P: ISSN No. 0976-8602 RNI No. UPENG/2012/42622 VOL.-10, ISSUE-1, January 2021

E: ISSN No. 2349-9443 Asian Resonance

Cytotoxic Effect of Aldrin on Faba Seeds

Paper Submission: 15/01/2021, Date of Acceptance: 29/01/2021, Date of Publication: 30/01/2021

Naina Srivastava
Assistant Professor,
Dept. of Botany,
D.A.V College,
Dehradun, Uttrakhand, India

Abstract

In present study evaluated the cytotoxic effects of Aldrin on the Vicia faba seeds after storage for five months. In the experiment, Aldrin caused losing in the mitotic index accompanied with considerable percentage of chromosomal aberrations. These abnormalities include stickiness, disturbed chromosomes, bridges, lagging chromosomes and micronuclei. The mitotic inhibition in five months was lower. The degree of limit mitotic inhibition reached to 11.75% after treated with insecticide storage for five months.

Keywords: Vicia faba, Aldrin, Chromosome aberration, Cytotoxicity

Introduction

The use of aldrin for the protection of crops and stored seeds or grains from insect pest during the mitotic divisions that may lead to aberration chromosomes. Root tips of Vicia faba were used as an experimental material. Aldrin used in the modern agricultural practices represent a very large input of toxic chemicals in our environment [1.] Their usage has increased manifolds in disease control management without considering their harmful side effects on plants, animals and human beings[2]. Although the use of these chemicals has become essential, but their ingredients have induced acute toxic effects [3, 4]. The toxic effect of Aldrin is not necessarily a result of direct application; some pesticides accumulate into the food to a toxic level and affect the public health [5, 6].

Oblective of Studies

Cytotoxicity inferred when the mitotic index of treated cells was significantly different from the control. It was observed that the overall effects of pesticides/biopeticides used in the present investigation led to genotoxic effects which included various chromosomal aberrations like disturbed metaphase, laggards, stickiness, abnormal anaphase, fragmentation at anaphase against different doses at long period. The pesticides are nontoxic at lower doses while higher doses are clastogenic. Analysis of cytotoxicism indicated correlation between chromosomal damage and toxic effects of pesticides. 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 is either not harmful or comparatively less harmful to agriculture and human health and is 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.

Review of Literature

The use of plant material or crude plant extracts and other chemicals for the crops protection and agriculture products protection from insect pests is as old as crop protection itself [10.] Cytogenetic effects of synthetic chemical used for protection of plants have been well documented. All studies confirm the injurious effects of synthetic chemicals used in agriculture but increase in pollution,that is a global trouble The reality, however, is that biopesticides currently represent only a small fraction of the world pesticide market. The potential of Neem the principal insect-active macrocyclic lactone component of neem seed oil, has broad insecticidal activity that makes it an attractive candidate insecticide for specialty and niche crops.. Because of their high biological activity, and in some cases of their persistence in the environment, the use of pesticides may cause undesired effects on human health and to environment. The heavy metals like cadmium (Cd) and other pollutants in agricultural soils have led to bioaccumulation of various toxicants in food crops. Pesticides are widely used chemical substances throughout the world in agriculture and public health this observation is similar to the Observation made by [11]. Plant test system is broadly used for monitoring cytotoxicity of chemicals because of many recompense such as low cost, easily available,

ease to handle, good chromosome condition for the study of chromosome abnormality and above all better correlation with other test systems [12].Effect of nanomicroparticles on mitotic index was also studied and proved [13].

Matereals and Methods

The Vicia faba (2n=12) seeds were used for all the experiments. Many Vicia faba seeds, weighting 1 Kg, mixed with Aldrin. The seeds aerated for 24 h at room temperature in order to dry and then stored for five months under normal conditions (at 22±1C).Non-treated seeds used as control. At the end of the storage periods, the seeds washed and were soaked in tap water for 24 h, then germinated in rolls of filter paper moistened with tap water. Three replicates were selected (15 seeds/replicate) for each treatment and the control. The roots were cut off when reached, 1.5-3.0 cm in length, fixed in acetic acid-ethyl alcohol (1:3) V/V then hydrolysis in 1N HCL and stained using Feulgen squash technique. Three replicates were selected for each treatment and control, three roots were examined/replicate. All experiments were conducted at room temperature (22±1ºC). The mitotic index and the mitotic inhibition were estimated as follows:

Mitotic index = No.of dividing cells/ No.of dividing cells+ No.of interphase cells.X 100

The mitotic inhibition = (mitotic index in control-mitotic index in treated) X 100

Mitotic index in control Chromosome abnormalities were scored in the pro-meta-and ana-telophase stages.

Results and Discussion

Table represent mitotic activities and chromosomal aberrations induced after Vicia faba seeds treated with Aldrin and storage . Percentage of limit mitotic inhibition slightly improved and reached to 11.75 %. This means that long periods of storage were improved the mitotic index.

From the results obtained the cytogenetic analysis indicated that mode of action for 22±1 toxicity involved disturbance of mitotic processes and induction of cell division aberrations. In the present study, the treatment of faba seeds induced a decrease in mitotic index (Table 1). The reduction in mitotic index suggests that, the cells undergoing mitosis are toxically (cytotoxic) affected by these treatments at end of time storage, the levels of toxicity which appearance various chromosome related to abnormalities increase toxically affected, after the cells exposed to Aldrin The Aldrin effected on percentage of different mitotic phases and abnormalities of phases, the insecticide have slightly decrease effect on ana- telophase stages (Table 1). Low abnormalities were observed in the prophase stage.

