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Influence of the methods of propagation on persimmon fruit tree producing

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Abstract. The study was carried out in the experimental field of the Agricultural University near Plovdiv – Central South Bulgaria during the period 2007 – 2010. Trees of cultivars Hyakume and Hiratanenashi were produced by chip and T-budding performed in the first year nursery field on 10 September and chip-budding and tongue grafting performed in the second year nursery field on 1 March. One year old seedlings of Date plum (Diospyros lotus L.) were used as rootstocks. During the studied period steady high bud take was assessed as final output of nursery trees to both cultivars was noted with the budding and grafting performed on 1 March (93.3 – 98.3%). Summer chip-budding provides higher bud taking for both cultivars in comparison to the T-budding performed in the same period. The budding performed in summer in the first year nursery field favours the obtaining of higher and more branched trees of both cultivars. Budding performed in spring in the second year nursery field resulted in smaller size and less branched trees. In order to avoid the risk of winter cold injury, the plants budded in the summer and those assigned for chip-budding in spring have to be hilled with soil up to 20 cm above the soil level.

Keywords: Diospyros kaki, budding, grafting, bud take, branching

Introduction

Climatic conditions suitable for figs, almonds, peaches and apricots are suitable for cultivation of persimmon (Ludders, 2003). This cultivar is still not commonly grown in Bulgaria. An increasing interest among growers in this cultivar and tree production in particular has been recently observed. In countries like Italy and Greece, where different persimmon cultivars are traditionally grown, the main rootstock used is Date plum Diospyros lotus L. (Bellini, 2003; Papachatzis, 1990). This plant combines powerful root system with good drought and cold resistance. According to Serafimov et al. (1983, 2005), Tsolov and Stoyanov (1991), Date plum is the most suitable rootstock for persimmon in our conditions.

Regarding the optimum time of grafting, the data in the literature are not always unidirectional, as they relate to countries with different environmental conditions from ours (Zhu, 2003; Cepoiu and Stanica, 2002). Mishra (1982) reported that grafting resulted in better success than budding. Other authors (Vorontsov and Shteyman, 1982; Omarov and Erokhina, 1991) pointed out the chip-budding as a reliable method for persimmon fruit tree production. Bellini (2002, 2003) reported that grafting is a more often used method for persimmon propagation than budding. He also recommended chip-budding for thinner rootstocks.

The aim of the study was to determine a proper method of budding or grafting regarding persimmon fruit tree production.

Material and methods

The study was carried out in the experimental field of the Agricultural University near Plovdiv – Central South Bulgaria during the period 2007 – 2010. The cultivars Hyakume and Hiratanenashi which belong to Pollination Variant Non Astringent (PVNA) group and Pollination Variant Astringent (PVA) group, respectively, were studied (Lichev et al., 2012). Seedlings of Date plum (Diospyros lotus L.) were used as rootstocks. Chip and T-budding were performed in the first year nursery field on 10 September and chip-budding and tongue grafting were performed in the second year nursery field on 1 March. The experiment was set up in a randomized block design, with four replications and seventeen plants per plot. The biggest and the smallest plant of each plot were eliminated from the trial. Drop irrigation was applied in the nursery. In order to establish the native propensity of the cultivars to branching, no branching practices were applied. In order to avoid the risk of winter cold injury, the plants budded in the summer and those assigned for the spring chip-budding were hilled with soil up to 20 cm above the soil level. The rootstocks assigned for spring grafting were stored outside during winter and planted in the nursery immediately after grafting. The bud sticks for the spring terms were collected in mid-December and were kept at 1 – 2°C until they were used. Due to problems with the irrigation water supply in 2008, we did not present data for that year.

The following parameters were determined: scion thickness – measured at 15 cm above the graft union, scion height, mean length of a lateral shoot, cumulative scion growth, and mean number of lateral shoots per tree. All parameters were estimated after leaf fall. The results were statistically processed by the method of variance analysis.

