Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4742 - 4746

Received 15 December 2020; Accepted 05 January 2021.

The Effect Oryza Sativa L. Residues on Some Growth Indicators of *Triticum Estivum* L., *Hordeum Distichum* L., and *Zeamays* L

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ABSTRACT

The current study was conducted in the Glass House at the Faculty of Education for Women of the University of Kufa to test the biological activity of the *Oryza Sativa* L. residues against *Triticum Estivum L.*, *Hordeum Distichum L.*, and*Zea Mays L*.The study also aims to examine if this toxicity is behind the decline of growth and germination of the cultivated plants after the rice had directly been harvested in the same field. The study included the glass house experiment, which is the cultivation of grains of (wheat, barley and corn) in plastic pots after treatment with the rice extract in the same concentrations (0.20, 40, 60). The results indicated that the rice residues reduced the growth of vegetative plants of wheat and barley and corn, and a decrease in the germination percentage and rate of germination parameters when the concentration increased to 60%.

KEYWORDS

Triticum Estivum L., *Hordeum Distichum L.*, and*Zea Mays L*,*Oryza Sativa*,Toxicity.

Introduction

Plants live in codependent groups depending on environmental requirements and usually have the same structural and morphological adaptations. In most cases, two or more plants occupy the same environmental location in nature and complement one another to support the various requirements of life[1].However, the residues of one plant and its secreted substances and vegetable extracts may have a harmful effect on seed germination and seedling growth as a result of toxic decaying products of leaves, stems, roots, fruits or seeds [2].This is called the Allelopathy, which is the phenomenon of the degradation of chemicals into the environment called Allelochemicals having useful and harmful effects on crops[3]. Allchemical compounds include various secondary compounds, including alkaloids, closides, non-protein amino acids, coumarins and nitroids[4]. The allelochemicaldiffer from the ---- as the first from adding chemical compounds to the environment; the second results from taking some environmental factors important for plant growth and reduction from the environment such as water, organic matter, light and other minerals, especially when they are not sufficiently available in the ecosystem[5].The available information on the effect of Alleloochemical compounds in the various physical and biochemical processes in plants is so rare due to the presence of a number of these compounds and each compound has more than one physiological effect[6].Therefore, it is necessary to clarify the phenomenon of aIIelopathy in terms of variation in the capability of species and cultivars to produce alleloochemical compounds through different stages of the life cycle[7].The nutritional value of wheat grains is derived from carbohydrates, as well as proteins, vitamins, and some salts such as calcium and phosphorus[8], followed by barley ranked second on the basis of nutritional significance[9].On the other hand, yellow maize is one of the most essential foods in the world nutritionally and industrially as it occupies the third place in terms of cultivated area, global production, the significance in feeding human and animal. In addition, it has various uses such as treatment and dye production. It is also used as biofuels and a substitute for traditional car fuel. It is therefore called *King of Crops*[10].

Materials and Methodology

Collection and Preparation of Plant Residues for Extraction

The rice residues were collected from roots, stems and leaves from a field in Najaf Governorate / Abbasiya area. The roots were washed well off soil. The residues were then spread onto a clean plastic sheet and left inside the glass house for a week to dry. Then they were chopped down into pieces, put into an electric oven (45 degrees) for 48 hours and then ground with a mill then save the powder into plastic bags.

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Preparation of Cold Water Extract

The method [11]was adopted in the preparation of the aqueous extract. Ten grams of dry powder was taken and placed in a 500 mL glass flask containing 200 ml of distilled water. The plant material was blended with tjlassco blender for 15 minutes, then left for one hour to settle down. After that they were filtered with three layers of gauze cloth to separate the large plankton and obtain a clear solution which is considered as 100% concentration.
Out of that solution (20%, 40% and 60%) concentrations were prepared by completing 20 mL of the basic solution to 100 ml of distilled water. The same method was followed to prepare the other concentrations.

Preparation of Grain for Germination

Wheat, barley and maize seeds were obtained from a field in Najaf Governorate / Al-Mashkhab District and isolated in vitro for experimentation. Cereals were applied to [12]by [13] to sterilize seeds with hypochlorite Sodium Hypochlorite) (5%) concentration by soaking for 5 minutes after the seeds were washed 4-5 times with distilled water to remove the effect of sodium hypochlorite solution.

Green House Experiment

This experiment was carried out in the green house of the Department of Biology at the College of Education for Women during the season (2015-2016) to examine the irrigation of the rice residues by the aqueous extract on the germination and growth of the wheat using mud-grinder soil taken from the site of experiment. The soil was then sifted with a 2 mm diameter sieve, sterilized with sodium hypochlorite at (5%), left for 24 hours to dispose moisture and then placed in a 1 kg-size plastic pots. After that 10 seeds were planted in each pot for the wheat, barley and corn. The pots were saturated with aqueous extract at 50 ml in the pots. The control treatment was saturated with distilled water with maintaining watering as needed. The experiment lasted for 15 days and three repetitions for each treatment [13] [12]. The following were calculated:

Percentage of Germination

The number of seeds grown in each pot was calculated after 10 days from the date of germination and the values were converted to a percentage according to the following equation:

$$\textbf{Percentage of Germination (G)}= \frac{\text{No of seeds germin ated}}{total\ seeds\ planted} * \mathbf{100}[14]$$

Percentage of Germination Coefficient

The number of germination seeds was calculated in each pot and the following equation was applied to determine the Coefficient of Velocity of Germination (CVG).

