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Receiving Liquid Complex Fertilizers and Growth Factors of Plants on the Basis of a Sodium Humate - Ammonium, Nitrate of Ammonium, a Carbamide and Sulphate of Ammonium

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ABSTRACT. In article the main results of receiving difficult liquid a humate of the containing growth factors of plants and fertilizers are described. Optimum ratios of initial components are defined. In considered to a system for receiving a growth factor of plants by an optimum ratio of initial components are a humate: ammonium nitrate: carbamide: ammonium sulfate = 100:0,9:0,7: At which the growth factor of development of plants the having structure N of 1,01%, a humate of ammonium of 4,92% turns out 0,017 and 0,010% are gray. Also a growth factor of plants with contents N of 0,63%, a humate of sodium of 4,92% 0,010% are also gray. For use as liquid fertilizers an optimum ratio of initial components is a humate: ammonium nitrate: carbamide: ammonium sulfate = 100:36:28. At which fertilizers the having structure N of 15,71%, a humate of ammonium of 3,04% turns out 0,68 and 0,25% are gray. Also containing N of 15,48%, a humate of sodium of 3,04% are also gray 0,25%.

KEYWORDS: brown coal, ammonium humate, sodium humate, ammonium nitrate, carbamide, ammonium sulfate, liquid fertilizers.

I. INTRODUCTION

For increase in efficiency of use of nutrients from fertilizers and the soil, strengthening of immunity of plants to adverse factors of the environment and improvement of quality received products of use of humic medicines are of great interest to agricultural production. They show high agrochemical efficiency at cultivation of various cultures in any soil climatic conditions.

II. SIGNIFICANCE OF THE SYSTEM

In article the main results of receiving difficult liquid a humate of the containing growth factors of plants and fertilizers are described. Optimum ratios of initial components are defined. The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

**III. LITERATURE SURVEY**

In work it is provided [1] that at application a humate of the containing fertilizers of a molecule of humates enter into soil structure, the exchange capacity of soils sharply increases in their presence. The adsorbed forms of nutrients do not contact the soil, are not washed away by water, are in available to use by plants a state. Further plants use these adsorbed substances, and more intensively, than from soil solution. The mechanism of interaction of humates and macrocells of mineral food is specific to each of them. Digestion of nitrogen goes on the way of an intensification of exchange processes at application of humates, at the same time negative processes of formation of nitrates slow down. Digestion of potassium accelerates due to selective increase in permeability of a cellular membrane. As for phosphorus, humates, connecting first of all ions of Ca, Mg and Al, interfere with formation of insoluble phosphates [2].

In works it is given [4-18] values and the mechanism of effect of humic substances and the organomineral of fertilizers at applications in agricultural production. Soluble humates are the most actively acting on food of plants. They influence the general course of a metabolism in a plant, strengthening oxygen absorption, activating enzymes (first of all a respiratory cycle), strengthening formation of a chlorophyll, changing forms of compounds of phosphorus, increasing contents mono and disaccharides and also protein in a harvest.

IV. METHODOLOGY

Initial materials for receiving the humates, humic fertilizers and other products containing humic substances are peat and the coal oxidized in nature. Coals with the content of humic acids higher than 45% are effectively used as raw materials for production of humic fertilizers and various humates. And coals with the content of humic acids to 20% need to be oxidized. In brown coal of the Angren field the content of humic acids is not enough. Therefore, in work [19] we for transformation of an organic part of coal into humic acids studied oxidation process. In experiences the brown coal of the Angren field having after drying to air dry state and crushing in a spherical mill to the size of 0,25 mm structure was used (weight, %): moisture 14,1; ashes 13,7; organic chemistry 72,2; humic acids of 4,1% for organic weight. Process of oxidation of coal was carried out at concentration of nitric acid from 10 to 40%, temperature from 30 to 60°C, lasting from 30 up to 120 min. and a weight ratio of an organic part of coal to monohydrate of nitric acid from 1:0,4 to 1:2. Under optimal conditions the oxidation level of coal was 65,5%. The received product of oxidation contains 57,2% of humic acids. Such oxidized coal can be used for receiving liquid complex fertilizers with humates of sodium and ammonium.

