International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 01-06-2021, Accepted: 16-06-2021, Published: 01-07-2021
Volume 6, Issue 4, 2021, Page No. 05-08

DUS characterization of local maize landraces of Kashmir Valley

Latif Ahmad Peer[1], Zahoor A Dar[2], Aijaz A Lone[2], Mohd Yaqub Bhat[1]
[1] Department of Botany, University of Kashmir, Srinagar, Jammu and Kashmir, India
[2] Dryland Agriculture Research Station, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Jammu and Kashmir, India

Abstract
Using DUS characters, morphological characterization of 70 local maize landraces collected from different parts of Kashmir Valley was done at DARS- Budgam, SKUAST-K. Thirty-one Argo-morphological characters were assessed, recorded and a wide range of variability for each trait was studied following standards laid in national DUS test guidelines. The frequency distribution of all the studied characters was also computed.

Keywords: DUS, maize landraces, characterization

Introduction
Maize (*Zea mays* L.), an important cereal crop, is cultivated at lower and higher altitudes in Kashmir Valley. Maize landraces comprise heterogeneous and genetically diverse populations usually used by farmers because of their needs and adaptation to local environments (Prasanna and Sharma, 2005) [3]. Representing the extra-ordinary genetic resource of the crop and possessing the substantial allelic diversity, landraces help in gene pool improvement that can lead to harnessing of advantageous alleles and genes to cope up with challenges like climate change and attaining other purposes of breeding programmes (Oppong et al., 2014) [2], and much of such diversity still needs its incorporation into improved varieties (Sharma et al., 2010) [4]. For registration, protection, and patenting of plant variety, morphological trait characterization enables identification and distinctiveness of each variety and allows breeders to select accessions exhibiting desirable traits (Camussi et al., 1983) [1]. Lack of morphological description of local maize landraces of Kashmir for variety identification impacts the quality seed production, so such characterization becomes necessary. DUS testing, performed under UPOV guidelines, establishes varietal uniqueness and unravels the distinctiveness, uniformity and stability of inbred lines and thus provides a way to compare NARS identified materials with materials belonging to other sources (Yadav and Singh, 2010) [5]. As germplasm characterization acts as a prerequisite for agronomic trait selection, evaluation and morphological characterization of seventy local maize landraces of Kashmir using 31 agronomic characters were carried out in the present study to identify the uniqueness of the landraces.

Material and Methods
The plant material in the present study comprised 70 local maize landraces collected from different areas of Kashmir valley and were designated from K-L1 to K-L70. A randomized complete block design was used for sowing the seed with three replications at DARS-SKUAST-K with geo-coordinates as 74.83^{0}E longitude, 34.08^{0}N latitude, and 1587m above MSL altitude during Kharif, 2019. Spacing maintained was 20cm as the plant to plant, and 70cm as the row to row, while specific agronomic practices were used to manage the ideal crop growth. Thirty-one agronomic characters were used to characterize the landraces using national DUS test guidelines, DMR, 2015 and their expression was recorded as:

1. Leaf: angle between blade and stem, whether small or wide.
2. Leaf attitude of blade, whether straight or drooping.
3. Anthocyanin colouration of brace roots, whether absent or present.
4. Time of anthesis, whether very early or early or medium or late.
5. Anthocyanin colouration of base of glumes, whether absent or present.
6. Anthocyanin colouration of glumes excluding base, whether absent or present.
7. Anthocyanin colouration of anthers, whether absent or present.
8. Density of spikelets, whether sparse or dense.
9. Angle between main axis and lateral branches, whether narrow or wide.
10. Tassel attitude of lateral branches, whether straight or curved or strongly curved.
11. Time of silk emergence whether very early or early or medium or late.
12. Anthocyanin colouration of silks, whether absent or present.
13. Anthocyanin colouration of sheath, whether absent or present
14. Tassel length of main axis above lowest side branch, whether short or medium or long.
15. Plant length, whether short or medium or long or very long
16. Ear placement, whether low or medium or high
17. Width of leaf blade, whether narrow or medium or broad.
18. Ear length without husk, whether short or medium or long
19. Ear diameter, whether small or medium or large

