

## **Effect of cultivar and maturity on the quality of frozen avocado pulp**

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### **SYNOPSIS**

*The quality of frozen avocado pulp is affected by the cultivar and the maturity level. The flesh of five avocado cultivars, harvested at three maturity levels were frozen at -40°C and stored at -18°C. Edranol cultivar had the best quality as a frozen product and in each cultivar oil contents of higher than 15 per cent were required as minimum maturity level to obtain a quality frozen product.*

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### **INTRODUCTION**

More than 32 avocado (*Persea americana* Mill) cultivars are grown in different areas in Chile.

Avocado flesh is normally consumed as a fresh product in paste, halves or slices. It can be processed in order to increase the consumption and regulate market prices.

The avocado flesh quality is mainly affected by the cultivar and the maturity level of the fruit (Hatton & Campbell, 1959).

After the enzymatic browning control, freezing has been reported as a good processing method to maintain the quality of avocado flesh pulp (Kaplaner *et al*, 1986; Carvallo & Schaffeld, 1983; Lime, 1969 and Bates, 1964).

In order to control enzymatic browning, antioxidant treatments were used to evaluate the quality of a frozen product of five avocado cultivars, harvested at three maturity levels.

### **MATERIAL AND METHODS**

The avocado cultivars Bacon, Edranol, Fuerte, Hass and Zutano, grown in the Quillota Valley, Chile, during the 1983-1984 season, were harvested at three maturity levels (Table 1), measuring the oil content (AOAC, 1980).

They were ripened in a chamber at 13-15°C until 2-3 kg presionometer value (0,79 cm, end) was reached.

Each cultivar fruit was hand-peeled and half of it was cut in slices. The rest of the fruit was blended and reduced to smooth uniform pulp. The flesh colour of each cultivar was measured (Munsell, 1976).

All samples were treated with 0,8 per cent ascorbic acid solution to prevent enzymatic browning, packed in polyethylene bags, frozen at -40°C for 24 hours in an air-blast freezer and transferred to -18°C for a three-month storage period.

After storage, colour (Munsell, 1976) was measured and samples were subjected to a sensory evaluation panel of 20 members for judging texture intensity, as well as flavour and general desirability.

## RESULTS

The maturity level did not affect the flesh colour of the analysed cultivars (Table 2).

After freezing and storage, the colour of the Zutano cultivar became darker in all the treatments, including treatments of the cultivars Edranol, Fuerte and Hass with a lower oil content (Table 3).

In all analysed cultivars the maturity level had no effect on the texture intensity of the pulp presented in slices (Table 4).

In the analysed cultivars, the best flavour and general desirability were reported in treatments with higher oil contents. Pulp in slices were preferred by the judges. Edranol cultivar had the best flavour in all treatments (Tables 5 and 6).

TABLE 1 Oil content of avocado fruit (*Persea americana* Mill) cultivars

Cultivars	Maturity level		
	I	II	III
Bacon	10	14	17
Edranol	11	15	17
Fuerte	12	15	22
Hass	11	17	21
Zutano	10	13	15

TABLE 2 Effect of maturity on the colour (Munsell) of avocado flesh

	Maturity level		
	2,5 GY9/8	2,5 GY9/8	2,5 GY9/8
Bacon	2,5 GY9/8	2,5 GY9/8	2,5 GY9/8
Edranol	10 GY9/9	10 GY9/9	10 GY9/9
Fuerte	2,5 GY8/9	2,5 GY8/9	2,5 GY8/9
Hass	2,5 GY8/9	2,5 GY8/9	2,5 GY8/9
Zutano	2,5 GY9/8	2,5 GY9/8	2,5 GY9/8

TABLE 3 Effect of freezing and storage on the colour (Munsell) of frozen avocado pulp.

	Maturity level	Bacon	Edranol	Fuerte	Hass	Zutano
Paste	I	2,5 GY7/10	2,5 GY8/8	2,5 GY8/9	2,5 GY7/10	2,5 GY6/8
	II	2,5 GY9/8	2,5 GY7/9	2,5 GY8/9	2,5 GY7/10	2,5 Y6/7
	III	2,5 GY9/8	2,5 GY7/10	2,5 GY8/9	2,5 GY8/9	2,5 GY6/8
Slices	I	2,5 GY7/10	10 Y9/9	10 Y7/9	10 Y7/9	10 Y7/9
	II	2,5 GY9/8	10 Y9/9	10 Y9/9	10 Y7/9	10 Y6/7
	III	2,5 GY9/8	2,5 GY7/10	2,5 GY8/9	2,5 GY8/9	10 Y7/9

TABLE 4 Effect of maturity on texture intensity of frozen avocado pulp slices.

Maturity level	Bacon	Edranol	Fuerte	Hass	Zutano
1	5,3	4,8	5,8	4,5	5,0
11	5,6	4,7	5,3	4,3	5,1
III	5,5	4,5	5,2	4,4	5,4

1 = Extremely hard/tough

7 = Extremely soft

## DISCUSSION

The minimum oil content required when harvesting Hass, Edranol, Fuerte and Bacon cultivars for freezing, was 15 per cent.

Edranol cultivar had the best quality as a frozen product.

Zutano cultivar did not have good quality as a frozen product.

A general conclusion was reached that freezing was a good processing method to preserve avocado pulp of proper cultivars and maturity levels.

TABLE 5 Effect of maturity on flavour of frozen avocado pulp.

	Maturity level	Cultivars				
		Bacon	Edranol	Fuerte	Hass	Zutano
Paste	I	2,6	4,6	3 1	3 7	2,5
	II	3,3	5,0	3 9	4 4	2,8
	III	4,2	5,3	4 7	5 4	4,2
Slices	I	3,6	5,4	3 0	3 9	2,8
	II	4,2	5,7	4 5	4 2	2,8
	III	4,9	5,5	5 2	5 2	3,7

1 = Extremely undesirable

7 = Extremely desirable

TABLE 6 Effect of maturity on general desirability of frozen avocado pulp.

	Maturity level	Cultivars				
		Bacon	Edranol	Fuerte	Hass	Zutano
Paste	I	3,7	4,5	3 1	3 7	2,5
	II	4,8	4,8	4 8	4 8	4,8
	III	5,4	5,7	5 7	4 8	4,2
Slices	I	4,4	5,4	3 3	3 8	2,8
	II	5,2	5,8	4 9	5 3	2,8
	III	5,8	5,9	5 4	5 2	3,7

1 = Extremely undesirable

7 = Extremely desirable

## REFERENCES

1. AOAC. Association of Official Analytical Chemist, 1980. Official Methods of analysis. 30 ed.
2. Bates, J, 1964. Factors affecting foam production and stabilization of tropical fruit products. *Food Technology*, 18(1), 93-96.
3. Carvallo, M & Schaffeld, G, 1983. Formulaci6n de un producto unttable de palta. *Revista Alimentos*, 8(4), 9-14.
4. Hatton, TT & Campbell, CV, 1959. Evaluation of indices for Florida avocado maturity. Florida State Horticulture Society, 72, 349.

5. Kaplaner, U, Huguet, C, Garrido, F, Cifuentes, A & Dondero, M, 1986. Formulacibn de Productos en base a paltas Fuerte y Hass. *Revista Alimentos*, 11(3), 9-14
6. Lime, B, 1969. Preparation and storage studies of freeze dried avocado salad. *Food Technology*, 23(3), 43-56.
7. Munsell Color, 1976. *Book of Color*. Glossy finish collection removable in two binders. MacBet Division of Koolmorgen Corporation, Baltimore.