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Composition of babaco, feijoa, passion-fruit and tamarillo produced in Galicia (NW Spain)

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Basic compositional data for the subtropical fruits babaco, feijoa, passion-fruit and tamarillo, growing in Galicia (NW Spain), are evaluated.

INTRODUCTION

The climatic conditions of Galicia, NW Spain (mild winters, warm summers and persistent rain) are ideal for the cultivation of a range of unusual subtropical fruits. Amongst those currently being evaluated by horticulturists are the babaco, the feijoa, the passion-fruit and the tamarillo (Salinero *et al.*, 1985).

The babaco (*Carica pentagona* Heil), a Caricacea native to the mountains of Ecuador, is now grown in some parts of New Zealand. The plant has a non-ramified stem, reaching a height of 1·5–2·5 m. The green fruit which emerge at the insertion of the leaf petioles ripen to yellow, and may reach 30 cm in length and 1·5 kg in weight. The fruit is pentagonal in transverse section, very juicy and may contain a few soft seeds which do not have to be removed before consumption. Each tree yields between 30 and 50 fruit (Williams, 1985; Cossio & Bassi, 1987; Bartley, 1988; Calabrese, 1988).

The Feijoa (*Feijoa sellowiana* Berg) belongs to the Myrtacea family, which includes many tropical and subtropical plants of great economic importance. *Feijoa sellowiana* (or *Acca sellowiana*) is a native of South America (Uruguay, Argentina, Paraguay and Brazil) that was introduced to Europe in 1890 via France, Spain, Italy and Portugal. Around 10 years later, it was also introduced to California and from there to New Zealand, where marketing of the fruit began. In Pontevedra (NW Spain) there are several elderly examples of this species; in most cases, these are descendants of the first plants brought over from South America. The plant is woody, evergreen and 2–4 m high. The fruits are round or ovoid, 3–8 cm long, green-grey berries with a rough skin. The pulp is whitish, uniform or granular, with a pleasant aromatic flavour. There are a large number of very small seeds which do not have to be removed before eating (Publiano, 1980; Azam *et al.*, 1981; Heywood, 1985; Salinero *et al.*, 1985; Mansilla *et al.*, 1989).

The passion-fruit (*Passiflora edulis* Sims) is a member of the Passifloraceae; this family is native to tropical and subtropical regions but grows well in temperate climates. *Passiflora edulis* Sims, which originated in Brazil, is currently cultivated commercially in outdoor plantations in Galicia. The plant climbs with the aid of tendrils, springing from the same axils as the flowers. The fruits are round or ovaloid and apricot-sized (4–6 cm in diameter). When mature they are deep purple with a thick hard dry skin; when this starts to wrinkle they are ready to eat. They contain numerous small black seeds set in a yellowish, aromatic, slightly acid pulp (Bellini & Giovannoni, 1987; Genders, 1988; Sale, 1988; Salinero & Lema, 1990).

The tamarillo or tree tomato (*Cyphomandra betacea* Sendt.) is a Solanacea native to South and Central America. Commercial growing started in New Zealand. It is a tree species which grow to 3–3·6 m high. The fruits are ovoid and smooth-skinned, yellow (yellow tamarillo) or red (red tamarillo), and contain many small seeds. The pulp is also yellow or red with a slightly acid taste, reminiscent of tomato (Rotundo *et al.*, 1981, 1983; Pileri, 1989, Rotundo, 1989).

In this study we determined a range of basic compositional parameters in samples of babaco, feijoa, passion-fruit and tamarillo growing in Galicia (NW Spain). The parameters determined were (in whole fresh fruit) weight, length, diameter and texture; (in fresh fruit juice) soluble solids content; (in homogenized fresh fruit) colour, pH, degree of maturity, vitamin C content and water content (in lyophilized fruit) total nitrogen, total fats, sucrose, D-glucose, D-fructose, detergent-neutral fibre, organic acids, ash, sodium potassium, calcium, magnesium, iron, copper, zinc, manganese and phosphates. We compare our data

from Galicia with previously published data from other regions. It should be stressed that the climate of Galicia is very different from that of central and southern Spain and thus our results should not be over-generalized.

MATERIALS AND METHODS

Samples

Mature specimens of all four fruits were collected in 1989 from the Finca Do Areeiro fruit farm owned by the Diputación de Pontevedra. Three babaco samples were collected from the Kiwi España farm.

