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Effect of Drying Methods on Plum Fruit Quality Indicators

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Abstract: This article describes the results of the research conducted on the drying of different varieties of plum. The experiments were carried out to study the chemical composition of plum fruit and the quality of the finished product after drying in two different ways, as well as the duration of drying. As a result of the research, scientifically based conclusions were made.

Keywords: plum, temperature, mode, dry matter, organoleptic evaluation, drying method, quality.

Introduction

More than 12 million tons of plums are grown every year around the world. More than half of it, that is, about 6.5 million tons, is grown in China. Romania (760,000 tons), Serbia (580,000 tons), Chile (420,000 tons), Iran (380,000 tons) and Turkey (330,000 tons) are in the next places in plum cultivation. Plum contains 87% water, 11% carbohydrates, about 1% proteins and less than 1% lipids. Plum contains a large amount of various microelements and vitamins, 100 grams contain 12% of the daily need for vitamin C.

Plum is also grown in large quantities in Uzbekistan. In 2022, Uzbekistan exported about 50,000 tons of plum to the Russian Federation. The demand for dried plum is very high in the world. therefore, drying plum is an urgent task.

Material and methods

Research was conducted on the following varieties of plum: "Samarkandsky chernosliv" (control), "Ispolinskaya", "Yarkhi", "Berton", "Vingerskaya fioletovaya".

The following were studied for the selected varieties: Biochemical composition of the selected varieties was analyzed; plum fruit was dried and analyzed in the form of stone and without stone by two methods.

The method of conducting research is as follows:

1. Determining the duration and organoleptic evaluation of plum fruit with and without stone in a natural way.
2. Determining the duration and organoleptic evaluation of plum fruit with and without stone in solar battery fan system (SBFS) equipment.

Results and discussion

The biochemical composition of the fruit of plum varieties under study was analyzed. The amount of dry matter content, sugar content and vitamin C content were mainly studied (Table 1).

The varieties "Samarkandsky chernosliv", "Ispolinskaya", "Yarkhi", "Berton", "Vingerskaya fioletovaya" regionalized in Uzbekistan were selected for the experiments. In this case, the "Samarkandsky chernosliv" variety was selected for control.

1 – table. Biochemical composition of fruit of suitable plum varieties for drying

Plum varieties	Years	Dry matter, %	Sugar, %	Vitamin C, mg / %
"Samarkandsky chernosliv" (control)	2019	15,9±0,5	18,2±0,5	6,8±0,2
	2020	16,3±0,5	17,1±0,5	7,3±0,2
	2021	15,7±0,5	16,7±0,5	6,5±0,2
	Average	16,0±0,5	17,3±0,5	6,9±0,2
"Ispolinskaya"	2019	16,6±0,5	20,2±0,5	7,5±0,2
	2020	17,1±0,5	18,3±0,5	6,9±0,2
	2021	17,3±0,5	18,9±0,5	6,8±0,2
	Average	17,0±0,5	19,1±0,5	7,1±0,2
"Yarkhi"	2019	18,8±0,5	23,5±0,5	7,7±0,2
	2020	18,3±0,5	22,1±0,5	7,2±0,2
	2021	17,9±0,5	19,1±0,5	7,4±0,2
	Average	18,3±0,5	21,6±0,5	7,4±0,2
"Berton"	2019	17,2±0,5	18,3±0,5	6,8±0,2
	2020	18,3±0,5	19,8±0,5	6,5±0,2
	2021	17,9±0,5	19,5±0,5	6,2±0,2
	Average	17,8±0,5	19,2±0,5	6,5±0,2
"Vingerskaya fioletovaya"	2019	15,5±0,5	16,9±0,5	6,1±0,2
	2020	16,2±0,5	16,6±0,5	5,9±0,2
	2021	17,1±0,5	17,1±0,5	7,4±0,2
	Average	16,3±0,5	16,9±0,5	6,5±0,2

Fruits characteristic of these varieties were analyzed for three years (2019-2021). The highest indicator of dry matter content was observed in the variety "Yarkhi" and made 18.3%, while the lowest indicator was shown in the variety "Berton" and made 15.5%. In the control variety "Samarkandsky chernosliv", it was 16.0%.

When drying plum, the sugar content is an important indicator. The content and organoleptic properties of dried plum depend on the sugar content of raw plum fruit. The sugar content of the "Samarkandsky chernosliv" variety, which was selected as a control during the experiments, was 15.9% in 2019, 16.3% in 2020, and 15.7% in 2021, while the three-year average sugar content was 17.3%.

The highest result according to this indicator was recorded in "Yarkhi variety". That is, it was 23.5% in 2019, 22.1% in 2020, 19.1% in 2021, and the three-year average was 21.6%. The lowest level of sugar content was observed in "Vingerskaya fioletovaya" variety, the three-year average of which was 16.3%. Also, 19.1% for "Ispolinskaya" variety, 19.2% for "Berton" variety three-year average was recorded.

