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Effect of seed priming on seedling growth in China aster cv. Kamini

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Abstract
A study was performed to determine the effect of seed priming treatment with different chemicals on seedling growth habit of China aster (*Callistephus chinensis* L. Nees). The experiment was conducted at Horticulture Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.) in 2017-18. The experiment comprises of 8 treatments *viz.* Control, distilled water, 3 levels of GA_3 (100 ppm, 150 ppm and 200 ppm) and 3 levels of $CaCl_2$ (0.1%, 0.2% and 0.3%) and laid out in Randomized Block Design (RBD) with three levels of replications. Seeds primed with GA_3 200 ppm showed best performance in all the growth characters *i.e.* Shoot length, root length, leaf length, leaf width, fresh and dry weight of seedlings over all the treatments. Control (unprimed) seeds failed to exert any significant effect on seedling parameters in China aster cv. Kamini. Thus, priming with GA_3 200 ppm could be used as an effective method to enhance seedling growth in China aster (*Callistephus chinensis* L. Nees) cv. Kamini.

Keywords: China aster, seedling, seed priming, GA_3, $CaCl_2$

Introduction
Seed germination is considered as critical stage in the whole life of a plant (Yang *et al.*, 2008) [15]. Poor seed germination and uneven seedling emergence results into low quality products which leads to financial losses to growers. Several techniques and strategies have been developed to improve seed germination and uniform seedling growth. Seed priming is a pre-soaking seed treatment to improve seed germination and uniform seedling emergence in a wide range of crops (McDonald, 2000) [3]. In seed priming, seeds are partially hydrated so that it activates metabolic activities but prevents redicle protrusion. After seed priming, seeds are re-dried to initial moisture content prior to sowing.
China aster is an annual flowering plant which produces a vast range of colours of flowers and belongs to Asteraceae family. Among annuals, it ranks next to chrysanthemum and marigold (Singh and Sisodia, 2017) [11]. Poor quality seed production of China aster is the main limiting factor in commercial cultivation. The poor quality of seeds is due to unfavourable and adverse environmental conditions during seed production and seed maturation stage. Osmotic adjustment of seeds prior to sowing is a potent way to increase seed germination (Sisodia *et al.*, 2018) [12]. However, plant growth regulators helped in influencing growth and flowering in China aster. Among PGRs, GA_3 at various concentrations influence flowering in China aster (Singh, 2006) [10]. Also, halopriming that includes $CaCl_2$, $CaSO_4$ and NaCl help in preventing radicle protrusion in support of pre-germination metabolic activities (Sisodia *et al.*, 2018) [12]. Though both use of PGRs and halopriming methods are simple and cheap agro-techniques that found suitable to be recommended to the farmer's level owing to better crop stand under various environment conditions. Keeping the ideas in view, the present study was undertaken to determine the effect of seed priming with $CaCl_2$ and GA_3 on seedling growth habit in China aster.

Materials and Methods
The present investigation was carried out at Horticulture Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.) during 2017-18 to evaluate the effect of seed priming treatments on the seedling growth characters in China aster (*Callistephus chinensis* L. Nees) cv. Kamini. The good quality seeds of China aster cv. Kamini were primed in priming chemicals i.e.GA_3 and $CaCl_2$ for 24 hours prior to sowing in the laboratory at room temperature and dried back to minimize the moisture content of seeds. The experiment includes 8 treatments *viz.*, control, distilled water, 3 levels of GA_3 (100 ppm, 150 ppm and 200 ppm) and 3 levels of $CaCl_2$ (0.1%, 0.2% and 0.3%). The seeds were dipped in the priming solution in petri plates and were covered with bloating paper due to light weight of

seeds which makes the seed floating on the solution surface and thus, seeds could not dip properly in the priming solution. Seeds were sown in lines in raised nursery beds during November 2017. Immediately after sowing, paddy straw mulch was covered on beds and light irrigation was given. The seedlings were observed on regular basis to note the growth stage and to see any disease incidence at seedling stage. The seedling behaviour of China aster was carefully observed in the nursery stage to evaluate the effect of seed priming treatments on seedling growth. The growth characters which were observed during seedling stage were root length, shoot length, root-shoot ratio, leaf length, leaf width, fresh weight and dry weight of seedlings and were statistically analyzed.

Results and Discussion

Data showed that seed priming treatment in China aster cv. Kamini influenced several seedling parameters such as shoot and root length, leaf length, leaf width and fresh and dry weight of seedlings (Table 1).

Table 1: Effect of various priming treatments on seedling stage.

