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Stability analysis for yield and its attributing traits in advanced breeding lines of rabi sorghum (*Sorghum bicolor* (L.) Moench)

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Abstract: An experiment was carried out involving twenty three advanced breeding lines along with two checks M 35-1 and Muguthi during rabi season 2012-13 at four locations. Observations were recorded on 10 different characters viz., plant height (cm), stem diameter (cm), ear head length (cm), ear head diameter (cm), days to 50 per cent flowering, days to maturity, 100 seed weight (g), fodder yield per plot (kg), seed yield per plot (kg), and lodging percentage. The pooled analysis of variance revealed that mean sum of squares due to genotypes was significant for ear head diameter, days to 50 per cent flowering, days to maturity and fodder yield, indicating presence of considerable amount of variability in the genotypes. The mean sum of square due to environment + (genotypes x environment) was significant for plant height, ear head length (cm), ear head diameter (cm), days to 50 per cent flowering, fodder yield per plot (kg), seed yield per plot (kg), and lodging percentage characters except stem diameter, days to maturity and 100 seed yield. On the basis of stability parameters a four genotypes viz., GS-6 (2364 kg/ha), GS-16 (2454 kg/ha), GS-22(2775 kg/ha) and GS-23(2978 kg/ha) were found most stable over Gulbarga, Raichur, Bellary and Malnoor environments of Hyderabad Karnataka region.

Key words: Eberhart and Russel model, Genotypes, Regression, Sorghum, Stability

INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is one of the important food crops in the world. It is cultivated in many parts of Asia and Africa, in world over an area of 37.86 m ha with a production of 54.03 m t and a productivity of 1430 kg per ha. While in India, it occupies an area of 6.23 m ha with a production of 60.06 m t and productivity of 962 kg per ha. Karnataka is the second state after Maharashtra with regard to area coverage in India. In Karnataka, sorghum is grown over an area of 11.45 lakh ha with a production of 11.60 lakh t and productivity is 1021 kg per ha (Anonymous, 2013; Kumar and Chopra, 2013). Hyderabad-Karnataka region covers an area of 6.9 lakh ha and production of 6.09 lakh tones with productivity 996 kg/ha (Anonymous, 2010). Over the years due to global warming and climatic changes directed to reduce the productivity of many crops around the world. Its influence on sorghum also, farmers were cultivating long duration land races which results in low yielding. The non performance of farmer variety due to climate fluctuations requires stable variety, which perform better in this condition. In this connection genotype × environment interaction continuous to be a challenging issue among the plant breeders, geneticists and production agronomists who carry out crop performance trails across diverse environments. Consequently, to develop a variety with high yielding ability and consistency, precise attention should be given to the importance of stability performance for the genotypes under different environments and their interactions. The interaction between genotype and environment had an important impact on breeding for better varieties (Allard and Bradshaw, 1964). So that a considerable attention should be given to the effect of genotype- environment interaction in the plant breeding programs especially in the developing countries. Developing high yielding cultivars is mainly depending upon existing genetic variation among the germplasm under existing breeding programs. The relative performance of cultivars for quantitative traits such as yield and the other characters, which influence yield, vary from an environment to another.

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Table 1. Origin of 23 advanced lines of sorghum.

