

The Allelopathic Effect of Marigold Infusion on the Mustard Seeds Swelling

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Abstract—The results of the experiments connected with the study of the allelopathic effect of marigolds daily water infusion on the mustard seeds swelling in combination with the different concentrations of infusion, different temperatures and acidity of the medium are presented. The complex dependence of water consumption by the seeds from the allelopathic effects are demonstrated.

Keywords— *allelopathy, seed swelling, marigolds, colins, complex action of factors*

I. INTRODUCTION

Biochemical processes in the question of plants allelopathic influence have not been studied. It is known from the literature that the physiological and biochemical effect of colins can be classified as follows: changes in the physical and chemical properties of protoplasm, changes in metabolism, changes in the physiology of the whole plant [1, 2]. The influence of colins on the water regime of plants has not been studied. Meanwhile, water consumption by seeds is the main point of the germinating seed. It provides a good start to the embryo and to its transformation into an independent plant [3, 4].

The main problem of the allelopathic effect of plant secretions study is the following: the studied substances almost never act in pure form in natural conditions. A mixture of substances that interact antagonistically, synergistically or additively may also be influenced by environmental factors. For example, the influence of temperature on the seeds swelling is known. Previously, we have studied the issues related with the influence of concentration, the organ of the plant, the method of obtaining the studied product on various crops [5]. The allelopathic role of weed plants in agrocenoses, especially of adventive flora, has been proven [6]. The role of representatives of individual families in the manifestation of allelopathy, for example, asteraceae, celery, and lipoceleta, is known [7].

It is known that marigolds have a strong allelopathy activity [8]. Previously, the results of the studies in marigolds showed that allelopathically active substances are synthesized in various active degrees depending on the organ, and does not accumulate in the roots [9, 10].

Based on this, the aim of the study is to assess the allelopathic effect of the marigolds daily water infusion on the mustard seeds swelling with the participation of temperature and acidity.

II. EXPERIMENTAL

The allelopathic activity was evaluated on the mustard seeds (*Sinapis alba* L.) of Rainbow sort (100 pieces). Seeds were previously disinfected in potassium permanganate. The marigolds rejected Orange-Flamme sort was chosen as the allelopathic agent. Their green mass was collected in the autumn, dried until the air-dry state and used to produce aqueous extracts, in which the seeds swelled. The study assessed the role of 1%, 2.5% and 5% concentration of daily water infusions. Seeds were placed into buxes, 10 ml of infusion was poured. The buxes were kept at different temperatures - 4 ° C, 22 ° C, 35 ° C, 45 ° C for 24 hours. The swelling was assessed by the change in the mass of dry and swollen seeds per day. At the same time, moisture was previously removed from the seeds with the the help of filter paper. There was triple repetition. The significance of the differences was determined by the difference method.

III. RESULTS AND DISCUSSION

The results of the experiment to the mustard seeds of the Rainbow sort swelling study (*Sinapis alba* L.) in marigolds rejected (*Tagetes patula* L.) Orange-Flamme sort daily infusions at different temperatures and acidity are presented in the table I.

As we can see from the table I, the control value of the swelling in water at room temperature and at neutral acidity was 150%. At room temperature, the concentration of infusion had no effect on the water consumption of seeds. Moreover, within the certain acidity, these differences were not manifested. At the same time, both slightly acidic and slightly alkaline marigolds infusion inhibited the swelling, and the higher concentration of infusion the stronger depressing was.

TABLE I. MUSTARD SEEDS SWELLING IN DIFFERENT CONDITIONS, %

Temperature	Concentration marigold infusion	Acidity of infusion		
		pH<7 slightly acidic	pH>7 slightly alkaline	pH=7 neutral
22°C room	Infusion concentration 0%	127.7±1,20*	125.0±4,00*	control 150.0±1,90
	Infusion concentration 1%	123.0±3,46*	123.7±2,31*	142.0±1,90
	Infusion concentration 2,5%	119.7±1,20*	125.0±1,90*	142.0±1,90
	Infusion concentration 5%	118.3±1,20*	120.3±3,06*	137.7±2,20
4 °C low positive	Infusion concentration 0%	105.3±1,20*	106.7±1,20*	127.0±1,70*
	Infusion concentration 1%	103.3±1,90*	100.0±1,90*	109.7±2,90*
	Infusion concentration 2,5%	105.3±1,20*	97.3±1,20*	104.0±1,90*
	Infusion concentration 5%	104.0±1,90*	102.7±2,20*	100.0±1,90*
35°C increase d positive	Infusion concentration 0%	147.3±1,20	148.7±1,20	154.0±1,90
	Infusion concentration 1%	140.7±1,20	139.3±1,20*	146.0±1,90
	Infusion concentration 2,5%	134.7±1,40*	127.7±1,20*	146.0±1,90
	Infusion concentration 5%	129.0±1,90*	125.0±1,29*	140.7±1,20
45 °C high positive	Infusion concentration 0%	89.3±1,20*	90.7±1,20*	106.7±1,20*
	Infusion concentration 1%	89.3±1,20*	90.7±1,20*	105.3±1,20*
	Infusion concentration 2,5%	86.3±1,20*	86.3±1,20*	102.7±1,20*
	Infusion concentration 5%	76.3±1,20*	77.6±1,20*	101.3±1,20*

* - 0.998,

** - 0.99,

*** - 0.995

A significant decrease in the swelling was observed from 110% (weak infusion, neutral reaction) to 97% (alkaline infusion of medium concentration) at low positive temperatures (4 °C) in a different combination of the acidity and the infusion concentration. There was a significant decrease in the swelling as the infusion concentration increases in water from 127% to 100% in the concentration of the strong infusion in a neutral reaction. The nature of acidity does not matter at this temperature. The combined effect of these factors (the concentration of the infusion, acidity) equally reduce water consumption.

The nature of the infusion at elevated positive temperatures (35 °C) with acidity does not affect the swelling. The values are in the range of 140%-154%, which

corresponds to the control. Only medium and high concentrations in slightly acidic and slightly alkaline medium significantly inhibit water consumption by seeds reducing it to 125%-135%.

High positive temperatures (45 °C) inhibit the swelling. In water, the swelling rate was 107%, which is significantly lower than the control. This process is aggravated by the concentration of infusion for each acidity. Neither increase nor decrease of the acidity matter in these conditions, but the increase of the infusion concentration is important. The increase of the concentration reduces the swelling with a neutral reaction to 101%, with weakly alkaline to 78%, with weakly acidic to 76%.

IV. CONCLUSION

Thus, the results of these experiments indicate that the marigolds have complex allelopathic activity. The effect of the marigolds on the first stage of the seed germination-swelling is significantly adjusted by other environmental factors. Temperature, and it is may be different during seed germination, the acidity of the soil in the field will create different conditions for the germination. All this determines the polyvariance of the initial stages of plant development within the population, and allelopathic contribution.

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