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Effect of Soil Treatment with Chlorpyrifos and Cypermethrin on the Germination and Growth of Triticum Aestivum and Vigna Radiata Seedlings

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Abstract: *The study was carried out in relation to effect of Hamla550 pesticide (chlorpyrifos and cypermethrin) on the germination and seedlings growth of Triticum aestivum and Vigna radiata. Various concentrations (10ppm, 30ppm, 50ppm, 70ppm, 90ppm) shows inhibitory or stimulatory effect on germination rate, growth of radicle and plumule of Triticum aestivum and Vigna radiata seedlings. On dicot (V. radiata) shows stimulatory or growth promoting effect and on monocot (T. aestivum) shows inhibitory effect at various concentrations of pesticide.*

Keywords: Pesticide, Germination

I. INTRODUCTION

Pesticides are the group of chemicals that are applied on insect pest and fungi for killing them but pesticides kill target pest and they also effecton non-targeted pests. Pesticides also affects growth and development of crop. The pesticide trade name- Hamla550 is used for control pests such as Aphids, Jassids, Thrips, White fly, American bollworm, Spotted IIbollworm, Pink bollworm. Hamla550 contains chemicals such as Chlorpyrifos 50%, Cypermethrin 5% and Emulsifiers. Chlorpyrifos molecular weight is 350.62 g/mol and it acts by blocking an enzyme which control messagetravel between nerve cells.Cypermethrin molecular weight is 416.3 g/mol. Cypermethrin is a fast-acting neurotoxin, it is highly toxic to pests, fishes, bees and other insects. It is an organophosphate insecticide used to control many different pests. Chlorpyrifos was first registered as an insecticide in 1965 and the United StatesEnvironmental Protection Agency (USEPA) registered it in 2006.Chlorpyrifos affects nervous system of human, pest, and other animals (Lee et al., 2015). Small exposure to human causes runny nose, tears, increase saliva, sweat, nausea and dizziness(Ayu and D.R.,2022). This pesticide when enters the body it moves to all parts of body. Chlorpyrifos itself is not toxic, but when it enters in body it is breaks down and create toxic form (chlorpyrifos Oxon) which is binds permanently to enzyme which control the messages that travel between nerve cells.Theingredients in some of the systemic pesticides may inhibit thegrowth and development of plants (Dhanamanjuri et al., 2013)

II. MATERIAL AND METHODS

Seeds of *Triticum aestivation* and *Vigna radiata* were collected from farmer. Seeds were carefully selected that was not any apparent infections. The solution of pesticide taken from market as trade name Hamla 550, it contains Chlorpyrifos 50%, Cypermethrin 5% and Emulsifiers.The market solution taken as stock solution we prepared various grades of pesticide solution such as Control, 10 ppm, 30 ppm, 50 ppm, 70 ppm, and 90 ppm concentrations.

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The seedling trays, coco-peat and soil were sterilized before used in experiment. The half proportion of each coco-peat and soil taken as germination and growth medium. In seedling trays, the seeds of *Triticum aestivum* and *Vigna radiata* taken in five replicates. The test solution 2 ml was given to seeds for germination and growth in daily 1-2 days interval and control wells were treated with distilled water in daily interval. All the seedling trays were maintained at room temperature. At third day after sowing germination percentage was counted. Germination percentage was calculated by using formula-

$$Gemination\ Percentage = \frac{Number\ of\ seeds\ germinated}{Total\ number\ of\ seeds\ planted} X\ 100$$

