
**SOIL POLLUTION DUE TO COMMON PESTICIDES: A MAJOR CONCERN TO THE FARMER
COMMUNITY OF M.P., INDIA.**

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Abstract

A 28 days experiment was conducted to investigate the impact of three different pesticides-Triazophos, Cypermethrin and Vitavex belonging to three different families of chemicals on the germination of wheat Var. Lok-1. Different concentrations (0.1, 0.5 and 1ppm) of the pesticides were applied on the crop under field conditions. First treatment was given directly to the soil and in the second case, sowing was done after a gap of 40 days of application. The results showed insignificant relation between the concentration of pesticide and the germination percentage in both the cases. In all the cases germination completed in initial 7-8 days. Triazophos (0.5ppm) and Cypermethrin (0.1ppm) proved a little toxic while Vitavex (0.5 and 1ppm) increased the Germination Rate Index (GRI) on direct application furthermore after 40 days of sowing, only Cypermethrin (1ppm) proved toxic while Vitavex 1ppm was the only treatment that significantly increased the Germination Rate Index.

Key words: Pollution Pesticide Cypermethrin Germination Wheat

Introduction

Soil is the biologically active, structured porous medium that results by the dynamic interaction between the atmosphere, biosphere, lithosphere and the hydrosphere and is capable of supporting life. It is the thin layer of organic and inorganic materials that covers the Earth's rocky surface, The organic portion, which is derived from the decayed remains of plants and animals and the inorganic portion made up of rock fragments, was formed over thousands of years by physical and chemical weathering. Productive soils are necessary for agriculture to supply the world with sufficient food.

There are different chemicals like Petroleum hydrocarbons, heavy metals, pesticides and solvents which are commonly involved in soil pollution. In agricultural areas worldwide, there is an increasing concern about soil contamination due to the widespread use of insecticides (Zhou et al., 2006; Reinecke and Reinecke, 2007; De Silva and van Gestel, 2009), herbicides, fungicides and other pesticides which result in diminishing yields season after season. The overdose of chemical pesticides retains the residue in soil even though, it is not always the case as pesticide movement and degradation rates vary depending on leaching, ability of a pesticide to bind with soil, volatilization, microbial degradation, chemical degradation, photo-degradation and pesticide persistence. Approximately 4.6 million tons of chemical pesticides are annually sprayed into the environment and only 1% of the sprayed pesticide is effective, while the other 99% is released to non-target bodies such as soils, water, and atmosphere, which increases the risk of human pesticide poisoning and death (Zhang et al, 2011).

Left over pesticide in soil distress the water potential reducing the nutrient uptake from the surrounding soil (Rengel & Wheal 1997) influencing the uptake of cations such as Zn, Cu and Mn etc (Tester, 1990). Thus the inability of plants to take up the essential micro nutrients may be due the presence of pesticide residues in soil and the nutrient deficiency so created might be reflected in the abnormality in the different growth parameters (Zamin & Soaliha 2006) like Seed germination, Seed vigor, Plant growth, yield parameters etc.. The present study was taken to evaluate the effect of three different synthetic pesticides Cypermethrin, Triazophos and Vitavex on the germination of wheat seeds in Soil.

Material and methods:

The present study was conducted in the field of Department of Botany, Madhav Science P.G. College Ujjain, M.P.. The solutions of the three selected pesticides with three different concentrations (0.1, 0.5 and 1ppm)

were prepared in distilled water. Measured quantity of soil (10 kg fresh wt., 7500gms dry wt.) prepared was filled in polythene bags of similar size. Randomization of the Experiment was ensured through completely randomized block design. Three replicates for each of the nine treatments and a control were used. Bigger and healthy seeds were selected from the certified seed lot obtained from Vasundara seeds among which 15 seeds were sown in each poly bag at a depth of 1 inch on 28th Nov.2014. The temperature ranged from 13.5°C to 33°C ± 1°C with a humidity of 39.214 % ± 12.01 to 68.35% ± 4.66 Soil pH was found to vary from 7.0 to 7.4. Germination percentage was evaluated according to the formulae

$$\text{Germination \%age} = \frac{\text{No. of germinated seeds}}{\text{Total No. of seeds}} \times 100$$

