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EFFECT OF DIPTEREX INSECTICIDE ON CARBOHYDRATE, RNA, DNA AND PHENOLIC CONTENTS OF *VIGNA RADIATA* (L.) WILCZEK AND *VIGNA MUNGO* (L.) HEPPER

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Abstract

Use of Dipterex insecticide showed a decrease in carbohydrate, RNA and DNA contents of *Vigna radiata* and *Vigna mungo* with more adverse effects on *V. radiata* specially at higher concentration of insecticide. An increase in total phenolic content was however recorded in the two test species.

Introduction

Dipterex (trichlorophon) is a contact insecticide belonging to organophosphate group used as foliar spray against various insect pests, such as aphids, chewing insect and flies on *Lycopersicon eesculentum, Solanum melongena, Glycine max, Gossypium hirsutum, Oryzae sativa, Capsicum annuum, Solanum tuberosum, Vigna mungo* and *Vigna radiata* (Mishra & Mani, 1994). There are reports where application of insecticides cause adverse effect on various metabolic pathways {Hartado, 1987), reduce nodulation and nitrogen fixation in dry bean (Schnelle & Hersely, 1990), alter nuclear division in maize (McMurphy & Rayburn, 1993) and suppress seedling growth of soybean (Gabr *et al.*, 1988). However, information about the changes in chemical composition of the host induced by pesticides are rather scarce (Berger & Cwick, 1990). The present report describes the effect of dipterex insecticide on carbohydrate, RNA, DNA and phenolic content of *Vigna radiata* (L.) Wilczek and *Vigna mungo* (L.) Hepper plants.

Materials and Methods

Seeds of *V. radiata* and *V. mungo* obtained from the National Institute of Agriculture and Biology, Faisalabad were surface sterilized with 0.1% mercuric chloride for 10 min., followed by washing with sterilized deionized water. The seeds were sown in 16" diameter earthen pots containing 15 kg soil mixed with cow dung manure in 3:1 ratios. Ten seeds were sown in each pot. The pots were regularly watered and kept in a glass house at 30 - 35°C and 50-65 % R.H. Three-week old seedlings were sprayed with dipterex @ 500, 1000 and 1500 ppm solution with the help of a hand sprayer. Unsprayed plant served as control. Treatments were replicated 3 times. Leaf samples were collected randomly after 10 days of spray and carbohydrate (Yemm & Willis, 1956), RNA, DNA (Hutchinson & Muntro, 1961) and total phenol (Swain & Hillis, 1959) contents were detected.

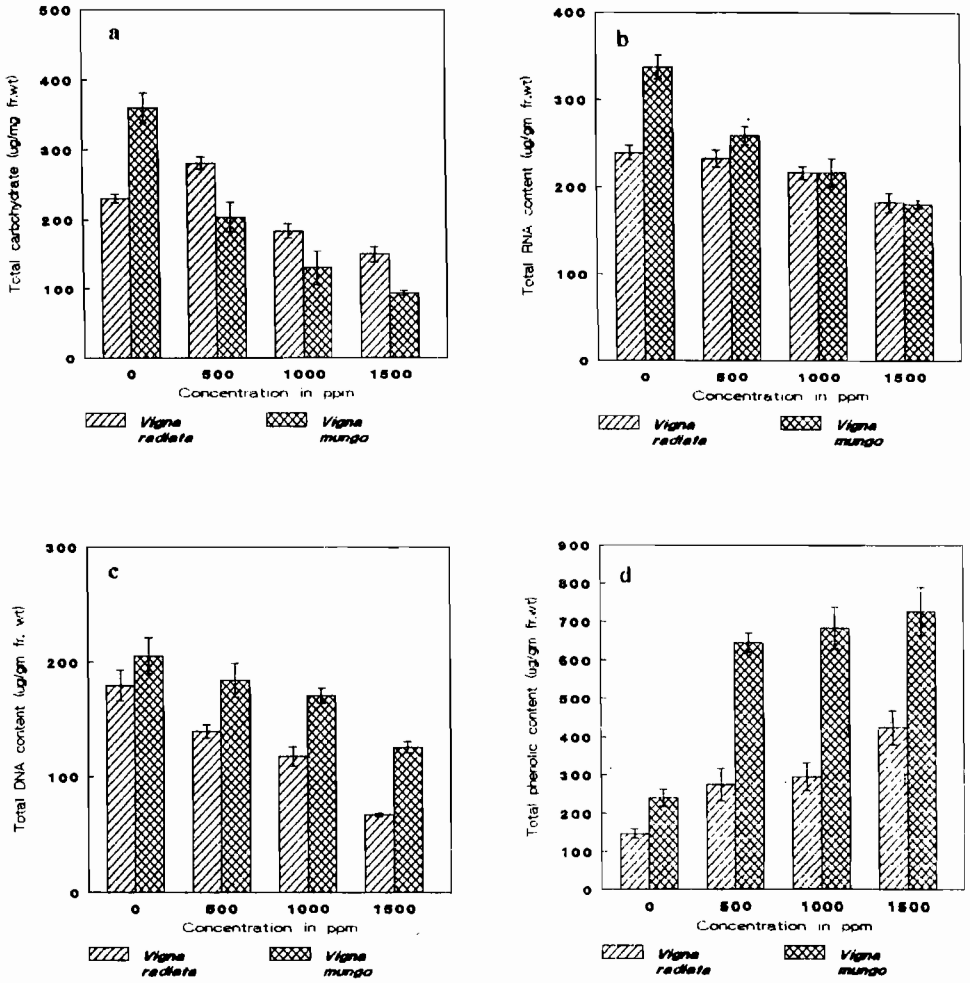

Fig.1. Effect of dipterex insecticide on (a) carbohydrate; (b) RNA: (c) DNA; (d) phenolic contents of *Vigna radiata* (L.) Wilczek and *Vigna mungo* (L.) Hepper.

