

OBTAINING AND STORING POWDER AVOCADO

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In order to obtain a product derived from avocado, with advantages when compared to fresh fruit, such as smaller volume and weight, able to be stored easily without getting dark when exposed to air, drying was carried out on finely ground pulp or avocado purée.

As pretreatment, fruits were washed, peeled, deseeded and immersed in a solution of citric acid. Once obtained, the pulp was mixed with preserving solution (citric acid, ascorbic acid), antioxidant (TBHQ) and drying adjuvant (maltodextrin).

To turn pulp into powder, a Niro minor atomizer was used, keeping outlet air temperature at 80°C and a feeding flow of 8-10 kg hr⁻¹. The yield obtained was of 15% of powdered product regarding pulp and 30% regarding the fruit. The powder was characterized by its typical green color and good mixing properties with water. The microbiological analyses indicate absence of pathogenic microorganisms and a total count of 18.000 cfu 100 mL⁻¹. The content of water was of 1% and 70% of lipids (b.s.).

The obtained product was stored under environmental conditions and refrigerated in darkness for a period of 2 months. This storage was carried out with 3 replicates, not showing significant differences in moisture, colour, taste, aroma, and peroxides index, obtaining a confidence level of 95%.

Key words - Dried by atomization

OBTENCION Y ALMACENAMIENTO DE PALTA (AGUACATE) EN POLVO

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Con el objeto de disponer de un producto derivado de la palta, de menor volumen y peso que el fresco, apilable, que no se oscurezca durante el almacenamiento ni por simple exposición al aire, se ensayó el secado por atomización de la pulpa o puré de palta.

Como pretratamiento el fruto fue lavado, descascarado, eliminada la semilla y se sumergió en una solución de ácido cítrico. Una vez obtenida la pulpa se mezcló con solución de preservantes (ácido cítrico, ácido ascórbico), antioxidante (TBHQ) y coadyuvante de secado (maltodextrina). Para la transformación en polvo se utilizó un atomizador minor Niro, en el cual se mantuvo la temperatura del aire de salida a

80°C y un flujo de alimentación de 8-10 kg hr⁻¹. El rendimiento obtenido fue de 15% de producto en polvo respecto de la fruta entera y 30% respecto de la pulpa. El polvo se caracterizó por su color verde típico y buena reconstitución con agua. Los análisis microbiológicos indican ausencia de microorganismos patógenos y un recuento total de 18.000 ufc 100 mL⁻¹. El contenido de agua fue de 1% y de lípidos (b. s.) de 70%.

El producto obtenido fue almacenado en condiciones ambientales y en régimen de refrigeración en oscuridad por un período de 2 meses. Este almacenamiento se realizó con 3 repeticiones no encontrándose diferencias significativas en humedad, color, sabor, aroma e índice de peróxidos con un nivel de confianza de 95%.

Palabras claves - Secado por atomización.

1. Introduction

The avocado is much appreciated by his qualities organoleptics and nourishing, that deteriorates easily if his pulp is exposed to the air or to the heat. The prosecution of this fruit presents certain obstacles as the pardeamiento enzymatic, the microbiological deterioration and the generation of smells and strange flavors as result of the application of thermal treatments, factors that limit the conservation of the avocado pear by means of the application of traditional methods used in other fruits.

The dried one by atomization, which allows using high temperatures in a short time allows to dry products termolábiles, since it is the case of the extracts of coffee, tea, antibiotics, milk, etc. In relation to the pulp of avocado pear, this one is clearly sensitive to the heat, for what the use of this one technology can allow to obtain marketable quality product and (Schwartz, 1989).

The process is characterized by the pulverization of million micro individual drops in a camera by the one that circulates a controlled current of warm air. The rapid vaporization of the water of the product, drying softly without thermal shock, transforms it into powder; it finishes the process with the collection of the same one. This process allows to reduce the weight, volume and the water activity of a nutritive fluid with solid dissolved.

