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Characterization of A Few Genotypes of *Gomphrena globosa* L. from a Composite Population and their Response to Pinching

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ABSTRACT

The present investigation was carried out in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat, Assam during the year 2021-2022 to study the effect of pinching on different component genotypes of *Gomphrena globosa* cv Choice mix. The experiment consisted of four genotypes G_1 (Purple violet), G_2 (Medium blue pink), G_3 (Light violet) and G_4 (White) and two level of pinching P_0: No pinching and P_1: With pinching. The experiment was laid out in Factorial Randomized Block Design (RBD) with 3 replications. Genotype G_2 recorded the maximum plant height (66.77 cm), plant spread (54.98 cm), number of primary and secondary branches (5.48 and 12.36 cm respectively), number of leaves (376.67), number of flowers per plant (144.95) and stalk length (19.35 cm). Early flower bud initiation (30.72 days) and 50% flowering (48.02 days) were recorded in G_4. Unpinched plants recorded the maximum plant height (63.94 cm), maximum stalk length (19.35 cm), early flower bud initiation (29.63 days) and 50% flowering (46.82 days) whereas, pinched plants recorded the maximum plant spread (58.48 cm), number of primary and secondary branches (5.59 and 12.65 days respectively), number of leaves (383.40) and number of flowers per plant (133.35).

Keywords Characterization, Genotypes, Gomphrena, Pinching.

INTRODUCTION

Gomphrena (*Gomphrena globosa* L.) also known as Bachelor's button, belongs to the Amaranthaceae family. The plant is native to Central America. It is a hardy annual flowering plant with erect branched stems and bushy growth. It produces small oval or round shaped inflorescence of colorful bracts exhibiting various colours like magenta, pink, red, white. It is commonly used as a loose flower in garland making and dried flowers in making flower arrangements and Potpourris. Besides this, the flowers were grown in the herbaceous border, bed, pot and in rock garden. It is used as a dry flower due to its ability to retain its color even after drying. It is a leading commercial dry flower crop with immense export potential (Rathava *et al.* 2021). Magenta flowers are a rich source of Betacyanin which have the potential to be used natural dyes for silks and wool (Cai *et al.* 2005) and also antioxidant rich food colorants (Cai *et al.* 2005).

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Management practices such as pinching is one of the important factor that governs the quality and yield of the flowers. It is a technique of removal of apical buds. Pinching of plants results in better vegetative growth, increase in side shoots resulting in increase in the flower yield. Flower yield and productivity are also greatly influenced by the choice of the variety.

MATERIALS AND METHODS

The present investigation was carried out in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat, Assam during the year 2021-2022. The experiment was laid out in factorial Randomized Block Design (RBD) with 3 replications. The mixed variety of Gomphrena var 'Choice mix' was taken for the experiment. Seeds were sown in the nursery bed in the 1st week of November, 2021 and after one-month seedlings were transplanted in beds in the rows with plant-to-plant distance of 30 cm. At 30 days after transplanting half of the plots were pinched and remaining were left unpinched. Four different component genotypes with different colors (comparing with Royal Horticultural Society color chart) of flowers were observed in the composite population and were evaluated and characterized.

Genotype	Flower color
Genotype 1 (G_1)	N81A (Purple violet)
Genotype 2 (G_2)	68B (Medium blue pink)
Genotype 3 (G_3)	75A (Light violet)
Genotype 4 (G_4)	N155A (White)

The parameters like plant height, plant spread, number of primary branches, number of secondary branches, number of leaves, days to flower bud initiation, day to 50% flowering, number of flowers per plant and stalk length were recorded during the experimental period.

RESULTS AND DISCUSSION

Plant height: Plant height was found to be significantly influenced by pinching and the genotypes (Tables 1– 2). Tallest plants (66.77 cm) were observed in G_2 (Medium blue pink flowers) followed by G_1 (Purple violet flowers) recording 64.18 cm plant height. On the other hand, minimum plant height (50.48 cm)

Table 1. Effect of different genotypes and pinching on the growth and yield of gomphrena.

Treatments	Plant height (cm)	Plant spread (cm)	No. of primary branches	No. of secondary branches	No. of leaves per plant	Days to flower bud initiation	Days to 50% flowering	No. of flowers per plant	Flower stalk length (cm)
Genotypes									
Genotype 1 (G_1)	64.18	52.03	4.67	11.81	376.67	36.85	52.63	127.97	18.20
Genotype 2 (G_2)	66.77	54.98	5.48	12.36	372.97	38.85	55.07	144.95	19.35
Genotype 3 (G_3)	55.50	49.97	4.80	11.60	362.67	32.35	49.42	126.32	16.67
Genotype 4 (G_4)	50.48	43.93	4.25	10.71	347.50	30.72	48.02	99.42	12.43
SE (d)	1.01	1.11	0.17	0.16	6.65	0.81	1.00	2.56	0.54
CD (0.05)	2.18	2.41	0.37	0.34	14.40	1.76	2.16	5.54	1.16
Pinching									
No pinching (P_0)	63.94	41.98	4.02	10.59	346.40	29.63	46.82	115.98	17.17
With pinching (P_1)	54.53	58.48	5.59	12.65	383.50	39.75	55.75	133.35	16.16
SEd (±)	0.71	0.79	0.12	0.11	4.70	0.57	0.71	1.81	0.38
CD (0.05)	1.54	1.70	0.26	0.24	10.19	1.24	1.53	3.92	0.82

