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Stability Analysis for Number of Leaves Per Plant in Forage Maize (Zea Mays L.) Accessions Under Different Environmental Conditions

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Abstract: *Maize leaves can be used in various forms, including fresh, dried, or as a component of silage. Leaves are significant source of forage, providing essential nutrients and energy for livestock. Observation on various parameters contributing to fodder yield potential were recorded at 50% silking stage of the accessions. Stability parameters were computed as method suggested by Eberhart and Russell. A count of total number of leaves was taken from basal node to uppermost node. 69 accessions and African Tall showed absence of G x E interaction whereas three accession showing presence of linear and non-linear component. Accessions namely IC-335035, followed by IC-335041, IC-334876, IC-335053, IC-335032 and IC-334889 had their mean values more than population mean. African Tall had maximum number of leaves per plant (17.44) and suited to all type of environments. Among accessions, IC-335035 had maximum leaves/plant but not suited to all type of environments.*

Keywords: Forage maize, stability analysis, G x E interaction, number of leaves/plant.

I. INTRODUCTION

Maize is widely adopted in different environments. It is cultivated in tropics, sub-tropics and the temperate region of both the northern and the southern hemisphere. 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). Another important feature is that the crop can be grown successfully during summer where irrigation is available. In most of the developing countries maize is consumed directly as food. In India, over 80 percent of the maize production is used as food. Maize leaves are significant source of forage, providing essential nutrients and energy for livestock. They can be used in various forms, including fresh, dried, or as a component of silage. The digest ability of maize fodder is higher than sorghum, bajra and other non-leguminous forage crops. Leaves are carbon recycling factories of plant designed to capture solar radiation and convert carbon dioxide and water into food through photosynthesis. Maize leaves are split into two main sections: the leaf blade and the leaf sheath. The leaf blade is the broad flat portion that extends outward to capture solar radiation while the leaf sheath is the basal, tubular part that wraps tightly around the stalk. They are jointed by a hinge like auricle and ligule.

II. MATERIAL AND METHODS

In present study a core collection of forage maize (*Zea mays* L.) accessions were evaluated with a control variety African Tall. A count of total number of leaves was taken from basal node to uppermost node. The experiment was conducted at the Central Research farm of Indian Grassland and Fodder Research Institute, Jhansi during 2001 – 2003. Each entry was sown in randomized block design having three replications on well-prepared land with optimum moisture for germination. Observation on various parameters contributing to fodder yield potential were recorded at 50% silking stage

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of the accessions. Stability parameters were computed as method suggested by Eberhart and Russell (1966). The regression coefficient (bi) and mean square deviation from the linear regression (S^2di) were also estimated.

III. RESULT AND DISCUSSION

In case of number of leaves/plant, 69 accessions and African Tall showed absence of G x E interaction as these were having non-significant regression coefficient (bi) and mean square deviation (S^2di) values. In case of both parameters only three accessions were significant showing the presence of linear and non-linear component. Twenty three accessions had significant bi revealing the presence of linear portion of G x E interaction, whereas five accessions had significant non-linear component (S^2di).

Fifteen accessions had bi values > 1, out of which three accessions namely IC-334954, IC-334836 and IC-334894 were found to have mean values greater to the population mean indicating their suitability to favourable environments while 12 accession having bi values < 1, indicated their adaptability to unfavourable environments in which six accessions namely IC-335035, followed by IC-335041, IC-334876, IC-335053, IC-335032 and IC-334889 had their mean values more than population mean.

Remaining 73 accessions and African Tall were suitable for all kinds of environments as these were having bi value approaching unity, out of which 38 accessions and African Tall were found to have mean values greater to population mean and were suitable for general environments. African Tall had maximum number of leaves per plant (17.44) and suited to all type of environments. Among accessions, IC-335035 had maximum leaves/plant but not suited to all type of environments (13.63, bi = -0.77*). Minimum number of leaves/plant was recorded for IC-335086 (9.81, bi = 2.27*).

Estimation of stability parameters for number of leaves/plant.

S. No.	Acc. No.	Mean	bi	S^2di	S. No	Acc. No.	Mean	bi	S^2di
1.	IC- 334821	9.92	0.83	1.20	52.	IC- 335025	11.93	1.22	0.27
2.	IC- 334825	11.56	0.53	0.17	53.	IC- 335027	12.33	1.46	-0.22
3.	IC- 334826	11.37	1.80	0.47	54.	IC- 335028	12.22	1.43	0.54
4.	IC- 334830	13.04	1.16	1.18	55.	IC- 335032	12.89	-0.57*	1.43
5.	IC- 334833	13.00	1.28	0.16	56.	IC- 335035	13.63	-0.77*	-0.28
6.	IC- 334834	12.55	1.87	0.93	57.	IC- 335041	13.33	-0.50*	-0.25
7.	IC- 334836	12.55	2.94*	-0.23	58.	IC- 335043	11.15	1.60	-0.27
8.	IC- 334837	12.67	-0.13	0.01	59.	IC- 335045	11.15	1.29	-0.05
9.	IC- 334838	11.78	0.19	-0.01	60.	IC- 335048	11.81	1.26	-0.30
10.	IC- 334841	13.07	1.38	-0.27	61.	IC- 335050	11.74	1.73	0.11
11.	IC- 334842	13.33	1.14	-0.29	62.	IC- 335051	12.33	1.22	2.32
12.	IC- 334846	12.52	1.04	-0.30	63.	IC- 335053	12.93	-1.28*	1.57
13.	IC- 334848	12.33	0.09	2.69	64.	IC- 335056	10.81	1.06	0.15
14.	IC- 334853	12.44	2.16	-0.08	65.	IC- 335060	10.18	0.34	0.47
15.	IC- 334855	13.15	1.34	1.78	66.	IC- 335062	10.00	0.23	2.72
16.	IC- 334863	12.74	1.12	1.81	67.	IC- 335068	9.89	1.05	1.18
17	IC- 334864	13.37	1.67	2.23	68.	IC- 335069	10.11	-0.31*	-0.19
18.	IC- 334867	11.70	2.53*	0.34	69.	IC- 335079	11.04	0.81	0.53
19.	IC- 334869	12.52	1.00	5.1*	70.	IC- 335082	10.63	2.77*	2.61
20.	IC- 334871	12.63	1.19	-0.26	71.	IC- 335086	9.81	2.27*	-0.08
21.	IC- 334872	12.07	0.01	0.45	72.	IC- 335089	11.70	0.91	-0.12
22.	IC- 334876	13.22	-0.35*	-0.09	73.	IC- 335092	11.22	-1.47*	-0.28

