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Effect of some commonly used insecticides on phenol content in roots of *Allium cepa*

SANCHITA BHATTACHARYA AND AJAY KRISHNA SAHA
Department of Botany, M.B.B. College, Agartala, Tripura 799109 E-Mail: Sanchita 270873@rediffmail.com/ aks.58@rediffmail.com

Effects of five commonly used insecticides on phenol content of *Allium cepa* roots were evaluated. An increase in phenol content was recorded with the increasing concentrations of all selected five insecticides. However, the pattern of increase was different in different insecticides. Variation in phenol content on roots of *A. cepa* induced by different levels and types of insecticides was statistically highly significant.

Key words: *Allium capa,* phenol, Chlorocid, Fencid, Endosulfan, Malathion, Monocid

INTRODUCTION

Pesticides largely used for plant protection in agricultural practices produce changes in plant metabolism and nutritional patternn. Excess and continuous uses of pesticides cause deficiencies or excess of nutrients diseases in plants (Sharma, 2003). Apart from that insecticides and fungicides can cause chemical stress in plants. This chemical stress in turn affects the secondary metabolism of plants (Lydon and Duke, 2006) and increases the phenolic contents in plant root and shoot system (Siddiqui and Zaman, 2004, 2004). Phenolic compounds produced as a chemical stress can have some adverse effect on physiological and biochemical processes like inhibition of germination and seedling growth (Heisy, 1991). Muscias *et al* (1992) have reported that phenol stresses are resposible for limiting growth, respiration, photosynthesis and disruption of cell membrane in plants. But at the same time phenolic compound may act as protective compound against pathogenic fungi and insects (Friend, 1977). Several works have been carried out to evaluate the effect of pesticides on phenolic content of plants. An increase in phenol content has been recorded in systemic insecticide treated samples of *Vigna radiata* (Siddiqui and Khan, 2001). Insecticide Dimecron reportedly stimulates phenolic content in *Pennisetum americanum* L.(Siddiqui *et al,* 1999). dipterex insecticide can cause increase in total phenol content in *Vigna radiata* and *Vigna mungo* (Siddiqui and Ahmed, 1990). Apart from that some systemic fungicides also reportedly increase in phenol contents in *Zea mays* (Siddiqui and Zaman, 2004). in *Solanum melangena and Avena sativa* (Siddiqui, 1997), in *Vigna radiata* (Siddiqui and Ahmed, 1996) in *Triticum aestivum* (Siddiqui *et al,* 2001; Siddiqui and Ahmed, 2002) and in soybean (Siddiqui and Ahmed, 2006).

MATERIALS AND METHODS

Healthy bulbs of organically produced *Allium cepa* purchased from farmers were grown in sand filled trays for sufficient rootings for five days. Bulbs with healthy roots were selected and thoroughly washed. Five insecticides i.e. Chlorocid (Chloropyriphos 20% EC), Fencid (Fenvelerate 20% EC), Malathion (Malathion 20% EC), Monocid (Monocrotophos 36% EC) and Thiodan (Endosulfan 35%) were obtained from authorized dealers. Based on commercial formulation five different concentration gradients (0.01 ml/l. 0.05 ml/l, 0.1 ml/l, 0.15 ml/l and 0.2 ml/l) were prepared for the five selected insecticides. Selected bulbs were subjected to treatment with five concentration levels of each of the selected insecticide for 6 hrs. After the treatment, roots were excised and total phenol content of the roots of each experimental set along with control set was

Table 1 : Phenol content (mean with SE) in Chlorocid, Fencid, Malathion, Monocid and Thiodan treated samples of *A. cepa* roots.

Insecticides used/ Control	Phenol content (mg/100 g)				
	Concentration levels of Insecticides				
	0.01 ml/l	0.05 ml/l	0.1 ml/l	0.15 ml/l	0.2 ml/l
Control	6.04±0.0044	6.04±0.0044	6.04±0.0044	6.04±0.0044	6.04±0.0044
Chlorocid	6.04±0.0044	6.,05±0.0031	6.18±0.0042	6.25±0.0024	6.25±0.0024
Fencid	6.04±0.0042	6.13±0.0031	6.13±0.0031	6.18±0.0044	6.18±0.0044
Malathion	6.05±0.0031	6.18±0.0042	6.18±0.0042	6.24±0.0037	6.27±0.0054
Monocid	6.05±0.004	6.24±0.0037	6.24±0.0037	6.27±0.0044	6.32±0.0037
Thiodan	6.05±0.002	6.13±0.0037	6.18±0.0024	6.18±0.0042	6.25±0.0024

estimated by standard method (Manickam and Sadasivam, 1996). Relevant statistical tests (AANOVA two way) were also carried out.

RESULTS AND DISCUSSION

Experimental data related to phenol content recorded in different experimental sets were represented in Table 1 and statistical analysis was given in Table 2.

Phenol content increased in all the five tested insecticide treated sample with the increasing concentration, however, the pattern of increase was different. The increase was more marked in Monocid treated samples among five tested insecticides. In Chlorocid and Fencid treated sample no change in phenol content was recorded in 0.01 ml/l concentration level in respect to control set. Phenol content increased from 0.05 ml/l concentration levels. In Chlorocid treated samples similar content was recorded in 0.15 ml/l and 0.2 ml/l levels. But in Fencid treated samples similar phenol content was recorded in 0.05 ml/l and 0.1 ml/l concentration levels and also in 0.15 ml/l and 0.2 ml/l levels. In Malathion, Monocid and Thiodan treated samples phenol content increased with the increasing concentration of tested insecticides in reference to control set. However, in Malathion treated samples similar phenol content was recorded in 0.05 ml/l and 0.1 ml/l concentration levels. Alike in Monocid treated samples similar phenol content was recorded in 0.05ml/l and 0.1 ml/l concentration levels. But in Thiodan treated samples similar phenol content was recorded in 0.1 ml/l and 0.15 ml/l concentration levels. Experimental data revealed an overall increase in phenol content which is at part with findings of earlier workers where insecticide treated plant samples exhibited dose dependent increase in phenol content, (Siddiqui *et al,* 1999; Siddiqui and Khan, 2001; Siddiqui and Ahmed, 1990).

Statistical analyses considering phenol content in each experimental set (ANOVA two way) revealed that calculated F (28.58) for various concentration levels of tested chemicals was much higher than tabulated F (3.00) and hence different concentration levels exhibited highly significant effect on phenol content in roots of *A. cepa*. Similarly calculated F (5.43) for different tested chemicals was slightly higher than tabulated F(3.00) and hence variation of phenol content in case of tested chemicals was also significant.

Table 2 : ANOVA analyses of the data

Sources of Variation	df	SS	MS	F	F0.05
Row	4	0.02478	0.0062	5.4386	3,0069
Column	4	0.13034	0.03259	28.5872	3.0069
Error	16	0.01818	0.00114		
Total	24	0.1733			

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