Table 2. Interaction effect of different genotypes and pinching on the growth and yield of Gomphrena.

Treatments	Plant height (cm)	Plant spread (cm)	No. of primary branches	No. of secondary branches	No. of leaves per plant	Days to flower bud initiation	Days to 50% flowering	No. of flowers per plant	Flower stalk length (cm)
$G_1 P_0$	68.70	43.00	4.23	10.78	353.00	32.20	48.73	119.20	19.00
$G_1 P_1$	59.67	61.07	5.11	12.83	400.33	41.50	56.53	136.73	17.40
$G_2 P_0$	72.20	44.93	4.22	11.31	357.60	33.73	50.33	134.50	20.00
$G_2 P_1$	61.33	65.03	6.75	13.41	388.33	43.97	59.80	155.40	18.69
$G_3 P_0$	59.00	43.33	3.93	10.53	344.33	27.00	44.73	123.47	17.00
$G_3 P_1$	52.00	56.60	5.67	12.66	381.00	37.70	54.10	129.17	16.33
$G_4 P_0$	55.87	36.67	3.68	9.73	330.67	25.60	43.47	86.77	12.67
$G_4 P_1$	45.10	51.20	4.82	11.69	364.33	35.83	52.57	112.08	12.20
SEd (±)	1.42	1.57	0.24	0.22	9.41	1.14	1.41	3.62	0.76
CD (0.05)	3.08	3.41	0.52	0.49	20.37	2.49	3.06	7.84	1.65

was recorded in G_4 (White flowers).

The unpinched plants recorded the maximum plant height (63.94 cm) as compared to pinched plants (54.53 cm). The interaction between genotype G_2 along with unpinched plants showed the maximum plant height (72.20 cm). However, the minimum plant height (45.10 cm) was recorded in the treatment combination G_4P_1. The difference in height observed among the genotypes might be due to the genetic factor. Similar results were reported by Ashwini *et al*. (2019) and Rathava *et al*. (2021) in gomphrena. The increase in height in the unpinched plants might be due to the effect of apical dominance. Similar findings were reported by Thakare *et al.* (2020), Jena *et al.* (2021) and Nagdeve *et al.* (2021) in annual chrysanthemum; Kumar *et al*. (2022) in marigold.

Plant spread: The data presented on Tables 1–2 showed that plant spread of Gomphrena globosa is significantly influenced by genotypes, pinching and as well as the interaction between the two factors. Genotype G_2 recorded the maximum plant spread (54.98 cm) whereas, the minimum plant spread (43.93 cm) was recorded in G_4. Pinching resulted in bushy plants (58.48 cm) as compared to the unpinched plants. The treatment combination G_2P_1 recorded the maximum plant spread (65.03 cm), whereas G_4P_0 recorded the least (36.67 cm). Genetic factor might be the responsible for the variation in growth characters such as plant spread among the different genotypes. Similar findings were reported by Gulia *et al.* (2017) in marigold and Ashwini *et al.* (2019) in gomphrena. However, the increased plant spread in pinched plants might be due to the removal of apical portion of plant, breaking the apical dominance and thereby resulting in more lateral branching. The results are in conformity with the findings of Thakare *et al.* (2020) in annual chrysanthemum, Yaseen *et al.* (2021) in gomphrena and Kumar *et al.* (2022) in marigold.

Number of primary and secondary branches: Higher production of primary branches (5.48/plant) and secondary branches (12.36/plant) was recorded in G_2, whereas the least (4.25 and 10.71 per plant respectively) were recorded in G_4.

Pinching resulted in more branching (5.59 primary branches and 12.65 secondary branches per plant) compared to unpinched plants. The treatment combination G_2P_1 recorded the maximum (6.75) primary branches (6.75) and secondary branches (13.41) whereas; G_4P_0 recorded the minimum number of primary branches (3.68) and secondary branches (9.73). Similar variation in number of branches among the genotypes were reported by Gulia *et al.* (2017) in marigold, Ashwini *et al.* (2019) and Rathava *et al.* (2021) in Gomphrena. The increase in primary and secondary branches in the pinched plants might be due to the diversion of photosynthates to the axillary buds instead of apical portion and thereby increases the number of branches. Similar results were obtained by Thakare *et al.* (2020) in annual chrysanthemum,

Ehsanullah *et al.* (2021) in chrysanthemum and Kumar *et al.* (2022) in marigold.

