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Effect Of Malathion And Fungicide Ridomil On Root Growth Of *Allium Cepa* L.

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Abstract.

The harmful effects of the active ingredient malathion and the fungicide ridomil on Allium cepa L. were studied in this research. We employed the percentage of germination, length of root, weight gain, and other factors to achieve this goal. The results revealed substantial Weight increase, germination percentage, and root length have all changed. The study's focus was to assess the toxic impact of malathion pesticide and fungicide ridomil on root growth. *Allium cepa* germination percentage, root length, and gaining weight were measured after they were subjected to a variety of dosages of malathion and fungicide ridomil (0.0,0.25, 0.5, 1.0, and 2.0, mgL-1) for 12 days. Subsequently the root development Both malathion and fungicide ridomil concentrations were inversely associated at all times when you're exposed,according to the obtained results.

KeyWords: *Allium cepa* L., Malathion, Ridomil, Germination percentage.

1. Introduction

Chemicals are discharged in large quantities into the environment, and many of them have negative impacts on non-target creatures, posing a risk to human health [1]. Pesticides are employed in current agriculture methods to increase crop yields and extend their shelf life by inhibiting disease-causing organisms throughout storing period and in the field [1]. Because Pesticide residues have been found to persist in the soil, water and food, repeated exposure to these chemicals with mutagenic potential may result in an organism's genetic constitution changing, making it mutagenic and/or carcinogenic [2]. Pesticides are used to manage pests in both agricultural and non-agricultural contexts. They're used in large concentrations, and the residues pollute the environment, posing a threat to creatures and human wellbeing [4]. As an acaricide and insecticide, malathion is known to be commonly used organophosphate insecticides (Singh and Roy, 2017), It is typically used on fruit, vegetable, and grain crops that have been preserved [3]. Pesticides are employed to prevent the spread of harmful species, yet they commonly wind up in the environment [17]. Malathion is an organophosphate insecticide with a broad spectrum of activity. It was one of the first organophosphate insecticides, produced by American Cyanamid Company and released to the United States in 1950. [18].

Ridomil (Ridomil Gold plus 42,5 WP) is a fungicide used to prevent illnesses caused by the Oomycete fungus in a variety of crops. Ridomil Gold SL protects vegetables, citrus, potatoes, and tree nuts from soilborne oomycete infections, as well as having hyper-systemic absorption and translocation properties.

Ridomil Gold SL also improves stand, root health, and crop vigor, and it comes in a simple, easy-to-use formulation with multiple application options.

2. Material and Methods

2.1. Analysis of *Allium cepa* rooting parameters

Equal sized bulb of commercial variety of common onion (*Allium cepa*.L.) (2n=16) were selected for the experiment. The bulb's outer scales were removed.The bulbs disks were cut with sharp clean blade so that the primodial roots were not destroyed. The prepared bulbs were placed directly on a wide bottle neck. This bottle contains different concentration of the tested chemical (Fungicide ridomil and Malathion). At the beginning of the experiments five bulbs were used for each dose the 3 homogenous bulbs were selected for experimental analaysis. The root length of rooted bulb was determined with a millimetric ruler after 12 days. The weights of wet and dry roots were calculated by using sensitive balance. The following equation was used to measure the rooting percentage of the bulbs:
R (%) = Rb/Tb x 100
Where R is the rooting (%); Rb is the rooted bulbs; and Tb is the total bulbs [6].

2.2. Statistical Analysis

Only a small portion of the data was manually evaluated, while the rest of the statistical analysis was finished with the help of graph pad prism v5.0 software. Randomized design (C. R. D) was implemented for the treatments. Then values from ANOVA tables were tested at 95% confidence interval and 99% confidence interval to test the significant (F). Dundan The significance of the various treatments employed in the trials and their controls was tested using the Multiple Range Test (DMRT).

3. Results

Tables (3.1) and (3.2) and Figures (3.1) and (3.2) indicate the effects of various dosages of the fungicides ridomil and malathion on the germination percentage, root length, and weight of *Allium cepa* L. bulbs . The outcomes of the experiments indicated adverse effects of both Fungicide ridomil and Malathion on all measured parameters. The inhibition was dose dependent. Which was considerably increasing (p0.01) with the increase in of both pesticides concentrations compared to the control group.

3.1. Effects of Malathion

The control group had the highest percentage of bulbs rooting (92 percent), in contrast to the lowest rooting rate of 14% was observed in 2.0 ml/l dose of Malathion. Malathion treatments significantly ($p<0.01$) decreased the no. of roots/bulb, root length, root root weight. The highest scores were in control groups at the end of the12-days experiment and their values were 67.6, 13.3, and 4.1, respectively. The lowest values for the same parameters were scored in 4 ml/l concentration and their values were 14, 1.8 and 0.3, respectively (Table 3.1 and Figure 3.1).

