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Evaluation of bachelor's button (*Gomphrena globosa* L.) genotypes for growth and yield parameters

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Abstract

Ten genotypes of bachelor's button (*Gomphrena globosa* L.) were evaluated with an aim to identify suitable varieties based on different characters under Northern Karnataka region at Horticulture farm, UAS, Raichur, during the year 2017-18. The results revealed that genotype AGS-10 recorded maximum plant height (132.17 cm), maximum plant spread (121.67 cm), number of leaves plant⁻¹ (4140.83), leaf area plant⁻¹ (1200.78 cm²), leaf area index (0.4447), number of primary branches plant⁻¹ (16.53) and number of secondary branches plant⁻¹ (106.93) were observed in the genotype AGS-1, whereas, maximum stalk length was recorded in AGS-5 (20.73 cm) genotype. Minimum plant height (40.30 cm), plant spread (44.50 cm), number of leaves plant⁻¹ (1513.87), leaf area plant⁻¹ (439.00), leaf area index (0.1625), number of primary branches plant⁻¹ (10.93), number of secondary branches plant⁻¹ (49.63), and stalk length (5.33 cm). The genotype 'AGS-13' took minimum number of days to flower bud initiation (9.67 days) but it was maximum in AGS-1 (14 days) whereas, days taken for 50 per cent flowering was minimum in AGS-13 (12 days) and maximum in AGS-5 (24 days) and Genotype AGS-1 flowered for a maximum period of 87.67 days and the flowering duration was minimum in genotype AGS-14 (67.67 days). The maximum flower yield (13.75 t/ha) was recorded in AGS-1 and it was lowest in AGS-14 (8.10 t/ha).

Keywords: Bachelor's button, genotype, growth and yield

Introduction

Bachelor's button (*Gomphrena globosa* L.) is an edible plant from the family Amaranthaceae. It is an annual ornamental plant that grows with varying height. The branched stems are erect and stiff and the plant has a bushy appearance. The leaves are opposite, oblong, 4-6cm in long, and wooly-white when young, becoming sparsely white-hairy as they became old. The round-shaped or clover like or button like flower inflorescences are a visually dominant feature and cultivars have been propagated to exhibit shades of colors but the most common color is magenta. Within the flower heads, the true flowers are small and inconspicuous. At maturity, the flower heads are approximately 4 cm long. It is native to Central America.

As a tropical annual plant, blooms continuously throughout summer and early fall. It is heat tolerant, fairly drought resistant and tolerates poor soil, but grows best in full sun and regular moisture and once a favorite in British gardens. It is an outcrossing species that is pollinated by butterflies, bees and other insects. Floral volatiles likely play a significant role in the reproductive success of the plant by promoting the attraction of pollinators.

Though the flower yield and quality are primarily varietal characters, they are also greatly influenced by climatic factors. The climatic factors like photoperiod, temperature, relative humidity and also soil moisture influence both vegetative and reproductive phases of the plant, ultimately leading to variation in the performance of genotypes. Hence, plants have to be exposed to proper climatic factors in order to get optimum and economic flower yields. Hence, there is a need to standardize the production technology under transitional tract of northern Karnataka involving systematic investigation to evaluate suitable genotypes.

Material and methods

The present investigation was carried out at Horticulture farm, Department of Horticulture, University of Agricultural Sciences, Raichur, Karnataka, during 2017-18 to study the performance of ten different bachelor's button genotypes viz., AGS-1, AGS-5, AGS-6, AGS-7, AGS-8, AGS-9, AGS-10, AGS-13, AGS-14 and AGS-15. The experiment was laid out in a Randomized Block Design (RBD) with three replications. Thirty days old healthy and uniformly grown seedlings were used for transplanting with a spacing of 60 cm x 45 cm at the rate of one seedling per hill.

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The observations on different growth stages for vegetative characters for vegetative parameters, fresh flower yield and quality characters were recorded at appropriate period. The crop was sown during *kharif* season. During the experimentation, the average maximum and minimum temperatures were 40.8 and 16.2 °C respectively, relative humidity 71.5% and total rainfall 702.7 mm were recorded.

Results and discussion

Vegetative characters: Genotypes significantly differed for plant height, plant spread, number of leaves per plant, leaf area per plant, leaf area index, number of primary branches and secondary branches per plant and stalk length (Table. 1).

