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CHANGES IN THE LOW MOLECULAR WEIGHT CARBOHYDRATE CONTENT OF *LAUROCERASUS OFFICINALIS* ROEM. CV. GLOBIGEMMIS DURING FRUIT DEVELOPMENT

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Summary. The low molecular weight carbohydrates of *Laurocerasus officinalis* cv. Globigemmis were identified and quantified by gas chromatography (GC) as oxime-TMS derivatives during fruit developing. The sugars quantified were fructose, glucose, sucrose and sorbitol. Quantities of all sugars varied significantly during fruit development. Quantities of fructose, glucose and sorbitol increased by developing. Sucrose was present in minor quantities after 5 weeks of development. The level of fructose, glucose and sorbitol decreased rapidly after day 23 and then remained low until day 58 except sorbitol (day 51). The sugars increased rapidly after day 65 and remained high until harvesting time day 86. The results indicate that the fruits in the ninth (day 79) and tenth weeks of fruit development are suitable both for consumption and commercial use.

Key words: *Laurocerasus offcinalis*, fruit development, fructose, glucose, sucrose, sorbitol

Abbreviations: TMCS – trimethylchlorosilane; HMDS – hexamethyldisilizane; GC – gas chromatography

Introduction

Laurocerasus officinalis Roem. (cherry laurel) is represented only by one species of the family Rosaceae in the Flora of Turkey. *L. officinalis* is a wild evergreen plant

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up to 10–12 m in height with bright blackish fruit (Davis, 1972). The fruits of the wild form are not eaten both fresh and dry due to their astringent taste (Flint, 1993), but it is cultivated in mountain areas, especially in gardens, for its sweety fruits. Therefore, many of these cultivars have been described in different countries (Shishkin, 1941; Dirr, 1990; Pamay, 1992). In recent studies with the wild and cultivated forms of *L. officinalis*, new cultivars have been reported in Turkey (Var, l992). Among these cultivars, *L. officinalis* cv. Globigemmis is abundantly grown for its large and sweeter fruits and eaten both fresh and in dry form. The cultivar differs greatly in quality from the other cultivars described. Preliminary report is only available on seed fatty acids (Ayaz et al., 1996). Despite the well known commercial importance of sugar levels in the fruits, our knowledge of sugar composition in these fruits is limited. Such information is essential in order to develop a rational post-harvest situation for Globigemmis fruit.

Our knowledge of the sugars that accumulate during fruit development is uncertain. The aim of the present work was to study the low molecular weight carbohydrate content that occurs during fruit development until harvesting time. We chose to work with cv. Globigemmis since this is one of the principal cultivars grown in the East Black Sea Region of Turkey.

This paper reports the changes in the contents of low molecular weight carbohydrates during the development of *L. officinalis* cv. Globigemmis.

Materials and Methods

Fruit material

Cherry laurel fruits (cv. Globigemmis) were harvested in late June from the vicinity of Trabzon (approx. 500 m above sea level, latitute 10 °E), Turkey. The fruits were collected in the period after 20 day of flowering on continuing basis at one-week intervals from late April to June. The fruits were transported to the laboratory and stored at -20 °C. The seeds were removed from the mezocarps and dried at 60 °C under *vacuo* for 24 h. After drying, 250 g of the fruit sample were ground in Waring Blender. For the extraction, 10 g ground fruit sample was used in triplicate. The samples were maintained at 80 °C until they were used.

Extraction of low molecular weight carbohydrates

Sugars were extracted after the method described by Chapmann et al. (1989). Ten grams of mezocarps were extracted with 50 ml 70% ethanol in a screw-capped container by shaking 10 min with a wrist-action shaker. The extract was filtered through Whatman No 4 filter paper and again made to volume with extracting solvent. 0.5 ml of aliquots of these extracts were used for sugar analyses.

Preparation of oxime-trimethylsilyl derivatives of sugar extracts

Trimethylsilylated oximes of sugars of ethanol extracts were prepared according to Biermann and McGinnis (1989). A *ca* 50 mg portion of sample was weighed and dissolved in 2.0 ml of pyridine. A 50 µl portion of the pyridine solution was transferred to a vial for pyridine stock solution containing 3% w/w hydroxylamine hydrochloride, and a known of methyl α-D-glucopyranoside as an internal standard (*ca* 250 µg/200 µl), was added. The sample was kept at 70 °C for 30 min. After cooling at room temperature 300 µl of HMDS and 200 µl of TMCS were added for silylation. The silylation was allowed to complete at room temperature for 30 min before analysis. All results are presented as means ± SD.

The GC analyses were performed with a Varian 3300 instrument equipped with a flame ionization detector (FID). The GC-column was an HP-1 capillary column (25 m × 0.32 mm i.d., 0.17 µm film thickness), and the column oven was temperature programmed starting at 100 °C. Hydrogen was used as the carrier gas at a flow rate of 55 cm/s. A Merck-Hitachi D-2000 integrator was used for the peak area measurements. Sugar identifications was based on retention time from analysis of reference sugars. Mass spectrometry was furthermore used in the identification. The GC-MS analyses were performed with an HP 5890-5970 instrument using similar GC-column operated at the same temperatures as in the GC-FID.

