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Rejuvenation in Mango

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- ✓ Mango (*Mangifera indica* L.) belonging to family Anacardiaceae is the most important commercially grown fruit crop of Indian subcontinent and is believed to have originated from south east Asia
- ✓ It is one of the most popular, nutritionally rich fruit with unique flavour, fragrance, taste and health promoting qualities making it a common ingredient in new functional food often called "The king of fruits" and rightly known as "national fruit of India"
- ✓ Fruit orchards have different phases like vegetative phase, pre-commercial bearing stage, economically bearing stage and lastly declining senile production stage
- ✓ In mango orchards, the economically viable phase of commercial production starts from 8 years onward and continues for a period of 20-22 years which with light canopy management intervention can be prolonged up to another period of 15-20 years resulting into total productive stage 40-45 years. Thereafter they start declining in the production and productivity levels
- ✓ It is common to see that every living organism after some period of time loses its efficiency to perform various functions. Likewise, in fruit plants also, there is a decline both quality and quality of produce after some period of time. As a result of which orcharding becomes economically non-viable and non-remunerative
- ✓ Presently in India, at least 30-40% of fruit orchard become old, senile and unproductive
- ✓ The old and senile orchards are now reverting towards a declining trend of production because of plant age factor, non-compatible varieties, poor canopy management, incidence of insect pest and diseases, non-availability of productive shoots and less penetration of sunlight due to overcrowding of branches
- ✓ The grower does not adopt the proper management practices in terms of plant protection, manuring, irrigation, mulching, pruning *etc.* and the orchard become sick
- ✓ Poor selection of material, haphazard plantation and poor management has made many orchards uneconomic
- ✓ For overcoming the problem of unproductive and uneconomic orchards existing in abundance, large scale uprooting and replacement with new plantations will be long term and expensive strategy
- ✓ Therefore, research efforts were initiated to standardize a technology for restoring the production potential of existing plantation by a technique called rejuvenation

What is Rejuvenation?

"Rejuvenation is the process of pruning and after pruning management of the plants to make them productive by utilizing the root system. which mean restoring the productive capacity of the fruit trees"

- ✓ Rejuvenation means restoring the vitality and freshness of plants

- ✓ It is other name of renewal
- ✓ It is practiced to restore the fertility of tree
- ✓ If the tree is showing huge decline in production, rejuvenation can restore its viability

Principles

- Trees have latent buds which are activated by heading back of branches at certain point to put forth new sprouts which grow into branches forming fruiting area
- When the branches are cut back, imbalance is created in root: shoot ratio as a result new shoots arise from plant to balance it

What is senility?

Senility is a stage of the plant in which after a long span of continuous fruiting, the ability of the branches or limbs and or whole tree to produce vigorous and efficient twigs having capacity to bear the fruit is reduced.

Characteristics of senile orchards

- ✓ Predominance of long unfruitful branches and tip bearing habit
- ✓ Reduction in the ability of a particular branch to produce vigorous and efficient twigs which can bear fruit
- ✓ Overcrowding of branches in the inner part of the canopy leading to restricted sunlight penetration
- ✓ Heavy incidence of pest and disease
- ✓ Drastic reduction in fruit yield, size and appearance

Objectives

- ✓ To increase the productivity and economic age of plant
- ✓ To convert the low yielding and inferior varieties/seedling origin trees into superior and high yielding trees
- ✓ To exploit the better root system of a plant who has survived in adverse soil and climatic conditions
- ✓ To reduce the time of gestation period
- ✓ To increase the orchard income
- ✓ To reduce the incidence of diseases and pests

Considerations for rejuvenation

- ✓ Age of the plant
- ✓ Ability of the species to coppice
- ✓ Frame of the tree
- ✓ Time and severity of rejuvenation
- ✓ Post rejuvenation care
- ✓ Transformation of rejuvenated juvenile shoots into productive one
- ✓ Top working to change the variety

Advantages of rejuvenation

- ✓ Utilization of existing root system
- ✓ Lowering the fruiting area which can be conveniently managed
- ✓ Creation of extra space for inter cropping in orchard
- ✓ Availability of large amount of pruned wood which can be provide additional income
- ✓ Enhancing the productivity of plant

Reasons for low productivity in mango

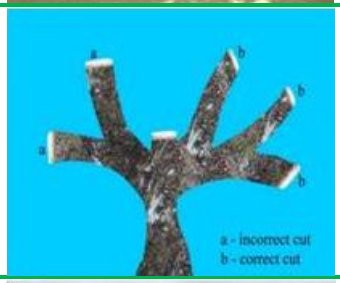
- ✓ Senility of mango trees
- ✓ Predominant existing orchards are of Seedling progenies

