

# The Effect of IBA, NAA and Carbohydrates on Rooting Capacity of Leaf Cuttings in Three Olive Cultivars (*Olea europea* L.)

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## Introduction

The rooting ability of olive leaf cuttings varies strongly amongst olive cultivars (Wiesman and Lavee, 1995). Between several factors, internal concentrations of auxins and carbohydrate have been reported to play an important role in rooting. The external application of auxins is one of the most important factors in increasing the rooting ability of many species (Avidan and Lavee, 1978; Hartman *et al.*, 2001). Several studies have indicated that auxins have the greatest effect on the initiation of adventitious roots and the division of root initials. Carbohydrates are particularly important as an energy source in the rooting process of cuttings (Fabbri *et al.*, 2004), they are also structural materials in the initiation of root primordia (Yoo *et al.*, 1996). It has been reported that carbohydrates might affect auxin metabolism (Wiesman and Lavee, 1995). However, the relationship between carbohydrate content and adventitious root formation in cuttings has remained controversial (Hartman *et al.*, 2001).

## Materials and Methods

Rooting experiments were performed in two seasons of 2008 (summer and autumn). Twenty thousand cuttings of three olive cultivars ('Arbequina', 'Kalamata' and 'Mastoidis') were used for each experimental season. Cuttings were treated with IBA and NAA at four concentrations each (500, 1000, 2000 and 4000 ppm) and the combination of these two hormones at three concentrations (500, 1000 and 2000 ppm). Two different rooting media (one organic and a mixture of peat:perlite, 1:1) were also used. Starch and sugar analyses of the cuttings were performed at 0, 3 and 7 days after they were put under mist propagation.

## Results

The results showed that all cuttings of the three cultivars rooted better in the organic substrate (Fig.1-2).

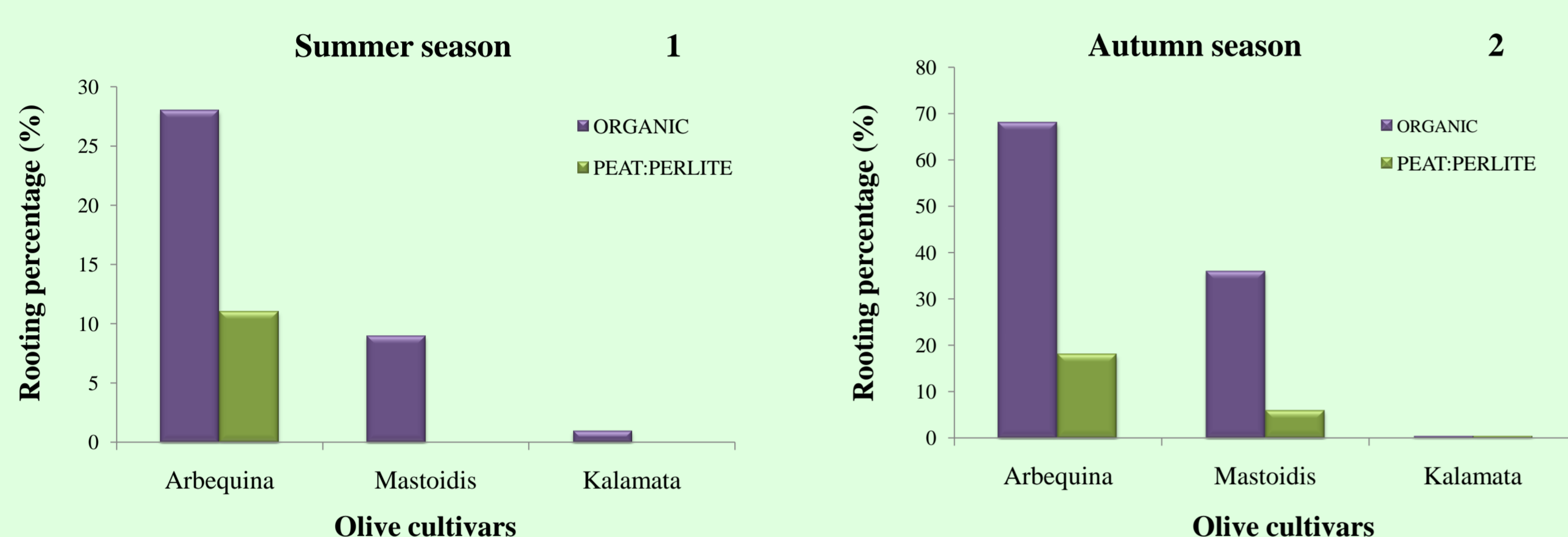


Fig. 1-2. Rooting ability of olive cultivars in two rooting medium and two seasons.