The results revealed that AGS-10 genotype recorded maximum plant height (132.17 cm) followed by AGS-7 (131.33 cm) and AGS-8 (131.17 cm), where as the lowest plant height was recorded in AGS-14 (40.30 cm). The plant spread was recorded maximum in AGS-1(121.67 cm) genotype followed by AGS-10 (121.33 cm), where as minimum plant spread was recorded in the genotype AGS-14 (44.50cm). The variation in vegetative growth parameters were attributed to genetic factors whose performance varied over a wide range of environmental conditions. Variation among the genotypes for plant height and plant spread were also recorded by Kulkarni *et al.*, 2004; Rajivkumar *et al.*, 2007; Munikrishnappa., 2011 and Srilatha *et al.*, 2015^[3, 7, 4, 11] (Fig. 1).

Table 1: Variation in growth parameters of different genotypes of bachelor's button

Characters Genotype	Plant height (cm)	Plant spread (cm)	Number of leaves/ plant	Leaf area/ plant (cm ²)	Leaf area index	Number of primary branches	Number of secondary branches	Stalk length (cm)
AGS 1	128.83	121.67	4140.83	1200.78	0.4447	16.53	106.93	19.43
AGS 5	130.33	120.77	4076.97	1182.27	0.4378	16.13	106.30	20.73
AGS 6	128.67	121.30	4060.97	1177.63	0.4361	16.20	106.00	19.67
AGS 7	131.33	121.23	4110.47	1192.00	0.4414	16.27	106.70	19.20
AGS 8	131.17	121.17	4077.83	1182.57	0.4379	16.07	105.93	20.67
AGS 9	130.67	121.25	4112.73	1192.63	0.4417	16.40	106.13	20.53
AGS 10	132.17	121.33	4121.93	1195.33	0.4426	16.47	105.80	20.40
AGS 13	42.73	46.87	1639.60	475.47	0.1760	11.40	50.70	5.57
AGS 14	40.30	44.50	1513.87	439.00	0.1625	10.93	49.63	5.33
AGS 15	130.33	121.32	4135.20	1199.20	0.4441	16.33	106.47	19.60
S.Em±	0.94	1.12	36.46	10.58	0.008	0.18	0.76	0.51
CD @5%	2.83	3.33	109.40	31.76	0.025	0.54	2.28	1.54

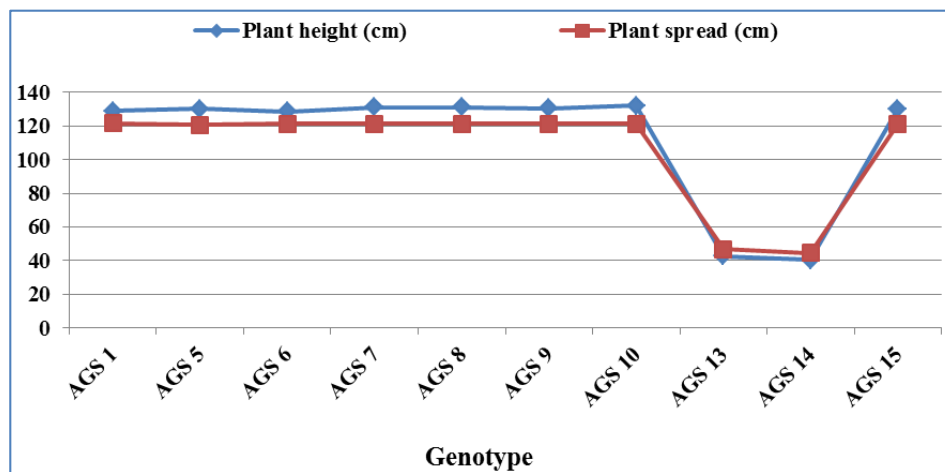


Fig 1: Variation in plant height and plant spread exhibited by different bachelor's button genotypes

The number of leaves per plant influenced the flower yield, higher number of leaves per plant throughout the growth period was noticed in AGS-1 (4140.83) genotype which was followed by the genotype AGS-15 (4135.20) throughout the growing period. However, the lowest flower yield of AGS-14 (1513.87) might be attributed to number of leaves per plant which indicates that higher the number of leaves per plant more would be the flower yield. Such variations in number of leaves among the varieties were also observed by earlier workers Poornima *et al.* (2006) and Zosiamliana *et al.* (2012)^[6, 13] in China aster.

