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Genetic variability in celosia genotypes

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Abstract
Genetic variability, characterization of genotypes for yield and quality traits were studied in Celosia (*Celosia* spp.). This study indicated considerable amount of genetic variability for all the characters studied. Higher GCV and PCV were recorded for characters like flower yield per plant, seed yield and number of flowers per plant indicating higher magnitude of variability for these characters and characterization of genotypes has been estimated for growth habit, stem colour, branching, leaf shape, leaf colour, leaf arrangement, leaf pubescent, leaf venation colour, flowering habit and flower bearing position. These characters can be effectively improved through selection.

Keywords: *Celosia* spp., PCV, GCV, characterization

Introduction
Celosias are versatile plants that have been used as herbal remedies, as ornamental annuals in the garden and as cut and dry flowers. Genus celosia consists of about 60 species in the family Amaranthaceae. Celosia is an herbaceous annual plant. The stem is erect, glabrous. Leaf blade is unlobed, variable, mostly lanceolate or ovate. The leaves are either green or bronze/maroon, depending upon the cultivar. The inflorescence is terminal with broad, showy fan-shaped heads.

In any selection programme, it may not be always possible to make selections based on yield alone, for evolving superior yielding genotypes because yield is a complex character and is collectively influenced by many component characters. Therefore present investigation was carried out to determine the nature and degree of association among the characters of celosia.

Materials and Methods
The experiment was carried out at the Botanic garden, TNAU, Coimbatore. The genotypes were evaluated for high yield and quality characters during the year 2016 – 2017. Each plant in the cross was labelled for recording ten quantitative and qualitative characters, which includes plant height, flowering branches, days taken to first flowering, inflorescence length, flower diameter, single flower weight, number of flowers, flower yield, seed yield and Betalain. PCV and GCV were classified as noted below and suggested by Sivasubramaniam Menon (1973).

Results and Discussion
Characterization of genotypes
The need for verification of varietal identity arises throughout the sequence of events from breeding to variety release, propagation, harvesting and export of the harvested material.

Morphological descriptors provide a unique identification of cultivated varieties (Molona-cano and Elena-rosssello, 1978) [5]. Lin and Bins (1984) reported that the morphological descriptors reflect not only genetic constitution, but also the interaction of the genotypes with the environment within which it is expressed. The studies by Andrej (2008) stated that the proved characterization of genetic material involved highly heritable morphological traits that appear to be atleast partly genetically controlled and can be used as a descriptors.

In the present investigation, it was found that the 20 genotypes of *Celosia* spp. did not show much variation for plant growth type, and all the 20 genotypes had herb type of growth habit. This may be due the fact that all the 20 genotypes studied belong to the same genus namely *Celosia* spp. With reference to the plant growth habit, the genotypes exhibited considerable variation. Among the 20 genotypes Acc.5, Acc.9, Acc. 11, Acc.12, Acc.18, Acc.19 and Acc.20 belonged to upright growth habit. Acc. 1, Acc. 7, Acc.8 and Acc. 10 belonged to semiupright growth.

Acc. 2, Acc.13 and Acc. 17 belonged to intermediate growth habit. Acc.3, Acc.4, Acc.6, Acc.14, Acc.15 and Acc.16 belonged to spreading type growth habit.

The twenty genotypes of *Celosia* spp. showed remarkable variation in leaf shape. The majority of genotypes were lanceolate and ovate in shape. The variation in leaf shape is due to the heterozygous nature of species. The genotypes did not show much deviation for leaf arrangement and all genotypes uniformly had the alternate leaf arrangement. There was considerable variation for leaf colour among the genotypes studied. Intensity of green colour was observed in most of the genotypes namely Acc.1, Acc. 4, Acc. 6, Acc. 12, Acc. 14, Acc.17, Acc.18 and Acc.19 were green in colour. Acc.3, Acc.7, Acc.9, Acc.11, Acc.13 and Acc.16 was moderate green in colour and the leaf colour of Acc.2, Acc.5, Acc.8, Acc.10 and Acc.15 were light green in colour.

Leaf pubescence was absent in all the twenty genotypes. Solitary type flower bearing was observed in all the 20 genotypes. This character was used by Andrej (2008) as a descriptor for grouping Christmas rose. Flower bearing position was both terminal and axillary for all the genotypes.

In the present study, inflorescence length was maximum in Acc. 1 [*Celosia cristata* (red) Coimbatore (Thondamuthur)] (19.30 cm) followed by Acc.20 [*Celosia argentea* (pink) Namakkal (Kunnamalai)] (18.40 cm). Among different genotypes, minimum inflorescence length was recorded in Acc.12 [*Celosia cristata* (Orange) Koyilpatti (Thirunavkoyilpatti)] (8.70 cm).

Table 1: Scoring for qualitative characters for celosia genotypes.

