

Growth and Development Stages of Four Japanese Persimmon Varieties in North Florida¹

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Introduction

Japanese persimmon (*Diospyros kaki*) (Figure 1) belongs to the family Ebenaceae, fruit known for their sweet and flavorful taste. Japanese persimmons are a good source of vitamins A and C and dietary fiber. They are also low in calories and fat. These fruits are popular in many Asian cuisines and are enjoyed in various ways, including fresh, dried, or cooked in multiple value-added products. There are two major fruit growth stages: flowering and fruiting. The vegetative stages include bud development, leaf development, shoot development, and senescence stage, while reproductive stages include inflorescence emergence, flowering, fruit development, and maturation. Accurate identification of flowering stages is important for making informed decisions on plant care, fertilizer, irrigation, and fruit harvesting, as flowering stages are sensitive to water or nutrition stress. This publication provides information on persimmon flowering and fruiting stages for four established varieties grown in a research plot at the UF/IFAS North Florida Research and Education Center in Quincy, Florida. This information will be helpful to students, growers, homeowners, nursery workers, and Extension agents interested in growing persimmons in Florida.



Figure 1. Japanese persimmon fruit types: non-astringent variety 'Fuyu' (left) and astringent variety 'Hachiya' (right).

Credits: Ali Sarkhosh, UF/IFAS

Principal Growth Stages

Stage 1: Dormant

Dormancy is a natural phase of temporary inactive growth in persimmon's annual growth cycle. During dormancy, the tree enters a rest period, defoliates, and drops fruit if not harvested, as well as conserves its energy and protects itself from harsh environmental conditions such as winter cold or frost (Figure 2). Dormancy is essential for plant survival as it prepares the tree for new growth in the spring. In Florida persimmon, the dormancy period starts from mid-November (second to third week) and continues

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until mid-March (first to second week), depending on the location, when the new growth period is ready to begin.



Figure 2. Dormancy period (dormant buds) of four persimmon varieties grown in north Florida from November to February. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

Stage 2: Bud Swelling

As the temperature begins to rise in early March, the buds on all varieties of persimmon trees start swelling. This is the first sign of active growth of the plant. During this stage, buds absorb water and nutrients become enlarged. As bud swelling continues, the buds reach the green tip stage around the third week of March (Figure 3). At this point, a small green tip emerges from the bud scales.



Figure 3. Bud swelling in four persimmon varieties grown in north Florida in early March. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

Stage 3: Bud Break

After the green tip extends further, the new shoot emerges from the bud by the end of March, right after 7 to 10 days of the visible green tip. This indicates the beginning of active growth for the season. After the bud break, the new shoot proliferates. Leaves begin to develop, and the tree starts photosynthesizing, producing energy for further growth and development (Figure 4).

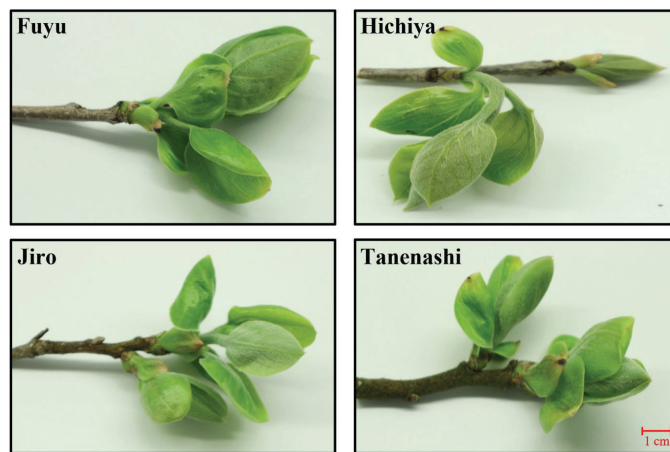


Figure 4. Bud break stage in four persimmon varieties grown in north Florida in the end of March. At this stage, the leaf tips elongate, and leaves are unfolded and expanded. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

Stage 4: Shoot Growth

As the leaves fully expand, they develop shoots for further growth at the start of April and continue developing until July. Shoot growth is a dynamic process in tree development and fruit production. The newly growing shoots are tender stems extending from the tree's branches and are essential for carrying leaves, flowers, and fruit (Figure 5).

