Mean halo length : Halo length was predominantly under the control of dominant genetic system, the ratio of GCA / SCA being 0.1914 suggesting that halo length can be improved by heterosis breeding (Table 1). Duhoon et al (1983) inferred the predominance of partial dominance in the genetic control of this character. The genotypes MCU 5, ISC 78 and Okra leaf Acala were positive general combiners which can be used for future breeding work. Although, four hybrids had positive sca effects, the combination MCU 5 x ISC 78 is the best because both of its parents are general combiners and the hybrid was having high mean performance and positive peterotic expression.

Thus, the studies indicated that seed characters, yield and quailty parameters are under non additive genetic system and MCU 7 x Acala Q 6-1, MCU 5 x ELS 481, MCU 5 x Glandless Acala and LRA 5166 x Deltapine are the best crosses identified for future plant breeding programme.

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PHENOTYPIC STABILITY FOR GRAIN YIELD AND ITS COMPONENT TRAITS IN SORGHUM

N.MUPPIDATHI, K.S. PARAMASIVAM, N.SIVASAMY, S.RAJARATHINAM AND S.SEVAGAPERUMAL

Agricultural Reserch Station
Tamilnadu Agricultural University
Kovilpatti - 628 501.

ABSTRACT

Sixty hybrids of sorghum were evaluated in four environment and stability parameters were studied for panicle yield per panicle. The genotypes showed significiant differences interaction was significant for all the characters except 100 grain weight. The hybrids 205 A x MR 750, 56 A x TNS 79, 73 A x TNS 88, 26 A x MR 750 and 111 A x 881 could be recommended for wider cultivation since they recorded superior mean, stability and average responsiveness for yeild and yeild component characters.

KEY WORDS : Sorghum,Hybrids, Stability, G x E interaction

Sorghum (*Sorghum bicolor* (L.) moench) is next in Tamilnadu. It is widely grown under different edaphic and environmental conditions and it is known to exhibit a high degree of genotype-environment interactions. But sorghum improvement has been limited in target areas with highly unpredicated environments. The main reason is the poor performance of the hybrids or varieties to the great difference among environmental conditions. Blum (1988) discussed limitation in using hybrid per se as a selection criterian based upon the large effect of environments. Hence,there is a need to develop hybrids with stability in performance over a wide range of environmental conditions.For this,information on stability of newly developed culture and behaviour of hybrids under different environments is quite important. The present study

Table 1. Pooled analysis of variance for different characters in sorghum

No	Source	Mean sum of squares				
		df	Panicle length	Number of rachis / panicle	100 grain weight	Grain yield per plant
1	Genotypes	77	35.76**	224.70**	0.206**	746.26**
2	Environments	3	94.15**	870.18**	0.616**	2455.99**
3	Genotype + (Geno x Env)	237	1.76**	45.11**	0.007*	25.95**
4	Environment (linear)	1	282.62*	2609.85**	0.619	7368.08*
5	Genotype X Environment (linear)	79	2.33*	35.48*	0.006	37.57*
6	Pooled deviation (Non-linear)	160	1.46*	43.44*	0.007	19.90*
7	Pooled error	640	0.58	9.28	0.003	6.53
	SEd		0.31	1.24	0.02	1.04
	CD (P=0.05)		0.61	2.43	0.04	2.04

* Significant at 5 per cent level

** Singificant at 1% level

was made to get information on the stability behaviour of new male sterile lines, cultivars and their hybrids,and its utility in breeding programme.

MATERIALS AND METHODS

The experiment material comprised of five cytoplasmic male sterile lines, 12 sorghum cultivars and the resultant 60 hybrids grown in two different seasons viz.,summer (April-August) and rabi (september-December), 1994. The experiments were conducted at the Regional Research Station.Aruppukottai and the Agricultural Research Station, Kovilpatti during the two seasons in a randomised block design with three replications in each environment. Each genotype was accomodated in a two row plot of 3 m Length with a spacing of 45 x 15 cm. The recommended package of practices was followed in all the four environments. Observation were recorded on 10 randomly selected plants in each plot for panicle length, number of rachis per panicle, 100 grain weight and grain yield per plant. The linear (bi) and non-linear (S^2d) components of genotype-environment interaction were calculated as suggested by Eberhart and Russell (1966).

