

## High Density Planting System in Fruit Crops

Udita Mondal

Assistant Professor, Brainware University, Kolkata

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### Introduction

High density orchard plantation is one of the most important novel concepts of increasing productivity without affecting the quality of fruits. After China India is the largest producer of fruits in entire world. For earlier production and economic benefit HDP has been found to be the most suitable technique for tropical and subtropical fruits. In addition to that restricting vegetative growth by dwarfing of root stocks, controlling the bio regulators play vital role in accommodating more plants per unit area *viz.*, Dashehari mango (1333 plants ha<sup>-1</sup>), guava (5000 plants ha<sup>-1</sup>), papaya (6400 plants ha<sup>-1</sup>), etc. HDP maintains a balance between vegetative and reproductive growth without affecting the plant health (Mishra, D.S. and Goswami, A.K.2016). So it can be concluded that high density planting has great potential for increasing productivity in fruit crops (Mishra *et al.* 2013).

### Principles of HDP

Maximizing returns per unit area

Better utilization of solar radiation and harnessing maximum possible returns per unit area per unit time. Both fruit yield and quality enhancement

### Choosing HDP over normal planting

The high density planting has several advantages as compared to the normal or low density planting system. The ever increasing population has led to shrinkage of land owing to diversion of orchard lands along with various other reasons like rising energy and land-costs with mounting demand for fruits have made it vital to achieve higher productivity of fruit crops from a limited space and time. When the tree is having vigorous growth the vegetative phase prevails over reproductive phase, which affects flowering and fruiting due to high competition for photosynthesis between that two-phase of the plant. Such things can be ward off through High Density Planting. High density planting is easily manageable and precocious. It is also open to several water-saving micro irrigation methods like drip and sprinkler irrigation methods which ultimately bestow higher yield, water use efficiency and

water savings as well. It is more amenable to several horticultural operations like pruning, trimming *etc.* The high-density orchard provides 8-9 times higher yields than the traditional ones as demonstrated by Ram (10) in alternate bearing of Dashehari mango in north India. Dashehari mango at 2.5 m × 3 m (1,333 plants ha<sup>-1</sup>) was raised under HDP with pruning and dehorning after the harvesting followed by paclobutrazol application and yield was secured every year (Mishra, D.S. and Goswami, A.K. 2016).

### Obstacles in HDP

Overcrowding results in building up of high humidity, reduced ventilation in the orchard, which results in diseases and pest infestation. There grows the chance of competition for nutrient, space and water which may affect the crop health. Plants growing closely results into low fruit size with lesser quality and one plant with vigorous growth can overcrowd another plant resulting in lower yield also.

Table: 1- Spacing at different planting system in fruit crops

Sr. No.	Crop	Normal spacing (m)	HDP spacing (m)	Meadow spacing(m)
1.	Mango	7.5 X 7.5 - 12.5 X 12.5	3 X 2.5 – 5 X 5	2.5 X 2.5 - 3 X 1
2.	Banana	2 X 2 - 2 X 3	1.5 X 1.5 - 1.8 X 1.8	1.2 X 1.2 - 3 X 0.5
3.	Citrus	6 X 6 – 8 X 8	3 - 6 X 3 - 4.5	-
4.	Papaya	2 X 2 – 3 X 3	1.8 X 1.8	1.2 X 1.2 - 1 X 1
5.	Gauva	6 X 6 – 8 X 8	3 X 3 – 3 X 1.5	2 X 2 - 2 X 1
6.	Sapota	10 X 10	5 X 5	-
7.	Aonla	10 X 10	5 X 5	-
8.	Apple	10 X 10	3 X 0.75	3 X 0.37 - 0.60

For obtaining better yield and quality HDP can be achieved with the suitable use of following components, they are (a) Dwarf scion varieties, (b) Dwarfing rootstocks and interstocks, (c) Training and pruning, (d) Use of growth regulators and (e) Suitable crop management practices.

**Table 2. Use of genetically dwarf scion varieties**

Crop	Genetically dwarf cultivars	Desirable features
Mango	Amrapalli	Precocious & tend to bear regularly
Papaya	Pusa Nanha	Dwarf & tend to bear at lower height
Banana	Dwarf Cavendish	High yielding with dwarf stature
Apple	Spur varieties like Red Chief, Oregon Spur	Bear on short stem, spurs; grow to 60-70% of standard cultivars in vigour and bear more spurs and yield more
Cherry	Compact Lambert, Meteor and North Star	High yielding, self fruitful, Dwarf
Peach	Red heaven	Dwarfing & high yielding
Sapota	PKM-1 PKM-3	Columnar tree shape Dwarf tree stature

