

TECHNICAL BULLETIN

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Sustainable Management of Flower and Fruit Dropping of Mango

Mango, due to its sweet taste, pleasing flavor and delicate texture, is one of the most popular fruits in Bangladesh. It has also a high nutritional value. However, severe flower and fruit dropping, despite adequate flowering and initial fruit setting, continue to be a major cause of low mango yields and economic losses for the producer farmers in the country.

Different biotic and abiotic factors are responsible for mango fruit dropping. Insect and disease infestation is the most damaging biotic factor, while macro and micronutrient deficiencies due to the lack of proper and balanced fertilization and water stress especially during flowering and fruit setting are the major abiotic factors responsible for flower/ fruit drops.



These biotic and abiotic stresses not only cause fruit dropping but also adversely affect the size and quality of fruits, and thus, their market values and overall profits. Chemical pesticides are presently used indiscriminately for pest control, without proper consideration for the dose and timing, but, in spite of large pesticide doses as much as 60-70% mango fruit dropping occurs at times. Repeated applications of pesticides have induced multiple resistance in pests against various pesticides.

The mango growers do not practice integrated nutrient management (INM) as well as irrigation at appropriate times. Cost-effective, sustainable and eco-friendly integrated crop management (ICM) practices against different biotic and abiotic stresses are necessary to reduce severe flower and fruit dropping in mango.

This project was undertaken to develop new ICM technologies, up-scale the existing technologies as well as validate them in the major mango growing areas of the country against



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different biotic and abiotic stresses to reduce severe flower and fruit dropping in mango.

The methodology included:

- Field surveys were conducted at the beginning of the project, during April to October, 2014 in 14 major mango growing districts, viz. Chapai Nawabganj, Rajshahi, Natore, Naogaon, Rangpur, Dinajpur, Thakurgaon, Jashore, Kustia, Meherpur, Sathkhira, Chuadanga, Mymensingh, Gazipur. Information was collected from different upazilas, unions, villages of these districts. Data were recorded on randomly selected mango growers' perceptions of pest problems of mango and their traditional management practices and also the abiotic factors affecting flower and fruit dropping in mango with the help of a structured questionnaire.
- On-station experiments were conducted on (i) bio-rational based management tactics for mango hoppers, (ii) management of mango hoppers with chemical insecticides, (iii) management of anthracnose with chemical pesticides, (iv) management of anthracnose with chemical pesticides, (v) management of the fruit fly (*Bactrocera dorsalis*) in the lure-and-kill method, (vi) management of the giant mealy bug. Different microbial, herbal and chemical pesticides, fungicides, pheromone traps and various spray and trap setting protocols were tried in these experiments.
- Experiments were also conducted on the effect of hormones, fertilizers and application schedules, and volume and schedule of irrigation to control mango flower and fruit dropping.
- An experiment was conducted at the Fruit Farm of Horticulture Research Centre, BARI, Gazipur in 2015-16 and 2016-2017 to develop an integrated package combining the application of growth regulators, fertilizers, irrigation and pesticides to control mango flower and fruit dropping.
- The data on plant height, base girth, canopy spread, length of terminal shoot at flowering, number of leaves per terminal shoot at flowering, length of panicle, number of secondary branches per panicle, date of first panicle appearance, date of full bloom, fruit retention at an interval of 7 days, date of harvest, fruit characters TSS and yield were recorded and statistically analyzed.
- On-farm validation of ICM packages: In 2014-15, a total of 10-15 mango growers from Chapai Nawabganj, Naogaon, Rangpur, Jashore, Sathkhira and Gazipur were selected for carrying out field trials. For the ICM packages, selected two sprays of pesticide, timely fertilizer application with proper doses, four irrigations and one spray of urea (2%) were applied to 400 mango trees of the above districts.