RESULTS AND DISCUSSION

Analysis of variance for the four component traits pooled over four environments indicated significant differences among the genotypes and the environments (Table 1). The mean square due to genotype X environment interaction (G x E) was also highly significant indicating the differential response of genotypes in different environments. This result was in confirmity with the earlier reports of patel et al (1984) and singh (1985). The mean squares due to regression (liner component of G x E interaction) and the non-linear component (pooled deviation of G x E interaction) were significant for all the characters except 100 grain weight.According to Eeberhart and Russell (1966), an ideally adapted genotype should record high mean value, unit regression co-efficient (bi=1) and deviation from regression as small as Possible (s^2 d=0).

The mean, regression coefficient and s^2d values are presented in Table 2. Among the 77 genotypes, 19 hybrids and 6 parents recorded characters. Considering the mean performance, eight hybrids viz.,111 A X SPV 881 (58.92g) 111 A X TNS 83, (62.38g) 56 A X TNS 79 (69.96g), 56 A X TNS 82 (57.00g), 56 A X TNS 83 (70.70g), 26 A X MR 750 (62.85g), 73 A X TNS 88 (67.69g) and 205 A X MR 750 (74.03g) recorded higher mean grain yield than general mean along with stability for yield and yield component characters. Among these hybrids 205 A X MR 750, 56 A x TNS 79, and 56 A X TNS 82 for number of rachies per panicle

Table 2. Estimates of stability parameters of grain yield and other three metric traits

