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Analysis of Leaf- Stem Ratio Stability in Forage Maize (Zea Mays L.)

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Abstract: *The leaf- stem (L:S) ratio were studied among one hundred forage maize accessions collected from different parts of India (Madhya Pradesh, Rajasthan and Uttar Pradesh) along with a known forage maize variety (African Tall). Observation on various parameters contributing to fodder yield potential were recorded at 50% silking stage of the accessions and Leaf - stem ratio was worked out by dividing leaf weight by stem weight per plant (on dry matter basis). Stability parameters were computed as method suggested by Eberhart and Russell.*

Significant bi as well as S2di was observed for only two accessions showing that both linear and non-linear types of interactions accounted for the G x E interaction. There was only one accession with significant S2di and as such the performance of this accession was not predictable across the environments. Study revealed that 62 accessions and African Tall were stable for all kind of environments. Maximum leaf-stem ratio was recorded in IC-335069 (0.62), which was stable for favourable environments (bi = 503) whereas African Tall had average mean performance (0.47) and was stable for all type of environments (bi = -0.22). The leaf- stem (L:S) ratio is a vital indicator of forage quality, determining palatability, crude protein content, and overall digestibility. The highest average range of leaf- stem ratio in forage maize is 0.55–0.62.*

Keywords: Forage maize, stability analysis, G x E interaction, leaf- stem ratio

I. INTRODUCTION

Stability analysis in forage maize identifies genotypes that produce high consistent dry matter and green fodder yields across diverse environments. Maize is grown at varying elevations, as high as 3800 m above sea level and performs amazingly well under varying photo-period, rainfall, temperature and soil condition (Vasal and Taba, 1988). The leaf- stem (L:S) ratio is a vital morphological indicator of forage quality, determining palatability, crude protein content, and overall digestibility. Higher ratios mean higher quality, as leaves contain more nutrients then stems. The total cropped area under cultivated forages in India is nearly 4.5 % (DARE, 2019) which is less as compare to demand. The present study was an attempt to assess the possibilities of exploitation of stable and high yielding accessions of forage maize in terms of leaf- stem ratio, through estimating genotype x environment interactions and stability parameter analysis.

II. MATERIAL AND METHODS

The present investigation embodied experiment in three environments to study the various growth, yield and quality parameters in forage maize. During investigation a set of 101 accessions was raised during Kharif (first week of July 2001, 2002 & 2003) as a rain fed crop on a comparatively better-textured sandy loam soil (Parawa) with average moisture holding capacity. Each entry was sown in randomized block design having three replications on well-prepared land with optimum moisture for germination. Each entry was grown in paired row plot of 4-meter length keeping 0.75-meter distance between the rows and 0.15-meter between the plants within a row. Standard agronomic practices were followed and recommended fertilizer dose were applied during the course of experiment. Observation on various parameters contributing to fodder yield potential were recorded at 50% silking stage of the accessions and Leaf - stem

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ratio was worked out by dividing leaf weight by stem weight per plant (on dry matter basis). The stability analysis technique partitions the genotype X environment interaction components of variance of each genotype into two parts. Therefore, each is characterized by three parameters viz.; (A) mean yield (x) over all environments, (B) a linear regression coefficient (bi) in relation to environment index and (C) the deviation from linear regression (S^2di).

Stability parameters were computed as method suggested by Eberhart and Russell (1966).

III. RESULT AND DISCUSSION

From the perusal of Table, fifty four accessions were having non-significant bi and S^2di values showing absence of G x E interactions. Forty two accessions and African Tall had only significant bi indicating that G x E interaction was linear in nature and performance of these accessions could be predictable. Significant value for both bi as well as S^2di was observed for only two accessions showing that both linear and non-linear types of interactions accounted for the G x E interaction. There was only one accession with significant S^2di and as such the performance of this accession was not predictable across the environments.

