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Estimation of mean performance in sorghum downy mildew resistant back cross progenies (BC₃F₃) of maize

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Abstract
The present investigation was carried out at Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India to identify the best performing Sorghum Downy Mildew resistant progeny for agronomical traits. The objective of this study was to identify the better *per se* performance of the resistant progeny. Nine biometrical characters of six SDM resistant progenies *viz.,* UMI 79/936-C1-7-7-7-40, UMI 79/936-C1-7-7-7-46, UMI 79/936-C1-7-7-7-48, UMI 79/936-C1-7-7-7-52, UMI 79/936-C1-7-7-7-80 and UMI 79/936-C1-7-7-7-92 were used for mean performance. Studies revealed that among the progenies, UMI 79/936-C1-7-7-7-S80 and UMI 79/936-C1-7-7-7-92 showed better *per se* performance for yield contributing characters. These two progenies showed highest mean values than the other progenies. It exhibited more mean values than the parents for the characters viz., Cob length, Cob diameter, Cob weight, Yield per plant and 100 grain weight. Based on the mean values progenies UMI 79/936-C1-7-7-7-S80 and UMI 79/936-C1-7-7-7-92 confirmed as the best progenies.

Keywords: Mean performance, Sorghum Downy Mildew resistant back cross progenies, Maize

Introduction
Maize (*Zea mays* L.) is world's third most important crop after rice and wheat. It is a versatile crop, growing across a range of agro ecological zones. The importance of maize to sustainable development cannot be overstated. Maize is utilized as food for human consumption, as feed for livestock and as a raw material for industry (FAO, 1992) [3]. Plant breeders are interested in developing cultivars resistant to pest and disease with improved yield and other phenological characters. In order to achieve this goal, the breeders had the option of selecting desirable genotype in early generations or delaying intense selection until advanced generations. Downy mildews are important maize diseases in many tropical regions of the world. They are particularly destructive in many regions of tropical Asia where losses in excess of 70% have been documented. Globally, downy mildew affected areas with significant economic losses are reported to be as high as 30% (Jeffers *et al*., 2000) [4].

Mean is the primary criterion for selection in any breeding programme. Mean serves as a basis for eliminating undesirable crosses or progenies. Hence, the present studies were undertaken to identify the best performing SDM resistant progeny for yield contributing characters through mean performance

Materials and Methods
The experiments were conducted at Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India during Rabi 2014. BC₃F₃ population was used in the present study. It is derived from crossing the inbred UMI 79 which is susceptible for sorghum downy mildew and UMI 936(w) which has resistance for sorghum downy mildew and backcrossing progenies with UMI79. Six progenies *viz., viz., viz.,* UMI 79/936-C1-7-7-7-40, UMI 79/936-C1-7-7-7-46, UMI 79/936-C1-7-7-7-48, UMI 79/936-C1-7-7-7-52, UMI 79/936-C1-7-7-7-80 and UMI 79/936-C1-7-7-7-92 were confirmed as resistant to sorghum downy mildew under sick plot condition.

In these six progenies the data on nine quantitative characters viz., days to 50% tasseling, days to 50% silking, plant height, Ear height, Cob length, Cob diameter, Cob weight, Yield per plant and 100 grain weight were recorded. Mean performance were calculated using the descriptive statistical analysis. Range was worked out for different biometrical traits from the minimum and maximum value of the trait.

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Table 1: Mean performance and range of progenies UMI79/936-C1 -7-7-7-40 and UMI79/936-C1 -7-7-7-46 in BC₃F₃ generation for different biometrical traits

TRAITS	Grand Mean			Range		Grand Mean	Range	
	Parents			UMI79/936-C1 -7-7-7-40		UMI79/936-C1 -7-7-7-46		
	P1	P2	BC₂F₁	Min.	Max.	BC₃F₁	Min.	Max.
Days to 50 per cent tasseling	54.60	57.75	55.64	54.00	58.00	55.67	54.00	58.00
Days to 50 per cent silking	56.60	59.25	57.73	56.00	60.00	57.83	56.00	60.00
Plant height (cm)	86.60	104.40	93.73	86.00	102.00	85.83	70.00	94.00
Ear height (cm)	41.80	52.40	44.82	35.00	52.00	44.00	40.00	49.00
Days to maturity	99.60	107.80	102.91	101.00	106.00	102.67	101.00	105.00
Cob length (cm)	11.52	12.82	11.65	8.80	14.30	13.79	9.50	14.30
Cob diameter (cm)	10.48	11.06	12.65	7.50	13.20	13.64	7.80	13.20
100 Grain weight (g)	14.44	13.12	15.68	10.40	17.80	15.24	10.40	17.80
Yield per plant (g)	19.16	16.79	20.25	15.60	24.60	20.50	15.60	24.60

Table 2: Mean performance and range of progenies UMI79/936-C1 -7-7-7-48 and UMI79/936-C1 -7-7-7-52 in BC₃F₃ generation for different biometrical traits

