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Research Note :

ROLE OF GROWTH REGULATORS IN PRODUCTION OF ESSENTIAL OILS IN AROMATIC CROPS

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ABSTRACT: The growth and development of aromatic plants, containing essential oil, may be influenced by many factors like genetic, climatic factors and agronomic practices. Among the different management practices, growth regulators influence the essential oil content in the aromatic crops. Most of the growth regulators like gibberellins, brassinolides, kinetins, NAA and CCC are most effective in improving quality of aromatic crops. Use of appropriate growth regulators at optimum concentration and right stage of the crop growth can increase the herbage and essential oil yield of aromatic crops.

Keywords : *Growth regulators, aromatic crops, essential oil.*

The characteristic property of aroma in plants is due to a variety of complex chemical compounds hence aromatic plants are generally referred as 'chemical goldmine'. Aromatic plants are those plants which produce a certain type of aroma. Their aroma is due to the presence of some kind of essential oil with chemical constituents that contain at least one benzene ring in the their chemical configuration. Essential oils are odoriferous and highly volatile in nature, they are insoluble in water and soluble in organic solvents. Many secondary metabolites of plants are commercially important and find used in a number of perfumery, flavouring and pharmaceutical compounds. Nearly 30 per cent of plant families are found to be rich in essential oils (0.01-10 % dry weight). Among 18,000 native species in India, only 1500 species contain aromas, of these only 65 have large demand in world trade. Due to vast area and varied agro-climatic condition, they can be commercially cultivated in different parts of India successfully (Sangwan *et al.,* 11).

Essential oils and aroma chemicals are indispensable in various human activities. They are adjuncts of cosmetics, soaps, pharmaceutical preparations, perfumery, confectionery, ice-cream, aerated waters, disinfectants and *agarbattis* etc. Essential oils of important aromatic crops like vetiver, davana, geranium, palmarosa, citronella,and lemon grass have great demand in our country. Most traded essential oils are Basil, Citronella, Eucalyptus, Geranium, Jasmine, Lavender, Lemon grass, Mint, Sandal wood and Tuberose. Major exporters of essential oil are Brazil, China, India, European Union, USA and Indonesia which account for 66% of essential oil exports. Major importers of essential oils are USA, Japan, Canada, Switzerland accounting for more than 70% of the total volume import. Aromatic crops are grown under an area around 557, 000 hectare with the production of 918, 000 MT, in India area covered is 3710 hectare with 21660 MT production (Anon.,1).

Essential oils are present in different parts of plants viz. leaves, bark, wood, roots, gum, seeds, fruits, rhizomes and flowers etc, which are used in different industries like perfumery, dental care products, pharmaceutical, food beverages, tobacco, adhesive, paper and printing (carbon paper), textile, petroleum and insecticidal preparations.

Growth regulators in essential oil production

Growth regulators can influence essential oil production through modification in plant growth, essential oil biosynthesis and the number of oil storage structures. These plant growth regulators have direct effect on monoterpene metabolism through increased activity of enzymes that synthesize essential oil terpenes leading to accumulation of essential oil. On the other hand, the time of exogenous application and kind of growth regulators can affect essential oil content.

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Table 1: List of the growth regulators for the production of essential oil in aromatic plants.

Crop	Growth Regulator and Inference	References
Bergamot mint	Foliar spray of GA_3 at 200 ppm influences the herbage yield and oil yield.	Dhuhan *et. al.* (4)
Japanese mint	Foliar spray of BAP, Kinetin at 200 ppm and CCC at1000 ppm induces lateral branches and herbage yield.	Farooqi *et. al.* (6)
Sweet marjoram	Foliar spray of GA_3 at 200 ppm influences the herbage and oil yield.	Vasundhara *et. al.* (14)
Lemongrass	Foliar spray of BAP at 60 ppm influences the herbage and oil yield.	Prins *et. al.* (9)
Geranium	Foliar spray of 28-homobrassinoloide at 3µM influences the oil yield and gereniol content.	Swamy and Rao *et. al.* (13)
	Foliar spray of IAA at 100 ppm increases plant stature and herbage yield.	Bhattacharya *et. al.* (3)
Patchouli	Foliar spray of kinetin at 200 ppm induces lateral branches and increase herbage yield.	Bhaskar *et. al.* (2)
Davana	Foliar spray of GA_3 at 200 ppm influences the herbage and oil yield.	Farooqi *et. al.* (5)
Chamomile	Foliar spray of NAA and Spermidine at 50 and 100 ppm influences quality of essential oil.	Sharafzadeh *et. al.* (12)
Rose	Foliar spray of Kinetin (25 ppm), NAA (25 ppm), CCC (3000 ppm) and Alar (5000 ppm) are useful to increase the number of flowers per plant.	Saffari *et. al.* (10)
Tuberose	Foliar spray of GA_3 at 150 ppm influences the production flowers.	Padaganur *et. al.* (8)
Mentha	Spray of 75ppm GA_3 produced 0.85% and 1.94% menthol oil during winter and summer season respectively.	Kumar *et. al.* (7)

Growth promoters like gibberellins influences the internodal elongation and this leads to increase in plant height and promotes more herbage subsequently oil yield (Farooq *et al.,* 5; Kumar *et al.,* 7). Peroxidase activity decreases with retardation of senescence and abscission of leaves by the application of kinetin. Brassinolide might trigger the intrinsic genetic potentiality of plants to produce more essential oil. Higher level of carbohydrates and their possible diversion to secondary metabolism might have contributed to the elevated levels of the essential oil. A direct effect of plant growth regulators on monoterpene metabolism through increased activity of enzymes that synthesize essential oil terpenes leading to accumulation of essential oil was observed in several species of family Lamiaceae. Such a possibility probably exists in the test crop also explaining the higher content of essential oil in the treated plants.

Further extensive research is needed to enjoy the benefit of various growth regulating substances in overall improvement of aromatic crops.

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