



CYTOTOXIC EFFECTS OF SOME BIOPESTICIDES ON *Vicia faba* (BROAD BEANS)

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ABSTRACT : The aim of this investigation was to find out the effects of some biopesticides (*Trichoderma* and Neem) at different concentrations on mitotic index and mitotic aberrations on *Vicia faba* L. plants. The poisonous effects of some chemicals used for agriculture practices and responsible for increasing the environmental pollution which is a recent worldwide problem. So that several experiment were taken to find out poisonous activity of chemicals/natural compounds for more ecological safety. Effect of different concentration of biopesticides that is 150ppm, 300ppm, 550ppm and 800ppm for 8 hrs has been observed. The mitotic index decreases due exposure to plant extract in higher concentration and longer duration period. The mitotic index decreases due exposure to *Trichoderma* solution in higher concentration and longer duration period. The mitotic index is minimum at 800ppm concentration of *Trichoderma* (solution) for 8 hrs that is 17.81 which is lower from control that is 22.11. The antimitotic effect was in low frequency at 300 ppm of for, 8 hrs was 21.89, 21.06, 20.95 respectively. While neem was less effective than *Trichoderma* by showing less reduction in MI that is at 800ppm MI is 20.6 which is lower than MI in control.

Keywords : Biopesticides, antimitotic effect, mitotic index.

Biopesticides normally used in the farming practices have chemicals used in control of diseases without observing their negative effects on plants and environment. These days use of biopesticides has become essential. Several chemical compound are present in biopesticides which directly or indirectly effect on mitosis. Cytological bio-assay are helpful in observing cytotoxicity and abnormality due to biopesticides and some chemicals. It was also reported that cytotoxicity can change fertility. But there is requirement of significant analysis on the effect of bio-pesticides on mitostatic behavior chromosomes of *Vicia faba*. Therefore, the aim of the present study was to analyse the cytotoxic effects of biopesticides on mitotic activity of *Vicia faba*. Farmers mostly used pesticide every year. Studies on some chemicals have proved that they are lethal. Cytotoxic effects due to exposure of pesticides has become a major concern to health because of pesticides are broadly use in the agriculture. The studies have reported that there are many plant extracts that have carcinogenic effects when it is used (Ernst, 4; Rietjens *et al.*, 14). The cytotoxic effects can be improved by UV light, and are linked to DNA intercalation that results in mutations. *Vicia faba* L. (2n = 12), self pollinated plant of the

family Fabaceae, (Gulfishan *et al.*, 6). Bioassays like *Alium cepa*, *Vicia faba* are helpful to observe mitotic index chromosome abnormalities because of large chromosome (Asthana and Kumar, 2). Pesticides being used in agricultural tracts are released into the environment and come into human contact directly or indirectly. Increasing incidence of cancer, chronic kidney diseases, suppression of the immune system, sterility among males and females, endocrine disorders, neurological and behavioral disorders, especially among children, have been attributed to chronic pesticide poisoning. Human health hazards vary with the extent of exposure. Moderate human health hazards from the misapplication of pesticides include mild headaches, flu, skin rashes, blurred vision and other neurological disorders while rare, but severe human health hazards include paralysis, blindness and even death. Pesticide pollution to the local environment also affects the lives of birds, wildlife, domestic animals, fish and livestock. The use of un-prescribed pesticides in inappropriate doses is not only disturbing the soil conditions but is also destroying the healthy pool of bio-control agents that normally co-exist with the vegetation. These biocontrol agents are the friends of agriculture and hence need to be nurtured, cared and developed by reducing the reliance on chemical's use in agriculture. The use of synthetic pesticides

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started in 1948-49 with the use of DDT for malaria control and BHC for locust control. Cytological anomalies and chromosomal aberrations were observed and analysed. The pesticides are non-toxic at lower doses while higher doses are clastogenic. The toxicity of pesticides are more considerable. The use of pesticides are known to cause undesired effects on human health and to environment. The indiscriminate use of pesticides should be discouraged as far as practicable. In contrast to pesticides, the biopesticides create uncontaminated environment. The use of biopesticides are either not harmful or comparatively less harmful to agriculture and human health and are also found ecofriendly. The results also indicated if the findings on biopesticides effects are implemented, it will benefit the farmers and in turn the society as a whole.

MATERIALS AND METHODS

Germinated seeds of *Vicia faba* were on moist filter paper in petri-dishes. When germinated seeds having root tips of 1.5 cm length were cut from seeds and treated with different concentration 100ppm, 300ppm, 550ppm, 800ppm for 8 hrs. (Haroun and Al Shehri, 7). Excised tips were fixed in freshly prepared fixative solution acetic alcohol (1:3) for 8hrs. Feulgen squash technique was used and microscopically observed. The percentage of aberrations at each dose of each pesticide was compared with that of the negative control using the one way ANOVA. The data obtained has been given in Table 1 with analysis of the effect of two biopesticides on mitotic index. Statistical analyses signify that all values after 8hrs were significant at p value $P < 0.05$ in comparison to control. All values for 8 hrs, observations were found extremely significant at p value $P < 0.05$ comparison to control.