S. N.	Lines	Pedigree	Region adapted	Kg/ha
1	GS-1	Kodikal-3	North Karnataka	2372
2	GS-2	Chincholi-2	North Karnataka	2353
3	GS-3	Mudbal-1	North Karnataka	2611
4	GS-4	M X Niralkodi-10-14-2	North Karnataka and Maharashtra	2684
5	GS-5	M X Niralkodi-9-14-1	North Karnataka and Maharashtra	2518
6	GS-6	JP-1-5	North Karnataka	2364
7	GS-7	M X Bommnahalli-4-2	North Karnataka	2303
8	GS-8	M X Bommnahalli-4-3	North Karnataka	2597
9	GS-9	(M X D) X M	North Karnataka	2674
10	GS-10	(M X D) -4-1-29-2	North Karnataka	2415
11	GS-11	(M X D)-4-2-1	North Karnataka	2536
12	GS-12	(M X Sapnapalli) X M -4-5	North Karnataka	2327
13	GS-13	(M X Sapnapalli)-4-5	North Karnataka	2279
14	GS-14	M X Bommnahalli-4-1	North Karnataka	2204
15	GS-15	M X Hottigudar-2 -4-5-2	North Karnataka	2732
16	GS-16	(M X Hottigudar-2) X M -2-1	North Karnataka	2454
17	GS-17	M X Hottigudar-2 -4-6	North Karnataka	2503
18	GS-18	Phule mule X M -18-1	North Karnataka	2621
19	GS-19	(IS26779 X M) X M -1-1-5-1	North Karnataka	2663
20	GS-20	(IS26779 X M) X M -1-1-5-2	North Karnataka	2810
21	GS-21	(IS26779 X M) X M -1-1-5-3	North Karnataka	2511
22	GS-22	(IS26779 X M) X M -1-1-5-4	North Karnataka	2775
23	GS-23	IS26779 X M -1-2-2-1	North Karnataka	2978
24	M-35-1	Land race selection	North Karnataka and Maharashtra	2549
25	Muguthi	Local check	North Karnataka and Maharashtra	2196

*M= M-35-1; D = DSV– 4

Stability of performance should be considered as an important aspect of yield trials. Researchers need a statistic that provides a reliable measure of stability or consistency of performance across a range of environments, particularly, one that reflects the contribution of each genotype to the total G × E interaction (Shukla, 1972). Keeping in view the present study was undertaken under post rain fed situation in four locations viz., Gulbarga, Raichur, Bellary and Malnoor to identify stable genotypes of sorghum for seed yield and its component traits.

MATERIALS AND METHODS

The 23 sorghum lines comprised of selection from local lines, advanced generation lines developed by crossing local, exotic lines with M-35-1 (Table 1). Lines were developed at Agricultural Research Station, Gulbarga, University of Agricultural Sciences, Raichur with inclusion of two varietal checks viz., M-35-1 and Muguthi. The trials were conducted in a Randomized Complete Block Design with three replications at four locations *viz.,* Agriculture Research Stations Raichur, Gulbarga, Malnoor and Hagari receiving annual average rainfall of 729mm, 549mm, 573mm and 534mm representing diverse agro climatic conditions during *rabi*-2012-13. The plot size was 6 rows of 4m length with inter row and inter spacing of 0.45m X.0.15m. Each row was over planted later thinned to 1 plants/hill 15days after emergence. 50kg Nitrogen per hactor and 25 kg phosphorus per hactor of Diamonimum Phosphate was applied as basal fertilizer. All other crop cultural management practices were followed to raise successful crop.

Observations were recorded on five randomly selected plants in each replication in each environment in respect of 10 different characters *viz.,* plant height (cm), stem diameter (cm), ear head length (cm), ear head diameter (cm), days to 50 per cent flowering, days to maturity, 100 seed weight (g), fodder yield per plot (kg), seed yield per plot (kg), and lodging percentage. Stability analysis was carried out by using the stability model proposed by Eberhart and Russell (1966) using Window Stat Programme. According to them regression coefficient (b_i) and deviation from regression (S^2di) may be considered as two parameters for measuring the varietal phenotypic stability. These varieties with (b_i) value which shall not significantly differ from unity (b_i=1) and (S^2di) did not significantly differ from zero could be described as a stable variety.