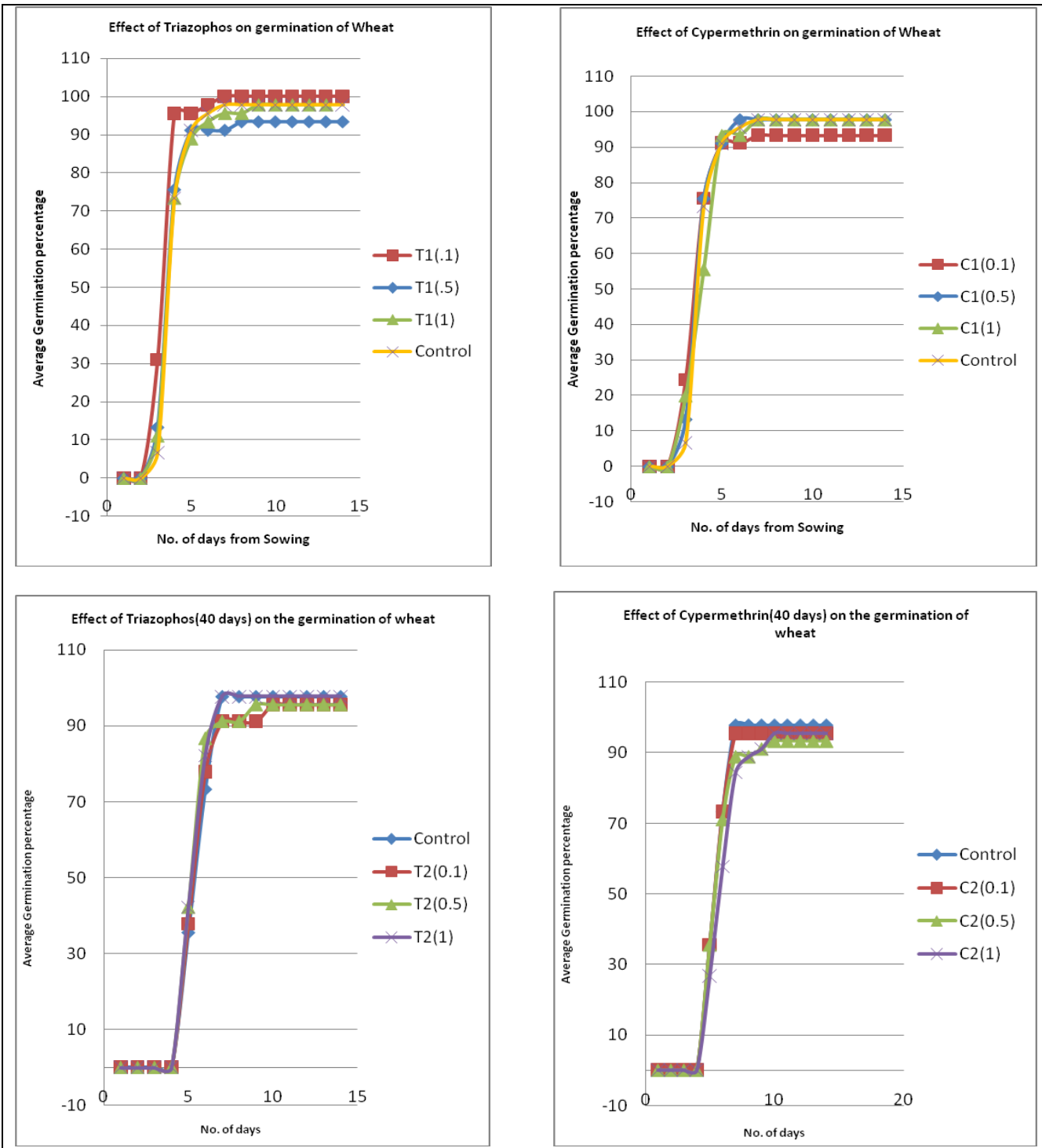
Germination Rate Index (GRI) was calculated was obtained by summarizing germination percentage at each counting divided by the days after sowing the seeds in soil (Maguire 1962)