In this work there try to be studied the conditions of operation of an atomizer (spray dryer) to produce avocado pear in powdered, without his typical green color falters for the high applied temperatures and that it is reconstituible for water addition

2. Materials and methods

2.1 Material :

Was worked by solutions of pulp of avocado pear cv Strong, to that there joined additives, like it shows in the Picture 1. Also, different pretreatments were used with the target to find the best conditions of dried in spray for the avocado pear

Picture 1. Conditions of operation experiences dried avocado pears

	Exp. 1	Exp. 2	Exp. 3	Exp. 4	Exp.5
Treated pulp (Kg)	21,3	11,9	10	9	11
Additives in water dilution pulp	no	yes (1)	yes (2)	yes (3)	yes (4)
T° entry air	150	140	120	130	120-130
T° oone out air	60-67	60	65-75	84	70-80
Veloc aliment Kg/h	12,1	10,6	10	8,3	9,6
Process time (h)	3,5	2,25	2	2,1	3,5

(1): 300 ppm acidulant, 300 ppm antirust

(2): 300 ppm acidulan, 300 ppm antirust, 300 ppm propionato de calcio, 200 ppm monosodic glutamate.

(3): 300 ppm acidulan, 300 ppm antirust, 300 ppm calcium propionate

(4): 300 ppm acidulan, 300 ppm antirust, 200 ppm BHA, 2% coadjutant

2.2 Methods

The pulp was mixed with a solution of acidulants and antirust, in a relation pulp: solution 1:1. For the dried spray 120 used a temperature of air entry - 130 °C, gone out 70 - 80 °C and of the steam 120 - 130 ° C, with speed of feeding of 8-10 Kg/h.

The flowchart that shows the process of securing of avocado pear in powder shows itself in the Figure 1.

Packed and storage: The conditions that they led to better results were those who were used during the storage. The product was packed in bags of transparent polyethene. The samples were stored to temperature ambience, in darkness and under refrigeration (0 °C).

3. Discussion and results

The atomization of the pulp of avocado pear produces a dust of green intense color, so that the phenomenon of pardeamiento enzymatic is not made clear because the speed with which it might happen is minor at the time that it is needed to eliminate the water and to transform in powdered. The yield was 15 % with regard to the entire avocado pear and from the pulp of 25 %.