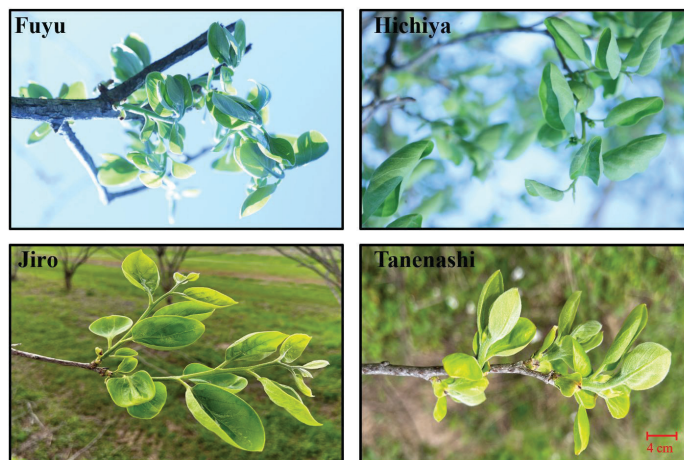


Figure 5. Shoot development stage in four varieties grown in north Florida in early April. At this stage, shoots initiate growth and turn light green. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

Stage 5: Flower Emergence (Pre-bloom)

In persimmon trees, flowers emerge on new shoots when shoots start developing in the second week of April (Figure 6a). The flower buds within the buds reach a stage where they are ready to bloom. These buds begin to elongate, separate from the surrounding bud scales, and continue growth by the end of the month (Figure 6b).

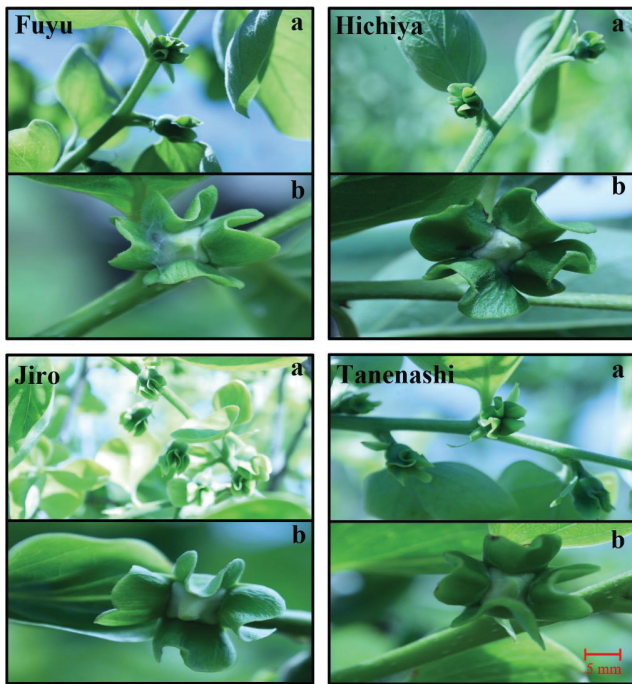


Figure 6. Flower emergence stage in four persimmon varieties grown in north Florida in the second week of April. In all four varieties, a) shows the flower emergence, in which stipules open and start swelling with green petal color, and b) shows the final emergence stage, where petal color begins to change from green to light yellow. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

Stage 6: Flowering

Flowering is a critical stage for pollination and fruit set. After flower emergence (first week of May), the individual flowers open and become visible (Figure 7). Three types of flowers—male, female, and perfect—can be seen on persimmon trees. However, most commercial persimmon varieties typically produce female flowers. The time of flowering depends on the specific variety and local climate conditions. The flowers are usually small, inconspicuous, and yellowish.

