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The Effect of Insecticide (Malathion) and Biopesticide (Azadirachta indica) on Seed Germination of Broad bean (*Vicia faba* L.)

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Abstract

Malathion is a pesticide that is used to kill insects on agricultural crops and store products. Chemical control of the harmful organism of crop plant is an accepted measure at the present time. Nowadays modern insecticides are used in all over the world. Among the modern insecticides organic phosphate is being extensively used in agriculture, the importance of which is undoubtedly economic due to its low cost and ease of application. But it is now evident that the use of this insecticide has many secondary consequences [Lin et; al.1984 b, Pellegrini and Santi 1972, Talcotl et; al. 1979 a, Toia et; al. 1980]

The insecticide has been shown to causes chromosomal aberrations. The present study was therefore undertaken to examine the effect of insecticide and biopesticide on seed germination of *Vicia faba* L.

Keywords: Malathion, Leaf extract of *Azadirachta indica* and seeds of Broad bean (*Vicia faba* L.)

Material and Method

This experiment was conducted with the seeds of broad bean (*Vicia faba* L.,2n=12) and insecticide Malathion-Diethyl [dimethoxyphosphinothioyl) thio but a mediate, empirical formula is $C_{10}H_{19}O_6PS_2$] and leave extract of *Azadirachta* indica.

Seeds locally brought were cleaned by 0.5% sodium hypochloride solution for five minutes, thoroughly washed and soaked in tap water for 10 hours. Seed coats were removed gently, and seeds were spread in petri dishes, containing cotton beds moistened with test concentration (100,250,500 and 750 ppm). For each concentration, three sets were used, and each petri dish had 25 seeds. A set of 25 seeds were treated with tap water containing 0.25% DMSO (organo-Sulphur compound) for negative control.

For morphological characters, germination percentage and seedling height were determined. Three sets of 50 seeds in each treatment were germinated at 18 ±1 °C in three replications onwet

blotting paper in petri dishes. The data for germination were taken on the 4th day and seedling height was measured on the 10th day.

Discussion and Result

In the present study, the clastogenic effects of insecticide and biopesticide were investigated by *Vicia faba* tests. Many substances have been considered antimutagenic and anticarcinogenic while also having mutagenic or carcinogenic properties (Zeiger 2003). Cytogenic assays have been widely used in the genotoxicity of test compound under in vitro and vivo conditions. Formation of micronuclei end chromosome aberrations are two important cytogenic points that are routinely used in genotoxicity evaluation. Chromosome aberrations are thought two arise from chromosomal breakage and exchange. They act not only as potent toxicants but also as clastogens to the chromosomes in this plant system.

These results might suggest that in animal system, inhalation/absorption of Malathionthrough the skin could have a greater effect than the biopesticides. The death of sprayermen (Malaria Worker) in Pakistan [Baker et; al., 1978], Seed treatment with insecticide and biopesticide had adverse effect on germination and seedling height.

The higher concentration of insecticide and biopesticide reduce the seedling height. The higher concentration of insecticide at 6hrs exposure of all the chemicals treatment reduced seed germination significance and biopesticide also reduce seed germination rates but they are not significant reduction compare to control. Insecticides are known to reduce the seedling height in plants. The various concentrations of the insecticides cause cytotoxicity that may results in cell death, which may appear as decline in the mitotic index. The inhibition of mitotic index can also be attributed to be the effect of environmental chemicals on DNA /protein synthesis of biological system. The similar Results have been reported by [Patraet; al.1997, Chauhan et al;1999, Mansour and Kamel 2005] on *Allium cepa*, *Vicia faba* and Hordeum vulgaris. The treatments at six hours of exposure generally showed maximum and significant inhibition in mitotic index.

Summary

The effect of insecticide (Malathion) has been studied on seed germination of Vicia faba. Malathion is an organophosphate insecticide of low human toxicity. Its chemical formula is $C_{10}H_{19}O_6PS_2$ and biopesticide Azadirachta indica, seeds of *Vicia faba* were treated with a series concentration, running from 100 ppm to 750 ppm for 2,4 and 6 hours. Examination of seed germination in the petri dishes in 3-replications were counted and percentage of seed germination calculated. In general insecticide decrease the germination rate were as the *Azadirachta indica* extract showed the decrease in the seed germination at higher concentration but not significant. Of course, the insecticide treated seeds generally showed the maximum in seed germination at 6 hours of insecticide treatment. The significant reduction in seed germination was observed at higher concentrations (500 and 750 ppm) of insecticide Malathion. The treated seeds with various concentrations of Malathion for different durations revealed that significant reduction in

