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Screening of Forage Maize (Zea Mays L.) Accessions on the Basis of Different Stability Parameters for Various Fodder Yielding Traits

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Abstract: *Nearly 95% accessions showed predictable behavior for Leaf blade length (cm)/ plant. For Sheath length (cm) 99% accessions showed predictable behavior while for Leaf width (cm) 100% accessions showed predictable behavior. In terms of forage yield, leaf width can serve as a good alternative to improve forage quality as well as yield. The present study helped to identify some accessions, which could be suitable for different kinds of environmental conditions. The selected accessions are likely to give predicted response for all the traits in a given environment.*

Keywords: Forage maize, stability analysis, leaf length, leaf width, sheath length.

I. INTRODUCTION

In India, maize is the third most important cereal crop after rice and wheat. It, often known as Indian corn, is used as both food and fodder. Most of the research work has been carried out in India and abroad on the grains aspect of maize crop. Hence, no attempts have been made so far in India for classifying genetic materials of forage maize. Although maize is being used since a long time as a dual-purpose crop, however, forage based collection, evaluation and documentation of maize germplasm has not been done as yet. Keeping in view importance of the crop and the meager availability of genetic information pertaining to the phenotypic stability in forage maize, the present investigation was conducted to identify the differential response of various accessions over different environments and to find out stable accessions.

II. MATERIAL AND METHODS

In present study a core collection of maize (*Zea mays* L.) accessions were evaluated with a control variety African Tall to study the nature and magnitude of stability for various fodder yielding traits. The experiments were conducted on same lines under three different environments.

This core collection was selected from the entire genetic diversity collected from the different parts/ eco-geographical location of the country. This genetic stock is being maintained at gene bank of Indian Grassland and Fodder Research Institute, Jhansi. Most of these genetic lines were initially explored and collected from the states of Rajasthan, Madhya Pradesh and Uttar Pradesh under NATP sub project on Sustainable Management of Plant diversity. A leading forage maize variety African Tall was also included in this study.

The experiment was conducted at the Central Research farm of Indian Grassland and Fodder Research Institute, Jhansi during 2001, 2002 and 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 of the accessions. A count of total number of leaves was taken from basal node to uppermost node. Leaf length was measured from the base to the tip of the leaf of seventh node of the main shoot while sheath length was measured from base attachment of leaf on node to the next node. Width of leaf was measured at the widest margin of the leaf lamina. Stability parameters were computed as method suggested by Eberhart

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and Russell (1966). The regression coefficient (bi) and mean square deviation from the linear regression (S ^{2}di) were also estimated.