20. Ear shape, whether conical or conico-cylindrical or cylindrical.
21. Number of rows of grain, whether few or medium or many
22. Type of grain, whether flint or semi flint/semi dent or dent
23. Colour of top of grain, whether white or white with cap or yellow or yellow with cap or orange or red or other.
24. Anthocyanin colouration of glumes of cob, whether white or light purple or dark purple.
25. Kernel row arrangement, whether straight or spiral or irregular.
26. Kernel poppiness, whether absent or present.
27. Kernel sweetness, whether absent or present.
28. Kernel waxiness, whether absent or present.
29. Kernel opaqueness, whether absent or present.
30. Kernel shape, whether shrunken or round or indented or toothed or pointed.
31. 1000 kernel weight, whether very small or small or medium or large.

Results and Discussion

The frequency distribution of local 70 maize landraces of Kashmir Valley is given in table 1 as:

Table 1

S. No.	Character	State of expression	No. of landraces	Frequency distribution (%)
1	Leaf: angle between blade and stem	Small	33	47.14
		Wide	37	52.86
2	Leaf attitude of blade	Straight	34	48.57
		Drooping	36	51.43
3	Anthocyanin colouration of brace roots	Absent	27	38.57
		Present	43	61.43
4	Time of anthesis	Very early	-	0.00
		Early	3	4.28
		Medium	21	30.00
		Late	46	65.71
5	Anthocyanin colouration of base of glumes	Absent	61	87.14
		Present	9	12.86
6	Anthocyanin colouration of glumes excluding base	Absent	59	84.28
		Present	11	15.71
7	Anthocyanin colouration of anthers	Absent	64	91.42
		Present	6	8.57
8	Density of spikelets	Sparse	58	82.86
		Dense	12	17.14
9	Angle between main axis and lateral branches	Narrow	47	67.14
		Wide	23	32.86
10	Tassel attitude of lateral branches	Straight	43	61.43
		Curved	18	25.71
		Strongly Curved	9	12.86
11	Time of silk emergence	Very early	-	0.00
		Early	-	0.00
		Medium	21	30.00
		Late	49	70.00
12	Anthocyanin colouration of silks	Absent	56	80.00
		Present	14	20.00
13	Anthocyanin colouration of sheath	Absent	67	95.71
		Present	3	4.28
14	Tassel length of main axis above lowest side branch	Short	-	0.00
		Medium	21	30.00
		Long	49	70.00
15	Plant length	Short	19	27.14
		Medium	21	30.00
		Long	12	17.14
		Very long	18	25.71
16	Ear placement	Low	4	5.71
		Medium	10	14.28
		High	56	80.00
17	Width of leaf blade	Narrow	51	72.86
		Medium	11	15.71
		Broad	8	11.43
18	Ear length without husk	Short	16	22.86
		Medium	43	61.43
		Long	11	15.71
19	Ear diameter	Small	54	77.14
		Medium	16	22.86
		Large	-	0.00
20	Ear shape	Conical	28	40.00
		Conico-cylindrical	35	50.00