A total of six samples of each fruit were collected. For each sample of feijoa, passion-fruit and tamarillo, approximately 1 kg of fruit was collected. In the case of babaco, approximately 10 kg was collected.

The parameters determined for the types of sample are now considered.

Whole fresh fruit

Weight, length and diameter were recorded. Texture was determined with a penetrometer (an instrument which measures resistance of fruit to penetration). Ten fruits per sample were used in the determination of these parameters. The sample mean is the mean of these 10 determinations.

Fruit juice

Soluble solids content of fruit juice (pooled from 10 fruits per sample) was determined as per the AOAC (1990) method, a physical method involving refractometry. The refractive index is converted, via a set of tables, into degrees Brix.

Homogenized fresh fruit

Approximately 500 g of each sample was homogenized for determination in triplicate of several variables. The sample mean is the mean of these three determinations.

Colour was determined using the simplified tristimulus method, of the Comission Internationale de L'Eclairage (Simal-Luzano *et al.*, 1986). This method involves determination of the dominant wavelength following measurement of transmittance of an acetone extract of the sample at 444·4, 495·2, 551·8 and 624·2 nm. pH was determined with a Crison 2002 potentiometer, and total acidity by titration to pH 8·1 with NaOH (AOAC, 1990). The relationship between degrees Brix and total acidity was used to determine the degree of maturity of the fruit. Vitamin C was determined by a reverse-phase high-performance liquid chromatography (HPLC) method, with UV detection at 245 nm. (Romero-Rodriguez *et al.*, 1992). Water content was determined by weighing before and after lyophilization.

Table 1. Characteristics of babacos grown in Galicia (NW Spain) and babacos as reported in previous studies[a]

	Babaco			
	Galicia X ± SD	Ecuador[b]	New Zealand[b]	Italy[c]
Weight (g)	755 ± 180	—	—	—
Diameter (cm)	8·3 ± 1·24	—	—	—
Length (cm)	25·3 ± 2·61	—	—	—
Colour (nm)	560—578	—	—	—
Firmness (kg)	4·2 ± 1·25	—	—	—
pH	4·0 ± 0·17	—	—	4·26
Brix value	7·5 ± 0·97	—	—	—
Total acidity[d]	0·7 ± 0·14	—	—	0·52
RI1[e]	11·6 ± 3·70	—	—	—
Moisture (%)	93·6 ± 1·16	93·3	93·0	92·8
Proteins (%)	0·7 ± 0·14	0·9	0·9	0·66
Fat (%)	0·02	0·1	0·2	0·1
Total sugars (%)		5·4	6·0	—
Glucose (%)	1·1 ± 0·22	—	—	2·54
Fructose (%)	1·0 ± 0·15	—	—	2·11
Sucrose (%)	1·5 ± 1·01	—	—	0·58
Fibre (%)	0·6 ± 0·22	0·5	0·7	—
Citric acid (%)	0·1 ± 0·03	—	—	0·16
Malic acid (%)	0·4 ± 0·04	—	—	0·57
Quinic acid (%)	0·03 ± 0·09	—	—	—
Ash (%)	0·3 ± 0·03	—	—	0·35
Vitamin C[f]	26·9 ± 3·44	29·0	31·0	22·6
Sodium[f]	2·7 ± 1·17	—	1·3	1·9
Potassium[f]	179 ± 24·9	—	220	154
Calcium[f]	9·9 ± 2·01	11·0	12·0	8·3
Magnesium[f]	15·3 ± 2·16	—	13·0	11·3
Iron[f]	0·3 ± 0·07	4·0	3·4	0·4
Copper[f]	0·1 ± 0·03	—	—	—
Zinc[f]	0·08 ± 0·03	—	0·1	—
Manganese[f]	0·08 ± 0·03	—	0·09	—
Phosphates[f]	7·7 ± 1·40	14·0	17·0	10·1

[a] Results are expressed as mean ± standard deviation of six samples mean, except in the case of colour (expressed as range).
[b] Cossio & Bassi (1987).
[c] Ferrara *et al.* (1989).
[d] Total acidity is expressed in g malic acid/100 g fresh wt.
[e] Ripeness is defined as Brix value/total acidity.
[f] Vitamin C and minerals in mg/100 g fresh wt.

Lyophilized fruit

The homogenized fresh fruit was lyophilized and the remaining variables were determined in triplicate. The sample mean is the mean of these three determinations.