RESULTS AND DISCUSSION

Pooled Analysis of variance of stability for different characters revealed that mean sum of squares due to genotypes was significant for ear head diameter, days to 50 per cent flowering, days to maturity and fodder yield. Variance due to G × E was significant for ear head diameter and fodder yield, indicating that the genotypes responded differently to the change in the environment (Table 2). Environmental linear component was significant for all traits except days to maturity, where as G × E (linear) interaction was non signify cant for most of the characters expect ear head diameter and fodder yield. Kher *et al.* (2008) in their studies revealed that (G × E) linear component was non significant, while pooled deviation (non- linear component) was significant for green forage yield. The mean sum of square due to environment + (genotypes x environment) was significant for plant height, ear head length (cm), ear head diameter (cm), days to 50 per

Table 2. Pooled mean sum of squares values for 10 quantitative traits over Raichur, Gulbarga, Bellary and Malnoor environments.

Source of Variations	d.f.	Plant height (cm)	Stem diameter (cm)	Ear head length (cm)	Ear head diameter (cm)	Days to 50 % flowering	Days to maturity	100 Seed weight (g)	Fodder yield (kg)	Seed Yield (kg)	Lodging (%)
Genotypes	24	112.8	0.011	1.845	0.659**	55.794**	72.446**	0.075	2.267**	0.081	14.393
Environemnt + (Genotype.xEnvironemnt)	75	931.0**	0.015	42.709**	22.858**	47.053**	17.086	0.094	49.111**	1.673**	22.825**
Environments	3	20737.5**	0.094**	1040.13**	555.969**	710.168**	12.673	0.260	1190.35**	39.873**	308.198**
Genotype.xEnvironemnt	72	105.7	0.012	1.150	0.645**	19.423	17.270	0.087	1.559*	0.081	10.934
Environments (Linear)	1	62212.7**	0.282**	3120.395**	1667.90**	2130.5**	38.020	0.781**	3571.05**	119.618**	924.593**
Genotype.xEnvironemnt (Linear)	24	124.7	0.014	0.808	1.760**	19.783	12.027	0.061	2.652**	0.065	12.220
Pooled Deviation	50	92.42	0.010	1.268**	0.084	18.473**	19.096**	0.096**	0.972**	0.086**	9.880**
Pooled error	192	86.10	0.004	0.384	0.281	2.327	1.947	0.013	0.538	0.009	3.485

*&** Significant at 5 and 1 percent respectively.

cent flowering, fodder yield per plot (kg), seed yield er plot (kg), and lodging percentage characters except stem diameter, days to maturity and 100 seed yield. Dudheech *et al.* (2007) concluded variance due environment, genotype × environment interaction and its linear components were found significant for test weight and number of grains per panicle. While non-linear component was found significant for days to maturity and 100 seed weight. The influence of external environment and its interaction enhance the performance of genotypes. The MSS due to environment (linear) was significant for plant height, stem diameter, ear head length, ear head diameter, days to 50 per cent flowering, days to maturity, 100 seed weight, seed yield, fodder yield and lodging percentage indicating that environment effects were additive. Kishore and Singh (2004) revealed significant mean square due to environment indicated considerable differences among environments and their predominant effects on quantitative traits.

Eberhart and Russell (1966) defined a stable genotype as the one which showed high mean yield, regression co-efficient (b_i) around unity and deviation from regression near to zero. Accordingly, the mean and deviation from regression of each genotype were considered for stability and linear regression was used for testing the varietal response. The estimates of stability parameters in respect of ten characters that had direct influence on genotypes performance is presented in Table 3. The genotype GS-3, GS-6 and GS-15 showed higher mean value with regression coefficient less than one and non-significant deviation from regression indicating wide adaptation to the entire environment with respect to plant height. Sharnabasappa (2009) indicated G × E interaction was significant for morphological characters suggesting that genotypes interacted significantly with environments. On the basis of stability parameters, BJB-28, BJB-42, BJB-133 and BJB-143 were found to be stable for majority of the characters across the dates of sowing.

