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Short Communication

GENE EFFECTS FOR SHOOTFLY (*ATHERIGONA SOCCATA*, RONDANI) RESISTANCE IN SORGHUM

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A field study was undertaken to estimate gene effects for shootfly resistance involving resistance × resistance, resistance × susceptible and susceptible × susceptible combinations. Six crosses viz., ICSV 700 × ICSV 705, ICSV 705 × IS 2312, ICSV 700 × GJ 39, ICSV 700 × GJ 40, GJ 39 × Malwan and CSV 15 × GSSV 148, each having six generations i.e., P_L, P_2, F_1, F_2, BC_1 and BC_2 were evaluated in compact family block design. Single rows of 4m length were represented by parents & F_1 generation, two rows by back cross generations, while four rows by F_2 generation. The distance was maintained at 45 × 15 cm. The transformed values using square root and arcsin transformation for number of eggs per plant and deadheart (%) were used for statistical analysis. Gene effects were estimated using six parameter model suggested by Hayman [1].

Analysis of variance revealed significant differences among generations in all the crosses for both (eggs per plant & dead heart %) the parameters except in cross ICSV 700 × ICSV 705 for number of shootfly eggs per plant, hence gene effects were not studied. The perusal of data (Table 1) on gene effects in ICSV 705 × IS 2312 revealed that additive and additive × dominance effects were important for no. of shootfly eggs per plant. However, for deadheart (%) in both the resistance × resistance crosses, additive and additive × dominance gene effects were evident. In cross, ICSV 700 × ICSV 705 in addition to above, dominance and all epistatics were observed to play a major role for shootfly resistance. Preponderance of additive gene effects were observed by Borikar and Chopde [2] and Nimbalkar and Bapat [3]. Additive as well as non-additive gene action has also been earlier reported for these two traits [4].

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Table 1. Gene effects of shootfly resistance parameters in six crosses of Sorghum

Crosses	ICSV 700 (RP) × ICSV 705 (RP)		ICSV 7005 (RP) × IS 2312 (RP)		ICSV 700 (RP) × GJ 39 (SP)		ICSV 700 (RP) × CJ 40 (SP)		CJ 39 (SP) × Malwan (SP)		CSV 15 (SP) × CSSV 148 (SP)	
Gene Effects	No. of shootfly eggs/ plant	Dead heart (%)	No. of shootfly Effs/ plant	Dead heart (%)	No. of shootfly eggs/ plant	Dead heart (%)	No. of shootfly eggs/ plant	Dead heart (%)	No. of shootfly eggs/ plant	Dead heart (%)	No. of shootfly eggs/ plant	Dead heart (%)
m	-	21.98** ± 1.26	0.94** ± 0.07	16.57** ± 2.63	1.30** ± 0.04	23.39** ± 3.50	1.05** ± 0.02	35.96** ± 2.65	0.95** ± 0.001	35.96** ± 2.65	0.88** ± 0.03	22.53** ± 2.05
a	-	–5.89* ± 2.38	–0.28** ± 0.03	–12.29** ± 2.08	–0.38** ± 0.02	4.68 ± 4.85	–0.3** ± 0.001	–4.93* ± 2.34	–0.177** ± 0.04	–6.31* ± 2.76	–0.34** ± 0.15	–18.56** ± 1.55
d	-	–39.43** ± 7.12	–309 ± 0.323	8.84 ± 11.41	–0.51** ± 0.18	38.73** ± 17.29	–0.62 ± 0.51	–55.56** ± 12.03	0.19 ± 0.10	–50.52** ± 12.64	0.13 ± 0.15	9.73 ± 9.23
aa	-	–42.03** ± 6.99	–0.39 ± 0.32	6.76 ± 11.32	–0.76** ± 0.18	11.83 ± 17.04	–0.19 ± 0.11	–62.03** ± 11.60	0.19** ± 0.09	–40.77** ± 11.97	–0.41** ± 0.14	17.00 ± 8.9
ad	-	–6.11** ± 2.88	–0.232** ± 0.04	–12.15** ± 2.21	–0.14** ± 0.03	2.73 ± 5.18	–0.04** ± 0.01	5.47 ± 3.19	–0.14** ± 0.05	–3.69 ± 3.65	0.15** ± 0.03	–15.27** ± 2.25
dd	-	35.93** ± 11.25	0.35 ± 0.34	–21.38 ± 13.73	0.37 ± 0.20	3.51 ± 24.66	0.84** ± 0.11	83.03 ± 15.54	–0.11 ± 0.21	51.25** ± 17.57	0.54** ± 0.16	–12.90 ± 11.82
Type of epistasis	D	D	D	D	D	C	D	D	D	D	D	D

RP = Resistant Parents; SP = Susceptible Parents
* = Significant at 0.05% level; ** = Significant at 0.01% level

In the case of resistance × susceptible crosses all the additive, dominance and epistasis effects were important. In both the crosses additive and additive × dominance gene effects were noted, besides dominance and additive × additive for ICSV 700 × GJ 39 and dominance × dominance for ICSV 700 × GJ 40 were observed for shootfly eggs per plant. For deadheart (%) in both the crosses dominance was significant, however in ICSV 700 × GJ 40, additive, additive × additive and dominance × dominance also played a major role. The same situation was also found in the crosses of susceptible × susceptible combination. For shootfly eggs per plant in both the crosses (SP × SP) additive and additive × additive and additive × dominance played important role. Whereas for deadheart (%), additive gene effect was important in both crosses. In GJ 39 × Malwan, dominance, additive × additive and dominance × dominance while in CSV 15 × GSSV 148 only additive × dominance interaction was significant. However, individual crosses in three categories i.e. resistance × resistance, resistance × susceptible and susceptible × susceptible combinations revealed gene effects differently. So, any generalization in such a situation is difficult. Hence, appropriate breeding methodology should be employed so as to isolate genotypes carrying host plant resistance. However, considering the major role of epistatic variance in most of the crosses, it would be appropriate that selection should be attempted between families and lines carrying resistance genes.

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