Treating grapes with a natural alkaline decoction prepared from (*Salsola arbuscula Pall.)*

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Abstract. In the article, the methods of increasing the efficiency of drying, shortening the drying time and obtaining high-quality dried raisins have been achieved by processing the bunches of large-sized raisin varieties of grapes grown in the Republic of Uzbekistan in different ways. The location of the large cultivation is considered to be the hill slopes with good wind circulation, as well as these areas are considered to be optimal, as well as there is a lot of precipitation in early autumn. To eliminate these inconveniences, the process of drying grape bunches is the use of basic and energy-saving methods of processing agricultural products, *Salsola arbuscula* Pall, which grows in the natural steppe regions of "Surkhandarya" region, is used for grape bunches. Experiments were conducted to determine the optimal concentration of the natural alkaline decoction prepared from the plant.

1 Introduction

Today, the world production of raisins is 1,220 mln tons. In this regard, countries such as Turkey (353,167 thousand tons), USA (332,760 thousand tons), Iran (122,595 thousand tons), Greece (72,861 thousand tons), Chile (51,128 thousand tons), and South Africa (37,049 thousand tons) are leading. In terms of gross raisin production, Uzbekistan ranks seventh in the world (32,893 thousand tons), and the share of raisin in it is 8-10 thousand tons. Increasing the volume of hermion raisin production in our country makes it possible to increase the volume of exports of products that are competitive in the foreign market [1-9].

The process of drying grape bunches is one of the main and energy-saving methods of processing agricultural products. It is known that to obtain 1 kg of dried product, it is necessary to remove 4-11 kg of water from raw materials. In this case, the significant consumption of energy can be 18-27 thousand kj/kg or 0.62-0.94 grams of conventional fuel [10, 13, 15].

In the climatic conditions of the Surkhandarya region, the practice of drying grapes in the open air and under the sun, typical of the conditions of Uzbekistan, where the summer season lasts long and the air humidity is relatively low, is common in the preparation of raisins (hermiyon) from large clustered varieties of grapes [11, 14].

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Drying of grapes in sunny open air is widely used in other countries where various raisin production is developed. For example, in the USA, grapes are wrapped in special papers between the rows, and in Greece they are dried under pallets.

The use of solar drying devices allows to significantly improve the quality of the dried grape product. However, depending on the weather conditions, the yield of this method will not be very high [19-22].

When drying with the help of fuel is used, conditions are created for transferring the product to industrial production. However, the high consumption of energy, the high cost of equipment and the low efficiency of energy use do not allow this method to be widely used.

The ability to make a dried product from grapes and store it for a long time depends on the need to reduce water to a certain amount in the freshly cut product. This stops the development and survival of microorganisms in the fruit. This indicator is 25-30 percent for bacteria, 18-20 percent for yeast and mold. Moisture content of raisins during consumption is 16-18 percent, depending on the ampelographic grape variety and drying method [16, 18].

The technology of making raisins from grapes is based on this criterion, and the drying process is continued until the moisture content of the raw material reaches 18%. However, it should not be forgotten that the drying speed also has a serious effect on the quality of the product. the faster the product dries, the shorter the activity of microorganisms in it. In addition, the biochemical processes in the quick-dried product also change in a positive direction. Because prolonged exposure to sunlight causes a change in product color (darkening of the product in white varieties) and a firmer consistency. Therefore, in order to shorten the drying period, the "objush" method is widely used in farms specializing in drying raisins, that is, raw materials are blanched in a boiling solution of caustic soda with a concentration of 0.3-0.4% [17, 18].

In countries leading in the production of raisins, concentrations and methods have been developed for drying grapes between the rows, first withering by breaking the stem on the bush, then drying, drying in large conveyor-type dryers using electricity and fuel, treating raw materials with substances such as caustic soda, sulfur. In these countries, only seedless raisin varieties such as Sultanina are dried. In our republic, in addition to young varieties, large bunched varieties of grapes such as Katta Kurgan, Sultani, Kara Djandjal, Muscat Husayni are dried and high-quality hermion is produced. The development of effective storage and cheap, convenient drying methods made from local raw materials, which allows to bring them to the condition corresponding to the requirements of the standards, is one of the urgent tasks of the national economy [3, 4, 5, 8].

