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Fatty Acid Profiles of Grapes (*Vitis vinifera* L. cv. Mazruma)

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ABSTRACT

The aim of this study was to determine the amounts of fatty acids in the internodes (1 - 2 - 3, 5 - 6 & 9 - 10) of *Vitis vinifera* L. cv. Mazruma during two years depending upon vegetation period. It was observed that there was an overall increase in the amount of fatty acids at bloom stage. At fruit ripeing, there was a decrease in the amounts of total fatty acids, linoleic and palmitic acids, while an increase in those of linolenic and oleic acids. At leaffall, there was an increase in the amounts of linoleic and palmitic acids and a decrease in those of linolenic and oleic acids. In all collected samples, the amount of linoleic acids was found to be the highest and that of stearic acid was the lowest.

Key Words: *Vitis vinifera;* Fatty acids; Internodes; Gas chromatography

INTRODUCTION

Nowadays, there has been a substantial development in the investigation of plant physiology, especially cultured plants are well-recognized for their more efficient use. Atalay *et al*. (1973) carried out studies on the fatty acids in the internodes of *Vitis vinifera* L. var. Ugni Blanc. Cherrad *et al.* (1975) obtained 2 saturated and 3 un-saturated fatty acids at different rates in staff roots, leaves and buds of the same kind vine and noted that linolenic acid in the leaves and the linoleic acid in the staff roots were found in sufficient amounts. Cherrad and Lavaud (1991) working on the fatty acids in 24 different vine seeds determined the differences from vine to vine and attributed these differences to the colors and shapes of grapes. Stafford *et al.* (1974) studied fatty acid ester residues in the dried grape processed by gas chromatographic analysis and determined that oleata was found at higher rates. Bauman *et al.* (1977) reported that crude lipid content in the bunch of Concord grapes was the highest level at blooming and that natural lipids tended to increase, while the polar lipids decreased during the ripening period.

Gallender and Peng (1980) noted that the lipid concentrations of 6 different grapes vary between 0.15 and 0.25%. They further reported that the palmitic acid was prevalent among the polar lipids in the French hybrids and *V. labrusca* L. From the stantpoint of polar lipids, there were significant differences between *V. vinifera* and other kinds of grapes. Kamel *et al.* (1985) reported that various grapes generally contained linoleic acid in abundance. Millan *et al*. (1992), while investigating fatty acids in the grape musts obtained from ripe and unripe grapes of *V. vinifera* (Pedro ximénez) noted an increase in the ratio of un-saturated to total fatty acids. Miele *et al*. (1993) showed that glycolipids were predominant in leaves, phospholipids in the pericarps and skin and neutral lipids in the seeds of *V. vinifera*. For the fatty acids composition, linolenic acid was the most abundant acid in leaves. Specifically glycolipids were greater in leaves, phospholipids in pericarps and skins, while in seeds linoleic acid was predominant representing about 95% of neutral lipids. Cherrad and Lavaud (1993) studied four groups *V. vinifera* comprising varieties, wild accessions, american and asian species. The fatty acid content of the seeds was different between and within the groups; the american species having the highest content, followed by the wild material, asian species and finally the varieties. The objective of this study was to examine the variation of fatty acids in the *V. vinifera* L. (Mazruma), which is widely grown in Diyarbakır region and has a high economic value.

MATERIALS AND METHODS

The samples were collected in Tileynik vineyards of Uzunlar village, in the district of Hani, Diyarbakır, every 15 day for two years in order to determine the variations of the fatty acid amounts depending on the developmental stage. Internode (1 – 2 - 3, 5 - 6 & 9 - 10) samples were collected following the method of Bouard (1966). The extraction of fats was carried out by using method of Bligh and Dyer (1959). Also, the extraction procedure of the fatty acids was carried out according to the method by Metcalfe *et al.* (1966). The saponification process allowed the fatty acids to separate and the methylation was carried out to prevent the fatty acids from combining in dimmers.

The amounts and kinds of the fatty acids of the methyl esters were determined by Packard- 439 gas chromatograph. The areas of peaks obtained in the chromatograms were calculated by Vista 401 electron integrator. The percentages of fatty acid methyl esters in the samples were determined by using peak areas.

RESULTS AND DISCUSSION

Variations in fatty acids during annual period. The

results showed a steady variation in the amount of fatty acids in shoots during their development linoleic acid was found at the highest level, followed by palmitic, oleic and linolenic acids. Stearic acid was found at the lowest level (Fig. 1, 2). These results are consistant with the results of the studies on *V. vinifera* L. var. Ugni Blanc by Cherrad *et al*. (1975) and on different grapes varieties by Kamel *et al*. (1985).

