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SELECTION OF SUPERIOR SWEET PEARL MILLET FODDER TYPES BY HETEROSIS

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ABSTRACT

Superior fodder sweet pearl millet types were selected by heterosis study from 76 crosses (crossing 4 lines and 19 testers in a L x T mating design). The cross 843 A x L 90 is the earliest fodder type and the cross 732 A x VVJ 2 is considered to be the best for the straw yield. The cross LIII A x L 90 is considered to be the best sweet type as it recorded the highest total soluble solids value.

KEY WORDS : Sweet Pearl Millet, Heterosis, Fodder Yield

Crosses involving diverse parental genotypes were evaluated in their F_1 generation in sweet pearl millet for expression of heterosis for superior fodder types. Only recently sweet stemed genotypes of pearl millet have been identified and this has opened up new lines of breeding to develop suitable varieties for fodder. The method used for the selection of high yielding cross combinations was reported by Burton (1951) in pearl millet. Hence, in the present study, the superior cross combinations were selected based on the heterotic study.

MATERIALS AND METHODS

In the present investigation, 76 hybrids obtained by crossing 4 male sterile lines and 19 restorers of pearl millet were raised in a randomised block design along with parents, in three replications during *kharif*, 1993. Observations were recorded for days to 50 per cent flowering, total soluble solids at maturity and straw yield per plant in randomly selected plants of hybrids and parents in each replication. Estimation of heterosis *viz.*, relative heterosis (over mid parent), heterobeltiosis (over better parent) and standard heterosis (over standard parent) were estimated by taking the overall mean values for each parent and cross combination in all the three replications. Significance of heterosis was ascertained by critical difference (CD) at one per cent and five per cent levels.

RESULTS AND DISCUSSION

The results and expression of relative heterosis, heterobeltiosis and standard heterosis are presented in Table 1. For fodder yield, early flowering is considered to be advantageous. Relative heterosis for days to 50 per cent flowering ranged from -12.69 to 20.50 per cent, -2.13 to 32.67 per cent for heterobeltiosis and for standard heterosis varied from -7.90 to 30.91 per cent. The cross combinations 842 A x MP 236 recorded the highest negative relative heterosis (-12.69%), 843 A x PCB 87-24 recorded the highest negative significant heterobeltiosis (-8.92%) and 843 A x L 90 cross combination recorded the highest negative standard heterosis. This reveals the possiblity of getting early hybrid combination through heterosis breeding in pearl millet. Negative heterosis for days to 50 per cent flowering was earlier observed by Kulkarni *et al.* (1993). The hybrids recorded positive relative heterosis which ranged from 0.14 to 97.53 per cent, 0.50 to 79.08 per cent heterobeltiosis and 1.41 to 58.46 per cent standard heterosis for straw yield. The hybrid 732 A x VVJ 2 recorded the highest relative heterosis and heterobeltiosis. The above cross combination can be recommended for getting more straw yield. Jayaraman (1989) also reported heterosis for straw yield per plant.

Of the 76 hybrids, 46 hybrids exhibited positive relative heterosis, 30 crosses recorded positive heterobeltiosis and 45 hybrids showed standard heterosis for total soluble solids. The ranges were from 0.00 to 54.92, 0.00 to 47.88 and 0.00 to 27.85 per cent for relative heterosis, heterobeltiosis and standard heterosis respectively. The cross LIII A x L 90 expressed highest significant relative heterosis and positive heterobeltiosis for total soluble solids.

Table 1. Expression of relative heterosis, heterobeltiosis and standard heterosis in 3 important line x tester combinations (%)

