
Intensity of Insect Pests on High Density Planting System in Citrus

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ABSTRACT

In the recent years, various crop production strategies are adopted for increasing production and productivity of agriculture and horticulture crops. One such concept is the adoption of closer planting density for enhanced utilization of resources thereby reducing the gestation period and increasing the productivity of the crop. Right selection of different components like suitable cultivars-rootstock, canopy management measures, space/land utilization, irrigation mode and scheduling nutrition delivery system, orchard planning and its layout is also very important in this context.

INTRODUCTION

Citrus is one of the predominant horticulture crops globally grown in more than 100 countries. Commonly cultivated citrus fruits of our country includes mandarins (loose skinned), sweet oranges (tight skinned) and limes to an extent of 50, 20 and 15 per cent of total area (3.48 lakh ha) under them respectively. This crop is highly adaptable to various agro-climatic conditions with good response to low input and a minimum of two season's fruit bearing character. A series of studies has been conducted across the world to analyse the impact of planting densities/spacings on yield and other attributes in citrus crop. Current research nowadays emphasizes on minimal spacing, optimised nutrient or water usage delivered through improved technologies like drip irrigation, fertigation, pruning and training of trees *etc.* With this background, high density and ultra-high-density planting systems has been exploited to accommodate a greater number of plants in a given unit space there by increasing the

production per plant and net return. Rootstock also has a significant role as they induce or control tree growth. Pruning is mandatory for citrus on high density planting system with limiting the tree height to a maximum of 2.5m height.

INCIDENCE OF INSECT PESTS

A plethora of insect pests like foliage, stem and fruit feeders attack citrus crop from nursery and fruit set to harvest causing cognizable damage in central India. Devitalization of foliage due to desapping by sucking insect pests, poor fruit set, entomological, pathological or physiological fruit drop both at berry and maturity stage, stem tunnelling, bark removal, girdling *etc* are some of the regular outcomes of pest incidence in citrus crop. On account of the attack of the different insect pests results in poor performance of the tree in quality fruit production which is a serious matter to ponder upon. In this context, recently adopted concept of closer planting systems in fruit crops especially citrus is highly economical in terms of production and productivity except the fact that proper care should be taken with respect to horticultural operations like training and pruning as well as plant protection measures *etc*.

Incidence levels of major insect pests like citrus leaf miner, citrus psylla, thrips, aphids, mites were observed in eight different (m²) viz., 6X6, 6X3, 4X3, 3X3, 4X2, 3X2, 4X1, 3X1 during 2013-2020 at ICAR-Central Citrus Research Institute experimental farm on Nagpur mandarin cultivar. Irrespective of the seasons or insects, wider spacing recorded lowest pest population than the closer spacing's. It was found that citrus leaf miner and citrus psyllids were regular pests active throughout the flushing seasons irrespective of spacing. There was significant increase in incidence levels of sap sucking insects and was inversely related to planting distance. It was confirmed that high density spacing proportionately favoured the insect infestation due to dense crop growth. This augmented favourable microclimate *i.e.* low temperature, high humidity, less sunlight penetration, might have accelerated new flush growth that favoured insect pests' multiplication. Systematic pruning operations in high density planting systems accelerates new flush growth that serves as abode for regular pests like citrus leaf miner.

In fact, high density planting system depends on maintaining a balance between vegetative growth and fruiting. High density systems require more training and minimal pruning during the initial years (up to 4 years) than traditional systems. If the vegetative vigour is excessive, it may harbour more insect pests. Three different spacings *viz.*, conventional (5 X 5 m²), HDP (5 X 2.5m²) and UHDP (2.5 X 2.5m²) were also evaluated for acid lime cultivar Pramalini during 2013-2019. Over a period of nine months flushing (Jan-March, June-August and October-December) in a year, the percent leaf miner infestation levels fluctuated in the range of 1.2-1.8-fold times in UHDP than in conventional planting system. Leaf miner infestations across the three flushing seasons ranged between 26-67% in UHDP, 17-51% in HDP and 11-39% in conventional spacing. Management of insects attacking flush like leaf miner may therefore be needed more frequently in young trees than older trees when it comes to UHDP and HDP till the canopy attains a stable size. Since the wounds produced by leaf miner on leaves helps the canker pathogen to invade the tissues, monitoring of the pest was carried out simultaneously using delta baited sex pheromone traps. Installation of these traps helped in early detection of the pests for timely implementation of control measures. In our studies we have observed that there is not much

significant difference in the quantity of spray solution required for the different planting densities as the plant canopy gets considerably reduced in UHDP and HDP (more vertical growth than lateral) as the tree ages due to the pruning and training operations. But such planting densities demand a greater number of sprays (9 times/year) than in conventional planting density (6 times/year) for the control of sucking insect pests in acid lime cultivar.

PROPHYLACTIC MEASURES

It is a well-known fact that pruning results in initiation of new flush which is the site of attack for these sucking insect pests. Due to the closer spacing and intermingling branches, the spread of the pest population from infected plant to a pest-free plant is comparatively quicker. Hence, pruning the intermingling branches, affected and dried shoots is mandatory and there by modify the canopy structure for increased sunlight penetration. Utmost care has to be taken to avoid pruning during active growth period to prevent the build-up of certain pests of flushing seasons like leaf miner. Regular practise of water shoot removal should be done to prevent the sheltering of leaf miner, blackfly-whitefly and aphids during off season. Yellow sticky cards can be used for monitoring of sucking insect pests. Plant protection measures should be adopted when the pest population is above economic threshold levels (ETL).

CONCLUSION

High-density and Ultra-high-density plantings is found to increase fruit yield as well as quality in young groves under the same quantity of fertilizer source (controlled release) and irrigation (micro sprinkler) in citrus. Since the demand for fruit is increasing in the market, to achieve higher yield of good quality fruit this concept of closer spacing is acceptable. With respect to insect pests and disease incidence, it is obvious that planting density and insect pest-disease incidence is inversely proportional. But we also found that bio-agent population build up will be accelerated which helps to check the pest population in a natural way. Equipment modification for plant protections and pruning/training operations is required. Maximum productivity may be attained at a very young age even though yield at maturity will not exceed yield for mature plantings at lower densities. Investment costs will be higher for high density plantings with higher initial risks under unforeseen circumstances.