



Effect of nutrients and growth regulators on seed yield in china aster (*Callistephus chinensis*) cv Poornima

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China aster (*Callistephus chinensis* (L.) Nees) is an annual flower crop of the family Asteraceae and grown commercially for its cut flowers and also for bedding and potting purpose in all parts of the world. In India, it is estimated to be grown in an area of 3000 ha (Chitra and Patil 2007). Due to increase in area under china aster cultivation there is a high demand among farmers for china aster variety of powderpuff types due to their attractive flower form and higher flower yields. Powder-puff flower types have globular flowers with one or more rows of flat and broad ray florets and long, tubular, narrow and showy disc florets of 1.5-2 inches long and arranged in multiple rows. However, tall types with pompon/powderpuff flower forms are poor seed setters (Phetpradap *et al.* 1993). An increase in productivity of flower seed of china aster variety Poornima released from IIHR, Bangalore would reduce the production cost involved in addition to meeting farmers demand. Further, studies to improve seed yield in powderpuff types is meagre. Hence, the present study aimed to study the effect of nutrients and growth regulators on seed yield in china aster in powderpuff type cv Poornima.

A field experiment was conducted at Indian Institute of Horticultural Research, Bangalore during the *rabi* seasons of the years 2006–08, to study the effect of nutrients and growth regulators on seed yield in china aster in powderpuff type cv Poornima. A randomized block design was adopted with ten treatments and four replications. The china aster crop of cv Poornima was raised with treatments consisting of twenty plants in each replication. The treatments included : T₁, Urea (1%); T₂, DAP (1%); T₃, ZnSO₄(0.5%); T₄, K₂SO₄(0.5%); T₅, boric acid (0.1%); T₆, gibberellic acid (150 ppm); T₇, gibberellic acid (200 ppm); T₈, gibberellic acid (200 ppm) + boric acid (0.1%); T₉, paclobutrazol (200

ppm) and T₁₀, control (distilled water). Two foliar sprays of nutrients and growth regulators were given, viz once at one month after planting and a second at fifteen days interval. Forty five days old seedlings were transplanted at a spacing of 60 cm × 30 cm with a gross plot size of 3.3 m² consisting of 20 plants in each plot. Recommended cultural practices were adopted.

Observations were recorded on growth characters such as plant height, number of branches and seed yield parameters, viz number of flower heads/plant, average seed weight/head (g), no. of filled seeds/head, 1 000-seed weight (g), seed weight/plant (g) and seed yield/hectare (kg). The results were subjected to pooled analysis of variance and tested for significant differences (Panse and Sukhatme 1989).

The influence of foliar sprays of nutrients and growth regulators on growth, flowering and seed yield contributing characters are presented as pooled data of two years (2006–08) in Table 1. Foliar sprays of GA₃ recorded significantly higher plant height (56.71 cm) at 150 ppm, GA₃ 200 ppm (56.81 cm) and also in combination with boric acid (0.1%) (57.64 cm). The increase in plant height in GA₃ spray is due to the increase in cell elongation in apical meristem leading to increased internodal length. Similar results of increased plant height were recorded due to GA₃ in china aster by Kumar *et al.* 2009. The increase in plant height due to gibberellic acid is by growth stimulation effecting cell elongation and vertical growth of plants (Doddagoudar *et al.* 2002). ZnSO₄ (0.5%) and paclobutrazol (200 ppm) recorded the least plant height (41.50 cm and 44.35 cm) respectively due to growth retardants exhibiting inhibitory effect by suppressing cell elongation at the meristematic region of growing point. With regard to number of branches/plant and number of flower heads/plant no significant differences existed between the treatments in both the years.

Foliar sprays of nutrients and growth regulators have significantly influenced the number of filled seeds/head. The number of filled seeds/head (main flowers) was higher in paclobutrazol 200 ppm (130), gibberellic acid 200 ppm (130)

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Table 1 Effect of nutrients and growth regulators on growth, flower, yield and seed yield characters in china aster Cv Poornima (pooled data)

