

EQUIPMENT FOR THE PRODUCTION OF FRUIT PAST

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Abstract: Highly advanced equipment for the processing of non-traditional wild plant raw material was developed for the production of organic food products with high biological value. The process of producing fruit paste with the use of cultural and wild growing of fruit-berry raw material and line to realize embodying this process is developed.

Keywords: equipment, fruit paste, concentration, bioactive matters

1. Introduction

Due to the deteriorating ecological situation it is particularly important to use organic raw diet with high content of biologically active substances such as fruits and berries. Lack of such products on the market, as well as of specialized equipment to produce high-quality functional food products using environmentally friendly raw material of plant origin determines the vitality of the problem. In addition to their direct use they can be produced in the form of powders, pastes, extracts, nectars, candied fruits.

2. Article objective and purpose

Development of advanced highly efficient technology and equipment for non-traditional wild plant material processing which results in production of organic food with high biological value. Expanding the range of organic products, saving the raw material nutritional value characteristics during its processing, smoothing the seasonality of its consumption and saving the resources.

3. Summary of the basic material research

Paste food products made of fruits and berries have become widely used in various areas of food industry – preserves, dairy, confectionery, bakery, catering and mass food industry due to their high nutritional and biological value.

The bulk of the fruit paste is produced from apples. Cultivated apples contain large quantities of pectin substances (up to 1.5%), carbohydrates, mainly fructose. However, apples contain relatively small amount of vitamins, organic acids, color

range of food produced from apples is rather poor and aesthetically unfavourable. These particular drawbacks can be eliminated by blending apples with fruits of various types of wild grown raw material. Use of wild fruits and berries enriches the pastes with biologically active substances such as vitamins, polyphenols, pectins, tannins, expands its aroma and taste range, improves its appearance. Blending cultivated fruits with various kinds of wild fruits dramatically enhances the possibilities for purposeful creation of multifunctional half-finished food products that have particular consumer properties.

Fruit pastes can include two or three components. In order to justify the fruit pastes recipes some experiments were conducted on blending apple puree with puree made of thorns, cornelian cherry, buckthorn, Japan quince (henomeles), black elder and hawthorn. The paste was created taking into account organoleptic and physical - chemical parameters of raw material. Wild fruits with high content of vitamins and pectins (black elder, dogwood) were selected for the production of three-components composition. In addition, for the performance of milder modes of sterilization it is necessary to ensure the active acidity pH of pastes, which does not exceed 3.3 ... 3.7.

The following recipes of fruit pastes with the use of wild grown raw material were proposed: the cultivated apple puree - 60%, buckthorn -35% and black elder - 5%, cultivated apple puree - 60%, Japanese quince (henomeles) - 35% and black elder - 5 %, cultivated apple puree - 60%, cornelian cherry - 30% and hawthorn - 10% [1, 2, 3].

For the manufacturing of those pastes the hardware kit of technological line (figure 1) was selected. Pastes made of wild grown raw material are the multicomponent systems and therefore fruits

and berries of various kinds are delivered to raw material primary preparation site consistently; this site includes inspection, cleaning, cutting, prior heat treatment and rubbing.

