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Research Article

AGROCHEMICAL EFFICIENCY OF SEED PROTECTORS BASED ON ACETIC ACID

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ABSTRACT

The data was obtained based on the studied systems and technological studies, which served as the scientific basis for the recommendation of obtaining seed dressing agents based on acetic acid, monoethanolamine, copper acetate monohydrate and ethanolammonium compounds of acetic acid, are presented. And also, the results of tests of dressing agents were obtained on the basis of acetic acid as stimulants in the field, as well as against root rot, homoza. It was shown on cotton crops that the tested preparations exhibit fairly good fungicidal and stimulating activity and can be used as dressing agents for cotton seeds and stimulants of plant growth and development.

KEYWORDS

Monoethanolamine, copper carbonate, acetic acid ethanolammonium compounds, seed dressers, gummosis, root rot.

INTRODUCTION

In the world, cotton growing and grain growing are the most important sectors of the agricultural economy. In conditions of concentration and specialization of agricultural production, the role of fungicides and seed dressings increases significantly. These drugs are designed to protect plants from diseases and occupy the third place in terms of production in agricultural technology. Plant disease usually occurs in the field before harvest. For most grain, vegetable and industrial forage crops, the main source of the disease is infected seeds.

Currently, research is being carried out in the world to develop the production of highly effective seed treaters. In this regard, an important task is the development and improvement of the technology for obtaining seed treaters with the involvement of economically available raw materials in industrial production. To do this, it is necessary to substantiate a number of existing scientific solutions, including in the following areas: determining the optimal technological parameters for obtaining seed dressings based on copper acetate monohydrate and monoethanolammonium salts of carboxylic acids; development of resource- and energy-saving technology for processing man-made waste from the production of acetic acid.

Analysis of the collected information on the main preparations for the pre-sowing treatment of seeds recommended and currently used in the country indicates that their existing range does not meet the current level of requirements imposed by agriculture. The functional spectra of the existing ranges of preparations for pre-sowing seed treatment are limited and insufficient, their protective actions are aimed only at the destruction of one or at most two pathogens of plant diseases, harmful objects and soil infection. This leads to the conclusion that it is necessary to search for and create new, more advanced preparations for pre-sowing seed treatment that have a multifunctional effect.

MATERIALS AND METHODS

Studies by the method of isomolar series were carried out by pouring isoconcentrate (isomolar) solutions of the components in various ratios, but at a constant sum of the initial volumes, and at the same time, the viscosity, density, refractive index, and pH of the solutions were measured.

The isomolar series method is also called the Ostromyslensky-Job method [1]. The condition of the study, but the method of isomolar series is to maintain the constancy of the concentration of the solvent, i.e. study of solutions lying on sections A-B, A2-B2. Usually, a study by the method of isomolar series is carried out by draining isoconcentrate (most often, isomolar) solutions of the components in various ratios, but with a constant sum of initial volumes. The isomolarity of the solvent (i.e., "movement" along straight lines parallel to the side AB) in this case is observed quite accurately only when working with dilute solutions when the difference in the molar fraction of the solvent in the initial solutions of the components can be neglected. The study of the system can be carried out at a constant molar ratio of components A and B. Separation of the liquid from the solid phase was carried out using a Schott filter No. 3.4.

Experimental data on the study of the solubility of the systems are summarized in tables, and the content of the components is expressed in mass per cent. On the basis of the obtained results, the "composition-property" diagrams of the system under study were constructed [2].

X-ray patterns of the original and synthesized new compounds were taken on a Dron-2 diffractometer with filtered copper radiation, voltage 25 kV, current strength 8 mA, with a counter speed of 2 deg/min. [3]. Tables [4] were used to calculate the interplanar spacings, and the relative intensity of the 1/10 lines was determined as a percentage of the most pronounced reflection at the maximum.

IR absorption spectra were recorded in the range 400–4000 cm–1 on a Nicolet AVATAR-360 instrument. The spectra of both initial and new compounds were taken by pressing the sample with potassium bromide or rubbing it in vaseline oil [5–6].

