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Rootstocks in Cherry Growing

Kiraz Yetiştiriciliğinde Anaçlar

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Abstract – Cherry trees do not reproduce from seed. Desirable cultivars are grafted onto rootstocks which is generally clonally propagated. Many cherry rootstocks have been released around the world and a wide range of cherry rootstocks is available for growers. The current trend towards obtaining optimum fruit yield and quality in cherry growing needs to choose of the best rootstock. Cherry rootstock evaluation mainly focused on plant adaptability, canopy volume, yield efficiency and fruit quality. Dwarfing rootstocks are able to present possible sweet cherry orchards with a reduced tree size, higher planting density, yield precocity, better fruit quality and efficient other orchard management work (pruning, harvesting, irrigation). Furthermore, the use of superior rootstocks may increase cherry plant tolerance to environmental stress factors. Some rootstocks help cherry plants to acquire tolerance against plant stress factors such as drought, low temperature and salinity. This review presents different rootstocks in sweet and sour cherry growing.

Keywords – Cherry, Dwarf, Fruit Growing, Plant Stress, Rootstock

Özet-Kiraz ağaçları tohumdan çoğaltılmazlar. Arzu edilen çeşitler genel olarak klonal çoğaltılmış anaçlara aşılanır. Dünya çapında birçok kiraz anacı ortaya konulmuş olup kiraz yetiştiricileri için geniş bir anaç çeşitliliği bulunmaktadır. Kiraz yetiştiriciliğinde optimum düzeyde meyve verim ve kalitesini elde etmek için günümüzdeki yaklaşım en iyi anacın seçilimi yönünde olmalıdır. Kiraz anaçlarının değerlendirilmesi genellikle bitkinin uyumuna, taç büyüklüğüne, verim etkinliği ve meyve kalitesine odaklanmaktadır. Bodur anaçlar küçük ağaç habitüsü, daha sık bitki dikimi, verimde erkencilik sağlanan kiraz bahçeleri sunabilmekte ve daha iyi meyve kalitesi ve meyve bahçesi bakım işlemlerinde (budama, hasat, sulama) etkinlik sağlayabilmektedir. Bununla birlikte, üstün özelliklere sahip anaçların kullanımı çevresel stres faktörlerine karşı kiraz bitkilerinin dayanıklılığını artırabilir. Bazı anaçlar kiraz bitkilerinin kuraklık, düşük sıcaklık ve tuzluluk gibi birçok bitki streslerine karşı dayanıklık kazanmasına yardım edebilmektedir. Bu derleme kiraz ve vişne yetiştiriciliğinde kullanılan farklı anaçları sunmaktadır.

Anahtar Kelimeler – Kiraz, Bodur, Meyve Yetiştiriciliği, Bitki Stresi, Anaç

I. Introduction

Sweet cherry (*Prunus avium* L.) and sour cherry (*Prunus cerasus* L.) are one of the most economically important fruits worldwide that grows in temperate climate zones. Turkey is large world producer and exporter of cherries with production of 627.132 tons from 85.400 ha of harvest area in 2017 [1]. The usefulness of cherry fruits helps to determine its total production. Cherry fruits are consumed fresh, and can be used to jam, jelly, stewed fruit, marmalade, syrup.

Fruit trees can be propagated by generative, vegetative and tissue culture method [2, 3, 4]. Propagation by seeds does not allow homogenous populations, resulting in great variability. Therefore, clonal propagation of plants possesses importance. Clonal rootstocks confer many benefits such as precocity, tolerance to environmental stress factors and decline in vigour of growth [2]. In Turkey, the most common rootstocks for cherries are MaxMa 14, Gisela 5, CAB 6P, Mazzard and Mahaleb.

Precocity, high yields, fruit quality and efficient resource management (irrigation, fertilizers, pesticides, etc.) are the prominent properties of the cherry orcharding [5, 6]. Dwarfing rootstocks are able to present possible sweet cherry orchards with a reduced tree size, higher planting density, yield precocity, better fruit quality and efficient other orchard management work (pruning, harvesting, irrigation). Furthermore, the use of superior rootstocks may increase cherry plant tolerance to environmental stress factors. Some rootstocks help cherry plants to acquire tolerance against plant stress factors such as drought, low temperature and salinity.

