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Research Of Physical And Chemical Properties Of Fillers For The Development Of Composite Chemical Preparations

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ABSTRACT

The results of the study of the structures, compositions, and physicochemical properties of the ingredients are presented. The possibility of using them in the development of composite chemicals for treating cotton seeds is shown.

KEYWORDS

Cotton seeds, chemical reagent, chemical technology, gossypol resin, caustic soda, sodium salts, carboxylic acids, carbolic acids, alumac, seed disinfectant.

INTRODUCTION

The most important in the fight against both gummosis and rotten root is the disinfection of seeds, for which various methods of pre-sowing treatment are used, such as

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mechanical, physical, mechanochemical, chemical and combined methods of processing cotton seeds. A more effective method is the mechanical-chemical method of processing agricultural seeds [1-2].

However, the chemicals used are either expensive or not effective enough. In this regard, the development of highly effective, affordable, cheap chemical preparations, as well as composite materials based on local raw materials and industrial waste, used for pre-sowing processing of cotton is an urgent problem.

RESEARCH OBJECTS

To develop a composite chemical preparation, we selected gossypol resin, Na-carboxymethylcellulose (Na-CMC), polyacrylamide (PAA), caustic soda, soda ash, household water and alumak — waste products from the production and processing of non-ferrous metals as objects of study.

Composition of gossypol resin. Gossypol resin contains from 52 to 64% synthetic fatty acid (SFA) and its derivatives, the rest is the products of condensation and polymerization of gossypol and its transformation, formed during the extraction of oil, mainly in the process of distillation of fatty acids from soap stocks. The composition and properties of gossypol resin depend on the quality of the feedstock, compliance with the technological regimes for the decomposition of fats, the depth of distillation of the obtained fatty acids, and other factors. In gossypol resin, 12.0% of nitrogen-containing compounds, 36.0% of the conversion products of gossypol and 52.0% of fatty and oxyfatty acids were found, which is also confirmed by the results of IR spectroscopic analysis (Fig. 1).

IR spectrum of gossypol resin. As can be seen from Figure 1, in the IR absorption spectrum of gossypol resin - 1,1 ', 6,6', 7,7 '- hexaoxy 3.3'-dimethyl - 5,5' - di-iso-propyl-2,2 ' -dynaphthyl - 8.8'1 - dialdehyde (C30H30O8) frequencies were detected at frequencies 3751, 3725, 3711, 3670, 3648, 3628, 3608, 3357, 2923, 2853, 1712, 1645, 1634, 1557, 1464, 1456, 1377 , 1280 1110, 967, 842 and 723 cm-1.

In our case, when preparing a composition for chemical preparations for pre-sowing treatment of cotton, the process of mixing components from various ingredients is carried out at high temperatures. In this regard, we investigated the effect of temperature on the properties of gossypol resin.

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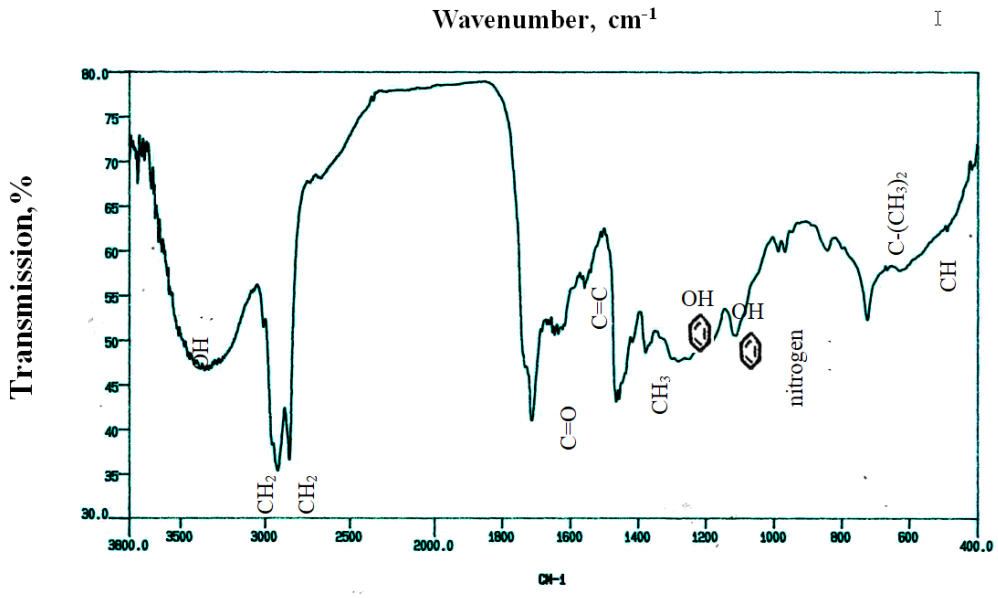

Fig. 1. IR - spectrum of gossypol resin

Taking this into account, the heat treatment of the samples of gossypol resin was carried out in order to decipher the fractional composition and determine the physicochemical properties of the obtained fractions. Fractionation was recorded at the beginning and end of the boiling point of each fraction. It should be noted that at the end of the distillation of each fraction, a temperature jump was observed by an average of 10-15 °C (Table 1).

