A CASE STUDY

ADVANCE RESEARCH JOURNAL OF
C R P
IMPROVEMENT
Volume 6 | Issue 2 | December, 2015 | 178-182
e ISSN-2231-640X

DOI :
10.15740/HAS/ARJCI/6.2/178-182
Visit us: *www.researchjournal.co.in*

Morphometric characterization of maize hybrids and their parents using DUS guidelines

B.P. MADHUKESHWARA[1] AND **ASHOK S. SAJJAN**

AUTHORS' INFO
Associated Co-author :
[1]Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

Author for correspondence:
ASHOK S. SAJJAN
Regional Agricultural Research Station (U.A.S.), VIJAYAPUR (KARNATAKA) INDIA
Email : assajjan@gmail.com

ABSTRACT : Maize is one of the economically important crop in the world. Protection of Plant varieties and Farmers Right Act (2001) insists on distinctness, uniformity and stability (DUS) characterization of extant, farmers and new varieties and recommends the registration of varieties for any one specific novel character. Studies initiated to verify morphological characters in two hybrids including GH-0727, Arjun and five parents CI-4, CI-5, KDMI-15, KDMI-16 and CI-4XCI-5 of UAS, Dharwad, Kranataka, India. The results revealed that the 7 genotypes have variation for different morphological characters like tassel attitude of lateral branches, tassel angle, ear shape, plant height, tassel density of spikelet's and thousand seed weight.

KEY **W**ORDS : Plant variety protection, Morphological characters, Genotypes

How to cite this paper : Madhukeshwara, B.P. and Sajjan, Ashok. S. (2015). Morphometric characterization of maize hybrids and their parents using DUS guidelines. *Adv. Res. J. Crop Improv.,* **6** (2) : 178-182.

Paper **H**istory : **Received :** 21.07.2015; **Accepted :** 30.11.2015

Maize (*Zea mays* L.) is the world's third most important cereal commercially valued economic crop of global importance widely used in poultry and cereal food industries next to wheat and rice. As it has higher yield potential than any other cereals, hence, it is referred to as "miracle crop" or the "queen" of cereals. Maize is grown both as food for human beings and fodder for animals. The maize was cultivated in an area of 177 million ha with a production of 967 million tonnes in the world and in India it is cultivated in an area of 9.4 million ha with a production of 23 million tonnes with the productivity of 2581 kg per ha during 2013-14. In Karnataka it is cultivated in an area of 1.32 million ha with production of 4.4 million tonnes and productivity of 3521 kg per ha (Anonymous, 2014). It provides raw materials for starch, gluten, corn oil, corn syrup, sugar, corn meal and corn flour and occupies an important place in Indian agriculture.

There is an important role of morphological data in the management of genetic resources that are conserved in *ex-situ* gene-banks. Many tools are now available to study the relationships among the cultivars, including various types of molecular markers; however, morphological characterization is the first step in the description and classification of germplasm. The characterization of morphological variability is useful tool to identify accessions with desirable characteristics such as earliness, disease resistance, or improved ear trait. The characterization and grouping of lines helps the breeders to avoid duplication in sampling populations and aid in the identification of varieties and hybrids. This emphasizes the demands of maize in India and there is an urging need to develop high yielding single cross hybrids. Therefore, knowledge on genetic diversity of inbred lines would help the breeder in planning crosses for superior hybrid development. The morphological characters are the important indicators to determine the off types in the seed production programme and this

morphometric characterization guides us to maintain the genetic purity in the seed field by rouging the deviant plants which directly facilitates in meeting the required standards of genetic purity, physical purity and seed certification standards. Protection of Plant varieties and Farmers Right authority insists on characterization and registration of extant, farmers and new varieties as a part of national and botanical asset. Pinnisch *et al.* (2012) also indicated that, inbred lines serve as the seed parent to estimate the profitability of commercial maize genotypes.