Thermogravimetric analysis was carried out on a derivatograph copper acetate monohydrate -Budachet [7] at a heating rate of substances 10-12 deg/min at a maximum temperature of 900 °C. Platinum-rhodium thermocouples isolated from substances were used. The analysis was carried out in platinum crucibles with a lid. The sensitivity of the galvanometers was DTA-1/10, DTG-1/15;

In quantitative chemical analysis, well-known methods of analytical chemistry were used, in particular: the content of elemental analysis of nitrogen, carbon, and hydrogen was carried out according to the procedure [10], and the content of copper was carried out according to the method of atomic absorption spectroscopy. On a RE-3030V spectrophotometer.

Results and discussions

To substantiate the process of obtaining protectants of complex action. We have studied the solubility in the $CH_3COOH·NH_2C_2H_4OH$-$(CH_3COO)_2Cu·H_2O$-H_2O system using the isothermal method [11]. With the study of the system, it was found that the formation of a compound of the composition: $CH_3COOH·NH_2C_2H_4OH·(CH_3COO)_2Cu·H_2O$ in crystalline form occurs, and in the second system [70% CH_3COOH+30%H_2O]-$NH_2C_2H_4OH$-$(CH_3COO)_2Cu·H_2O$-H_2O, compound - $CH_3COOH·NH_2C_2H_4OH·(CH_3COO)_2Cu·H_2O$ - in a liquid state. Studies have shown that the neutralization of 70 and 99.6% acetic acid with monoethanolamine leads to the formation of monoethanolammonium salts of this acid. In this regard, we have studied the production of seed treaters of complex action, synthesized based on 70 and 99.6% acetic acid, monoethanolamine and copper acetate monohydrate. Based on the study of the solubility diagram and rheological properties of the above systems, the optimal compositions of cotton seed disinfectants with stimulating and fungicidal properties were selected [12, 13].

The optimal composition of cotton seed disinfectants with stimulating properties was experimentally revealed at the following ratios of components:

[$CH_3COOH:NH_2C_2H_4OH:(CH_3COO)_2Cu·H_2O$=1:1:1] in solid state and [70%$CH_3COOH:NH_2C_2H_4OH:(CH_3COO)_2Cu·H_2O$=1:1:1] in liquid state.

Agrochemical tests of the synthesized solid and liquid compounds of the $CH_3COOH·NH_2C_2H_4OH·(CH_3COO)_2Cu·H_2O$ type have established that the preparations obtained not only have a fungicidal effect but also significantly stimulate

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plant growth, which ultimately contributes to an increase in the yield of raw cotton.

The preparations were tested by the method of pre-sowing treatment of cotton seeds of the C-6524 variety with a consumption rate of 4 litres per ton of seeds. As a reference, the preparation "P-4" 65% s.c. was used. with the same rate of consumption. To carry out the experiments, pubescent untreated cotton seeds were placed in a 5-litre flask and an aqueous solution of the studied preparation was added with continuous rotation at the rate of 10 ml of working solution per kilogram of seeds. Then the seeds were unloaded from the flask, dried at room temperature and used for sowing.

During the growing season of cotton, the number of ascended plants (field germination), including those affected by root rot (by seedlings) and gummosis (in the phase of formation of 1-2n / leaves) according to the natural background of these diseases, as well as phenological records of plant growth and development.

Laboratory test data showed that if the germination energy of untreated (control) seeds reached 89.0%, then under the influence of the studied samples it increased by 1-4% and ranged from 90.4-93.2%, with the highest value being noted in the application of the sample under No. 1. The samples had a similar effect on the general germination of cotton seeds. Moreover, it should be noted that according to these indicators, the studied samples were superior to the P-4 preparation taken as a comparison standard. This was also confirmed by the field germination records.