Results and discussion

During the study period high bud take percentage was noted for Hyakume with both methods performed on 1 March (Figure 1). The commonly used in our country summer budding resulted in less bud take percentage. It should be mentioned that in terms of bud taking in the first year nursery field chip-budding resulted in better success than the well-known T-budding, which reached only 55% in 2010. In Hiratanenashi cultivar again higher rate of bud taking was recorded when the budding was performed in spring with both test methods (Figure 2), which coincides with the results reported by Chauhan et al. (2010). Omarov and Erokhina (1991) reported very low levels of
success in summer budding in comparison with budding performed at the beginning of vegetation. In our trial summer budding in the first year nursery field gave satisfactory results, and only in 2010 the success in budding in both tested methods performed in that period was comparable even to that of spring budding and grafting. Different cultivars do not affect the period and dynamics of sprouting of scion buds in the next growing season.

The results concerning the vegetative characteristics of the trees of Hyakume cultivar are presented in Table 1. The highest trees were obtained when chip or T-budding were performed in first year nursery field. Scion thickness was also greater when summer budding was used in comparison with the trees produced by budding or grafting in the beginning of vegetation. During the studied period low tree branching was noticed regardless of the propagation method. The best branching was recorded in trees produced by chip-budding in the first year nursery field, and the poorest branched trees were those obtained by budding or grafting in the second year nursery field.

Concerning tree height, similar results were noted for Hiratanenashi cultivar (Table 2). The highest trees were obtained when chip or T-budding were performed in the first year nursery field. Exceptions are the results recorded in the production cycle for 2006–2007, for T-budding in the first year nursery field, when trees were the smallest. Regarding the scion thickness, again significant differences were recorded in summer budding compared to the other variants. The best branching was recorded in trees produced by budding in the first year nursery field, and the poorest branched trees were those obtained by budding or grafting in the second year nursery field. It should be noted that in 2010 the trees of both cultivars obtained by chip-budding at the beginning of the vegetation did not form any lateral shoots, probably due to their weak vegetative growth as a whole during that year.

Summer budding in the first year nursery field resulted in bigger trees compared to those produced by budding or grafting in the beginning of vegetation. This is due to the fact that in the beginning of vegetation trees that budded in the previous summer have already formed the graft union, while budding performed in spring according Ketsarapong et al. (2007) takes around 35 days to complete establishment of the graft union between scion and rootstock. For other fruit tree species it is also reported that the later period of budding reduces the duration of scion growth (Lichev, 1997; Ayanoglu et al., 1997; Dimri et al., 2005).

Commonly used in Bulgaria T-budding performed in the first year nursery field can be successfully replaced for persimmon with

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**Figure 1.** Percentage of bud take of Hyakume cultivar

**Figure 2.** Percentage of bud take of Hiratanenashi cultivar
chip-budding or tongue grafting performed at the beginning of vegetation, because these methods performed in the second year nursery field provide a higher percentage of bud taking. There is a risk of cold injuries for rootstocks budded in the first year nursery field or those assigned to spring budding if extremely low winter temperatures occur. In order to avoid the risk of winter cold injury, the plants budded in the summer and those assigned for spring chip-budding were hilled with soil up to 20 cm above the soil level.

Conclusions

Higher percentages of bud taking for both cultivars can be obtained if chip-budding and tongue grafting methods are performed in the second year nursery field in comparison with chip and T-budding performed in the first year nursery field. The summer chip-budding method provides higher percentages of bud taking for both cultivars in comparison with the traditional for our country T-budding performed in the same period. Summer budding favours the obtaining of bigger trees of both cultivars in comparison with the trees produced by budding or grafting performed in the beginning of vegetation.

There is a risk of cold injuries for rootstocks budded in the first year nursery field or those assigned to spring budding if extremely low winter temperatures occur. In order to avoid the risk of winter cold injury, the plants budded in the summer and those assigned for chip-budding in spring have to be hilled with soil up to 20 cm above the soil level.

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