

Stability Analysis for Days to 50% Silking Stage in Forage Maize (*Zea Mays L.*) Accessions

Sanjeev Kumar Srivas

Assistant Professor, Department of Botany,
Government Degree College Nadhabhood (Sahaswan), Budaun, UP, India
sanjeev_srivas@yahoo.com

Abstract: *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. One hundred and one forage maize accessions including African Tall were evaluated at central research farm of Indian Grassland and Fodder research Institute, Jhansi in a RBD design with three replications during the kharif, 2001, 2002 and 2003. The observations were recorded on various yield and yield contributing traits at 50% silking stage of the crop. Stability parameters for day to 50% silking stage showing both b_i and S^2_{di} values were non-significant in 72 accessions and African Tall revealing the absence of $G \times E$ interaction. Above average 50% silking were found in African Tall (59) followed by IC-334833 (55), IC-334853 (54) which are stable to late 50% silking and early accessions for this trait were IC-335056 (43), IC-334973 (43.22), IC-334996 (43.33) and IC-335000 (43.78). Hence, in forage maize, 50% silking (tasseling/flowering stage) generally occurs in 43- 59 days after sowing. The peak 50% silking stage is typically recommended for harvesting forage maize to balance nutrient quality.*

Keywords: *genetic materials*

I. INTRODUCTION

Maize is not only a staple food for many communities but also serves as feed for livestock. Forage maize is quick growing, sweet palatable, high yielding, nutritious and free from toxicants and can be safely fed to animals at any stage of crop growth (Devi, 2002). It is utilized in the form of grains, green fodder, silage, Stover and pasturage. Green fodder provides adequate energy and proteins for growth of animals and milk production (Takawale et al., 2009). The total cropped area under cultivated forages in India is nearly 4.5 % (DARE, 2019). Sorghum, maize, pearl millet, and cowpea are common kharif fodder crop. 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.

II. MATERIAL AND METHODS

One hundred and one forage maize accessions including African Tall were evaluated at central research farm of Indian Grassland and Fodder research Institute, Jhansi in a RBD design with three replications during the kharif, 2001, 2002 and 2003. The observations were recorded on various yield and yield contributing traits at 50% silking stage of the crop. This core collection of 101 forage maize accessions were selected from the entire genetic diversity collected from different geographical regions of India. This genetic stock is being maintained at gene bank of Indian Grassland and Fodder Research Institute (IGFRI), 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 on forage crops". Stability analysis for days to 50% silking was computed as method suggested by Eberhart and Russell (1966). The regression coefficient (b_i) and mean square deviation from the linear regression (S^2_{di}) were also estimated.

III. RESULT AND DISCUSSION

Both b_i and S^2_{di} values were non-significant for days to 50% silking in 72 accessions and African Tall revealing the absence of G x E interaction. Only three accessions had both b_i and S^2_{di} significant, indicating the presence of linear and non-linear components of G x E interactions. Nine accessions had significant b_i with non-significant S^2_{di} indicating the presence of linear components of G x E interaction. On the other hand 16 accessions had non-linear component of G x E interaction as they had significant S^2_{di} with non-significant b_i value.

Twelve accessions had > 1 b_i values indicating their stability to favourable environments. All these accessions were late in 50% silking as they showed their mean more than population mean. No accessions were found with less than unity regression coefficient but 88 accessions and African Tall were suitable to all kinds of environments as these were having b_i values approaching unity, out of which 62 accessions were early in days to 50% silking. 94 accessions had average days to 50% silking while above average 50% silking were found in African Tall (59) followed by IC-334833 (55), IC-334853 (54) which are stable to late 50% silking and early accessions for this trait were IC-335056 (43), IC-334973 (43.22), IC-334996 (43.33) and IC-335000 (43.78).

Days to 50% silking stage is a critical quantitative parameter for forage maize. 50% silking (tasseling/ flowering stage) generally occurs in 43- 60 days after sowing. The peak 50% silking stage is typically recommended for harvesting forage maize to balance nutrient quality. Srivas & Singh (2004) concluded that the 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. Srivas (2020) concluded that forage maize does not have problems of hydrocyanic acid and therefore it can be used even before in flowering or in dry weather. Fodder yield is not a unitary character but depends on the development of various plant characters with suitable environment. Nirala and Jha (2003) studied the phenotypic stability for fodder traits in maize and reported highly significant mean squares due to genotypes and environments (linear) for all the traits under study indicating the presence of significant difference among genotypes and environments.

Table- Estimation of stability parameters for days to 50% silking.

