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Influence of Pinching, Fertilizer Levels and Growth Retardant Sprays on Seed Yield and Quality in China aster Cv. Phule Ganesh

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ABSTRACT: *Field studies on influence of planting, fertilizer levels and growth retardants on plant growth, seed yield and quality reviled that pinching at 25 DAT with fertilizer application (270:180:100) and foliar spray of MH (500 ppm) followed by CCC (200 ppm) on same day of pinching resulted in marked increase in number of branches, leaves and flowers per plant with higher seed yield and quality. These treatments also significantly increased seed germination and seedling vigour parameters I China aster.*

INTRODUCTION

China aster is an important commercial ornamental annual grown in many parts of the world for cut flowers. It can be successfully grown under different agro-climatic conditions. It is gaining more importance for decorating, preparation of bouquets, garlands in addition to landscape gardening to provide mass aesthetic value. Hence, growing popularity of China aster in most of the major cities in India has lead to its increased area under cultivation as commercial crop for cut flowers. On the contrary, non availability of adequate quantity of quality seeds has become the major constraint in larger cultivation of this flower crop. hence, there is a need to produce adequate quantity of quality seeds of China aster by adopting comprehensive agronomic package of seed production by manipulating number of flower bearing branches by pinching and growth regulators *etc.*

Hence, the present investigation has been made in China aster to ascertain the influence of pinching, fertilizer and growth regulators on seed yield and quality in China aster.

MATERIAL AND METHODS

The field experiment was conducted on China aster Cv. Phule ganesh involving totally 30 treatment combinations with two buds of pinching (P_1 – pinching and P_2-No pinching) as main factor, three levels of fertilizer (F_1 – 180:120:100 kg NPK/ha, F_2-225:150:125 kg NPK/ha and F_3 – 270:180:150 kg NPK /ha) and five growth retadents sprays (S_1 –CCC 100 ppm, S_2 – CCC 200 ppm, S_3 – MH – 500 ppm, S_4 – MH 100 ppm and S_5 – water spray– control). Sufficient numbers of seedlings were raised in nursery and 40 days old two healthy seedlings were transplanted at 45 x 30 cm. The pinching was done after 15 days after transplanting (DAT) and on the same day, growth retardants were sprayed. The seed crop was kept weed free by twice hand weeding need based plant protection measures with Endosulfan 35 EC was taken up. The field was irrigated at an interval of 7 days depending upon soil moisture status.

Field observations were made on 10 randomly selected plants as plant height, number of branches, number of leaves per plant, days to 50 per cent flowering, number of flowers per plant, flower diameter, seeds per flower and seed yield per ha. The observations on seedling length, vigour index (SVI = Germination (%) x seedling length), electrical conductivity were made as per ISTA Rules (Anon., 1996).

RESULTS AND DISCUSSION

In many branching field and horticultural crops beneficial influence of apical bud pinching been established on crop growth, seed yield and quality. In the present study, pinching at 15 DAT resulted in

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decreased plant height (48.38 cm) with increased number of flower bearing branches (11.6), number of leaves (37.16) compared to non pinched plants. The pinched plants took more number of days (90.06) to 50 per cent flowering than non pinched plants (84.16). Decreased plant with apical bud pinching is mainly due to artificial cessation of vertical growth while the increased number of flower bearing branches and number of leaves was mainly due to translocation of photosynthates to leaf auxiliary buds which resulted in production of more number of branches and also more umber of leaves (Seharawat *et al.,* 2003, in marigold, Sudarshan (2004) in fenugreek, Kumar and Singh (2003) in carnation. Delayed flower noticed may be related to pinching effect on altering of source-sink relationship (Arora, 1980 and Grawal *et al.,* 2004).

The seed yield was more ( ) with pinching treatment and was positively associated with mainly number of productive branches ( ) number of seeds per flower (67.71), test weight (2.08 g), seed yield per plant (4.27 g). The increase in seed yield and yield parameters with pinching was mainly due to more accumulation of photosynthates and effective utilization for the development of seeds (Iyyangouda, 2003 and Sudarshan, 2004).

The seed quality parameters with pinching treatment were found to be more as is evident with higher germination (88./26%), seedling length (4.67 cm), vigour index (413), seedling dry weight (16.68 g) with low (1.51 dSm-1) electrical conductivity values. The higher seed quality parameters noticed with pinching may be ascribed to higher assimilation and accumulation of seed results in seeds which are generally utilized during germination and seedling growth.

The application of adequate quantity of fertilizer in any seed crop influences the crop growth, seed yield and quality. The plant height (49.52 cm) at harvest, number of branches (11.66) and leaves per plant (40.61) were more with application of 270:180:100 kg NPK per ha. Similarly, higher seed yield (342.21 kg/ha) was recorded with this dose of fertilizer which may be related to better crop growth, better seed development and more number of filled seeds and 1000 seed weight an account of better growth and photosynthesis and accumulation of food (Doddagoudar *et al.,* 2004 and Akkannavar, 2000).