Crosses	Days to 50 per cent flowering			Straw yield per plant (g)			Total soluble solids at maturity (degree)		
	di	dii	diii	di	dii	diii	di	dii	diii
843 A x APFB 1	9.60**	11.34**	3.28**	10.10**	13.60**	-18.33**	-2.22**	-2.22**	-10.71**
843 A x APFB 2	0.86	3.55**	-3.95**	-34.49**	-44.12**	-57.40**	-12.53**	-23.87**	-6.14**
843 A x APFB 3	-2.72*	1.43	-5.93**	-28.44**	-47.08**	-40.59**	-23.33**	32.92**	-18.31**
843 A x AFB 48-1	4.17**	6.38**	-1.32	-8.31**	-9.37**	-50.06**	-22.76**	-34.12**	-14.76**
843 A x AFB 6-12-2	-2.36	2.83*	-4.61**	3.90**	-5.31**	-38.04**	7.58**	1.39**	8.07**
843 A x AFB 52-12	-6.08**	1.43	-5.93**	-55.23**	-62.40**	-70.22**	-3.81**	-15.83**	2.49**
843 A x COMP 6	12.58**	20.57**	11.83**	-28.55**	-38.54**	54.08**	-7.89**	-15.02**	-18.17**
843 A x COMP 9	-3.01*	2.83*	-4.61**	-17.15**	-21.28**	-52.93**	9.46**	1.42**	8.57**
843 A x HC 4	-4.00**	2.13	-5.27**	-29.50**	-44.76**	-47.57**	-10.34**	-23.53**	-1.07**
843 A x ICMV 87 111	-3.81**	2.83*	-4.61**	-6.79**	-23.77**	-35.46**	0.00	-0.55**	-8.17**
843 A x L 72	0.69	3.53**	-3.95**	-40.43**	-53.79**	-54.90**	-6.21**	-9.74	-10.71**
843 A x L 90	-8.05**	-0.70	-7.90**	-36.07**	-47.22**	-56.38**	-1.21**	-7.21**	-15.27**
843 A x MP 171	-5.41**	-0.70	-7.90**	-15.66**	-28.99**	-44.10**	-17.53**	-25.78**	-15.27**
843 A x MP 217	-2.07	0.70	-6.59**	-33.97**	-53.59**	-38.42**	-1.23**	-11.11**	1.47**
843 A x MP 218	-10.56**	1.43	-5.27**	2.47*	-12.18**	-33.80**	-5.64**	-12.38**	-6.65**
843 A x MP 236	-12.69**	1.43	-7.24**	12.76**	-6.91**	-23.05**	23.33**	23.33**	12.63**
843 A x PCB 87-24	-8.92**	-2.13	-5.93**	-35.56**	-54.21**	-41.48**	-16.15**	-21.08**	-18.32**
843 A x TNSC 1	3.38**	9.94**	0.65	-16.43**	-33.23**	-39.89**	-10.12**	-19.11**	-7.66**
843 A x VVJ 2	8.28**	5.68**	3.28**	3.16**	-4.41**	-35.52**	-0.51**	-7.62**	-1.57**
732 A x APFB 1	11.08**	20.97**	17.10**	-15.55**	-31.92**	35.65	8.21**	0.48**	7.05**
732 A x APFB 2	14.37**	21.88**	21.70**	1.66	-10.58**	-31.82**	-6.40**	-12.76**	7.56**
732 A x APFB 3	17.07**	26.14**	26.31**	-7.80**	-30.12**	-21.59**	-8.00**	-13.75**	5.02**
732 A x AFB 48-1	20.50**	29.94**	27.62**	63.08**	59.17**	-7.87**	-10.54**	-18.43**	5.53**
732 A x AFB 6-12-2	20.24**	28.85**	30.91**	4.58**	-1.46	-35.52**	0.94**	-2.91**	7.05**
732 A x AFB 52-12	15.21**	20.50**	28.28**	6.82**	-7.57**	-26.78**	-7.11**	12.92**	6.04**
732 A x COMP 6	9.52**	16.77**	21.04**	0.14	-11.14**	-33.61**	-6.86**	-7.51**	0.00
732 A x COMP 9	9.31**	11.75**	19.73**	3.31**	1.65	-39.22**	-13.06**	-13.27**	-7.15**
732 A x HC 4	14.97**	21.38**	26.31**	-23.69**	-38.58**	-14.71**	-5.81**	-14.12**	11.11**
732 A x ICMV 87111	13.86**	19.01**	25.65**	11.77**	-5.91**	-20.34**	8.67**	1.43**	8.07**
732 A x L 72	18.52**	28.19**	26.31**	-5.56**	-24.77**	-26.59**	5.19**	1.43**	8.07**
732 A x L 90	14.62**	18.66**	27.62**	-15.54**	-28.20**	-40.65**	18.89**	1.91**	8.57**
732 A x MP 171	12.73**	25.57**	22.36**	26.19**	9.48**	-13.80**	-16.32**	-19.11**	-7.66**
732 A x MP 217	6.17**	16.51**	13.15**	-4.38**	-31.34**	-8.89**	11.26**	7.56**	22.78**
732 A x MP 218	3.57**	6.20**	14.47**	56.68**	38.66**	4.53**	1.43**	1.43**	8.09**
732 A x MP 236	-1.40**	2.30	15.78**	14.18**	-2.93**	-19.77**	-14.87**	6.67**	13.65**
732 A x PCB 87-24	-2.87*	3.78**	11.18**	-22.19**	-43.47**	-27.77**	4.83**	3.33**	10.10**
732 A x TNSC 1	8.48**	10.04**	17.76**	-1.03	-12.01**	-25.28**	15.86**	12.00**	27.85**
732 A x VVJ 2	19.14**	32.67**	26.97**	97.53**	79.08**	27.46**	2.38*	2.38**	9.08**
L-111 A x APFB 1	13.57**	26.45**	19.73**	-14.24**	-17.71**	-22.22**	39.71**	33.89**	22.27**
L-111 A x APFB 2	10.66**	20.55**	17.76**	-19.99**	-24.89**	-34.76**	17.65**	-1.24**	21.77**
L-111 A x APFB 3	9.14**	17.00**	17.76**	-17.60**	-26.91**	-17.98**	21.98**	2.92**	25.32**
L-111 A x AFB 48-1	14.29**	20.41**	21.04**	-18.46**	-33.37**	-42.12**	7.62**	-11.37**	14.66**
L-111 A x AFB 6-12-2	17.22**	29.48**	27.62**	-32.87**	-41.15**	-48.88**	12.86**	-0.46**	9.08**
L-111 A x AFB 52-12	2.23	5.82**	13.81**	-37.44**	-40.16**	-48.02**	4.20**	-12.08**	7.05**
L-111 A x COMP 6	4.76**	8.08**	15.78**	-23.82**	-29.15**	-38.45**	15.34**	2.35**	10.60**
L-111 A x COMP 9	8.11**	15.56**	18.41**	8.58**	-8.33**	-20.32**	14.89**	2.37**	9.59**
L-111 A x HC 4	7.19**	10.70	17.76**	5.44**	0.97	-4.17**	0.48**	-17.25**	7.05**
L-111 A x ICMV 87111	7.30**	13.40**	18.41**	-2.88**	-4.11**	-16.71**	24.50**	18.68**	9.59**
L-111A x L 72	10.49**	20.13**	17.76**	-19.54**	-23.95**	-23.79**	35.56**	25.31**	23.80**
L-111 A x L 90	4.58**	8.86**	16.44**	-1.81	-4.19**	-16.77**	54.92**	47.88**	23.80**
L-111 A x MP 171	6.67**	13.26**	15.78**	-18.97**	-22.76**	-32.91**	13.23**	-1.78**	12.18**
L-111 A x MP 217	8.02**	18.53**	15.12**	-25.34**	-38.24**	-18.05**	1.03**	-12.44**	0.00
L-111 A x MP 218	4.17**	9.32**	15.12**	25.00**	16.74**	1.41	12.53**	0.48**	7.05**
L-111 A x MP 236	1.96	0.00	15.12**	-0.68	-3.08**	-15.81**	41.15**	16.11**	6.04**
L-111 A x PCB 87-24	-1.15	0.30	13.15**	-10.77**	-25.06**	-4.24**	29.54**	17.16**	21.26**
L-111 A x TNSC 1	4.24**	11.32**	13.15**	-50.30**	-31.53**	-38.36**	15.36**	0.00	14.16**
L-111 A x VVJ 2	7.41**	17.17**	14.47**	-13.84**	-21.62**	-31.91**	-5.60**	-15.71**	-10.20**
S.E		0.88			0.79			0.07	
C.D. (P=0.05)		2.47			2.19			0.20	
C.D. (P=0.01)		3.26			2.90			0.26	