Determination of total nitrogen, to provide an estimate of protein content, was carried out using Kjeldahl's method (AOAC, 1990). Total fats were determined by continuous extraction with petroleum ether at 40–60°C in a Soxhlet extractor (AOAC, 1990). Sucrose, D-glucose and D-fructose were determined by Boehringer–Mannhein enzyme test No. 716 260. Neutral detergent fibre was determined following extraction of fats with detergents (Van Soest & Wine, 1967). Organic acids were determined by reverse-phase HPLC, employing UV/visible detection at various wavelengths (Romero-Rodriguez *et al.*, 1990). Ash content was determined following calcination of the lyophilized sample (AOAC, 1990) at 550°C. Sodium, potassium, calcium, magnesium, iron, copper, zinc and manganese were determined by atomic absorption spectrophotometry. Phosphates were determined by

Table 2. Characteristics of feijoas grown in Galicia (NW Spain) and feijoas as reported in previous studies[a]

	Feijoa		
	Galicia X ± SD	New Zealand[b]	New Zealand[c]
Weight (g)	31·7 ± 3·43	—	—
Diameter (cm)	3·6 ± 0·14	—	—
Length (cm)	4·6 ± 0·24	—	—
Colour (nm)	571–574		
Firmness (kg)	3·3 ± 0·42	—	—
pH	3·4 ± 0·39	—	3·70–3·90
Brix value	12·3 ± 1·18	—	—
Total acidity[d]	1·4 ± 0·20	—	0·80–1·60
RI1[e]	9·4 ± 2·45	—	—
Moisture (%)	83·4 ± 1·15	84·0–86·0	84·0–89·0
Proteins (%)	1·1 ± 0·05	0·50–1·00	0·70–0·90
Fat (%)	0·08 ± 0·01	0·30–0·40	—
Glucose+Fructose (%)	2·6	3·1	0·60–2·20
Glucose (%)	1·0 ± 0·23	—	—
Fructose (%)	1·6 ± 0·05	—	—
Sucrose (%)	5·0 ± 0·46	6·40–7·40	2·90–5·20
Fibre (%)	5·0 ± 0·46	3·80–4·30	—
Citric acid (%)	1·2 ± 0·30	—	—
Malic acid (%)	0·1 ± 0·03	—	—
Quinic acid (%)	—	—	—
Ash (%)	0·3 ± 0·01	0·20–0·40	—
Vitamin C[f]	16·2 ± 0·17	25·0–36·0	28·0
Sodium[f]	4·9 ± 0·35	0–9	5·0
Potassium[f]	133 ± 15·1	90·0–170	166
Calcium[f]	14·4 ± 3·7	4·5–8·0	4·0
Magnesium[f]	7·7 ± 1·23	5·8–9·0	8·0
Iron[f]	0·3 ± 0·08	0–0·2	0·05
Copper[f]	0·1	0·02	—
Zinc[f]	0·1	0·05–0·06	—
Manganese[f]	0·2 ± 0·05	0·04–0·05	—
Phosphates[f]	16·2 ± 0·94	10·0–17·0	10·0

[a] Results are expressed as mean ± standard deviation of six samples mean, except in the case of colour (expressed as range).
[b] Visser & Burrows (1983).
[c] Azam *et al.* (1981).
[d] Total acidity is expressed in g malic acid/100 g fresh wt.
[e] Ripeness is defined as Brix value/total acidity.
[f] Vitamin C and minerals in mg/100 g fresh wt.

addition of molybdate–vanadate reagent to a solution of ash in hydrochloric acid, and spectrophotometric measurement at 405·1 nm (AOAC, 1990).

RESULTS AND DISCUSSION

The results of the various analyses and comparative data from Ecuador, Italy and New Zealand are summarized in Table 1 (babaco), Table 2 (feijoa), Table 3 (passion-fruit), Table 4 (red tamarillo) and Table 5 (yellow tamarillo). Two factors make comparison difficult. First, to date there have been relatively few studies of the composition of these fruits. Secondly, those studies which have been published vary considerably in the parameters determined. It should also be noted that, in the case of most parameters, previously published results show considerable variability.

Data for babacos (Table 1) are available from Ecuador, New Zealand and Italy. Our values for iron and phosphates are considerably lower than those reported by Cossio & Bassi (1987) for fruit grown in Ecuador and New Zealand. Our values for glucose and fructose are lower than those reported by Ferrara *et al.* (1989) for fruit grown in Italy.