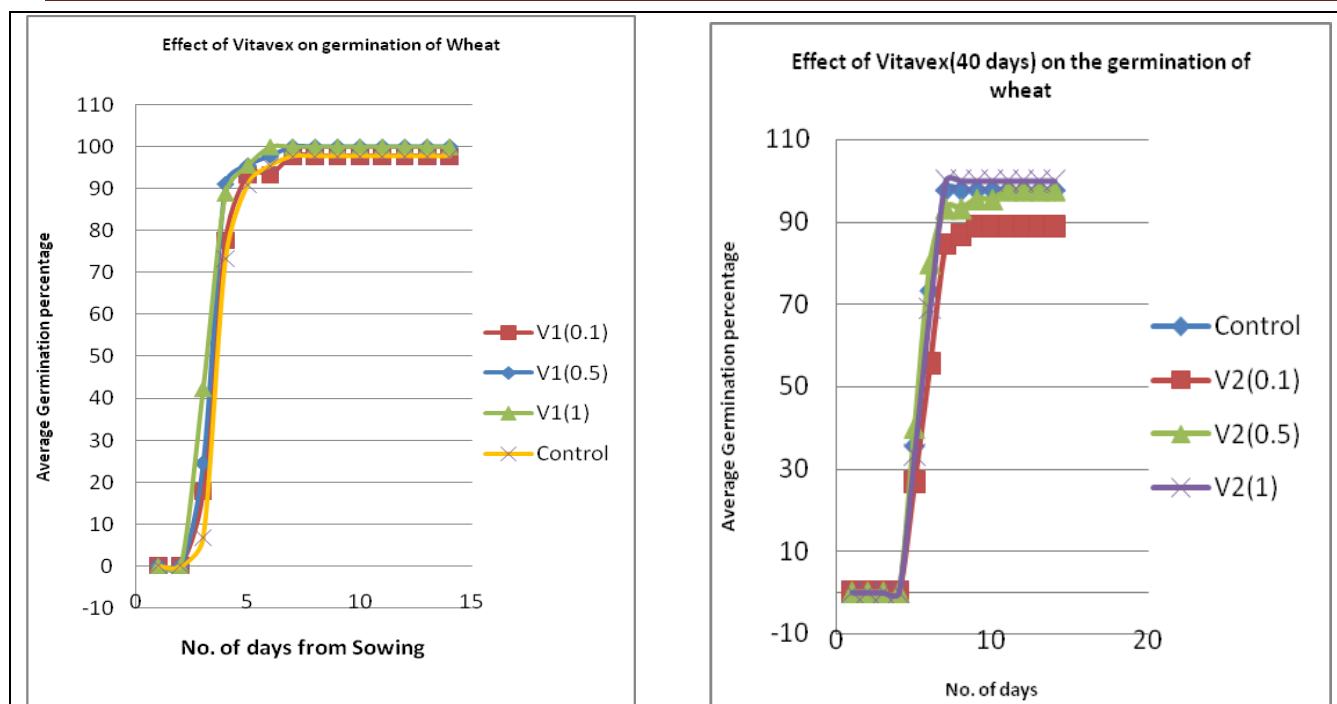
$$\text{Germination Rate Index(GRI)} = \frac{\text{Germination percentage}}{\text{Days after Sowing}}$$

Data analysis was done using SPSS 16. Technique of F-test and ANOVA were used to evaluate any possible relation of pesticide and their different concentrations on the germination of wheat.