The purpose of this work are receiving fertilizer and a growth factor of plants of the containing various forms of nitrogen, soluble forms of humic substances and also sulphurs. It should be noted, when choosing ratios of initial components recognized from this that the received solutions could be used as a stimulator where low concentration of solutions and where their high concentration as liquid fertilizers. In fertilizers will be ammonium, amide, and nitrate forms of nitrogen thanks to what contain fertilizer works is prolonged, and plants during vegetation are provided with three forms of nitrogen. Also improves the content in fertilizers of sulphur quality received fertilizers. As sulphur is from the most important batteries of plants without which life is impossible. As well as nitrogen is a component of a baby seal.

For receiving liquid difficult the humate of containing of nitrogen – sulphur stimulators of plants and fertilizers it is used brown coal of the above-stated structure, also ammonium sulphate (weight, %): moisture – 0,21; N the general – 21,2; ammonium nitrate (weight, %): moisture – 0,3; N the general – 34,7 and a carbamide (weight, %): moisture – 0,3; N the general – 46,2. Process of oxidation of a coal trifle was carried out in the mode: concentration of nitric acid of 30%, temperature of oxidation 40°C, duration is 1 hour, a ratio of an organic part of coal to monohydrate of nitric acid 1:2. After the end of process of oxidation the firm phase was separated from liquid by centrifugation. For extraction of humic acids from the oxidized coal it was processed by 1,0% solution of alkalis at a mass ratio of firm and liquid phases $T=1:8$. Process of extraction was carried out in the mixer within 60 minutes at a temperature of 70°C, then the office of a liquid phase was carried out centrifugation, and the remained firm phase was in addition subjected to processing at the second and third stages, at each stage added solution of alkali and before achievement of a ratio of $T=1:8$ also carried out process of extraction and office of a liquid phase under the same conditions, as at the first stage. Then solutions of the humates received in three stages combined and upriver at a temperature no more than 70°C to the content of 95% of moisture. Further to uparennny solutions of humates ammonium nitrate, a carbamide and sulphate of ammonium at ratios added a humate: ammonium nitrate: carbamide: ammonium sulphate = 100:(0,9-45):(0,7-

35):(0,017-1,36) then mixed before full dissolution. Thus, received liquid fertilizer of the containing various forms of nitrogen, sulphur and humates. For definition of storage conditions, transportation and entering into the soil is defined density and viscosity of liquid fertilizers. Density was measured by a psychometric method, and viscosity by means of the glass capillary viscometer of VPJ-2 brand with a diameter of 0,99 mm in the range of temperatures 20-40°C. The composition of the received liquid fertilizers is given in tables 1, 2.

V. EXPERIMENTAL RESULTS

From tables it is visible, by mixture of 5% of solution of a humate of ammonium ammonium nitrate, a carbamide and sulphate of ammonium it is received difficult liquid fertilizers with contents N from 0,38 to 17,84%, a humate of ammonium from 2,76 to 5% and from 0,001 to 0,4% are gray. By mixture of 5% of solution of a humate of sodium ammonium nitrate, a carbamide and sulphate of ammonium it is received difficult liquid fertilizers with contents N from 0,02 to 17,63%, a humate of sodium from 2,76 to 5% and from 0,001 to 0,45% are gray. Also from tables it is visible that with increase in concentration of solutions and decrease in temperature density of solutions increases. And a pulp viscosity in the ranges of temperature of 20-40°C, and ratios a humate: ammonium nitrate: carbamide: ammonium sulphate = 100:(0,9-45):(0,7-35):(0,017-1,36) has low values. And it means that solution it is transportable and will not cause any difficulties at its pumping from the device in the device and further use

Table 1

Structure of the liquid humic stimulator and fertilizers received on the basis of a humate of ammonium, nitrate of ammonium, a carbamide and ammonium sulphate (humate ammonium of 5% solution)