The genotypes GS-6, GS-11, GS-22 and GS-23 exhibited high mean value, deviation from regression was significant with close to zero values but regression coefficient showed around unity, indicates stable performance with respect to stem diameter. Genotypes GS -8, GS-16, GS-19, GS-20, GS-21, GS-22, GS-23, and and check variety Muguthi had high mean value with non-significant regression value check variety Muguthi had high mean value with non-significant regression value and non-significant deviation from regression indicating wider adoptability on tested environment with respect to ear head length. Patil *et al.* (1991) evaluated ten genotypes of sorghum (Sorghum bicolor) at five different environments during five monsoon seasons with respect to six yield and growth characters. Analysis of pooled data revealed significant genotype × environment interactions for all traits. Stability parameters indicated that best adapted genotype

Table 3. Mean and stability parameters in advanced breeding lines of *S. bicolour* L. Moench.

Traits	Plant height (cm)			Stem diameter (cm)			Ear head length (cm)			Ear head Diameter (cm)		
Genotypes	mean	S^2di	b_i	mean	S^2di	b_i	mean	S^2di	b_i	mean	S^2di	b_i
GS-1	185.83	320.59*	0.85	1.542	0.024**	2.708	12.76	1.21*	1.00	6.28	-0.27	1.07
GS-2	189.20	28.91	1.19	1.481	0.030**	0.928	10.93	1.94**	0.81	5.50	-0.14	0.88
GS-3	186.58	-16.69	0.96	1.549	0.001	1.028	12.57	2.15**	0.94	5.93	-0.29	0.94*
GS-4	179.08	-65.24	0.74	1.439	0.004	2.183	12.35	-0.30	0.98	6.19	-0.29	1.08*
GS-5	180.08	-93.99	0.82	1.475	-0.003	1.492	12.21	0.66	0.91	6.09	-0.28	0.92*
GS-6	186.92	-39.67	0.82	1.549	0.021*	0.044	12.25	0.72	0.94	6.44	-0.13	1.14
GS-7	186.50	-79.26	1.08	1.462	-0.002	-0.310	12.36	-0.13	0.99	5.99	-0.17	0.91
GS-8	185.40	-32.59	1.03	1.517	-0.001	1.846	12.67	-0.29	1.01	6.27	-0.25	0.95
GS-9	178.17	-14.92	0.75	1.546	0.002	1.952	12.50	-0.30	1.02	5.96	-0.13	0.84
GS-10	178.32	85.05	0.72	1.547	-0.002	1.353	13.57	1.79**	1.12	6.66	-0.27	1.27*
GS-11	175.58	216.90*	0.82	1.557	0.013*	-1.224	14.43	6.28**	1.23	6.94	-0.23	1.43*
GS-12	179.33	-62.23	0.77	1.500	0.003	1.467	12.31	0.50	1.00	5.48	-0.29	0.80*
GS-13	171.42	-71.65	0.82	1.528	0.008	1.431	12.05	0.11	0.94	5.71	-0.29	0.94*
GS-14	183.17	-46.15	1.20	1.528	0.001	0.150	11.87	2.13**	0.90	5.40	-0.20	0.77*
GS-15	183.17	-39.21	0.90	1.551	0.006	0.091	12.43	-0.14	0.97	5.86	-0.28	0.91*
GS-16	181.67	-10.68	1.20	1.423	-0.002	0.484	12.72	-0.04	1.00	6.29	-0.06	0.95
GS-17	180.50	-53.27	0.90	1.509	-0.003	2.274*	12.75	1.96**	0.97	6.60	-0.19	0.99
GS-18	176.58	-71.22	0.87	1.418	0.001	0.664	12.03	-0.21	0.94	5.60	-0.28	0.87*
GS-19	193.83	-70.53	1.04	1.508	0.004	3.375	13.63	-0.37	1.06	6.57	0.10	1.12
GS-20	189.67	-56.29	1.44	1.423	-0.003	-0.130*	12.71	-0.03	1.02	6.39	-0.29	1.12*
GS-21	185.50	-74.52	1.26	1.433	0.006	1.156	13.24	0.21	1.08	6.32	-0.28	1.15*
GS-22	185.00	-19.14	1.02	1.556	0.023**	0.765	13.26	0.05	1.05	6.58	-0.22	1.23*
GS-23	178.08	-41.20	0.96	1.561	0.017**	0.171	13.12	0.66	1.05	5.90	-0.20	0.78*
M 35-1	178.17	71.26	1.32	1.413	-0.001	1.948	12.57	0.03	1.00	5.93	-0.15	0.97
Muguthi	189.80	9.97	1.51	1.453	0.018**	-0.847	12.94	2.51**	1.08	5.88	-0.29	1.00
Population mean	182.70			1.490			12.64			6.10		

