

## STUDY OF THE BIOSTIMULATORY PROPERTIES OF MEE SERIES BIS-CARBAMATES

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**Abstract:** In this research work, the biostimulant properties of MEE series bis carbamates for cotton and vegetable crops in agriculture were studied. Tested preparations MEE-1 and MEE-2 showed effective growth activities for vegetable and cotton crops at concentrations of (0, 1, 0.01 and 0.001%). It should be noted that their high results at a concentration of 0.001% lead to the disappearance of their toxicity, increase in economic efficiency and increase in resistance to various diseases.

**Key words:** Bis-carbamate, dimethylsulfoxide, biostimulant, cotton, cucumber, tomato, root, stem, concentration, activity.

**Introduction.** Carbamates and bis-carbamates are widely used in various fields. Its members exhibit various biological activities and as a result are used as medicines and plant protection agents as herbicides and insecticides [1]. However, the most widely used form of the largest carbamates is a variety of molds, elastic forms, protective coatings, paint and varnish products, adhesives, sealants, insulators, implants and other products used as polyurethanes related to the polymer industry [ 2]. The authors synthesized the new MEE series of bis-carbamates and their derivatives for the first time in the world [3]. Then they studied their initial analysis in International Bases and it was predicted that they may have biostimulatory activity [4]. However, it is important to study its toxicity level before applying it to agricultural crops, and it has been studied. As a result, it was determined that they are class 3 of the toxicity classification, that is, less toxic [5]. The aim of this work is to identify N,N'-hexamethylene bis(o-cresolyl)-carbamate i.e. MEE-1 and N,N'-hexamethylene bis(m-cresolyl)-carbamate i.e. MEE-2 investigation and study of plant growth properties.

**Materials and Methods.** The analyzes were carried out for N,N'-hexamethylene bis (o-cresolyl)-carbamate i.e. MEE-1 and N,N'-hexamethylene bis (m-cresolyl)-carbamate i.e. MEE-2 preparations. The primary screening was conducted according to Yu.V. Rakitin's method. In the experiments, cucumber of the grade "Uzbekistan-740", pamildori of the grade "Temp" and medium stem cotton of the grade "S-6524" were used. "Roslin" industrial sample was used as a control drug.

**Results and Discussions.** In vitro tests were conducted for the preliminary evaluation of the reproductive activity of the synthesized bis-carbamates. Vegetable crops and cotton seeds served as biotests. The primary screening was conducted according to Yu.V. Rakitin's method. This method allows to quickly determine the level of physiological activity of chemical compounds, which is determined by increasing or inhibiting the germination of plant seeds, as well as by changing the length of the root and the length of the stem. The substances were tested by soaking



the seeds in solutions of different concentrations and then germinating them in Petri dishes. Control seeds were soaked in distilled water. In the experiments, cucumber of the grade "Uzbekistan-740", tomato of the grade "Temp" and medium stem cotton of the grade "S-6524" were used. The drugs were dissolved in dimethylsulfoxide (DMSO) and treated with seeds for 18-20 hours before sowing. 0.1; 0.01; and 3 concentrations of 0.001% were used. Experiments were repeated 4 times. Calculations were made by measuring the length of stems and roots in 10-day-old seedlings of vegetable crops (cucumber and tomato) and 7-day-old seedlings of cotton.

It was found that when the seeds of tomato are soaked with MEE-1,2 preparations: Preparation MEE-1 - 0.01; 0.001%; drug MEE-2 - 0.01; 0.001% led to an increase in their germination. A significant increase in seed germination was observed at the following drug concentrations: drug MEE-1 (0.001) was 30.0% higher than the control; the drug showed MEE-2 (0.001) - 20.0% higher than the control.

The best effect on the growth of roots and stems of tomato was shown in the preparation MEE-2: in the concentration of 0.1 and 0.001% of the root (66.7 and 34.2%) and the stem part was 30.1% compared to the control did (Table 1).