'Arbequina' ave the highest percentage of rooting (up to 96%), followed by 'Mastoidis' (60%) and 'Kalamata' (2-5%). Hormone treatments affected the rooting ability of cultivars differently. IBA (2000 ppm) gave the highest % rooting for 'Arbequina' in summer, while IBA+NAA (1000 ppm) in autumn. NAA (1000 ppm) gave the best results for both seasons in 'Mastoidis' cv (Figs 3, 4), while IBA (500 ppm) gave the highest % rooting (up to 5% in summer) in 'Kalamata' cv (data not shown).

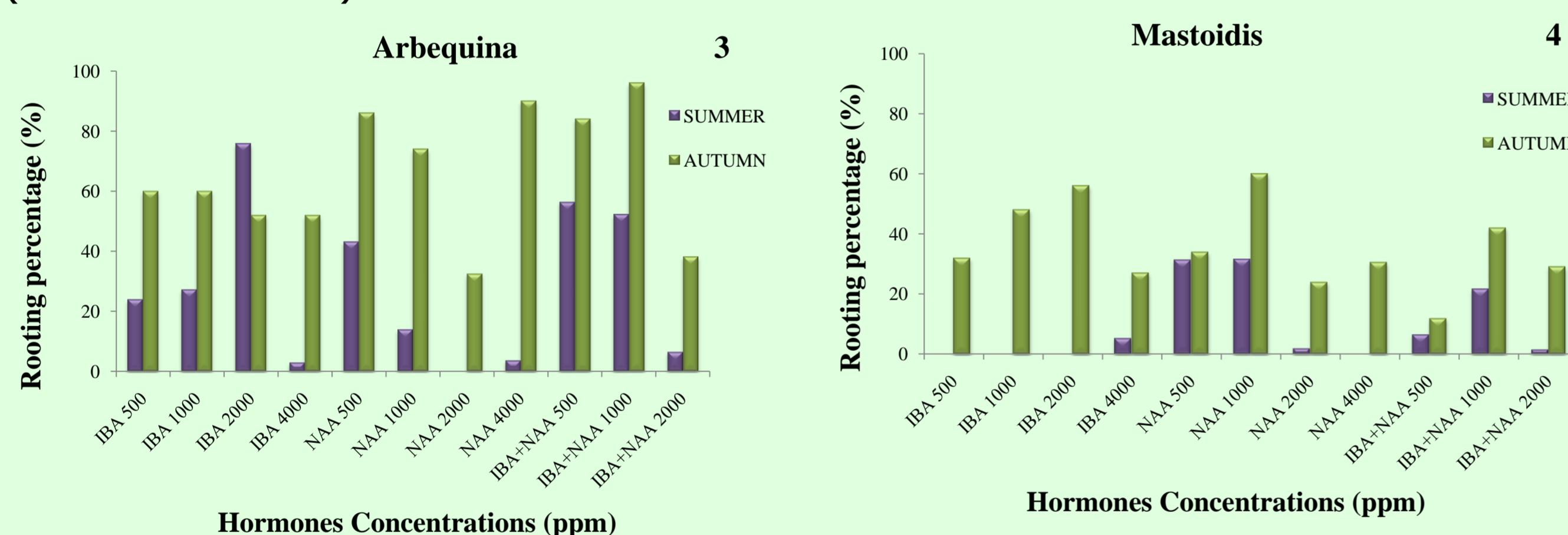


Fig. 3-4. Effect of hormones in the rooting % of two olive cultivars for the organic medium.

Stachyose, mannitol, fructose and glucose concentrations were significantly higher in 'Arbequina' (Figs 5, 8, 9 and 10), while 'Mastoidis' and 'Kalamata' had significantly higher concentrations of raffinose (Fig. 6). Sucrose was initially higher in 'Kalamata' cuttings than in those from other cv's (Fig. 7). The total sugar concentration was higher in 'Arbequina' than in the other cv's and gradually decreased from 0 to 7 days after planting (Fig. 11). Starch concentration was higher in 'Kalamata' than in the other cultivars (Fig. 12).

