

Effect of Some Clonal Rootstocks on Growth and Earliness of '0900 Ziraat' Sweet Cherry

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Abstract

The importance of sweet cherry (*Prunus avium* L.) production in Turkey recently has increased very sharply. To solve rootstock problems and increase cherry yield and quality in a modern and economical way, trials were conducted at six locations using *P. avium*, 'Gisela 5', 'MaxMa 14', 'Weiroot 158', *P. mahaleb* (L.) 'SL 64' and 'Tabel' (Edabriz) as rootstocks, '0900 Ziraat' as the main cultivar, and 'Bigarreau Gaucher' and 'Stark's Gold' as pollinizers. The results at Yalova will be presented here. The planting distance was 5 x 3 m, the design was a randomised block with four replicates and 4 trees per plot, and irrigation was by a drip system. The growing habit and bearing habit differed among the rootstocks in the early years of the experiment. 'Gisela 5' seemed to be the most precocious, followed by 'Tabel' (Edabriz). Fruit size and total soluble solids were not affected significantly by rootstock.

INTRODUCTION

Turkey with 250,000 t of sweet cherries (*Prunus avium* L.) plays an important role in world production (Anon. 2001). According to the recent statistics, Turkey is second after the USA in both sweet cherry production and export. The ecological zones where sweet cherries are grown are very suitable. Thus, fruit quality is very high. However, due to the lack of rootstocks that reduce tree vigour and increase productivity, yield per unit area is very low and tree management is difficult and expensive.

Development of intensive sweet cherry orchards requires the use of dwarfing rootstocks inducing precocious (early) cropping (Magein and Druart, 2005). In many countries during the past decade, especially in Europe, attempts have been made to change sweet cherry production methods by replacing large trees on vigorous rootstocks with trees grafted on dwarfing rootstocks (Grzyb et al., 2005). Data from many experiments showed that the use of vigor-reducing rootstocks can improve yield efficiency and precocity (De Salvador et al., 2005; Shane et al., 2003; Webster and Schmidt, 1996; Perry and Cummins, 1990; Sansavini, 1984).

The purpose of this study was to compare the yield, growing habit and precocity of '0900 Ziraat' sweet cherry on six clonal rootstocks including seedling *P. avium*, under Yalova ecological conditions.

MATERIALS AND METHODS

The experiment included '0900 Ziraat' grafted on 'Mazzard' seedling (*P. avium*) as well as *P. mahaleb* (L.) 'SL 64', 'Gisela 5', 'MaxMa 14' (Brokforest), 'Weiroot 158' and 'Tabel' (Edabriz) clonal rootstocks. 'Bigarreau Gaucher' and 'Stark's Gold' were used as pollinizers. One-year-old trees were planted in spring 1999 at Yalova Research Institute, Turkey. The trees were planted in a loamy soil (Table 1) at a spacing of 5.0 x 3.0 m, using an arrangement of four random blocks with 4 trees per plot for a total of 16 trees of each scion/rootstock combination. The trees grafted on seedling and 'F 12/1' was regarded as controls. The experimental orchard was drip irrigated and the trees were trained as a modified-leader system.

The data collected included tree vigour (as trunk cross-sectional area, TCSA), yield, flowering and tree mortality. The results were analyzed statistically and Duncan's

Multiple Range test at $p=0.05$ was used to separate statistically different means.

RESULTS AND DISCUSSION

Tree Mortality

After planting the one-year-old trees in the orchard, some were lost during the early years of the experiment (Table 3). The trees on 'Tabel' (Edabriz) and 'Weiroot 158' were very weak and high losses occurred for 'Weiroot 158', while no losses occurred for 'MaxMa 14' and 'Mazzard' seedling. Graft incompatibility symptoms were not observed in any scion/rootstock combination.

Bloom dates were nearly similar for all of the rootstocks except 'SL 64' that was flowered a little bit earlier (Table 2).

Tree Growth

The differences in tree vigour, as indicated by TCSA, were significantly (Table 3). The weakest rootstock was 'Tabel Edabriz' with a TCSA of 32 cm² and the most vigorous rootstock was 'MaxMa 14' (135 cm²), followed by 'SL 64'. De Salvador et al. (2005) found 'MaxMa 14' and 'SL 64' to be the most vigorous of 18 rootstocks in the Catanzaro region of Italy. 'Gisela 5' was the second weakest rootstock after 'Tabel'. Stehr (2005) also found 'Tabel' to be less vigorous than 'Gisela 5' in Germany. For high density systems with irrigation, 'Gisela 5' and 'Tabel Edabriz' seem to be promising in relation to tree vigour.

Early Bearing and Yield

One of the most important traits for vigour reducing clonal rootstocks is early bearing and high yield capacity. In this regard, 'Gisela 5' is the leading rootstock (Table 3), which is in agreement with De Salvador et al. (2005) and Hilsendegen (2005). 'Gisela 5' is followed by 'Tabel Edabriz' and 'Weiroot 158'. The fruit size and total soluble solids (TSS) of '0900 Ziraat' were nearly similar on all rootstocks (Table 4). These data are preliminary, however, and may not show the mature effect of rootstocks on fruit characteristics.

Regarding tree vigour, 'Gisela 5' and 'Tabel Edabriz' seem to be the most promising dwarfing rootstocks, with early bearing and yield efficiency. These results are in agreement with those of other researchers (De Salvador et al., 2005; Hilsendegen, 2005; Franken-Bembenek, 2005; Charlot et al., 2005).