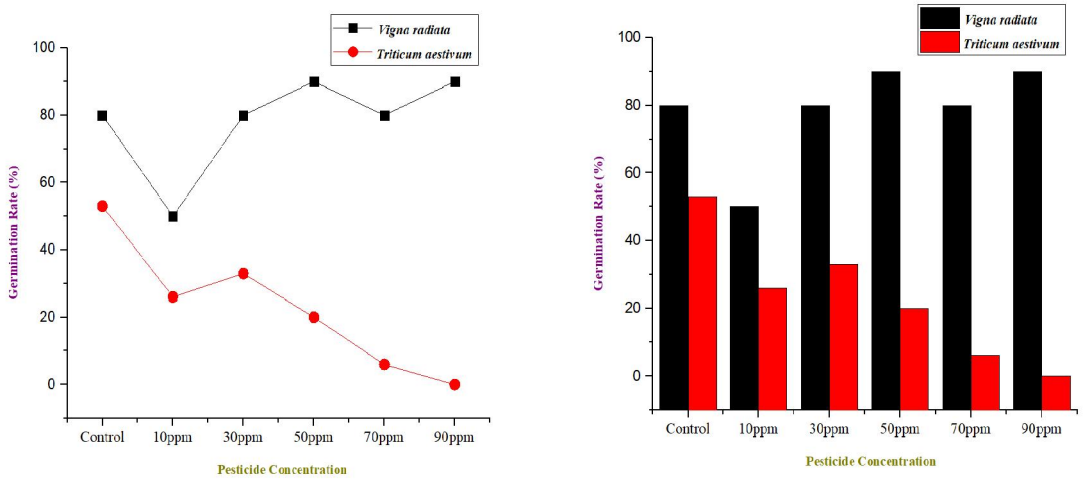
After seventh day of sowing the length of radicle and plumule was counted manually by using ruler. At the end of experiment the weight of wet biomass was taken and weight of dry biomass was taken by oven dried sample at 60°C for 48 hours.

The data was analysed by using MS Excel 2019 and graphs were prepared by using OriginPro 2015 software.

III. RESULTS

Effect of Pesticides on the seed germination of *Triticum aestivum* and *Vigna radiata*

It can be seen in data table 1.1 and graphical data (graph 1.1), In *Triticum aestivum*(monocot) concentration of pesticide (chlorpyrifos and cypermethrin)affects the germination rate. Increased concentration of pesticide decreased the germination rate and data table 1.2 and graphical data (graph 1.1) shows that, In *Vigna radiata* (dicot)concentration of pesticide (chlorpyrifos and cypermethrin) accelerate the germination rate.Monocot shows higher inhibitory effect on germination rate of pesticide (chlorpyrifos and cypermethrin).



Graph 1.1 Graphical data represents germination rate of *Triticum aestivum* and *Vigna radiata*on the effect of pesticide

Concentration	G. R.	S.L.	R.L.	W.B.	D.B.
Control	53%	12.5	9.4	1.52	0.16
10ppm	26%	10.1	9.9	1.23	0.15
30ppm	33%	9.2	8.6	0.77	0.16
50ppm	20%	9.4	10.1	0.82	0.18
70ppm	6%	9.3	8.5	0.92	0.18
90ppm	0%	8.8	8.4	0.8	0.14

**G.R.-Germination Rate (%), S.L.- Shoot Length (cm). R.L.- Root Length (cm), W.B.- Wet Biomass (gm), D.B.- Dry Biomass (gm)

Table 1.1 Effect of Pesticides on the seed germination, seedling growth, wet biomass, and dry biomass of *Triticum aestivum*