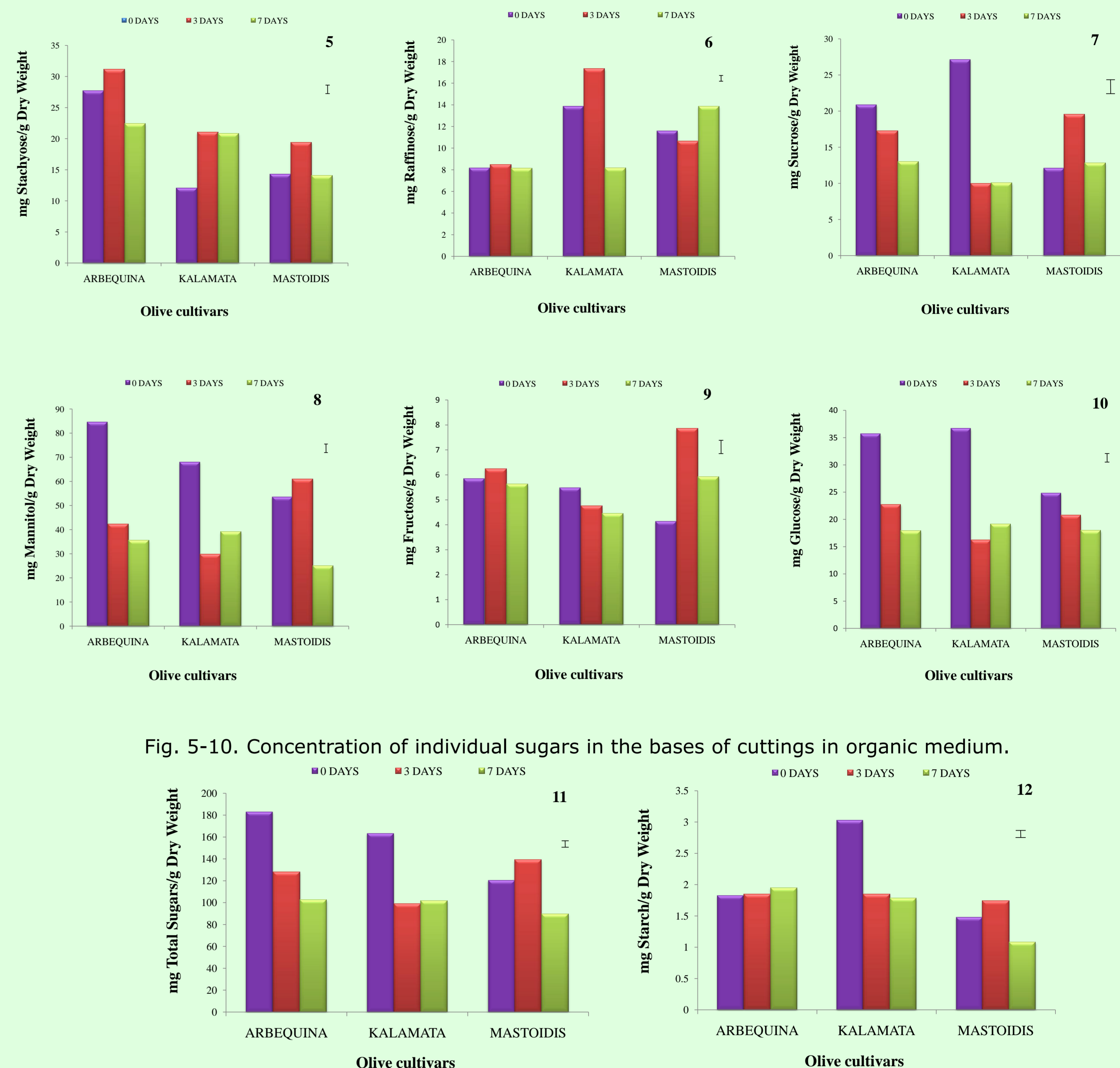


Fig. 11-12. Concentration of total sugars and starch in the base of cuttings in organic medium.

## Discussion

The higher rooting percentage in the organic medium might be attributed to the better ability of organic matter to maintain a higher moisture constant and a longer protection of exogenously applied hormones. The increased rooting ability of 'Arbequina' and 'Mastoidis' cv's in autumn compared to summer is possibly due to the reduced number of rotten cuttings caused by the lower air temperature in the former. The role of carbohydrate sources or other internal factors must also be considered. The effect of hormones on rooting ability varied strongly amongst cultivars. In agreement with previous results, in the hard-to-root 'Kalamata' cv the hormone treatments were ineffective in root initiation (Avidan and Lavee, 1978; Wiesman and Lavee, 1995) although a massive callus was produced (data not shown). The increased soluble sugar concentration, particularly that of mannitol (the most abundant sugar in cuttings), in 'Arbequina' and the following reduction during the initial period of rooting indicates a possible important role in the higher rooting ability of this cv. This also indicates that the internal carbohydrates might interact with hormones and play a stimulatory effect on root initiation, as has been suggested (Wiesman and Lavee, 1995). However, the carbohydrate source seems to be the soluble sugars rather than starch, as has been suggested (Wiesman and Lavee, 1995).

## References

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Fig. 13. Rooted cuttings of 'Arbequina' cv in the organic rooting medium