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Effect of budding method and graft union height on sweet cherry budding / mahaleb rootstock compatibility

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Abstract

A study was done during the summer 2013 at Nursery in Isfahan, Iran. The native cultivar of sweet cherries (White and Black) was used as Scion and Mahaleb seedling were used as rootstock. The treatments consisted of three budding methods (T-budding, T with wood budding and Chip budding) at three different height (10-12, 20-25 and 30-35 cm) above ground. The experiment was laid out in a split plot- randomized complete block design with three replications. Bud take rate, bud sprouting rate, bud shoot diameter and bud shoot length were determined as experimental parameters after budding. All budding methods were found to be suitable for sweet cherry propagation. However, the highest mean percent of bud take and sprouting rate were obtained from Black sweet cherry scion with T-budding with wood performed at 10-12cm above ground. The highest mean shoot diameter were obtained in both scions with chip budding at 20-25 cm above ground and the highest shoot length were obtained from Black sweet cherry scion with T-budding with wood performed at 10-12 cm above ground. Beside of these findings, we suggest to all gardener and graftman in order to produce and propagate the sweet cherry with use of Mahaleb rootstock, use the Black sweet cherry (cultivar Ghaheri) as scion with T with wood budding at 10-20 or 20-25 cm height.

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Introduction

The basic rootstocks used under Cherries in Iran are the seedling of mahaleb cherry (*Prunus mahaleb L.*) and sweet cherry (*Prunus avium L.*). The seeds for their production are obtained from valid places.

Cherry belongs to the genus *Prunus* of Rosaceae, or rose family. The genus *Prunus* includes stone fruits such as almond, apricot, plum, peach and nectarine. There are many cherry species, but only a few have been domesticated (Richard *et al*, 2009). The parent trees, from which the seeds for seedling production are obtained differ in the growth strength, resistance to frost, the period of the fruit ripening and other properties. An alternative for the production of trees on seedlings are the rootstocks obtained due to vegetative multiplication, which gives genetically equal material after budding or grafting (Baryla and Kaplan, 2005). Vegetative rootstock, compared with generative ones, ensures on orchards uniformity in terms of vigour and fruit bearing and a better adaptation to different the soil types (Mlan *et al*, 2010). Time of season will largely determine what type of propagation techniques you will need to use to create new plants. All forms of top working and repair grafting are done only when the plants are dormant in late winter to early spring. Budding can be done in the dormant season with a dormant chip bud but is most often done during the growing season using either T-budding or chip budding (Crasweller, 2005). Graft incompatibility is a complex, anatomical, physiological and biochemical process that is not fully understood. Compatible graft is typically comprised of three major events: cohesion of the rootstock and scion: proliferation of callus cells at the graft interface and vascular dedifferentiation across the graft interface (Guclu and Koyuncu, 2012). There are several external symptoms to detect graft incompatibility including graft union uniformity, lack of lignification, yellowing of foliage, decline in vegetative growth and vigor and anatomical abnormalities (Gulen *et al*e, 2012; Hartmann *et al*, 1997). Graft incompatibility in fruit trees is one of the greatest obstacles in rootstock breeding (Davarynejad *et al*, 2008). This research was done with aim of determine the most suitable Scion source, the best grafing height and the most suitable budding methods on Mahaleb rootstock.

Materials and methods

Plant material

The study conducted during the growing season of 2013 at Nursery in Isfahan – Iran. The native cultivar of sweet cherries (White and Black) was used as scion and Mahaleb seedling were used as rootstock.

Methods

The treatments consisted of three budding methods (T-budding, T with wood budding and Chip budding) at three different height (10-12, 20-25 and 30-35 cm) above ground. The experiment was laid out in a split plot randomized complete block design with three replication. The percentages of bud take successes were recorded after two months of the budding operations, whereas the different growth parameters (bud sprouting rate, bud shoot diameter and bud shoot length) were recorded from early April till end of the season.

Bud shoot diameter

This growth parameter was recorded by vernier caliper from early April till end of the season.

Bud shoot length

Bua shoot length was recorded by ruler from early April till end of the season.