**Table 1. Plant growth activities of MEE series preparations**

№	Name	Concentration %	Tomato		
			Day 5	Day 10	
			Maturation %	Root growth %	Stem growth %
	Control - water	infinite	70,0	100,0	100,0
1.	Drug MEE-1: N,N'-hexamethylene bis (o-cresolyl)-carbamate	0,1	100,0	166,7	120,3
		0,01	100,0	125,9	127,6
		0,001	100,0	134,2	130,1
2.	Drug MEE-2: N,N'-hexamethylene bis (m-cresolyl)-carbamate	0,1	90,0	95,1	114,8
		0,01	60,0	135,9	122,5
		0,001	90,0	152,4	131,0
	Roslin (industrial preparation)	0,75	89,0	120,9	113,0

The drugs affected the germination of cotton seeds and root growth of seedlings. Thus, the drug MEE-1: 0.1; 0.01 and 0.001%; MEE-2 preparation: 0.1; at concentrations of 0.01 and 0.001%, on the 3rd day of experiments, it accelerated the germination of cotton seeds from 10.0% to 35.0% of the control (Table 2).

**Table 2. Cotton growth activities of MEE series preparations**

№	Name	Concentration %	Cotton		
			Day 3	Day 7	
			Maturation %	Root growth %	Stem growth %
	Control - water	infinite	85,0	100,0	100,0
1.	Drug MEE-1: N,N'-hexamethylene bis (o-cresolyl)-carbamate	0,1	93,0	110,4	124,7
		0,01	96,0	121,2	118,3
		0,001	98,0	132,6	128,4
2.	Drug MEE-2: N,N'-hexamethylene bis (m-cresolyl)-carbamate	0,1	90,0	108,5	113,6
		0,01	90,0	136,8	129,1
		0,001	80,0	116,8	110,2
	Roslin (industrial preparation)	0,75	85,0	109,8	112,7



**Table 3. Cucumber growth activities of MEE series preparations**

№	Name	Concentration %	Cucumber		
			Day 5	Day 10	
			Maturation %	Root growth %	Stem growth %
	Control - water	infinite	90	100,0	100,0
1.	Drug MEE-1: N,N'-hexamethylene bis (o-cresolyl)-carbamate	0,1	90,0	145,2	143,7
		0,01	85,0	115,4	108,3
		0,001	95,0	128,6	119,8
2.	Drug MEE-2: N,N'-hexamethylene bis (m-cresolyl)-carbamate	0,1	85,0	96,6	104,9
		0,01	85,0	112,0	122,0
		0,001	75,0	110,0	133,1
	Roslin (industrial preparation)	0,75	90,2	126,2	115,0

The drug MEE-1 had the best effect on the formation of cucumber roots. In this case, the drug MEE-1 at a concentration of 0.1% gave a higher rate of root growth than the control by 45.2%. The drug MEE-2 showed activity in the growth of the stem part of cucumber, but did not show biological activity in the growth of the root. At the same time, MEE-2 and MEE-1 preparations at a concentration of 0.1-0.001% improved tomato root growth (152.4 -166.7%), as well as stem growth (131.0%) higher than the control. resulted (Table 3).

These drugs can be applied by means of vegetative spraying of plants (at the stage of budding) and treatment of cotton seeds. When treating cucumbers with the drug MEE-1, the spraying method can be used at a concentration of 0.01%. In Pamildor, 2 concentrations of 0.1-0.001% can be used both for moistening seeds and spraying plants.

The drug MEE-2 showed the best growth activity in cotton, at a concentration of 0.01%, root growth was 136.8% and stem growth was 129.1% higher than the control. In cucumber, the best concentration for MEE-1 preparation was 0.1%, in which root growth was 145.2% and stem growth was 143.8% higher than the control. The drug MEE-2 had a good effect on tomato at a concentration of 0.001%, where root growth was 152.4% and stem growth was 131.0% more than the control. Thus, the drug MEE-2 showed its biological activity in both stem growth and root growth at low concentrations (0.001%).

**Conclusion.** The tested preparations MEE-1 and MEE-2 at concentrations of: (0, 1; 0.01 and 0.001%) have shown effective growth promoting activities in laboratory conditions for vegetable and cotton crops and therefore they are further used in agriculture.

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