RESEARCH PROCEDURE

The seven genotypes viz., GH-0727, Arjun, CI-4, CI-5, CI-4XCI-5, KDMI-15 and KDMI-16 were used for the morphometric characterization using DUS guidelines. The seeds were collected from the Seed Unit, UAS, Dharwad. Each of the individual genotypes was raised in a Randomized Block Design (RBD) in 4 lines of 6 m row length with the spacing of 60 × 30 cm of inter and intra row spacing with three replications as per the guidelines of PPV and FRA (Anonymous, 2007). During crop growth, the morphological characters were observed for plant height (cm), stem anthocyanin colour, leaf angle, leaf attitude, tassel density of spikelet's, days to 50 per cent tasseling, tassel angle, tassel attitude, days to 50 per cent silk emergence, plant ear placement, Harvesting was done when the plants had completely senesced with the expression of physiological maturation, the dunken layer formation (Baker, 1973). The harvested cobs were observed for ear shape, kernel row arrangement, and 1000 grain weight (g).

RESEARCH ANALYSIS AND REASONING

Based on plant height at maturity, the cultivars were grouped as long, medium and short. The plant height at maturity varied from 158.6 cm to 194.7 cm and the cultivars were grouped into long (GH-0727, CI-4XCI-5 and Arjun) and medium (CI-4, CI-5, KDMI-15, KDMI-16) which suggest significant variations in plant height that could be used for identification of off types at the time of field inspection (Table 1). Based on stem anthocyanin colouration of brace roots, all the cultivars exhibited absence of anthocyanin colouration and similarly with respect to the leaf attitude of blade all the cultivars exhibited the drooping type and no one noticed with straight leaf attitude (Fig. 1). Based on the phenotypic traits studied, Wietholter *et al.* (2008) concluded that, the traits contributed majorly to the classification of Brazilian corn landraces were plant height, ear insertion, female

Table 1 : Morphometric characterization of maize hybrids GH-0727 and Arjun with their parents based on plant morphology

Lines	Plant height at maturity (cm)	Stem anthocyanin colour of brace roots	Leaf attitude of blade	Leaf angle	Plant: ear placement
GH-0727	Long* (194.7 cm)	Absent	Drooping	Small	Medium
Arjun	Long (191.6 cm)	Absent	Drooping	Small	Medium
CI-4	Medium (158.6 cm)	Absent	Drooping	Small	Medium
CI-5	Medium (163.3 cm)	Absent	Drooping	Small	Medium
KDMI-15	Medium (165.8 cm)	Absent	Drooping	Small	Medium
KDMI-16	Medium (169.5 cm)	Absent	Drooping	Small	Medium
CI-4XCI-5	Long (182.3 cm)	Absent	Drooping	Small	Medium

Table 2 : Morphometric characterization of maize hybrids GH-0727 and Arjun with their parents based on flowering characters

Lines	Tassel attitude of lateral branches	Days to 50% tasseling	Days to 50% silking	Tassel angle	Tassel density of spikelets
GH-0727	Straight	Late	Late	Wide	Sparse
Arjun	Strongly curved	Late	Late	Wide	Sparse
CI-4	Straight	Late	Late	Narrow	Sparse
CI-5	Strongly curved	Late	Late	Wide	Sparse
KDMI-15	Curved	Late	Late	Wide	Sparse
KDMI-16	Straight	Late	Late	Narrow	Dense
CI-4XCI-5	Straight	Late	Late	Wide	Sparse

*Long: 181-210 cm Medium: 150-180 cm

Table 3 : Morphometric characterization of maize hybrids GH-0727 and Arjun with their parents based on cob and grain characters

Lines	Ear: shape	Kernel row arrangement	Thousand seed weight
GH-0727	Conico cylindrical	Straight	Large* (304.6 g)
Arjun	Cylindrical	Straight	Large (302.9 g)
CI-4	Conico-cylindrical	Straight	Medium (269.6 g)
CI-5	Conical	Straight	Medium (273.5 g)
KDMI-15	Conico-cylindrical	Straight	Medium (280.3 g)
KDMI-16	Conico-cylindrical	Straight	Medium (277.7 g)
CI-4XCI-5	Conico-cylindrical	Straight	Large (300.5 g)

