

### Alternate Bearing in Mango: Causes and Management

Anshul S. Lohakare

Assistant Professor, College of Horticulture, V.N.M K.V. Parbhani (M.S.)

#### SUMMARY

Alternate Bearing is the phenomenon of bearing heavily in one year followed by a lean crop or no crop during next year which can be specifically called as 'alternate bearing', while irregular or erratic bearing is that in which the tree bears in one year followed by two or three 'off' years. These phenomena are mainly due to specificity of varieties, climatic changes in a locality, imbalance in soil nutrition status and consequent changes in balance of these nutrients in the shoots of the tree mainly the carbohydrate / nitrogen and hormonal substances. No single reason could be pin pointed to this strange phenomenon. To avoid alternate or erratic bearing, an integrated management practices needs to be followed by the horticulturist.

#### INTRODUCTION

It is a burning problem in mango industry since; it renders cultivation of mango less remunerative to the growers. When the mango tree bears heavy crop, the bearing season is called 'on' year. When it bears a poor or lean or no crop, the season is called 'off' year. In both the years the mango grower is at a loss. In the 'on' year there is abundant fruiting and the market is flooded with fruits and the prices fall down. In the off year, there is scarcity of fruits for supply to market, prices are highly remunerative but the grower has a very little or no fruits to supply to the market. Most of the promising varieties like Alphonso, Dashehari, Chausa, Langra, Mulgoa, Kesar etc. are prone to this malady. In some instances, however, failure to crop in one year is not followed by normal crop. Instead, two or more bad years succeeds before a good cropping year occurs again. Thus, the rhythm of bearing is not strictly alternate but irregular and erratic. The non-bearing intervals seem to be longer in neglected orchards and old ones, while in good orchard it tends to appear a biennial bearing or alternate bearing. In broad sense, two major factors seems to be responsible for alternate bearing in mango *viz.*,

**Internal factors:** Physiological, genetical, nutritional, sex ratio, hormonal imbalance and

**External factors:** Rain, wind, temperatures, cloudy weather, light, pests and diseases.

The influence of individual cause is discussed as below.

#### Probable causes:

**Genetic or varietal factor-** Most of the south Indian varieties and almost all hybrids are regular-bearer, whereas north Indian ones are alternate-bearer. The habit of bearing heavy and poor or no crop in alternate years is believed to be an inherent character hence the selection of regular bearing varieties specific to a locality is very important. The Neelum, Totapuri and Bangalora are regular bearers under South Indian conditions which are not much affected by changes in weather conditions in a particular year while, Rumani is adjudged as a stable variety under Gujarat condition. The varieties like Bangalora, Neelgoa, Neeleshan can be chosen if assured irrigation is available so that there can be regular cropping. As per physiological studies in regular and irregular varieties of mango indicated that mesophyll cells in leaves of the regular mango varieties are more uniform and highly efficient in CO<sub>2</sub> utilization.

**Seasonal vegetative growth-** The maturity of shoots, age of trees and flushing episodes influence on flowering in mango. The vegetative growth and new flushes are occurs at different times in different part of the country. In mango a definite relationship appears to exist between growth of vegetative flushes and fruit bud formation. An early production of shoots during the first flush (February-April), and an early cessation of the growth in the season seem to be conducive to regular bearing in mango. But in several old and neglected orchards the tree bearing heavily in a year put forth little or no vegetative growth during flowering to fruit maturity, and as such no fruiting wood is available for the following year, which consequently, turns out to be an off year for cropping. Generally 8-10 month old mature shoots produced in spring and early summer that cease to grow at least 4 months prior to blossoming season will initiate flowering. Thus the spring and summer shoots get sufficient time to grow rest and mature for producing flowers but later formed shoots fail to achieve this physiological maturity.

**Low C/N ratio-** It is also contended that irregular bearing in mango is caused by nutritional deficiency especially Nitrogen. A proportionate increase in nitrogen leads to vegetative growth, whereas its proportionate decrease

induces flowering. Higher starch reserves, total carbohydrates and C: N ratio favors flower bud formation but not in Baramasi and regular bearing varieties. Studies on nitrogen content in stems and leaves of different cultivars indicated possibility of high number of trees to flower, but no correlation between flower bud initiation and total nitrogen could be derived. Thus C: N ratio reserve, though playing an important role in flowering, may not be the primary cause of biennial bearing.

**Hormonal imbalance in the shoots-** The higher level of auxin like substances and lower levels of gibberellins (GA<sub>3</sub>) like substances are vital for the production of floriferous shoots in mango.

**Bearing nature of trees and pollination-** The varieties that produce mostly terminal inflorescence and only few auxiliary types of flower clusters are more markedly biennial bearers; while those varieties which produce a greater percentage of auxiliary inflorescence are moderately regular bearing. All the precautions to ensure the production of flower buds may be taken, but without proper pollination, trees will still fail to bear. Mango cultivars within a species either cannot produce fruit or will produce very little when pollinated with their own pollen. Such trees require pollen from another cultivar of the same species to be fruitful and hence it may be beneficial to grow few trees of other variety in mango orchards for better pollination.