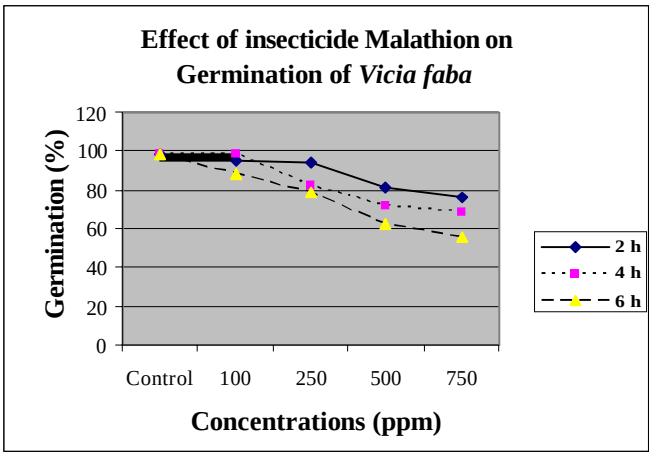
germination at 750 ppm concentration of 4 and 6 hours of exposure. The Azadirachta indica extract did not show any significant effect at any concentration in at any duration of treatment.

Finally, it can be concluded with the data that all concentrations of insecticide and leaf extract of *Azadirachta indica* had no significant difference at lower concentration in the evasiveness of seed germination compared to control, but the higher concentration of Malathion produced significant diminution in comparison to control. In general, it showed that 4 and 6 hours of exposure had the pronounced effect of seed germination.

Table 1.Germination of *Vicia fabaL.* seeds exposed to various concentrations of insecticide Malathion.

Chemicals & Concentration (ppm)	Exposure Time (h)	Germination (%)+ SE
Control	2	98.35 + 0.24
	4	98.56 + 0.52
	6	98.85 + 0.35
Malathion		
100	2	95.36 + 0.25
	4	98.66 + 0.36
	6	88.15 + 0.15
250	2	94.68 + 0.18
	4	82.44 + 0.42
	6	79.25 + 0.36
500	2	81.38 + 0.52
	4	72.40 + 0.75
	6	62.95 + 0.15**
750	2	76.25 + 0.36
	4	68.34 + 0.42*
	6	55.85 + 0.26**

Significant level calculated by New Duncan's multiple tests *p<0.05 **p<0.01



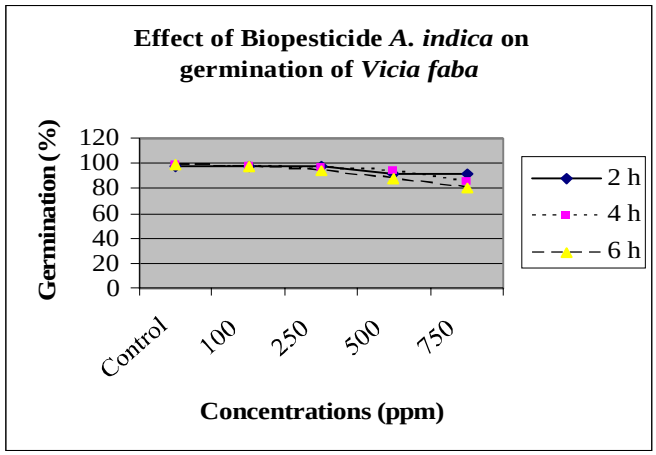


Table 2.Germination of *Vicia faba L.* seeds exposed to various concentrations of *Azadirachta indica*

Chemicals & Concentration (ppm)	Exposure Time (h)	Germination (%)
Control	2	98.35 + 0.24
	4	98.56 + 0.52
	6	98.85 + 0.35
Azadirachta indica		
100	2	98.14 + 0.35
	4	97.85 + 0.42
	6	97.14 + 0.15
250	2	98.35 + 0.64
	4	96.14 + 0.35
	6	93.46 + 0.67
500	2	91.92 + 0.32
	4	94.15 + 0.18
	6	88.42 + 0.48
750	2	91.50 + 0.32
	4	85.45 + 0.48
	6	80.14 + 0.65

Significant level calculated by New Duncan's multiple tests *p<0.05 **p<0.01

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