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Methods For Studying the Physical and Mechanical Properties of Chemicals for Pre-Sowing Treatment of Agricultural Crops

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Abstract
The properties of both inorganic and organic powder ingredients play a certain role in the preparation of chemical preparations based on them. Therefore, first of all, before obtaining high-quality chemical preparations, it was necessary to study the properties of powder ingredients. Note that for the preparation of high-quality chemical reagents, bulk density, specific gravity, density and granulometric composition of powder ingredients play a special role.

Keywords. Drug, powder ingredient, density, bulk density, specific gravity, bulk mass.

Introduction

The leading agricultural crop of Uzbekistan, cotton, is affected by many diseases. Obtaining high and stable yields of high quality is impossible without implementing a set of measures to protect yields from such dangerous diseases as gommosis and root rot. Cotton root rot is a very common disease. It is found everywhere and causes great harm to the cotton growing industry of the Republic. Every year, an area of 200-300 thousand hectares is reseeded or reseeded.

Pre-sowing disinfection of seeds in order to protect them from diseases and pests is one of the most necessary plant protection measures. Already in ancient times, people tried to protect seed material from harmful organisms using various substances - ash, olive pomace, crushed cypress leaves, salt water, Glauber's salt, copper and arsenic compounds, etc.

Thus, seed disinfection is of utmost importance in the fight against both gommosis and root rot. Therefore, this work analyzes existing methods of pre-sowing treatment such as mechanical, physical, mechano-chemical, chemical and combined methods in order to identify highly effective methods for treating cotton seeds. It has been revealed that the mechanical and chemical method of treating agricultural seeds is a more effective method. However, the chemicals used are either expensive or not effective enough. In this regard, this work is devoted to the research and development of highly effective, accessible, cheap chemicals based on local raw materials and waste from food production and non-ferrous metal processing industries.

Object and subject of research

The objects of research are: Na-carboxymethylcellulose, polyacrylamide (PAA) and ferrochlorolignosulfonate-1, obtained from alcohol production waste - lignin, and cottonseed oil (gossypol resin), caustic and soda ash, gossypol resin - waste from oil and

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fat production, alumak - waste from the production and processing of non-ferrous metals.
The subject of the study is to establish the patterns of changes in the physicochemical and technological characteristics of the developed compositional compositions of chemical preparations for treating sowing seeds and wheat crops.
Methodology for determining the bulk mass of powder materials. Bulk bulk mass - is the mass per unit volume of loose powdery bulk material with voids.
To determine this indicator, use a standard funnel with a shutter at the bottom (Fig. 1). A pre-weighed vessel (g1) is placed under the funnel. The capacity of the vessel depends on the type and size of the material particles, for example, the bulk mass of sand is 1 liter (V0). Having opened the funnel shutter, slowly fill the vessel from a height of 10 cm until a pyramid is formed, which is then carefully cut off with a ruler and the vessel with the material is weighed.
Volumetric bulk mass is determined in g/cm3 as the arithmetic mean of the results of three determinations using the formula:
Yо.н=g / V0= (g2- g1) / V0
Method for determining the specific gravity (density) of powder ingredients. Density of the solid phase (specific gravity) is the mass of a unit volume of material in a dense state. The density of the solid phase of drilling fluids is determined using a volumetric meter (Le Chatelier-Candlot device), a volumetric flask, or the drying method.

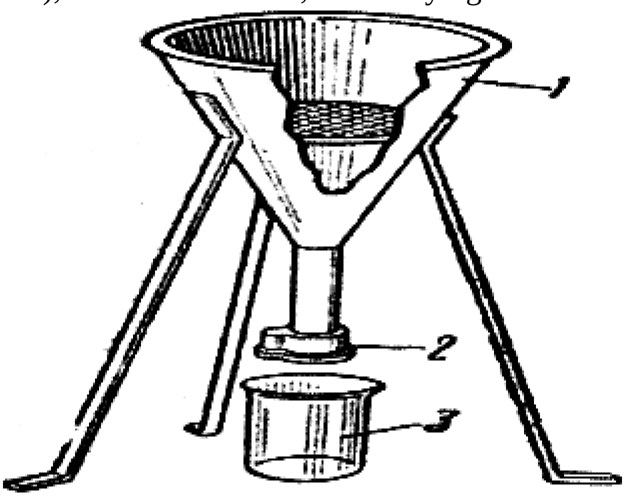

Fig. 1. Funnel for determining bulk bulk mass
1-funnel with material; 2-shutter; 3-vessel

The volume meter is a glass flask, the neck of which in its middle part is expanded in the form of a reservoir and ends in a funnel (Fig. 2). The volume of the tank is 20 cm3, there are marks on the top and bottom. The upper neck of the flask is graduated at 0.2 cm3.
The volume meter is filled with kerosene to the bottom mark, placed in a vessel with water at a temperature of 20°C, and kept until the liquid in it reaches the temperature of water (about 15-20 minutes).