Number of leaves per plant: Maximum number of leaves (376.67) were recorded in genotype G_1 which is statistically at par with G_2 (372.97). However, the minimum numbers of leaves per plant (347.50) was recorded in G_4. Pinched plant recorded the maximum number of leaves per plant (383.40) as compared to unpinched plants. The treatment combination G_1P_1 recorded the maximum number of leaves (400.33) whereas, G_4P_0 recorded the minimum number of leaves (330.67). Variations in number of leaves among the different genotype were also reported by Rathava *et al.* (2021) in gomphrena. Increase in number of leaves per plant in pinched plants might be due to the diversion of food materials to the developing auxiliary branches instead of apical portion and thereby results in production of more number of leaves. Similar observations were reported by Ehsanullah *et al.* (2021) in chrysanthemum, Jena *et al.* (2021) in annual chrysanthemum and Kumar *et al*. (2022) in marigold.

Days to flower bud initiation: Genotype G4 took the earliest time for flower bud initiation (30.72 days) whereas, G_2 took the maximum number of days to flower bud initiation (38.85 days). This might be due to the difference genetic trait among the different genotypes and the similar variations were reported by Roopa *et al.* (2018) in chrysanthemum, Naik *et al.* (2019) in marigold and Rathava *et al*. (2021) in gomphrena. Flower bud initiated earlier (29.63 days) in unpinched plants as compared to pinched plants. Treatment combination G_4P_0 recorded the minimum number of days to flower bud initiation (25.60 days). However, G_2P_1 recorded the maximum number of days to flower bud initiation (43.97 days). Delayed in flower bud initiation in pinched plants might be due to the decapitation of apical portion that results in more and longer vegetative growth which delayed the physiological maturity of the plant and thereby delayed the flower bud initiation. Similar results were reported by Jena *et al.* (2021) in annual chrysanthemum, Nakum *et al*. (2022) and Sheoran *et al.* (2022) in marigold.

Days to 50% flowering: Maximum days to 50% flowering (55.07 days) was recorded in G_2 whereas, the minimum number of days to 50% flowering (48.02 days) was recorded in G_4. Delayed in flower bud initiation might also delayed the 50% flowering in G_2. Similar variations among the genotypes were reported by Naik *et al.* (2019) in marigold. Unpinched plants recorded the maximum number of days to 50% flowering (55.75 days) as compared to pinched plants. Treatment combination G_4P_0 recorded the minimum number of days to 50% flowering (43.47 days) which is at par with G_3P_0 (44.73 days). On the other hand, G_2P_1 recorded the maximum number of days to 50% flowering (59.80 days). Delayed in flower bud initiation in turn might have delayed the days to 50% flowering. Similar findings were obtained by Nakum *et al.* (2022) in marigold.

Number of flowers per plant: The perusal of Tables1–2 showed a significant effect on number of flowers per plant. Maximum number of flowers per plant (144.95) was recorded in G_2 whereas, minimum number of flowers per plant (99.42) was recorded in G_4. Increase in number of flowers in G_2 might be due to the production of more number of branches and shoots. Similar observations were reported by Ashwini *et al.* (2019) and Rathava *et al.* (2021) in gomphrena. Pinched plants recorded the maximum number of flowers (133.35) as compared to unpinched plants. Interaction between G_2 and pinched plants recorded the maximum number of flowers per plant (155.40). The increase in the number of flowers in the pinched plants might be due to the formation of more number of branches and shoots which resulted in more number of flowers. Similar observations were reported by Thakare *et al.* (2020), Jena *et al.* (2021) and Nagdeve *et al*. (2021) in annual chrysanthemum

Stalk length: Longest flower stalk (19.35 cm) was recorded in G_2 whereas; G_4 recorded the shortest stalk (12.43 cm). Similar variations in stalk length were reported by Ashwini *et al.* (2019) in gomphrena. Unpinched plants recorded the maximum stalk length (16.16 cm) as compared to pinched plants. G_2P_0 recorded the longest flower stalk (20.00 cm) whereas, G_4P_1 recorded the shortest stalk (12.20 cm) which is at par with G_4P_0 (12.67 cm). The increase in the stalk length in the unpinched plants might be due

to less number of branches as well as the flowers and thereby the food materials are concentrated only on few flowers and also increase its stalk length.

CONCLUSION

From the experiment it can be concluded that Genotype G_2 along with the pinched plants showed superior performance in almost all the growth and yield parameters.

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