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Title

EFFECT OF TWO ROOTSTOCK SELECTIONS ON THE SEASONAL NUTRITIONAL VARIABILITY OF
BRAEBURN APPLE

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Materials and Methods

A fertigation trial was carried out over two growing seasons in 2001/2002 (wet summer) and 2002/2003 (wet spring) on an apple orchard plot (Braeburn variety) located in Retiro village (UTM datum WGS 84; HUSO 19 254001 m E and 6000159 m N), central south of Chile. The orchard was established in 1991 over a frame of 4.5 m * 1.75 m, two different sectors were selected to make evaluations, one of them with M-111 and the other with seedling rootstocks. The fertilization in the period before harvest was the following: Calcium Nitrate and Urea (40 kg N and 47 kg CaO ha⁻¹), and in the post-harvest period was 66 kg ha⁻¹ of a commercial fertilizer 18:6:18 (*Ultrasol desarrollo*). Additionally in each orchard 8 calcium chloride foliar sprays were applied (6 kg Ca ha⁻¹) on each season. Four sampling points were selected in each sector and each one was composed of two trees, which were selected by chemical soils uniformity. At the harvest in each growing season 40 fruits per point were collected, and their peel and pulp were analyzed. Additionally, 40 fruits per point were harvest and stored by 60 days in cooling storage. Consequently this fruits were exposed to normal ambient conditions for evaluate its Bitter pit incidence.

Results and Discussion

Results indicated that the yield was not affected by the rootstock (Table 1). The statistical analysis performed during each growing season between sectors did not show significant differences on N, P, K, Ca, Mg and B concentrations evaluated on tissues ($p < 0.05$) (dates not showed), which contrasted with results of authors (Ponchia et al., 1996; Chun et al., 2001; Slowiński and Sadowski, 2001). Moreover, statistical analysis performed between growing seasons showed differences for some nutrients (Tables 2 and 3), as was indicated by Tomala (1996) y Noè et al. (1996). The highest content of K, Mg and B and lowest P content were obtained in peel during 2001/2002 (Table 2). The highest content of K, Mg and B and lowest P content were obtained in pulp during 2002/2003 (Table 3). The highest calcium and magnesium content were obtained in peel and the highest potassium content was obtained in pulp, which is coincident with the results obtained by Zavalloni and Marangoni (2001). The boron content was highest in both peel and pulp for the season 2002/2003. Wójcik and Cieslinski (2000) indicated a positive relationship between boron and calcium content, which was not observed here. A high incidence of bitter pit was observed during the last growing season, and was associated with a yield decrease in comparison to the first season (Table 4). The results suggest a seasonal incidence on fruits nutritional content, which would affect the post harvest quality.

Table 1
Braeburn apple yield on two rootstocks (seasons 2001-2002 and 2002-2003)

Season	Yield (ton ha ⁻¹)	
	Seedling rootstock	M-111 rootstock
2001-2002	70.7 a	71.7 a
2002-2003	51.7 a	50.4 a

Within a file, means followed by the same letters are not significantly different according to LSD (0.05)

Table 2
Nutrient content in Braeburn apple peel on two evaluated seasons

Nutrient	Season		Variability coefficient (%)
	2001-2002	2002-2003	
N, %	0.4550 a	0.2345 b	10.01
P, %	0.0623 a	0.0432 b	14.87
K, %	0.5922 a	0.6222 a	13.50
Ca, %	0.0559 a	0.0227 b	21.70
Mg, %	0.0703 a	0.0439 b	10.23
B, mg kg ⁻¹	17.250 b	20.121 a	11.97

Within a file, means followed by the same letters are not significantly different according to LSD (0.05)

Table 3
Nutrient content in Braeburn apple pulp on two seasons of evaluation

Nutrient	Season		Variability coefficient (%)
	2001-2002	2002-2003	
N, %	0.2525 a	0.2593 a	11.57
P, %	0.0961 a	0.0550 b	22.93
K, %	0.7008 b	0.8943 a	11.93
Ca, %	0.0147 a	0.0106 a	29.02
Mg, %	0.0233 b	0.0259 a	8.38
B, mg kg ⁻¹	13.500 b	21.298 a	19.73

Within a file, means followed by the same letters are not significantly different according to LSD (0.05)

Table 4
Bitter pit incidence on Braeburn apple variety fruits on two evaluated seasons

Bitter pit (%)	Season		Variability coefficient (%)
	2001-2002	2002-2003	
	1.563 b	37.488 a	49.52

Means followed by the letters different are significantly different according to LSD (0.05)

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