Table 3. Characteristics of passion-fruits grown in Galicia (NW Spain) and passion-fruits as reported in previous studies[a]

	Passion-fruit	
	Galicia X ± SD	Unspecified origin[b]
Weight (g)	36·8 ± 2·31	—
Diameter (cm)	4·5 ± 0·15	—
Length (cm)	4·7 ± 0·02	—
Colour (nm)	570—571	—
Firmness (kg)	6·5 ± 0·82	—
pH	3·3 ± 0·08	—
Brix value	14·1 ± 0·51	—
Total acidity[c]	2·1 ± 0·18	—
RI1[d]	6·6 ± 0·54	—
Moisture (%)	72·2 ± 0·37	80·1
Proteins (%)	3·0 ± 0·10	2·80
Fat (%)	0·12 ± 0·05	0·40
Total sugars (%)		13·4
Glucose (%)	2·1 ± 0·17	—
Fructose (%)	2·1 ± 0·15	—
Sucrose (%)	2·9 ± 0·23	—
Fibre (%)	12·8 ± 0·96	1·50
Citric acid (%)	3·0 ± 0·42	—
Malic acid (%)	0·3 ± 0·08	—
Quinic acid (%)	—	—
Ash (%)	0·5 ± 0·03	—
Vitamin C[e]	23·3 ± 2·37	20·0
Sodium[e]	8·0 ± 0·92	28·0
Potassium[e]	208 ± 15·0	350
Calcium[e]	6·8 ± 0·74	—
Magnesium[e]	27·9 ± 0·40	—
Iron[e]	0·6	1·1
Copper[e]	0·2 ± 0·05	—
Zinc[e]	0·5 ± 0·04	—
Manganese[e]	0·2	—
Phosphates[e]	63·8 ± 1·35	54·0

[a] Results are expressed as mean ± standard deviation of six samples mean, except in the case of colour (expressed as range).
[b] Elmadfa *et al.* (1989).
[c] Total acidity is expressed in g malic acid/100 g fresh wt.
[d] Ripeness is defined as Brix value/total acidity.
[e] Vitamin C and minerals in mg/100 g fresh wt.

Data for feijoas (Table 2) are available from New Zealand. In general, our values for carbohydrates and vitamin C are lower than those reported by Visser & Burrows (1983), but out values for calcium, copper, zinc and manganese are higher, Our values for glucose, fructose, calcium, iron and phosphates are higher than those reported by Azam *et al.* (1981) also, for fruit grown in New Zealand, but our values for potassium and vitamin C are lower.

In the case of passion-fruits (Table 3), our values for moisture content, sodium, potassium and iron are lower than those reported by Elmadfa *et al.* (1989), while our values for fibre and phosphates are higher.

Data for tamarillos (Tables 4 and 5) are available from Italy and New Zealand. In the case of both red and yellow tamarillos our values for glucose, fructose and vitamin C are lower than the values reported by

Table 4. Characteristic of red tamarillos grown in Galicia (NW Spain) and red tamarillos as reported in previous studies[a]

	Red Tamarillo		
	Galicia X ± SD	New Zealand[b]	New Zealand[c] X ± SD
Weight (g)	62·6 ± 5·38	—	—
Diameter (cm)	4·6 ± 0·15	—	—
Length (cm)	5·5 ± 0·24	—	—
Colour (nm)	579—580	—	—
Firmness (kg)	3·1 ± 0·93	—	—
pH	3·6 ± 0·01	3·70–3·80	—
Brix value	11·1 ± 0·27	12·6	—
Total acidity[d]	1·8 ± 0·11	2·10–2·40	—
RII[e]	6·0 ± 0·43	—	—
Moisture (%)	86·9 ± 0·12	81·0–82·0	87·0 ± 1·0
Proteins (%)	2·2 ± 0·02	2·0	2·0 ± 0·1
Fat (%)	0·08 ± 0·01	—	0·60
Total sugars (%)		6·60–6·80	5·30
Glucose+Fructose (%)	2·2	4·40–4·50	3·20
Glucose (%)	1·0 ± 0·23	—	—
Fructose (%)	1·2 ± 0·14	—	—
Sucrose (%)	2·5 ± 0·27	2·20–2·30	2·10
Fibre (%)	3·0 ± 0·15	—	3·90
Citric acid (%)	1·70 ± 0·03	—	—
Malic acid (%)	0·05 ± 0·01	—	—
Quinic acid (%)	0·4 ± 0·03	—	—
Ash (%)	0·7 ± 0·03	—	0·83
Vitamin C[f]	21·9 ± 0·13	35·0–45·0	31·0 ± 7·0
Sodium[f]	8·9 ± 2·90	—	1·60 ± 1·1
Potassium[f]	347 ± 14·7	—	320 ± 40·0
Calcium[f]	9·2 ± 1·09	—	11·0 ± 2·0
Magnesium[f]	19·7 ± 1·80	—	21·0 ± 3·0
Iron[f]	0·4 ± 0·05	—	0·6 ± 0·1
Copper[f]	0·2 ± 0·05	—	0·05
Zinc[f]	0·2 ± 0·03	—	0·10
Manganese[f]	0·1	—	0·11
Phosphates[f]	33·9 ± 3·32	—	39·0 ± 9·0

