

## (217) Rootstocks for California Prune (*Prunus domestica*) Production

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Growing prune trees from seed does not produce a tree genetically identical to its parent. Prune seeds are derived from open pollinated flowers so seeds are progeny of parent trees and are not genetically identical. In fruit and nut production, the industry needs every tree producing the same variety. Clonal propagation of fruitwood is one option. However it is much more common to graft the desired variety on a rootstock of choice. This allows a clonal choice for the prune variety and a rootstock choice to manage orchard site problems such as soil type and structure, nematodes and/or diseases. Because prune orchard life may be 25 to 40 years, it is important to anticipate rootstock responses to the soil type where it will be planted and different soil-borne diseases and pests which may be present. Certain rootstocks respond differently than others to soil, disease, and pest problems; selection of the most suitable stock for the proposed site can have a major influence on long-term performance of an orchard. Similarly, with spot or localized replanting, causes of original tree loss should be taken into account in selecting replacement stocks. The plum rootstocks, Myrobalan (*Prunus cerasifera*), Myrobalan 29C (*Prunus cerasifera* cuttings), Mariana 2624 (*Prunus cerasifera* × *Prunus munsoniana*) are most commonly used in California prune orchards. Other *Prunus* species such as peach, almond and apricot are rootstocks used for special situations. The M40 Marianna plum stock is a relatively new release that may in time replace Mariana 2624. Advantages/disadvantages for each rootstock are discussed.

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## (218) Pecan Shell Mulch Affects Peach Tree Growth, Yield, and Survival

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Pecan shells are a waste product that are occasionally used for mulch in ornamental landscape settings; yet most shell waste is left in piles near the shelling facility or discarded by other methods. If another use for this waste product could be developed, it may lead to added income for pecan producers. A peach orchard was planted at a spacing of 5.5 m × 6.8 m in Feb. 2005 at the Cimarron Valley Research Station in Perkins, Okla. consisting of several different cultivars on 'Halford' rootstock. From this orchard, the 'Loring' block was chosen to determine what effect pecan mulch would have on peach trees. Five treatments were imposed: no herbicide, no mulch, mow only (Trt 1), herbicide (glyphosate) (Trt 2), 1.8 m × 1.8 m × 5 cm deep mulch (Trt 3), 1.8 m × 1.8 m × 10 cm deep mulch (Trt 4), and 1.8 m × 1.8 m × 15 cm deep mulch (Trt 5). All blooms and fruit were eliminated by frosts or freezes in 2006 and 2007. Yields in 2008 revealed that Trt 1 was statistically the poorest option (13.2 kg/tree and 93 fruit/tree). All other treatments did not differ, but Trt 4 had the highest mean yield (26.4 kg/tree and 195 fruit/tree). Fruit quality (°Brix) and fruit weight did not differ by treatment. Tree growth parameters of tree height, pruning weights, and trunk caliper were not statistically different with the exception of Trt 1 which was significantly less in all three categories beginning in 2007. Tree mortality increased with depth of pecan mulch. Treatments 1–3 had little tree loss (0–5%), whereas Trt 4 and Trt 5 had increased mortality (15% and 35%, respectively). The

primary reason for mortality was likely due to record rains in 2007 coupled with the longer moisture retention from deeper mulch.

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## (219) Diurnal Variation of Photosynthetic Characteristics in Coolidge Pineapple Guava

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The pineapple guava (*Feijoa sellowiana* Berg.), a great commercial plant for its fruit quality and unique flavor, has been introduced into China in recent years. To better grow this plant for orchard, the diurnal variations of photosynthesis on *Feijoa sellowiana* 'Coolidge' were studied using a Li-6400 portable photosynthesis system. Relationships between net photosynthetic rate (Pn) and its physio-ecological factors, including photosynthetic active radiation (PAR), relative humidity of the air (RH), temperature of leaves (TL), atmospheric CO<sub>2</sub> concentration (Ca), stomatal conductance (Cond), intercellular CO<sub>2</sub> concentration (Ci), and transpiration rate (Tr) etc. were determined by path analysis and stepwise regression equation. The curve of diurnal variation of Pn was demonstrated two peaks in a clear day, which appeared at 12:00 and 14:00, respectively. There was a clear depression at noon. Correlation analysis showed that there were positive relationship between Pn with Cond and Tr. Their correlation equations were  $Pn = 6.1883 Cond^2 + 66.0030 Cond - 0.6763$ , ( $R^2 = 0.893$ ) and  $Pn = 0.5473 Tr^3 - 5.9285 Tr^2 + 22.1925 Tr - 18.042$ , ( $R^2 = 0.914$ ), respectively. Among the ecological factors, PAR was the major one that influenced the variations of Pn. Cond and Tr were two key physiological factors that influenced the variations of Pn. The correlation equation between Pn and the major physio-ecological factors was  $Pn = 73.82 - 0.0041 PAR + 1.8069 RH + 1.9585 TL - 0.4479 Ca - 102.62 Cond + 3.6657 Tr - 0.1354 Ci$  ( $R^2 = 0.999$ ). This study can provide foundational data on the physiological ecology in pineapple guava for its introduction, cultivation and production.

