Advances in production technology of muskmelon *Cucumis melo* L.

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Introduction:-

Among the cucurbits, muskmelon (*Cucumis melo* L.) is known for its unique flavor and taste. It is most commonly grown in tropical regions of the country. It is also known as nutmeg melon or kharbooj. It is an important crop of Africa, Middle East, Asia, South-East Asia, Japan, USA, South and Central America, France, Spain, Israel and Eastern European countries. In India muskmelon is cultivated on river beds for obtaining an early harvest. Muskmelon is a diploid species (2n=24). There are seven polyploid species of *Cucumis* including *C. ficifolius* (2n= 28,72), *C. prophetarum* (2n=48), *C. zevheri* (2n=48), *C. heptadactylis* (2n=48) (Swarup V., 2016).

Nutritional And Meditional Values Of Vegetable Crops

Muskmelon consumed as dessert mainly. Per 100 g of edible portion of muskmelon contain 78% edible portion, 95.2% moisture, 17 k-cal energy, 3.5 g carbohydrate, 32 mg calcium, 14 mg phosphorus, 1.4 mg iron, 169 µg carotene and 26 mg Vitamin C (Bose *et al., 2002).* Muskmelon provides relief in constipation, acidity, diarrhea etc. It maintains skin texture, removes oil spots, prevents baby from birth defects and regulates blood flow during menstruation etc. (Goutam *et al*., 2020).

Climate

Muskmelon needs dry warm weather and enough sunshine for proper growth and better production. The temperature range from 18°C to 28°C is optimum and plant growth severely retarded at low temperature below 12°C. While, plants can easily withstands to very high temperatures up to 40°C. Moreover, plants are very sensitive to frost as they shows sever mortality due to frost and high humidity reduce plant growth, affect fruit quality adversely, and promote leaf diseases.

Soil

Muskmelons can grow successfully on a range of soil types. In general, loamy soil produces higher yields and better-quality fruits. Early crop can be achieve on lighter soils (sandy or sandy-loam) whereas heavier soils (clay-loam) gives high yields but in later-season. Windbreaks are suggested for sandy soils to minimize 'sand blast' damage and stunting to young seedlings during spring winds. The pH should be above 5.8 and mostly near 6.2.

Seed Rate and Sowing

In muskmelon mostly direct sowing is practiced in which 2-3 seeds per hole, sown 2-4 cm deep on ridges or hills, subsequently one plant per hole is maintained by thinning. Spacing 120-200 cm between and 50-60 cm within the rows is usually followed with 8,000-16,000 plants ha^{-1} planting density. In situ, for off season production, are grown in soil blocks or in polythene pots and four week old seedling are transplanted carefully to the field. In the direct sowing method 1.5 to 2 kg seeds are sufficient whereas, 0.5 kg seeds are enough for transplant method. Sowing time varies from November to March. The optimum time of sowing in North Indian plains is February month.

Mulching

Mulching with black, transparent, or silver-painted polythene sheets, or rice straw, or grass is the well established practice in muskmelon cultivation to control weeds and soil temperature. Meena *et al.* 2018

Varieties and F1 Hybrids

Hara Madhu

Late maturing variety. Fruits are of large size, round shape having average weight of about one kg. Skin is of light yellow color. TSS contain is about 13% and very sweet in test. Flesh is of green color, thick and juicy. Seeds are of small size. It is resistant to powdery mildew. It gives average yield of 50qtl/acre.

Punjab Sunehri

Mature 12 days before Hara Madhu. Fruits are of round shape with netted rind and of light brown color. Its average weight is about 700-800gm, TSS is about 11%. Flesh is thick, orange color. It has good keeping quality. It is resistant to fruitfully attacked. Its average yield is about 65qtl/acre.

Punjab Hybrid

It is early maturing variety. Fruit is of round shape, light yellow color with netted skin. Flesh is thick, orange color, juicy and excellent flavor. TSS is upto 12% and average weight about 800gm. It is resistant to fruit fly and gives average yield of 65qtl/acre.

MH-51

Released in 2017. It gives an average yield of 89qtl/acre. It has round fruits, having stripes and are gauzed. It contains 12% sucrose content.

F1-RUBY-903:

Size 1.25-1.5 kg Maturity 72-80 days from sowing, Fruit round with thick netting, orange flesh, and good aroma, thick and very sweet flesh with -14.5 % to 15% sugar content. Remarks long shelf-life.