Stage 7: Fruit Set

In the third week of May, the flower petals start to dry and fall (Figure 8a). Afterwards, fruit setting results in the fall of the petal crown (Figure 8b). Successful pollination of female flowers leads to this fruit set. Persimmon trees require cross-pollination for fruit development, as most varieties are not self-pollinating. Bees and other pollinators are crucial in this process.

Stage 8: Fruit Development and Ripening

As the fruit develops (Figure 9a), the shoots bearing fruit continue to elongate and mature. The leaves on these shoots contribute to photosynthesis, providing energy to the growing fruit. The fruit gradually grows and matures over

the summer and into the fall (June through September), changing in color (Figure 9b) and texture as it ripens.

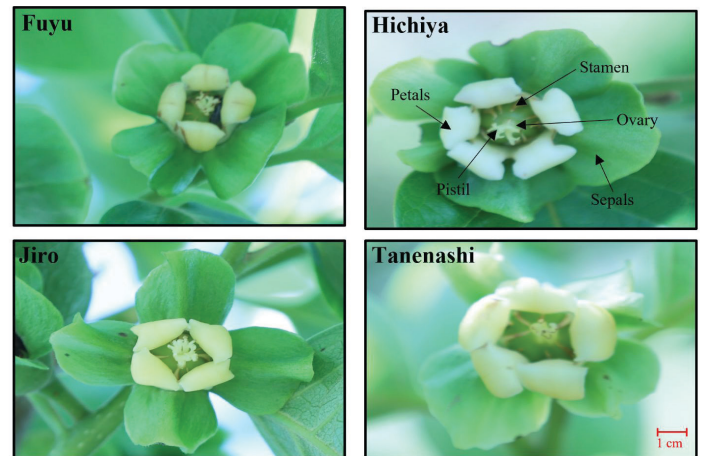


Figure 7. Flowering stage in four persimmon varieties grown in north Florida in the first week of May. At this stage, flowers are opened and light yellow. Different flowering parts, that is, the sepals, petals, stamen, pistil, and ovary, are also indicated for Hachiya.

Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

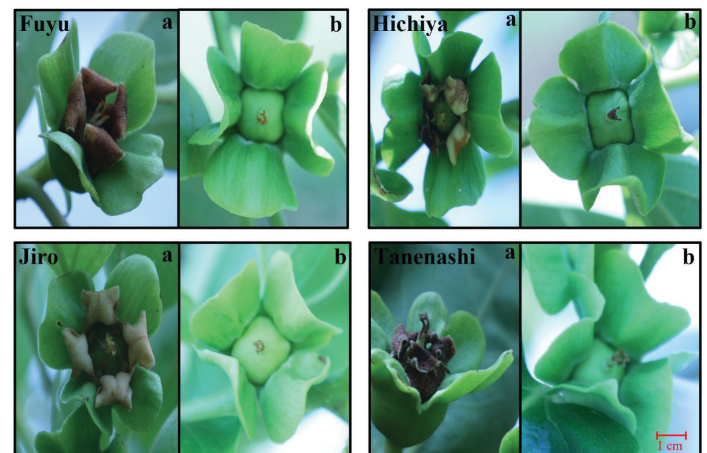


Figure 8. Fruit setting stage in four persimmon varieties grown in north Florida in the third week of May. In all four varieties, a) shows the yellow petals have become dried and will start falling, and b) shows the fruit set.

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Stage 9: Fruit Maturity

Persimmons are harvested when they reach a level of fruit maturity that ensures good taste, texture, and sweetness. The harvest timing may vary depending on the persimmon variety, climate conditions, and the intended use of the fruit. The varieties of our study in north Florida start to ripen from mid-September and into October. It's important to note that persimmon varieties have different characteristics, and what constitutes maturity can vary widely (Figure 10 and Figure 11). Once the fruit is fully mature and harvested, it can be ripened at room temperature (particularly for astringent varieties); fully ripe varieties or non-astringent varieties can be stored in the refrigerator (32°F to 40°F) for five to seven days.