Table 1. Fractional composition of gossypol resin, heat-treated at different temperatures

Fraction No.	Temperature, °C	External characteristics	pH	Content of the total mass, %
1	100-110	odorless b/c liquid	6,4	14-16
2	110-150	brown liquid with a pungent odor	4,6	8-9
3	150-180	light yellow liquid with a pungent odor	6,1	4-6
4	180-250	light yellow liquid with a pungent odor	6,1	1,2
residue	after heat treatment	black solid	-	71-73

According to external features and the data obtained, fraction No. 1 mainly consists of water formed as a result of condensation of live steam used in the technology of

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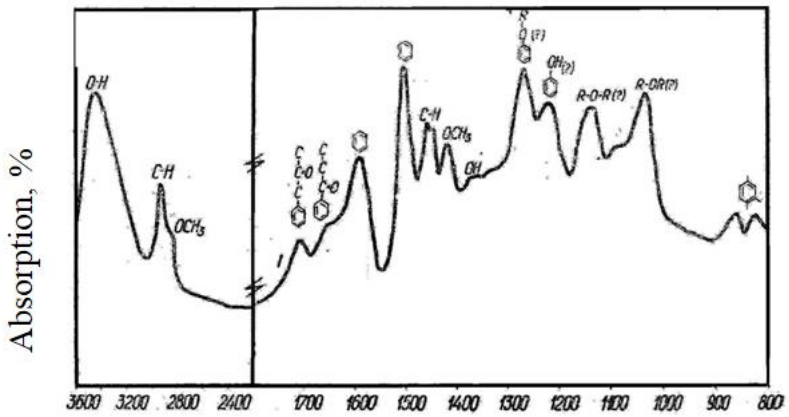
transporting gossypol resin through factory pipelines. After thermal treatment of gossypol resin to a temperature of 240-260 °C, a black solid remains, which is well ground into a powder. This residue is highly soluble in acetone but insoluble in water, polar and non-polar organic solvents.

Analyses have shown that the lignins of various hydrolysis plants differ significantly in their properties, the latter can vary significantly even from cooking to cooking. The composition of hydrolysis lignin includes significantly altered lignin itself, a part of polysaccharides, a group of substances of the lignohumic complex, sugar not washed after hydrolysis, resins, fats, wax, mineral and organic acids, ash elements and other substances. The ratio of the listed components varies in a wide range and depends on the type of raw material and the mode of the hydrolysis process. According to studies [3], the main contribution (40-88%) belongs to lignin itself, the rest is subdivided into difficult-to-hydrolyzable polysaccharides (13-45%), resinous substances and substances of the lignohumic complex (5-19%), ash elements (0, 5-10%).

Studies show that nitrolignin and leoxide obtained from hydrolyzed lignin of cotton husks have the following elemental composition, wt%: for nitrolignin - carbon 77.08; hydrogen 8.37; nitrogen 7.46; oxygen 6.34; for leoxide - carbon 69.55; hydrogen 7.43; oxygen 23.02. The IR spectrum of lignin is shown in Figure 2. As can be seen from Figure 2, the IR spectrum of lignin consists of a number of characteristic absorption bands.



Wavenumber, cm-1

Fig. 2. IR - spectrum of hydrolysis lignin

Due to the presence of the above functional groups, hydrolysis lignin, as well as gossypol resin, can interact with the components of the developed composite chemical preparations for the pre-sowing treatment of seeds of agricultural crops with gossypol resin.After being unloaded from the apparatus, hydrolytic lignin contains from 1.8 to 2.3 g of water per 1 g of absolutely dry matter. Depending on the moisture content, the physical properties of hydrolysis lignin are characterized by the following data: moisture content -0-65%, specific gravity-1.15-1.5 g/cm^3, bulk density-0.2-

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0.7 g/cm³, angle of repose for crude lignin 40-45 °C.