Ratio Ammonium humate: NH ₄ NO ₃ :CO(NH ₂) ₂ :(NH ₄) ₂ SO ₄	General N, %	General SO ₃ , %	Humate of ammonia %	Moisture, %	Density, g/sm ³ at temperatures, °C			Viscosity, sPz at temperatures, °C		
					20	30	40	20	30	40
100:0 : 0: 0	0.38	0,001	5	94.05	1,016	1,008	1,000	1,323	1,066	0,859
100:0,9 : 0,7: 0,017	1.001	0.010	4.92	92.55	1,026	1,016	1,008	1,659	1,293	1,017
100:1,8 : 1,4: 0,034	1.602	0.019	4.84	91.10	1,038	1,028	1,018	1,985	1,540	1,215
100:2,7 : 2,1: 0,051	2.186	0.029	4.77	89.70	1,043	1,033	1,024	2,320	1,758	1,363
100:4,5 : 3,5: 0,085	3.299	0.047	4.63	87.01	1,049	1,038	1,033	2,646	2,004	1,540
100:9 : 7: 0,17	5.813	0.089	4.30	80.96	1,055	1,045	1,038	3,673	2,735	2,093
100:18 : 14: 0,34	9.917	0.156	3.78	71.07	1,098	1,072	1,080	3,407	2,587	2,024
100:36 : 28: 0,68	15.710	0.250	3.04	57.11	1,137	1,117	1,123	3,170	2,439	1,945
100:45 : 35: 1,36	17.835	0.454	2.76	51.86	1,182	1,172	1,162	2,933	2,330	1,906

Table 2

Structure of the liquid humic stimulator and fertilizers received on the basis of a humate of sodium, nitrate of ammonium, a carbamide and ammonium sulfate (humate sodium of 5% solution)

Ratio Humate sodium: NH ₄ NO ₃ : CO (NH ₂) ₂ : (NH ₄) ₂ SO ₄	General N, %	General SO ₃ , %	Humate sodium, %	Moisture, %	Density, g/sm ³ at temperatures, °C			Viscosity, sPz at temperatures, °C		
					20	30	40	20	30	40
100:0 : 0: 0	0,02	0,001	5	94.05	1,055	1,047	1,038	1,374	1,107	0,892
100:0,9 : 0,7: 0,017	0.63	0.010	4.92	92.55	1,065	1,055	1,047	1,722	1,343	1,056
100:1,8 : 1,4: 0,034	1.23	0.019	4.84	91.10	1,077	1,067	1,057	2,060	1,599	1,261
100:2,7 : 2,1: 0,051	1.82	0.029	4.77	89.70	1,082	1,072	1,063	2,409	1,825	1,415
100:4,5 : 3,5: 0,085	2.95	0.047	4.63	87.01	1,089	1,077	1,072	2,747	2,081	1,599
100:9 : 7: 0,17	5.49	0.089	4.30	80.96	1,095	1,084	1,077	3,813	2,839	2,173
100:18 : 14: 0,34	9.63	0.156	3.78	71.07	1,140	1,113	1,121	3,536	2,686	2,101
100:36 : 28: 0,68	15.48	0.250	3.04	57.11	1,181	1,159	1,165	3,290	2,532	2,019
100:45 : 35: 1,36	17.63	0.454	2.76	51.86	1,227	1,217	1,206	3,044	2,419	1,978

However, at a ratio a humate: ammonium nitrate: carbamide: ammonium sulphate =100:18:14:0,34 in solutions begins formations of insignificant number of draft because of increase in concentration of solution, formations of draft amplifies at a ratio a humate: ammonium nitrate: carbamide: ammonium sulphate =100:45:35:1,36. In terms of agro chemistry, for receiving a growth factor of plants an optimum ratio of initial components are a humate: ammonium nitrate: carbamide: ammonium sulphate =100:0,9:0,7. At which the growth factor of development of plants the having structure N of 1,01%, a humate of ammonium of 4,92% turns out 0,017 and 0,010% are gray. Also a growth factor of plants with contents N of 0,63%, a humate of sodium of 4,92% 0,010% are also gray.

For use as liquid fertilizers an optimum ratio of initial components is a humate: ammonium nitrate: carbamide: ammonium sulphate =100:36:28. At which fertilizers the having structure N of 15,71%, a humate of ammonium of 3,04% turns out 0,68 and 0,25% are gray. Also containing N of 15,48%, a humate of sodium of 3,04% are also gray 0,25%.



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VI. CONCLUSION AND FUTURE WORK

Thus, results of the conducted researches convincingly show about a possibility of receiving liquid soluble various humic stimulator and fertilizers of the containing various forms of nitrogen, soluble forms of humic substances and also sulfurs.

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