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EFFECT OF GREEN MANURING *Sesbania rostrata* AND FERTILIZERS APPLICATION ON CHEMICAL PROPERTIES OF SOIL AND GRAIN YIELD IN RICE- RICE CROP SEQUENCES

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ABSTRACT

A field experiment was carried out during *kuruvai* (June - September) (South West Monsoon) and *thaladi* (October - January) (North East Monsoon) seasons of 1990-91 to evaluate the effectiveness of *Sesbania rostrata* grown as intercrop and ratoon in transplanted rice-rice sequence. Direct and residual effects of *S.rostrata* on rice yield and chemical properties of soil were studied. Grain and straw yields of rice were increased significantly due to green manuring. Fertilizer nitrogen could be saved upto 50 per cent through green manuring. Soil chemical properties *viz.*, organic carbon content, available N and K were increased significantly with green manure incorporations, particularly in ratooned ones, as compared to no green manuring. Green manuring combined with 50 kg N/ha was found to be better than pure stand of rice with 100 kg N/ha.

KEY WORDS : Rice, Crop Sequence, Green Manuring, Fertilizers, Yield, Soil Properties

Escalating cost of chemical fertilizers has forced the scientists to rely more on renewable resources through integrated nutrient supply system. Intercropping *Sesbania rostrata* in rice field under waterlogged conditions is found to be an economically feasible and viable proposition to reduce the requirement of inorganic fertilizer nitrogen for rice. The role of green manure as a component crop in rice based crop sequence has been well documented. Studies on possibility of introducing *S.rostrata* as intercrop in rice-rice sequence is limited. Hence, present investigation was carried out to study the direct and residual effect of *S.rostrata* applied from outside @ 12.5 t/ha and intercropped with rice (one row of *S.rostrata* for every 10 rows of rice) in rice rice cropping system on rice crop yield and soil chemical properties.

MATERIALS AND METHODS

Field exepriment was conducted at the Tamil Nadu Agricultural Universtiy, Coimbatore during *kuruvai* (South West Monsoon) and *thaladi* (North East Monsoon) seasons of 1990-91. The soil of the experimental field was neutral in reaction and deep clay loam in texture with organic carbon content of 0.73 per cent. The available nutrient contents were:

Table 1. Biomass production and nitrogen accumulation by *S.rostrata* (*Kuruvai* '90)

Treatments	Fresh biomass (t/ha)	B-added (kg/ha)
SR incorporated 7 DBT at 12.5 t/ha	12.5	40.0
SR incorporated at the time of transplanting	12.5	38.7
Intercropping SR and incorporated at 30 DAT	3.43	38.2
Intercropping SR and incorporated at 45 DAT	6.18	53.8
Intercropping SR and incorporated t 30 DAT and incorporated at 30 DAT and harvest	8.64	73.8
Intercropping SR ratooned at 45 DAT and incorporated at 45 DAT and harvest	10.62	82.6
Pure stand of rice	-	-

DAT : Days after transplanting ;