II. Effect of Rootstocks on Cherry Plant Growth

Cherry plant growth is affected by many factors (environmental conditions, plant nutritional status and hormone activities) related to different physiological processes. The control of plant growth is mainly exerted through the rootstock. Nowadays, dwarf rootstocks have been used due to higher tree density than traditional orcharding, resulting improved economic returns and labor efficiency. Dwarfing mechanisms have been studied, including the whorls of xylem, reduced vessel size, low water and nutrient uptake [7]. According to Whiting et al. [8], Mazzard rootstock showed a higher vigour of growth than Gisela 5 and Gisela 6 and Gisela 5 was vigour controlling rootstock. Gonçalvez et al. [7] reported that the rankings of the size controlling potentials of cherry cultivars 'Burlat', 'Summit' and 'Van' grafted onto five rootstocks were as follows: Prunus avium L. > CAB11E > Maxma14 > Gisela 5 > Edabriz. In a previous experiment, trunk cross-sectional area was higher in Mazzard than on Colt for 20.55% [9]. Hrotko et al. [10] tested some rootstocks such as *Prunus mahaleb* seedlings CEMA (C500), clonal P. *mahaleb* SL 64, Bogdány, Egervár, Magyar; interspecific hybrids: Colt, Brokgrow (MaxMa 97), P. *cerasus* CAB 11E and stated that the largest trees were grown on *Prunus mahaleb* seedling CEMA (C500), followed by Egervár, Bogdány, and SL 64. Trees were moderate vigorous on Magyar, CAB 11E, Colt and Korponay and the smallest tree size was measured on Brokgrow (MxM 97). Another experiment revealed Gisela 5 shows very low annual increasing rate when compared to CAB 6P, Tabel-Edabriz, Saint Lucie GF 64 (SL 64), Saint Lucie GF 405 (SL 405), Adara, and MaxMa 14 [11].

III. Effect of Rootstocks on Cherry Fruit Yield and Quality

Abundance and consistency of yield as well as fruit quality are affected by rootstocks in cherry plants. The influences of rootstock on fruit yield and quality have been well documented in cherry trees. In a study related with cherry yield among rootstocks, yield efficiency of rootstocks Brokgrow and mahaleb seedling Korponay was high when calculated on trunk cross sectional area basis [10]. In another experiment, it was reported that trunk cross sectional area Gisela 6-rooted trees were the most productive, yielding between 13% and 31% more than Gisela 5-rooted trees [8].

Gonçalves et al. [7] stated that cheryy fruit firmness, an indicator of fruit quality, was higher when grafted onto dwarfing rootstocks. In a study of Usenik et al. [12] it was reported that Lapins cherry cultivar grafted onto W 72 rootstock gave fruits with the highest fruit quality based on fruit weight, firmness, soluble solids content, and concentration of phenols as health promoting substances. A study of Cantín et al. [11] (2010) showed Adara rootstock had higher yield, yield effiency and fruit quality compared to CAB 6P, Tabel-Edabriz, SL 64, SL 405, Gisela 5 and MaxMa 14 rootstocks. They also reported the high fruit quality (fruit weight and skin colour) of MaxMa 14 may be interesting. Jiménez et al. [13] remarked that cumulative yield and yield efficiency of the plantation were generally larger on *P. cerasus* rootstocks (MM 9, CAB 6P and CAB 11E) compared to Colt, SL 64, MaxMa 14, MaxMa 97 and Damil rootstocks.

IV. Effects of Rootstocks on Plant Tolerance against Environmental Stresses

One strategy to increase cherry plant growth, fruit yield and quality under stress conditions is to use rootstocks with superior stress tolerance. Thus, selecting rootstocks may maintain economic yield and quality under stress conditions [14]. Many in vitro and in vivo studies were conducted on stress tolerance by rootstock use in cherry plants. Majority of studies are determination of the responses of rootstocks against stresses. Moreover, salt and drought stress factors are the most studied environmental challenging in cherry plants and the information of the responses other stress factors is still limited. In a previous study we stated that the inhibitory effects of NaCl were less in Mazzard compared with MaxMa 14 and CAB-6P [14]. Ranney et al. [15] studied the osmotic adjustments of Colt and Meteor rootstocks under water stressed. Meteor typically had a lower water potential than did Colt for a given irrigation treatment. In a previous study conducted on frost stress, it was reported that Colt can show sensitivity to early frost, but no injury has been observed on sweet cherry trees budded on Colt [16]. For calcareous soils, Mahaleb seedlings ('Cema') proved to be tolerant to calcareous and high pH soils [17].

V. Conclusion

Several cherry rootstocks have been used for many purposes. Selection of appropriate rootstock is crucial for the production of cherry plants, because rootstocks affect water relations, vigour of scion growth, mineral uptake, fruit quality and yield. Use of superior rootstocks may increase cherry plant tolerance to environmental stress factors. Moreover, dwarfing rootstocks maintain reduced tree size, higher planting density, yield precocity, better fruit quality. Thus, properties of rootstocks such as dwarfing, stress tolerant must be studied and the rootstocks should be recommended to cherry growers to gain optimum fruit yield and quality.

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