A comparison carried out for the variations in percentage rates as regards fatty acids in the studied samples revealed that the stability in individual fatty acid exists remarkably from year to year (Fig. 3 & 4). Furthermore, permanent variation occurred not only during the active growth period of the plant but also during leaffall (slow growth period). Those occurences observed for internodes 1 - 2 - 3, were similar to those observed for internodes 5 - 6 and 9 - 10 (Fig. 5). These results are consistent with those of Atalay *et al.* (1973) on *V. vinifera* L. var. Ugni Blanc and Gallender and Peng (1980) on lipid levels in six grape varieties.

Relationship between variations of fatty acids and the growth of shoots. Analysing the results regarding variations of fatty acids as a whole allowed us to easily distinguish some stages in the variations of fatty acids present in the samples. At the first stage, it was observed that there was a sharp decrease in the amount of linoleic acid, first until the beginning of June and then a slight increase and again a decrease at the beginning of September (Fig. 1, 2). This stage also corresponds to the end of the active growing period of the main shoots. A similar result was observed for palmitic acid as well as total fatty acids. From fall of leaves

Fig. 1. Variations of fatty acid amounts in internodes 1-2-3, of *Vitis vinifera* L. (Mazruma) during vegetation period 1986-1987 (µg/g)

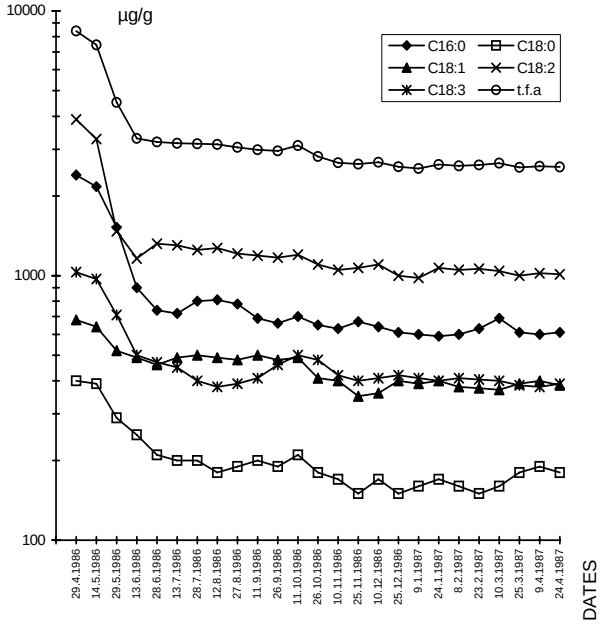


Fig. 2. Variations of fatty acid amounts in internodes 1-2-3, of *Vitis vinifera* L. (Mazruma) during vegetation period 1987-1988 (µg/g)

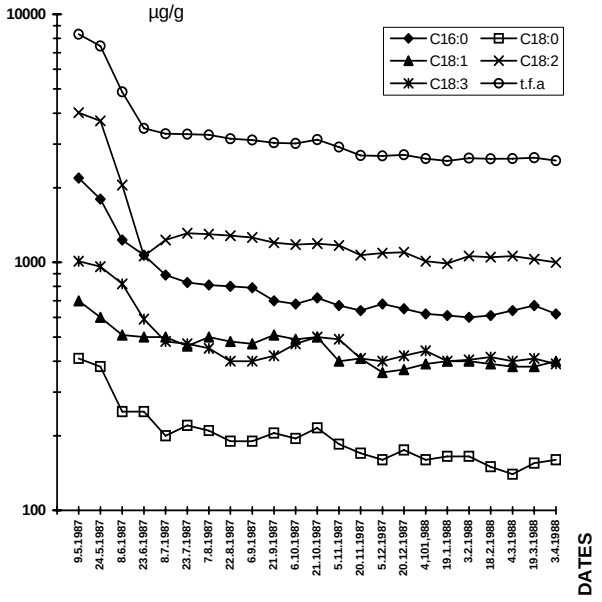
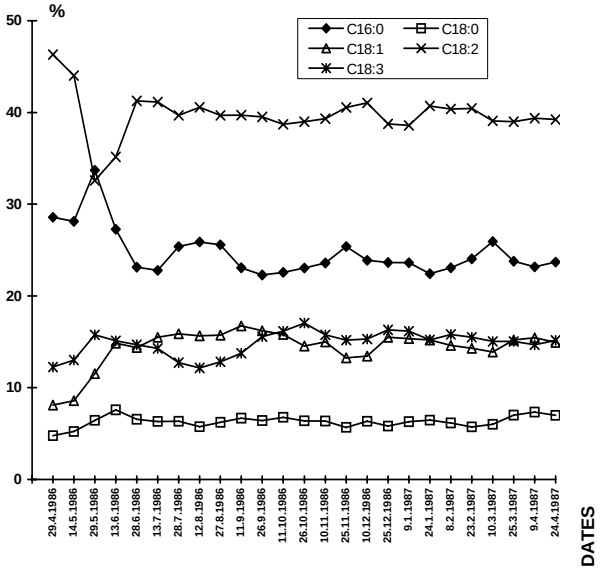