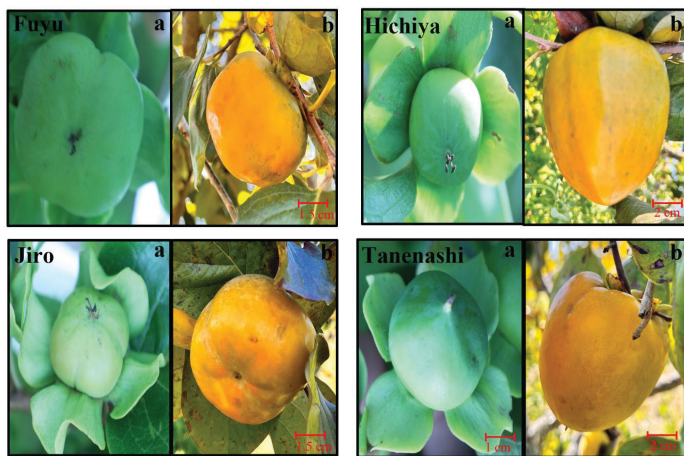


Figure 9. Fruit development and color change stages in four persimmon varieties grown in north Florida in May through June. In all four varieties, a) shows how the fruit develops gradually, and b) shows the color change as the fruit ripens in the final stage of maturity. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

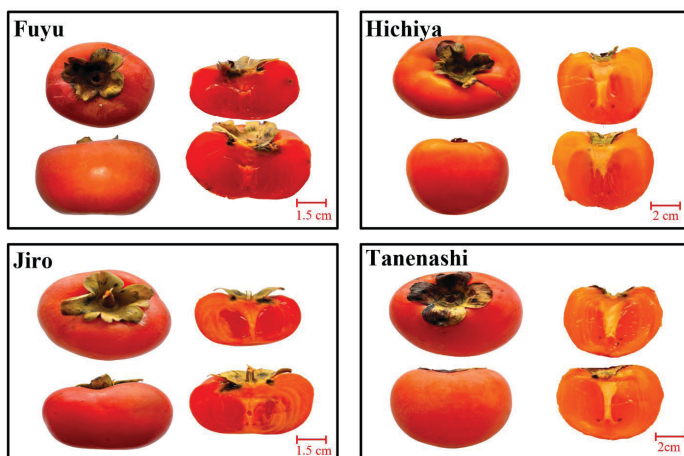


Figure 10. Fruit at full-ripe stage in four persimmon varieties grown in north Florida in mid-September. The fruit color change is complete and ready to harvest at this stage. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

An illustration of the whole growth cycle of persimmon is described in Figure 12.

