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Canopy Management of Washington Navel Orchards under Egyptian Conditions

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Abstract

Citrus ranking as the first fruit crop in Egypt, Navel orange (*citrus sinensis L.*) represents the main citrus variety cultivated in Egypt in both terms of cultivated areas or productivity, currently; there is different challenges faces navel orange production which required proper management for various agriculture practices.

Canopy management is very important practice in determining tree productivity, there is more attention to construct strong tree structure and sustain regular productivity, and there are different mistakes in Navel orange orchards particularly the old one like higher trees and complicated canopy which affect tree growth and productivity. The aim of pruning variable from new orchards than the mature one, also, there are different types of pruning include Regular annual pruning, suckering, skirting up pruning, control of alternate bearing, canopy thinning, and Rejuvenation of old orchards. There are various factors determined by the proper type of pruning and the accurate tools used in pruning like orchard conditions, trees size, and varieties growth habitat.

Keywords: Citrus; Navel orange; Canopy management; Pruning; Skirting up; Tree productivity

Introduction

Citrus (*Citrus spp.)* is an important fruit crop in the world with over 5.4 million ha cultivated over world currently under cultivation, in Egypt, citrus ranks first position among cultivated fruit crops with 200000 ha, produce 4.32 million metric tons approximately, according to (Annual Reports of Statistical Institute and Agricultural Economic Research in Egypt (2019) [1], also, citrus fruits ranking the top fruits in the agricultural export products both in terms of quantity and value. However, citrus cultivation practices still remain traditional with a low average (about 26 t/ha) and reasonable fruit quality. The main commercial citrus varieties in Egypt are Washington Navel, Valencia orange, Mandarin group, and Lemon, while there are some areas cultivated with grapefruit, common orange, Acidless orange, and another citrus. Navel orange (*Citrus sinensis L.)* is the main citrus variety with 64.412 ha, cultivated area, while, production area reaches 62000 ha produced 1.5 million metric tons in 2019 [1], also, Navel orange considered a popular fruit cultivar in Egypt and the Arabian region and there is a large demand for fruit consumption due to its flavor and aroma characteristic, desirable taste, and economic prices compared to other fruits in season.

Majority of Navel orchards are cultivated in Delta region due to proper soil, freshwater, and climate, whereas, there are many neglected orchards cultivated for 50 years approximately with improper pruning practice, some of these orchards need ladders to collect fruits during the harvesting season [2]. Proper management of various activities such as pruning, fertilizing, irrigation, and pest control, in proper timing, enhance physiological functions and resulting in high production with worthy fruit quality [3].

Wrong pruning practice affect negatively tree yield and fruit quality, also, increase spreading pathogens. This work discusses the right pruning practice for navel orange orchards in the Delta region and newly reclaimed lands (Sandy soil).

Cultivated Area

Orange represented the major citrus variety in Egypt in both terms of cultivated area and as the quantity of production. Navel orange planted area is concentrated in the Delta governorates (Qalyoubia, Gharbia, Menoufia, Sharqiya, and Ismailia) which considered the main producing areas. Navel oranges are the predominant variety of citrus all over Egypt and especially in Delta region, also, Navel orange occupies the first position between all citrus species grown in Egypt and representing 32 percent of total citrus cultivated area and 52.8 percent of the total orange production which reach to 2.89 million metric ton [1], from another side, Economically, Navel orange is the main source of income for a wide range of citrus growers in Egypt, particularly in the Delta region.

Pruning

Pruning, is the art of cut off undesirable growth of plant parts in a scientific way, Citrus as an evergreen tree requires reasonable annually pruning less than other deciduous fruit trees for continued productivity and fruit quality, so, regular pruning in citrus required for increasing tree efficiency and sustain productivity, there is an essential role for proper pruning for improving tree health through a strong tree structure, improving air movement in the canopy and increase light penetration, furthermore, removing out gourmands (water sprouts) reduce competition to the main branches, develop fruits, and decrease pathogens infection [4].

In mature orchards of Navel orange, the tree canopy becomes compacted and combined with excessive growth of the leaders, gourmands, and laterals, which shading the internal shoots and fruits, and trees suspecting to attacked by various insects and pathogens [5].

There are numerous benefits for regular pruning of mature citrus trees include stimulate fruit growth, harvesting, as well as assists weeding, and other cultural practices, also, regular pruning decrease pests and pathogen infection. Therefore, trimmed citrus trees after harvesting and cut off lateral, leaders, and tangled branches improving yield and fruit quality in the next season [6].

Under semiarid conditions, the main aim of citrus pruning is to provide enough light intensity inside the canopy and reduce exposing new shoots and fruits to high solar irradiation and higher temperature, also, permitting an effective balance between vegetative growth and crops outside and inside tree canopy, and avoiding physiological disorders like sunburn [7].

Main pruning faults in citrus orchards

There are various mistakes during pruning particularly in neglected orchards (Figure 1).

- Too height trees.
- Overcrowded and dense canopy.
- More laterals and leaders branches growing on the main trunk.
- Main branches near to the soil surface.

Figure 1: *Image field for mistakes in pruning in neglected orchards (Photo by Dr. Abobatta 2018).*

The determining factors for pruning in citrus

- System of cultivation
- Tree planting space.
- Orchards age and stage of tree growth.
- Specie of citrus.
- Rootstocks.
- Climate conditions.

Time of Pruning

Commonly, preferable pruning citrus orchards directly after harvesting, before new flushing cycle, to avoiding mechanic injured for old branches, conversely, from another side, early pruning pushes tree to produce new flushes which harming by cold weather, also, during pruning all thinner branches (< 0.5 cm) must be removing. Late citrus varieties like Valencia orange and clementine mandarin pruning could be after harvesting in Late May or after June drop to reducing adverse effects on the new crop [8].