Result and Discussion:

The results showed an insignificant effect of the different concentrations of pesticides used. It appeared that the concentrations used i.e. 0.1ppm; 0.5ppm and 1ppm were far less to significantly affect germination percentage of wheat in the field conditions but have significant effects in laboratory conditions (Khanday et. al, 2015). On instant treatments after sowing, Triazophos 0.5ppm and Cypermethrin 1ppm retarded the germination (in accordance with Sharma et. al, 2014) although the effects were less while Vitavex increased the germination percentage with the corresponding increase in concentration from 0.1ppm to 1ppm. Sowing after 40 days of treatment showed Cypermethrin 1ppm, the only toxic pesticide concentration and Vitavex 1ppm the only beneficial concentration affecting wheat germination to a considerable extent. It becomes clear that there is no considerable effect of these different pesticide concentrations on the overall germination percentage of wheat crop and therefore could be used to restrict the pest populations for better yields in both soyabean and wheat crops.





Germination evaluation for consecutive fourteen days immediately after treatment of pesticides
 Germination Rate Index of Wheat after 1, 7 and 14 days of sowing under the effect of different concentrations of three different pesticides

S. No.	Triazophos			Cypermethrin			Vitavex			Control
	0.1	0.5	1	0.1	0.5	1	0.1	0.5	1	
1 D-1	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0
2 D-7	14.29± 0.4364	13.02± 0.8536	13.65± 0.7039	13.33± 1.2631	13.96± 0.7098	13.96± 0.764	13.96± 0.5843	14.29± 0.4364	14.29± 1.1742	13.96± 0.599
3 D-14	7.14± 0.3656	6.66± 0.5799	6.98± 0.4874	6.66± 0.8896	6.98± 0.4856	6.98± 0.5518	6.98± 0.4071	7.14± 0.3656	7.14± 0.861	6.98± 0.4082

D=Day, Average Values of Standard deviation follow ± preceded by actual values for the three periods

Germination evaluation for consecutive fourteen days after a 40 days gap of pesticidal treatment
 Germination Rate Index of Wheat after 1, 7 and 14 days of sowing under the effect of different concentrations of three different pesticides

S. No.		Triazophos			Cypermethrin			Vitavex			Control
		0.1	0.5	1	0.1	0.5	1	0.1	0.5	1	
1	D-1	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0	0± 0
2	D-7	13.02± 0.6431	13.02± 0.6424	13.96± 0.4542	13.65± 0.4089	12.70± 0.8904	12.06± 0.6177	12.06± 2.3110	13.33± 0.5345	14.29± 0.8141	13.96± 0.7828
3	D-14	6.82± 0.8634	6.82± 0.4447	6.98± 0.3342	6.82± 0.3110	6.67± 0.6564	6.82± 0.4254	6.35± 1.6700	6.98± 0.3942	7.14± 0.5983	6.98± 0.5323

D=Day, Average Values of Standard deviation follow ± preceded by actual values for the three periods

At 5% level, the table value of F for $v_1 = 3$ and $v_2 = 20$ is 3.10 and at 1% level the table value of F is 4.94. Both these values are more than the calculated value (calculated value of 0.029) and accordingly we infer that F-ratio is insignificant at both levels which prove that up to a concentration of 1ppm, Triazophos and Cypermethrin are not toxic to wheat. It also becomes clear from the results that Vitavex increases germination noticeably.

Conclusion:

The results suggest the use of these pesticides for the control of pests to the limits that they prove toxic to the plant they are applied directly (mostly Soybean) or to the following crop. It needs to be ensured that the residues left after first cropping is less than the least concentration which could significantly affect the crop yields. Since the present results showed an insignificant effect of the three different pesticides up to concentrations of 1ppm on the germination of wheat, it becomes important to evaluate the recommended concentrations of these pesticides which are about 3ppm. We need to ensure that the residues are less than the least significantly toxic concentration and it also needs to be evaluated that how much residue is left after the first cropping. The farmer community more often uses these chemicals indiscriminately to kill the heavy infestation of crops but have to suffer for the yields for many years thereafter, so, feasible concentrations of effective and less toxic chemical or biological control measures should be used. Vitavex was found to effectively increase the germination percentage with increase in concentration from 0.1 to 1ppm which is in accordance with Malaker and Mian (2009) and Dey et al. 1992. Farmers of M.P. should be encouraged to use Vitavex (seed treatment) to curb the menace of pests but at the same time the limitations of the overuse of chemical pesticides also clarified for healthier and sustainable farm yields.

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