Seed quality parameters such as germination (88.96%), seedling length (4.74 cm), vigour index (421) and seedling dry weight (17.39 mg) were higher with low EC (1.47 dSm-1) were recorded with application of higher dose of fertilizer. The well developed seeds with higher test weight generally have higher germination and seedling vigour as the food reserves are available in adequate quantity germinating seeds. The present results are also in agreement with the earlier reports of Doddagoudar *et al.* (2004) in China aster and Shivakumar (2000) in marigold.

Foliar spray at higher concentration of MH (1000 ppm) and CCC (200 ppm) found to decrease t5he plant height while MH @ 500 ppm and CCC @ 200 ppm found to increase significantly the number of branches and leaves compared to control. The decreased plant height may be an account of reduction of auxin content in growing tissues due to antagonistic effect and dwarfening properties of growth retardants. While, the increase in number of leaves and branches due to diversion of photosynthates to auxillary buds.

The suppression of vegetative growth and subsequent increase in flower bearing branches resulted in delayed flowering by days.

The pronounced influence of growth retardants on seed yield and yield parameters were noticed in the present study. Significantly maximum (362.28 kg/ha) yield was recorded with MH 500 ppm which may be due to increased number of flower bearing branches, number of flowers per plant, number of seeds per plant (7216) and test weight (2.20 g). Similar beneficial influences were reported by Doddagoudar *et al.* (2002) in China aster.

The seeds obtained from plants sprayed with MH (500 ppm) were better in seed quality with higher (90.72%) germination, seedling length (4.81 cm), vigour index (437), seedling dry weight (17.67 mg) with lower EC (1.45 dSm^{-1}) and the results are in conformity with Doddagoudar *et al.* (2004) in China aster and Akkannavar (2001) in ageratum.

The interaction effect between apical bud pinching and fertilizer levels showed significant effect only on seed yield and yield parameters but not on seed quality parameters. The seed yield was higher (362.21 kg/ha) in pinched plants at higher dose of fertilizer (P_1F_3) which was mainly due to increased availability of nutrients for better growth of plants as seed development which is evident with higher test weight of seed (2.178), number of seeds per flower (69.60) and number of flowers per plant (34.05). Similar results were also reported by Grawal *et al.* (2004) in Chyrasanthemum.

The interaction effect due to pinching and growth regulatos did not show any significant effect on plant weight but relatively decreased plant height waas noticed in pinched plants sprayed with growth

regulators. On the contrary, more number of leaves and branches and flowers were recorded in pinched plants sprayed with MH 500 ppm and CCC 200 ppm which may be related to utilization of photosynthates for production of leaves and branches. The seed yield per hectare was significantly more (395.96 and 341.31 kg/ha) in pinched plants and sprayed with MH (500 ppm) and CCC (200 ppm) respectively which may be related to efficient utilization of photosynthates for production of more number of better developed seed as is evident with higher test weight. The results are in conformity with the report of Khandelwal *et al.* (2003) in marigold.

Similar seed quality parameters with the interaction of pinching and growth regulators were not significantly influenced.

The three way interactions of pinching, fertilizer and growth regulator had no significant influence on plant growth, seed yield and seed quality parameters.

Based on the results of the present study, it may be concluded that pinching at 25 DAT followed by foliar spray of MH (500 ppm) on the same day of the pinching may be practiced to obtain higher seed yield and quality.

Table 1
Effect of pinching and growth retardants spray on plant height, number of branches, number of leaves, days to 50 per cent flowering, number of flowers per plant, number of seeds per flower per flower and seed yield per plant of china aster