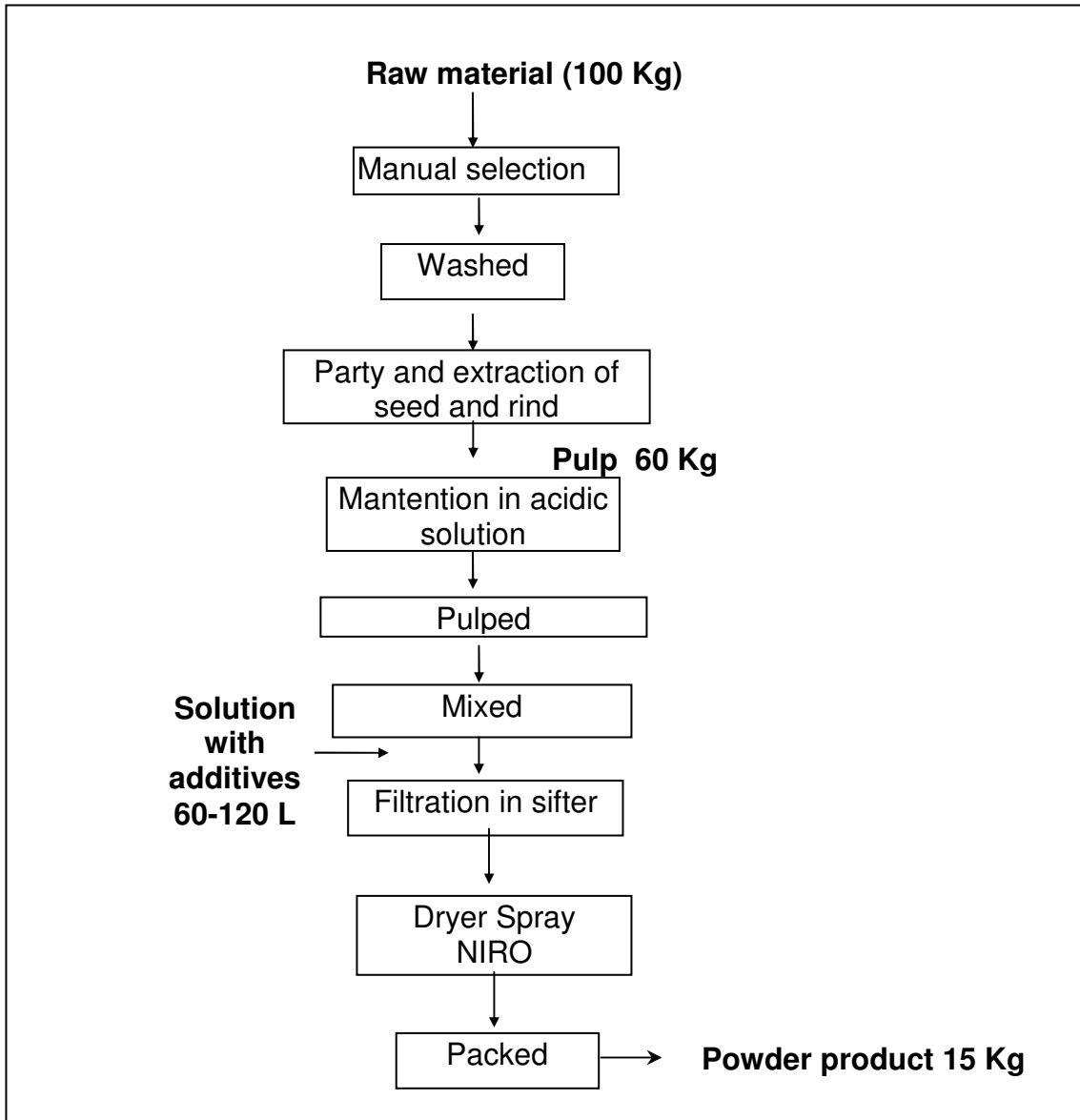


Figure 1. Process dried by atomization

Since appears in the Picture 2, the moisture performs the order of 1 %, which it demonstrates that the reduction of the water activity explains his chemical and microbiological stability. This also suggests that it is required a sufficiently impermeable packing to the water to assure that it should not absorb moisture and that for it the product should falter.

Picture 2 Characterization and storage of the dehydrated avocado pear

PARAMETER	0 Month	1 Month
Sample temperature ambience		
Humidity (%)	1,1	0,5
Lipids (%b.s.)	69,8	
Peroxides (meq/Kg)	13,4	4,7
Colif. entire (NMP/100 ml)	< 3	< 3
Colif fecal (NMP/100ml)	< 3	< 3
Entire recount	18000	6200
Color	typical green	typical green
Flavor	Bitter taste	Bitter taste
Reconstitution 1:1	good	good
Sample refrigerated (0°C)		
Humidity (%)		0,3
Lipids (%b.s.)		
Peroxides (meq/Kg)		4,3
Colif. entire (NMP/100 ml)		< 3
Colif fecal (NMP/100ml)		< 3
Entire recount		3600
Color		typical green
Reconstitución 1:1		Good

The physical chemistry evaluation and microbiological of the product in powdered, to the time zero, indicate absence of pathogenic microorganisms and an entire recount of bacteria inside the limits estimated for foodstuff in powdered.

The level of peroxides (related to problems of oxidation of the product) found in the experiences is still a little high. The color and aroma of the product is considered to be typical and intense. They did not present themselves to problems of reconstitution in any of experiences.

Storage: The product obtained in all the experiences stored in conditions ambience and refrigeration, in darkness. Analyses of the product were realized every 30 days by a period of 2 months.

Considering the changeability that could exist in the realized analyses it is possible to determine that, in general, ambience did not observe big difference in the results of the samples stored in cold v/s those kept to temperature.

The moisture can be considered to be approximately constant in the time. The entire recount of microorganisms stays relatively constant or tends to go down.

The moisture can be considered to be approximately constant in the time. The entire recount of microorganisms stays relatively constant or tends to go down. For the last experiences the absence is supported in the time of pathogenic, and in some cases, where presence of entire coliformes was, these do not increase.

The color is supported in the stored product, practically without alteration. The reconstitution keeps on being good.

With regard to the index of peroxides (IP), a tendency is observed to a light increase at the beginning of the storage followed by a fall of the same ones. In some cases, to the first month an important decrease is detected directly.

