RESPONSES OF TRIACONTANOL IN BIOASSAY SYSTEMS

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SUMMARY

The effect of Triacanthanol (TRIA) was tested in several bioassay systems and its activity compared to that of the commonly known growth regulators viz., Indole-3-yl acetic acid (IAA), Gibberellic acid (GA), and 6-aminofurfuryl purine (Kn). TRIA produced only slight growth responses in these bioassay systems. In combination with other growth substances, TRIA showed a slight synergism. The exact role and mode of action of TRIA in plant growth regulation still remain uncertain.

INTRODUCTION

Triacanthanol, a 30-carbon long chain alcohol, was shown to possess growth stimulating properties (Ries et al., 1976). The substance is widely distributed in the environment mostly as a constituent of plant leaf waxes. It was first isolated from lucerne wax and identified by Chibnall et al. (1933). Growth stimulating property of TRIA was initially discovered when chopped alfalfa plants were used as a substitute for nitrogen fertilisers. Later experiments with rice, corn, tomato, cucumber etc. showed that TRIA, in addition to nitrogen, was also responsible for stimulation (Ries et al., 1976). Synthetic TRIA has also been reported to behave in a similar way and the fact that even low concentrations of \(10^{-8}\)M stimulated growth of plants, tissues, etc. manifold, prompted workers to investigate the nature of growth responses evoked.

Analytical methods for TRIA at the level at which it is effective are not available. In view of this, some standard bioassay procedures were used for comparing responses of TRIA with other growth substances with a view to categorise TRIA action.

MATERIALS AND METHODS

Bioassay for IAA. The wheat coleoptile segment method as described by Nanda and Kaur (1967) was employed. Grains of MACS-9, a pure line wheat variety, were soaked and germinated for 72 h in the dark. The coleoptiles of uniformly grown seedlings were placed on a glass slide and after the removal of 2 mm tip, the first 5 mm segments were excised. These were floated on solutions containing 1% sucrose and known concentrations of IAA and TRIA. Results were recorded after 24 and 48 h incubation in the dark. As no significant increases were recorded after 48 h, further observations were taken only after 24 h.
Bioassay for GA. The method Halevy and Cathey (1960) using cucumber hypocotyls was employed with slight modifications. Seeds of “Poona Khira” variety of cucumber were placed in petri plates on filter papers with 5 ml solution of known concentrations of GA or TRIA or both. They were incubated at 25°C in diffuse white light. Hypocotyl length was noted three and a half days after germination.

Bioassay for Kn. Letham’s method (1971) was used with slight modifications. Seeds of “Punjabi Kalmi” variety of radish were germinated in the dark for 36 h at 25°C. The smaller of the cotyledons was then excised from uniformly grown seedlings and placed in petri plates on filter papers with solutions of known concentration of Kn or TRIA or both and incubated for 48 h in diffused light at 25°C for observations.

RESULTS

From Fig. 1A, it may be seen that there was no significant stimulation of coleoptile growth with TRIA. Combination of TRIA and IAA (Fig. 1B) showed that the effect of IAA was slightly enhanced at concentrations 10^{-7} M, 10^{-6} M and 10^{-5} M IAA, but inhibited at concentrations 10^{-4} M IAA. These results do not suggest the use of such a test for the bioassay of TRIA. Similarly from Figs. 2A, 2B, 3A, 3B, the cucumber hypocotyl growth for the bioassay of GA activity or the radish cotyledon test for Kn activity did not prove satisfactory for the assay. In view of this, it may be concluded that TRIA cannot be compared in the activity with IAA, GA and Kn and the complementary action of TRIA when used in combination with above growth substances was slight. Hence TRIA cannot be categorised into any of the three groups of growth regulators.

![Fig. 1A. Relative activity of IAA and TRIA in the wheat coleoptile segment bioassay system](image)

![Fig. 1B. Activity of TRIA in various combinations with IAA in the same system.](image)
DISCUSSION

The mode of action of TRIA remains obscure. Marcelle and Chrominski (1978) reported negligible response of TRIA on photosynthetic and respiratory activities and Hoagland (1980) and Charlton et al. (1980) failed to see the stimulatory effect of TRIA on germination and early growth of plants.

Our results on rice and tomato seedling growth also showed very little stimulation. To test the sensitivity of TRIA action, therefore bioassay methods were used. Lack of significant response of TRIA in the bioassay systems used in the studies also pointed out lack of activity of TRIA.

We have obtained uniform results with synthetic samples of TRIA and varying results with the natural product. It may be argued that contamination of
TRIA with 1-octacosanol (C-28) at concentrations as low as $2.4 \times 10^{-13}$M inhibited TRIA action (Jones et al., 1979). However, it is difficult to understand as to why synthetic samples showed no stimulation.

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REFERENCES