Nursery Techniques protrays

Nursery preparation: Nursery for muskmelon can be prepared either with polythene bags of 200-gauge, 10 diameter and 15 cm height size or through protrays under protected nursery.

Use protrays, each having 98 cells for raising seedlings. Transplant about 12 day's old seedlings in the main field. Source TNAU portal.

Water Requirement

Watering before and after planting should be gave to secure seed germination, emergence and establishment of seedling. Sprinkling is most frequently followed. However, drip irrigation is getting popularity and desirability due to its tendency to release droplets just near to root zone and minimizing water loss and disease incidence. After fruit set, irrigation should be light and frequent whereas, it should be stopped 7 to 10 days before the harvesting.

Weed control

In general, primary tillage operations like mould-board plowing and bedding are recommended to control weeds, because these generally kill most of the emerged weeds. Plastic mulching is an alternative to manage weeds. In spite of this, hand hoeing and pulling of weeds should be practiced frequently.

Role of PGR

The application of ethrel 250 ppm increases the female flower production.

Exogenous application of silver thiosulphate 300-400 ppm induced the male flowers in gynoecious lines of muskmelon. These chemicals should be applied twice at two true-leaf stage and secondly at four true-leaf stage. Muthukumar and selvakumar 2017.

Organic Manures and Fertilizers

The requirement of fertilizers varies with the soil type, fertility status, climate/ season and location wise. FYM should be applied to the soil at the time of land preparation. Apply FYM 20 t/ha along with neem cake 100 kg before last ploughing, Vermicompost also used. Source TNAU**.** The dug pits are also filled with manure and fertilizer mixture, a week prior to sowing of seeds. In the case of nitrogenous fertilizers, only one-third of quantity is mixed with the soil at the time of field preparation. The rest of nitrogen is given as basal applications twice during the early stages of vine growth, the first after 25-30 days of sowing followed by the second after another 25-30 days. (**Goutam *et al.*, 2020**). Recommended dose: 200:100:100 Kg/ha^{-1}

Biofertilizers

Apply *Azospirillum* and *Phosphobacteria* @ 2 kg/ha and *Pseudomonas* @ 2.5 kg/ha. TNAU

Pest And Diseases and Their Management

Aphid and Thrips

Symptoms of damage:

They suck the sap from the leaves resulting in yellowing and dropping of leaves. Thrips results in curling of leaves, leaves become cup shaped or curve upward.

Management:

If infestation is observed in field, to control spray the crop with Thiamethoxam@5gm/15Ltr of water. If infestation of sucking pest and powdery /mildew is observed to take spray of Thiamethoxam 15 days after spraying, spray with dimethoate @250ml+Tridemorph@100ml/200Ltr of water.

Leaf Miner:

Symptoms of damage:

Maggots of leaf miner feed on leaf and make serpentine mines into leaf. It affects the photosynthesis and fruit formation.

Management:

If infestation of leaf miner is observed, take spray of Abamectin@6ml/15Ltr of water

Fruit fly:

Symptoms of damage:

It is serious pest. Females lay eggs below epidermis of young fruits. Later on maggots feed on pulp afterward fruits starts rotting.

Management:

Remove and destroyed infected fruits away from field. If infestation is observed, at initial stage take spray of Neem seed kernal extracts@50gm/Ltr of water. Take spray of Malathion@20ml + Jaggery@100gm in 10litre of water 3-4times at 10days interval.

Diseases:

1. Powdery Mildew:

Symptoms of damage:

Patchy, white powdery growth appears on upper surface of leaves and also on main stem of infected plant. It parasitizes the plant using it as a food source. In severe infestation it causes defoliation and premature fruit ripening.

Management:

If infestation is observed take spray of water soluble Sulphur@20gm/10Ltr of water 2-3 times with interval of 10 days.

2. Downy mildew – (*Pseudoperonospora cubensis*)

Symptoms

It occurs on cucumbers, squash, muskmelons, and pumpkins and less frequently on watermelons. On cucurbits other than watermelons, small, yellowish areas occur on the upper leaf surface. Later a more brilliant yellow color develops with the center of the lesion turning brown. Usually spots are angular because they are restricted by leaf veins.

Management

Spraying with Metalaxyl 500 g or Metalaxyl + Mancozeb 1 kg/ha or Mancozeb 1kg/ha.