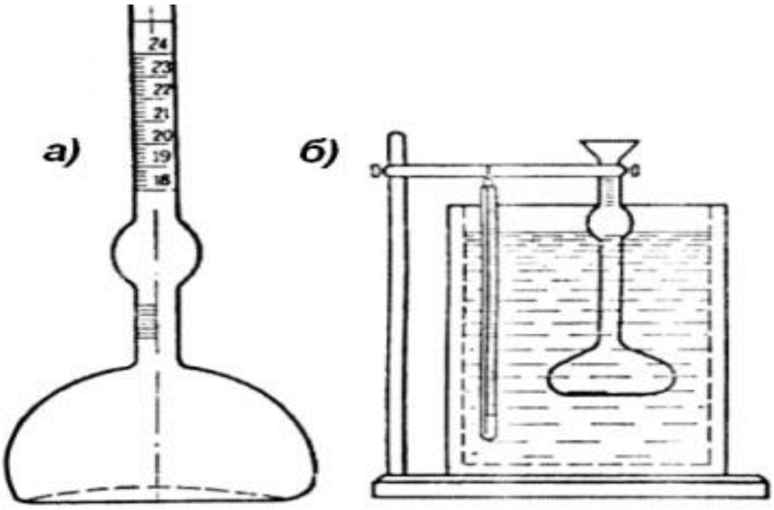

Fig.2. Device for determining specific gravity
a-Le Chatelier-Candlot flask; b-device assembled

If the level of kerosene changes relative to the mark, then, accordingly, either remove the excess kerosene with a strip of filter paper, or add it exactly to the mark. Then small portions of the solid phase of the analyzed drilling fluid weighing 100 g are poured into the volumemeter, dried to a constant weight, ground in a mortar and sifted through a sieve with mesh size of 0.25 mm.

The sample is weighed with an accuracy of 0.01 g as the arithmetic average of the results of three tests. The sample is poured by lightly shaking the volumetric meter until the kerosene level rises to the upper mark or to a division above this mark within the graduated part of the pycnometer. After this, the VU meter is rotated around a vertical axis until the release of air bubbles completely stops. The volume meter with a sample of the solid phase is kept in a vessel with water until the level of kerosene in the volume meter stops changing. Based on the difference between the upper and lower marks of the kerosene level in the volume meter, the volume of kerosene displaced by a sample of the solid phase is determined. The level of kerosene in the volume meter before and after pouring out the sample is measured along the lower meniscus. The remainder of the solid phase after filling the volumeter is weighed again and the mass of the solid phase is found from the difference in the masses of the solid phase before analysis P1 and the remainder P2:

$$P = P1 - P2.$$

The density of the solid phase is calculated using the formula:

$$Ptv = P/Vk,$$

where P is the mass of the solid phase poured into the volume meter, g;

Vk is the volume of kerosene displaced by the solid phase (volume of the solid phase), cm3.

When studying the physico-chemical and structural-mechanical properties of chemical solutions, we studied their density, static shear stress, viscosity, fluid loss, and pH value.

Study of the physicochemical and technological properties of an aqueous solution of Na-carboxymethylcellulose of various concentrations. It should be noted that currently the

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most common chemical reagent used in the preparation of solutions for cultivating and growing agricultural crops is Na-caboxymethylcellulose (Na-CMC), obtained from cotton linters.
The effectiveness of solutions is directly dependent on the quality of the chemical reagents used. Because of this, certain requirements are imposed on chemical reagents regarding their physical, chemical and technological properties.
Taking this into account, we investigated the physicochemical and technological properties of an aqueous solution of Na-CMC of various concentrations of domestic production.
The Na-CMC we used had the following indicators: mass fraction of water 8%; degree of substitution for carboxymethyl groups 0.82; mass fraction of the main substance in an absolutely dry technical product is 58.5%; solubility in water in terms of absolutely dry technical product 96.5%; pH value of aqueous solution pH=11; degree of polymerization 716.
In Fig. 3. The results of studies of the physicochemical and technological properties of an aqueous solution of Na-CMC of various concentrations are presented.