*Large: >300g Medium: 200-300g

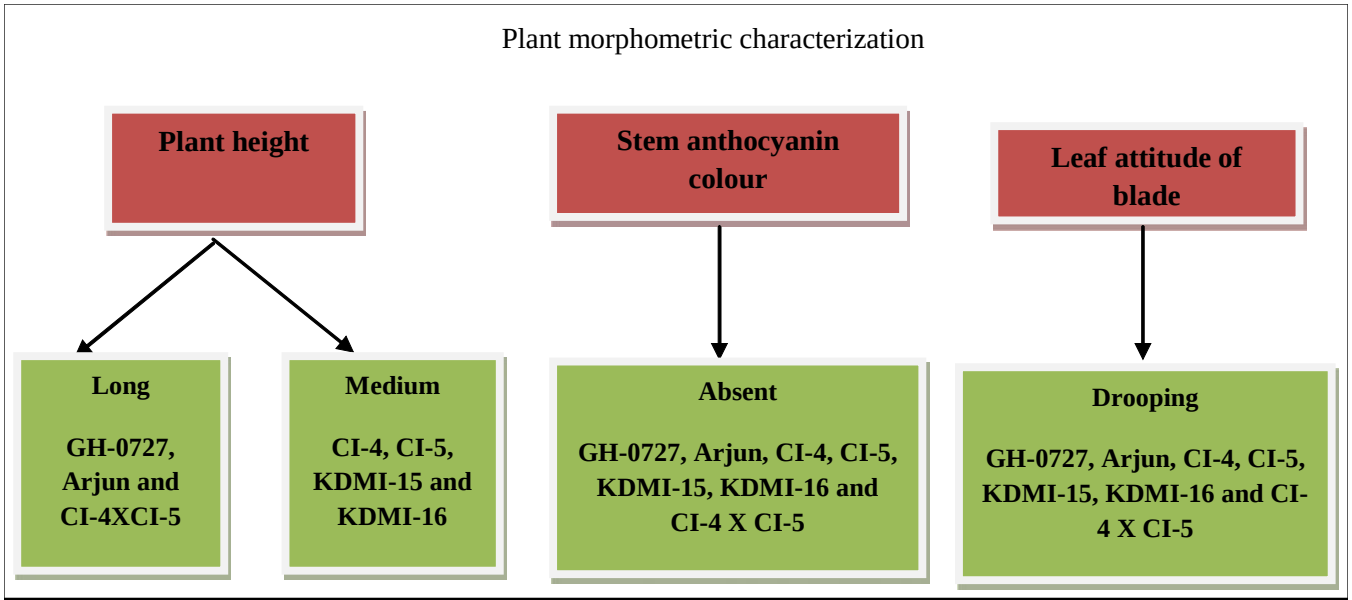

Fig. 1: Plant height, stem anthocyanin colour and leaf attitude of blade

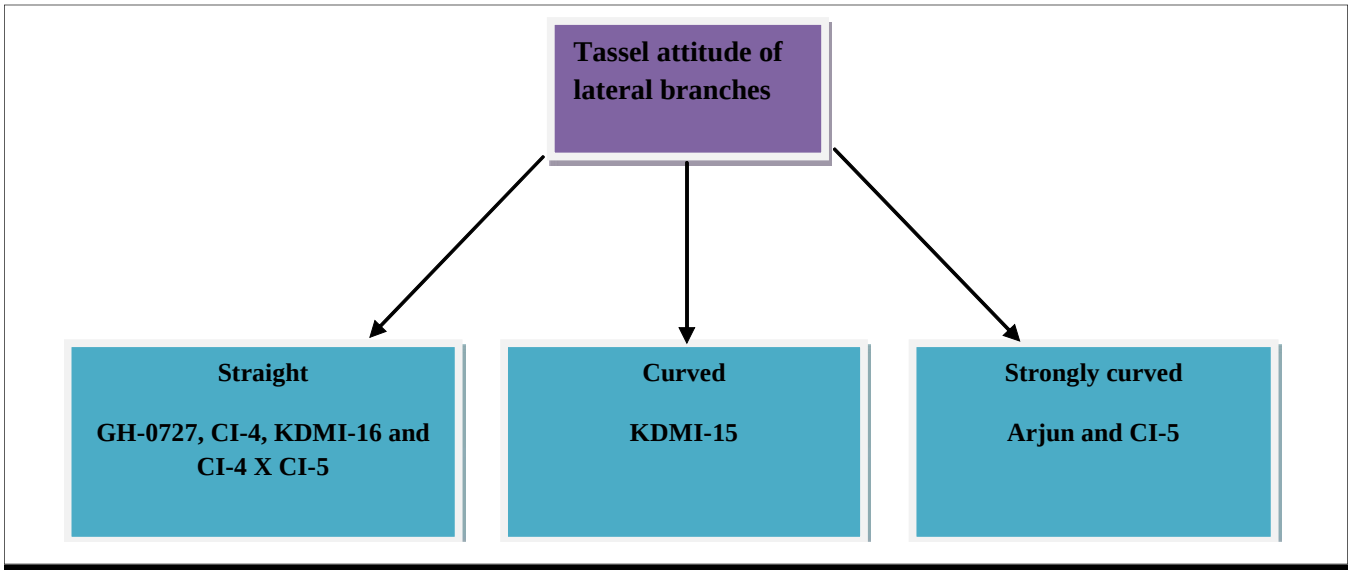

Fig. 2 : Tassel attitude of lateral branches

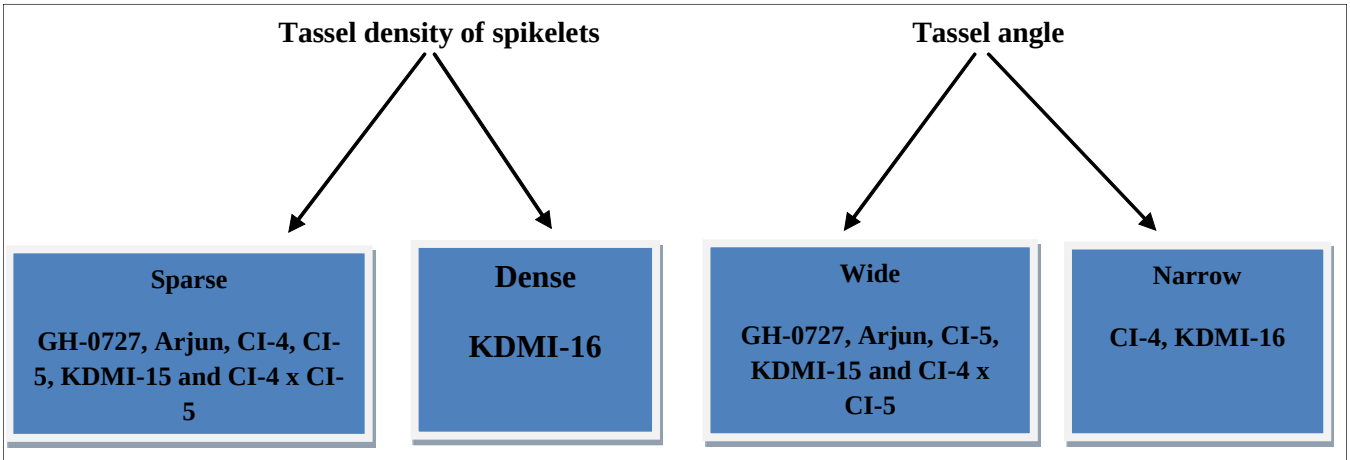

Fig. 3 : Tassel density of spikelets

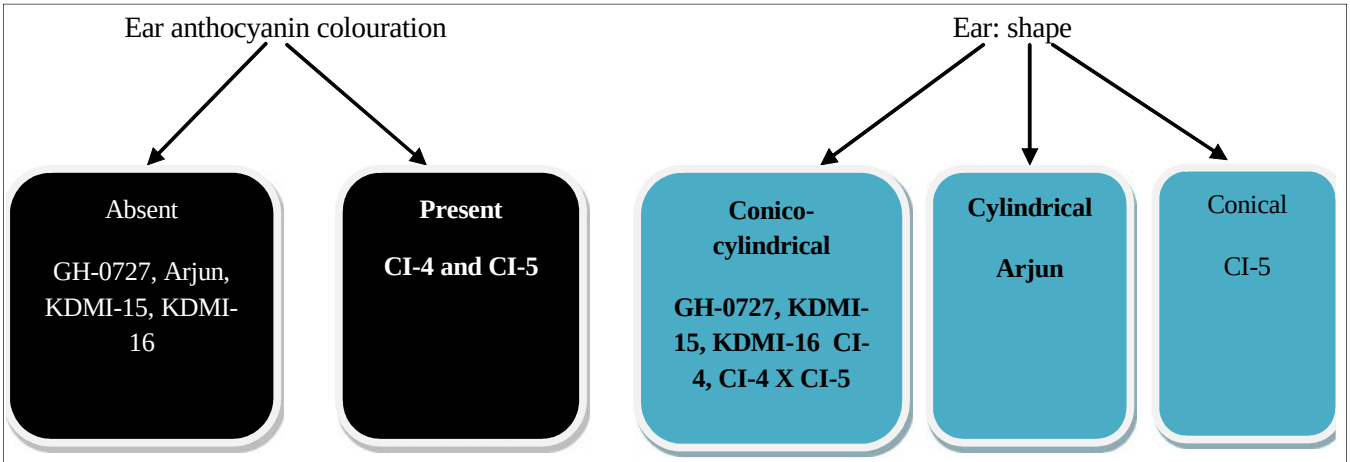

Fig. 4 : Ear anthocyanin coloration and ear shape

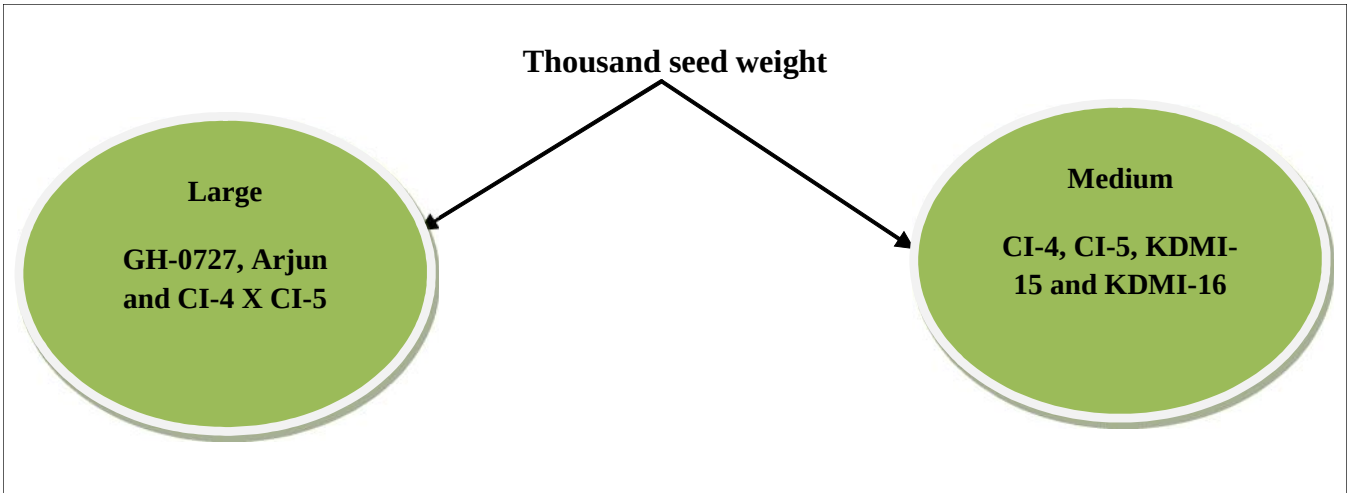

Fig. 5 : Thousand seed weight

flowering, male flowering and kernel row number per ear. Though both qualitative and quantitative characters could be a better descriptive for grouping the maize genotypes, but high heritable traits are much useful in selection of inbreds for further breeding programme.

Based on leaf angle between blade and stem, all the lines exhibited the small angle and no cultivar noticed with wide angle and similarly with respect to the days to 50 per cent flowering all the cultivars were grouped