When calculating the number of plants affected by gummosis, it was found that in the control plots they were on average 12 pcs/case, which corresponded to 6.8% of the natural background of the lesion. On the plots of the variant of the use of the reference preparation "P-4", the number of diseased plants did not exceed an average of 2 pcs/div or 1.1%, which is 83.8% of the biological efficiency. The biological efficiency of the studied samples was significantly lower. In the variant using sample No. 1, it averaged 61.8%, sample No. 2-25.0%, and sample No. 3-44.1% (Table 1). Thus, the studied samples were ineffective against homosis.#

Table 1. Influence of seed treaters on the disease infestation of cotton seedlings

Experi-ence options	Consumption ratea l/t	Seed germination, %		Clarified seeds, pcs per plot	The average number of seedlings per plot							
		germination energy	germination		only on 21.05	Incl. affected by root rot		Biol. efficient. %	In T.Ch. affected by gummosis		Biol. efficient. %
						pcs	%		pcs.	%	

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Control	-	89,0	93,0	200	176	34	19,3	-	12	6,8	-
П-4, 65% с.к	4	90,4	93,2	200	179	6	3,3	82,9	2	U	83,8
№1	4	93,2	98,0	200	190	6	3,2	83,4	5	2,6	61,8
№2	4	90,1	94,3	200	177	22	12,4	35,8	9	5,1	25,0
№3	4	91,3	96,1	200	185	15	8,1	58,0	7	3,8	44,1

The positive effect of samples No. 1 and No. 3 was also noted in the formation of reproductive organs. So, if during the accounting on 02.08. the number of ovaries and bolls in the control was 9.4 and 4.9 pcs/plant, respectively, in the variant using samples No. 1-14.3 and 6.2 pcs/plant. In the variant of using sample No. 3, these figures were 11.2 and 5.4 pieces/plant, respectively (Table 2).

Table 2. The influence of the studied samples on the yield of cotton variety c-6524 (pre-sowing seed treatment)

Experience Options	Norm expense l/t	Raw cotton harvest					
		From open boxes			Gross		
		g/rast	Addition to control		g/rast	Control Gain	
			g/rast	%		g/rast	in, %
Control	-	28.1	-		40.8	-	-
#1	4.0	33.0	4.9	17.4	45.0	4.2	10.3
#2	4.0	30.5	2.4	8.5	42.5	1.7	4.2
Number 3	4.0	31.8	3.7	13.2	43.8	3.0	7.4
P-4	4.0	30.9	2.8	10.0	42.9	2.1	5.1

If in the control, the yield of raw cotton from open bolls averaged 28.1 g/plant, and the gross yield was 40.8 g/plant, then in the options for using sample No. 1, these figures were 33.0 and 45.0 g/plant, respectively. , i.e. received additionally at 4.9 and 4.2 g/plant, respectively.

The increase in the yield of raw cotton in the variant of the application of sample No. 3 amounted to 3.7 and 3.0 g/plant, respectively. In the variant of the application of the preparation "P-4", the increase in yield was, although reliable, less pronounced and reached 2.8 g/plant from open boxes and 2.1 g/plant for the gross harvest.

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Results of the conducted primary field trials indicate that the sample under No. 1, used by the method of presowing treatment of cotton seeds, to a certain extent, exhibits fungicidal properties, protecting cotton seedlings from root rot (biological efficiency 83.4%) and gummosis (61.8%), and also has a stimulating activity that has a beneficial effect on the development of cotton plants and is expressed in the formation of an additional number of cotton bolls and their faster maturation. This contributed to obtaining an additional yield of raw cotton in the amount of 4.9 (first harvest) and 4.2 (gross yield) g/plant.

Sample No. 3 showed only stimulating properties, which made it possible to obtain an additional 3.7 and 3.0 g/plant of the raw cotton crop at the first and gross harvest, respectively.

Thus, the results of tests of disinfectants obtained on the basis of acetic acid, its production waste, cuprous oxide, copper carbonate, monoethanolammonium acetate and copper acetate monohydrate: to combat root rot, gummosis, and also as stimulants in the field on cotton crops showed that the tested preparations exhibit sufficiently good fungicidal and stimulating activity and can be further used as disinfectants for cotton seeds and stimulators of plant growth and development.

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