

PRELIMINARY EVALUATION OF LOCAL MAIZE GERMPLASM FROM U.P. HILLS

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Maize (*Zea mays* L.) has adapted itself to an array of environments from tropics to temperate regions of both the northern and southern hemispheres. Being a cross pollinated crop, it permits free flow of genes beyond political boundaries to evolve new genetic recombinants which has enhanced its adaptability (Vasal and Taba 1987). However, poor genetic diversity among the local germplasm has been reported from the plain areas in India (Rachie, 1962). Contrary to this, the higher elevations of north-eastern hills of India, Nepal, Bhutan and Indonesia are endowed with rich genetic diversity in maize (Singh, 1979). Although occurrence of substantial variability has been documented from Chamba valley of Himachal Pradesh (Khehra et al. 1979), no systematic attempts have so far been reported with respect to variability studies in the indigenous wealth of maize crop from U.P. hills. In this context, local germplasm collected from eight districts of U.P. hills was evaluated, to study the extent of variability and genetic diversity to breed better varieties for the hills.

Systematic attempts for the collection of local germplasm of maize from U.P. hills (Kumaon and Garhwal Himalayas) were made in the recent past. The area surveyed included eight districts, viz. Almora (19), Nainital (7), Pithoragarh (22), Pauri Garhwal (6), Tehri Garhwal (15), Chamoli (5), Uttarkashi (4) and Dehra Dun (2). The seed samples were collected from the bulk of seed material, instead of individual ears, in order to pool extent of variability within and between populations. Seventy five local collections were evaluated in 4 rows plot each of 5 m length at experimental farm Hawalbagh, Vivekananda Parvatiya Krishi Anusandhan Shala, Almora. Bulk sib pollinations were performed for the maintenance of these collections. The observations on days to 75 per cent silk, *Helminthosporium turcicum*, *Helminthosporium maydis* leaf blight

incidence, grain colour and texture, plant, ear and husk cover traits were recorded on plot basis while the data on plant height, ear height, ear girth, ear length characters were recorded on 10 randomly selected plants in each plot.

It was observed that on the basis of variation in 75 per cent days to silk, these accessions can be grouped into 4 distinct maturity classes namely late, medium, early and very-early. In the very early maturity group, the silking duration varied from 40-42 days, while the early, medium and late maturity collections took 49-53, 60-62 and 64-67 days to 75 per cent silk respectively. Most of the collections belonged either to early maturity (41%) or very early groups (26%), whereas 26% collections were medium in maturity and only 5% were late maturing types. The range of variability in the maturity duration thus suggested farmers preference for shorter maturity group in the U.P. hills. The range and mean of 75 genotypes for 10 characters, under four maturity groups (Table 1) showed that plant height varied from 152-288

Table 1. Means and ranges for different characters under 4 maturity groups

Sl. No.	Character	Late	Medium	Early	Very early
1.	Days to silk (75%)	65.0 (64.67)	60.9 (57-63)	51.2 (48-55)	43.3 (38-47)
2.	Plant height (cm.)	233 (204-288)	237 (191-277)	205 (154-237)	181 (152-232)
3.	Ear height (cm.)	132 (99-207)	135 (77-181)	106 (74-136)	81 (45-128)
4.	Ear length (cm.)	171.1 (15.4-18.4)	15.5 (13.2-17.0)	13.4 (11.2-14.8)	12.7 (9.0-15.2)
5.	Ear girth (cm.)	13.6 (13.2-14.0)	13.0 (11.4-14.2)	12.4 (10.6-15.5)	12.1 (9.0-14.4)
6.	<i>H. turcicum</i> * (1-5)	2.4 (2.0-2.5)	2.1 (1.5-2.8)	2.7 (1.8-2.5)	2.8 (2.3-4.5)
7.	<i>H. maydis</i> * (1-5)	2.1 (2.0-2.5)	2.0 (1.5-2.5)	2.1 (1.5-2.8)	2.0 (1.5-3.0)
8.	Plant aspect** (1-5)	2.5 (2.5-2.8)	2.5 (2.3-3.0)	3.1 (2.0-4.0)	3.1 (2.8-4.8)
9.	Ear aspect** (1-5)	2.5 (2.5-2.5)	2.5 (2.0-2.8)	2.3 (2.3-2.5)	2.7 (2.7-3.5)
10.	Husk cover** (1-5)	2.3 (2.3-2.3)	2.4 (2.3-2.8)	2.6 (2.5-3.0)	2.7 (2.5-3.3)

*1 Resistant, 5 Highly susceptible

**1 best, 2 poor

cm. in the collections with an average height of 181, 205, 237 and 233 cm in very early, early, medium and late maturity groups, respectively. The average ear height in the very-early maturity group was 81 cm with a range of 45-128cm. As compared to very early group the average ear height in early, medium and late groups were 106, 135 and 132 cm respectively. The variation with respect to ear length varied from 11-14, 13-15, 14-16 and 15-18 cm in the very-early, early, medium and late maturity groups, respectively. From the data on plant height, ear height and ear length in four maturity groups it appeared that these characters had negative association with the early maturity duration.

In general, the local collections showed susceptibility to *H. turcicum*. However, moderate incidence was recorded in some collections in late, medium and early maturity groups. On the other hand most of the varieties recorded moderate scores ranging from 2.0-2.3, indicating tolerance to *H. maydis*.

As regards to plant, ear and husk cover traits the medium and late type collections were better compared to the remaining maturity groups. Hence, late and medium collections indicated better yielding ability than early and very early collections. With regards to grain colour, the yellow and orange colours were observed to be dominant among the local germplasm followed by yellow-white mixed grain colour (Table 2). The frequency of the colours revealed that by and large yellow and orange grain colours are liked by the hill farmers, however, uniformity in grain colour was not important in many pockets. Further, observation on grain texture showed farmers liking for the flint grains as dint grains were absent among the collections.

Table 2. Classification of local germplasm by grain colour and texture in different maturity groups

Maturity groups	Single coloured			Mixed coloured			Total
	YF	OF	WF	RF	YWF	OWF	
Late maturity	1	1	-	-	2	-	4
Medium maturity	5	2	7	1	5	-	20
early maturity	6	6	2	-	4	2	20
Very early maturity	9	7	1	1	11	2	31
Total	21	16	10	2	22	4	75

YF = Yellow flint, OF = Orange flint, WF = White flint, PF = Purple flint

YWF = Yellow white flint, OWF = Orange white flint.

The present study indicated that the extent of variability was not large for all characters. Nevertheless, the desirable variability available for earliness, shorter plant height, and attractive grain type are of immense breeding value.

Some of the impressive collections can be used in the breeding programme for developing highly adapted early hybrids and composites for higher maize production in the hill region.

REFERENCES

- Khehra A.S., V.V. Malhotra B.S. Dhillon and V.K. Saxena. 1979. Evaluation and exploitation of local germplasm of Maize (*Zea mays* L.). *Crop. Improv.* 1 : 36-42.
- Rachie K.O. 1962. Report on the systematic collection of sorghum, millets and maize in India. Rockefeller Foundation, New Delhi.
- Singh B. 1979. Evaluation of primitive cultivars from north eastern Himalayan region in relation to lineages. *Indian J. Genet.* 37 : 103-113.
- Vasal S.K. and S. Taba. 1987. Conservation and utilization of Maize genetic resources. In: Plant Genetic Resources. R.S. Paroda, R.K. Arora and K.P.S. Chandel (Eds.) N.B.P.C.R., New Delhi p 91-107.