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MICROBIOLOGICAL ACTIVITY 1-CYCLOHEXYL-3-DIETHYLAMINOPROP-3-YN-1-YL ESTER OF N- PHENYL THIOCARBAMIC ACID

Abstract. This article is given the results of the synthesis of thiocarbamate aminoacetylene alcohol and tests of its microbiological activity against mushroom cultures - pathogens of root rot. It is established, an antimicrobial agent based on 1-cyclohexyl -3-diethylaminoprop-3-yn-1-yl ester of N-phenyl thiocarbamic acid has been given a significantly high protection effect from microbes at very low concentrations. The antimicrobial activity of the agent solution AN-60-2 was found to be from 10 to 100 times higher than the corresponding polytrimethylvinylethynyl-piperidol (PTMVEP) solution. With the practical use of the drug AN-60-2, the economic effect can be achieved by increasing the safety of the seed pool, reduce crop losses from disease, in particular from root rot pathogens, during ventilation and during storage of agricultural products, reduce the cost sanitation of premises, boxes, securities, because they use very low doses of AN-60-2.

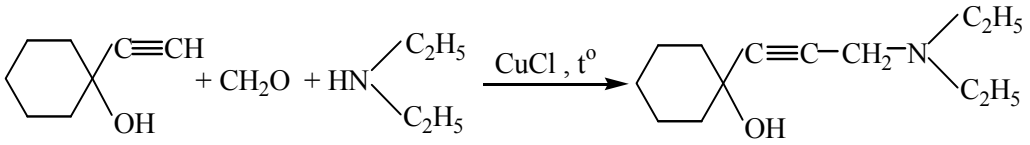
Key words: thiocarbamate aminoacetylene alcohol, carbamic acids, microbiological activity, antimicrobial agent.

Introduction. At present, in medicine, sanitation and agriculture against harmful microorganisms various inorganic and organic compounds are used [1-3]. Usually highly effective are substances having several functional groups [4-6]. However, many bactericides inhibit the growth or destroy not only microorganisms, but also have a harmful effect on warm-blooded animals. In this regard, some bactericides were removed (for example, phenol) from the application, and for some of them the scope of application is limited.

Currently, derivatives of thio - and dithiocarbamates acids widely-used in the practice of agriculture as seed disinfectants and contact tion of fungicides. For example, by the beginning of the XXI century in the USA tio- and dithiocarbamates accounted for about 60% of all fungicides used [7-9]. However, until today there is very little information about the antimicrobial properties of this class of ester production, although they are polyfunctional compounds and contain several potentially active functional groups in terms of microbiological activity, such as active acetylene bond due to the inductive effects of methyl groups located in α- and β-positions, and the tertiary amine group with an undivided electron pair can give such compounds new useful properties.

In the aspect of said, the synthesis and study of microbiological properties of 1-cyclohexyl-3-diethylaminoprop-3-yn-1-yl ester of N-phenyl thiocarbamic acid was of some interest.

Methods. Acetylene amino alcohol 1-cyclohexyl-(1´)-ol-3-diethylamino-propyne-1 synthesize on the basis of acetylene alcohol ethynylcyclohexanol, paraform and diethylamine [10] by the famous Mannich reaction:



To a three-neck flask with a volume of 1 l, equipped with a mechanical stirrer with an oil shutter, by a reflux condenser and a separating funnel, put 400 ml of dry dioxane, 124 g (1 mol) ethynylcyclohexanol, 9.9 g (0.1 mol) freshly prepared copper monochloride, 30 g of paraform and, stirring, were heated to 70°C.

Continuing heating of the reaction mixture through a separating funnel, 73 g (1 mol) of diethylamine dissolved in 100 ml of dioxane was added dropwise.

Stirring was continued for 4 hours at the indicated temperature.

After the end reaction inorganic impurities were separated with hot filtration, and dioxane was distilled off in a vacuum of a water-jet pump.

