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CHANGES IN IAA LEVELS IN RICE DUE TO UREA-CARBOFURAN INTERACTION

In the recent past, phytotonic effects of certain soil applied insecticides have been reported by many workers (Jaiswal *et al*. 1973; Singraram, 1975). Indications of synergism between applied nutrient and soil applied granular insecticides have been observed in many crops (Aquino and Pathak, 1976; Arunachalam and Kalaimani, 1980; Biddappa, *et al*. 1980; Daphiphale *et al*. 1979; Park, 1981; Somasundaram, 1981).

The role of IAA in plants to stimulate the meristematic activity as well as root production is very well known. In the present study an attempt was made to estimate the IAA concentration in rice roots treated with different levels of N and growth stimulating insecticides. Their influence on root production in terms of root dry weight was also assessed.

The experiment was conducted in the wetlands of TNAU, Coimbatore during 1983 wet season (June - Sept.). The soil was clay loam and was medium in N, low in P and high in K with pH of 8.2

The treatments involved factorial combinations of four levels of N as urea (0, 60, 90 and 120 kg N/ha) and three levels of insecticide (no insecticide, carbofuran 3% granules @ 0.75 kg/ai/ha and phorate 10% granules @ 1.0 kg ai/ha). Nitrogen @ 120 kg/ha, carbofuran @ 0.75 kg ai/ha and phorate @ 1.0 kg ai/ha are the recommended rates for medium duriation rice varieties. There were 12 treatments with three replications. The soil was ploughed well, levelled and plots were laid out. Twenty day old IR-20 seedlings were planted and the crop was raised following standard procedures and techniques. The IAA content of fresh roots was estimated at panicle initiation stage employing the method suggested by Dullart (1967) and Gorden and Paleg (1957). The presence of IAA was confirmed by paper chromatography using a solvent system of isopropanol : ammonia : water, 10:1:1 (v/v) for spot development. The IAA spot was identified by Salkowski's reagent (Dullart, 1967) and the Rf values were compared with that of authentic IAA co-chromatographed with the sample. The root dry weight was also recorded at panicle initiation stage.

Nitrogen application increased the IAA content of roots at higher levels. Insecticide application enhanced the IAA content of roots and the highest quantity (387/μg/kg of fresh root) was observed with carbofuran application which was greater than with phorate (342/μg/kg of fresh root) which in turn was greater than in control (267/μg/kg).

Nitrogen-insecticides interaction was found to be synergestic in rice to enhance the IAA concentration of fresh roots as well as to increase the root production. Nitrogen at 120 kg/ha with carbofuran produced the highest content of IAA in roots (456/μg/kg fresh root) which was greater than in the other N-insecticide combinations. Interaction between phorate and N was observed up to 90 kg N/ha. Lee (1976) and Lee and Champman (1977) found that two metabolites of carbofuran (carbofuran phenol and 3-hydroxy carbophenol) were inhibitory to IAA oxidase thus preserving the plant growth hormone at a higher level which was responsible for growth stimulation. It is suggested that

Table.1 Interaction effects of N and insecticides on IAA content and root dry weight at panicle initiation stage

Treatments	IAA content (µg/kg of fresh root)	Root dry weight (kg/ha)
NO. + no insecticde	266	388
NO + carbofuran @ 0.75 kg ai/ha	405	538
NO + phorate @ 1.0 kg ai/ha	271	663
N60 + no insecticide	273	488
N60 + carbofuran @ 0.75 kg ai/ha	348	515
N60 + phorate @ 1.0 kg ai/ha	322	775
N90 + no insecticide	256	813
N90 + carbofuran @ 0.75 kg ai/ha	342	1025
N90 + phorate @ 1.0 kg ai/ha	393	720
N120 +no insecticide	276	913
N120 +carbofuran @ 0.75 kg ai/ha	456	1150
N120 +phorate @ 1.0 kg ai/ha	384	1025
SEM ±	15	58
CD (0.05)	43	170

a similar mechanism could also exist in rice due to application of carbofuran and phorate as well.

The effect of nitrogen insecticides and their interactions on root dry weight was similar to that observed on IAA concentration in fresh roots (Table 1). The results show a definite influence of carbofuran and phorate on root production in rice.

Venugopal (1981) observed similar results. The interaction effects between N and insecticides were also pronounced. Nitrogen at 120 kg/ha along with carbofuran produced the highest amount of roots and the interaction effect at this level was on par with that at 90 kg N/ha. The effect of phorate-nitrogen interaction was beneficial on root production up to 120 kg N/ha.

The phytotonic effects of carbofuran can be attributed to the suppression of enzymaitic degradation of the auxin IAA as reported by Lee (1976) and Lee and Chapman (1977). But the growth promotion due to phorate application needs further elucidation. However, it is apparent that a similar mehchanism exists in the rice plant due to phorate application as well. The data on IAA concentration of rice roots as influenced by phorate application obtained from the present study subscribe to this view.

The beneficial effect on root dry weight due to N-insecticide interaction can be attributed to the enhanced IAA activity in the roots. From the study it can be concluded that nitrogen insecticide interaction was synergistic in rice to enhance the IAA concentration in fresh roots as well as to increase the root

production. Nitrogen at 120 kg/ha with carbofuran @ 0.75 kg ai/ha produced the highest concentration of IAA in roots (456/μg/kg fresh roots) and highest amount of roots (1150 kg dry roots/ha). Interaction between phorate (@1.0 kg ai/ha) and N was observed up to 90 kg N/ha resulting in the production of 393/μg of IAA per kg fresh root.

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