Leaf area per plant (1200.78 cm²) and leaf area index (0.4447) in case of AGS-1 were found to be high as a result of which

the yield was also maximum in the same genotype, followed by AGS-15 (1199.20 cm²). The lower values of these parameters at various growth stages revealed the lowest yield in case of AGS-14 (439.00 cm²). Leaf area and leaf area index are the indices for better photosynthesis. As more leaf area results in increased photosynthesis. It might be attributed that higher flower yield might be the result of higher leaf area coupled with increased photosynthesis. The variation in Leaf area and leaf area index by Singh and Singh (2005)^[10] and Munikrishnappa (2011)^[4] were also in close confirmation of these results (Fig. 2 and 3).

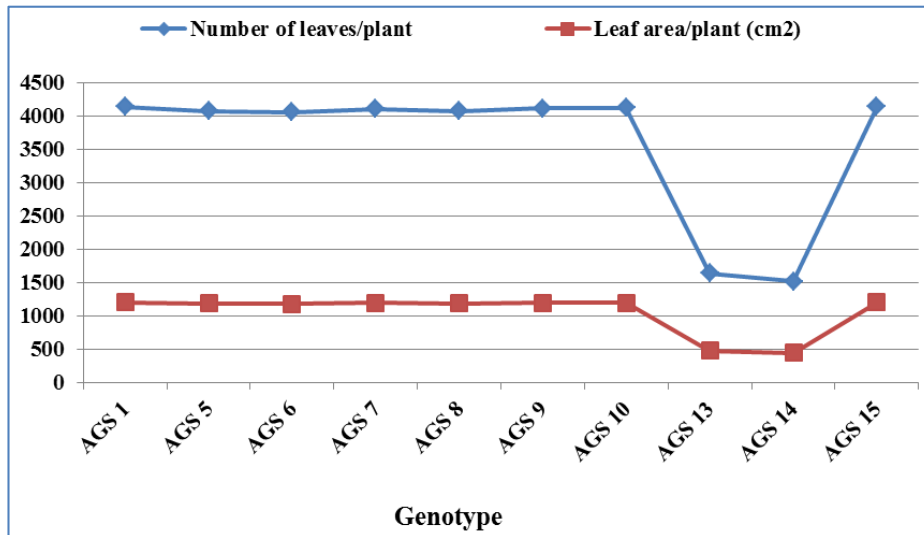


Fig 2: Variation in number of leaves per plant and leaf area per plant exhibited by different bachelor's button genotypes

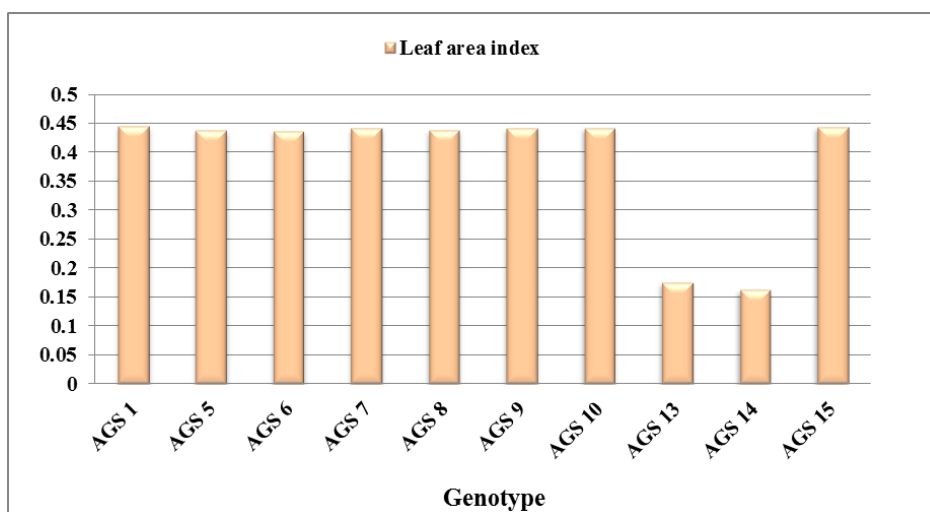


Fig 3: Variation in leaf area index exhibited by different bachelor's button genotypes