Details of 101 maize accessions under study

S. No.	Accession No.	Area of collection		
		Village	District	State
1.	IC- 334821	Sawai Man	Jaipur	Rajasthan
2.	IC- 334825	Kheragardi	Rajsamand	Rajasthan
3.	IC- 334826	Kheragardi	Rajsamand	Rajasthan
4.	IC- 334830	Pitampura	Rajsamand	Rajasthan
5.	IC- 334833	Pitampura	Rajsamand	Rajasthan
6.	IC- 334834	Pitampura	Rajsamand	Rajasthan
7.	IC- 334836	Miarei	Rajsamand	Rajasthan
8.	IC- 334837	Miarei	Rajsamand	Rajasthan
9.	IC- 334838	Miarei	Rajsamand	Rajasthan
10.	IC- 334841	Miarei	Rajsamand	Rajasthan
11.	IC- 334842	Pritia	Rajsamand	Rajasthan
12.	IC- 334846	Pritia	Rajsamand	Rajasthan
13.	IC- 334848	Pritia	Rajsamand	Rajasthan
14.	IC- 334853	Kavita	Rajsamand	Rajasthan
15.	IC- 334855	Darwaza	Udaipur	Rajasthan
16.	IC- 334863	Simta	Udaipur	Rajasthan
17	IC- 334864	Galahoton ka Guda	Udaipur	Rajasthan
18.	IC- 334867	Galahoton ka Guda	Udaipur	Rajasthan
19.	IC- 334869	Bakeria	Sirohi	Rajasthan
20.	IC- 334871	Oria	Sirohi	Rajasthan
21.	IC- 334872	Oria	Sirohi	Rajasthan
22.	IC- 334876	Oria	Sirohi	Rajasthan
23.	IC- 334877	Oria	Sirohi	Rajasthan
24.	IC- 334879	Barajar	Sirohi	Rajasthan
25.	IC- 334880	Barajar	Sirohi	Rajasthan
26.	IC- 334881	Barajar	Sirohi	Rajasthan
27.	IC- 334884	Barajar	Sirohi	Rajasthan
28.	IC- 334889	Rajgarh	Dungarpur	Rajasthan
29.	IC- 334904	Barwat	Banswara	Rajasthan
30.	IC- 334915	Chotti Sukhan	Banswara	Rajasthan
31.	IC- 334920	Charawra Gait	Ratlam	Rajasthan
32.	IC- 334929	Shragaingarh	Ratlam	Rajasthan
33.	IC- 334932	Shragaingarh	Ratlam	Rajasthan
34.	IC- 334942	Majarpur	Ujjain	Madhya Pradesh
35.	IC- 334943	Majarpur	Ujjain	Madhya Pradesh
36.	IC- 334944	Majarpur	Ujjain	Madhya Pradesh
37.	IC- 334945	Majarpur	Ujjain	Madhya Pradesh
38.	IC- 334947	Mopakher	Sajapur	Madhya Pradesh
39.	IC- 334949	Mopakher	Sajapur	Madhya Pradesh
40.	IC- 334954	Borda	Jhalawar	Rajasthan
41.	IC- 334955	Borda	Garhi	Rajasthan
42.	IC- 334957	Sakaria	Garhi	Rajasthan

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43.	IC- 334973	Salempur	Kannauj	Uttar Pradesh
44.	IC- 334974	Salempur	Kannauj	Uttar Pradesh
45.	IC- 334989	Sarai Sunder	Kannauj	Uttar Pradesh
46.	IC- 334996	Ruppur	Kannauj	Uttar Pradesh
47.	IC- 334999	Ruppur	Kannauj	Uttar Pradesh
49.	IC- 335009	Pattikhud	Farrukhabad	Uttar Pradesh
50.	IC- 335017	Dhirpur	Farrukhabad	Uttar Pradesh
51.	IC- 335024	Kureli	Farrukhabad	Uttar Pradesh
52.	IC- 335025	Kureli	Farrukhabad	Uttar Pradesh
53.	IC- 335027	Kureli	Farrukhabad	Uttar Pradesh
54.	IC- 335028	Kureli	Farrukhabad	Uttar Pradesh
55.	IC- 335032	Allawalpur	Farrukhabad	Uttar Pradesh
56.	IC- 335035	Allawalpur	Farrukhabad	Uttar Pradesh
57.	IC- 335041	Nagla Simi	Farrukhabad	Uttar Pradesh
58.	IC- 335043	Nagla Simi	Farrukhabad	Uttar Pradesh
59.	IC- 335045	Nagla Simi	Farrukhabad	Uttar Pradesh
60.	IC- 335048	Nagla Simi	Farrukhabad	Uttar Pradesh
61.	IC- 335050	Nagla Simi	Farrukhabad	Uttar Pradesh
62.	IC- 335051	Nagla Simi	Farrukhabad	Uttar Pradesh
63.	IC- 335053	Ahirwa	Hardoi	Uttar Pradesh
64.	IC- 335056	Ahirwa	Hardoi	Uttar Pradesh
65.	IC- 335060	Ahirwa	Hardoi	Uttar Pradesh
66.	IC- 335062	Ahirwa	Hardoi	Uttar Pradesh
67.	IC- 335068	Bhanayal	Hardoi	Uttar Pradesh
68.	IC- 335069	Banekeuya	Hardoi	Uttar Pradesh
69.	IC- 335079	Gaushganj	Hardoi	Uttar Pradesh
70.	IC- 335082	Gaushganj	Hardoi	Uttar Pradesh
71.	IC- 335086	Kethipurwa	Hardoi	Uttar Pradesh
72.	IC- 335089	Baghoura	Hardoi	Uttar Pradesh
73.	IC- 335092	Baghoura	Hardoi	Uttar Pradesh
74.	IC- 335094	Baghoura	Hardoi	Uttar Pradesh
75.	IC- 335098	Bisenpur	Kannauj	Uttar Pradesh
76.	IC- 335103	Kalsan	Kannauj	Uttar Pradesh
77.	IC- 335109	Kalsan	Kannauj	Uttar Pradesh
78.	IC- 335110	Kalsan	Kannauj	Uttar Pradesh
79.	IC- 335111	Kalsan	Kannauj	Uttar Pradesh
80.	IC- 335112	Kalsan	Kannauj	Uttar Pradesh
81.	IC- 335115	Bisenpur	Kannauj	Uttar Pradesh
82.	IC- 335116	Bisenpur	Kannauj	Uttar Pradesh
83.	IC- 335117	Budia	Kannauj	Uttar Pradesh
84.	IC- 335120	Budia	Kannauj	Uttar Pradesh
85.	IC- 335122	Budia	Kannauj	Uttar Pradesh
86.	IC- 335128	Budia	Kannauj	Uttar Pradesh
87.	IC- 335131	Ratanpurva	Kannauj	Uttar Pradesh
88.	IC- 335138	Ratanpurva	Kannauj	Uttar Pradesh
89.	IC- 335141	Ratanpurva	Kannauj	Uttar Pradesh
90.	IC- 335144	Bharin	Kannauj	Uttar Pradesh

