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A Chemical study of Betaines Isolated From the Post-alcoholic Bard

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Abstract:

From the post-alcohol corn bard, similarly to the release from the molasses bard, betaine hydrochloride is obtained, the technological yield of which is 2-4 times higher than that of traditional raw materials. In comparison with the standard sample (SS) of betaine hydrochloride, the test sample has withstood all analytical tests: by physicochemical parameters, authenticity and quantitative determination. These results create the prospect of import substitution of drugs based on betaines.

Keywords:
post-alcohol corn bard, betaine hydrochloride, acidine, analytical characteristics.

INTRODUCTION

In recent decades, much attention has been paid to the development of medicines based on amino acid derivatives, which include betaines - the products of complete methylation of amino acids, performing various vital functions [1, 2]. Produced on the basis of betaines medicines are foreign goods, only Acidin-pepsin, tablets produced in the Republic of Belarus are imported to Russia.

Currently, betaines are produced from molasses and by synthesis. Since beet wastes are characterized by low concentrations of betaines and are of greater interest as a source of pectins, their use for the production of betaines is not advisable. A rational raw source of betaines can be a spirally-alcoholic cereal bard, which is predetermined by a high concentration of betaines (0.5-1.3%), proteins (28-32%), proteins (19-25%), rich amino acid composition, a huge raw material resource in Russia (about 10 million m3 per year), the availability of experience in the production of feed betaine and copper Atsidina (10 tons per year) from the bard at Ukrainian alcohol enterprises [3, 4, 7]. These factors

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favor the possibility of import substitution of drugs based on betaines.

Another serious problem in the development of medicines based on betaines is the standardization of their quality. Requirements for the quality of the substance and betaine tablets are regulated by outdated normative documents (42-2608-89 and 42-9712-05, Republic of Belarus), which include analysis methods, indicators and quality standards that need to be revised in terms of requirements State Pharmacopoeia (SP) XIII edition [6]. In comparison with the requirements of foreign pharmacopoeias, the quality of medicines requires control over additional indicators.

All of the foregoing has determined the purpose of this study

Purpose of the study - the aim of the study is the experimental substantiation of the possibility of isolating the hydrochloride (acidine) from the post-alcohol corn bard of betaine and studying its analytical indices.

Materials and methods of research. The object of the study was the post-alcohol corn bard produced by the distillery "Suvorovsky". The technology of separation from corn bard of betaine hydrochloride is borrowed from the known chemical technology of obtaining betaine from molasses bard [8] with the introduction of some modifications. The essence of this technology lies in the following stages:

- separation of the bard into the liquid and solid phases by straining and filtering;
- precipitation of carbohydrates of liquid phase of bard with excess of calcium oxide (1: 4) in the form of calcium sugar;
- neutralization of liquid ammonium bard phase with oxalate, separation of calcium sugarate precipitate by filtration;
- concentration of the filtrate of the liquid phase of the bard, hydrolysis with concentrated hydrochloric acid, separation of the humus precipitate, purification of the concentrate with activated carbon, crystallization of the crude acid salt from it (mixture of betaine hydrochloride and metal chlorides);
- purification of crude acidium salt with 96% alcohol, concentrated hydrochloric acid, filtration, concentration of the filtrate to form a crystalline mass (crude acidine salt);
- crystallization of yellow salt of acidine, filtration, dissolution of the sediment in water, clarification of the solution with activated carbon, crystallization of acid, washing and drying of crystals (medical acid).

These first 3 stages are introduced into the technology by us.

To solve analytical problems from the tablets "Acidin-Pepsin" produced in the Republic of Belarus, we have isolated a substance intended for use as SS of azidine, according to the above-described method for producing betaine hydrochloride.

Comparative analytical studies of the test sample and SS of betaine hydrochloride were carried out according to the indices:

1. Physicochemical parameters:

- description (visual control method);
- solubility in water and alcohol at a temperature of 20 °C [6];
- pH 1% of aqueous solutions at a temperature of 20 °C using the pH-340 pH-meter potentiometry method when using silver chloride electrode as a reference electrode [6].

2. Authenticity:

- thermal decomposition reaction of N-methylated α-aminoacids to form trimethylamine [5];
- reaction of complexation of amino acids with copper (II) ions [5];
- reaction to chlorides with silver nitrate [6].

3. Quantitative determination was carried out by the method of direct alkali metry using 0.1 M sodium hydroxide as a titrated solution, phenolphthalein indicator [6].

RESULTS AND ITS DISCUSSION

As a result of this study, betaine hydrochloride (acidine) was isolated from the post-alcohol corn bard with a production yield of 0.8% to the liquid phase; after purification, its yield was 0.4%.

The use of a new source of raw materials made it possible to increase the technological yield by 2-4 times in comparison with traditional raw materials: molasses bard, yield of feed betaine from which is 0.2%. From the solid phase of the post-alcohol corn bard, it was not possible to isolate betaine hydrochloride. Along with the target product (betaine hydrochloride), the liquid phase of the vinasse was additionally isolated: purified glutamic acid (0.1% yield to the liquid phase), calcium saccharate (yield 3.0% to liquid phase), mixture of humic and potassium chloride, sodium (0.4% yield to the liquid phase).

From the tablets "Acidin-pepsin" of the production of the Republic of Belarus, a substance was allocated for use as analytical SS-betaine hydrochloride (yield 10.2% to the nominal content).

From the studied physicochemical parameters of betaine hydrochloride in comparison with SS of betaine hydrochloride, the following was established:

- Description: both samples are white crystalline powders, are hygroscopic.
- Solubility: both samples are readily soluble in water and alcohol.
- pH 1% of aqueous solutions was: the test sample - 1.05, SS - 0.93.

When testing the authenticity of the samples, the following results were obtained:

- thermal decomposition reaction of N-methylated αaminoacids: positive for both samples (characteristic smell of trimethylamine);
- reaction to amino acids with copper (II) ions: positive for both samples (intensely blue colored crystalline precipitates);
- reaction to chlorides with silver nitrate: positive for both samples (white cheesy precipitate, soluble in excess ammonia solution).

The quantitative determination by direct alkalimetry showed that the content of betaine hydrochloride in terms of dry substance in the test sample was 99.2%, in SS of betaine hydrochloride it was 99.9%.

Thus, from the post-alcohol corn bard, beanine hydrochloride (acidine) was obtained with a higher technological yield (2-4 times) than from the traditional raw material - molasses bard. In comparison with SS of betaine hydrochloride, the test sample of betaine hydrochloride was identical in physicochemical parameters (description, solubility in water and alcohol, pH of solutions), authenticity (thermolysis reactions of N-methylated αaminoacids, complexation with copper ions (II), precipitation with silver nitrate) and quantitative content (direct alkalimetry method). As a result of indepth preclinical trials of isolated betaine hydrochloride, a solution to the problem of import substitution of medicines based on betaines is possible.

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