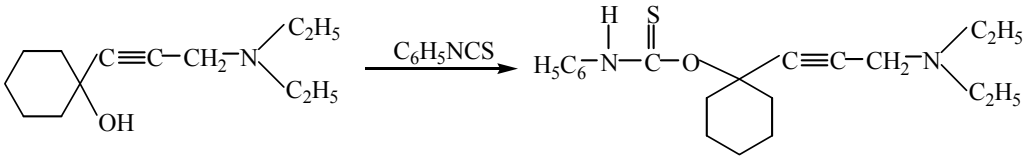
The residue was distilled under vacuum, at 115°C/8 mm Hg 127.4 g (61% of theory) of aminoacetylene alcohol was obtained.

Gross formula: $C_{13}H_{23}NO$,

Is calculated, %: C – 74,64; H – 11,00; N – 6,70;

Is found, %: C – 74,56; H – 10,83; N – 6,73.

The ester of the synthesized aminoacetylene alcohol with N-phenylthiocarbamic acid was obtained according to the following scheme:



The equimolar amount of the components interacts when heated in the medium of an organic solvent. To do this, in a flask equipped with a reflux condenser were placed 4.18 g (0.02 mol) of acetylene amino alcohol 1-cyclohexyl- (1´) -ol-3-diethylamino-propyne-1 and 2.7 g (0.02 mol) of phenyl isothiocyanate in 50 ml of abusolutized benzene, heated at the boiling point of the latter for 5 hours.

Then the reaction mass was cooled to room temperature and the benzene was distilled off under the vacuum of a water jet pump, and the residue was distilled under vacuum. 4.68 g (68% of theoretical) of 1-cyclohexyl-3-diethylaminoprop-3-yn-1-1-yl ester of N-phenylthiocarbamic acid were obtained, Tmelt = 127-129 °C.

Gross formula: $C_{20}H_{28}NOS$,

Is calculated, %: C – 72,72; H – 8,48; N – 4,24;

Is found, %: C – 72,81; H – 8,39; N – 4,32.

The resulting thiocarbamate, under the conditional name the drug AH-60-2, is subjected to microbiological testing under laboratory conditions using a known technique [11-14].

Results and discussions. The concentrations of the AN-60-2 preparation solutions were tested from 0.0001 to 0.05%, which are obtained by the method of serial dilutions of a 1% aqueous alcohol solution (ethyl alcohol: water = 1: 1 by volume). Bacterial and mushroom test cultures were taken as the test object.

Antimicrobial properties of AN-60-2

A drug	*Test culture*	Drug concentrations, % (mass)**				
		0,0001	0,001	0,005	0,01	0,05
PTMVEP*	*Botrytis cinerea*	–	–	–	+	+
PTMVEP*	*Helminthosporium*	–	–	–	+	+
AN-60-2	*Botrytis cinerea*	±	±	+	+	++
AN-60-2	*Helminthosporium*	±	+	+	++	++

*Famous drug, polytrimethylvinylethynylpiperidol.

** - (-) – does not possess antimicrobial activity; (±) – suppression zone 5 mm; (+) – suppression zone between 5 and 10 mm; (++) – suppression zone between 10 mm and above.

Practically all tested concentrations of AN-60-2 showed a pronounced antimicrobial activity against fungal cultures that are the causative agents of root rot.

The results of microbiological tests are presented in table.

From the data of table 1 it can be seen that the proposed antimicrobial agent AN-60-2 based on 1-cyclohexyl-3-diethylaminoprop-3-yn-1-yl ester of N-phenylthiocarbamic acid gives a significantly high microbial protection effect at very low concentrations.

Conclusion. Thus, it is established, an antimicrobial agent based on 1-cyclohexyl -3-diethylaminoprop-3-yn-1-yl ester of N-phenyl thiocarbamic acid has been given a significantly high protection effect from microbes at very low concentrations. The antimicrobial activity of the agent solution AN-60-2 was found to be from 10 to 100 times higher than the corresponding PTMVEP solution.

AN-60-2 is ecologically safe, does not irritate the skin and respiratory tract, as a crystalline substance, it is well soluble in many polar organic solvents and their mixtures with water, at low concentrations and in a cold aqueous-organic medium, at relatively low the dosage of the antimicrobial activity significantly exceeds the known antimicrobial agents.