RESULTS AND DISCUSSION

The results discovered that the occurrence of mitotic index decreases and abnormality of chromosomes increases along with increasing the concentration of pesticides. The mitotic index decreases due exposure to plant extract in higher concentration and longer duration period.

The reduction in mitotic index might be due to clastogenic changes induced by the pesticides extract in chromosomes (Asthana and Kumar, 2). The pesticides have a mitostatic effect on *Vicia faba* cell. The mitotic index is minimum at 800 ppm concentration of *Trichoderma* (solution) for 8 hrs that is 15.89 which is lower from control that is 22.11. The antimitotic effect was in low frequency at 300 ppm of for 8 hrs was 16.12,

respectively. The cytotoxicity level of a pesticides can be analyzed on the basis of decrease in the mitotic index which can be used as a constraint of cytotoxicity. This bioassay is useful in biomonitoring of environmental (Fernandes *et al.*, 5). The analysis confirms the mitotic index higher in low concentration of neem powder solution for 8 hrs that in 300ppm & 550ppm MI observed 22 & 21 while at higher concentration there is reduction in MI that is 20.6 in comparison to control that is 22.11 (Table 1) and this result is similar to the observation of Prasad *et al.* (12). Kim, (9) and Mateuca *et al.* (10). These reduction may be due to the presence of more chemical component which are antioxidant and inhibitory substances in the higher concentrations of pesticides compared to control. It is observed concluded that ethanol extracts of biopesticides can solubilize more antioxidant compounds from various plant species than simple water. However, Sodaiezadeh *et al.* (16) indicated the presence of some inhibitory component which are water soluble. The mutagenic and cytotoxic activity of some chemicals is also observed by using bio assays or Cytogenetic assays for evaluation of these cytological parameters like mitotic index and chromosomal abnormality. the cytotoxic and mutagenic activity of unknown compounds was observed by Seth *et al.* (15) and Andrade *et al.* (1). The analysis also proved that the decreases in MI also influence germination percentage with increase in concentration and exposure time. (Table 1). Which is also observed by Celik and Aslantürk (3) who discovered that root growth rate and cell division decrease parallel to increasing concentration of the chemical. Ilbas *et al.* (8) has also observed that Aloe extract affects cell division which is related to concentrations. Some chemicals and alkaloids have showed an anti mutagenic and mitostatic potential. the solution of Ethanol was establish to be the better solvent for withdrawal of the

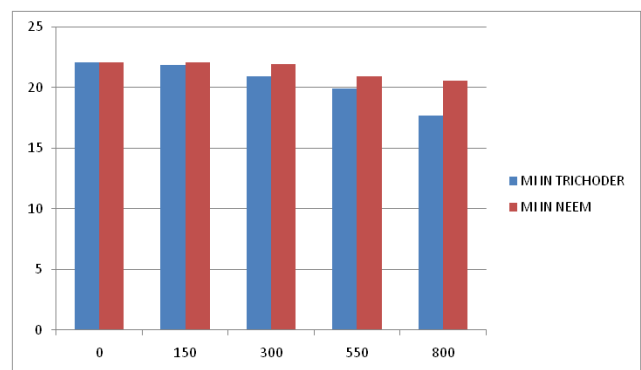


Fig. 1: Effect of different concentration of *Trichoderma* and neem on mitotic index of *Vicia faba* L.

Table 1 : Effects of different concentrations of *Trichoderma* and neem on mitotic index of *Vicia faba* L.

Treatment	Concentration	Nos. of Cell Observed	Nos. of Dividing Cells	Mitotic Index
Control				22.11
<i>Trichoderma</i>	150	1059	232	21.90
	300	1147	240	20.95
	550	995	198	19.95
	800	1025	182	17.75
Mean		1056.50	213.00	20.16
SD		65.75	27.54	1.81
<i>Neem</i>	150	1152	254	22.1
	300	1027	226	22
	550	1165	245	21
	800	1046	215	20.6
Mean		1097.50	235.00	21.43
SD		71.06	17.72	0.74

antioxidant compounds from medicinal plants than water (Mekki, 11; Patel *et al.*, 13). Effect of concentration of biopesticides on mitotic index was in relation to the control (Table.1). This trend of negative effects of plant extract was previously reported by Haroun and Al Shehri (7), Which is similar to the present findings. Tested chemicals showed inhibitory effects on cell division, at high concentrations.

CONCLUSION

All values for 8hrs observations were found extremely significant at p value ($P < 0.05$) comparison to control. This research discovered that a reduction effect in the mitotic index with increase in duration increasing and concentration biopesticides. The chemicals induced reduction in the MI at higher concentrations. The highest concentration biopesticides resulted in the lowest MI. The current findings indicate that the percent of mitostatic effect increase with increasing concentration. *Vicia faba* chromosome examination have shown clastogenic action of biopesticides. Thus, results of the present study indicate that each biopesticides needs certification of lethal properties before their release for commercial use.

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