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## (220) Growth and Development of Huafeng Pear

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*Pyrus pyrifolia* Nakai. 'Huafeng' is a new superior pear cultivar derived from the cross of 'Nitataka' × 'Hosui'. To investigate the growth and development of huafeng pear, we measured stem circumference and branch length and analyzed leaf and fruit nutrients. Huafeng pear grew fast at its first 1–3 years with vigorous branches. The stem circumference increased 142% at the first three year, which was higher than its stem growth at 120% from 4–6 years. The one-year fruit branches grew well with high percentage of flower buds (average at 63.2%) and their fruiting capacity was similar to that of the two and three-year's fruit branches. In 30 to 150 days after blossom, SPAD increased gradually from 39.6 to 48.8. The contents of P, K and Mg in leaves decreased gradually from 0.058% to 0.124%, 1.07% to 1.48%, 0.250% to 0.332%, respectively. Both Ca and N content increased from 1.10% to 2.37% and 2.08% to 2.85%. The increment of fruit size showed a 'W' shape, a trend of "fast-slow-fast-slow-fast." The increase of water content in fruit was similar to the change of fruit size, i.e. water content was higher when the fruit size increased faster. Inorganic matters changed fast in early fruit stage. The K content showed a highest change from the period of young fruits (1.092g×100g<sup>-1</sup> FW) to mature fruits (1.035g×100g<sup>-1</sup> FW). Fruit sugar content exhibited progressive accumulation and its highest content was 9.83 g×100g<sup>-1</sup> FW in mature fruits. Organic acid displayed a trend of "decline-rise-decline" pattern and the lowest level was at the mature fruit. Therefore, growers should harvest huafeng pear within 150 to 160 days after blossom.

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### **(221) Utilizing Within-cluster Hand-thinning to Increase Pawpaw Fruit Weight**

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Pawpaw (*Asimina triloba*) is a tree fruit native to the Eastern U.S. with increasing popularity as a high-value niche crop. Pawpaw fruit sell for \$3–4/lb at farmers markets and \$5–10/lb via mail order. Two undesirable characteristics of pawpaw are great variation in fruit size and short shelf life, caused in part by a small tear in the skin created when fruit are harvested from the cluster, allowing pathogens to enter the fruit. It is beneficial for growers to produce large, consistently sized fruit to command a premium price and decrease time sorting fruit. Within-cluster thinning of pawpaw to one fruit could increase fruit size and improve shelf-life by allowing the peduncle to be cut at harvest, maintaining an intact epidermis. Four pawpaw cultivars (Mitchell, NC-1, Overleese, and PA-Golden) were utilized in a fruit thinning study at the Kentucky State University research farm over two years. The objective of the study was to determine the effect of hand-thinning on pawpaw fruit size. Treatments were no thinning (control) or hand-thinning all clusters on the tree to one fruit per cluster. Trees were thinned in early June, when fruit were approximately 1.5 cm in length. Fruit were harvested from mid August through late September, and twenty-five fruit per tree were weighed to obtain average fruit weights. Fruit from hand-thinned trees weighed significantly more than those from control trees (47% and 23% greater weight in 2006 and 2008, respectively). Pawpaw, like many other tree fruits, benefits from fruit thinning to reduce crop load

in order to increase fruit size.

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### **(222) Improving 'Bing' Sweet Cherry Fruit Quality with Plant Growth Regulators**

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Final fruit diameter is the prime determinant of sweet cherry value. Previous research has shown that mesocarp cell size accounts for most variability in fruit size within a genotype. Our research program is now evaluating the potential to improve sweet cherry fruit size/weight with growth regulators. In the current study we screened 8 plant growth regulators and their combinations for their ability to increase 'Bing' fruit weight. Each treatment was applied in lanolin paste directly to fruit pedicels at 9 and 30 days after full bloom, to coincide with estimated peak in cell division and onset of cell expansion activity, respectively. During the cell division stage, several cytokinins improved fruit weight significantly (ca. + 15%) with N-(2-Chloro-4-pyridyl)-N'-phenylurea (CPPU) at 100 mg·L<sup>-1</sup> being the best. Auxin treatments were ineffective at improving fruit quality but several GA treatments improved fruit size significantly. GA<sub>3</sub> at 200 mg·L<sup>-1</sup> during the cell division stage was the most effective and improved final fruit weight by 15%. From this treatment, 60% of the fruit were ≥ 9 g compared to just 15% of similar weight fruit from untreated limbs. These results are consistent with the previous study of applications at full bloom and show promise for early applications of GA<sub>3</sub> to improve sweet cherry fruit quality. Furthermore, while single applications of GA<sub>1</sub> or CPPU during fruit expansion did not increase fruit weight, their combination increased fruit weight by 19%. More than 80% fruit fall into the category of ≥ 9 g. Results of large-scale orchard trials will also be discussed.

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### **(223) Influence of Proline Foliar Application on the Growth Characteristic and Fruit Quality of 'Fuji' Apple Trees**

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Frost damages often occur in several apple tree growing areas. Apple growers have been used many active ways to protect apple trees against frost damage, such as combustor, air moving fan, and overhead sprinkler. However, there is little information available for chemical protectants in apple trees, except plant growth regulators. This study was carried out to find the effects of four different concentrations of proline applications on the frost resistance and growth characteristics of young and mature 'Fuji' apple trees, which were one and eleven-year-old, respectively. The application of 50 mg·L<sup>-1</sup> proline significantly increased leaf fresh weight and leaf dry weight of young 'Fuji' apple trees, compared with those on the control. In addition, foliar spray of 50 mg·L<sup>-1</sup> proline significantly promotes flower formation in young 'Fuji' apple trees. In the growth characteristics of mature 'Fuji' apple trees, the current shoot growth were relatively shorter in the 25 or 100 mg·L<sup>-1</sup> of proline treatments than those on control tree. However, there were no differences in tree height, trunk cross-sectional area, and chlorophyll content in the leaves of both young and mature 'Fuji' apple trees. Among the fruit