

APPLICATION OF GROWTH HARMONES IN OLERICULTURE

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One of the major problems of Indian agriculture is low productivity. Several factors responsible for low productivity are lack of high yielding varieties (HYVs), lack of fertilizer responsive cultivars, lack of disease/pest resistance cultivars, lack of drought resistant/salt tolerant/cold tolerant cultivars. In India, major occupation is agriculture. Population of India is nearly 120 crores. Due to increase pressure on land through population, industrialization and urbanization, it is not feasible to increase area under vegetables to meet out ever increasing population. So, here comes the role of plant growth regulators (PGRs) for increasing the vegetable production. Every crop plant has potential to produce 20-30 per cent higher yield by the use of growth regulators. Till recently, enhanced yield were achieved through of fertilizers, pesticides, better management and exploitation of genetic resources to develop high yielding varieties.

Plant growth regulators are chemicals which are naturally occurring endogenous hormones or are synthetic PGRs which are potential for improving productivity of different crops; these chemical are applied directly to the target plants to change its life process leading to improve the quality of its produce. Synthetic PGRs cause their effect through changing endogenous levels of naturally occurring hormones and hence modify the growth and development of the plant in desired direction and to a desired extent. Crop productivity depends upon prolonging photosynthesis, delaying senescence, reducing photorespiration, stimulating mineral uptake and invigorating nitrogen metabolism. IAA, GA and phenolics besides cytokinins are reported to stimulates CO₂ fixation and delay senescence. The term plant growth factor is essentially employed for plant hormones/substances of similar effect that are administered to plants. In India, NICO emulsion, Vipul, mixtalol, cytozyme, Humacil are available. Most of these are based on mixing of various aliphatic alcohols.

Functions of growth hormones:

Auxins:

- Germination: IAA, IBA, NPA, 2,4-D are mostly used in soaking seed for germination at low concentrations.
- Flowering: Play florigenic role in day neutral plants. IAA promotes formation of female flowers.
- Parthenocarpy: IBA, NAA produces seedless

fruits, smaller sized by more number.

- Fruit setting: Fruit setting and yield increased with 2,4,5-T. IAA, IBA, NAA increased fruit set.
- Prevention of pre-mature fruit drop by IAA, IBA, 2,4-D and 2,4,5-T.
- Inhibition of prolonged dormancy
- Prevention of leaf fall
- 2,4-D as Selective weedicide
- IAA and kinetin are used in tissue and organ culture

Gibberellins:

- Germination: Increases length of hypocotyls and cotyledonary leaf area.
- Inhibits root growth
- Leaves become broader and enlarged
- Flowering induction in long day plants and in plants requiring cold induction. Also promotes formation of male flowers
- Parthenocarpy in brinjal
- Increased fruit set
- Stem elongation and increased number of internodes
- Breaking dormancy: Potato tubers made to sprout in winter by GA

Cytokinin: Response will vary depending upon the type of cytokinin and plant spp.

- Stimulates cell division
- Stimulates shoot initiation/bud formation in tissue culture
- Stimulates growth of lateral buds-release of apical dominance
- Stimulates leaf expansion resulting from cell enlargement
- Enhances stomatal opening in some spp.

Ethylene: Principle accelerator of abscission. Natural ripening happens due to ethylene.

Abscissic acid:

- Inhibits shoot growth
- Inhibits the effect of gibberellins
- Promotes senescence and accelerates leaf abscission
- Induces flowering during long days in certain short day plant.

Precautions in application of growth regulators:

- Spray in afternoon preferably
- Avoid spray in windy hours

Practical uses in olericulture

Growth regulator	Concentration (mg/l)	Mode of application	Crops	Attributes affected
Cycocel (CCC)	250-500	Foliar spray	Cucurbits, tomato, okra	Flowering, sex expression, fruit yield
Isopropyl-N (3-chlorophenyl)	250	Seed treatment	Okra	Resistance to salt, fruiting and yield
	5000	Dust	Okra	Storage at room temperature
P-chlorophenoxy acetic acid (PCPA)	50	Foliar spray	Tomato	Fruit set, fruiting and yield
2,4-diurophenoxy acetic acid	0.5	Do	Do	do
Ethephon (CEPA)	100-500	Do	Cucurbits, tomato, okra	Flowering, fruiting, sex expression and yield
	1000	Pre-harvest	Tomato, chillies	Fruit ripening, earliness and yield
	2000	Post-harvest	Do	Fruit ripening
GA	10	Foliar spray	Watermelon, tomato	Sex expression, fruiting and yield
	40-100	Seed or foliar	Okra, tomato, brinjal	Seed germination, fruit set and yield
IAA	10-15	Do	Okra, tomato, brinjal, onion, cowpea	do
IBA	25-100	Foliar spray	Lettuce	Growth and yield
MH	50-100	Do	Cucurbits	Flowering, sex expression and yield
	2500-3000	Do	Onion, garlic	Reducing storage losses
Mixtalol	2	Foliar spray	Tomato, chilli, brinjal	Flowering, fruit set and yield
NAA	0.2	Seedling roots	Tomato, brinjal, onion	Growth and yield
	10-20	Foliar spray	Tomato, chilli	Flower drop, fruit set and yield
	25-30	Seed/foliar	Okra, tomato, brinjal, onion, cucurbits	Seed germination, growth and yield
NOA	25-100	Do	Tomato, okra	Germination, growth and yield
Silver nitrate	500	Foliar spray	Cucumber	Induction of males in gynocious lines
Silver thiosulphate	400	Do	Muskmelon	Do
TIBA	25-50	Do	Cucurbits	Flowering, sex expression, yield
Tricantanol	2	Do	Chilli, peas	Fruit set and yield

- Uniformity in spraying and both sides of leaves should be wet
- Add adhesive material like Teepol, Tween-20@ 0.5-1.00 ml/l solution
- Apply at recommended stage of plant growth
- Dissolve chemical completely before use
- Always use fresh solution
- Prepare solution in distilled water
- Use hand automizer to spray fine for better efficacy

- Wash pump after spray

Constraints:

- Difference in sensitivity of plant spp.
- Costly affair
- Sometimes, hazardous to human health
- Lack of knowledge of toxicity and mechanism of action
- Difficulty in determining proper stage of crop growth for application of PGRs.

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