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Tables

Table 1. Soil characteristics of the experimental orchard at Yalova, Turkey.

| Soil depth (cm) | Salinity 1:2.5 mmhos/cm | pH 1:2.5 | Organic matter (%) | P (ppm) | K (ppm) |
|-----------------|-------------------------|----------|--------------------|---------|---------|
| 0–20 | 0.13 | 7.22 | 2.9 | 38 | 277 |
| 20–40 | 0.14 | 7.28 | 2.8 | 36 | 270 |

Table 2. Phenological observation of ‘0900 Ziraat’ sweet cherry on different rootstocks at Yalova, Turkey (2004).

| Rootstocks | Months | | | |
|-------------|------------|---|--|---|
| | 0–15 March | 16–31 March | 0–15 April | 16–30 April |
| Mazzard | |  |   |  |
| SL 64 | |  |   |  |
| MaxMa 14 | |  |   |  |
| Gisela 5 | |  |   |  |
| Weiroot 158 | |  |   |  |
| Tabel | |  |   |  |





 Bud burst  Beginning of flowering  Full bloom  End of bloom

Table 3. Tree survival, tree size, yield and yield efficiency of ‘0900 Ziraat’ sweet cherry on different rootstocks.

| Rootstocks | Tree survival (%) | Tree height (cm) | Trunk cross-sectional area (cm ²) | Cumulative yield (kg/tree) | Yield efficiency (kg/cm ²) |
|-----------------|-------------------|------------------|---|----------------------------|--|
| Mazzard | 100.0 | 464 a* | 110 | 0.19 | 0.001 |
| Mahaleb SL 64 | 93.8 | 459 a | 111 | 0.53 | 0.002 |
| MaxMa 14 | 100.0 | 472 a | 135 | 0.14 | 0.001 |
| Gisela 5 | 93.8 | 328 c | 43 | 1.50 | 0.035 |
| Weiroot 158 | 50.0 | 317 cd | 49 | 0.18 | 0.004 |
| Tabel (Edabriz) | 87.5 | 267 d | 32 | 1.23 | 0.038 |

*Means separation by Duncan's multiple range test at $P < 0.05$.

Table 4. Pomological characteristics of ‘0900 Ziraat’ sweet cherry on different rootstocks.

| Rootstock | Fruit weight (g) | Total soluble solids (%) | Pedicel weight (g) | Pedicel length (cm) | Stone weight (g) | Fruit flesh/pedicel + stone |
|-------------|------------------|--------------------------|--------------------|---------------------|------------------|-----------------------------|
| Mazzard | 8.2 | 13.5 | 0.12 | 9.8 | 0.40 | 15.8 |
| SL 64 | 9.7 | 14.8 | 0.17 | 8.9 | 0.42 | 16.5 |
| MaxMa 14 | 9.5 | 14.5 | 0.13 | 9.3 | 0.46 | 16.1 |
| Gisela 5 | 10.8 | 14.8 | 0.17 | 10.9 | 0.48 | 16.6 |
| Weiroot 158 | 11.3 | 15.7 | 0.13 | 10.9 | 0.46 | 19.1 |
| Tabel | 9.5 | 15.0 | 0.18 | 10.7 | 0.48 | 14.4 |

Figures

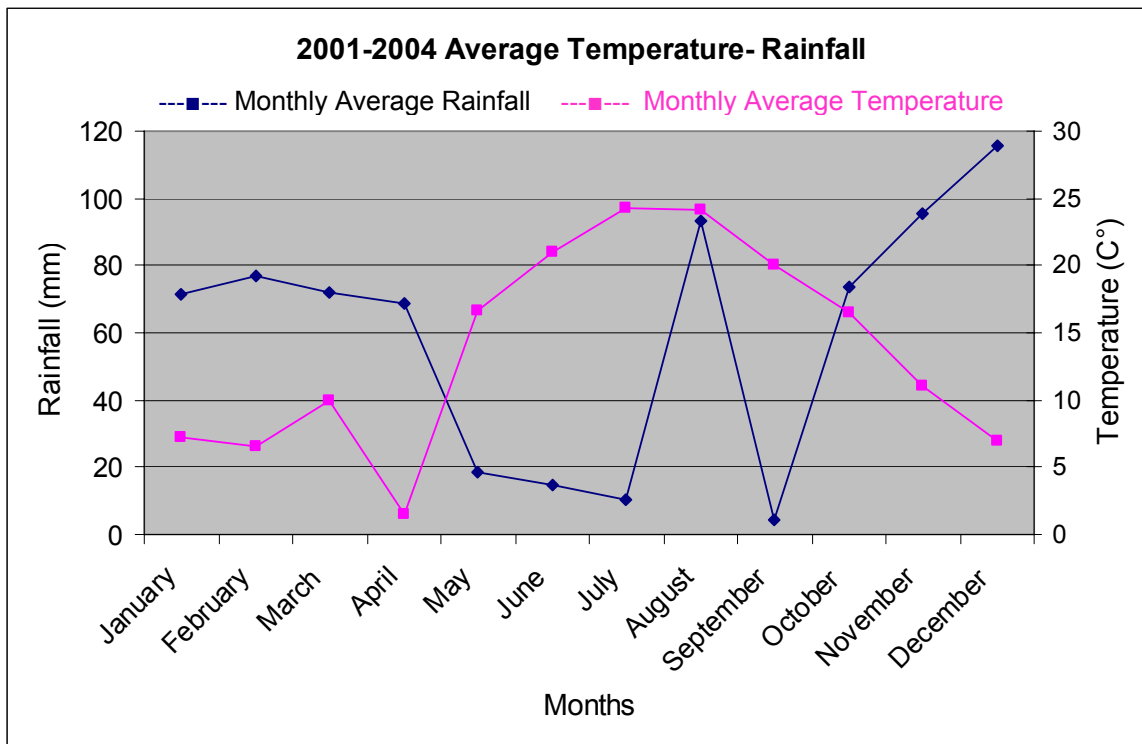


Fig. 1. Main meteorological traits of Yalova, Turkey (2001–2004).