Treatment	Shoot length (cm)	Leaf length (cm)	Leaf width (cm)	Root length (cm)	Root: Shoot Ratio	Fresh weight (g)	Dry weight (g)
Control	3.40	2.38	1.07	5.10	0.89	0.23	0.04
Distilled water	3.70	2.41	1.08	5.57	0.91	0.24	0.04
GA_3 100 ppm	5.37	3.78	1.57	6.67	1.51	0.37	0.06
GA_3 150 ppm	6.03	4.46	2.08	6.73	1.73	0.68	0.10
GA_3 200 ppm	6.36	5.31	2.18	8.73	1.99	0.70	0.11
$CaCl_2$ 0.1%	3.77	2.73	1.14	5.63	1.15	0.30	0.04
$CaCl_2$ 0.2%	4.47	3.39	1.52	6.10	1.37	0.37	0.06
$CaCl_2$ 0.3%	5.70	4.00	1.58	6.67	1.52	0.46	0.08
CD at 5%	1.02	0.98	0.41	NS	0.49	0.17	0.03

A significant difference was found with all the parameters in seedling stage due to various priming treatments except root length parameter (Table 1). Results showed that maximum shoot length (6.36 cm) was observed in seedlings that were primed with treatment $GA_3$200 ppm which was found statistically at par with $GA_3$150 ppm (6.03 cm), $CaCl_2$ 0.3% (5.70 cm) and $GA_3$100 ppm (5.37 cm) and minimum shoot length (3.40 cm) was observed with control, as also illustrated by Figure 1. Priming treatment of GA_3 might helped the plants in absorbing more soil moisture and mineral nutrients efficiently and consequently plants grew more luxuriantly as compared to other seed priming treatments whereas, in control poor root growth was reported could be the reason for lesser shoot length. These results were found similar to Anandhi and Rajmani (2012) [1] in glory lily and Pangtu *et al.* (2018) [7] in China aster. Maximum root length (8.73 cm) was also found with treatment GA_3 200 ppm and minimum root length (5.10 cm) was recorded with control (Figure 1).

The increased shoot and root length might be due to enhanced carbohydrate accumulation and increased rate of cell division in shoot and root tips due to response of GA_3. The observed results are confirmation with the work of Montero *et al.* (1990) [5] in antirrhinum, Anandhi and Rajmani (2012) [1] in glory lily and Pangtu *et al.* (2018) [7] in China aster. It was observed that seed priming also influenced significantly root: shoot ratio of seedlings. Maximum root: shoot ratio (1.99) was observed in seed priming with GA_3 200 ppm, whereas, minimum root: shoot ratio (0.89) was recorded in control (Table 1).

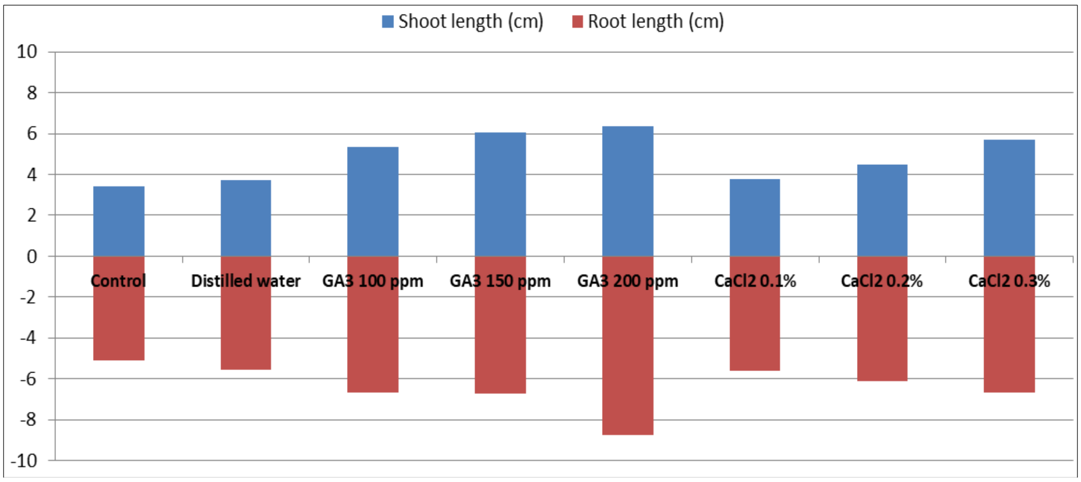

Fig 1: Effect of seed priming on shoot length and root length of seedling.