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91.	IC- 335148	Bharin	Kannauj	Uttar Pradesh
92.	IC- 335149	Bharin	Kannauj	Uttar Pradesh
93.	IC- 335152	Bharin	Kannauj	Uttar Pradesh
94.	IC- 335156	Ashkaranpur	Kannauj	Uttar Pradesh
95.	IC- 335158	Ashkaranpur	Kannauj	Uttar Pradesh
96.	IC- 335164	Malhapur	Kanpur	Uttar Pradesh
97.	IC- 335169	Malhapur	Kanpur	Uttar Pradesh
98.	IC- 335173	Mithua	Kanpur	Uttar Pradesh
99.	IC- 335178	Mithua	Kanpur	Uttar Pradesh
100.	IC- 335184	Rajapur	Kanpur	Uttar Pradesh
101.	African Tall	-	-	-

III. RESULT AND DISCUSSION

Results showed significant difference amongst accessions for all traits. The environment (linear) and pooled deviation were significant for all fodder yield characters and genotype x environment (linear) were also significant for all traits except leaf blade length.

In the study of many workers, it has been revealed that even for the unpredictable characters, prediction can still be made when one considers stability parameters of individual accession. Based on this study the performance of majority of accessions was predictable for all fodder traits. The discrepancy might be due to the differential testing procedures in the analysis. However, Leaf blade length (cm)/ plant exhibited unpredictable behavior for some accessions. Nearly 95% accessions showed predictable behavior for Leaf blade length (cm)/ plant. For Sheath length (cm) 99% accessions showed predictable behavior while for Leaf width (cm) 100% accessions showed predictable behavior. The present study helped to identify some accessions, which could be suitable for different kinds of environmental conditions. The selected accessions are likely to give predicted response for all the three traits in a given environment.

Distribution of different accessions on the basis of different stability parameters for various fodder yielding traits in maize.

Sr. No.	Characters	Predictable		Unpredictable	
		Both bi & $S^{-2}di$ non- significant	Only bi significant	Both bi & $S^{-2}di$ significant	Only $S^{-2}di$ significant
2.	Leaf blade length (cm)	64	31+ African Tall	3	2
3.	Sheath length (cm)	64+ African Tall	35	0	1
4.	Leaf width (cm)	50	51+ African Tall	0	0

Srivas (2019) concluded 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. Singh *et al.* (2020) evaluated fodder productivity, silage quality and nutrients uptake potential in maize cultivar and found African Tall were most suitable for silage making.

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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