Number of primary branches per plant (16.53), number of secondary branches per plant (106.93) and length of stalk (20.73 cm) were maximum in genotype AGS-1, whereas, minimum was recorded in AGS-14 genotype. The highest flower yield per hectare of AGS-1 had an influence of higher number of primary branches per plant, higher number of secondary branches per plant and highest length of stalk

throughout the growth period. Though the genotype AGS-8 had longest stalk length but expressed the lower flower yield per plant which might be attributed as the genotypic response. Similar variations for number of branches were also observed in China aster (Ravi kumar, 2002) [8] and in Marigold (Singh *et al.*, 2003 and Verma *et al.*, 2004) [9, 12] (Fig. 4).

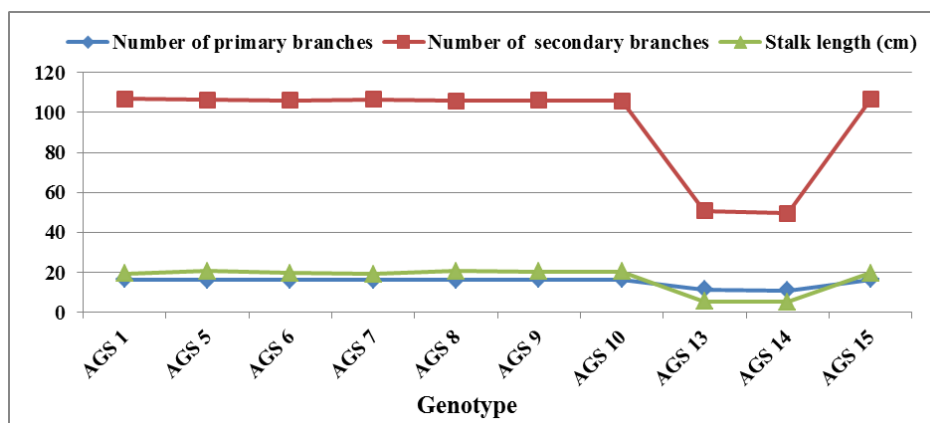


Fig 4: Variation in number of primary and secondary branches per plant exhibited by different bachelor's button genotypes

Flowering parameters: The data regarding to flowering parameters are given in Table 2. There were no significant

difference with respect to days to flower bud initiation. The genotype 'AGS-13' took minimum number of days to flower

bud initiation (9.67 days), whereas, the genotype ‘AGS-1’ recorded maximum number of days taken for flower bud initiation (14 days). The days taken for 50 per cent flowering and duration of flowering varied significantly among all the genotypes. Genotype ‘AGS-13’ (12 days) took minimum number of days for 50 per cent flowering. Maximum number of days to 50% flowering were taken by the genotype ‘AGS-

5’ (24 days). Genotype AGS-1 flowered for a maximum period of 87.67 days and the flowering duration was minimum in genotype AGS-14 (67.67 days). Variations in flower characters were expected among China aster varieties as also reported by Munikrishnappa (2011) [4] and Zosiamlina *et al.* (2012) [13] (Fig. 5).