3. Sudden Wilt

Symptoms

It can affect crop at any stage. Plant get weak and give yellow appearance at initial stage, in severe infestation complete wilting is observed. Unlike bacterial wilt, which can occur any time during the season, sudden wilt generally occurs late in the season and is closely associated with a heavy fruit load on the plant. Cucumbers and melons appear to be most sensitive to sudden wilt. Initial symptoms are a slight flagging of the plants in midday even when, abundant moisture is present. This flagging will continue to worsen so that, by the third or fourth day, many of the plants are completely wilted.

Management:

Good soil drainage and thin plant density reduces the incidence of disease. Use bumper crop kit 1 kit/1 acre.
Destroy diseased plant debris. Soil application of *T.viride* @ 2.5 kg/ha with 50 kg FYM. Spray Mancozeb/ Copper Oxychloride at 2.5 g /lit or Carbendazim/ Thiophanate- Methyl at 1 g /lit.

4. Anthracnose:

Symptoms:

Anthracnose affected foliage appears scorched appearance. It occurs on cucumbers, squash, muskmelons, and Pumpkins and less frequently on watermelons. On cucurbits other than watermelons, small, yellowish areas occur on the upper leaf surface. Later a more brilliant yellow colour develops with the centre of the lesion turning brown.Usually spots are angular because they are restricted by leaf veins.

Management:

As a preventive measure, treat seed with Carbendazim@2gm/kg of seed. If infestation is observed in field, take spray of Mancozeb@2gm or Carbendazim@0.5gm/liter of water. Spraying with Metalaxyl 500 g or Metalaxyl + Mancozeb 1 kg/ha or Mancozeb 1kg/ha.

5. Angular Leaf Spot – (*Pseudomonas lachrymans*)

Symptoms

Symptoms of the disease firsts appear as small, angular, water-soaked lesions on the leaves. When moisture is present, bacteria ooze from the spot in tear like droplets that dry and Form a white residue on the leaf surface. Water-soaked areas turn gray or tan, die, and may tear away leaving irregular holes. Water-soaked spots may also appear on the fruit and are frequently followed by soft rot bacteria.

Management

Angular leaf spot may be controlled by planting disease-free seed Rotating with unrelated crops, keeping workers out of fields when foliage is wet And Spray 400 ppm Streptomycin sulphate.

Gummy Stem Blight – (*Mycosphaerella melonis*)

Symptoms:

Infected stems first appear water-soaked and then become dry, coarse and tan. Older stem lesions (dead tissue) reveal small black fruiting bodies (pycnidia) within the affected tissues. Large lesions girdle stems and

plants wilt in the heat of the day. Stem lesions on melons exude a gummy, red-brown substance which may be a symptom of Fusarium wilt.

Management

Use of disease-free seed and transplants is essential to prevent serious crop losses. Periodic applications of fungicide like mancozeb @ 0.2% can help limit secondary infections, especially on fruits. Fall ploughing and extended rotations with other crops can significantly reduce the amount of inoculum in infested fields.

Post-harvest handling:

After harvesting do precooling to reduce field heat. Grading is done on basis of size of fruit. Muskmelons harvested at partial slip can be held for up to 15 days at 2° to 5°C at 95% relative humidity whereas Muskmelons harvested at full slip can be held for 5 to 14 days at 0° to 2.2°C at 95% relative humidity.

Post Harvest Technology And Processing

Flow Chart: Post harvest operations practiced in muskmelon handling

Harvesting
(Half slip or full slip)
↓
Dumping
(Fruits prone to mechanical injury)
↓
Sorting
(Remove diseased, cracked and undersized fruits)
↓
Hot water treatment
(52-55°C for 2-3 min)
↓
Waxing
(With or without fungicide)
↓
Grading
(On the basis of size and surface)
↓
Precooling
Hydro-cooling or forced air cooling (+10°C)
↓
Packing
(Plastic crates and cardboard fiber boxes)
↓
Storage
(At 10°C or more)
↓
Transportation
↓
Marketing

Harvesting:

Muskmelon fruit will be ready for picking in about 110 days depending upon variety and agro- climate. Harvesting of Hara Madhu should be done when fruits turn to yellow. Harvest other variety depending upon market distance. For long distance markets harvest fruits at mature green stage whereas for local markets harvest at half-slip stage. A slight depression of the stem end indicates half-slip stage.

Yield:

The average yield is 100 to 150 quintal / ha.

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