[a] Results are expressed as mean ± standard deviation of six samples mean, except in the case of colour (expressed as range).
[b] Cacciopo (1984).
[c] Visser & Burrows (1983).
[d] Total acidity is expressed in g malic acid/100 g fresh wt.
[e] Ripeness is defined as Brix value/total acidity.
[f] Vitamin C and minerals in mg/100 g fresh wt.

Table 5. Characteristics of yellow tamarillos grown inv Galicia (NW Spain) and yellow tamarillos as reported in previous studies[a]

	Yellow tamarillo		
	Galicia X ± SD	New Zealand[b]	New Zealand[c] X ± SD
Weight (g)	42·7 ± 2·75	—	—
Diameter (cm)	3·9 ± 0·06	—	—
Length (cm)	5·6 ± 0·12	—	—
Colour (nm)	575	—	—
Firmness (kg)	2·0 ± 0·20	—	—
pH	3·2 ± 0·35	3·70–3·80	—
Brix value	10·0 ± 0·52	13·2	—
Total acidity[d]	1·8 ± 0·27	1·90–2·10	—
RII[e]	5·2 ± 0·66	—	—
Moisture (%)	87·8 ± 0·88	82·0–84·0	86·0 ± 1·0
Proteins (%)	2·5 ± 0·19	2·2	2·0 ± 0·2
Fat (%)	0·05 ± 0·005	—	0·50
Glucose+Fructose (%)	1·2	3·90	3·20
Glucose (%)	0·5 ± 0·1	—	—
Fructose (%)	0·7 ± 0·14	—	—
Sucrose (%)	1·6 ± 0·26	2·30	0·30
Fibre (%)	4·3 ± 0·49	—	6·00
Citric acid (%)	1·8 ± 0·11	—	—
Malic acid (%)	0·07 ± 0·010	—	—
Quinic acid (%)	0·8 ± 0·06	—	—
Ash (%)	0·7 ± 0·02	—	0·77 ± 0·05
Vitamin C[f]	19·7 ± 0·25	30·0–35·0	31·0 ± 3·0
Sodium[f]	4·96 ± 0·66	—	1·3 ± 0·7
Potassium[f]	4·4 ± 47·1	—	290 ± 60·0
Calcium[f]	10·6 ± 0·05	—	10·0 ± 4·0
Magnesium[f]	22·3 ± 2·09	—	20·0 ± 2·0
Iron[f]	0·6 ± 0·03	—	0·45 ± 0·1
Copper[f]	0·2 ± 0·06	—	0·07
Zinc[f]	0·2	—	0·18
Manganese[f]	0·1	—	0·20
Phosphates[f]	36·2 ± 2·50	—	40·0 ± 1·0

[a] Results are expressed as mean ± standard deviation of six samples mean, except in the case of colour (expressed as range).
[b] Cacciopo (1984).
[c] Visser & Burrows (1983).
[d] Total acidity is expressed in g malic acid/100 g fresh wt.
[e] Ripeness is defined as Brix value/total acidity.
[f] Vitamin C and minerals in mg/100 g fresh wt.

Cacioppo (1984) and Visser and Burrows (1983) for fruit grown in New Zealand. Our values for sucrose in yellow tamarillo are lower than those reported by Cacioppo, but higher than those reported by Visser and Burrows. Again, for both red and yellow tamarillos, our values for fibre were lower than those reported by Visser and Burrows, but our values for sodium and copper were higher. Our value for potassium in yellow tamarillo was also higher than that reported by Visser and Borrows and for moisture content in both red and yellow tamarillos were higher than those reported by Cacciopo.

In agreement with all previously published data, we found low fat content in all four fruits.

