapine 25 × fungicide, Deformeh leaf × fungicide, 43259 × fungicide and Mehr × fungicide interaction. The Carboxin Thiram was the most damping off at 30 days after planting in Oultan genotypes (Table 2). Relatively low incidence of pre-emergence damping off caused by *R. solani* occurred in Chembred7, DP 6200 and Royal^[13].

Oultan genotypes × control interaction was the most post emergencies damping off (53%). Crema × control and Crema × fungicide was the least post emergencies damping off (12 and 11.6%, respectively) (Table 2).

Post emergencies damping off with 1 ranking was evaluated. Crema × control, Bakhtegan × control and 43259 × control interaction were the least 1 degree of damping off (1.8, 2 and 2.1, respectively). Also Sahel × fungicide and Oultan × fungicide interaction were the most damping off (1 degree) (Table 2).

Two degree (damping off) was evaluated. Oultan × control interaction was the most damping off (8.8%). Crema × control interaction was the least 2 ranking of post emergencies damping off (0.3%) (Table 2).

Results was showed Oultan × control and 43259 × control were the most 3 ranking of post emergencies damping off (41.6 and 40%, respectively). Smoothleaf × fungicide, Crema × fungicide and Deltapine 25 × fungicide were the least of 3 ranking of post emergencies damping off (Table 2). The susceptibility of 12 upland cotton to damping off was evaluated in greenhouse experiment. Based on symptom development and seedling survival, cultivars highly resistant to *P. ultimum* included Deltapine (DP) 6166, Prema, DP 6200 and Maxxa^[13].

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