2 Materials and Methods.

Experiments were conducted in 2017-2019 at the experimental farm of Tashkent State Agrarian University and at specialized farms of Surkhandarya region. Drying processes of raisin grapes were carried out according to the recommendations given in the methodical literature of Z.S. Iskandarov entitled "Scientific foundations of the controlled thermal process of drying food products of high humidity".

All studies related to the organization of processes of drying grape varieties were carried out using the methods recommended by scientists such as A.V. Lykov and L.Ya. Auerman and M.M. Mirzaev.

The experiment is carried out in the following scheme: 0.4% caustic soda solution – control; 1% extract of the plant *Salsola arbuscula* Pall; 2% extract of the plant *Salsola arbuscula* Pall; 3% extract of the plant *Salsola arbuscula* Pall; 4% extract of the plant *Salsola arbuscula* Pall*;* 5% extract of the plant *Salsola arbuscula* Pall; 6% extract of the plant *Salsola arbuscula* Pall.

For drying, grapes with a sugar content of at least 19-20% are cut. Drying is carried out by the "objush" method. To obtain the appropriate extract of the native plant Salsola arbuscula Pall, 1 kg to 6 kg of plant material is boiled in 100 l of water. The experiment is replicated in 4 replicates.

3 Results and Discussion

Grapes are one of the oldest plants. Different methods and solutions are used for drying of ripe, processed and dried raisin varieties.

Salsola arbuscula Pall (syn. *Salsola arborescens* L., *Xylosalsola arbuscula*) is a shrubby herbaceous plant belonging to the *Arbuscula* species of the *Chenopodiaceae* family, the family of the sorghum family, the genus *Salsola*.

In research, in order to dry quality and environmentally friendly products from the raisin grape varieties studied in the previous experiment, local *Salsola arbuscula* Pall. The efficiency of using a natural alkali solution from the plant is determined. Concentrations of natural alkaline decoction prepared from *Salsola arbuscula* Pall plant for blanching of raw grapes are studied.

Salsola arbuscula Pall growing in the natural steppe regions of Surkhandarya region in research. Experiments were conducted to determine the optimal concentration of the natural alkaline decoction prepared from the plant. In the experiment, the Sultani variety, distinguished by its size and high sugar content, was dried.

During the studies on drying of the Sultani variety, it was found that the control - when treated with a concentration of 0.4% of caustic soda, compared to the treatment with a 3% decoction of plant extract, moisture loss was faster during drying. When treated at this concentration of plant extract, the total water content of the raw material decreased to 14.9% at the end of the second day of drying, and to 29.4% on the third day. A 50% reduction in total water occurred on day 4 of drying in this variant. The condition of the finished product (18%) was reached on the 9th day of drying.

It should be noted that lower concentrations of plant extract (1 and 2%) resulted in somewhat slower moisture release. Consequently, 50% of the water content of the raw material was removed after 5 days when processed in a 1% decoction of plant extract, while in a 2% decoction, the remaining moisture content of the product on the same day was 50.7% (Table 1).

Table 1. Dynamics of changes in moisture content of raw materials depending on treatment with different concentrations of natural decoction of Salsola arbuscula Pall plant (Sultani variety), 2012-2019.

Experiment option	Moisture content during drying days, %								
	1	2	3	4	5	6	7	8	9
0.4% caustic soda - control	100,0	85,3	71,2	52,6	30,8	24,1	19,3	18,1	17,8
1% decoction	100,0	86,3	76,8	60,5	50,3	40,8	33,1	27,5	24,2
2% decoction	100,0	85,9	74,2	58,6	49,3	38,1	29,3	25,2	22,0
3% decoction	100,0	85,1	70,6	52,4	30,5	23,0	19,1	18,5	18,0
4% decoction	100,0	84,2	69,7	50,3	29,9	24,2	20,5	19,8	19,0
5% decoction	100,0	84,0	65,4	49,2	28,5	24,1	21,9	20,6	20,1
6% decoction	100,0	83,1	63,7	47,8	29,1	25,0	22,9	21,8	21,5

The data in the table shows that the rate of moisture loss of raw materials during drying is affected to some extent by further increasing the concentration of plant extract.