No	Crosses	Panicle length per panicle			Number of rachis			100 grain weight			Grain yield per plant		
		Mean	'bi'	S²d	Mean	'bi'	S²d	Mean	'bi'	S²d	Mean	'bi'	S²d
1	111 A X TNS 79	27.64	1.91	-0.48	70.33	1.51	19.88*	2.43	-1.23	0.020*	68.70	1.23	3.09
2	111 A X TNS 80	23.09	1.86	0.29	65.25	0.80	3.74	2.25	1.37*	-0.003	36.73	1.40	0.04
3	111 A X TNS 81	24.15	0.33	-0.08	62.92	-0.04	101.85*	2.08	-0.24	0.011*	43.18	0.52	2.47
4	111 A X TNS 82	30.38	1.91	4.44*	78.17	2.94	105.40*	2.57	2.04	0.002	68.13	1.60	0.49
5	111 A X TNS 83	28.10	-0.28*	-0.29	62.33	1.05	8.10	2.50	1.43	0.006	62.38	0.93	12.13
6	111 A X TNS 88	24.28	0.98	-0.41	56.33	0.70	-8.02	2.31	0.96	0.001	53.83	0.94	8.89
7	111 A X CS 3541	24.05	0.75	0.23	71.58	-1.65	138.20*	2.45	2.85	0.024*	61.23	-0.88	[illegible]
8	111 A X SPV 881	26.19	0.21	0.56	70.92	0.59	9.50	2.41	0.88	-0.003	58.92	1.01	3.65
9	111 A X SB 1085	26.24	1.22	1.09	68.67	4.02	97.60*	2.40	1.76	0.001	48.21	1.53	-4.37
10	111 A X MR 750	26.02	0.72	-0.54	78.40	1.57	10.81	2.71	0.88	-0.001	62.95	0.04	80.40*
11	111 A X AKR 150	28.23	-0.96	0.22	68.10	1.91	85.80*	2.49	1.10	-0.003	70.19	0.48	5.61
12	111 A X TNS 001-1-3-1-1	25.23	0.61	-0.38	69.00	0.18	83.30*	2.43	1.51	0.001	63.68	0.61	2.67
13	56 A X TNS 79	23.79	1.50	-0.46	72.60	1.35	-0.18	2.43	1.37	0.003	69.76	1.32	-3.67
14	56 A X TNS 80	21.68	2.11	1.80*	57.40	2.80	43.80*	2.11	1.71	-0.001	59.18	1.25*	6.38
15	56 A X TNS 81	22.10	0.33*	-0.56	67.30	-1.25	179.50*	2.50	1.28	-0.002	93.93	1.20	1.00
16	56 A X TNS 82	21.65	0.70	0.48	66.90	0.68	-8.74	2.26	1.63*	-0.003	57.00	0.99	-2.59
17	56 A X TNS 83	21.01	1.29*	-0.58	59.70	-0.18	-4.89	2.08	0.17	0.002	70.70	1.34	-3.73
18	56 A X TNS 88	24.18	0.49	5.56*	60.00	1.82	7.96	2.16	0.21	0.004	53.24	0.93	3.18
19	56 A X CS 3541	23.50	1.59	0.09	66.80	1.48	60.85*	2.14	0.43	0.002	58.82	0.90	-0.13
20	56 A X SPV 881	21.28	2.13	-0.17	65.30	1.38	239.50*	2.48	2.08	0.004	53.37	1.14	-3.92
21	56 A X SB 1085	30.43	-0.22	-0.16	64.40	0.27	53.03*	2.93	2.71	0.009*	52.64	0.17	25.10
22	56 A X MR 750	22.69	1.33	2.24*	62.80	0.65	-3.27	2.48	2.00	0.003	64.94	1.76	10.74
23	56 A X AKR 150	21.77	1.50	-0.40	54.40	1.07	-8.20	2.20	-0.42	0.022*	48.48	0.97	-5.09
24	56 A X TNS 001-1-3-1-1	22.69	1.46	-0.17	68.10	3.17	179.80*	2.37	1.23	0.001	50.95	0.13	43.41**
25	26 A X TNS 79	21.58	1.98	-0.05	55.30	2.63	226.00	2.36	1.04	-0.003*	41.38	2.02	25.35
26	26 A X TNS 80	20.56	1.41	1.45*	76.30	-1.37	77.14*	2.38	1.18	-0.002	39.95	1.98	28.32*
27	26 A X TNS 81	21.22	1.40	-0.05	57.70	1.77	-0.55	2.30	0.61	-0.003	46.76	1.16	2.08
28	26 A X TNS 82	24.73	0.29	0.04	74.30	-0.83*	-0.14	2.48	1.77	-0.001	34.81	1.62	4.63
29	26 A X TNS 83	23.47	1.21	0.51	61.80	1.13	127.04*	2.28	-1.12	0.015	51.20	1.97	39.67**
30	26 A X TNS 88	21.75	1.70	2.78*	62.40	1.52	2.55	2.28	0.21	0.004	37.41	1.58	7.44
31	26 A X CS 3541	21.83	2.28	0.80	44.50	1.48	-5.94	2.48*	1.14	-0.002	41.39	1.38	3.06
32	26 A X SPV 881	27.99	1.25	2.78*	42.70	1.29	-6.76	2.37	0.98	-0.001	53.49	1.21	0.63
33	26 A X SB 1085	20.96	1.21	-0.55	73.20	1.28	76.11*	2.32	0.17	0.002	42.50	1.05	1.59
34	26 A X MR 750	26.69	0.95	-0.49	55.25	1.06	-1.23	2.51	0.80	-0.003	62.85	1.93	-4.58
35	26 A X AKR 150	21.59	2.05	0.63	57.83	1.54	16.11	2.13	1.14	-0.003	35.93	1.56	1.18
36	26 A X TNS 001-1-3-1-1	23.88	0.37	0.47	60.25	0.68	6.75	2.46	1.33	-0.002	43.11	1.80	37.84
37	73 A X TNS 79	22.06	0.70	-0.50	58.17	0.87	3.45	2.06	1.02	0.001	53.63	0.46	-1.74
38	73 A X TNS 80	23.98	0.79	-0.51	61.75	0.97	18.03*	2.45	1.45	-0.002	62.71	1.63	-6.67
39	73 A X TNS 81	23.79	1.93	0.51	64.33	0.52	1.07	2.83	0.21	0.004	52.18	1.29	7.94
40	73 A X TNS 82	25.08	1.86	0.69	71.92	1.18	2.24	2.02	-0.06	0.004	53.58	0.88	-3.99

Contd..