Pruning Tools

There are necessary tools required for pruning citrus trees include:

a. Hand pruners
b. Secateurs
c. Pruning saw
d. Chainsaw for branches larger than 3 cm
e. Pole pruner for higher trees

Besides that, in old orchards with higher trees may be required ladders. All pruning tools should be sharp and clean, preferably,

sterilizing pruners after each tree particularly with the suspected of Viruses and viroids diseases, to avoid transmitted infection by pruning tools. Old trees (>40 years) in orchards could be a source of contamination because they were not recognized or treatable at cultivation time.

Types of pruning

The aim of pruning varying from new establishment orchards than the mature one, also, in mature orchards there are various factors determining the proper types of pruning for citrus orchards include trees size and varieties growth habitat.

New establishment orchards: firstly at the establishment stage all seedlings should be trimmed after planting, to stimulate new flushes which will grow into a lower level, to remain tree size-controlled and easier other agricultural practices.

Mature orchards pruning: Mature orchards require various types of pruning (Figure 2) such as following:

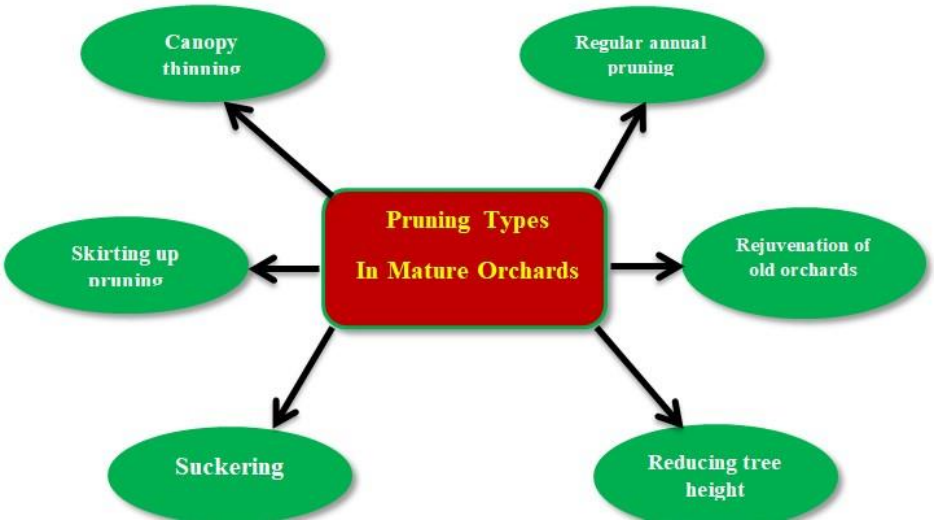

Figure 2: *Schematic for various types of pruning for mature orange orchards.*

- **Regular annual pruning:** it is an annual pruning to trimmed mainly aim to control tree height via taking out only a third of the height before new flushing, also, including canopy thinning, removing dried, infected wood, water sprouts, and crossing branches from trees as necessary throughout the year [7].
- **Suckering:** cut of growing shoots from the rootstock below grafting union regularly during the growing season.
- **Skirting up pruning:** this type of pruning used in citrus varieties that tend to has pendulous branches that droop to the soil with heavy crop loads like some mandarin varieties (*citrus reticulata*), so, raising canopy about 75 cm from the surface of every two years above to improve productivity [9].
- **Control of alternate bearing:** there are some citrus varieties that have the alternate bearing phenomenon like some mandarins and some sweet orange, so, after off-year, trees must pruning heavily to reduce potential crop load, which assists to a more balanced annually bearing [10].
- **Canopy thinning:** There are many problems happened in overcrowded orchards like an intertwined canopy which includes new flushes, old, and dried branches, spreading pests and disease with low production, all these factors have a contrary impact on tree productivity with low quality, therefore, regular canopy thinning enhancing vegetative growth with high production and reducing infection of pests and pathogens [11] .
- **Reducing tree height:** In the case of the old orchards, the trees grow up without proper pruning and the higher branches shading out other parts of the trees, which affect negatively on productivity, increases harvesting costs, losses significant part of the crop, and decrease fruit quality. Therefore, trees required renovation pruning to reduce height through trimmed back the major branches to the base, while, this processing required 2-3 years to avoid losing the trees, therefore, trimmed a third of height each year [7] .
- **Rejuvenation of old orchards:** This type of pruning used in old orchards with low productivity but tree trunk is remaining healthy without pest or pathogens infections, under this conditions, the renovation trimmed aim to enhancement growth and productivity of old trees [2], so, trimmed any branches less than 5 cm to stimulate new flushes and construct tree canopy with proper height, while, it is necessary trimmed one side and left the other one two years later, also, some growers pruned row and left the next one for two years, so, all trees could be rejuvenated through two or three years [12].

Pruning Residues

Residues of pruning could be used to cover soil as mulching which provides many benefits like reducing water evapotranspiration, control weed growth in the orchards besides that return some nutrients to the soil and increasing organic matter, and stimulate biological activity, but this materials need to be sharding or chipping before using to facilitate their use and allows workers and machinery movement in the orchard [13].

Conclusion

Navel orange is the main citrus species in Egypt and required more attention to improving productivity, pruning play a vital role in improving tree growth, determining productivity, and enhancing fruit quality, there are different types of pruning used in citrus orchards according to tree conditions and the aim of trimming, also, using proper tools for pruning is very effective.

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