STUDY OF DRYING KINETICS OF WILD PLANT

SALICORNIA EUROPAEA L

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Global food security problems, the search for sustainable food sources and interest in edible plant raw materials have led to the recognition of a number of little-known plants, including Salicornia (family Amarantthaceae), as a valuable source of nutrients in the last ten years [1,2]. This halophyte has a wide geographical distribution, and studies suggest the possibility of its consumption. The name Salicornia comes from the Latin word meaning "salt". There is a lot of information about the use of Salicornia as a source of salt. Salicornia is used as a green salad for its salinity and crunchiness. Only tender green parts of the plant are recommended for eating, the reddish color of the leaves indicates too high content of NaCl and silicon dioxide [3]. Salicornia has a number of functional compounds, including dietary fiber, polyphenols, flavonoids, minerals, including selenium, magnesium, sodium, chlorine, manganese, chromium, iron, copper, potassium, calcium and others. Chromatographically detected β-sitosterol, stigmasterol, uracil and isoramnetin-3-O-β-D-glucopyranoside and saponins, some of them have antioxidant activity [4,5]. Hyperlipidemia is the leading cause of morbidity and mortality worldwide. The current group of antidiabetic drugs provokes side effects. In this regard, the search for safer options for controlling hyperglycemia. The efficacy of *Salicornia* powder in diabetic rats was studied and higher expression of hepatic glucose transporters was found [6]. In addition, the hepatoprotective effects of the herbal drink, which included *Salicornia*, were evaluated. At a dose of 500 mg / kg, the drink had a protective effect on the liver of mice.

The green plant turns orange in autumn, from pink to reddish, and dies in winter. Thus, *Salicornia* is a source of valuable nutrients, among which there are those that determine the valuable functional and technological properties and organoleptic characteristics in the finished products with it. Important for the creation of new foods with *Salicornia* are emulsifying properties (emulsion stabilization), improved texture, salty taste, color formation (green color due to natural dyes), increasing the efficiency of yeast (stimulates the reproduction of microorganisms that support fermentation processes). The plant of the species *Salicornia Europaea L*. is one of the most salt-resistant species on the coast of the Sea of Azov (Ukraine) and Aral Sea (*Kazakhstan*) can become a promising non-traditional plant raw material in Ukraine and Kazakhstan. Therefore, research on the creation of a dietary supplement based on *Salicornia Europaea L*. and its use in food technology and diets is relevant.

We have investigated the kinetics of convective drying of *Salicornia* at three different temperatures of the drying agent: 60, 70, 80 °C and a constant speed of movement of the drying agent 7 m/s. Before drying, the raw material was inspected, separated from the roots, the aboveground part of the saltwort was washed in running water to cleanse it from possible natural impurities, then it was crushed to an average particle size of 3...5 mm. The mass of the sample to be dried was determined by periodic weighing on an electronic balance with an accuracy of 0.2 g. Drying was completed when equilibrium humidity was reached at a given temperature of the drying agent and a constant relative humidity of 60% at the inlet to the dryer.

Figure 1 shows the graphs of the kinetics of *Salicornia* drying. To approximate the experimental data, we used the mathematical model proposed by prof. V.Potapov [7].

$$W = W_0 \exp[-(k\tau)^n] + W_e\,, \qquad (1)$$

where k, n are empirical coefficients, W_0 is the initial moisture content, kg/kg of dry matter, W_e is the equilibrium moisture content, kg/kg of dry matter, τ - time, min.

As a result of the regression analysis of the kinetic curves, the coefficients of equation (1) were found shown in Table 1.

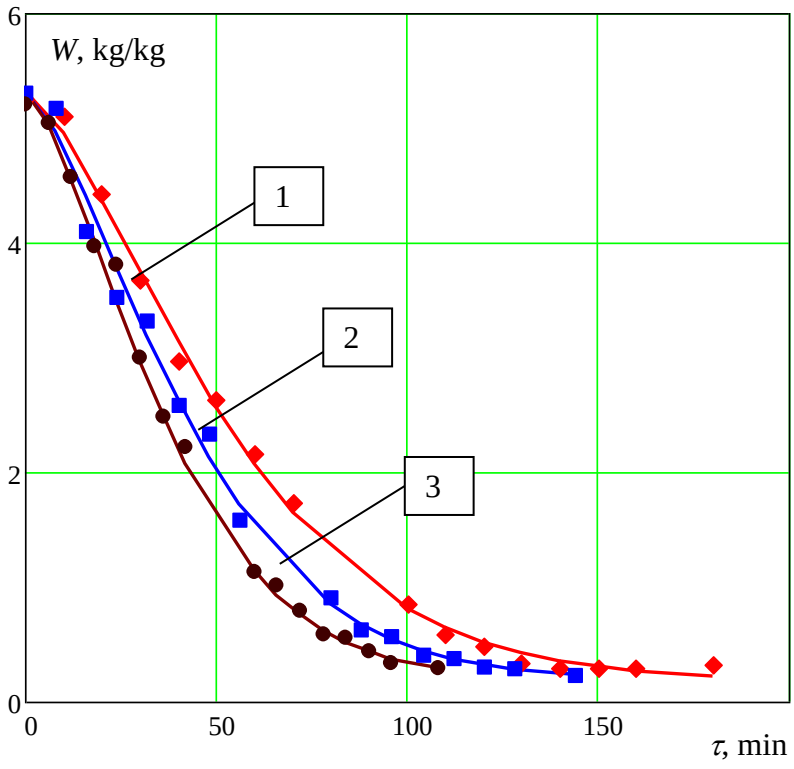

Fig. 1. Kinetics of drying salicornia depending on the temperature of the drying agent at a constant speed of its movement of 7 m/s: 1 - t=60 °C; 2 - t=70 °C; 3 - t=80 °C; v=7 m/sec.

The resulting model makes it possible to calculate the duration of the convective drying of *Salicornia* at the studied temperatures using the formula:

$$\tau_{end} = -\frac{1}{k}\left[\ln\left(\frac{W_e}{W_0 - W_e}\right)\right]^{\frac{1}{n}}, \quad (2)$$

where τ_{end} is the drying time, min.

Table 1 - Coefficients of the mathematical model of the kinetics of *SALICÓRNIA EUROPAÉA*.

Coefficents	t=60 °C	t=70 °C	t=80 °C
k	0,017	0,02	0,024
n	1,460	1,462	1,463
W_0	4,939	4,970	4,983
W_e	0,191	0,160	0,147

To establish the optimal drying temperature, we conducted organoleptic studies of the dried product on the indicators: color and odor. It was found that the samples dried at different temperatures had a different color: namely dark green with specks of brown - at a temperature of 80^0 C, and light green at a temperature of 60^0 C, the most acceptable color was at a temperature of 70^0 C. The smell of dried product is characteristic of dried vegetable raw materials. Thus, the optimum drying agent temperature for drying *SALICÓRNIA EUROPAÉA* is 70^0 C.

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