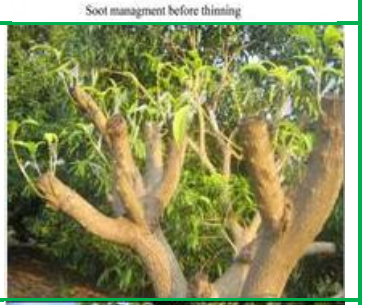
- ✓ Long gestation period
- ✓ Alternate bearing habit of mango
- ✓ Dominance of vegetative phase over reproductive phase Conventional spacing (wider spacing) followed in many parts of the country
- ✓ Physiological disorders associated with mango
- ✓ Pest and disease problems

Rejuvenation Strategies

- ✓ Mark trees and their undesired branches for pruning
- ✓ Pruning of marked branches should be done in the recommended month
- ✓ Pruning should be done in alternate row
- ✓ Pruning should be initiated from lower surface of the branch and alter from upper surface to avoid cracking of branch and bark splitting
- ✓ Immediate after heading back, apply copper oxychloride paste on the trunk, branches as well as cut surfaces to avoid infestation of diseases
- ✓ Care should be taken to control pests and disease
- ✓ After pruning a greater number of shoots will emerge, for proper growth of newly emerged shoots thinning out of undesired shoots is essential

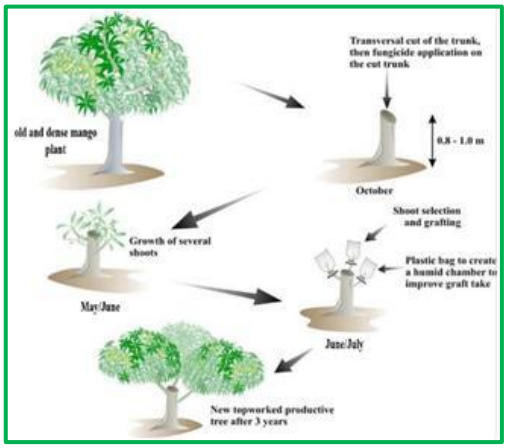
Steps for Rejuvenation in Mango

Step-1	Select the overcrowded and uneconomical mango orchard of more than 30 years' old	
Step-2	Mark the branches, central trunk is beheaded from about 3-5 meter height from the ground level which having 4-5 outward growing primary branches	
Step-3	Paste cow dung slurry or copper oxychloride on cut portion	
Step-4	Plough the orchard and prepare it for intercrops	

Step-5	Application of full dose of 3 kg SSP and half dose of 2.5 kg urea along with 100kg FYM in February month is recommended for each pruned tree	
Step-6	These trees must be irrigated at interval of 15-20 days before onset of rainy season	 Soot managment before thinning
Step-7	Select 6-8 healthy sprouted shoot in June-July month on each stub and graft them with the desired cultivar and half dose of 2.5 kg. urea is given during June month	
Step-8	Thinning of new emerging shoots and retain 6 to 8 outward growing, well-spaced, healthy shoots on pruned branches	
Step-9	➢ Application of paclobutrazol to restore the canopy productivity ➢ Year of application: Third year after pruning ➢ Time of application: September-October	
Step-10	Rejuvenated mango trees come into bearing within 2.5-3 years depending up on the grafted cultivar and climate situation	

Top working

1. Dense old and unproductive seedling tree
2. Heading back of branch from 2.5-3.0 m above the ground level→ December/January
3. Emergence of new shoots on beheaded branch
4. Thinning of newly emerged shoots
5. Top working by grafting/budding →May-August
6. After sprouting of bud, removal of top portion above the budding point
7. Fruiting after 2 years



Advantages of top working

✓ Increase the tree productivity
✓ Conversion of old and senile orchards into productive orchards

- ✓ Conversion of inferior variety orchard into new orchard with desirable variety or varieties through top working.
- ✓ Possibility of grafting several varieties on the same plant
- ✓ Increasing the fruit set of orchards by grafting few shoots with pollinizer varieties

Calendar of Activities

December – January

- ✓ Marking of trees and their undesired branches for pruning. Pruning of marked branches in December
- ✓ Pruning to be followed in alternate row
- ✓ Application of copper oxychloride paste on the trunk, branches as well as cut surfaces to check microbial infection
- ✓ Ploughing and weeding of orchards in January
- ✓ Preparation of basins and irrigation channels

