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RESEARCH RELATED TO PRESERVING ROOT VEGETABLES BY DRYING

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Abstract

Dried vegetables are foods obtained from fresh vegetables which preserve the identity of the respective species, presented in different forms, dehydrated through normal or artificial processes or through the two methods combined. in order to eliminate the most of the water content from their composition.

Dried vegetables are used for the preparation of cooked meals and of industrialized products assigned for alimentation.

Dehydration is the technological process through which the natural water content is reduced to a level that prevents the activity of the microorganisms, without destroying the tissues of the vegetable or without decreasing the nourishing value of the products to be dehydrated.

The study related to the drying preservation of the root vegetables has been performed in laboratory conditions for three species of vegetables: carrot, celery and parsley, in the electric oven and in the house drier.

Key words: drying, preservation, root vegetables organoleptic characteristics.

INTRODUCTION

Drying is a widely spread operation in the food industry because it is one of the traditional food preserving methods that is by eliminating a certain part of the water that the respective food contains. Drying is a used method when processing, storage, transport and use demand it. (Banu C., 2007).

Drying is the oldest way to preserve vegetable products which uses the solar energy to eliminate water and in which the parameters that influence the elimination of the water can not be controlled. During the dehydration programme the elimination of the water happens in special machines (driers) which allow the automatic adjustment of the temperature, of the relative humidity and of the air speed, according to the chemical and physical characteristics of the products. (Lazăr V., 2006).

Root vebetables (carrot, parsley, parsnip, celery) are excellent when dehydrated. The raw material contains whole and healthy roots. These

vegetables are very well washed, the ones that do not correspond are thrown away and then the roots are peeled .After being peeled the roots are cut into round pieces, chopped or noodle like shape.(Marca Gh., 2004).

The main physical tranformations suffered by the vegetables while they are being processed are: decrease of volume, loss of weight, the migration of the soluble components, and shrinkage. The weight losses are a natural consequence of water elimination from a content of 85-90% of a fresh vegetable to 4-6% when talking about root vegetables. (Gherghi A.).

The hot air dehydration process of the vegetables happens in three successive stages: the period of pre heating – in which the heat is almost entirely consumed to heat the product; the drying period, at a constant speed – that is actually the real dehydration period and it lasts until it reaches the hygroscopic humidity within the perispheric layer of the vegetable itself; the decreasing speed drying period – in which the drying speed decreases gradually in proportion to the product's humidity.(Mănescu S., I Juduc, 1970).

The higher the temperature, the higher the dehydration speed, the resistance to diffusion and the thickness of the product are smaller, the relation between the surface of the product and its water content is higher and the hot air's movement speed is higher as well(Potec I.et all, 1983).

The enzimes are only partly not activated during the drying process and during the storage they are again reactivated and in time they can lead to a distortion of the dried products. A very efficient measure to make enzimes inactive is to scald the products at 90-95^{o}C, measure which is currently applied to the vegetables meant to be dehydrated. (Violeta Nour, 2002).

The most spread method of drying is that of the convection to atmospheric pressure. (drying with hot air). During drying with hot air, the air itself is the vector which supplies the surface of the product with energy and the vector which removes the water vapors.(Banu C., 2008).

Dehydrated carrots must have a hard consistency, they must break when they are bent, they must have the taste and the smell of fresh carrots, they must be dark orange to red orange, they must be shiny, have a specific taste and a flavor, without a fine flavor of being burnt, musty or other foreign smells, a good texture, withoud wooden parts. The very well dried parsley and celery must have a hard consistency (they must break when bent), with a characteristic smell and taste. The colour is white-yellowish for the parsley and with a yellowish tint for the celery. (Mănescu S., 1973).

By malt drying plant which used geothermal water, is recommended to use a heat exchanger with porous medium.

The porous core heat exchanger, heat transfer is achieved indirectly through a surface exchange (intermediate heat exchanger wall between the fluid and the environment). (Iancu C, 2011)

MATERIAL AND METHOD

The studied root vegetables have been the following the carrot, the parsley and the celery. They have been dried in : the electric oven and in the house drier and the process of dehydration has been performed in the laboratory of the Faculty of Environmental Protection – Methods of food conservation.

The root vegetables meant for the study have been washed, peeled and chopped in pieces of 10 mm and then scalded at a temperature of 96-98^{o}C, (for 4-5 minutes for the carrot and 1-2 minutes for the parsley and the celery).

The samples taken for the study have been weighed, the weight of each sample being of 50g , the samples have been placed on baking paper and introduced into the dehydrating spaces: the electric oven and the house drier respectively.

The weighing of the analyzed samples during the dehydrating programme has been performed every 30 minute.

RESULTS AND DISCUSSION

In the study related to the drying process of the root vegetables we have followed the weight of the products and the time necessary for the water to be eliminated out of the products, starting with an initial weight of 50g for each product and reaching the final weight after the products have been in the electric oven or in the house drier.

1.Establishing the weight of the products dried in the electric oven

The data obtained for establishing the initial weight and the final weight of the three types of root vegetables analyzed in the electirc oven are presented in table 1.