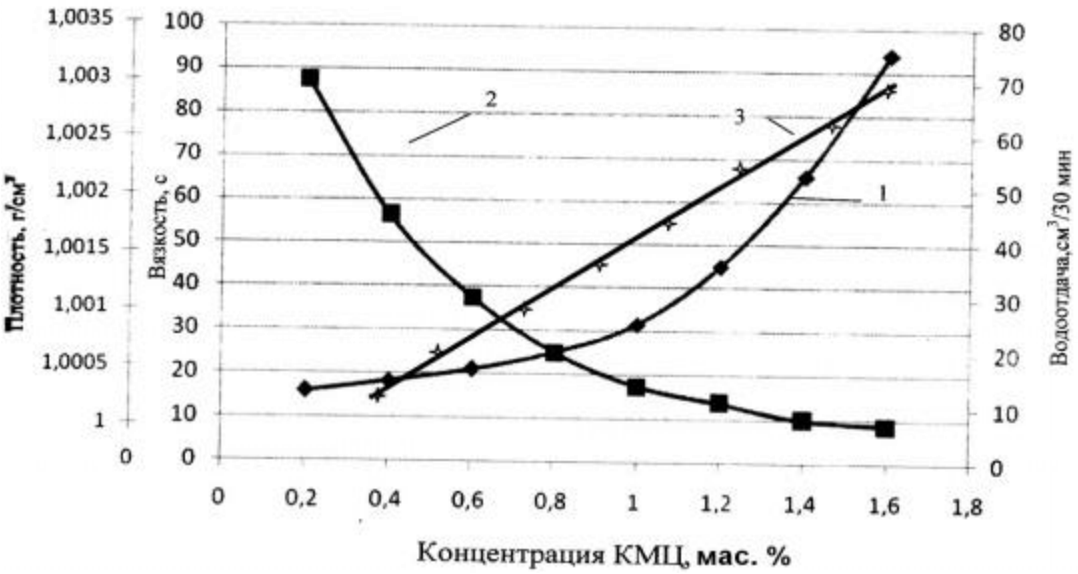

Fig. 3. Dependence of viscosity (1), fluid loss (2) and density (3) of aqueous solutions of Na-CMC on its concentration

From the course of the curves in Fig. 3. it can be seen that the viscosity and density of solutions increase as the CMC concentration increases, and the water loss rate decreases. This pattern of curves is explained by the fact that Na-CMC is a high-molecular substance with a higher density compared to water. As it dissolves in water, the viscosity of the system increases, and with increasing viscosity, the fluid transfer rate of solutions decreases and vice versa.
The above is confirmed by the data obtained from studying the technological parameters of aqueous solutions of Na-CMC (Table 1).
As can be seen from the data in table. 1, the viscosity, density and fluid loss of solutions significantly depend on the concentration of Na-CMC. In this case, the viscosity of Na-

CMC solutions increases from 16 to 94 sec. The density indicator changes slightly [7-9]. However, water yield decreases from 70 to 7 cm3/30 min. So, we can conclude that by selecting the appropriate concentration of Na-CMC, it is possible to purposefully regulate the rheological and technological parameters of the resulting solutions, which creates favorable conditions during work.

Table 1 - Technological parameters of aqueous solutions of Na-CMC of various concentrations

Concentration of aqueous solution of CMC, wt. %	Viscosity, sec	Density, g/cm3	water yield, cm3/30 min	pH
0,2	16	1,0004	70	7,5
0,4	18,22	1,0008	45	8
0,6	21,04	1,0012	30	8
0,8	25,08	1,0016	20	8
1	31,56	1,002	14	9
1,2	45,07	1,0024	11	9
1,4	65,84	1,0028	8	10
1,6	94	1,0032	7	10

Conclusions. An analysis of literary sources and patent-licensing studies of the method of pre-sowing treatment of agricultural seeds, organic and inorganic ingredients and chemicals for treating, cultivating and growing cotton, wheat and other agricultural crops was carried out [10-12]. Taking into account the analysis of literary sources, gossypol resin, caustic and soda ash, alumac - a waste product from the processing of non-ferrous metals, carboxymethylcellulose and hydrolytic lignin were selected as ingredients for the development of effective compositions of composite preparations.

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