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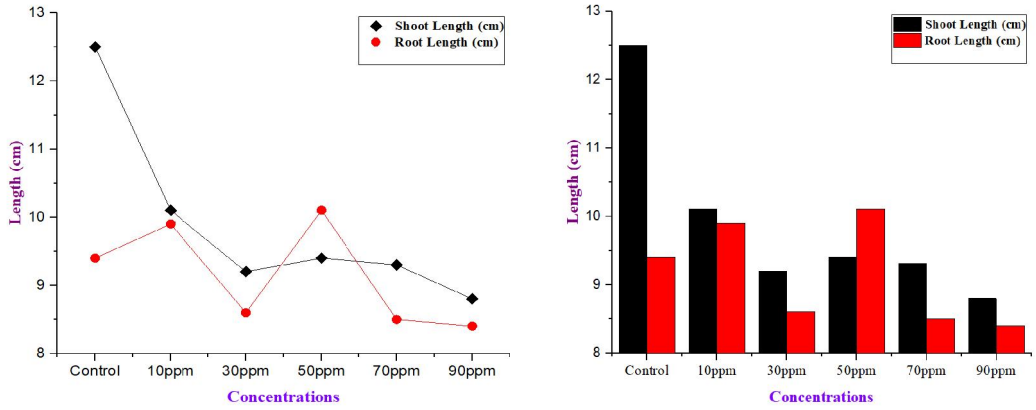
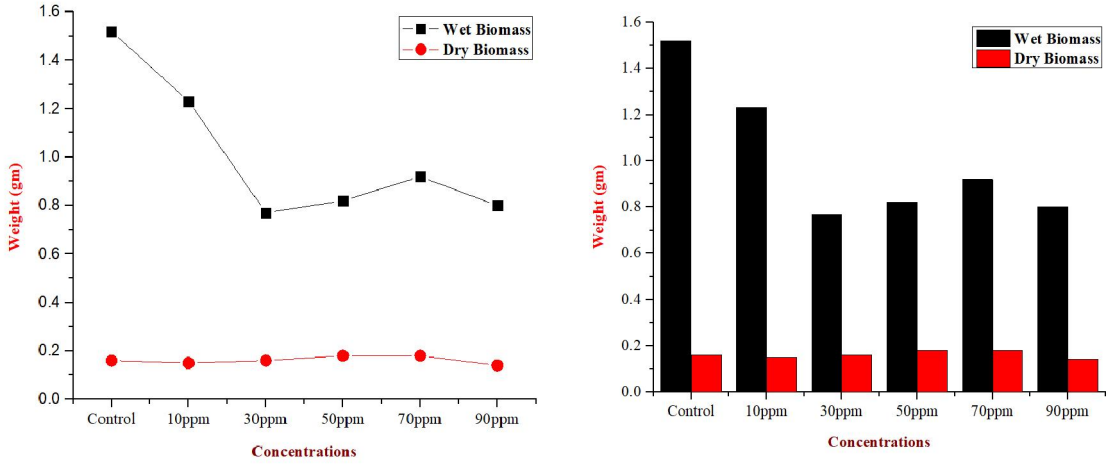
Effect of Pesticide (chlorpyrifos and cypermethrin) on the seedling growth, wet biomass, and dry biomass of *Triticum aestivum*

The graphical and tabular data (table 1.1 and graph 1.2) shows that given pesticide negatively effect on shoot and root length of *Triticum aestivum*seedlings. At 90 ppm concentration of pesticide there is lower shoot and root length than control seedlings. Tabular (table 1.1) and graphical (graph 1.3) data shows thatdry biomass of *T. aestivum* at various concentration remains same but wet biomass of *T. aestivum* decreased as the concentration of pesticide increased and at 30 ppm, 50 ppm and 70 ppm remain stable and then after it decreased.



Graph 1.2 Graphical data represents shoot length and root length of *Triticum aestivum* on the effect of pesticide



Graph 1.3 Graphical data represents wet biomass and dry biomass of *Triticum aestivum* on the effect of pesticide

Effect of Pesticide (chlorpyrifos and cypermethrin) on seedling growth, wet biomass, and dry biomass of *Vigna radiata*

The table 1.2 and graph 1.4 shows that, on the seedling growth (shoot length and root length)of *Vigna radiata*, the effect of pesticide is stimulatory but at higher concentration (90 ppm) it negatively affected. At 70 ppm shoot and root growth of seedlings higher. The graph 1.5 shows that the wet biomass of *Vigna radiata* is increased at higher pesticide concentration but dry biomass is decreased at higher pesticide concentration. Wet biomass graph is stable up to 50 ppm and dry biomass graph stable at all concentration except control.

Concentration	G.R.	S.L.	R.L.	W.B.	D.B.
Control	80%	6.3	4.4	0.78	0.6
10ppm	50%	5.6	3.7	0.74	0.12
30ppm	80%	8.5	4.8	0.78	0.08
50ppm	90%	8.7	5.1	0.83	0.1