Contd….

Traits	Days to 50 % flowering			Days to maturity			100 Seed weight (g)		
Genotypes	mean	S^2di	b_i	mean	S^2di	b_i	mean	S^2di	b_i
GS-1	68.667	5.332*	1.053	110.17	12.82**	1.40	3.310	0.154**	0.061
GS-2	69.417	46.819**	1.276	111.00	16.16**	3.91	3.452	0.367**	0.181
GS-3	68.667	12.975**	1.362	112.00	17.51**	3.97	3.292	0.179**	0.529
GS-4	61.333	4.660	0.295	105.83	7.83**	3.25	3.290	0.058*	-1.329
GS-5	63.500	31.674**	0.388	107.25	41.75**	6.08	3.437	0.140**	3.288
GS-6	64.750	20.315**	0.542	111.08	15.61**	-0.55	3.283	0.011	2.349
GS-7	63.333	2.513	0.182	112.92	45.71**	-2.54	3.116	0.019	0.033
GS-8	62.667	6.811*	0.427	109.58	31.29**	6.34	3.005	-0.001	1.609
GS-9	63.667	3.194	0.663	111.67	12.56**	4.56	3.253	0.017	1.620
GS-10	63.667	2.847	0.996	113.33	11.01**	2.23	3.166	0.301**	3.227
GS-11	56.083	38.559**	0.464	98.67	3.95	1.06	3.209	0.016	1.835
GS-12	63.750	-0.329	0.937	111.25	6.09*	0.33	3.038	0.015	-1.009
GS-13	64.083	1.580	1.019	111.08	0.67	-0.60	3.328	0.075**	3.408
GS-14	73.333	43.284**	1.593	115.75	80.53**	-5.30	3.476	-0.014	0.480
GS-15	66.583	32.375**	1.338	113.58	15.48**	0.57	3.183	0.009	0.158
GS-16	63.333	11.295**	0.813	109.17	2.45	0.91	3.270	0.026	0.484
GS-17	65.417	10.743**	1.166	112.33	23.94**	-0.51	3.103	0.053*	-0.030
GS-18	66.167	10.938**	0.410	112.33	3.18	-2.72	3.063	0.023	0.766
GS-19	67.833	3.041	1.277	113.08	5.43*	4.40	3.307	0.293**	3.237
GS-20	66.583	13.739**	1.878	115.42	16.16**	0.13	3.146	-0.011	-1.368*
GS-21	69.167	41.288**	1.407	115.75	43.75**	-0.35	3.490	0.116**	0.550
GS-22	64.833	21.597**	1.395	114.00	-0.93	-1.86	3.413	0.022	1.981
GS-23	63.917	9.527**	1.031	112.58	6.45*	-0.28	3.303	0.087**	0.015
M 35-1	66.917	-0.587	1.890*	116.67	-1.22	0.14	3.314	-0.010	1.354
Muguthi	74.000	27.356**	1.197	122.17	9.70**	0.44	3.148	-0.017	1.568
Population mean	65.660			111.90			3.250		

Contd….