In general, most of the accessions (58 accessions and African Tall) had bi approaching to unity (bi = 1) showing their adaptability for general environment. Out of these, 45 accessions and African Tall were having mean values greater or equal to the population mean. Eighteen accessions had bi > 1 showing their suitability to favourable environments, out of which only five accessions had mean values more or equal to population mean. Twenty four accessions were having bi < 1 indicating their adaptability to unfavourable environments, in which four accessions had mean values more than or equal to the population mean. Thirty three accessions had below average, 62 accessions had average, and five accessions and African Tall had above average mean for leaf-stem ratio. Among the stable genotypes, 62 accessions and African Tall were stable for all kind of environments. Maximum leaf-stem ratio was recorded in IC-335069 (0.62), which was stable for favourable environments (bi = 503*) whereas African Tall had average mean performance (0.47) and was stable for all type of environments (bi= -0.22). Among the high or equal mean performance than population mean, 24 accessions were not found stable. The highest average range of leaf- stem ratio in forage maize was 0.55–0.62. Vavilov (1951) was first to indicate the importance of greater range of variation in material for rapid improvement.

Stability analysis for leaf- stem ratio in forage maize identifies accessions that maintain high productivity and consistent morphology across diverse environmental conditions. Research indicates that while environmental factors have the strongest influence on forage yield, genotype-by-environment (G × E) interactions are significant for traits like forage yield per plant and green stem weight. According to Eberhart and Russell (1966) a desirable variety is one that has high mean with unity regression coefficients and S 2di values approaching to zero. Srivas & Singh (2004) concluded that improvement in characters like days to 50% silking, number of leaves per plant and stem girth will help to improve the fodder yield in maize both directly and indirectly. In general terms, forages with greater leaf/ stem ratio contain greater coefficients of dry matter (DM) and NDF digestibility given that leaves have lower concentrations of NDF.

Estimation of stability parameters for leaf – stem ratio.

S. No.	Acc. No.	Mean	bi	S^2di	S. No	Acc. No.	Mean	bi	S^2di
1.	IC- 334821	0.41	1.96	0.03**	52.	IC- 335025	0.31	2.00	0.01
2.	IC- 334825	0.23	0.87	0.00	53.	IC- 335027	0.37	1.58	0.00
3.	IC- 334826	0.37	2.12	0.00	54.	IC- 335028	0.33	1.64	0.01
4.	IC- 334830	0.35	0.81	0.00	55.	IC- 335032	0.44	1.70	0.01
5.	IC- 334833	0.39	0.84	0.01	56.	IC- 335035	0.48	1.82	0.02*
6.	IC- 334834	0.36	0.68	0.00	57.	IC- 335041	0.42	2.13	0.03**
7.	IC- 334836	0.49	0.32	0.03**	58.	IC- 335043	0.36	1.12	0.00
8.	IC- 334837	0.37	0.79	0.00	59.	IC- 335045	0.39	1.58	0.02*
9.	IC- 334838	0.33	-0.61	0.01	60.	IC- 335048	0.35	1.68	0.01