No	Crosses	Panicle length per panicle			Number of rachis			100 grain weight			Grain yield per plant		
		Mean	'bi'	S^2d	Mean	'bi'	S^2d	Mean	'bi'	S^2d	Mean	'bi'	S^2d
41	73 A X TNS 83	25.97	1.58	7.56*	71.83	0.84	219.50*	2.32	1.73	0.001	54.18	-6.06	62.07*
42	73 A X TNS 88	26.27	1.09	-0.03	72.08	0.88	-8.90	2.57	1.82	0.003	67.69	1.00	4.61
43	73 A X CS 3541	19.62	1.93	0.35	53.00	1.48	-5.44	2.38	1.87	0.011*	55.63	1.70	19.23*
44	73 A X SPV 881	27.62	1.98	4.37*	73.08	-0.37	101.70*	2.37	0.08	0.001	79.18	1.19	16.45*
45	73 A X SB 1085	20.42	1.38	-0.48	54.25	1.21	-3.70	2.06	-0.16	0.027*	42.60	2.21	3.51
46	73 A X MR 750	28.33	0.18	0.16	86.70	0.05	20.60*	2.52	1.28	-0.002	73.03	0.19	30.88*
47	73 A X AKR 150	24.90	1.13	-0.18	70.70	1.25	25.74*	2.62	1.34	0.010*	52.39	0.23	11.91
48	73 A X TNS 001-1-3-1-1	26.54	1.00	0.81	60.80	0.81	1.14	2.09	0.74	0.003	42.93	1.84	8.57
49	205 X TNS 79	31.98	-1.04	0.34	63.20	-0.62	51.63*	2.46	1.02	-0.001	63.94	1.09	11.38
50	205 X TNS 80	30.54	-0.79	1.11	62.80	0.47	35.20*	2.32	-0.42	0.021*	79.15	1.73	23.32*
51	205 A X TNS 81	24.08	-0.18	0.42	75.90	2.70	51.80*	2.55	0.39	-0.001	98.93	-0.13	1.33
52	205 A X TNS 82	21.67	-0.60	1.09	62.50	0.87	1.15	2.35	0.75	-0.001	54.69	0.13	22.30*
53	205 A X TNS 83	29.74	0.09	3.28*	62.20	-0.10	47.73*	2.55	0.84	-0.001	73.23	0.65	31.07*
54	205 X TNS 88	27.05	1.17	0.85	60.20	1.34	0.58	2.58	0.96	0.001	39.54	1.55	0.84
55	205 X CS 3541	23.53	-0.14	8.27*	55.80	1.97*	-9.24	2.84	2.67	0.013*	78.25	2.28	31.94*
56	205 X SPV 881	27.85	0.89	-0.55	74.00	-0.03	-5.85	2.72	2.85	0.024*	66.16	0.13	75.04*
57	205 X SB 1085	28.93	1.25	5.21*	69.70	0.44	-8.33	2.11	-1.13	0.037*	62.76	0.70	-3.26
58	205 X MR 750	24.08	1.70	1.03	73.20	1.80	3.82	2.65	1.47	0.004	74.03	0.72	-1.81
59	205 X AKR 150	26.13	0.42	9.75*	70.90	1.27	2.21	3.02	1.95	0.005	63.90	0.77	-3.25
60	205 X TNS 001-1-3-1-1	26.64	0.98	-0.53	63.60	0.44	2.06*	2.38	1.10	-0.003	52.42	0.25	26.30*
61	111 A	21.32	1.99	0.52	64.80	0.83	-0.90	2.23	0.14	-0.000	41.02	1.63	16.12*
62	56 A	21.21	1.55	-0.21	54.10	1.20	31.26*	1.91	0.74	0.003	34.65	0.97	-0.75
63	26 A	22.49	0.62	-0.39	50.80	1.30	-9.09	1.89	1.63	-0.002	27.83	0.36	3.61
64	73 A	20.69	-0.47	0.52	58.80	1.06	-6.40	2.02	0.31*	-0.003	45.54	0.55	1.90
65	205 A	20.10	1.90	1.66*	60.30	1.96	6.55	2.03	1.41	-0.002	46.96	1.43	0.61
66	TNS 79	25.00	-0.12	1.41*	65.40	-1.83	67.04*	2.13	2.81	0.029*	50.43	0.25	1.52
67	TNS 80	22.02	0.39	0.05	56.10	-0.74	35.60*	2.27	1.87	0.013*	50.45	0.24	-0.58
68	TNS 81	23.53	0.17	0.02	61.70	2.48	48.60*	2.32	1.34	0.010*	44.93	0.17	3.47
69	TNS 82	22.56	0.58	0.70	61.70	1.87	15.10	2.38	-0.85	0.009*	54.26	2.15	121.99*
70	TNS 83	26.28	0.86	-0.15	66.00	0.62	24.90*	2.12	-0.75*	-0.003	55.46	0.49	28.99*
71	TNS 88	20.98	1.85	-0.04	58.00	1.97	8.79	2.91	2.75	0.025*	60.63	0.19	2.85
72	CS 3541	19.07	1.87	0.58	57.90	0.71	-4.60	2.18	2.44	0.009	35.00	0.63	5.65
73	SPV 881	23.40	1.56	-0.49	56.30	1.49	-3.67	2.28	1.37*	-0.003	44.58	1.05	-5.57
74	SB 1085	21.78	1.66	0.97	51.50	0.76	-5.40	2.04	-0.02	0.008	44.60	0.84	-5.41
75	MR 750	24.03	1.26	0.20	54.90	1.01	-7.92	2.07	0.84	-0.003	33.90	0.67	0.42
76	AKR 150	20.47	2.09	0.53	65.70	1.62	35.50*	2.31	1.30	-0.017*	35.10	1.31	27.02*
77	TNS 001-1-3-1-1	21.27	2.05	0.56	59.40	-0.59	34.63*	2.24	0.48	-0.003	44.68	-0.15	0.62
	G.M	24.15			63.7			2.35			54.7		
	S.Ed	0.31			1.24			0.02			1.04		
	CD (P=0.05)	0.61			2.43			0.04			2.04		