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23.	IC- 334877	11.70	1.09	-0.30	74.	IC- 335094	11.19	0.60	0.55
24.	IC- 334879	12.41	0.49	0.95	75.	IC- 335098	11.41	-1.45*	0.03
25.	IC- 334880	12.78	0.76	1.16	76.	IC- 335103	11.67	3.67*	3.49*
26.	IC- 334881	12.44	1.38	3.16	77.	IC- 335109	11.44	2.61*	-0.24
27.	IC- 334884	12.26	2.50*	1.75	78.	IC- 335110	12.44	0.43	1.13
28.	IC- 334889	12.37	-1.20*	-0.30	79.	IC- 335111	12.16	0.73	-0.28
29.	IC- 334904	12.00	0.48	-0.24	80.	IC- 335112	11.52	1.40*	0.17*
30.	IC- 334915	12.48	1.54	0.29	81.	IC- 335115	11.26	-1.68*	-0.21
31.	IC- 334920	11.82	0.23	0.46	82.	IC- 335116	12.26	1.19	1.20
32.	IC- 334929	12.63	0.77	3.37*	83.	IC- 335117	11.52	2.64*	0.35
33.	IC- 334932	13.07	1.95	1.69	84.	IC- 335120	11.16	0.45	-0.06
34.	IC- 334942	13.15	0.41	-0.06	85.	IC- 335122	11.90	0.00	0.10
35.	IC- 334943	13.48	1.87	0.30	86.	IC- 335128	12.30	0.72	-0.30
36.	IC- 334944	11.41	1.63	1.24	87.	IC- 335131	12.33	0.82	-0.30
37.	IC- 334945	12.89	1.46	-0.10	88.	IC- 335138	11.63	0.57	-0.10
38.	IC- 334947	11.89	1.29	-0.17	89.	IC- 335141	10.63	0.05	-0.29
39.	IC- 334949	12.85	2.06	0.10	90.	IC- 335144	10.89	0.07	1.27
40.	IC- 334954	12.67	2.95*	-0.29	91.	IC- 335148	11.89	2.82	0.06
41.	IC- 334955	11.89	0.54	0.42	92.	IC- 335149	10.56	1.66	-0.13
42.	IC- 334957	11.78	0.67	-0.22	93.	IC- 335152	11.22	2.82*	0.06
43.	IC- 334973	11.45	0.84	-0.26	94.	IC- 335156	11.15	0.73	0.13
44.	IC- 334974	12.22	1.93	0.19	95.	IC- 335158	11.74	-0.95*	7.03**
45.	IC- 334989	11.48	0.97	0.15	96.	IC- 335164	11.15	1.54	0.55
46.	IC- 334996	10.55	2.94*	-0.23	97.	IC- 335169	10.85	0.99	4.39*
47.	IC- 334999	11.44	2.40*	2.94	98.	IC- 335173	10.90	1.23	0.14
48.	IC- 335000	11.74	1.17	-0.03	99.	IC- 335178	12.15	0.97	0.15
49.	IC- 335009	12.00	0.90	1.83	100.	IC- 335184	10.70	0.60	-0.29
50.	IC- 335017	12.15	0.41	-0.06	101.	African Tall	17.44	0.58	0.02
51.	IC- 335024	11.92	3.05*	-0.23					

Significant at 5% level

Srivas (2019) revealed that African Tall had above average leaf width while maximum leaf width was recorded in IC-334932 (10.32) followed by African Tall (10.21). IC-334932 (bi = 1.90) and African Tall (bi = -0.82*) showed above average and below average response, respectively. In terms of forage yield, leaf width can serve as a good alternative to improve forage quality as well as yield. Srivas and Rastogi (2019) reported that accession IC-334999 had maximum leaf blade length (99.00), which was suited to unfavorable environments due to its above average response and was stable. African Tall had maximum sheath length (20.53) followed by IC-334833, IC-334846 and IC-334871. All of these were stable for all kinds of environments. According to Srivas (2020) Fodder yield is not a unitary character but depends on the development of various plant characters with suitable environment. There is a significant positive correlation between plant height and other forage yielding traits in forage maize (Zea mays L.).

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