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10.	IC- 334841	0.35	0.57	0.01	61.	IC- 335050	0.30	1.47	0.00
11.	IC- 334842	0.37	0.13	0.01	62.	IC- 335051	0.39	0.86	0.01
12.	IC- 334846	0.32	0.45	0.00	63.	IC- 335053	0.44	-0.44	0.00
13.	IC- 334848	0.37	0.48	0.00	64.	IC- 335056	0.46	2.06	0.05**
14.	IC- 334853	0.42	0.74	0.00	65.	IC- 335060	0.45	2.81*	0.05**
15.	IC- 334855	0.39	1.24	0.02*	66.	IC- 335062	0.44	2.23	0.05**
16.	IC- 334863	0.46	-0.54	0.00	67.	IC- 335068	0.62	5.03*	0.00
17	IC- 334864	0.38	1.66	0.01	68.	IC- 335069	0.48	0.26	0.05**
18.	IC- 334867	0.38	1.43	0.00	69.	IC- 335079	0.51	-1.48*	0.07**
19.	IC- 334869	0.46	1.79	0.00	70.	IC- 335082	0.42	1.43	0.00
20.	IC- 334871	0.42	0.63	0.00	71.	IC- 335086	0.33	1.15	0.01
21.	IC- 334872	0.44	-1.36*	0.00	72.	IC- 335089	0.44	0.69	0.00
22.	IC- 334876	0.40	0.79	0.02*	73.	IC- 335092	0.32	2.42*	0.00
23.	IC- 334877	0.40	1.43	0.01	74.	IC- 335094	0.39	1.75	0.01
24.	IC- 334879	0.33	-0.21	0.00	75.	IC- 335098	0.40	0.54	0.03**
25.	IC- 334880	0.39	0.27	0.00	76.	IC- 335103	0.42	0.54	0.00
26.	IC- 334881	0.44	-1.31*	0.03**	77.	IC- 335109	0.44	2.29*	0.05**
27.	IC- 334884	0.32	-0.02	0.01	78.	IC- 335110	0.53	-0.56	0.03**
28.	IC- 334889	0.55	1.24	0.01	79.	IC- 335111	0.42	0.19	0.00
29.	IC- 334904	0.46	0.57	0.03**	80.	IC- 335112	0.39	1.36	0.05**
30.	IC- 334915	0.33	1.46	0.00	81.	IC- 335115	0.36	1.72	0.03**
31.	IC- 334920	0.33	0.90	0.00	82.	IC- 335116	0.43	-1.04	0.05**
32.	IC- 334929	0.38	3.64*	0.03**	83.	IC- 335117	0.40	1.51	0.00
33.	IC- 334932	0.45	1.20	0.00	84.	IC- 335120	0.47	0.22	0.00
34.	IC- 334942	0.32	0.44	0.02	85.	IC- 335122	0.40	1.93	0.01
35.	IC- 334943	0.36	0.25	0.00	86.	IC- 335128	0.42	1.74	0.03**
36.	IC- 334944	0.41	0.13	0.00	87.	IC- 335131	0.55	-3.39*	0.06**
37.	IC- 334945	0.44	0.31	0.00	88.	IC- 335138	0.38	1.12	0.01
38.	IC- 334947	0.31	0.42	0.01	89.	IC- 335141	0.33	-0.37	0.01
39.	IC- 334949	0.45	0.61	0.00	90.	IC- 335144	0.52	2.93*	0.01
40.	IC- 334954	0.40	0.86	0.00	91.	IC- 335148	0.37	0.78	0.00
41.	IC- 334955	0.30	1.50	0.00	92.	IC- 335149	0.34	0.37	0.02*
42.	IC- 334957	0.43	1.00	0.01	93.	IC- 335152	0.30	1.82	0.00
43.	IC- 334973	0.46	2.32*	0.04**	94.	IC- 335156	0.46	0.68	0.02*
44.	IC- 334974	0.43	2.06	0.00	95.	IC- 335158	0.39	0.79	0.02*
45.	IC- 334989	0.29	0.97	0.01	96.	IC- 335164	0.30	0.55	0.00
46.	IC- 334996	0.28	1.86	0.00	97.	IC- 335169	0.38	0.72	0.02*
47.	IC- 334999	0.36	0.78	0.00	98.	IC- 335173	0.31	0.61	0.02*
48.	IC- 335000	0.29	0.57	0.00	99.	IC- 335178	0.37	2.52*	0.00
49.	IC- 335009	0.42	1.70	0.00	100.	IC- 335184	0.35	1.96	0.00
50.	IC- 335017	0.38	1.40	0.00	101.	African Tall	0.47	-0.22	0.00
51.	IC- 335024	0.33	2.08	0.01					

Significant at 5% level

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REFERENCES

[1]. DARE. 2019. Annual report, department of agricultural research and education, Ministry of griculture and cooperation, Government of India, New Delhi.

[2]. Eberhart, S. A. and W. A. Russell. 1966. Stability parameters for comparing varieties. Crop Sci., **6:** 36-40.

[3]. Srivas, S K & Singh U P. 2004. Genetic variability character association and path analysis of yield and its component traits in forage maize (Zea mays L) Range Mgmt Agroforestry **25** 149–153.

[4]. Vasal, S. K. and S. Taba. 1988. Conservation and utilization of maize genetic resources. In : Plant Genetic Resources – Indian Perspective (Eds. R. S. Paroda, R. K. Arora and K. P. S. Chandel) NBPGR, New Delhi, India.

[5]. Vavilov, N. I. 1951. Origin, variation, immunity and breeding of cultivated plants. Pp. 331- 342. In: Proc. Of VI Int. Congr. Genet.