February – March

- ✓ Application of recommended full dose of single super phosphate 3 kg/tree and half dose of urea 2.5 kg/tree in basins by the end of February
- ✓ Careful observation for infestation of stem borer in pruned trees: placing cotton wick soaked with dichlorvos or kerosene oil or inject water emulsion of chlorpyriphos
- ✓ Spray carbendazim 50 g/100 litre of water spraying against hopper

April – May

- ✓ Irrigation as per requirement
- ✓ Mulching in basins around trees
- ✓ Hoeing and weeding in basins
- ✓ Care for new emerging shoots
- ✓ Observation for incidence of stem-borer and its management

June – July

- ✓ Thinning out of undesired shoots while retaining about 8-10 healthy shoots
- ✓ Application of remaining half dose of 2.5 kg urea per tree during June
- ✓ Application of 120 kg FYM per tree in basins during July
- ✓ Spray of copper oxychloride (3 g/litre) twice at an interval of 15 days if there is infestation of anthracnose and other leaf spot diseases on new leaves
- ✓ If there is serious incidence of leaf cutting weevil, two sprays of 2% carbaryl (2 g/litre) at an interval of 15 days
- ✓ Sowing of green manuring crops or inter crops

August – September

- ✓ Thinning out undesired shoots
- ✓ Observation of incidence of stem-borer and anthracnose and other leaf spot diseases and their management
- ✓ If attack of Mango Leaf Webber is noticed, spraying of 0.05% quinalphos
- ✓ Ploughing of green manuring crops
- ✓ Cleaning and removal of weeds to be done

October-November

- ✓ Cultural operations of ploughing, hoeing, weeding *etc.*
- ✓ Removal of dried and diseased twigs
- ✓ Management of insect pests and diseases
- ✓ Spray 200 ppm NAA to overcome the mango malformation

Research Recommendations

Junagadh Agricultural University - Junagadh

1. The farmers of South Saurashtra Agro-Climatic Zone having rejuvenated Kesar mango trees of 40 years old and are advised to spray cycocel (CCC) @1000 ppm (1 ml in one liter of water) during October and second spray after a month in order to increase yield and net return. [Rejuvenation done during 2013 and bearing of rejuvenated tree started from the year 2016]
2. Farmers in the South Saurashtra Agro-Climatic Zone with Kesar mango orchards that have been revived for 40 years are advised to apply paclobutrazol @ 7.5 g *a.i.* per tree in the month of mid-July in soil with 150 percent RDF (i.e., 150 kg FYM + 1125: 240: 1125 NPK g/tree) for getting higher yield and net return. [Rejuvenation was completed in 2013 and the tree's bearing cycle began in 2016.]

Navsari Agricultural University – Navsari

1. Effect of heading back and training on growth, flowering, yield and quality of fruit in old orchard of mango cv. Kesar (2015)
2. The farmers of south Gujarat with heavy rainfall zone are advised to headed back their high density planted (5 m x 5 m) old mango tree cv. Kesar at 4 to 5 m height from ground level and maintain 6 newly emerged tertiary limbs to get higher yield with quality production
3. Effect of heading back and training on growth, flowering, yield and quality in old orchard of mango cv. Rajapuri

The farmers of south Gujarat with heavy rainfall of Agro-climatic zone are advised to headed back of above 30 years old mango tree cv. Rajapuri at 4 to 5 m height from ground level and maintain 6 newly emerged tertiary limbs to get higher yield with quality production

Note:

1. Rejuvenation should be done after completion of monsoon (in month of October)
2. For rejuvenation slant cut should be made and cut portion should be treated with copper fungicide
3. Care should be taken for controlling stem borer by frequent visit of rejuvenated orchard

Conclusion

It can be concluded that the orchard can be pruning up to 3rd to 5th order or up to 2 meter with keeping 3 to 4 diverse branch followed by recommended package of practices. This helps in restoring the production potential, as well as in maintaining the manageable tree height with open architecture.

Future Thrust

- ✓ The method, height, timing of pruning and rejuvenation in mango orchards need to be standardised
- ✓ Rejuvenation technology is accepted by the farmers but still farmers have some doubt in their mind about these techniques, however due to positive results of rejuvenation technique their perspective might be changing
- ✓ The required technical training for rejuvenation technology needs to be provided