Hydrolysis lignin, due to its complex three-dimensional structure and high molecular weight, does not melt and is almost completely insoluble in water and common organic solvents.

The empirical formula of lignin for a phenylpropane group is as follows:

$C_9H_{3,61}O_{3,69}\left(OCH\right)_{0,21}\left(OH\right)_{0,63}\left(CO\right)_{0,37}$.

Hydrolysis lignin is considered from the point of view of a multifunctional ingredient suitable for use in agricultural production. For this purpose, lignin of the Yangiyul Biochemical Plant was used for laboratory experiments. Our research has established that the elemental composition of hydrolysis lignin in% on the absolutely dry matter is as follows: C-17,34; H-6,43; O-43,50. Content of functional groups, wt. %: phenolic (OH) – 5,06; OCH_3^- – 3,06; $COOH^-$ – 1,18; total acidic groups 6.24. The moisture content of the lignin used is 60-65%, the ash content is 4.12-2.74%. The following are the physical and chemical properties of polymer reagents. Tables 3.2-3.4 show the physicochemical properties of polyacrylamide (PAA), ferrochlorolignin (FCHL-1) and sodium carboxymethylcellulose (Na-CMC) [4].

Table 2. Physicochemical characteristics of polyacrylamide - PAA (- [- CH_2CH ($CONH_2$)-] n) JSC "Navoi-Azot"

Indicators	Indicator values
Content of acrylamide polymer in the commercial reagent,%: grade A grade B	≥50 ≥45
Ammonium sulfate content,%: grade A grade B	≤38 ≤40
Insoluble sediment content,%	≤5
Product moisture,%	16-20
Color	white, green, brown
Melting point, oC	120
Dissolution time, 40 oC	≤48
Reactivity towards metals, oxygen, air and water	close to zero
Manifestation of electrical insulation during grinding, dissolution and transportation	do not appear
Fire hazard, toxicity	non-explosive, non-toxic, fireproof

Table 3. Physicochemical characteristics of ferrochlorolignin -FCHL-1 of Fergana KhZFS (TSh 6.19-41-2008)

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Indicator name	Norm	Fact
Appearance	lumpy mass from dark brown to black	corresponds to
Concentration of hydrogen ions, pH, not less	10,0	10,9
Mass fraction of water,%, no more	12,5	9,7
Solubility in water,%, not less	75,0	85,3
Water loss of 20% drilling reagent solution, cm3, no more	9,0	8,0

Table 4. Physicochemical characteristics of sodium carboxymethyl cellulose (Na-CMC)

Description of characteristics	According to TSh 88.2-12: 2005 grades A-B TSh	Received values	
		lot no. 85	lot no. 78
Appearance	fine fibre material from white to light cream colour		
Mass fraction of water,%, no more	12,0	6,7	7,3
The degree of substitution for carboxyl groups, within	0.8 to 1.0	0,81	0,82
Mass fraction of the main substance,%,	50	52	52,7
Dynamic viscosity of an aqueous solution at a temperature of 25 °C, MPa, within	over 100	230	230
Solubility in water,%, not less	97	97	97
Hydrogen index (pH) of an aqueous solution, within	from 8 to 12	10,14	10,01
Polymerization degree, not less	700	700	827

As can be seen from tables 2-4, the revealed characteristics of pilot batches of composite chemical preparations of the KPGS type and "KPM-Darmon" for pre-sowing treatment of agricultural seeds show that they fully comply with the results of laboratory studies and meet the requirements for chemical preparations used in dressing seeds of agricultural crops in the Republic of Uzbekistan. Thus, the study of the structure, composition, and physicochemical properties of the ingredients showed that they can be used as components for the development of composite chemical preparations.

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REFERENCES

1. Askarov M.A., Negmatov S.S., Abdukadirova N.M., Abdukaromova D.N. (2017). Causative agents of plant diseases and their ways of spreading. Composite materials. Tashkent. Number 3. P.96.

2. Makhkamov, K.M., Karimov, H.H., Kadyrova, D.H., & Krakow, V.E. (1984). Method of processing cotton seeds.

3. Askarov M.A., Negmatov S.S., Abdukadirova N.M., Egamberdiev B. (2017). The role of chemicals in the cultivation of cotton, wheat and other crops. Composite materials. Tashkent. No. 1. pp.25-26.

4. Abdukarimova, D.N., Negmatova, K.S., & Eminov, Sh.O. (2020). Investigation of the physicochemical and technological properties of Na-carboxymethylcellulose and composite powdered gossypol resin from their concentration. Universum: Engineering Sciences, (5-2 (74)).