**Adverse climatic condition-** It includes cloudy weather, rains, high humidity, convert an 'on' year in to an 'off' year by promoting incidence of mango hoppers and diseases like powdery mildew and anthracnose etc., especially during flowering, preventing pollination and damaging the floral parts. Frost during flowering adversely affects fruit set there by turning an 'on' year in to 'off' year. Though mango is a hardy tree an adverse weather condition can convert an 'on year' into an 'off-year'. The mango cultivated under tropical and subtropical conditions exhibiting different flowering behavior. Therefore, cool temperature is the dominant induction factor, which provides stress that is essentially needed for fruit bud differentiation. If frequent showers occur during the period of fruit-bud differentiation (October- November) and flowering (January) with cloudy weather and excessive dew, both flowering and fruit set would be adversely affected. Dry and cool weather with a diurnal temperature around 20°/15 °C during winter season trigger flowering induction.

#### **Suggested measures to overcome alternate bearing:**

- Planting of varieties which are regular bearers eg. Totapuri, Rumani, Banglora, Neelum, Mallika, Amrapali and Ratna.
- Plough and harrow the orchard twice in a year, in the beginning of the monsoon after harvest and in October.
- Apply the fertilizers as per recommended schedule.
- After the harvest of the crop, dead and diseased branches and the Loranthus parasite should be cut off and removed.

**Deblossoming:** Half the number of flower clusters are removed from the tree in the 'on year' as soon as they emerge. The food reserves of these deblossomed shoots would be utilized by the tree in producing vegetative growths in the spring and summer and mature to produce. Over vigorous trees may be subjected to induce rest by withholding irrigation with good exposure to sunlight.

**Pruning:** Proper pruning of mango trees after the harvest gives the best results in terms of disease and pest management, diversion of food materials to the productive shoots, increased photosynthetic activity and increased carbohydrate and starch content, early production of new flush that bear the crop in the next season. Pruning also helps in increased cytokinin content, Ascorbic acid and auxin, which is beneficial for flowering. Thus pruning helps in obtaining regular fruiting and production of quality fruits.

Smudging during October-December is reported to be useful in forcing Mango to flower but has limited practical utility.

**Hybridization:** By crossing good quality variety with regular bearing varieties may be helpful in inducing regular bearing tendency in to the hybrid eg. Mallika and Neeleshan.

- Providing orchards with wind breaks, liberal manuring at appropriate intervals and adequate irrigation and other cultural practices are also recommended for regular bearing.
- Spraying 1% urea immediately after harvest of fruits in rain fed orchards and prophylactic sprays against mango hopper during September- October, also helps in regularity in bearing.
- Application of growth retardants like Paclobutrazol (Cultar) which restrict vegetative growth and put forth regular flowering.

**Use of Paclobutrazol (Cultar)**

- The application of paclobutrazol @ 3 ml/m average canopy diameter.
- It should be applied from 15<sup>th</sup> July to 30<sup>th</sup> August in Konkan region whereas, it should be applied in Marathwada region of Maharashtra during 25<sup>th</sup> August to 25<sup>th</sup> September because occurrence of flowering is late in remaining part of the state than konkan region.
- For regular bearing it should be applied every year.
- Average canopy diameter (m) = N-S diameter (m) + E-W diameter (m)/2.
- Quantity of Paclobutrazol in ml/tree = Average canopy diameter X 3 ml.
- A required quantity of Paclobutrazol be dissolved in plastic bucket containing 3-5 L water.
- A 30-35 small holes (10-12 cm deep) are to be dug inside the tree canopy at uniform distance.
- Then the uniform quantity of solution drenched into holes, followed by closing of holes with soil.
- Weeding should be done before application of Paclobutrazol.
- The soil should be sufficiently wet at the time of Paclobutrazol application.

**CONCLUSIONS**

Alternate bearing tendency in mango has been one of the major problems. Most of the south Indian varieties are regular-bearer, whereas north Indian ones alternate-bearer. As it is a complex phenomenon a package of practices to be followed including soil drenching with paclobutrazol which is a promising chemical for flower induction with minimum outbreak of vegetative flushes during September to October giving an early and profuse flowering and more annual yield without affecting fruit size and quality in mango.

**REFERENCES**

- Davenport TL (2007) Reproductive physiology of mango. *Braz J Plant Physiol* 19(4): 363-376.
- Jangid R, Kumar A, Masu MM, Kanade N and Pant D (2023) Alternate Bearing in Fruit Crops: Causes and Control Measures. *Asian Journal of Agricultural and Horticultural Research*, 10(1), 10-19.
- Kumar A, Bhuj BD and Singh CP (2021) Alternate Bearing in Fruits Trees: A Review. *Int.J.Curr.Microbiol.App.Sci.* 10(01): 1218-1235.
- Nimisha S, Sanjay KS, Jai P, Manish S, Ajay KM, Nagendra KS (2017) Understand Bearing Habit in Mango. *Curr Trends Biomedical Eng & Biosci.* 7(2): 30-32.
- Sharma N, Singh SK, Singh NK, Srivastav M and Singh BP (2015) Differential Gene Expression Studies: A Possible Way to Understand Bearing Habit in Fruit Crops. *Transcriptomics* 3: 110.