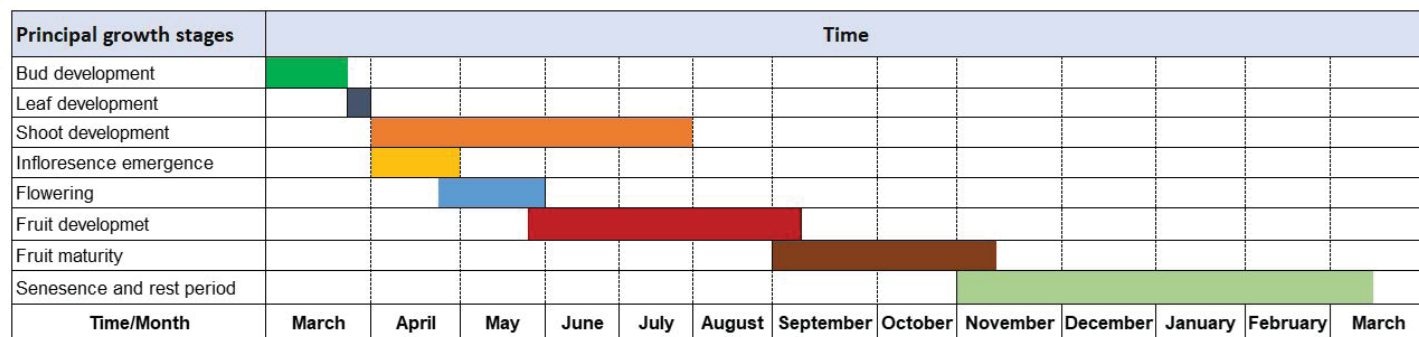


Figure 12. Schematic representation of time in the typical phenological growth stages and the dormancy period of persimmon varieties grown in north Florida. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

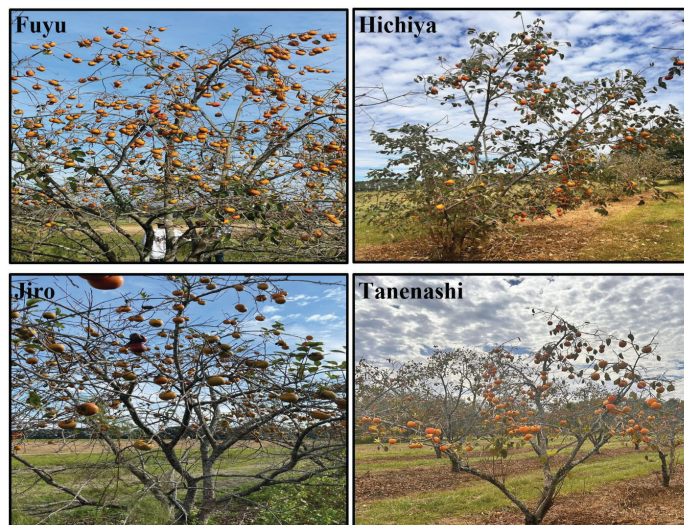


Figure 11. Mature fruit on trees of four persimmon varieties grown in north Florida in October. Credits: Shahid Iqbal and Muhammad Shahid, UF/IFAS

References

Sarkhosh, A., D. M. Huff, , P. C. Andersen. 2020. “Japanese Persimmon Cultural Practices in Florida: HS1389, 10/2020.” *EDIS* 2020 (5). <https://doi.org/10.32473/edis-hs1389-2020>

George, A. P., R. J. Nissen, and R. J. Collins. 1994. “Effects of Temperature and Pollination on Growth, Flowering and Fruit Set of the Non-astringent Persimmon Cultivar ‘Fuyu’ under Controlled Temperatures.” *Journal of Horticultural Science* 69 (2): 225–230. <https://doi.org/10.1080/14620316.1994.11516448>

Tetsumura, T., S. Ishimura, T. Takita, S. Funaki, H. Uchida, T. Hidaka, S. Haranoushiro, Y. Udatsu, M. Matsuo, C. Honsho, and H. Asakuma. 2019. “Tree Growth, Flowering, and Fruiting of ‘Taishuu’ Japanese Persimmon Grafted onto Dwarfing Rootstocks.” *The Horticulture Journal* 88 (1): 57–66. <https://doi.org/10.2503/hortj.UTD-020>

Tetsumura, T., R. Tao, and H. Yukinaga. 1999. “Orchard Growth, Flowering and Fruiting of Micropropagated Japanese Persimmon Trees.” *The Journal of Horticultural Science and Biotechnology* 74 (2): 251–253. <https://doi.org/10.1080/14620316.1999.11511103>

Choi, S.T., D. -S. Park, E. -S. Kim, H. -Y. Shin, and S. -M. Kang. 2014. “Seasonal Growth and Characteristics of Fruits Developed from Delayed Flowers of ‘Fuyu’ Persimmon.” *Scientia Horticulturae*, 177: 108–111. <https://doi.org/10.1016/j.scienta.2014.07.043>