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Research note

EFFECT OF CCC, ETHREL AND KINETIN ON QUALITY OF GINGER (*Zingiber officinale* R.)

India ranks among the ginger producing countries contributing to more than 35 per cent of the world production. Kerala is the largest producing state accounting for about 25 per cent of the production in India (George, 1989). The quality of ginger is the most important and critical aspect in the ginger trade especially in the international markets. The content of volatile oil, non-volatile ether extract crude fibre and starch in the rhizome primarily influences the quality of the spice. Cleanliness, phyto-sanitary regulations and the elimination or reduction of microbiological contamination of ginger rhizome are very essential to capture foreign markets.

The information about the role of growth regulators viz., CCC (2-chloro ethyl trimethyl ammonium chloride), Ethrel (2-chloro ethyl phosphonic acid), kinetin (6-furfuryl amino purine) in enhancing quality of ginger is scanty. The quality of potato was improved by the application of CCC (Choudhri *et al.*, 1976). In ginger cv. Rio-de-Janeiro application of the growth regulator Planofix (NAA) resulted in the increased yield of oleoresin (Nair and Das, 1982). An investigation was tharefore undertaken to study the effect of CCC, Ethrel and kinetin on quality of gingar.

The experiment was laid out in a randomised block design which consisted of 11 treatments with thres replications. Each plot consisted two beds of 1x3 m. Rhizome bits of ginger cv. Rio-de-Janeiro were sown on raised beds at a spacing of 25 x 25 cm. Foliar sprays of the growth regulators viz., CCC (100,500 & 1000 ppm), Ethrel (50,100 & 200 ppm) and kinetin (10,50 & 75 ppm) were given three times at 15 days intervals, starting from 70th day after planting. The crop was harvested 240 days after planting. Rhizomes were cleaned, peeled and dried to 10 per cent moisture and subjected to chemical analysis. Volatile oil and non-volatile ether extract were analysed using Clevenger distillation method and Soxhlet distillation method respectively (AOAC, 1975). Determinations of starch and crude fibre were carried out by adopting standard analytical procedures (AOAC 1960, 1975).

The mean values of percentage content of volatile oil, non-volatile ether extract, starch, crude fibre and rhizome yield per net plot ara given in Table 1. The chemical CCC at 100 and 500 ppm increased the volatile oil content of ginger rhizomes. It appears that this increase may be due to blocking of tha biosynthesis of gibberellins (Audus, 1972) which in turn might have increased the volatile oil. However, the highest concentration of the chemical (1000 ppm) appears to reduce the volatile oil content of the rhizomes probably clue to the severe blocking of the biosynthesis of gibberellins. The crude fibre was found to increase progressively in all concentrations of the chemical. This is undesirable when ginger is used for vegetable purpose and as ground ginger. However, the higher content of crude

Table 1

Content of volatile oil, non-volatile ether extract, starch, crude fibre and rhizome yield of ginger

Treatments	Volatile oil (v/w %)	Non-volatile ether extract (%)	Starch (%)	Crude fibre (%)	Fresh rhizome yield per net plot (kg)
1 Control	2.70	8.25	39.70	6.50	12.45
2 Water spray	2.72	8.18	39.99	6.65	14.88
3 CCC 100 ppm	3.15	8.07	38.23	6.95	14.41
4 ,, 500 ppm	3.02	7.50	39.55	7.10	11.53
5 ,, 1000 ppm	2.40	6.55	41.05	7.17	13.07
Means of levels of CCC	2.85	7.37	39.61	7.07	12.00
6 Ethrel 50 ppm	3.30	9.24	40.23	7.10	12.59
7 ,, 100 ppm	2.95	8.61	40.61	7.10	12.39
8 ,, 200 ppm	3.05	8.19	40.27	6.92	9.31
Means of levels of Ethrel	3.10	8.67	40.70	7.04	11.43
9 Kinetin 10 ppm	3.01	8.44	41.76	6.26	12.92
10 ,, 50 ppm	2.91	8.96	42.22	6.73	13.95
11 ,, 75 ppm	2.60	10.60	43.47	6.94	15.03
Means of levels of kinetin	2.83	9.33	42.48	6.44	13.97
CD (0.05) for comparison between treatments	0.14	0.25	1.42	0.33	2.68
CD (0.05) for comparison between growth regulators	0.06	0.15	0.83	0.11	1.54

Volatile oil. non-volatile ether extract, starch and crude fibre are on dry weight basis

fibre has no adverse effect on the extraction of volatile oil. Non-volatile ether extract of the rhizome was not altered significantly by the chemical in all concentrations.

Lower concentrations of Ethrel (50 and 100 ppm) increased the volatile oil and non-volatile ether extract and crude fibre. Since both the aromatic and pungent principles which impart the characteristic flavour of the spice increase, Ethrel is effective in improving the quality of ginger. The high crude fibre content will not adversely affect the extraction of volatile oil and oleoresin in the processing industry. The highest concentration of Ethrel (200 ppm) resulted in more volatile oil but the rhizome yield was significantly reduced by the treatment. The effect of Ethrel in altering the volatile oil, non-volatile ether extract and crude fibre of the rhizome may

be due to the enhanced protein synthesis and synthesis of cellulose hydrolyzing enzyme cellulose (Audus, 1972).

Kinetin at 50 ppm increased volatile oil, non-volatile ether extract and starch. It is notable that the treatment did not increase the crude fibre content significantly, thus having the desirable qualities. Kinetin at 10 ppm increased volatile oil but not the non-volatile ether extract. The chemical at 75 ppm recorded a maximum increase of 23.5 per cent non-volatile ether extract and 20.72 per cent increase in rhizome yield resulting the higher recovery of oleoresin. Due to the increase in rhizome yield the total recovery of volatile oil is also comparable with the treatment Ethrel (50 ppm) which recorded highest content of volatile oil. The increase in the volatile oil, non-volatile ether extract and starch of the rhizome might be due to the effect of the chemical on the regulation of amino acid incorporation into protein as suggested by Audus (1972).

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References

A.O.A.C. 1960. *Official Methods of Analysis,* 9th ed. Association of Official Agricultural Chemists. Washington D. C.

A.O.A.C. 1975. *Official Methods of Analysis* 12th ed. Association of Official Agricultural Chemists, Washington D. C.

Audus, L. J. 1972. *Plant Growth Substances, Chemistry and Physiology* Vol, I 3rd ed. Leonard Hill London.

Choudhri, R. S., Choudhri, R. P. K. and Veeraraghavan, P. A. 1976. Response of potato crop to treatment with absorbic acid and Cycocel. *Indian J. PI. Physiol.* 19:15-19.

George, C. K. 1989. Spices of India—An overview. General papers on spices. Workshop on Strategies for Export Development of Spices. International Spice Fair, Spices Board, Cochin, April 1989.

Nair G. S. and Das, R. C. 1982. Effect of foliar application of urea and Planofix (NAA) on the oleoresin and fibre contents of ginger. *Ginger and Turmeric* Proceedings of the National Seminar on Ginger and Turmeric CPCRI, Calicut, April 1980.