Traits	Fodder yield per plot (kg)			Seed yield/ plot (kg)			Lodging %		
Genotypes	**mean**	**S^2di**	**b_i**	**mean**	**S^2di**	**b_i**	**mean**	**S^2di**	**b_i**
GS-1	9.867	-0.192	0.894	1.708	0.254**	0.876	10.239	1.800	1.079
GS-2	10.975	1.083	1.015	1.694	0.139**	1.093	8.256	0.152	0.787
GS-3	10.108	1.429*	1.147	1.880	-0.003	1.153*	10.312	9.947	1.631
GS-4	8.858	0.281	0.863	1.932	-0.002	1.110	10.231	2.441	0.769
GS-5	10.025	-0.395	0.887	1.813	0.152**	0.960	10.666	7.720	1.498
GS-6	9.150	0.862	0.881	1.702	0.185**	1.060	12.695	0.923	1.407
GS-7	9.958	-0.384	0.995	1.658	0.029*	0.941	12.978	-0.977	1.272
GS-8	9.575	-0.488	0.949	1.870	0.006	1.063	12.024	-2.029	1.471
GS-9	9.933	0.172	0.977	1.925	0.152**	1.038	9.902	-1.668	1.342
GS-10	9.008	6.087**	0.826	1.739	0.153**	0.777	11.743	-1.091	1.808
GS-11	8.025	0.625	0.814	1.826	0.058**	0.791	7.198	-1.190	0.151
GS-12	9.092	-0.530	1.020	1.675	-0.002	0.965	8.409	4.769	0.950
GS-13	10.508	-0.427	1.029	1.641	0.020*	0.941	10.648	7.036	0.646
GS-14	8.858	-0.475	0.963	1.587	0.207**	0.749	11.922	15.451*	1.465
GS-15	9.500	-0.251	1.094	1.967	0.006	1.197	12.763	-0.169	1.736
GS-16	9.283	-0.495	0.985	1.767	0.031*	1.001	11.347	-1.283	1.705
GS-17	10.333	0.900	1.187	1.802	0.117	1.071	12.010	-2.389	1.664
GS-18	9.083	2.083*	0.774	1.887	0.010	0.953	12.332	16.726*	0.918
GS-19	9.275	0.355	0.893	1.917	0.110**	1.097	13.289	11.180*	0.901
GS-20	9.917	-0.504	1.111*	2.023	0.180**	1.169	13.139	-3.153	0.815
GS-21	10.925	-0.091	1.232	1.808	0.086	1.008	11.785	1.305	0.496
GS-22	10.233	-0.235	0.944	1.998	-0.008	1.007	8.528	-0.127	0.083
GS-23	9.867	1.279*	1.055	2.144	0.016	0.987	7.267	-4.803	0.031*
M 35-1	10.267	-0.143	1.166	1.835	-0.003	1.051	13.511	24.821**	0.162
Muguthi	11.192	-0.339	1.300*	1.581	0.042**	0.943	12.598	30.263**	0.215
Population mean	9.750			1.810			11.030		