Time	% of limited Mitotic inhibition	Prophase % aberration	Metaphase %aberration	Ana-telophase % aberration
Control (normal)	00.00	0.00	0.00	0.00
After Five months storage	11.75	1.58	35.33	9.38

Table 1, Percentage of limit mitotic inhibition, Percentage of mitotic phases and Percentage of abnormal phases in Vicia faba root-tip meristems after seeds treatment with Aldrin and storage for five months.

Most types of chromosome aberrations observed in high percentage were stickiness, disturbance, chromosome bridges in anaphase and telophase, lagging chromosome and micronuclei appearing in interphase cells. Percentage of disturbed reached to 11% after treatment and storage for five months. Stickiness might be due to the effect of pollutants and chemical compounds on the physical-chemical properties of Disturbance during metaphase and anaphase , the insecticide as a toxic agent on formation of the mitotic spindle. Chromosomes bridge during anaphase and telophase raises when the chromosomes fail to separate because of chromosomes stickiness. Chromosome fragment is an indication of chromosome break, and can be a consequence of anaphase/telophase bridges.).Often result from the a centric fragments or lagging chromosomes that fail to incorporate into daughter nuclei during telophase of the mitotic cells and also, it can cause cellular death due to the deletion of primary genes. These abnormalities have also been reported for several extracts and chemicals already investigated as also observed by [7,8,9].

Conclusion

The experiments showed that reduction in the effect of Aldrin lowered according to period of storage. Significantly higher frequencies of cells with mitotic aberrations indicated the action of insecticide to involve chromatin organization and mitotic spindles, leading to the induction of several abnormalities.

Acknowledgement

The author feels privilged to thank the University Grants Commission, New Delhi for providing the financial assistance and necessary facilities to carry out the research project.

References

1. *Crosby G.D. 1981. Pesticides as an environmental muta_gens in genetic toxicology: An agricultural perspective.R.A. Fleck, A. Hollander (Eds.). Plenum Press, N.Y.*
2. *Ajay K.J., Sarbhoy R.K. 1987. Cytogenetical studies on the effect of some chlorinated pesticides I. Effect on somatic chromosomes of Lens and Pisum. Cytologia,52:47–53.*
3. *Amer S.M., Farah O. R. 1974. Cytological effects of pes_ticides. VI. Effects of pesticides "Rodor" on the mitosis of Vicia faba and Gossipium barbadense. Cytologia,39:507–514.*
4. *Badr A., Elkington T.T. 1982. Antimitotic and chromo_toxic effects of isoproturon in A. cepa and H. vulgare.Environ. Exp. Bot., 22:265–270.*
5. *Dryanovska O.A. 1987. Mutagenic effect of the herbicide alachlor during meiosis in Tradescantia paludosa.Acad. Blug. Sci., 40:73–76.*
6. *Cantor K.P., Blair A., Everett G., Gibson R., Burmeis_ter L.F., Brown L.M., Schuman L., Dick F.R. 1992.Pesticides and other agricultural risk*

factors for non_ Hodgkin's lymphoma among men in Iowa andMinnesota. Cancer Res., 52:2447–2455.

7. *Yadav SK (1986). Antimitotic and Cytological Activities of Tropical Forest Tree: Tamarindus indica. J. Trop. Forestry. 2(1): 53-58.*
8. *Nwakanma, N.M.C., P.G.C. Odeigah and B.O. Oboh, 2009. Genotoxic effects of Gongronema latifolium and Vernonia amygdalina using the Allium test. In: BooK of Proceedings, 4th UNILAG Conference and Fair, Nigeria, October 21-22, pp: 81-90.*
9. *Mohamed,F.I. and El-Ashry,Z.M.(2012). Cytogenetic Effect of Allelochemicals Brassica nigra L. extracts on Pisum sativum L. World Applied Sciences Journal 20 (3): 344-353.*
10. *Teerarak, M., Laosinwattana, C. and Charoenying, P. 2010. Evaluation of allelopathic, decomposition and cytogenetic activities of Jasminum officinale L. f. var. grandiflorum (L.) Kob. on bioassay plants. Bioresour. Technol. 101:5677–5684.*
11. *Haroun&. Abualghaith 2015, Evaluation of the Allelopathic Effect of Aqueous Extract of Zygophyllum simplex L. on Vicia faba L.PlantsCytologia 80(3): 363–371*
12. *Rehab M. Rizk; Magda I. Soliman and Eman M. EL-Zayat,(2015)Cytotoxic and Genotoxic Effects of some Narcotic plant extracts using Higher Plant Bioassay Global Advanced Research Journal of Agricultural Science (ISSN: 2315-5094) Vol. 4(11) pp. 748-760,*
13. *Xiaofeng Jiang, Hao Chen, Yuanchen Liao, Ziqi Ye 1, Mei Li, Göran Klobučar 2019 Jul;250:831-838. 2019 Apr 13 .j.envpol. Ecotoxicity and genotoxicity of polystyrene microplastics on higher plant Vicia faba doi: 10.1016/j.envpol.2019.04.055. Epub.*