		Cylindrical	7	10.00
21	Number of rows of grain	Few	12	17.14
		Medium	47	67.14
		Many	11	15.71
22	Type of grain	Flint	50	71.14
		Semi flint/semi dent	9	12.86
		Dent	11	15.71
23	Colour of top of grain	White	8	11.43
		White with cap	13	18.57
		Yellow	9	12.86
		Yellow with cap	22	31.43
		Orange	7	10.00
		Red	9	12.86
		Other	2	2.86
24	Anthocyanin colouration of glumes of cob	White	47	67.14
		Light purple	11	15.71
		Dark purple	12	17.14
25	Kernel row arrangement	Straight	42	60.00
		Spiral	20	28.57
		Irregular	8	11.43
26	Kernel poppiness	Absent	70	100.00
		Present	-	0.00
27	Kernel sweetness	Absent	67	95.71
		Present	3	4.28
28	Kernel waxyness	Absent	70	100.00
		Present	-	0.00
29	Kernel opaqueness	Absent	70	100.00
		Present	-	0.00
30	Kernel shape	Shrunken	-	0.00
		Round	33	47.14
		Indented	18	25.71
		Toothed	16	22.86
		Pointed	3	4.28
31	1000 kernel weight	Very small	17	24.28
		Small	45	64.28
		Medium	8	11.43
		Large	-	0.00

Many variations were observed in the frequency distribution of local maize landraces of Kashmir valley for different characters. 47.14% and 52.86 % of landraces showed small angle and wide angle between leaf blade and stem, respectively. Altitude of leaf showed experession variation with 51.43% as drooping and 48.57% with straight. Most of the landraces exhibited brace root anthocyanin colouration (61.43%), absence of glume base anthocyanin colouration (87.14%), absence of glume anthocyanin colouration (84.28), absence of anther anthocyanin coluration (91.42%), absence of silk anthocyanin colouration (80.00%), and absence of sheath anthocyanin colouration (95.71%). Cob glume coluration exhibited by landraces included 67.14% white, 15.71% light purple, and 17.14% dark purple. Anthesis time was found late (65.71%), followed by medium (30.00%), and early (4.28%) while none of the landraces showed very early anthesis. Likewise silk emergence was mostly late (70.00%) followed by medium (30.00%) and none of the landraces exhibited early or very early silk emergence. Most of the spikelets were having narrow angle between lateral branches and main axis (67.14%), and spikelet density found was mostly sparse (82.86%). Tassel altitude of lateral branches were mostly straight (61.43%) and longer tassel main axes above lowest side branches in most of the landraces (70.00%). Plant height exhibited much variation with 25.71% very long, 17.14% long, 30% medium and 27.14% short, whereas leaf blade width found was mostly naroow (72.86%). Ear placement was mostly high (80%) with majority of landraces having medium lengthened ear without husk (61.43%), small ear diameter (77.14%), conico-cylindrical shape (50%) and with medium (67.14%) number of grain rows. The landraces exhibited mostly flint grains (71.14%) with varied grain top colours. Kernels borne on most landraces were having straight row arrangement (60%), round in shape (47.14%), small 1000 kernel weight (64.28%) and lacking poppiness, sweetness, opaqueness, and waxiness.

References

1. Camussi A, Spagnoletti Zeuli PL, Melchiorre P. Numerical taxonomy of Indian Maize populations: genetic distances on the basis of heterotic effects. Maydica,1983:28:411-424.
2. Oppong O, Bedoya CA, Ewool MB, Asante MD, Thompson RN, Dapaah HA. *et al*. Bulk genetic characterization of Ghanaian maize landraces using microsatellite markers. Maydica,2014:59(1):1-8.
3. Prasanna BM, Sharma L. The landraces of maize (*Zea mays* L): diversity and utility. Indian Journal of Plant Genetic Resources,2005:18:155-168.
4. Sharma L, Prasanna B, Ramesh B. Analysis of phenotypic and microsatellite-based diversity of maize landraces in India, especially from the North East Himalayan region. Genetica,2010:138:619-631.

5. Yadav VK, Singh IS. Comparative evaluation of maize inbred lines (*Zea mays* L.) according to DUS testing using morphological, physiological and molecular markers. Agricultural Sciences,2010:1(3):131-142.
6. Yadav MK, Rai AK, Kumar M, Kumar A, Yadav S. Standardization of maize genotype for the rearing of maize spotted stem borer, Chilo partellus on natural host. The matics Journal of Zoology. 2017;1(1).