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TECHNOLOGY OF OBTAINING POLYSACCHARIDES BASED ON DIMETHYLSULPHOXIDE

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Abstract: Researchers have presented a technology for extracting valuable monosaccharides from rice stalks, which are of little importance for industry.
Keywords: Trifluoroacetic acid, solution, hydrolysis, arabinose, xylose, glucose, mannose, galactose, natural polymer, rice stalk, dimethylsulfoxide urea.
Аннотация: Исследователи представили технологию извлечения ценных моносахаридов из стеблей риса, не имеющих большого значения для промышленности.
Ключевые слова: трифторуксусная кислота, раствор, гидролиз, арабиноза, ксилоза, глюкоза, манноза, галактоза, природный полимер, стебель риса, диметилсульфоксид мочевины.

Introduction. By extracting various compounds from the rice stalk, its place in industry can be increased. With the help of ionic liquid, it has been established that there is a possibility of extracting compounds from the stems of reeds, hemp and other plants [1]. Rice stem contained cellulose melting process molecular and odor gardens violation with goes Lignin is cellulose raw in IS (ionic liquid) conditions processing to give scientific in terms of based on is an industry scale apply to promise important has [2]. This increased as IS for dimethylsulfoxide urea was applied. Dimethyl sulfoxide important biodegradable solvent being another representative of than harmful side Strong solvents such as cellulose to fractions in separation high efficiency proved [3].

Research materials and style. Rice stem Surkhandarya of the region rice grown from the fields received Ionic liquid as dimethylsulfoxide urea was used. Ultrasound with processing to give temperatures when the interval is 80-140°C and from 5 to 20 minutes the working frequency 45 kHz and power 10, 30, and 50 W has been ultrasonic using a dispersant UZDN-2T done increased. Rice stem in ionic liquid 5, 10, 15 minutes 10, 30, 50 W at a temperature of 80, 110, 140°C during ultrasonic in radiation three different in the circumstances processing given Harvest done natural polymers triftoruxus acid using hydrolysis was done [4].

Analysis and results. Received to the results of the ultrasound use product of the product to increase help gives, and processing to give the term shortens. Rice the stem at 100 °C for 15 minutes 10 W during in-power ultrasound with processing product yield is 52.6 % achieved, simple 60 minutes under conditions during processing 43.1% when given organize did

Ultrasound 50 W of power to increase with product yield up to 63.1 % rises. An increase in ultrasound power by 50 W has been proven to increase hemicellulose by 6% and lignin by 10% within 15 minutes. It depends on the effective breaking of cross-links between lignin and hemicellulose during ultrasound treatment. Under normal conditions, i.e., treatment of rice stalks without ultrasound requires 7 hours more. Therefore, the use of ultrasound to dissolve rice stalks in ionic liquid can save up to 5-6 hours. 5.9% of lignin is separated into fractions when rice stalks are treated at 100°C for 1 hour under normal conditions, which increases to 10% in 15 minutes if 10 W ultrasound is used.

As a result of separation from lignin and hemicelluloses, the percentage of hydrolyzable polysaccharides in the TS fraction increases after thermal treatment due to the weakening of the strength of the hydrogen bond network. As a result, despite the decrease in the amount of polysaccharides, the release of monosaccharides after acid hydrolysis of the fraction increases (Table 1).

Table 1. of TS fractions in hydrolyzates of monosaccharides quantity

Conditions, °C/ s	T composition , % mass .					Total, % mass.
	Bee	Xyl	Man	Gal	Glc	
100/1	4.60	26.80	0.03	0.55	13.00	44.98
120/1	6.00	24.60	0.03	1.05	18.00	49.68
140/1	4.80	24,30	0.20	1.52	19.80	50,62
150/1	5.70	23.03	0.01	1.55	25,20	55.49
140/2	6.70	25.60	0.35	2.43	28.80	63.88

of monosaccharides exit increase of cellulose hydrolysis at the expense of receiving is, which is at 100 ^{o} C (1s). In the hydrolysates glucose share from 28.9 % starting from to increase and up to 45.4% at 150 ^{o} C (1s). increase provides.