**Table 3. Use of Dwarfing Rootstock**

Crop	Dwarfing Rootstock
Apple	M9, M26, M27, Bud.9, P22 & Ottawa3
Pear	Quince C
Peach	Siberian C, St Julien X, Prunus besseyi and Rubira
Plum	Pixy
Cherry	Colt and Charger
Ber	<i>Zizyphus rotundifolia</i>
Citrus	Citrangquat, Feronia and <i>Severinia buxifolia</i>
Guava	<i>Psidium friedrichsthalianum</i> , <i>P. pumilum</i>

**Use of pruning to control tree growth**

Several attempts have been made by various workers on pruning for canopy management in high density orchards (Sharma and Singh, 2006; Mishra and Lal, ; Nath *et al.*,2007).Mango, guava, litchi and other fruit crops in India are evergreen and are seldom pruned. In case of slow growing trees pruning and training responds favourably and can be

maintained at a given size and shape without sacrificing yield. In case of grape, apple and some other temperate fruits tree size can be controlled through pruning.

### **Use of growth retardant**

Plant growth regulators such as Paclobutrazol, Alar, Uniconazole, prohexadione-calcium have predominantly been used to restrict vegetative growth in case of high density orchard plantation. Among these these Paclobutrazol treatments in mango at Pantnagar induced flowering and fruiting in new shoots produced after pruning without any fruit quality loss. However, uniconazole was more prominently effective for restricting shoot growth than paclobutrazol in avocado in South Africa (Kohne and Kremer-kohne., 1989).

### **Suitable crop management practices.**

High density planting systems has been successfully adopted improved yields using double hedge row system of planting in litchi (Mishra et al.2016), mango (Singh et al.2016.,Nath et al.2007), aonla (Singh et al.2012) guava (Lal et al.,2007 Singh et al. 2016) etc. Plant spacing using different planting systems like hedge row, double hedge row, paired planting and cluster planting has come out to be an important tool in achieving high quality produce and productivity. However, early production of high quality fruit and its sustainability in the long run is an important factor in case of high density planting in an orchard plantation.

### **Conclusion**

High density planting is very profitable and standardized systems in tropical and subtropical fruit trees like Mango, litchi, Guava are grow vigorously in tropical and subtropical region. But the use of pruning machineries are very low in India as well as the initial investment cost is showing less interest among farmers in adoption of this techniques. However adoption of modern training pruning system with proper planting material, systematic use of fertiliser, adoption of dwarfing rootstock, scion cultivars, proper farmers training as well as microirrigation methods can be of great profit in the long run.

### **References**

Kohne, J. and Kremer-Kohne (1989). Comparison of growth regulators paclobutrazol and uniconazole on avocado. *S. Afr. Avocado Growers Assoc. Yearb.*, 12 : 38-39.



- Lal, S., Tiwari, J.P. and Mahajan, A.R. (2007). Studies on planting systems in guava (*Psidium guajava* L.) cv. Sardar. *Acta Hort.*, 735 : 263-266.
- Mishra, D.S. and Goswami, K.S. (2016). High density planting in fruit crops. *HortFlora Research Spectrum*. 5(3); 261-264
- Mishra, D.S. and Lal, R.L. (2013). Canopy management in overgrown litchi orchards for improving yield and quality. In: *Canopy Management and High Density Planting in Subtropical Fruit Crops* (Eds.) Singh, V.K. and Ravishankar, H., Army Printing Press Lucknow pp. 225-228.
- Mishra, D.S., Lal, R.L. and Chand, S. (2014). Precision litchi culture technologies in Uttarakhand. In : *Recent Plasticulture Approaches Towards Precision Horticulture* (Eds.) Mishra, D.S., Singh, C.P., Singh, P.K., Singh, D., Singh, V.P. and Dhami, V., PFDC, Pantnagar, pp. 73-77.
- Nath, V., Das, B. and Rai, M. (2007). Standardization of high density planting in mango (*Mangifera indica*) under sub-humid Alfisols of Eastern India. *Indian J. Agri. Sci.* 77 : 3-7.
- Sharma, R.R. and Singh, R. (2006). Pruning intensity modifies canopy microclimate, and influences sex ratio, malformation incidence and development of fruited panicles in 'Amrapali' mango (*Mangifera indica* L.). *Sci. Hort.*, 109 : 118-122.
- Singh, A.K., Singh, C.P. and Pandey, G. (2012). Effect of planting systems on growth, yield and quality of mango (*Mangifera indica* L) cv. Dashehari. *Ann. Hort.*, 5 (2) : 173-178.
- Singh, A.K., Singh, S., Appa Rao, V.V., Bagle, B.G. and More, T.A. (2011). Effect of high density planting systems on the productivity of NA-7 aonla under rainfed conditions. *Indian J. Hort.*, 68 (4): 461-465.
- Singh, G., Singh, A.K. and Mishra, D. (2007). High density planting in guava. *Acta Hort.*, 735 : 235-241.