	GH	SC	BR	LS	LC	LA	LP	LVC	FH	FBP
Accession 1	2	1	2	1	1	2	0	1	1	3
Accession 2	3	2	2	1	2	2	0	2	1	3
Accession 3	4	1	2	1	1	2	0	1	1	3
Accession 4	4	1	2	1	1	2	0	1	1	3
Accession 5	1	2	2	1	1	2	0	2	1	3
Accession 6	4	1	2	2	3	2	0	1	1	3
Accession 7	2	3	2	2	3	2	0	2	1	3
Accession 8	2	1	2	2	3	2	0	1	1	3
Accession 9	1	1	2	1	1	2	0	1	1	3
Accession 10	2	1	2	1	1	2	0	1	1	3
Accession 11	1	3	2	1	2	2	0	2	1	3
Accession 12	1	2	2	1	2	2	0	1	1	3
Accession 13	3	4	2	1	3	2	0	3	1	3
Accession 14	4	3	2	1	1	2	0	2	1	3
Accession 15	4	1	2	2	1	2	0	1	1	3
Accession 16	4	1	1	2	3	2	0	1	1	3
Accession 17	3	1	2	3	1	2	0	1	1	3
Accession 18	1	1	2	1	1	2	0	1	1	3
Accession 19	1	1	2	1	1	2	0	3	1	3
Accession 20	1	2	2	1	2	2	0	2	1	3

Cont….

Growth Habit (GH)	Upright-1, semi upright-2, intermediate-3, spreading-4
Stem Colour (SC)	Green-1, orange-2, dark orange-3, purple-4
Branching (BR)	Monostem-1, branched-2
Leaf shape (LS)	Lanceolate-1, ovate-2, acuminate-3
Leaf colour (LC)	Green-1, middle green-2, light green-3
Leaf Arrangement (LA)	Opposite-1, alternate-2
Leaf Pubescence (LP)	Absence-0, presence-1
Leaf Venation Colour (LVC)	Green-1, orange-2, purple-3
Flowering Habit (FH)	Solitary-1, cluster-2
Flower Bearing Position (FBP)	Terminal-1, axillary-2, both-3

Phenotypic and genotypic coefficient of variation (%)

The variability of 10 characters based on phenotypic and genotypic coefficient of variances is furnished in Table 2. Coefficient of variation was worked out for valid comparison between the characters, which were associated with different units.

The genotypic coefficient of variation ranged from 139.15% for single flower weight to 14.80% for betalain content. GCV was high for single flower weight followed by flower yield (88.17%), seed yield (82.30%), Total number of flowers (75.17%), flowering branches (72.69%), flower diameter (69.12%), plant height (30.84%) and inflorescence length (29.53%). Moderate GCV was observed in days to first flowering (19.72%) followed by betalain content (14.80%).

The phenotypic coefficient of variation ranged from 139.95% for single flower weight to 19.20% for betalain content. PCV was high for single flower weight followed by flower yield (89.26%), seed yield (83.56%), total number of flowers (76.34%), flowering branches (74.29%), flower diameter (70.31%), plant height (33.13%), inflorescence length (2.14%) and days to first flowering (23.28%). Moderate PCV was observed in betalain content (19.20%).

Table 2: Genotypic (GCV) and phenotypic (PCV) co-efficient of variation for different morphological characters.

Characters	GCV	PCV
Plant height	30.84	33.13
Flowering branches	72.69	74.29
Days taken to first flowering	19.72	23.28
Inflorescence length	29.53	32.14
Flower diameter	69.12	70.31
Single flower weight	139.15	139.95
Number of flowers	75.17	76.34
Flower yield	88.17	89.26
Seed yield	82.30	93.56
Betalain	14.80	19.20

In the present investigation, the genotypes exhibited considerable amount of variability for all the ten traits studied. Numerically, the phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for most of the characters indicating that these characters are having an interaction with the environment to some extent. Differences between the phenotypic and genotypic coefficients of variation were observed to be narrow for all the characters indicating the least influence of environment on the expression of these characters. High GCV and PCV for the characters suggest high variability, which in turn offers good scope for selection. Also, its major portion is attributed through its additive components and additive interaction instead of dominance and epistatic components may be considered for selection. The results are in agreement with the reports of Chaugule (1985) [2] and Chattopadhyay *et al*., (1991) [1] in chrysanthemum. Similar observations were also reported in chrysanthemum by Mishra *et al*. (2006) [3] and in African marigold by Vishnupriya *et al*. (2015) [4].

Conclusion

High estimates of PCV and GCV were observed for single flower weight, flower yield, seed yield, total number of flowers, number of flowering branches, flower diameter, plant height and inflorescence length. By this study, we conclude that Celosia can undergo mass selection breeding programme, to bring about the improvement in yield.

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