was SPV-346 for all characters, RSV 6 for fodder yield and RSV 10 for 1000 grain weight. Hybrid SPH 196 was stable and had the highest fodder yield (14.1 t/ha), grain yield (4.3 t/ha) and 1000 grain weight (25.34 g) under favourable environments. CSH-1 and CSH-6 was stable for days to maturity and response to poor environments. Mukri (2007) reported pooled analysis of variance revealed significant difference among the genotypes and environments for all the characters, indicating that genotypes and environments tested were diverse in nature. Genotype × environment interaction was significant for most of the characters suggesting, genotypes interacted significantly with environments. On the basis of stability parameters, DSH-4 and M-35-1 were promising genotypes for majority of the characters with higher mean performance across all the six dates of sowing. The genotypes GS-1, GS-4, GS-10, GS-11, GS-19, GS-20, GS-21 and GS-22 had regression coefficient more than one indicating lines were sensitive to environment but adapted to favourable environment with respect to ear head diameter. The genotypes GS-4, GS-5, GS-6, GS-7, GS-8, GS-9, GS-10, GS-11, GS-12, GS-16 and GS-18 showing average stability having regression coefficient less than one with respect to 50 per cent flowering. The genotypes GS-6, GS-7, GS-12, GS-13, GS-14, GS-15, GS-17, GS-18, GS-20, GS-21, GS-22, GS-23 with both varietal checks M 35- 1 and Muguthi exhibiting regression coefficient less than one with high mean than the population mean indicating stable performance in unfavourable environment with respect to days to maturity. Narkhede *et al.* (1998) revealed the variance due o environment was significant for both grain and fodder yield and there was considerable interaction between cultivar and environment. The hybrid SPH 821 was stable for grain yield and SPH 792 was stable for fodder yield. Amith *et al.* (2007) indicated variance due to environment interaction and its linear components were significant for test weight and number of grains per panicle, while non linear genotypes exhibiting regression coefficient less than unity, maximum test weight was exhibited by genotypes SU 596 followed by SU 606 and SU 627 showing stable performance in unfavourable environment. In addition to maximum test weight, genotype SU 596 showed minimum days to maturity. For 100 seed weight the genotypes GS-14 and GS-16 showed regression value less than unity (bi<1), mean value higher than grand mean, with non-significant deviation from regression indicating that they were suitable for wide range of environments. The genotypes GS-2, GS-13, GS-17, GS-20, and GS-21 showed higher mean values compared to grand mean, regression coefficient more than unity indicating the lines were suitable for favourable environmental condition with respect to fodder yield per plot. Narkhede *et al.* (1997) expressed linear and non –linear components played an important role in expression of both traits. The genotypes, CSV-15, SPV 1134, SPV 46 and SPV 1247 showed stable performance with high mean grain yield. The variety CSV-15 had high grain and fodder yield with good stability and responsive to environmental fluctuations. Significant genotype and environment interaction was observed for both traits and SPV 489 was stable for fodder yield. For seed yield per plot the genotypes GS-18 and GS-23 exhibiting regression coefficient less than one with high mean value than the population mean value and non-significant deviation from regression coefficient indicating wider adoptability. The genotypes GS-6, GS -7, GS-8, GS-10, GS-14, GS-15, GS-16 and GS-17 were found high mean value and regression coefficient value more than unity indicating their sensitive to adopt favourable environment condition with respect to lodging percentage.

Conclusion

It is concluded that yield and its related traits may be taken into account while selecting/evaluating genotypes for stability performance across the environments. As for as 100 seed weight concern genotypes GS-14 and GS-16 were suitable for wide range of environments. Genotypes GS-18 and GS-23 were wider adopted for seed yield per plot. As for as fodder yield is concern genotypes GS-1, GS-5, GS-9, GS-22, GS-23, M 35- 1 and Muguthi were adopted wider environments. Genotypes GS-8, GS-16, and GS-17 were wider adopted for ear head diameter. Genotypes GS-16, GS-21, GS-22 and GS-23 were stable for ear head length. The genotypes GS-6 (High mean values of plant height, stem diameter, days to 50 per cent flowering and sensitive to lodging), GS-16 (High mean values of ear head length, ear head diameter, days to 50 per cent flowering, 100 seed weight and sensitive to lodging), GS-22 (High mean values of stem diameter, ear head length, days to maturity and fodder yield) and GS-23 (High mean values of stem diameter, ear head length, days to maturity and fodder yield and 100 seed yield) were most stable for mentioned characters with seed yield of 2364 kg/ha, 2454 kg/ha, 2775 kg/ha and 2978 kg/ha over all four environments. This indicated that these lines were the potential ones for further use and these genotypes are recommended for farm trials in Hyderabad-Karnataka region, while further testing of the genotypes is required for further genetic manipulation.

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