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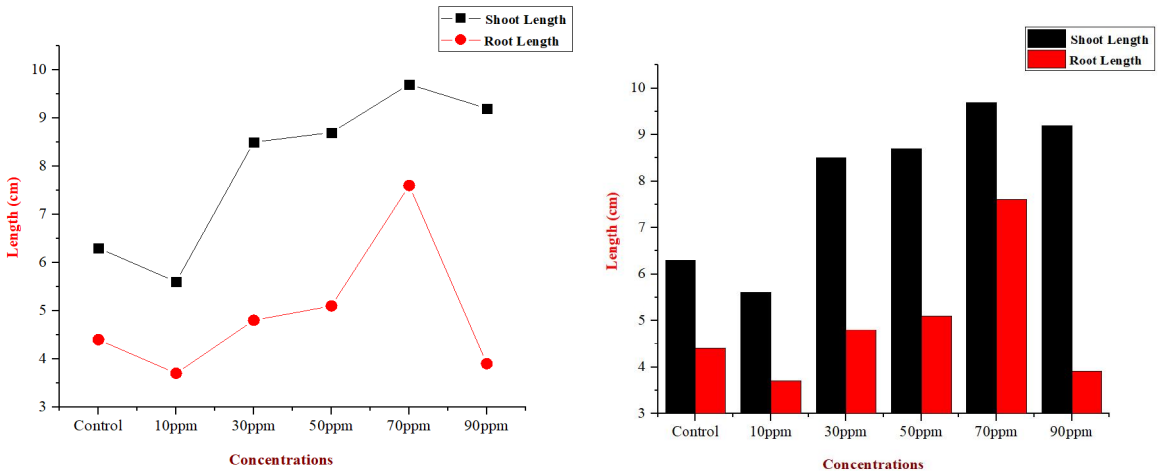
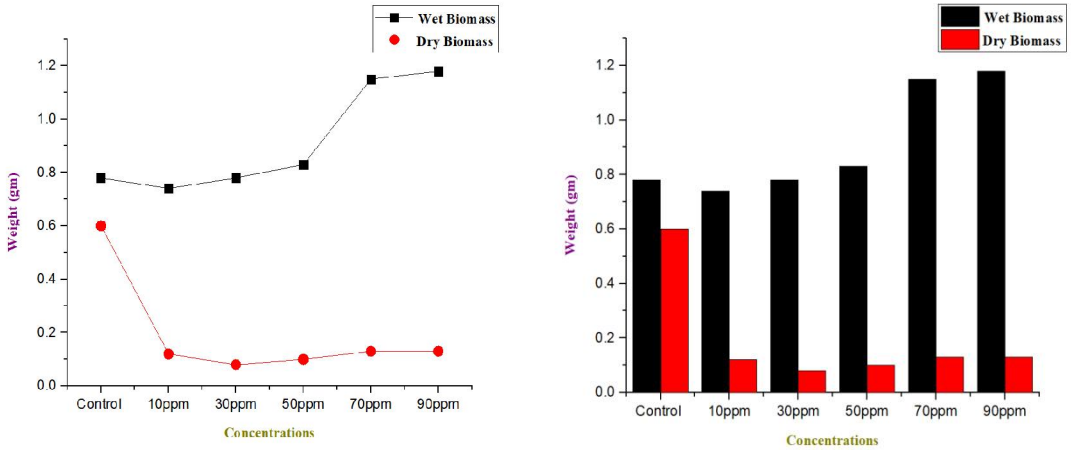
70ppm	80%	9.7	7.6	1.15	0.13
90ppm	90%	9.2	3.9	1.18	0.13

**G.R.-Germination Rate (%), S.L.- Shoot Length (cm). R.L.- Root Length (cm), W.B.- Wet Biomass (gm), D.B.- Dry Biomass (gm)

Table 1.2 Effect of Pesticides on the seed germination, seedling growth, wet biomass, and dry biomass of *Vigna radiata*



Graph 1.4 Graphical data represents shoot length and root length of *Vigna radiate* on the effect of pesticide



Graph 1.5 Graphical data represents wet biomass and dry biomass of *Vigna radiate* on the effect of pesticide

IV. DISCUSSION

Pesticides used in the study shows growth inhibitory as well as growth promotory effect on germination rate and seedling growth. Pesticide shows growth promotory effect on *Vigna radiata* seedlings and germination. Pesticide shows inhibitory effect on *Triticum aestivum* seedlings and germination rate. The growth parameters affected may be due to the suppression or elimination of pathogenic population from the medium because of pesticide (chlorpyrifos and cypermethrin). Increase in growth of seedlings due to the higher production of cytokinin and gibberellins. Seedling growth is affected by osmotic shock effect of systemic pesticides which causes loss of transportability in leaves (Lea and Leonora, 1973). Germination rate of *V. radiata* is higher at 90 ppm and it is lower in *T. aestivum* at 90 ppm.

V. CONCLUSION

Data obtained indicates that pesticide effect on the germination rate, wet-dry biomass and plumule-radicle growth of *T. aestivum* and *V. radiata.* The lower concentration (10 ppm) of pesticide (chlorpyrifos and cypermethrin) is tolerated by both seedlings as compared with control.

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