As the concentrations tested in the experiment increased, a different trend was observed in the rate of formation compared to the previous options. Consequently, rapid moisture

loss was observed in the first days of drying, and then it was observed that the moisture loss slowed down somewhat compared to the previous options. For example, when the concentration of the plant extract decoction was increased to 5%, 50% of the moisture in the raw material was released on the 4th day, while the moisture content of the control variant did not decrease from 20.1-21.5% on the day of conditioning (the 8th day of drying).

When the concentration was increased (6%), the following negative situation was noted, i.e., if at first the water starts to be lost quickly, in the next days of product drying, the peel becomes juicy due to the exit of the product juice to the outside of the grape cluster, and as a result, the rate of development is observed to be reduced (Figure 1).

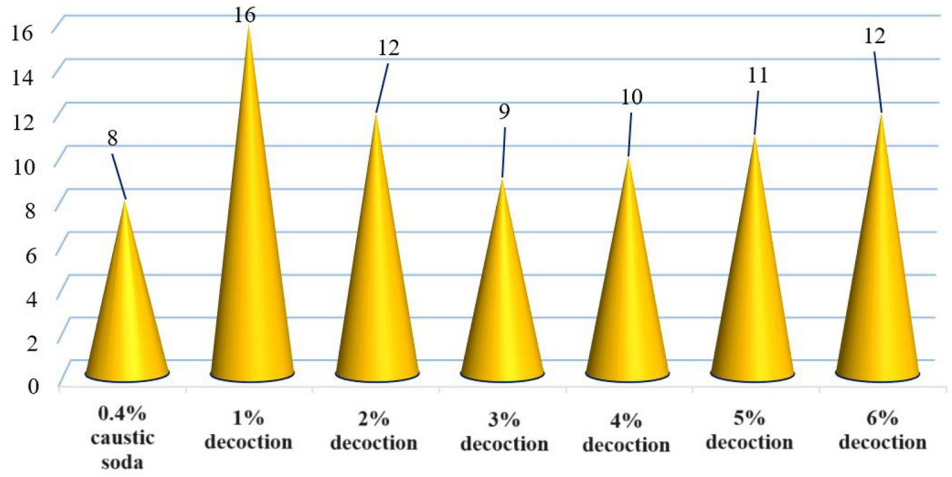

Figure 4. Effect of the concentration of natural alkali solution of *Salsola arbuscula* Pall on the duration of drying of grape variety Sultani, 2017-2019.

Changing the concentration of alkali directly affected the total duration of drying time. The shortest drying time was observed in raw materials treated with 3% concentration of *Salsola arbuscula* Pall plant. In this experimental variant, the drop of raw materials to conditioned humidity (18%) was recorded on 7 days. It differed by 1 day compared to the control.

Reducing or, on the contrary, increasing the concentration of herbal decoction led to an increase in the duration of drying. In the first case, due to the low concentration of alkali, insufficient microcracks were formed in the bark, and in the second case, on the contrary, because of the excess of microcracks in the bark, visible sap was also noted. and this had a negative effect on the formation of piles in the lower layers.

It should be noted separately that when the concentration of plant extract is increased, as a result of excessive damage (microcracks) of the skin of the product, a large amount of sap is released, and even when the product reaches conditioned moisture, it is noted that it feels as if it has not dried well when held by hand, that is, stickiness occurs. It can be seen that the concentration of 3-4% natural alkali solution of *Salsola arbuscula* Pall plant is the most optimal for pre-treatment during drying of raisin grapes.

It is known that the drying process of grapes is accompanied not only by the evaporation of moisture, but also by a change in the chemical composition of the fruit. On the one hand, these changes are related to the continuation of the biochemical activity of enzymes, and on the other hand, to the loss of moisture caused by physico-chemical

changes in the composition of the fruit, mainly due to the change of substances in the colloidal state.

Table 2 below shows the changes in the quality parameters of the sultana variety hermonia product after treatment with different concentrations of Salsola arbuscula Pall plant extract on the raw material and then drying.

Table 2. Effect of raw material treatment with different concentrations of Salsola arbuscula Pall plant extract on Sultani variety (hermion) product quality indicators, 2017-2019.