Stability in the storage of the powdered avocado

After establishing the best conditions of process for the dried one of the avocado pear by atomization, powdered avocado pear was prepared and it was stored in darkness, under refrigeration and of temperature ambience, in bags metallized (Picture2)

Three repetitions were realized using the conditions earlier special. The characterization of the product obtained in each of them appears in the Picture to 3.

Picture 3. Characterization of dehydrated avocado pear purée

Parameter	1	2	3
Humidity (%)	1,3a	1,1a	1,1a
Lipids (% dry base)	54,8a	58,7a	56,4a
Peroxides (meq/Kg oil)	11,2a	12,8b	11,7a
Color	typical green	typical green	typical green
Reconstitution 1:1	good	good	good

The same lettering indicates that there are no significant differences.

Storage: The product was stored in bags termolaminadas of aluminum, in refrigeration and to temperature ambience. Analyses were realized every 20 days up to completing 2 months. The results of the pursuit realized to the product during the storage appear in the Picture to 4.

Picture 4. Results of storage powdered avocado pear

	0 day	20 days	40 days	60 days
Refrigeration				
Humidity (%)	1,3	1,5	1,3	1,2
Lipids (%dry base)	54,8	54,2	55,2	54,0
Peroxides (meq/kg)	11,2	12,9	13,5	15,3
Reconstitution 1:1	good	good	good	good
Color	typical green	typical green	typical green	typical green
Ambience Temp.				
Humidity (%)	1,3	1,2	1,0	1,2
Lípidos (%dry base)	54,8	53,9	53,5	53,1
Peroxides (meq/kg)	11,2	13,9	17,2	17,6
Reconstitution 1:1	good	good	good	good
Color	typical green	typical green	typical green	typical green

Moisture: The values of the content of moisture of the obtained product stay constant during the storage in the evaluated conditions, fluctuating between 0,9 and 1,5 %. The stability in storage is determined in most by the content of residual moisture. This way, when the content of residual moisture is 5 % equivalent to a monomolecular layer of water associated with the dry product, the alteration it is more rapid than with low moisture.

Lipids: As for the lipids content it appreciates that there exists certain tendency to which these diminish during the storage, both in refrigeration and to temperature ambience. This decrease might owe to itself to the oxidation that the greasy acids suffer product of the thermal treatment that was used. The status of fluctuation goes from 53,1 to 58,7 % (dry base).

Index of peroxides: It is observed that the values of initial peroxides (time 0) are little more shallows to the obtained ones previously, but are increasing gradually during the storage.

In relation to the reconstitution, this one keeps on being good and with regard to the color it was possible to establish that the product is extremely sensitive to the light, producing to him an entire bleaching of it opposite to these conditions. On the contrary, stored in darkness, the color is supported without alterations during the period of storage.

.4 Conclusions

- The powdered avocado pear obtained had a green typical color, without declarations of pardeamiento.
- During the storage of 60 days, so much to temperature ambience as in diet of refrigeration the product was preserved by the green color and his capacity of reconstitution with water.
- The content in oil is superior to 50 % (dry base.)
- The product is re-constituted appropriately in water.

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5. References

1. Moreno, J. A., Gasque, F., Schwartz, M. and Lafuente, B. 1984. Maltodextrin as a coadjuvant for spray drying of the orgeas of "chufas" (Cyperus esculentus L.). Proc. M.O.C.C.A. Vol I. P. 261-268.
2. Schwartz, M. 1989. Secado por atomización. Factores que intervienen en la retención del aroma de los alimentos. Revista Alimentos, 14 (4), 5-8.
3. Schwartz, M., Gasque, F., Montesinos, M. y Lafuente, B. 1986. Secado por atomización de la horchata de chufas (Cyperus esculentus L.): efecto de las condiciones del proceso sobre la calidad del producto. Rev. Agroquím. Tecnol. Aliment., 26 (1), 81-89.
4. Schwartz, M., Costell, E. y Gasque, F. "Efecto de los tratamientos de estabilización sobre el color y propiedades reológicas de la horchata de chufas". Rev. Agroquím. Tecnol. Aliment., 24 (2), 271-277, (1984).