and 100 grain weight, 73 A X TNS 88, 111 A X SPV 881 and 111 A X TNS 83 for panicle length,number of rachies per panicle and 100 grain weight, 26 A X MR 750 for panicle length and 100 grain weight recorded superior mean performance than the respective general mean.

While considering the responsiveness to the environments all tthe hybrids recorded average responsiveness to environments. Among the hybrids, except 111 A X TNS 83 for number of rachis per panicle, 56 A X TNS 82 for 100 grain weight,and 56 A X TNS 83 for panicle length,all other hybrids recorded average responsiveness to environment. The hybrid 111 A X TNS 83 showed below average responsiveness and it performed better with higher number of rachies per panicle at poor environment. The hybrids 56 A X TNS 82 and 56 A X TNS 83 recorded above average responsiveness to environment and recorded higher 100 grain weight and panicle length under favourable environment.

The present study indicates that the hybrids 205 A X MR 750, 56 A X TNS 79, 73 A X TNS 88, 26 A X MR 750 and 111 A X SPV 881 can be recommended for wider cultivation since they recorded superior mean, stability and average responsiveness for yeild and yield component characters.

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RESEARCH NOTES

YIELD TARGETING AND INTEGRATED PLANT NUTRITION SYSTEM FOR SOIL FERTILITY MAINTENANCE IN A RICE BASED CROPPING SEQUENCE

It is necessary to choose appropriate yield targets and fertiliser use practices so that twin objectives of high yields and maintenance of soil fertility over seasons could be achieved. In the present study, field experiments were conducted at Agricultural Research Station, Bhavanisagar on Inceptisol alluvium (Typic Ustropept) under rice-rice-pulse cropping sequence.

The experimental soil was sandy clay loam with pH 7.2, E.C.O. 11 dSm^{-1}. organic carbon 0.405%, $KMnO_4$-N, Olsen-P and NH_4OAc-K were 236, 10.7 and 146 kg ha^{-1} respectively. The treatments comprised of chemical fertilisers viz., N as urea at five levels (0, 50, 100, 150 and 200 $kgha^{-1}$), P_2O_5 as Udaipur rock phosphate at four levels (0, 30, 60 and 90 kg ha^{-1}), K_2O as muriate of potash at four levels (0, 60, 120 and 180 kg ha^{-1}), organics viz., green manure (*Sesbania rostrata*) at two levels (0 and 6.25 tha^{-1}) and biofertiliser viz., phosphobacteria (*Bacillus megaterium* var. *phosphaticum*) at two levels (0 and 2 kg ha^{-1}). Fractional factorial design was adopted.

After the creation of fertility gradients, these treatments were superimposed over the fertility strips and rice crop was grown during kharif and rabi seasons and blackgram was grown as a residual crop during summer. The initial and post-harvest soil samples of each experiment were analysed for $KMnO_4$-N (Subbiah and Asija, 1956), Olsen-P (Olsen *et al.*, 1954) and NH_4OAc-K (Hanway and Heidal, 1952). The grain yield was recorded ; grain and straw samples were analysed for total N, P and K contents (Piper, 1966) and their uptake was computed.

In the present study, fertiliser adjustment equations (FAE) and post-harvest soil test values (PHSTV) prediction equations were developed for