Germination rate coefficient = (A_1 + a_2 + a_s) / (a_1 b_1 + a_ (2) b_2 + a_sb_s)
Where I_1= 1st day initiatives
I_2= 2nd day initiatives
I_l=Last day initiatives
$D_{1=}$ Day 1
$D_{2=}$ Day 2
$D_{l=}$Last day [14]

Average of Shoot System Lengths

The shoot system length of the plant in the pots was measured by measuring the total length of the stem to the end of the longest leaf after separating the shoot system from the root system with a sharp knife. Three plants were randomly tested for each dish at 15 days old[15].

Statistical Analysis

The results were statistically analyzed using the SPSS system for statistical analysis of data obtained from the study

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using the complete randomized design (CRD) in the green house experiment and compared the treatment median of the experiment by selecting the Least Significant Difference (L.S.D) at 0.05 [16].

Results

The results showed that the increase in concentrations led to a decrease in the percentage of germination from 100 for control to 83.3 at 60%. The percentage of germination velocity coefficient decreased from 0.156 to 0.148 and the shoot system length from 18.77 to 17.22 at 60%.

Table 1. Shows a comparison of the different concentrations with control based on the percentage of germination velocity coefficient, percentage of germination and shoot system length average (for barley)

Concentrations	Germination Parameters	Germination Percentage	Shoot System Length Average
Control	0.156	100	18.77
20%	0.155	100	18.66
40%	0.154	96.3	18.55
60%	0.148	83.3	17.22
LSD	0.007significant differences in favor of 60% decrease P<0.05	8.9significant differences in favor of 60% decrease P<0.05	1.4significant differences in favor of 60% decrease P<0.05

Table 2. Shows a comparison of the different concentrations with control based on the percentage of germination velocity coefficient, percentage of germination and shoot system length average (for wheat)

Concentrations	Germination Parameters	Germination Percentage	Shoot System Length Average
Control	0.157	100	19.33
20%	0.156	96.6	18.33
40%	0.154	83.3	18.66
60%	0.145	63.3	17.33
LSD	0.009significant differences in favor of 60% decrease P<0.05	12.2significant differences in favor of 60% decrease P<0.05	2.3significant differences in favor of 60% decrease P<0.05

The results showed that the percentage of germination decreased from 100 to 63.3 at 60%. The percentage of germination velocity coefficient decreased from 0.157 to 0.145. The shoot system length decreased from 19.33 to 17.33 when the concentration increased to 60%.

Table 3. Shows a comparison of the different concentrations with control based on the percentage of germination velocity coefficient, percentage of germination and shoot system length average (for maize)

Concentrations	Germination Parameters	Germination Percentage	Shoot System Length Average
Control	0.147	96	20.88
20%	0145	86.6	20.33
40%	0.142	76.6	20.22
60%	0.137	73.3	20
LSD	0.006significant differences in favor of 60% decrease P<0.05	13.4significant differences in favor of 60% decrease P<0.05	0.72significant differences in favor of 60% decrease P<0.05

The results showed that the percentage of germination parametersdecreased from 0.147 at control to 0.137 when the concentration increased to 60%. The percentage of germination decreased from 96 to 73.3 at 60%. The shoot system also decreased from 20.88 to 20 at 60 %.

Many farmers in many countries observed a decrease in growth due to the successive planting of some crops with other crops or the same crop for successive years in the same field. The researchers ascribed that to the effect of plant secretions of the first crop on the next due to chemical secretions introduced into the environment by washing, root excretions or microbial decomposition of post-harvest plant residues mixed with soil to affect the subsequent crop grown in the same soil[5].

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The results of the present study showed that there is a decrease in the percentage of germination, germination velocity coefficient and shoot system of wheat and barley by increasing the concentration of the extract. This is not consistent with [17]. Table (2) shows decrease in the percentage of germination, germination velocity coefficient and shoot system of wheat by increasing concentrations. This is consistent with [12][15][18] who stated that the inhibitory effect of plant extracts increases by increasing the concentration. This is because the residues have some active compounds such as phenols and alkaloids[5].

Regarding wheat, researchers on the other hand agreed with the results of the present study. They established that the plant extracts are different in their effect. Some of them are activating and others are inhibitory and sometimes ineffective. The results of [19] indicate that the efficacy of residues range from inhibition to stimulation depending on the concentration of the extract, the response of the plant tissue, environment, and genotype of the studied types in a species.

Table (3) shows the effect of the concentration of the aqueous extract of rice on the germination velocity coefficient, the percentage of germination and the shoot system length average. The results show an inhibiting effect by increasing concentration, which is not consistent with what [20] highlighted. They indicated that the type of extract had an effect on stimulation or inhibition. For instance tea extract affected the growth of maize. Hence, it was found that the tea residue led to raise the values of the capillary action to the top and push the water up and drawing the movement of water down, which led to a raisingthe growth of maize.

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