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Seed production of onion as influenced by the application of growth regulators and nutrients

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ABSTRACT

Field experiment was carried out to study the effect of growth regulators and nutrients on onion seed production. Among the sprays, spraying of NAA (100 ppm) at first flower stalk emergence and second spray at 10 per cent flowering stage (*i.e.* 35 and 45 DAP) enhanced seed recovery and yield by 22.7 per cent. The improvement of seed germination and vigour index due to NAA over control was 16 and 55 per cent, respectively. The performance of GA_3 (100 ppm) as foliar spray was found to be the next best. The seed protein content was also 7 per cent higher in NAA (100 ppm) and GA_3 (100 ppm) spray treatments compared to the unsprayed plots. Panchagavya (3 %) spray caused scorching of flower stalk which reduced the formation of new umbellets.

Key words : Onion, Growth regulators, Nutrients, Seed yield.

Onion (*Allium cepa var. aggregatum*) is a common vegetable crop grown in India. Its seed yield unit^{-1} area is comparatively low. To achieve higher productivity, the mother plants could be supplemented with nutrients through foliar sprays which will reduce the loss through absorption, leaching and other processes associated with soil application (Vasilas *et al.,* 1980). It could also bring manifold changes in seed composition and its viability and vigour. The response of onion seed crop to various growth substances has been well documented by many workers. Use of plant growth regulators to the onion crop alters the physiology of crop growth and influences the storage life of bulbs and seeds besides affecting seed quality. The role played by different plant growth regulators differs from each other. In this context, foliar application of growth substances assumes paramount importance for better productivity of the seed crop.

MATERIALS AND METHODS

The field trial was conducted during *rabi* 2003 with COOn5 onion seeds adopting Randomized Block Design and replicated thrice. The crop was raised with recommended package of practices in a plot size 3 x 2.5 m^2 under irrigated condition. Foliar spray of growth regulators and nutrients were given during first flower stalk emergence and 10 per cent flowering stage.

The present study was undertaken with 9 treatments: Control, IAA 100 ppm solution, NAA 100 ppm solution, GA_3 100 ppm solution, Ethrel 100 ppm solution, Boric acid 100 ppm solution, TIBA 50 ppm solution, Cytokinin 100 ppm solution, Panchagavya (3%) solution.

The following observations such as days to 50 per cent flowering, number of umbels plant^{-1}, seedset per cent, number of seeds umbel^{-1} , seed yield umbel^{-1}, seed yield plant^{-1}, germination percentage, seedling length , drymatter production, vigour index and protein content were recorded.

RESULTS AND DISCUSSION

Flowering in onion was mainly induced by low atmospheric temperature ranging from 4 to 15ºC further, higher temperature after floral initiation some times prevent normal development of flower stalks due to abortion of flower initials (Brewster,1994). Attempts have been made to induce flowering in onion through foliar spray with chemicals and growth regulators (Nehra *et al.,* 1992). The greater potentialities of growth regulators for maximizing the yield of vegetable crops have been reported by Maurya and Lal (1987) and Sinha and Pal (1983).

In the present study, the growth regulators and nutrients *viz.* IAA, NAA, GA_3, ethrel, boric acid, cytokinin each at 100 ppm, TIBA 50 ppm and panchagavya 3 per cent spray were evaluated for their efficacy in seed set of aggregatum onion cv. COOn5. The number of days required for flowering varied significantly with respect to the growth regulators and nutrients sprays over control. The minimum days to 50 per cent flowering were exhibited in plants sprayed with NAA at 100 ppm, while maximum days were taken for flowering in control. This might be due to the effect of NAA on auxin production, which changes the meristem from vegetative to reproductive

stage (Chhonkar and Singh, 1962). Salah and Abd (1989) in onion and Hussaini and Babu (2004) in bhendi also reported the increased seed set due to application of NAA. In the present study, the plants sprayed with NAA at 100 ppm recorded maximum number of umbels, seed yield umbel^{-1} and seed yield plant^{-1} and it was followed by GA_3 at 100 ppm (Table 1). Booji (1990) and Aditya and Fordham (1995) in cauliflower and Nehra *et al.* (1992) in onion opined that the better performance of GA_3 might be attributed to the production of healthier plants, higher splitting of bulbs and increasing number of scapes plant^{-1}. Among the evaluated sprays, panchagavya reduced the development of umbels and resulted in reduced seed yield. Albert (2004) reported that spraying of panchagavya enhanced seed set in tomato. The poor seed yield observed in the present study might be due to higher concentration that caused scorching injury of flower stalk reduced the formation of further umbellets.