Results and Discussion

All measurements began 23 days after flowering, the earliest stage at which fruits could conveniently be obtained. The soluble sugars identified and quantified in the cultivar were fructose, glucose, sucrose and sorbitol. Among these sugars fructose, glucose and sorbitol were the major sugars while sucrose was in much lesser amount in the first weeks from day 23 to 44 of fruit development. The quantities of fructose and glucose decreased rapidly after day 23 and then remained low until day 58 except sorbitol (day 51). These sugars began to increase after day 65 and remained high until harvesting time day 86. Sucrose was not determined until day 44, but the level increased with a jump to 3.7% by day 72 and then remained very low at around 0.001 per cent.

Total sugars were found to be present within the range of 2.11–68.40% dry matter. Quantities were maximum at about the later-ripe stage of development and remained relatively constant thereafter (Tabl. 1).

Glucose and fructose are generally considered the main sugars in cherry laurel fruits (Ayaz and Kadioglu, 1996). Sucrose synthesized in the leaves is thought to be enzymatically hydrolyzed to glucose and fructose when translocated to the flesh of the fruit. This could have explained the low quantities of sucrose measured in ma-

Table 1. Changes in the low molecular weight carbohydrate content in developing fruits of cherry laurel (cv. Globigemmis); nd – not determined

Date of fruit harvesting	Days of fruit development	Fructose (%)	Glucose (%)	Sucrose (%)	Sorbitol (%)	Total sugars
23 April	23	12.77 ± 0.20	18.60 ± 0.33	nd	3.38 ± 0.16	34.75
30 April	30	11.89 ± 0.24	17.74 ± 0.28	nd	3.36 ± 0.35	32.99
7 May	37	12.40 ± 0.43	16.90 ± 0.81	nd	3.36 ± 0.35	32.66
14 May	44	4.10 ± 0.36	4.06 ± 0.42	nd	1.32 ± 0.14	9.48
21 May	51	2.33 ± 0.02	1.48 ± 0.04	0.05 ± 0.01	0.81 ± 0.03	4.67
28 May	58	0.66 ± 0.16	0.19 ± 0.02	0.11 ± 0.02	1.15 ± 0.05	2.11
4 June	65	3.54 ± 0.02	0.72 ± 0.01	0.14 ± 0.02	3.92 ± 0.11	8.32
11 June	72	8.04 ± 0.02	7.57 ± 0.22	0.37 ± 0.01	9.01 ± 0.39	24.99
18 June	79	18.70 ± 0.88	27.37 ± 0.43	0.03 ± 0.04	13.00 ± 0.84	59.10
25 June	86	26.80 ± 0.52	27.90 ± 0.60	0.001 ± 0.02	13.70 ± 0.22	68.40

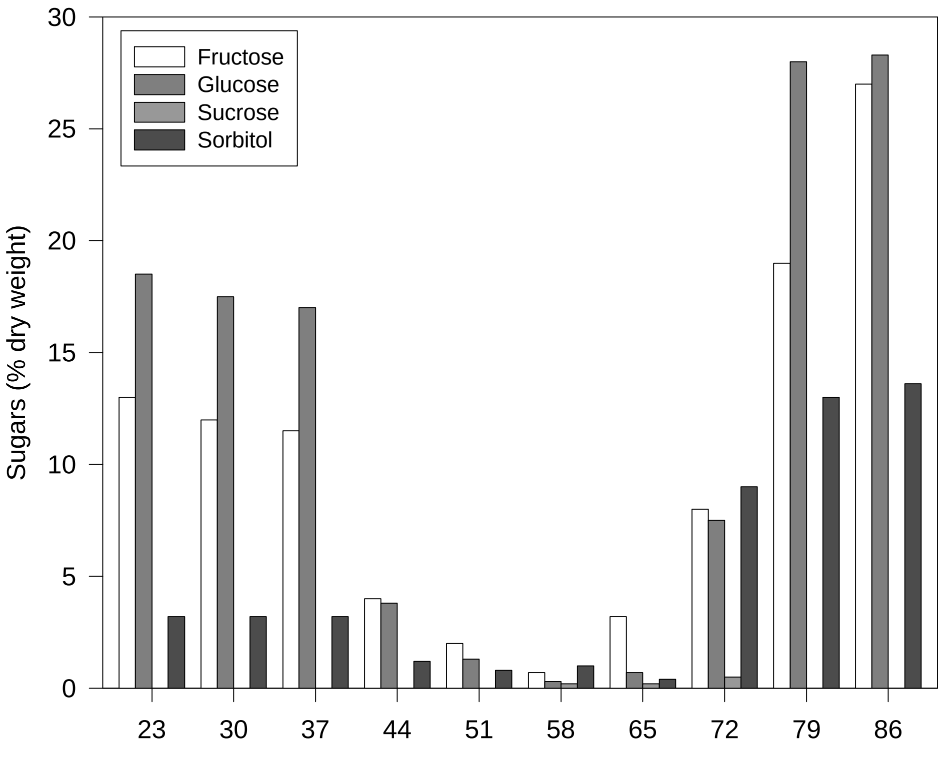

Fig. 1. Changes in the low molecular weight carbohydrate contents during fruit development of *Laurocerasus offcinalis* Roem. cv. Globigemmis after 20 days interval of flowering

ture and dried fruit by the same researchers. Contrary to those reports however, we found sucrose in significant amount in one stage of maturity day 72 in the fruit.

In summary, from the results presented in this paper we emphasise the following points. First, glucose and fructose are the major soluble sugars to accumulate during fruit development. Second, sucrose is not synthesized in the fruits at early weeks of development. Third, sucrose does not contribute significantly to the sugar content of Globigemmis fruits.

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