Experiment option	Description of the finished product			
	sugar content, %	acidity, %	organoleptic description	tasting score, score
0.4% caustic soda - control	70,3	1,35	The product is dry, does not stick to the hand, looks beautiful, tastes excellent, and the color is characteristic of the variety.	8,0
1% decoction	69,9	1,31	The product is dry, does not stick to the hand, has a satisfactory appearance, a satisfactory taste, and has a dark color.	7,4
2% decoction	70,1	1,33	The product is dry, does not stick to the hand, looks good, tastes good, and the color is slightly darkened.	7,6
3% decoction	70,5	1,33	The product is dry, does not stick to the hand, looks very beautiful, tastes great, and the color is characteristic of the variety.	8,5
4% decoction	70,2	1,32	The product is dry, does not stick to the hand, looks beautiful, tastes excellent, and the color is characteristic of the variety.	8,2
5% decoction	68,2	1,31	The product sticks to the hand, the appearance is negative, there are lumps, the taste is satisfactory, the color is yellowish.	7,4
6% decoction	67,9	1,30	The product adheres strongly to the hand, the outside is juicy, the appearance is negative, there are large lumps, the taste is satisfactory, the color is yellow.	7,0

The study showed that the amount of water that evaporates from the fruit does not depend on the method of processing and drying. Because the dried product is ultimately brought to the specified (18%) moisture content. However, the methods of initial processing of the fruit have a certain influence on the rate of evaporation of moisture. In addition, a high level of moisture evaporation was observed in grape bunches when treated in a boiling alkaline solution before drying.

The data in the table show that the sugar content and acidity of the finished product did not change significantly when the bunches of Sultani grapes were treated with different concentrations *of Salsola arbuscula* Pall plant extract before drying and then dried. It can be seen that the treatment of raw materials with an alkaline solution does not have a strong effect on the chemical composition of the product.

It should be noted that preliminary processing (blanching) of raw materials, although it did not significantly change the amount of sugar and acid, had a significant effect on other organoleptic quality indicators of the product. The best results were recorded in its concentration of 3-4%. The quality indicators of the Hermione lamp obtained in these experimental variants were of the highest description. Therefore, when organoleptically evaluated, the finished product obtained in this pre-processing option was distinguished by its non-stickiness, the preservation of its color in the shade characteristic of the respective variety, and the maximum preservation of appearance and taste qualities. All these descriptions were the basis for giving the product a tasting score of 8.2-8.5 points.

Reducing the concentration of plant extract led to a slight decrease in the quality of the product along with the extension of the construction period. In this case, although the sugar content, viscosity, and taste qualities of the blanched lumps in a boiling extract solution with a concentration of 1 or 2% did not change significantly, a significant change in their color, i.e. darkening, was observed. This situation is explained by the fact that the product is exposed to sunlight for a longer time due to the longer drying time.

Further increasing the concentration of plant extract (5 and 6%) led to a sharp decrease in product quality. The organoleptic condition of the hermion product obtained from the raw material processed in such a concentrated decoction had a lower description compared to the indicator of the previous options, that is, the finished product was observed to stick to the hand (juiciness), the lumps stuck to each other, and the formation of lumps was observed. This had a negative effect on the overall tasting score of ready-made hermion raisins, which caused the overall score to not exceed 7.0-7.4.

4 Conclusion

3-4% concentration of natural alkali solution of *Salsola arbuscula* Pall plant is the most optimal for pre-treatment during drying of raisin grapes. In this case, the quality indicators of the received Hermione lamp will be of the highest description. When the finished product is organoleptically evaluated, it is distinguished by its non-stickiness, color preservation in the appropriate variety, appearance and taste qualities at the maximum level.

A semi-open tent covered with a white film was distinguished by the shortest drying time. In this drying method, the duration of drying of unblanched grape varieties is 13-16 days, and 7-8 days when blanched. When covered with a black film, the duration of this period is extended to 2-3 days.

From the point of view of organoleptic and brand appearance, it is preferable to dry grapes under a black film. In this drying method, the consistency, color and taste qualities of the fruit are at the highest points (tasting score 8.99-9.2 points according to the varieties).

The fastest drying of raw materials during drying of bunches of the Sultani variety in a tunnel dryer is recorded in the experimental variant treated with exposure for 3-4 seconds in natural alkaline broth prepared from the *Salsola arbuscula* Pall plant. On the 4th day of drying, the moisture content of the drying product decreased to the required condition (18%) in these options.

When drying in a tunnel dryer, pre-treatment of the raw material with an alkaline solution for 2-3 seconds of exposure ensures obtaining a high-quality product. Increasing exposure leads to a significant decrease in product quality indicators.

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