

Screening of Ideal Forage Maize (*Zea Mays* L.) Accessions for Plant Height and Number of Leaves Per Plant

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Abstract: In present study one hundred forage 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. Observation on various parameters contributing to fodder yield potential were recorded at 50% silking stage of the accession. Plant height was measured from the base to the tip of main shoot. A count of total number of leaves was taken from basal node to the uppermost node. The accessions were grouped on the basis of three stability parameters like mean ($\bar{x}$), regression coefficient (b_i) and mean square deviation (S^2_{di}). Result revealed that maximum number of accessions were found predictable and stable for both characters, indicating that plant height and number of leaves per plant are more stable characters in forage maize. African tall was stable for both characters confirming its wide adaptability.

Keywords: Forage Maize, Stability Analysis, Plant Height and number of leaves per plant.

I. INTRODUCTION

Maize (*Zea mays* L.) is one of the world's most important cereal crop and serves as a staple food for both human and animal populations. Livestock is major contributor of the agriculture GDP of India and livestock sector depend on good quality of fodder that is the main feed for ruminants productivity. Forage crops are generally grown as per specific needs under diverse ecological conditions and the management systems.

Maize (*Zea mays* L.) is widely grown throughout the world today. Wilkes and Goodman, (1996) characterize maize as having "a passport without a birth certificate" because its parentage is still shrouded in mystery. It is now fairly understood that different varieties of crops vary greatly in their response to a wide range of environments and that the stability in production is the property of a specific genotype. This was demonstrated by Paxman (1956) in *Nicotiana rustica*, Finlay and Wilkinson (1963) in barley and Eberhart and Russell (1966) in 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.

II. MATERIAL AND METHODS

In present study one hundred 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 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 and **National Bureau of Plant Genetic Resources, New Delhi (NBPGR)** for long term storage. 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.

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 accession. A count of total number of leaves was taken from basal node to the uppermost node. Plant height was measured from the base to the tip of the plant of main shoot. 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^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
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	Baghaura	Hardoi	Uttar Pradesh
73.	IC- 335092	Baghaura	Hardoi	Uttar Pradesh
74.	IC- 335094	Baghaura	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
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

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 both traits. The discrepancy might be due to the differential testing procedures in the analysis.

The accessions were grouped on the basis of three stability parameters like mean ($\bar{x}$), regression coefficient (b_i) and mean square deviation (S^2_{di}). Out of one hundred accessions, none of the accession was found to be stable for all the characters studied. Hence a comparative statement for stability parameters was made to sort out the promising high yielding stable accessions with respect to fodder yield trait.

Sr. No.	Characters	Predictable		Unpredictable	
		Both b_i & S^2_{di} non- significant	Only b_i significant	Both b_i & S^2_{di} significant	Only S^2_{di} significant
1.	Plant height (cm)	71+African Tall	23	1	5
2.	No. of leaves/ plant	69+African Tall	23	3	5

For plant height (cm), out of 100 accessions 71 accessions and African tall were found stable with both b_i and S^2_{di} non- significant. This indicates their predictable performance across environments with average adaptability and is most desirable. 23 accessions showed predictable performance with only b_i significant. These are responsive accessions. If b_i more than one then they are suitable for favorable environments, if b_i less than one for poor

environments. One accession with both bi and S^2di significant and 5 accessions with only S^2di significant. These show unpredictable response and are not stable.

For number of leaves per plant 70 accessions including African tall were stable with both bi and S^2di non-significant, showing average stability and predictable performance across environments. Twenty three accessions were predictable with only bi significant indicating environment specific adaptability. Three accessions with both bi and S^2di significant and 5 accessions with only S^2di significant. These have high $G \times E$ interaction and cannot be predicted reliably. 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 (2020) revealed that African tall had maximum plant height followed by IC-334855 (233.19 cm), whereas IC-335060 showed minimum plant height and stability for all kinds of environments. Srivas (2021) reported that 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. Cross and Zuber (1973) evaluated ten strains of maize for interrelationship among plant height, number of leaves and flowering dates found significant correlation between plant height and number of leaves in majority of strains. Kumar (1982) studied genetic variability of quantitative characters contributing to forage yield in maize and reported that forage yield was highly correlated with leaf number and plant height similar results was also reported by Katiyar and Choudhary (1999).

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 plant height and number of leaves / plant in a given environment. 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 plant height and number of leaves per plant in a given environment.

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