K. K. Srivastava*, Dinesh Kumar and P. K. Shukla

Transforming conventional mango orchard to high-density planting for high productivity and quality mango production

Malihabad is a famous *'Dashehari'* mango growing region of Uttar Pradesh and exports mango to various parts of India as well as outside countries. Mango is traditionally grown at 10-12 m distance accommodating only 100-70 plants per ha resulting in large tree size and such trees starts late bearing. The high density planting system accommodates 8-10 times more trees/ha and bearing starts early, ultimately more income. Shri Vijay Kumar Shrotia, resident of Lucknow, started HDP planting of mango with technical support of CISH and earned ₹ 1.5 to 2.0 lakh per ha in 3rd year and ₹ 3.5-4.0 lakh/ha in 7th year. Due to small statured trees, harvesting of fruits and interculture operation are quite easy. CISH organized on-farm training and demonstrations for wider adoption of the HDP system.

MANGO is the most important fruit of India. Uttar Pradesh leads in area and production of mango. Malihabad region is 14th most important Mango belt. In most parts of the country, mango is grown at 10×10 m or 12×12 m distance accommodating only 100 to 70 plants/ha area. Due to long gestation period of traditional mango plantations, farmers have to wait long for income. Moreover, tall and huge statured growing trees involve more capital investment to control disease, pest and in fruit harvesting as the fruiting zone is on the upper periphery of canopy which makes bagging of fruits difficult for quality enhancement. Alternate bearing pattern in *Dashehari*, *Langra*, *Chousa* and Lucknow Safeda varieties lead to high yield in one year and poor or no yield in another year, and due to on and off bearing pattern, farmers experience hardship.

ICAR-CISH has developed high-density planting system for high productivity and quality of mango. Sh. Vijay Kumar Shrotia, R/O Aliganj, Lucknow, Uttar Pradesh, contacted CISH for adoption of intensive orcharding system for regular yield of mango in his field. CISH Scientists provided full technical support for spacing, layout of orchard, pit digging, pit filling, selection of varieties, planting technique, time of planting, training of young plantations, canopy management, irrigation and nutrient management practices, annual containment pruning, harvesting, bagging of fruits, disease and pest management etc. The results obtained were quite encouraging.

The mango plantation was done during July-August 2017 at Hardaurpur, Bakshi Ka Talab, District Lucknow, a famous mango belt of Malihabad, Uttar Pradesh. The grafted plants of mango varieties i.e. Amrapali, Arunika, Ambika and Mallika obtained from CISH nursery were planted at 3×3 m distance. The pit of 1×1×1m deep was dug during May-June 2017 and after one month, pit was refilled with upper layer soil, 10 kg FYM, 2 kg vermicompost, 250 g bonemeal, 250 g neem cake, 100 g/pit Di-ammonium phosphate. After the start of monsoon showers, the planting was carried out in July. The newly planted saplings were supported by bamboo stick to keep the plants straight. In case of no rainfall, irrigation was provided. The plants were trained in open center system which finally develops a semi-spherical type canopy. To keep the tree canopy under control, annual light pruning and thinning out was done after fruit harvest in August. The irrigation was given through drip system. Each tree was provided 2 drippers of 4 LPH discharge capacity. Disease and pest management was carried out as per CISH recommendations. The bearing in mango varieties started in 2rd year, yielding 10-15 fruits/tree (1.5-2.5 kg/tree) and in 3rd year, 20-35 fruits/tree (6-8 kg/tree) (7.5 t/ha) and at the age of 6-7 years, 13-15 kg fruits/tree were harvested with average fruit weight 210-220g/fruit (14-16 t/ha) with 22-27^0 Brix T.S.S and per ha income was ₹1.5-2.0 lakh and from 7th year onwards, earnings were ₹ 3.5-4.0 lakh from one ha of area.

Nutrient and water management

In bearing trees, nutrients were applied at different phenological stages, i.e. after harvest (40 g N, 20 g P and 25 g K), pre-flowering (25 g N, 20 g P and 20 g K), flowering to fruit set (20 g N, 10 g P and 25 g K), fruit development stage (15 g N and 30 g K). Well decomposed farmyard manure, source of soluble fertilizers such as NPK grade (18:18:18%), urea and Muriate of Potash were

Tree architecture development and management

Two year old HDP mango started bearing

Amrapali at the age of 4 years laden with fruits

Mango variety Amrapali in full bearing at 4 years of age

Dr Dinesh Kumar advising farmer for water and nutrient management through drip system

Mango variety Mallika in full bearing after 5-6 years

applied at different phenological stages. The nutrient doses as per the stage was divided into six dose and applied at weekly intervals. The concentration of the nutrient solution was >1-1.5% and injected through ventury. For irrigation, drip irrigation is most effective and efficient technology to supply precise amount of water directly to root zone by saving of water through percolation and seepage losses. The water requirement assessed on daily

Mango variety Amrapali tree laden with fruits after 5-6 years

Amrapali in full bearing at 6-7 years of age

Arunika, a coloured, export potential variety of mango after 6 years

Mango variety Ambika is in bearing at 5-6 years of age

On-Farm training and gosthi on HDP mango by the ICAR-CISH Scientists

basis and applied through drip on alternate day. During the rainy season (June to September), rain provides 30-40% of total crop water requirement, and from October to May, crops require 60-70% irrigation water for better productivity and quality.

The mango belts of Malihabad are predominant in '*Dashehari*' mango cultivation and the market gets flooded at the same time, hence, farmers get poor return. To make mango plantations profitable business, it is advisable to go for high-density planting along with diversification in varietal front which widens the scope of profit. The high density plantation quickly comes into bearing 2nd year after planting and canopy occupies allotted space soon, the small statured trees ease the pruning, training, bagging and pest and disease management. CISH HDP technology has changed the perception of farmers. Therefore, the fresh mango plantations are being done under high density system coupled with coloured varieties which mature mid-to-late in season.

For further interaction, please write to:
Dr K. K. Srivastava (Principal Scientist), ICAR-Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh 227 101. *Corresponding author: Kanchan.Srivastava@icar.gov.in