Fig. 3. Comparison of relative proportions of fatty acids in internodes 1-2-3 of *Vitis vinifera* L. (Mazruma) during vegetation period 1986-1987 (%)



until the beginning of the following year, it was found that the enzyme involved in the biosynthesis of fatty acids was actively operative and that the plant entered the slow growth period. When temperature reached an adequate level, it was observed that the saps were dripped out of the pruned parts of the plant and the amount of total fatty acids was steady at the first place, but that this turned into a substantial increase. According to Bauman *et al.* (1977) the amount of lipids was at the highest level in Concord grapes during the blooming

Fig. 4. Comparison of relative proportions of fatty acids in internodes 1-2-3 of *Vitis vinifera* L. (Mazruma) during vegetation period 1987-1988 (%)

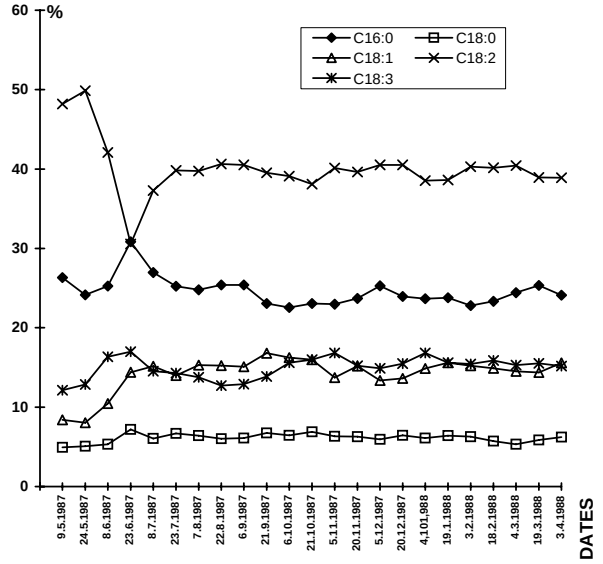
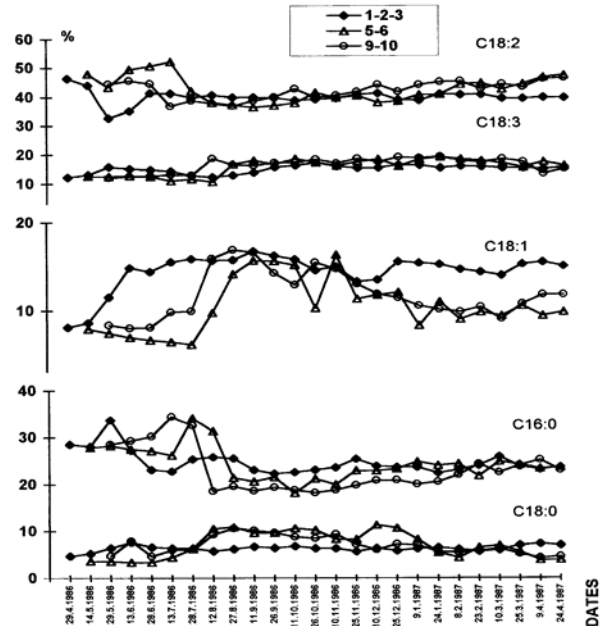


Fig. 5. Comparison of relative proportions of fatty acids in internodes 1-2-3, 5-6 and 9-10 of *Vitis vinifera* L. (Mazruma) during vegetation period 1986-1987 (%)



of the grapes, while this amount decreases with ripening, as noted by Millan *et al*. (1992).

Observations showed that there was an increase in the total amount of fatty acids in internodes 1 - 2 - 3 for an observed period of two years during blooming and a decrease during fruit ripening period; especially in this later period, there was a substantial decrease in the amount of linoleic ($C_{18:2}$) and palmitic ($C_{16:2}$) acids, while an increase in the amount of linolenic ($C_{18:3}$) and oleic ($C_{18:1}$) acids. Still after leaffall, an increase was again observed in the total amount fatty acids, linoleic and palmitic acids, while a decrease in those of linolenic and oleic acids. This observation was not significant for stearic acid. These results show that there is no significant difference between internodes 1 - 2 - 3 and internodes 5 - 6 and 9 - 10. Among the fatty acids, linoleic acid was found in the highest, while stearic acid in the lowest proportion. These results are similar to the results of the studies carried out by Atalay *et al.* (1973), Cherrad *et al*. (1975), Cherrad and Lavoud (1991).

In conclusion, the variation of fatty acids in terms of developing period depends entirely on physiological and genetic properties of plants. In addition, some proportion of fatty acids are respirated during fruit respiration.

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