With the practical use of the drug AN-60-2, the economic effect can be achieved by increasing the safety of the seed pool, reduce crop losses from disease, in particular from root rot pathogens, during ventilation and during storage of agricultural products, reduce the cost sanitation of premises, boxes, securities, etc., because they use very low doses of AN-60-2.

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N-ФЕНИЛТИОКАРБАМИН ҚЫШҚЫЛЫНЫҢ 1-ЦИКЛОГЕКСИЛ-3-ДИЭТИЛАМИНОПРОП-3-ИН-1-ИЛ ЭФИРІНІҢ МИКРОБИОЛОГИЯЛЫҚ БЕЛСЕНДІЛІГІ

Аннотация. Қарастырылып отырған мақалада аминоацетилен спиртінің тиокарбаматы синтезделіп оның өсімдіктер тамырларының шіруіне соқтыратын саңырауқұлақтарға қарсы микробиологиялық қасиеттері зерттелгендігі жайлы мәліметтер келтірілген. N-фенилтиокарбамин қышқылының 1-циклогексил-3-диэтиламинопроп-3-ин-1-ил эфирінің микробиологиялық белсенділігі аз ғана концентрацияның өзінде жоғары екенідігі көрсетілген. АН-60-2 препарат ерітіндісінің антимикробты белсенділігі тиісті политриметилвинилэтинилпиперидол (ПТМВЭП) ерітіндісінен 10-нан 100 есеге дейін жоғары болды. АН-60-2 препаратын практикалық пайдалану кезінде экономикалық тиімділігі тұқымдық қордың сақталуын арттыру, ауыл шаруашылығы дақылдары түсімінің аурулардан, атап айтқанда тамыр шірінділерінің қоздырғыштарынан, өсіп-өну кезеңінде және ауыл шаруашылығы өнімдерін сақтау кезінде, бокстардың, бағалы қағаздардың санитарлық өңделуін арзандату есебінен қол жеткізуге болады, өйткені АН-60-2 дозасының өте төмен мөлшерлері пайдаланылады.

Түйін сөздер: аминоацетилен спиртінің тиокарбаматы, карбамин қышқылы, микробиологиялық белсенділік, микроорганизмдерге қарсы препарат.

А. Б. Баешов[1], А. К. Мамырбекова[2], М. К. Касымова[3], А. Д. Мамитова[3], А. К. Мамырбекова[2], Н. У. Алиев[4], О. Н. Чечина[5]

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МИКРОБИОЛОГИЧЕСКАЯ АКТИВНОСТЬ 1-ЦИКЛОГЕКСИЛ-3-ДИЭТИЛАМИНОПРОП-3-ИН-1-ИЛОВОГО ЭФИРА N-ФЕНИЛТИОКАРБАМИНОВОЙ КИСЛОТЫ

Аннотация. В статье приведены результаты синтеза тиокарбамата аминоацетиленового спирта и испытаний его микробиологической активности против грибных культур – возбудителей корневых гнилей. Установлено, что антимикробное средство на основе 1-циклогексил-3-диэтиламинопроп-3-ин-1-илового эфира

N-фенилтиокарбаминовой кислоты дает значительно высокий эффект защиты от микробов при весьма малых концентрациях. Антимикробная активность раствора средства АН-60-2 оказалось от 10 до 100 раз выше соответствующего раствора политриметилвинилэтинилпиперидола (ПТМВЭП). При практическом использовании препарата АН-60-2 экономический эффект может быть достигнут за счет повышения сохранности семенного фонда, снижения потерь урожая сельскохозяйственных культур от болезней, в частности от возбудителей корневых гнилей, в период вегетации и во время хранения сельхозпродуктов, удешевления санобработки помещений, боксов, ценных бумаг, поскольку используются весьма низкие дозировки АН-60-2.

Ключевые слова: тиокарбамат аминоацетиленового спирта, карбаминовые кислоты, микробиологическая активность, антимикробное средство.

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