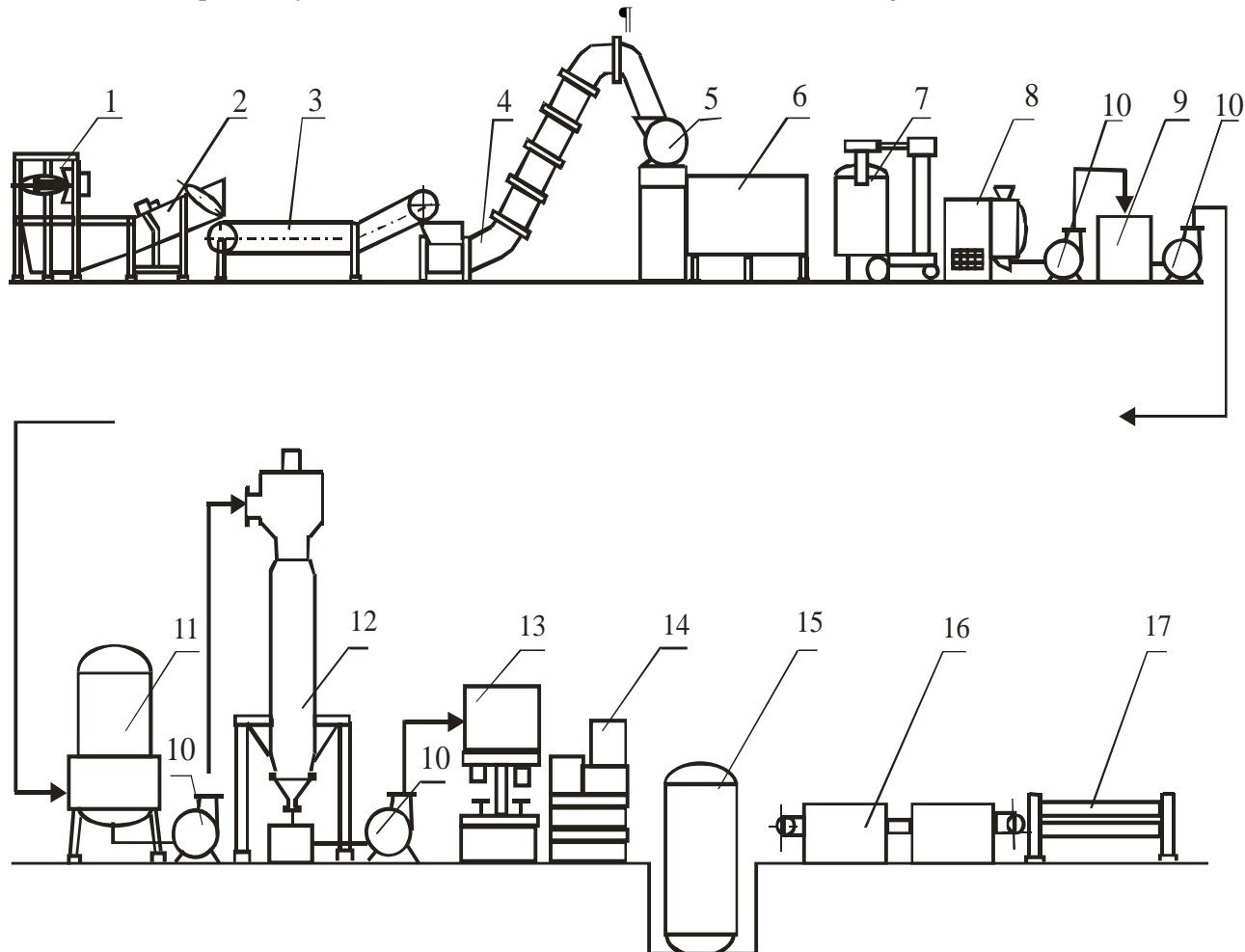


Figure 1. Technological process of fruit paste production

- 1- container shifting device; 2- conveyor washing machine; 3- roller inspection conveyor; 4- transporter; 5- crusher; 6- accumulative reservoir; 7- multi-purpose device; 8- rubbing machine; 9- collector-measuring device; 10- gear pump; 11- heater; 12- rotary film device; 13- filler; 14- closing machine; 15- autoclave; 16- cleaning and drying machine; 17- labeling machine

Rotary film device (RFD) is used for pure concentration process, which substantially accelerates the boiling of pasty masses made of raw material of plant origin and improves the quality of the final product [4 ÷ 17].

RFD has shown good results during the processing of pasty masses (mashed wild fruit and vegetable raw materials) and can be used for different processes: concentration, distillation, rectification, desorption, drying, mixing, homogenization and the other processes widespread in food industry. RFD has sufficient advantaged compared to existing evaporation devices. The main advantages of RFD are:

- the absence of sediments on the surface which transmits heat at 150°C of evaporating environment;
- the possibility to use a large-scale temperature difference between heating and evaporation environments, which gives the possibility to keep completely the vitamin and mineral complex of the primary product;
- low quantity of metal used for the construction manufacturing (2 ... 3 times lower than in existing devices);
- modularity and processibility of the constructions;
- high energy potential of secondary vapor which gives the possibility to use almost completely

- the consumed for the evaporation heat for technical domestic purposes;
- short time of the product stay in the device when it is assembled vertically (up to 10 sec.);
 - high evaporation level with the receipt of final product mass fraction up to 67%.

The rest of equipment used in the line is serially manufactured by machinery plants.

The studies to determine the rational mode of concentration of fruit puree made of wild grown raw material as well as the content of biologically active substances in the paste were carried out prior the technological line development. It was determined that in order to reach the effective evaporation of moisture in puree from 13...15% to 28...30% of dry matter in the RFD it is necessary to grind raw material after tenderizing to get the particles diameter less than 0.01...0.05 mm.

Temperature of puree heat treatment in RFD is 60...70 °C, pressure - 13 ... 15 kPa, and concentration period - 2 ... 5 minutes. To reduce the evaporation period and to use RFD more rationally it is necessary to provide puree heating up to 50 ... 55 ° C before the operation.

Using the small temperatures during the boiling process in RFD prevents significant loss of biologically active substances (table 1).

As seen from the table, natural fruit pastes made with the addition of wild grown raw material contain large amount of biologically active substances such as ascorbic acid, carotenoids, pectins, polyphenols, which have antioxidant effects. Besides, the high content of pectin substances increases viscosity and improves the consistency of pastes.

¶Table 1. Content of biologically active substances in the fruit paste made with the addition of wild grown raw material

Name of the product	Ascorbic acid, mg per 100 g	B-carotene mg per 100 g	Pectin substance, %	Anthocyanins, mg per 100 g	Catechins, mg per 100 g
Paste made of apples, buckthorn, and elder	58.5	45.20	1.54	233	102.1
Paste made of apples, Japanese quince and elder	47.3	0.23	1.71	192	94.8
Paste made of apples, cornelian cherry and hawthorn	42.7	1.34	2.95	189	91.7

4. Conclusions

Pastes can be used as vitamin supplements, fillers, thickeners in different sectors of food industry, such as confectionery, dairy, bakery, as well as home cooking and catering, beverage production.

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