
Research Article

Determination of LC50 for Profenofos Q (curacron 500 PRO) with germination parameters of *Vigna radiata*, L. seeds

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Abstract

Profenophos EC50 (curcuroc 500 PRO) was used in the experiment with 20 concentration of pesticide in range of 0.01% to 1% to find out LC50 for the test plant *Vigna radiata*, L. grown under laboratory conditions. The parameter used to find out LC50 was germination percentage of seeds after 72 hours of pesticide treatment. The LC 50 is calculated where there is 50 % germination of seeds and was found to be 0.45% of profenofos. The LC 100 (Lethal Concentration) where all seeds failed to germinate was found to be 1% of pesticide concentration. The MAC (maximum allowable concentration) was found to be 0.02% Profenophos.

Keywords: *Vigna radiate*, EC50, LC50, germination, Profenophos

Introduction

The use of pesticides in agricultural crops is of serious environmental concern due to entrance of residues in to food chain. Organophosphates (OPs) are most hazardous pesticides which cause biotype pollution (Gupta,2006) .Profenofos (O-4-bromo-2-chlorophenyl-O-ethyl S-propyl phosphorothioate), is a broad-spectrum organophosphate pesticide used widely for agricultural and household purposes in India. Profenofos (PFF) had been investigated to be highly toxic to different organisms including mammals, insects, and fish .It

also has been classified as moderately hazardous (toxicity class II) pesticide by WHO and it has a moderate order of acute toxicity following oral and dermal administration.(Siddiqui and Ahmed,1999, Parveen et. al.2012, Mishra andMoni,1994, Pandey et al,2011)

The Effective concentration (EC50) and lethal concentration (LC50) are been extensively used to evaluate the suitability of the pesticides for laboratories studies with various seeds of cereals, pulses etc. This will help to find out the concentration of toxic chemicals with which the

seedling characteristics can be studied in laboratory conditions. The guidelines for accurate estimation of EC 50/ LC 50 are already available (Sebaugh, 2010).

A common way of defining LC 50/EC 50 is the 50% response of the test compound to the test organism under laboratory conditions. This is also against the control values where it does not contain any test compound and produces 100% activity studied in the test subject. The LC 100 (lethal concentration 100%) where there is absolute zero activity of the test organism leading to the death/inactivity.

Organophosphates (OPs) are a very important group of pesticides commonly used to protect crops, live stock, and human health and also as warfare. The adverse effects of OPs have been mostly studied in animal. Studies in plant system very rare that with of seedling studies also. The inhibitory effect of OPs mostly depends upon the leaving group which has higher affinity to the enzyme systems.

In order to perform eco-physiological studies with Profenophos EC 50 to the seedlings of *V. radiata* (green gram) the present study has made an attempt to find out the effective concentration of the pesticide.

Materials & Methods

Test Chemical & Concentration: The test chemical, a pesticide, profenophos EC50 (curcuron 500 PRO) was used in the experiment. 20 concentration of pesticide in range of 0.01% to 1% (, 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0%.) were selected to find out the LC 50 of the pesticide..

Test Organism: The prime pulse seed ,*Vigna radiata*, var.PDM 139 Samart commonly used in eastern state of India, particularly in Odisha State has been chosen for study. Healthy seeds of radiation were obtained from OUAT extension Centre, Ratnapur, Ganjam for the experimentation.

Parameter Evaluated:

The parameter used to find out the LC 50 is by the % germination of seeds. Healthy seeds collected for experimentation was surface sterilized with sodium hypochlorite for 10 minutes and were incubated in the dark at 25 ± 2 °C for 03 days (72h).

Experiments were conducted in petriplates (6") with cotton and blotting paper soaked with different concentrations of pesticide. 15 healthy seeds were used to each petriplate to study the % percentage of germination after 24 to 72 hours.

The control set was kept with pesticide free environment. In each concentration of pesticide, three replicate were taken to find out the % of germination of seeds. The seed germinator (**Remi ,C-6**) was used in experimentation with 25 ± 2 ° C temperature 90% humidity and 12 hours light cycle exposure.

Results and Discussion:

The results obtained from the experiment were given in fig No. 1. The control (0 % of pesticide treatment) was taken as 100% seed germination since they are grown with distilled water only. Fig 1 shows the % of germination of mung seeds with respect to % of concentration of pesticide. The LC 50 is calculated where there is 50 % germination of seeds and was found to be 0.45% of profenofos. The LC 100 (Lethal Concentration) where all seeds failed to germinate was found to be 1% of pesticide concentration. The MAC (maximum allowable concentration) was found to be 0.02% profenofos.