REFERENCES

AOAC (1990). *Official Methods of Analysis*, Association of Official Analytical Chemists, Arlington, Virginia, USA.

Azam, B., Lafitte, F., Obry, F. & Paulet, J. L. (1981). La feijoa en Nouvelle-Zélande. *Fruits*, **36**(6), 361–81.

Bartley, J. P. (1988). Volatile flavor components in the headspace of the babaco fruit (*Carica pentagonia*). *J. Food Sci.*, **53**(1), 138–40.

Bellini, E. & Giovannoni, G. (1987). La coltura delle passiflore, specie fruttifere tropicali e subtropicali. *L'Informatore Agrario*, **42**, 61–8.

Cacioppo, O. (1984). *La Feijoa* (*Feijoa sellowiana*). Reda, Italia.

Calabrese, F. (1988). Babaco: quale destino?. *Frutticoltura*, **10**, 63–5.

Cossio, F. & Bassi, G. (1987). Alcune osservationi sul babaco in Italia e all estero. *Frutticoltura*, **3**, 45–53.

Elmadfa, I., Aign, W., Muskat, E., Fritzsche, D. & Cremer, H. D. (1989). *La Gran Guíra de la Composición de Los Alimentos*. Oassis, Barcelona.

Ferrara, E., Giorgio, V. & Gherardi, S. (1989). Aspetti qualitative dei frutti di babaco (*Carica pentagona Heil.*) prodotti in Puglia. *Frutticoltura*, **7**, 67–9.

Genders, R. (1988). *Plantas Silvestres Comestibles*, 1st edn. Blume Barcelona.

Heywood, V. H. (1985). *Las Plantas con Flores*. Revertér, Barcelona.

Mansilla, J. P., Vazquez, R. A., Salinero, M. C. & Abelleira, A. (1989). *Frutos exórticos. Galicia* DOA, **1**, 46–50.

Pileri, A. M. (1989). Il tamarillo. *Rivista di frutticolture*, **11**, 67–70.

Pugliano, G. (1980). La feigoa. *Estratto da Frutticoltura*, **XLII**(9), 51–4.

Romero-Rodriguez, M. A., Gonzalez Rodriguez, V., Lage Yusty, M. A., Lopez-Hernandez, M. J., Paseiro Losada, P. & Simal-Lozano, J. (1990). Identificación y cuantificación por HPLC de los árcidos mayoritarios en frutas. *Anal Bromatol.*, **XLII**, 299–306.

Romero-Rodriguez, M. A., Vazquez-Oderiz, M. L., Lopez-Hernandez, J. & Simal-Lozano, J. (1992). Determination of vitamin C and organic acids in various fruits by HPLC. J. *Chromatog. Sci.*, **30**, 433–7.

Rotundo, A. (1989). Il tamarillo nella frutticoltura meridionale: quali prospettive? *L'Informatore Agrario*, **XLV**(21), 41–3.

Rotundo, A., Raffone, C. & Rotundo, S. (1981). Una prova di coltura del tamarillo in Campania. *Frutticoltura*, **XLII**(6), 41–6.

Rotundo, A., Rotundo, S. & Gherardi, S. (1983). Il tamarillo. *Frutticoltura*, **XLV**(8), 37–40.

Sale, P. R. (1988). *Passionfruit Culture*. Ministry of Agriculture and Fisheries, Wellington, New Zealand.

Salinero Corral, M. C., Mansilla, J. P., Vazquez, J. P. & Abelleira Argibay,. A. (1985). La feijoa. Servicio Agrario de la Excma, Diputación Provincial de Pontevedra, Spain.

Salinero, M. C. & Lema, M. J. (1990). La frambuesa. *Albariza*, 2.

Simal-Lozano, J., Lopez-Hernandez, J. & Vazquez-Oderiz, M. L. (1986). Contribución al estudio sobre el pimiento de Padrón. III. Determinatión del color. *Técnicas de Laboratorio*, **132**, 453–6.

Van Soest, P. J. & Wine, R. H. (1967). Use of detergents in then analysis of fibrous feeds: IV. Determination of plant cell-wall constituents. *J. Assoc. Off. Anal. Chem.*, **50**(1), 50–5.

Visser, F. R. & Burrows, J. K. (1983). Composition of New Zealand foods. I. Characteristic fruits and vegetables. *Bull. N.Z. Dept. Sci. Ind. Res.*, **235**, 36.

William, D. (1985). *Home Fruit Growing in New Zealand*. Government Printing Office, Wellington, New Zealand.