Among seed priming treatments, maximum leaf length and leaf width (5.31 cm and 2.18 cm respectively) was recorded in seeds primed with GA_3 200 ppm which was found statistically at par with GA_3 150 ppm (4.46 cm and 2.08 cm respectively), whereas, minimum leaf length and leaf width (2.38 cm and 1.08 cm respectively) was recorded with control (Figure 2). Gibberellic acid (GA_3) is often used gibberellins for seed priming as it is known to be involved in plant growth and development by controlling seed germination, leaf expansion, stem elongation and manipulating flowering. An application of GA_3 promoted plant height, number of leaves and length of leaf due to enhanced level of auxin causing increased rate of cell division and cell elongation (Taiz and Zieger 1998) [13]. The findings are in line with Tyagi and Kumar (2006) [14], Sharifuzzaman *et al.* (2011) [9] in chrysanthemum, Girisha *et al.* (2012) [2] in *Aster amellus* L. cv. Dwarf Pink, Rani and Singh (2013) [8] in tuberose and Padhi *et al.* (2018) [6] in gladiolus.

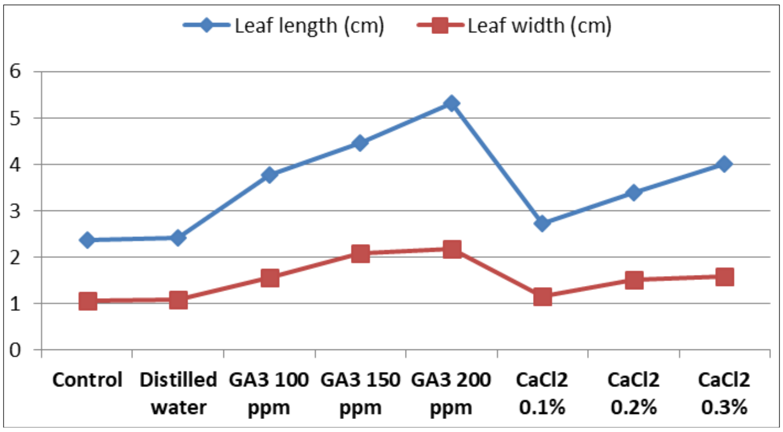

Fig 2: Effect of seed priming on leaf length and leaf width of seedling.

Data appended in Table 1 indicated that seed priming treatments had a significant effect on fresh weight and dry weight of seedling. Results of experiment clearly indicated that maximum fresh weight of seedling (0.70 g) was recorded when seeds were treated with 200 ppm concentration of GA_3 which was found statistically at par with GA_3 150 ppm (0.68 g),whereas, minimum fresh weight of seedling was observed with control (0.23 g), as illustrated by Figure 3.This might be due to increased water uptake of the growing seedlings with response of GA_3which might have activated the enzymes with accumulation of carbohyderates and thus strong seedlings were achieved as a result of better embryo growth, which further leads to increased fresh weight of seedlings. The obtained results were found closer to results observed by Pangtu *et al.* (2018) [7] in Chinaaster.

Similarly, among seed priming treatments, GA_3 200 ppm recorded maximum dry weight of seedlings (0.11 gm) which was found statistically at par withGA_3 150 ppm (0.10 gm) and $CaCl_2$ 0.3% (0.08 g), whereas, minimum dry weight of seedling (0.04 gm) was found in control and distilled water, as indicated by Figure 4.This might be due to the fact that GA_3 is known to pick up the water uptake of the growing seedlings which might have activated the enzymes with mobilization of reserve materials in the embryo and thus strong seedlings were achieved as a result of good embryo growth. This increases the fresh weight of the growing seedlings which is positively correlated with the dry weight of the seedlings. These results of dry weight of seedlings are supported by Pangtu *et al.* (2018) [7].