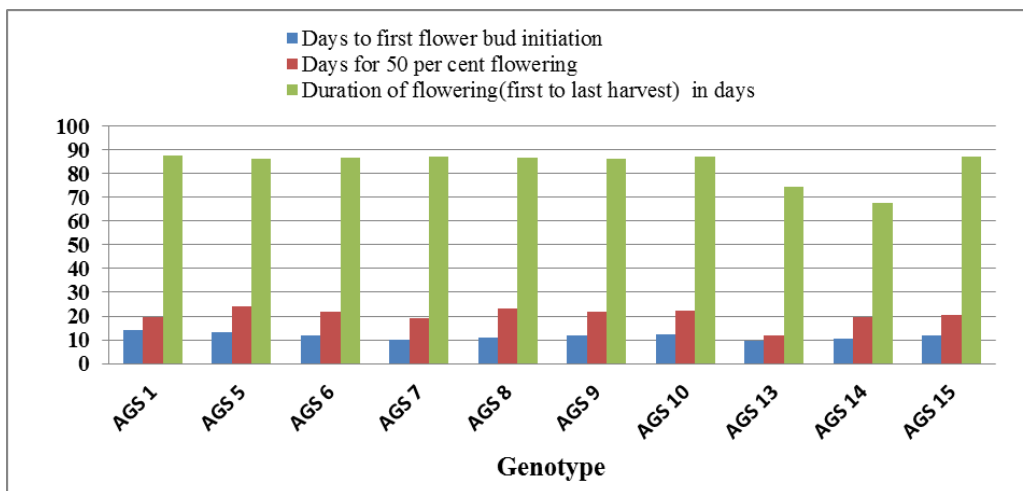


Fig 5: Variation in days to first flower bud initiation, days for 50 per cent flowering and duration of flowering exhibited by different bachelor’s button genotypes

Yield parameters: Genotypes significantly differed for yield per hectare is given in Table 2. Flower yield per hectare were maximum in genotype AGS-1 (13.75 t) followed by AGS-15 (12.37 t), AGS-10 (12.34 t) and AGS 7 (12.10 t). The flower yield was minimum in the genotype AGS-5 (8.45 t) and AGS-14 (8.10 t). The increased flower yield was because of

increased weight of flowers and more number of flowers per plant. Variation in flower yield was also observed previously in *Chrysanthemum* (Jamal Uddin *et al.*, 2015 and kireeti *et al.*, 2017) [1, 2] and in *China aster* (Munikrishnappa *et al.*, 2013) [5] (Fig. 6).

Table 2: Evaluation of different bachelor’s button genotypes for flowering parameters

Genotype	Characters	Days to first flower bud initiation	Days for 50 per cent flowering	Duration of flowering (first to last harvest) in days	Yield/ha (t)
AGS 1		14	19.67	87.67	13.75
AGS 5		13	24	86.33	8.45
AGS 6		12	22	86.67	11.89
AGS 7		10	19	87.33	12.10
AGS 8		11	23	86.67	9.82
AGS 9		11.67	21.67	86.33	9.34
AGS 10		12.33	22.33	87.00	12.34
AGS 13		9.67	12	74.33	9.44
AGS 14		10.33	19.67	67.67	8.10
AGS 15		12	20.67	87.33	12.37
S.Em±		1.07	0.69	0.68	0.31
CD @5%		NS	2.07	2.05	0.93

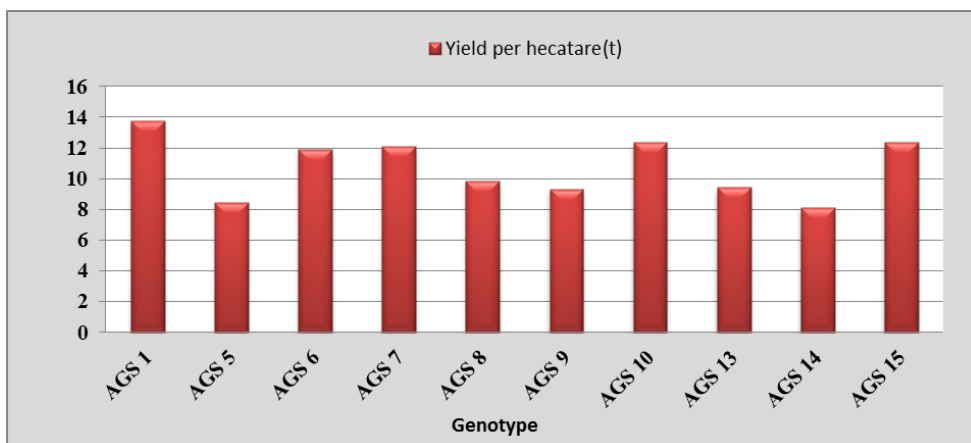


Fig 6: Variation in yield per hectare exhibited by different bachelor’s button genotypes

Conclusion

From the present investigation it could be concluded that among the ten genotypes, AGS-1 found to be vigorous genotype among ten others. The genotype had more of primary and secondary branches, more number of leaves per plant coupled down more number of flowers hence, vigourousness of AGS-1 might be the factor for highest flower yield of AGS-1.

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