S. No.	Acc. No.	Mean	b_i	S^2_{di}	S. No.	Acc. No.	Mean	b_i	S^2_{di}
1.	IC- 334821	45.00	0.72	25.94*	52.	IC- 335025	47.67	0.89	-1.77
2.	IC- 334825	45.67	0.71	9.62	53.	IC- 335027	52.33	-0.06	-1.79
3.	IC- 334826	45.00	0.59	17.12	54.	IC- 335028	46.56	0.94	-0.37
4.	IC- 334830	50.33	1.61*	40.01**	55.	IC- 335032	46.56	0.93	-1.82
5.	IC- 334833	55.22	0.70	61.02**	56.	IC- 335035	50.33	0.84	9.44
6.	IC- 334834	52.78	1.33	10.97	57.	IC- 335041	46.00	0.63	-1.49
7.	IC- 334836	52.89	1.16	10.72	58.	IC- 335043	45.11	1.12	18.22
8.	IC- 334837	52.22	1.66*	23.81*	59.	IC- 335045	46.67	1.11	41.78**
9.	IC- 334838	52.67	2.01*	12.00	60.	IC- 335048	47.22	1.24	-1.61
10.	IC- 334841	50.33	1.93*	50.62**	61.	IC- 335050	47.00	1.13	4.88
11.	IC- 334842	51.67	1.51	1.14	62.	IC- 335051	46.67	1.19	1.76
12.	IC- 334846	51.56	1.23	9.19	63.	IC- 335053	48.67	1.52	174.75**
13.	IC- 334848	51.33	1.04	54.83**	64.	IC- 335056	43.00	0.69	1.37
14.	IC- 334853	54.33	1.42	49.09**	65.	IC- 335060	46.22	0.00	10.67
15.	IC- 334855	51.11	1.65*	9.79	66.	IC- 335062	44.33	0.84	6.50
16.	IC- 334863	53.78	1.19	51.79**	67.	IC- 335068	44.00	0.82	-0.03
17.	IC- 334864	49.11	1.42	1.47	68.	IC- 335069	46.11	0.91	-1.59
18.	IC- 334867	52.11	1.84*	15.44	69.	IC- 335079	46.00	1.03	10.79
19.	IC- 334869	50.78	1.39	16.65	70.	IC- 335082	48.22	1.24	-0.92
20.	IC- 334871	51.78	1.15	6.18	71.	IC- 335086	44.11	0.42	7.02
21.	IC- 334872	51.22	1.80*	8.43	72.	IC- 335089	45.78	0.66	2.08

22.	IC- 334876	49.89	1.05	2.58	73.	IC- 335092	45.00	0.79	23.38*
23.	IC- 334877	51.89	1.22	20.59*	74.	IC- 335094	44.89	0.75	4.08
24.	IC- 334879	51.44	1.98*	1.49	75.	IC- 335098	45.78	1.11	2.66
25.	IC- 334880	50.67	1.82*	7.00	76.	IC- 335103	47.89	0.48	-1.74
26.	IC- 334881	50.56	1.73*	17.26	77.	IC- 335109	45.22	0.94	1.00
27.	IC- 334884	51.22	1.04	14.07	78.	IC- 335110	45.11	0.60	-0.19
28.	IC- 334889	45.22	0.88	9.38	79.	IC- 335111	44.33	0.38	-1.85
29.	IC- 334904	51.44	0.47	-1.71	80.	IC- 335112	46.11	1.19	24.92*
30.	IC- 334915	44.22	-0.09	-1.64	81.	IC- 335115	45.22	0.95	14.51
31.	IC- 334920	44.67	0.61	26.40*	82.	IC- 335116	45.56	0.83	33.63*
32.	IC- 334929	47.67	0.71	2.04	83.	IC- 335117	45.78	0.80	12.90
33.	IC- 334932	50.56	1.30	5.06	84.	IC- 335120	47.22	0.94	2.81
34.	IC- 334942	52.67	1.63*	5.44	85.	IC- 335122	45.00	0.97	20.68*
35.	IC- 334943	52.44	1.53	2.03	86.	IC- 335128	47.78	0.94	30.62*
36.	IC- 334944	50.33	1.07	-1.64	87.	IC- 335131	46.11	0.92	1.87
37.	IC- 334945	52.89	1.81*	3.27	88.	IC- 335138	47.33	0.77	1.12
38.	IC- 334947	44.89	0.82	7.94	89.	IC- 335141	45.56	1.02	25.29*
39.	IC- 334949	50.56	1.38	-1.68	90.	IC- 335144	48.00	1.07	-1.64
40.	IC- 334954	50.78	1.16	-0.95	91.	IC- 335148	46.56	0.83	33.63*
41.	IC- 334955	45.22	0.82	7.94	92.	IC- 335149	47.44	1.35	-0.35
42.	IC- 334957	48.44	0.97	-1.81	93.	IC- 335152	45.00	0.83	0.32
43.	IC- 334973	43.22	0.30	1.47	94.	IC- 335156	47.33	0.69	-1.13
44.	IC- 334974	47.22	0.83	18.78	95.	IC- 335158	46.11	1.11	0.88
45.	IC- 334989	44.89	1.06	-1.34	96.	IC- 335164	46.11	0.47	-0.12
46.	IC- 334996	45.56	0.68	1.18	97.	IC- 335169	45.44	0.92	3.91
47.	IC- 334999	43.33	0.42	14.94	98.	IC- 335173	46.00	0.96	6.34
48.	IC- 335000	43.78	0.67	9.68	99.	IC- 335178	46.33	0.96	0.25
49.	IC- 335009	45.67	0.52	5.55	100.	IC- 335184	44.67	0.71	4.12
50.	IC- 335017	46.78	1.05	9.14	101.	African Tall	59.22	0.04	0.17
51.	IC- 335024	47.33	1.08	0.17					

Significant at 5% level.

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