The resultant seed and seedling quality characters were improved by the foliar spray treatments compared to seeds of unsprayed plants. The germination improvement due to NAA and GA_3 sprays were 16 and 13 per cent, respectively compared to untreated seeds. The seedling vigour observations such as root length, shoot length, drymatter production were also in same trend as that of germination and the improvement of seed vigour due to NAA and GA_3 over control were 55 and 41 per cent, respectively, which could be due to the effect of auxin in increasing the plasticity of the cell wall and their participation in deposition of additional cellulose molecules within the cell wall (Meyer and Anderson, 1955). The favourable effects of NAA on development of tomato roots were also reported by Friedrich (1940). The seed protein content was also 7 per cent higher in NAA (100 ppm) and GA_3 (100 ppm) spray treatments compared to the unsprayed plots. Thus the study highlighted that foliar spray with NAA 100 ppm twice at first flower stalk emergence and 10 per cent flowering stage (35 and 45 DAP) improved the seed yield (656 kg ha^{-1}) and seed quality characters. The performance of GA_3 (100 ppm) as foliar spray was found to be the next best.

Table 1 : Effect of foliar spray on umbel, seed and seedling characters in onion CV. COON5

Treatments	Days to 50% flowering	Number of umbel plant^{-1}	Seed set %	Seed yield umbel^{-1} (g)	Seed yield plant^{-1} (g)	Germination (%)	Root length (cm)	Shoot length (cm)	Dry matter production 10^{-1} seedling (mg)	Vigour index	Protein content (%)
Control	50	5.80	69.1	0.507	2.680	80.0	5.1	6.9	13.4	960	17.7
						(63.43)					(24.88)
IAA 100 ppm	48	6.42	75.4	0.683	2.746	81.0	6.1	7.0	14.2	1061	17.8
						(64.16)					(24.95)
NAA 100 ppm	46	6.80	79.1	0.867	3.490	93.0	7.2	8.8	15.8	1488	19.0
						(74.66)					(25.84)
GA_3 100 ppm	47	6.46	77.0	0.750	3.233	90.0	6.3	8.7	15.5	1350	18.9
						(71.57)					(25.77)
Ethrel 100 ppm	49	6.06	71.7	0.690	2.842	85.0	5.6	7.7	14.7	1137	18.3
						(67.21)					(25.35)
Boric acid 100 ppm	49	6.42	73.1	0.639	2.989	89.0	6.2	7.8	14.8	1257	18.1
						(70.63)					(25.18)
TIBA 50 ppm	48	6.00	75.7	0.567	2.700	81.0	5.7	7.4	14.7	1061	17.8
						(64.16)					(24.95)
Cytokinin 100 ppm	48	6.40	73.4	0.701	2.711	81.0	5.9	7.2	14.4	1058	17.8
						(64.16)					(24.95)
Panchagavya 3%	48	5.90	75.3	0.564	2.690	85.0	5.2	7.7	14.7	1096	17.8
						(67.21)					(24.95)
Mean	48	6.25	74.4	0.663	2.898	85.0	5.9	7.7	14.7	1163	18.1
						(67.21)					(25.18)
S.E. $\pm$	0.797	0.303	1.243	0.031	0.222	2.844	0.401	0.310	0.50	39.43	0.256
C.D. (P=0.05)	1.690	0.642	2.635	0.063	0.471	5.975	0.850	0.657	1.10	83.59	0.543

(Figures in parentheses indicate are sine values)

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