Experiments were conducted on drying plum fruit in two different ways - natural and solar-battery-fan-system (SBFS) equipment. Plum fruit being dried were also placed in two types - with stone and without stone. As a result of these experiments, it was mainly carried out in order to determine the optimal duration of drying (see Table 2).

Due to the fact that the skin of the plum fruit is thick and covered with wax, evaporation does not occur quickly, so dehydration is very slow. Therefore, when whole dried plums are split in half and pitted, the process takes a relatively short time. During the experiments, when drying "Samarkandsky chernosliv" variety, from 100 kg of raw material, an average of 25 kg of dried product was obtained when dried in the stone state, and 20 kg in the non-stone state. Also, 31 kg of dry product with stone and 27.1 kg of dry product was obtained when dried in SBFS equipment. When dried in the granular state, the mass of the dried product due to the stone was relatively higher. This situation was repeated in all varieties tested.

Table 2. Duration of drying plum fruit in different drying methods and output of finished product (2019-2021)

Varieties	Drying method	Type of dried product	Product output from 100 kg of raw materials, kg				Duration of drying, (hours)	Tasting grade, maximum 100 point
			2019	2020	2021	average		
"Samarkandsky chernosliv" (control)	Natural	with stone	24,1	25,6	25,3	25,0	288±4	85±0,5
		without stone	18,7	21	20,3	20,0	192±4	95±0,5
	SBFS equipment	with stone	31,8	30,7	30,5	31,0	96±2	83±0,5
		without stone	27,6	29,3	27,1	28,0	60±2	95±0,5
"Ispolinskaya"	Natural	with stone	28,9	27,8	27,3	28,0	276±4	86±0,5
		without stone	21,6	22,1	22,3	22,0	202±4	95±0,5
	SBFS equipment	with stone	29,4	30,4	30,2	30,0	101±2	88±0,5
		without stone	26,6	27,6	26,8	27,0	74±2	95±0,5
"Yarkhi"	Natural	with stone	25,7	24,6	24,7	25,0	276±4	92±0,5
		without stone	20,6	20,9	21,5	21,0	216±4	95±0,5
	SBFS equipment	with stone	30,5	29	30,5	30,0	91±2	94±0,5
		without stone	25,6	26,3	26,1	26,0	58±2	96±0,5
"Berton"	Natural	with stone	31,1	28,3	29,2	29,5	240±4	89±0,5
		without stone	24,3	25,6	25,9	25,3	168±4	92±0,5
	SBFS equipment	with stone	28,8	29,1	29,3	29,1	79±2	91±0,5
		without stone	24,5	25,2	25,9	25,2	60±2	93±0,5
"Vingerskaya fioletovaya"	Natural	with stone	28,8	29,1	28,5	28,8	216±4	86±0,5
		without stone	23,4	24,6	25,1	24,4	168±4	89±0,5
	SBFS equipment	with stone	29,1	28,6	28,9	28,9	86±2	88±0,5
		without stone	24,9	23,8	25,2	24,6	58±2	92±0,5
NSR_{05}			0,8	0,8	0,8	0,8	0,7	0,8
Sx			4,8	4,8	4,8	4,8	4,8	4,8

The highest productivity in terms of the amount of dried product output was recorded in the "Samarkandsky Chernoliv" variety, which was observed when it was dried with seeds in the SBFS equipment. In other varieties, this indicator was close to each other.

Also, unique results were noted in the experiments conducted to determine the duration of drying. Experiments were carried out mainly at air temperature of 30-35°C. The time spent in natural drying was 3 times longer than in drying with the help of the SBFS equipment. For example, it took 288 hours to dry the "Samarkandsky chernosliv" variety by stone method, while drying in the equipment took 96 hours. This rule was repeated in all the selected varieties.

Drying without stone also led to positive results being recorded. It was noted that the duration of drying was reduced by 25-30% in all varieties. This difference was observed in both methods under study. The reason for this is explained by the increase of evaporation surfaces for moisture to escape.

During the experiments, the evaluation of the finished product according to its organoleptic

properties was also determined. The organoleptic value of naturally dried plum fruit when dried in the stone state was relatively low, and when evaluated on a 100-point system, it was around 85-90 point in all varieties. It was in the range of 90-95 point when dried in the drying equipment and naturally without stone.

Conclusion

As a result of research on drying plum, the following conclusions can be drawn:

- ✓ The content and organoleptic properties of dried plum depend on the sugar content of raw plum fruit.
- ✓ The duration of drying in the stoneless state is 25-30% less than that in the stone state.
- ✓ The time spent drying plums in the SBFS equipment is 3 times less and the organoleptic value is higher.

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