- In 2015-16, a total of 15-25 mango growers in the same 14 major mango growing districts were selected for performing field trials. In 2016-17, a total of 10-30 mango growers in each district (total 408 farmers) were selected for performing field trials including an additional 3200 mango trees.
- Hands on training sessions for trainers were arranged for Scientific Assistants of different NARS institutes at different locations along with Sub Assistant Agricultural Officers of DAE. Training on ICM packages was also arranged for the project farmers as well as the neighboring mango growers.

Results and Outputs

Bio-rational based management

Spraying of the microbial pesticide, *Beauveria bassiana* within 10 days of flowering and spraying of Bioneem plus (Azadiractin) + Indofil M 45 at pea stage of fruit growth was found to be most effective for the control of both nymph and adult populations of the mango leaf hopper as well as anthracnose. These measures increased (170%) the retention of mango flowers and fruits over untreated control.



Chemical insecticides

Only two sprays of the commercial formulation of Imidacloprid (Confidor) 70 WG, Lambda cyhalothrin (Karate) 2.5 EC and Cypermethrin (Ripcord) 10 EC gave 100% reduction of mango hopper adult population.

Management of anthracnose

In respect of incidence, severity, disease reduction and fruit retention, fungicidal treatments were found to be effective in the

order, Bavistin DF> Indofil M-45 > Cabrio top > Dithane M-45> Tilt 250 EC. The fungicide should be sprayed along with the insecticides during flower bud breaking and another one during fruit setting stage.

Lure-and-kill method to manage the fruit fly

Both male and female attractants were used to trap and kill fruit flies in mango. Around 88-96% healthy mango could be harvested from the treated areas by the trapping method compared with untreated control.

Management of the giant mealy bug

Stem banding with wrapping tape and application of the pesticide carbaryl can effectively control adult giant mealy bugs during March-April and also can effectively control the neonate larvae during November.

Hormone and urea treatment

Application of the hormone 2,4-D in 2% urea solution substantially reduced mango fruit dropping, increased yield and improved quality of mango.

Proper irrigation

Six irrigations at an interval of 10 days starting from the pea size stage of mango resulted in a higher fruit retention per panicle, number of fruits as well as yield per plant over control.

Effect of fertilizers

The treatment 250 % (N: 576.02 g, P: 125.00 g K: 250 g, S: 89.92 g, Zinc: 9 g and Boron: 8.5 g) the recommended fertilizer doses along with 4 irrigations resulted in maximum number of fruits per plant and highest yield. ICM packages reduced fruit dropping by, on an average, 9.2%, resulting in a 31.3% yield increase. Also, ICM reduced production cost by about 34% and increased profits by 41% in comparison with non-ICM plants.

Benefits and Outcomes

An Integrated Crop Management (ICM) package consisting of the use of a growth regulator, pest management practices, application of proper combinations and doses of fertilizers at the right times, and appropriate irrigation scheduling to combat mango flower and fruit dropping was developed by the project which was validated through large scale on-farm trials.

Knowledge and awareness of mango growers, agricultural extension workers and NGO operatives personnel regarding the scientific management of the mango flower and fruit dropping have been enhanced.

Expected Impacts

Positive impacts of the ICM technology consisting of growth regulator, fertilizers, irrigation schedule and pest control measures are expected in substantially reducing mango flower and fruit dropping and hence increasing mango yield and production, enhancing mango growers' profits and livelihood in the country.

The ICM technology is environment friendly because its large scale use holds promise for minimizing indiscriminate use of harmful chemical pesticides.

Knowledge and awareness of the mango growers, researchers, extension officials and NGO workers regarding ways and means to tackle the problem of flower and fruit dropping in mango have been broadened and they can work collaboratively in the future to boost mango cultivation, trade and business which will contribute to the overall socio-economic development of the mango growing districts of the country.

This bulletin has been prepared on the basis of technical information available from a completed CGP project of KGF, the details of which are given below:

Project code and title: TF-14 C: Sustainable management of flower and fruit dropping of mango; Principal Investigator: Dr. Syed Nurul Alam, Chief Scientific Officer, Entomology Division, BARI, Gazipur; Project duration: May 2014 to October 2017