Treatments

Table 3.1: Effects of various doses of Malathion on various root parameters of *Allium cepa* L.

Growth parameters	0.0 ml/L	0.25 ml/L	0.5 ml/L	1.0 ml/L	2.0 ml/L	Significance
Rooting Percentage (%)	92% ±0.88 a	70% ±1.15 b	46% ±1.45 c	29% ±1.85 d	14% ±2.08 e	**
Number of Roots	67.6 ±4.20 a	45.6 ±6.55 b	38 ±4.11 c	28 ±2.61 cd	14 ±2.63 d	**
Root Length (cm)	13.3 ±0.90 a	9.1 ±0.23 b	5.8 ±0.14 c	3.1 ±0.12 d	1.8 ±0.03 d	**
Root Weight (g)	4.1 ±0.88 a	2.2 ±0.28 b	1.2 ±0.24 bc	0.6 ±0.08 c	0.3 ±0.05 c	**

There is no significant difference at 5% probability using DMRT when means in the column followed by the same letter. * $p < 0.05$:indicates a significant difference from the control:; ** $p < 0.01$:indicates a substantial difference from the control.

Treatments	**Growth parameters**				
	Germination Percentage(%)	**Root Length (cm)**	**Number of Roots**	**Wet Weight (g)**	**Dry Weight (g)**
0.0 ml/L	97% ±0.88 a	12.3 ±0.90 a	79.6 ±4.20 a	5.3 ±0.88 a	3.1 ±0.33 a
0.5 ml/L	74% ±1.15 b	9.1 ±0.23 b	60.6 ±6.55 b	2.6 ±0.28 b	1.3 ±0.14 b
1.0 ml/L	56% ±1.45 c	4.2 ±0.14 c	44 ±4.11 c	1.5 ±0.24 bc	0.4 ±0.06 c
2.0 ml/L	37% ±1.85 d	2.4 ±0.12 d	31 ±2.61 cd	0.7 ±0.08 c	0.2 ±0.03 c
4.0 ml/L	18% ±2.08 e	1.5 ±0.03 d	19 ±2.63 d	0.4 ±0.05 c	0.1 ±0.03 c
Significance	**	**	**	**	**

Figure 3.1: Effect of Malathion on root length at various

3.2 Effects of Fungicide ridomil

The highest bulbs rooting percentage In the control group, this was seen (93%), in contrast to the lowest bulb rooting rate of 12% was observed in 2.0 ml/l dose of ridomil. Fungicide ridomil treatment significantly ($p<0.01$) decreased the no. of roots /bulb, root length, root weight. The highest scores were in control groups and their values were 66.2, 7.2, and 3.9, respectively. The lowest values for the same parameters were scored in 4 g/l concentration and their values were 13, 1.6, and 0.2, respectively (Table 3.2 and Figure 3.2).

Table 3.2: Effects of various doses of Fungicide ridomil on various root parameters of *Allium cepa* L.

Table 3.2: Effects of various doses of Fungicide ridomil on various root parameters of *Allium cepa* L.

Growth parameters	Treatments					
	0.0 ml/L	0.25 ml/L	0.5 ml/L	1.0 ml/L	2.0 ml/L	Significance
Rooting Percentage (%)	93% ±0.88 a	67% ±1.15 b	41% ±1.45 c	22% ±1.85 d	12% ±2.08 e	**
Number of Roots	66.2 ±4.20 a	52.1 ±6.55 b	37 ±4.11 c	28 ±2.61 cd	13 ±2.63 d	**
Root Length (cm)	7.2 ±0.90 a	4.6 ±0.23 b	3.9 ±0.14 c	1.8 ±0.12 d	1.6 ±0.03 d	**
Root Weight (g)	3.9 ±0.88 a	2.1 ±0.28 b	1.0 ±0.24 bc	0.4 ±0.08 c	0.2 ±0.05 c	**

There is no significant difference at 5% probability using DMRT when means in the column followed by the same letter. *Significantly different from control: $p < 0.05$; **significantly different from control: $p < 0.01$.