Treatment	Plant height (cm)	No of branches/plant	No of flower heads /plant	Seed weight/ head (g)	No of filled seeds/ head	1 000 seed weight (g)	Seed weight/ plant (g)	Seed yield/ ha((kg)
Urea (1%)	44.73	28.28	35.84	0.23	120	2.37	3.63	402
DAP (1%)	51.73	28.33	44.60	0.27	110	2.27	3.92	435
ZnSO ₄ (0.5%)	41.50	31.10	30.08	0.19	84	2.33	3.45	282
K ₂ SO ₄ (0.5%)	51.88	23.33	42.58	0.26	115	2.20	4.09	439
Boric acid (0.1%)	52.95	30.29	42.13	0.30	129	2.20	4.99	554
Gibberellic acid (150 ppm)	56.68	30.00	41.83	0.18	79	2.08	1.60	101
Gibberellic acid (200 ppm)	56.78	28.48	40.38	0.30	130	2.25	2.95	356
Gibberellic acid (200 ppm) + Boric acid (0.1%)	57.64	27.93	35.93	0.28	117	2.37	3.34	371
Paclobutrazol (200 ppm)	44.35	28.28	40.53	0.28	130	2.14	4.59	509
Control (dist.water)	52.45	28.77	40.35	0.24	116	2.18	1.82	201.39
CD (5%)	8.95	NS	NS	0.06	18.43	NS	1.35	145.76

and boric acid 0.1% (129) which were on par with each other and significantly superior to control (116). Foliar sprays of nutrients and growth regulators have significantly influenced seed weight per head. The seed weight/head was superior in all the spray treatments which were significantly superior to control (distilled water) except in the case of gibberellic acid 150 ppm (0.18g) and ZnSO₄ (0.19g). The highest seed weight/head was recorded in boric acid (0.1%) and gibberellic acid (200 ppm) treatments (each 0.30g) which were superior as compared to 0.24g in control (distilled water). Higher number of seeds per flower head and seed weight per flower head in boric acid (0.1%) spray treatment may be accounted for involvement of boron in active partitioning of photosynthates and greater accumulation of food reserves in seed and pollen viability. With regard to thousand seed weight, the pooled data indicated that there were no significant differences between the treatments for the character thousand seed weight.

Pooled analysis of the data of two years indicated that foliar sprays of boric acid (0.1%) twice recorded the highest seed yield per plant of 4.99g (554 kg/ha) followed by paclobutrazol 200 ppm (4.59 g and 509 kg/ha respectively), which was significantly superior to control (distilled water) of 1.86 g/plant (201 kg/ha). The higher seed yield/plant and seed yield/ha in treatments of boric acid (0.1%) and paclobutrazol 200 ppm could be attributed to the higher number of filled seeds/head and seed weight/head (g) recorded in these treatments in comparison to control treatment. Higher seed weight/head and seed weight/plant might be due to better translocation of photosynthates from source to sink in

foliar spray treatments of boric acid. The highest seed yield in boric acid (0.1%) treated plants could be attributed to physiological and biochemical changes caused by boron in the plant tissues by the exogenous application as also noted by Sarkar *et al.* 2007. Foliar application of boron has facilitated in development of cell wall, cell differentiation, root and shoot elongation, ovary development, seed development and maturity. Boron is involved in the carbohydrate metabolism in plants, protein synthesis, seed and cell wall formation, germination of pollen grains and growth of pollen tubes and sugar translocation. Higher seed weight/head and seed weight/plant in paclobutrazol 200 ppm might be due to increase in seed production by exogenous application of growth retardants partitioning more assimilates to the reproductive parts

The present results indicated that foliar sprays of boric acid (0.1%) twice (once at one month after planting and repeat spray after 15 days) recorded the highest seed yield per plant of 4.99g and seed yield of 554 kg/ha followed by paclobutrazol 200 ppm (4.59 g) and (509 kg/ha) respectively which was significantly higher than untreated control (1.82 g/plant and 201 kg/ha) . Hence, in PowderPuff flower type and tall types of china aster cv Poornima , seed yields could be improved to meet farmers demand by foliar sprays of boric acid (0.1%) and paclobutrazol 200 ppm.

SUMMARY

Studies were conducted to study the effect of nutrients and growth regulators to improve seed yield in china aster (Cv Poornima) during *rabi* seasons of 2006–08. The seed

weight/head was superior and significant in 0.1% spray treatment of boric acid (0.38g) compared to control (distilled water-0.24g). The average number of filled seeds per head was highest in paclobutrazol (PBZ) 200 ppm spray treatment (130) which was on par with GA 200 ppm (130) and boric acid (0.1%) and also found to be superior to control (distilled water-116.30). Pooled analysis of data of two years (2006–08) indicated that foliar sprays of boric acid (0.1%) twice (once at one month after planting and repeat spray after 15 days) recorded the highest seed yield/plant of 4.99g and seed yield of 554 kg/ha followed by PBZ 200 ppm (4.59 g) and (509 kg/ha) respectively which was significantly higher (at 5% level of significance) than untreated control (1.82 g/plant and 201 kg/ha).

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