The material safety data sheet given by the company malfunctioning profenofos (Curacron 500 PRO) have not studied any toxicity test in relation to seed of any pulse crop. The acute toxicity test was conducted only in experimental mammals like rat and rabbit to calculate the LC 50 concentration of pesticide (Material Safety Data ,2005). Hence, here we have made an attempt to find out the LC50 concentration of pesticide in relation to agricultural crops like pulse seeds under laboratory conditions. Studies conducted by Gvozdenac et al (2013) found that EC50 for Chlorpyrifos was 0.09 ug a.i/L for germination of white mustard and 3.2 ug a.i /L for

maize. The authors have used LC 50 to determine the concentration of pesticide for further

experimentation with those crops.

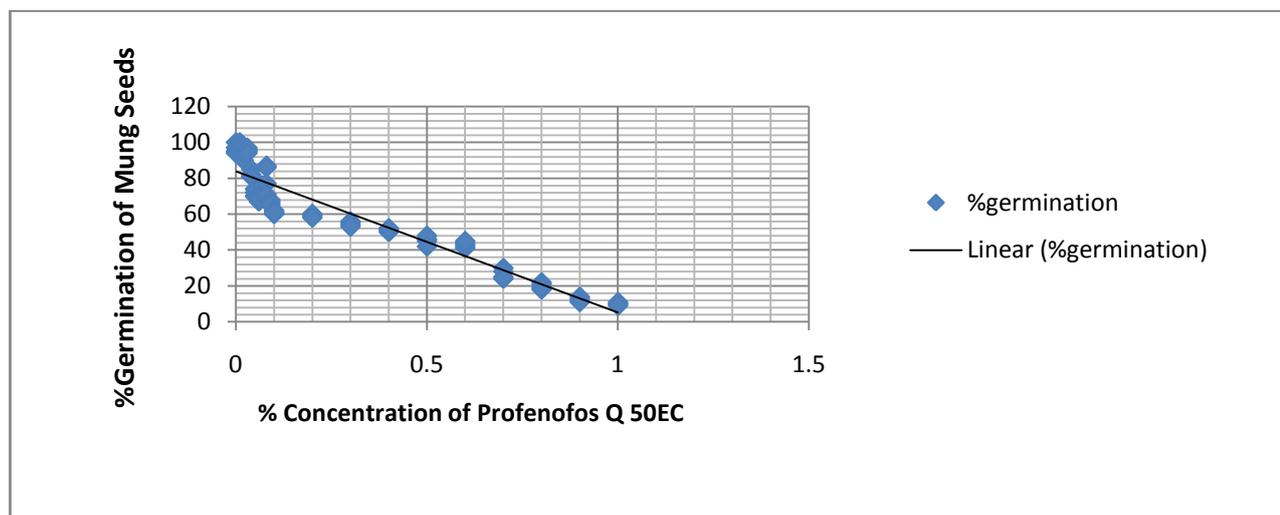


Figure 1 : Effect of % Profenofos concentration on %germination of Mung Seeds after 96 hours
($Y = -78.59x + 83.89$, $r = -0.896$, $P > 0.05$)

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Reference

1. Gupta, R.C. (2006) *Toxicology of Organophosphate & Carbamate Compound*. Elsevier Academic press.
2. Gvodenac,S,Indic,D and Vukovic,S: (2013) Phytotoxicity of chloropyrifos to white mustard (*sinapis alba,L.*) and Maize (*Zea mays,L.*): Potential indicators of insecticide presence in water, *Pestic Phytomed.* (Belgrade), 28(4), 265-271
3. Mishra, S.G, and Mani, D: (1994) Pest and Pesticides, in *Agricultural Pollution*, Vol.II, Ashish Publications, New Delhi, 36-40
4. Pandey, A.K., Nagpurea, N.S., Trivedi, S.P., R.Kumar and Kushwaha,B: (2011) Profenophos induced DNA damage in fresh water fish, *Channa punctatus*(Bloch) using alkaline single cell gel electrophoresis, *Mutation Research*, 726, 209-214
5. Parween,T, Mahomooduzzafar,S.J. and Fatima,T: (2012) Evluation of oxidative stress in *Material Safety Data* , *Vigna radiata, L.* in response to Chloropyrifos, *Int. J. Env. Sci., &Technol.*, 9,605-612
6. Sebaugh,J,L.: (2011) Guidelines for accurate EC50/LC 50 estimation , *Pharmaceutical Statistics* ,10,128-134
7. Siddiqui,Z,S, and Ahmed,S: (1999) Effect of Diterex insecticide on carbohydrate,RNA,DNA and phenolic contents of *Vigna radiata,L.* Wilczek and *Vigna mungo,L. hepra*, *Pak. J. Bot.*, 31(1),93-96
8. *Material Safety Data Sheet for Profenofos Q* by Syngeta Crops Protection pty Company, NSW,2113,Vol.3,1-3,2005