Figure 3.2: Effect of ridomil on root length at various

4. Discussion

Plant roots are a highly vulnerable organ when it comes to environmental challenges. Root apical meristems play an important role in the plant's rapid response to stress stimuli, which initiates signaling pathways to other plant organs [14]. *Allium cepa* L. is thought to be a useful test system for evaluating pesticides' cytogenetic potential among plant species [10]. Onion (*Allium cepa* L.) is excellent root cells grow in direct contact with the material of interest in vivo. Information on the cytogenetic effect of pesticides in general are uncommon in Kurdistan Region of Iraq in contrast to international literature. In this study, cytogenetic effect of a two pesticides malathion and fungicide ridomil are analyzed by evaluating of their effects of different doses on the rooting percentage, root length, number of roots per bulb, root weight in Allium cepa L.

4.1. Effects of Malathion doses

Rooting percentage is, in particular, the most important stage in the establishment of plant growth for determining crop yield. The rooting of bulbs is a complicated process influenced by environmental and genetic variables like as salt, light, and temperature [7].
In this study, evaluation of the influence of malathion on rooting parameters of Allium cepa L. plant has been examined. The experimental results demonstrate that the effect of malathion on all bulb rooting parameters in all concentration depend on doses. The data in table (3.1) and figure (3.1) reveals negative correlation between malathion doses and the percentage of rooting, roots length, number of roots /bulb and root weight, because the rooting percentage and all other parameters was not the same as the control groupThe highest observed rooting percentage in the control treatment was (97 percent), root length (12.3), number of roots / bulb (79.6) and roots weight (5.3) while the lowest score of 18% was at 4.0 ml/L dose of malathion for rooting percentage and 1.5cm for root length, 19 for number of roots / bulb, 0.4g for root wet weight. When *Allium cepa* are exposed to water, their cell proliferation is stimulated, and their meristematic cells lengthen. Likewise results were obtained by [13], [11]. This is in line with Salazar and Maldonado's research (2019), In their study, concentrations of 0 and 1 parts per million (ppm) of malathion resulted 90% of rooting and 75% of rooting respectively, but rooting rates dropped to 55% at 2 and 3 ppm and reduced to 40% in 4 ppm treatments.

Treating barley crop with malathion decrease in rooting levels in the lab. Some studies claimed that root growth can be inhabited with high levels of malathion in different species of plants. The mean root lengths of *Allium cepa* L. obtained for the tested compound ranged between 0.29cm and 4.90cm, in comparison to 6.82cm for the control, which indicates that the growth rate was concentration dependent. All these studies found that malathion had adverse effects on rooting parameters. These data are in line with the experimental results of this study Because of interactions with cell components, Malathion's toxicity to root parameters is unclear.

The reduction of the root length and root weight may result in major variation in tissue nutrient content and nutrient status. Additionally, it is well identified that the soil matrix absorbs malathion which blocks the shikimate pathway, which can then reduce aromatic amino acid biosynthesis. The bulk of chemical residues found in the environment end up being diluted in water supplies. As a result, they're usually found in extremely little quantities [16]. As a result, high-concentration analyses aren't particularly useful when attempting to quantify the impacts of environmental exposure to a certain substance [15].

4.2. Effects of Fungicide ridomil doses

The results of the current study (Table 4.2 and Figures 4.2) showed that the effect of Fungicide ridomil on bulb rooting in all doses was also determinant. There was a negative and significant ($p > 0.01$) correlation between the dose of Fungicide ridomil and all rooting parameters measurements. In the control group, the highest scores were observed, while the lowest scores were at 4.0 g/L dose of Fungicide ridomil. The cytogenetic effects of the fungicide ridomil in plant roots systems are poorly understood; nevertheless according to US Pest Control Products Act (23-Dec-2008-4320) Fungicide ridomil 50 is a warning poison. In study by [5] it was shown that Fungicide ridomil had a positive impact on rice germination (90%) at low concentration of 0.05%, but subsequently the germination percentage was dropped to 42% at incremented concentrations. They attributed this to the effect of Fungicide ridomil on producing cytokine and gibberellin. [9], found that, growth of young sweet potato plants was inhibited by increasing Fungicide ridomil to significant concentrations. Another study by [12] suggested thatApplying excessive amounts of copper oxychloride to tomato plant soil and leaves can substantially impair normal plant development, Total yield, fruit number, dry root weight, and plant height were all reduced significantly. Observing that the fungicide ridomil generates an excess of oxy radicals, In plant cells, this is thought to be the major harmful impact. This toxicity may be the cause of adverse effects of Fungicide ridomil to all onion bulb-rooting parameters [8].

Conclusion

According to the results, both pesticides lowers Allium cepa rooting percentage , root length and root weight due to its cytotoxic conduct. both pesticides may be called a plant mutagenic agent based on these results. As a consequence, this pesticide's use in agricultural fields should be tightly controlled.

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