TRAITS	Grand Mean	Range		Grand Mean	Range	
	UMI79/936-C1 -7-7-7-48			UMI79/936-C1 -7-7-7-52		
	BC₃F₁	Min.	Max.	BC₃F₁	Min.	Max.
Days to 50 per cent tasseling	56.00	54.00	58.00	55.75	54.00	58.00
Days to 50 per cent silking	58.33	56.00	60.00	58.00	57.00	60.00
Plant height (cm)	88.67	81.00	95.00	99.75	88.00	110.00
Ear height (cm)	43.33	40.00	48.00	48.00	41.00	54.00
Days to maturity	103.00	101.00	105.00	103.00	102.00	105.00
Cob length (cm)	12.98	10.20	13.20	12.88	9.50	13.28
Cob diameter (cm)	13.12	9.30	13.54	12.65	7.80	13.15
100 Grain weight (g)	15.12	12.20	16.70	17.63	15.70	21.50
Yield per plant (g)	20.89	15.40	20.20	19.50	16.80	22.40

Table 3: Mean performance and range of progenies UMI79/936-C1 -7-7-7-80 and UMI79/936-C1 -7-7-7-92 in BC₃F₃ generation for different biometrical traits

TRAITS	Grand Mean	Range		Grand Mean	Range	
	UMI79/936-C1 -7-7-7-80			UMI79/936-C1 -7-7-7-92		
	BC₃F₁	Min.	Max.	BC₃F₁	Min.	Max.
Days to 50 per cent tasseling	55.25	54.00	57.00	55.00	54.00	56.00
Days to 50 per cent silking	57.75	56.00	60.00	57.50	56.00	59.00
Plant height (cm)	89.20	80.00	96.00	88.50	86.00	91.00
Ear height (cm)	42.80	36.00	48.00	43.00	39.00	47.00
Days to maturity	103.60	102.00	106.00	104.50	103.00	106.00
Cob length (cm)	12.68	10.20	13.60	12.45	11.40	13.50
Cob diameter (cm)	13.45	9.30	14.60	12.10	9.10	13.20
100 Grain weight (g)	16.14	12.60	19.80	16.60	15.40	17.80
Yield per plant (g)	20.75	16.80	24.50	21.05	19.70	22.40

Results and Discussion

Mean is the primary criterion for selection in any breeding programme. Mean serves as a basis for eliminating undesirable crosses or progenies.Choice of parents is one of the most essential step in any breeding programme. Selection method can extract good cultivars if the parents used in the breeding programme are suitable. Therefore, an elite inbred UMI 79 was selected to introgress SDM resistance from UMI 936(W). Inclusion of elite inbred as parent (UMI 79) will largely help to ensure the recovery of a high proportion of progenies (inbreds) with adaptation and quality that would in turn helpful in developing superior hybrids with SDM resistance. The parents selected in the study UMI 79 and UMI 936(w) was having extreme variations in case of SDM resistance parameters. F_1s' of these parents were selected for further advancement so that the recovery of the parental genotype is faster with not much compromise on local adaptability and per se performance of the recurrent inbred.

The important biometrical traits *viz.*, days to 50per cent tasseling, days to 50 percent silking, days to maturity, plant height, ear height, cob length, cob diameter, cob weight, 100 grain weight and grain yield per plant were studied in the back crossed generations to simultaneously monitor the agronomic performance of the introgressed progenies. Mean values for various traits were computed for resistant progenies inBC₃F₃generation. Among the progenies, UMI 79/936-C1-7-7-7-S80 and UMI 79/936-C1-7-7-7-92 showed better *per se* performance for yield contributing characters. The progeny UMI 79/936-C1-7-7-7-80 showed highest mean values for the characters namely cob length (11.64 cm), cob diameter (10.44 cm), 100 grain eight (16.14 g) and yield per plant (20.50g). The progeny UMI 79/936-C1-7-7-7-92 also showed highest mean values for the characters namely cob length (12.45 cm), cob diameter (10.15 cm), 100 grain eight (16.60 g) and yield per plant (21.05g). The characters days to 50 per cent tasseling, days to 50 per cent silking and plant height for these progenies almost similar to recurrent parent.The mean value and the range of different biometrical traits for resistant progenies are presented in the Table 1 to Table 8. Similar results were obtained by Aarthi 2012 [1], Vashishta *et al.*

(2013) [6], by Bekele and Rao (2014) [2] and Panwar *et al.* (2013) [5].

To conclude that the study revealed that among the six progenies studied the progenies UMI 79/936-C1-7-7-7-S80 and UMI 79/936-C1-7-7-7-92 showed better *per se* performance for yield contributing characters *viz.,* days to 50 per cent tasseling, days to 50 per cent silking, days to maturity, plant height, ear height, cob length, cob diameter, cob weight, 100 grain weight and grain yield per plant. Hence, it's an indication that SDM resistant progenies possess the resistance to disease along with better agronomical performance.

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