Acidic in the hydrolysis of cellulose to the reaction get in ability growth him lignin and from hemicellulose cleaning result and thermal processing in giving crystalline cellulose amorphous pass with depends to be a 120 ^{o} C is confirmed by the analysis of the composition of fraction hydrolysates. In the studied temperature range, the shares of arabinose and xylose decrease from 69.8 to 51.8% of the total amount of monosaccharides. The greatest depth of hydrolysis for the TS fraction obtained at 140 °C (2 s) may be due to the low lignin content and additional softness in the cellulose structure. The amount of polysaccharides in the fraction is 82.1% (37% asm) and corresponds to 78% of those hydrolyzable by acid. The amount of glucose in the resulting hydrolyzate is higher than that of xylose.

Hemicellulose is more easily hydrolyzed with trifluoroacetic acid than technical cellulose. As can be seen from the results presented in Table 2, the total yield of monosaccharides obtained during the hydrolysis of GS fractions varies from 73 to 81%, but at the same time, the amount of monosaccharides in the hydrolysates of TS fractions is not more than 64% of the unit fraction.

Table 2. of GS fractions hydrolyzates of monosaccharides composition

Conditions, ° C / s	Content, % mass.					Total, % mass.
	Bee	Xyl	Man	Gal	Glc	
100/1	6.01	66.00	0.11	1.60	4.60	78.32
120/1	5.92	64.21	0.15	1.28	6.01	77.57
140/1	6.70	56.50	0.12	2.29	7.70	73.31
150/1	7.20	53.80	0.24	2.81	11.70	75.75
140/2	6.52	66.30	0.23	2.61	5.50	81.16

Monosaccharides leader from the components one xylose considered, this hemicellulose fractions contained of xylan a lot amount that guess to do possibility will give. Processing to give temperatures in growth of xylose the amount reduction of furan derivs harvest to be with passing secondary changes and chemical of processes series another inhibitors reason to be can

Arabinose quantity temperature and processing to give duration depends it's not and 5.9 from to 7.2% in between will be That's it similar amount in glucose occurs. Very little amount galactose and mannose was also determined. GS fractions in hydrolysis of monosaccharides maximum level output rice to the stem dimethylsulfoxide 2 hours at 140 °C during processing given after received and to the faction compared to 81.2 % organize reached.

The percentage of natural polymers that can be hydrolyzed by trifluoroacetic acid solution is about 64% of the mass of the technical cellulose (TS) fraction. A relatively high amount of glucose, xylose and arabinose was recorded in the monosaccharides of hydrolysis, indicating the presence of hemicelluloses (GS) in the fraction [5]. Xylose and arabinose are the main monosaccharides in the GS fraction since the glucose content in the hydrolyzate fraction does not exceed 5%. The GS fraction contains more than 80% of the mass of natural polymers that are hydrolyzed with a trifluoroacetic acid solution to form arabinose, xylose, glucose, mannose, and galactose.

Table 3 - 100°C (15 min, 50 W) ultrasonic heat with processing from giving after separated polysaccharide factions hydrolyzates of monosaccharides composition.

Fraction	Fraction profitability %.	Monosaccharides, % weight.				
		rabinose	Xylose	Mannose	Galactose	Glucose
Fraction T S Fraction GS	63.6 20.7	5.90 7,10	27.30 67.80	0.44 0.19	2.09 1.65	24.10 4.80

In the table given from the data, as it is rice from the stem received of polysaccharides TS fraction 63.6%, GS fraction and 20.7 % organize did of polysaccharides to monosaccharides decay percent to see maybe of monosaccharides leader from the components one xylose calculated (27.30 and 67.80 %), this hemicellulose fractions contained xylan a lot amount that guesses to do possibility will give.

Arabinose quantity temperature and processing to give duration depends it's not and 5.9 from to 7.2% in between will be That's it similar amount in glucose occurs. A very small amount of galactose and mannose was also determined.

Summary. As a result of the study, technical cellulose, hemicellulose, and lignin were purified up to 71.2% when treated with ultrasonic power at 50 W for 15 minutes at 100°C. At the same time, the productivity of the fraction was 47.5%. It was found that the cellulose content of the original rice stalk was around 47.5%, and the compounds contained in the rice stalk were extracted at a level higher than 90% when treated with ultrasound using ionic liquid.

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