under the late flowering group. Similar variation was also reported by Hidayat *et al*. (2008) in maize and Houman (2011) in corn. Based on tassel attitude of lateral branches (Fig. 2), cultivars were grouped into three different categories namely straight (GH-0727, CI-4XCI-5, CI-4, KDMI-16), curved (KDMI-15) and strongly curved (Arjun and CI-5) (Table 2). Based on tassel density of spikelets, all the cultivars exhibited sparse density and none of them were dense. Based on tassel angle between main axis and lateral branches all the cultivars were grouped into two groups namely narrow (CI-4, KDMI-16) and wide (GH-0727, Arjun, CI-4XCI-5, CI-5, KDMI-15) (Fig. 3).

Based on plant ear placement, all the cultivars grouped under medium position and none of them were low or high. Based on ear anthocyanin colouration of silk, the cultivars were classified into two groups present (GH-0727, Arjun, CI-4XCI-5, CI-5and CI-4) and absent (KDMI-15, KDMI-16). Based on ear shape, the cultivars were classified into three different groups conical (CI-5), conico-cylindrical (KDMI-15, GH-0727, CI-4XCI-5, CI-4 and KDMI-16) and cylindrical (Arjun) (Table 3 and Fig. 4). Based on kernel row arrangement all the cultivars were grouped under the straight and none of them exhibited either spiral or irregular. Medium (CI-4, CI-5, KDMI-15, KDMI-16) and large (GH-0727, Arjun, CI-4XCI-5) were the two different categories of genotypes based on their thousand seed weight (Fig. 5)but none of them were small or very small and similar reports were given by Pinnisch *et al.* (2012). In summary, our analysis of morphometric characterization for seven genotypes revealed that more variation for plant height, tassel attitude, tassel angle, ear shape and thousand seed weight as compared to the other traits'.

Literature Cited

Anonymous (2007). Guidelines for the conduct of tests for distinctness, uniformity and stability on maize (*Zea mays*). The Protection of Plant Varieties and Farmers' Rights authority, New Delhi. *Plant Variety J. India,* 1(1):1-13.

Baker, R. (1973). Black –layer development. *World Fmg.,* **15** : 14-19.

Hidayat, U.R., Ali, Sajid, Syed Mehar A., Shah, Syed, S.S., Naveed, U.R., Ibn, A.K., Izhar, H. and Fehmida, A .(2008). Diversity for morphological and maturity traits in Maize populations from upper dir. *Sarhad J. Agric.*, **24**: 439-443.

Houman, Homaoun (2011). Study of some morphological traits of corn hybrids. *American-Eurasian J. Agric. & Environ. Sci.,* **10** (5) : 810-81

Pinnisch, R., Mowers, R., Trumpy, H., Walejko, R. and Bush, D. (2012). Evaluation of maize (*Zea mays* L.) inbred lines for yield component traits and kernel morphology. *Maydica,* **57** : 1-5.

Wietholter, P., Cruz, de Melo, Sereno, M.J., de Freitas, Terra, T., Delmar dos Anjos eSilva S. and Barbosa Neto, J.F. (2008). Genetic variability in corn landraces from Southern Brazil. *Maydica,* **53** : 151-159.