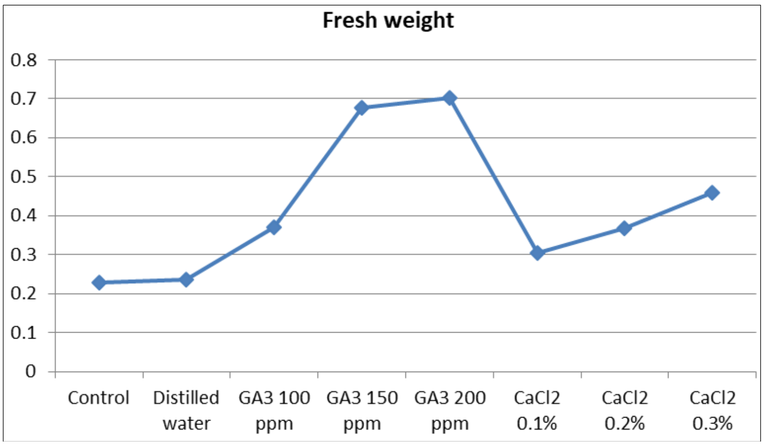

Fig 3: Effect of seed priming on fresh weight of seedling

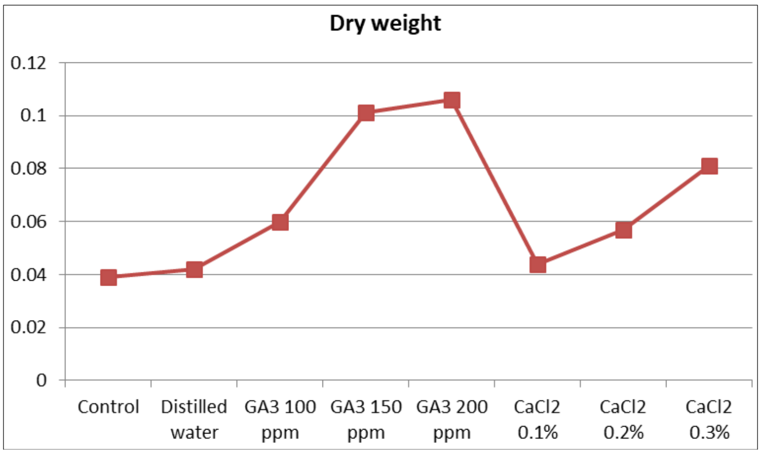

Fig 4: Effect of seed priming on dry weight of seedling

Conclusion

The results of the present study concluded that GA_3 200 ppm influence significantly the shoot and root length of seedlings, leaf length and leaf width and fresh and dry weights of seedlings. Gibberellic acid has a wide adaptability in the horticultural research for it is known to cause on cell elongation in number and size of plant parts, improves the quality of produce and also breaks the dormancy (Misra *et al.*, 1993) [4]. Hence, it can be concluded that seed priming of China aster with GA_3 200 ppm is a promising approach in influencing the seedling growth.

References

1. Anandhi S, Rajamani K. Studies on seed germination and growth in *Gloriosa superba* (L.). Global Journal of Research on Medicinal Plants & Indigenous Medicines. 2012; 1(10):524-528.
2. Girisha R, Shirol AM, Kulkarni BS, Reddy BS, Anupa T. Studies on effect of plant growth regulators on growth, flowering and quality of daisy (*Aster amellus* L.) cv. Dwarf Pink. International Journal of Agriculture Environment and Biotechnology. 2012; 5(2):127-131.
3. McDonald MB. Seed priming. Seed technology and its biological basis, 2000, 287-325.
4. Misra RL, Tripathi DK, Chaturvedi OP. Implication of GA_3 spraying on the standing crop of gladiolus var. Sylvia. Progressive Horticulture. 1993; 25(3):147-150.
5. Montero F, Herrera J, Alizago R. Effect of gibberellic acid and prechilling on dormancy breaking in snapdragon (*Antirrhinum majus*) seeds. Agronomia Costarricense. 1990; 14(1):55-60.
6. Padhi M, Sisodia A, Pal S, Kapri M, Singh AK. Growing media, GA_3 and thiourea stimulates growth and rooting in gladiolus cormels cv. Tiger Flame. Journal of Pharmacognosy and Phytochemistry. 2018; 7(3):1919-1922.
7. Pangtu S, Sharma BP, Dilta BS, Chaudhary SVS. Effect of seed priming on seed parameters of China aster (*Callistephus chinensis* (L) Nees.). Agric International. 2018; 5(1):43-48.
8. Rani P, Singh N. Impact of gibberellic acid pretreatment on growth and flowering of tuberose (*Polianthes tuberosa* L.) cv. Prajwal. Journal of Tropical Plant Physiology. 2013; 5:33-41.
9. Sharifuzzaman SM, Ara KA, Rahman MH, Kabir K, Talukdar MB. Effect of GA_3, CCC and MH on vegetative growth, flower yield and quality of chrysanthemum. International Journal of Experimental Agriculture. 2011; 2(1):17-20.
10. Singh AK. Flower Crops: Cultivation and Management. New India Publishing Agency, New Delhi, 2006, 61-71.
11. Singh AK, Sisodia A. Textbook of Floriculture and Landscaping. New India Publishing Agency, New Delhi, 2017, 304.
12. Sisodia A, Padhi M, Pal AK, Barman K, Singh AK. Seed Priming on Germination, Growth and Flowering in Flowers and Ornamental Trees. *In*: Rakshit A. and Singh H. (Eds). Advances in Seed Priming, Springer, Singapore, 2018, 263-288.
13. Taiz L, Zeiger E. Plant Physiology. Sinauer Associate Inc. Publishers. 2nd Ed, 1998, 792.
14. Tyagi AK, Kumar V. Effect of gibberellic acid and vermicompost on vegetative growth and flowering in African marigold (*Tegetes erecta* Linn.). Journal of Ornamental Horticulture. 2006; 9(2):150-151.
15. Yang QH, Wei X, Zeng XL, Ye WH, Yin XJ, Zhang-Ming W *et al*. Seed biology and germination ecophysiology of *Camellia nitidissima*. Forest Ecology and Management. 2008; 255(1):113-118.