Statistical analysis

Data were evaluated by analysis of variance with SAS and the means were compared using Duncan' Multiple Range Test.

Results and discussion

Budding take and Sprouting

Table .1 shows the earliest budding take was belonged to treatment at low height (10-12) cm above ground in both sweet cherry scions with three budding methods. However, the highest mean percent of bud take were obtained from Black sweet cherry scion with T-budding with wood performed at

10-12 cm above ground and this treatment was sprouted faster than other treatments on spring. Because increasing the calluse tissue was earlier in T-budding with wood, so the empty space between rootstock and scion filled faster and vessel connection was confirmed earlier. Also percent of budding take depends on good temperature and relative humidity and rate of sap movement in rootstock and scion at time budding; if all situations are suitable, due to earlier healing of budding union and callus formation, percent of budding take increase. On the other hand, Anatomic study showed that in T budding cambium connection was often poor and caused bud rosette and delayed scion growth.

Table 1. Effect of scion, budding method and budding height on treatments.

Treatments	Budding take(%)	Sprouting(%)	Shoot diameter(mm)	Shoot length(mm)
White-T-budding-30-35cm	17^{a}	241^{c}	$1/4^{bc}$	135^{a}
White-T-budding with wood-30-35cm	17^{a}	241^{c}	$1/2^{efg}$	125^{c}
White-chip budding-30-35cm	17^{a}	241^{c}	$1/4^{bc}$	126^{c}
White-T-budding-20-25cm	17^{a}	241^{c}	$1/3^{de}$	125^{c}
White-T-budding with wood-20-25cm	$16/5^{bc}$	241^{c}	$1/2^{fgh}$	121^{cd}
White-chip budding-20-25cm	$16/67^{ab}$	241^{c}	$1/1^{hij}$	121^{cd}
White-T-budding-10-12cm	16^{c}	240^{d}	$1/1^{j}$	121^{cd}
White-T-budding with wood-10-12cm	16^{c}	240^{d}	$1/2^{efg}$	121^{cd}
White-cheap budding-10-12cm	16^{c}	240^{d}	$1/16^{hi}$	110^{e}
Black-T-budding-30-35cm	17^{a}	243^{a}	$1/4^{ab}$	124^{cd}
Black-T-budding with wood-30-35	17^{a}	243^{a}	$1/2^{efg}$	124^{c}
Black-chip buddig-30-35cm	17^{a}	243^{a}	$1/3^{e}$	118^{d}
Black-T-budding-20-25cm	$16/67^{ab}$	242^{b}	1^{j}	105^{e}
Black-T-budding with wood-20-25	$16/33^{bc}$	243^{a}	$1/1^{ij}$	124^{cd}
Black-chip buddig-20-25cm	17^{a}	242^{b}	$1/5^{a}$	127^{c}
Black-T-budding-10-12cm	16^{c}	242^{b}	$1/2^{ef}$	144^{a}
Black-T-budding with wood-10-12	$17/22^{a}$	$243/61^{a}$	$1/3^{cd}$	147^{a}
Black-chip buddig-10-12cm	16^{c}	242^{b}	$1/13^{hij}$	110^{e}

Shoot length

Table.1 shows the highest shoot length was obtained from Black sweet cherry scion with T-budding with wood performed at 10-12 cm above ground. Because budding take and sprouting was done earlier in T-budding with wood than other treatments, as increasing the callus tissue was earlier in this treatment. Match the cambium layers is so important in budding, since the first connection between rootstock and scion was done through the their cambium connection. So earlier healing and formation cambium layer in T with wood budding is due to exist a wood layer with scion in this method.

Diameter shoot

Table.1 shows the highest mean shoot diameter was obtained in both scions with chip budding at 20-25 cm above ground. Because the most powerful budding take and faster absorption of water and nutrition in chip budding was done better and earlier than T-budding.

Conclusion

Highest mean percent of bud take and sprouting rate were obtained from Black sweet cherry scion with T-budding with wood performed at 10-12cm above ground. The highest mean shoot diameter were obtained in both scions with chip budding at 20-25 cm above ground and the highest shoot length were obtained from Black sweet cherry scion with T-budding with wood performed at 10-12 cm above ground.

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