Table 1

The weight of the vegetables dried in the electirc oven

Nr. Prb.	**Type of vegetable**	**Weight**						
		Initial	after 30 min.	After 60 min.	after 90 min.	after 120 min	after 150 min	after 180 min
1.	**Carrot**	50	45	37	29	22	17	12
2.	**Parsley**	50	43	35	28	21	17	13
3.	**Celery**	50	42	35	28	22	17	12

From the data obtained when drying the root vegetables in the electric oven we can notice that their weight decreases progressively, according to the drying time. The initial weight of the three samples analyzed – carrot,parsley, celery - has been of 50 g and, after 180 minutes the carrot and the celery reach 12 g and the parsley reaches 13g.

During the dehydration process the weight of the root vegetables varies: in the first part the quantity of the lost water is less so that after 30 minutes of dehydration the weight of the carrots decreases from 50 g to 45 g, the parsley's is of 42 g and the celery's is also of 42g.

The dehydration process is accelerated in the interval 60-120 minutes when the weight of the three samples decreases significantly, then the weight of the carrot and of the celery reaches 22 g and the one of the parsley reaches 21 g.

In the last part the dehydration speed is reduced, the quantity of lost water is less; after 150 minutes the weight of the three analyzed samples is the same – that is 17 g – and after 180 minutes the final weight is of 12g in the case of the carrot and of the celery and of 13 g in the case of the parsley.

In what the organoleptic features are concerned, the root vegetables dehydrated in the electric oven have got the following characteristics:

- The carrot chops are almost uniform in shape and color, they have got a mat, dark orange color, specific taste and flavor, without any foreign flavor, good texture, they do not present brownish parts.

- The parsley chops are not uniform in shape, a little bit elongated, of a non uniform color white-yellow, with shades of grey, characteristic taste and flavor , no foreign smell, the consistency is hard.

- The celery chops are uniform in shape and color, they have a white-yellowish color characteristic taste and flavor, with no foreign smell, the consistency is hard.

2.Establishing the weight of the vegetables dried in the drier

The data obtained when establishing the initial and final weight of the three types of root vegetables analyzed in the drier, according to time, are presented in table 2.

Table 2

Weight of the vegetables dried in the house drier

Nr. Prb.	**Type of vegetable**	**Weight**					
		Initial	after 30 min.	after 60 min.	After 90 min.	after 120 min	after 150 min
1.	**Carrots**	50	39	29	22	15	11
2.	**Parsley**	50	37	27	20	14	11
3.	**Celery**	50	40	29	22	15	10

When the root vegetables have been dehydrated in the house drier the dehydration period has been reduced with 30 minutes in comparison to the electric oven, so that from the initial weight of 50g of the three analyzed products , after 150 minutes the products reached a weight of 11 g, meaning the carrots and the parsley and 10 g the celery.

In what the house drier dehydration is concerned we can notice a significant decrease in the weight of the analyzed samples in the first interval, meaning in the first 0 to 60 minutes when the weight reaches from an initial 50 g to 29 g in the case of the carrot and the celery and to 27 g in the case of the parsley.

In the interval 60-120 minutes the weight losses are moderate, so in the case of the carrots and of the celery the weight reaches to 15 g after 120 minutes and the weight of the parsley reaches 14g after 120 minutes.

In the last part of the dehydration, in the interval 120-150 minutes, the weight losses are more reduced so that they reach a final weight of 11 g in the case of the carrots and of the parsley and of 10 g in the case of the celery.

The weight of the products dried in the houdse drier is pretty uniform in the time unit in comparison to the drying in the electric oven and the dehydration time is more reduced.

In what the organoleptic features are concerned the root vegetables dried in the house drier have got the following characteristcs:

- The carrot chops are uniform in shape and color, they have got a light, shiny orange color, characteristic taste and flavor, with no foreign smell, good texture, and they do not present brownish parts.
- the parsley chops are uniform in shape and color, they are white-yellowish, they have characteristic taste and flavor, they have no foreign smell and the consistency is hard and crunchy.
- the celery chops are uniform in shape and color, they have got a white color, characteristic taste and flavor, they have got no foreign smell and the consistency is hard and crunchy.

The organoleptic features of the three samples of root vegetables dried in the house drier are better than those of the vegetables dried in the electric oven, this fact being due to the air's ventilation , air that circulates over the products during the dehydration and which also has as a consequence the decrease of the dehydration time.

CONCLUSIONS

The drying of the root vegetables is an efficient preserving procedure when the drying is performed gradually according to the structural properties of the products.

Slowly dried products, at relatively slow temperatures (max 65ºC), offer the dried products organoleptic properties similar to those existent in the fresh products.

Conservation through drying can be adapted to all the vegetables but it shall be customized for each species; the root vegetables shall respect another technology different from the one used to dry leafy vegetables.

Due to the advantages of using the conservation method through dehydration, vegetables preserved like this maintain their nutritious value, their taste, smell, savour and their volume and their weight respectively is decreased up to 10 times so they need little space to be stored.

In what the root vegetables dehydrated in the house drier are concerned, the dehydrating time was reduced with 30 minutes in comparison to the electrical oven, so that from the initial 50 g weight of the three samples analyzed, it has reached 11 g after 150 minutes, for the carrot and the parsley and10 g in what the celery was concerned.

The organoleptic characteristics of the three samples of root vegetables dried in the house drier are better than the ones dried in the electric oven, this fact is due to the air ventilation which circulates over the products during the dehydration programme and which has as a consequence the reduction of the dehydrating time period.

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