Results and Discussion

Application of dipterex insecticide showed a significant decrease in carbohydrate content of *V. radiata* except at 500 ppm, where an increase of 21.7% was observed in both *V. radiata* and *V. mungo* over the control (Fig.1a). Maximum decrease (74%) was found in *V. mungo* when treated with dipterex at 1500 ppm. Use of different concentrations of dipterex showed significant linear decline in RNA and DNA content in both the test species (Fig.1b,1c). *V. radiata* was more adversely affected in terms of DNA content showing 62.7% decrease as compared to *V. mungo*

(38.6%) over control at 1500 ppm. A gradual increase in total phenolic content with increasing concentration of dipterex was recorded in the two test species (Fig. 1d). However, maximum increase (187%) was observed in *V. radiata* where 1500 ppm concentration was used.

Increase in total phenolic content in both the test species usually indicates some kind of chemical stress produced by the application of insecticide. It has been suggested that plant sprayed with the chemical pesticides suffer from the chemical stress and phenolic compound produced as a result of the stress may act as protective compound against pest and disease (Friend, 1977; Siddiqui *et al.*, 1997). Stress condition causes abnormal changes in metabolic pathway resulting in production of toxic phenolic compound (Reid *et al.*, 1992). Phytotoxin in the form of phenolic compounds are responsible for limiting cell division, nodulation, respiration, photosynthesis, disruption of cell membrane and reduction in total protein and carbohydrate content of various plant species (Wilson, 1970; Bernestein & Ogata,1966; Hafeez *et al.*, 1988; Siddiqui & Ahmed, 1996; Siddiqui *et al.*, 1997). Consequently, the synthesis of carbohydrate, DNA and RNA may also be affected by the application of insecticide specially at higher concentration.

References

Berger, S and K. Cwick. 1990. Selected aspect of adverse nutritional effect of pesticides. *Ernahrung.*, 14: 411-415.

Bernstein, L and G. Ogata. 1966. Effect of salinity on nodulation, nitrogen fixation and growth of soybean and alfalfa. *Agron. J.*, 58:201-203.

Gabr, M. A., M. A. Shakeeb and I. M. Zid. 1988. Metabolic changes associated with growth of soybean as affected by pre-emergence application of metribuzin. *Can. J. Bot.*, 66: 2380-2384.

Friend, J. 1977. Phenolic substances and plant diseases. Recent Adv. *Phytochem.*, 12:557.

Hafeez, F. Y., Z. Aslam and K A. Malik. 1988. Effect of salinity and inoculation on growth, nitrogen fixation and nutrient uptake of *Vigna radiata*. (L) Wilczek. *Plant & Soil*, 106:3-8.

Hartado, M. E. 1987. *South Syndication Service*, News Bulletin, Deccan Herald, Banglore, India.

Hutchinson, W.C. and H.N. Muntro. 1961. Determination of nucleic acids in biological material. *The Analyst*, 86: 768-815.

McMurphy, L.M. and A.L. Rayburn. 1993. Nuclear alteration of maize plant grown in soil contaminated with coal fly ash. *Arch. Environ. Contam. Toxicol.*, 25: 520-524.

Misra, S.G. and D. Mani. 1994. Pest and Pesticides. In: *Agricultural Pollution* vol. II. Ashish Pub. New Dehli. pp 36-40.

Reid, L. M., D.E. Mather, J. Arnason, T. Hamilton and R. J. Bolton. 1992. Changes in phenolic constituent in maize silk infected with *Fusarium graminearum*. *Can. J. Bot.*, 70: 1697-1700.

Schnelle, M. A. and L. Hersely. 1990. Effect of pesticides upon nitrogen fixation and nodulation in dry bean. *Pestic. Sci.*, 28: 83-88.

Siddiqui, Z. S. and S. Ahmed. 1996 Effect of systemic fungicide on germination, seedling growth and phenolic content of *Vigna radiata*. *Pak. J. Bot.*, 28: 191-193.

Siddiqui, Z. S., S. Ahmed and S. Gulzar. 1997. Effect of topsin-M (Methyl- thiophenate) and Bayleton (Triademifon) on seedling growth, biomass, nodulation and phenolic content of *Sesbania sesban*. *Bangl. J. Bot.*, 26: 127-130.

Swain, T and W. E. Hillis.1959. The phenolic constituent of *Prunus domestica*. *J. Sci. Food Agric.*, 10: 63-68.

Wilson, J. R. 1970. Response to salinity in *Glycine* VI. Some effects of a range of short- term salt stresses on the growth, nodulation and nitrogen fixation of *Glycine wightii* (formerly *javanica*). *Aust. J. Agric. Res.*, 21: 571-582.

Yemm, F.W. and A. J. Willis. 1956. The estimation of carbohydrate in plant extract by anthrone. *J. Biochem.*, 57: 508.

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