Treatments	*Plant height (cm)*	*Number of branches*	*Number of leaves*	*Days to 50% flowering*	*Number of flowers per plant*	*Number of seeds per flower*	*Seed yield per plant (g)*
Pinching (P)							
P_1 – Pinching	44.54	11.60	40.29	90.06	30.78	67.71	4.27
P_2 - No pinching	48.38	9.71	37.16	84.13	26.12	65.66	3.61
Mean	46.46	10.65	38.73	87.10	28.45	66.68	3.94
S.Em±	0.47	0.19	0.44	0.63	0.28	0.56	0.04
CD at 5%	1.33	0.52	1.24	1.78	0.78	1.58	0.11
Growth regulators sprays (S)							
S_1 – CCC 100 ppm	49.61	10.83	39.78	85.77	29.01	67.11	3.97
S_2 – CCC 200 ppm	45.84	11.18	40.17	86.72	30.15	69.00	4.39
S_3 – MH 500 ppm	43.83	12.12	42.20	88.66	31.57	72.16	5.03
S_4 – MH 1000 ppm	40.41	10.08	37.11	91.66	27.56	63.72	3.48
S_5 – Water (control)	52.62	9.05	34.37	82.66	23.95	61.44	2.85
Mean	46.46	10.65	38.73	87.10	28.45	66.68	3.94
S.Em±	0.74	0.29	0.69	0.9959	0.4368	0.8855	0.06
CD at 5%	2.10	0.83	1.95	2.81	1.23	2.50	0.18
Interaction (PxS)							
P_1S_1	47.83	11.93	41.61	88.33	31.62	68.22	4.36
P_1S_2	44.00	12.20	41.31	90.00	32.73	70.00	4.74
P_1S_3	42.02	13.00	43.68	92.00	34.21	73.33	5.49
P_1S_4	38.33	10.93	38.75	95.00	29.61	64.66	3.73
P_1S_5	50.54	9.93	36.12	85.00	25.73	62.33	3.05
P_2S_1	51.40	9.73	37.96	83.22	26.40	66.00	3.59
P_2S_2	47.68	10.17	39.03	83.44	27.57	68.00	4.04
P_2S_3	45.65	11.25	40.71	85.33	28.94	71.00	4.56
P_2S_4	42.48	9.24	35.46	88.33	25.52	62.77	3.23
P_2S_5	54.71	8.16	32.63	80.33	22.17	60.55	2.65
Mean	46.46	10.65	38.73	87.10	28.45	66.88	3.97
S.Em±	1.05	0.42	0.98	1.41	0.62	1.25	0.10
CD at 5%	NS	NS	NS	NS	NS	NS	0.25

NS – Non significant

Table 2
Effect of pinching and growth retardants spray on seed yield per ha, 1000 seed weight, germination (%), seedling length, vigour index, seedling dry weight and electrical conductivity of china aster

Treatments	*Seed yield per ha (kg)*	*1000 seed weight (mg)*	*Germination (%)*	*Seedling length (cm)*	*Vigour index*	*Seedling dry weight (mg)*	*EC (dSm^{-1})*
Pinching (P)							
P_1 – Pinching308.00	2.08	88.26 (69.99)*	4.67	413	16.68	1.51	
P_2 - No pinching	260.50	2.02	86.15 (68.18)	4.58	396	15.74	1.57
Mean	284.21	2.05	87.21 (69.04)	4.63	404	16.21	1.54
S.Em±	2.95	0.01	0.31	0.02	1.65	0.11	0.01
CD at 5%	8.33	0.03	0.88	0.04	4.67	0.32	0.019
Growth regulators sprays (S)							
S_1 – CCC 100 ppm	286.48	2.03	87.61 (69.42)	4.68	413	16.49	1.55
S_2 – CCC 200 ppm	316.15	2.11	88.72 (70.41)	4.71	417	16.93	1.47
S_3 – MH 500 ppm	362.28	2.20	90.72 (72.30)	4.81	437	17.67	1.45
S_4 – MH 1000 ppm	250.93	1.98	85.83 (67.92)	4.57	393	15.91	1.57
S_5 – Water (control)	205.19	1.92	83.16 (65.80)	4.37	362	14.06	1.63
Mean	284.21	2.05	87.21 (69.04)	4.63	404	16.21	1.54
S.Em±	4.66	0.02	0.50	0.03	2.61	0.18	0.01
CD at 5%	13.18	0.048	1.40	0.08	7.39	0.51	0.03
Interaction (PxS)							
P_1S_1	314.13	2.05	88.88 (70.57)*	4.73	424	16.95	1.51
P_1S_2	341.31	2.15	90.00 (71.60)	4.77	426	17.33	1.43
P_1S_3	395.72	2.23	91.77 (73.36)	4.86	448	18.23	1.42
P_1S_4	268.96	2.03	86.66 (68.67)	4.61	400	16.26	1.54
P_1S_5	219.54	1.96	84.00 (66.45)	4.25	368	14.63	1.62
P_2S_1	258.84	2.01	86.33 (68.23)	4.62	402	16.03	1.58
P_2S_2	291.00	2.07	87.44 (69.27)	4.66	409	16.53	1.50
P_2S_3	328.85	2.18	89.66 (71.27)	4.78	426	17.11	1.47
P_2S_4	232.91	1.93	85.00 (67.24)	4.53	385	15.55	1.61
P_2S_5	190.84	1.89	82.33 (65.17)	4.34	356	13.50	1.67
Mean	284.21	2.05	87.21 (69.04)	4.63	404	16.21	1.54
S.Em±	6.59	0.02	0.70	0.03	3.70	0.26	0.02
CD at 5%	18.64	NS	NS	NS	NS	NS	NS

NS – Non Significant * Figures in the parenthesis are arcsine transformed values

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