**Watermelon**

*(Citrullus lanatus)*

**1) Introduction:**

Watermelon is a warm-season crop originated in South Africa. It is an important cucurbitaceous vegetable in India. It is an excellent desert fruit and its juice contain 92% water along with proteins, minerals and carbohydrates related to cantaloupe, squash, cucumber and pumpkin. Watermelons can be grown on any well-drained soil, it is grown throughout the world as a staple food (edible seeds), a dessert food (edible flesh), and for animal feed. Although it is primarily eaten fresh, it is also eaten as a cooked vegetable in Africa. In Russia, watermelon is a staple food, eaten pickled and used for production of syrup by boiling the sugary flesh. In China, firm-fleshed cultivars are cut into strips and dried for use as pickles or glace’ candy. Some varieties are grown mainly for seed production. In addition to nutritive value, watermelon is said to have medicinal value because of the high amount of lycopene and beta-carotene that it contains. The rind is also reported to contain citrulline that is important in treating cardio-vascular and impotency problems.

**2) Land selection and preparation:**

- Plough land and bring to fine tilth. In North India, sowing is done February - March month. In North east and west India sowing is done during November to January.
Watermelon can be direct seeded or transplant in nursery and then transplanted to main field.

- Raise beds of 1.2 m width and 30cm height for sowing.

**Manuring:**
Apply FYM 20 t/ha, P 55 kg and K 55 kg as basal and N 55 kg/ha 30 days after sowing. Apply along with FYM 50 kg and neem cake 100 kg before last ploughing.

3. **Season and climate:**

**Season:**
Sow the seeds during November – December.

Watermelon are mainly warm season crops grown mainly in tropical and sub-tropical regions. River bed cultivation, a kind of vegetables forcing is being used in India where cucurbits are grown in the river beds during winter season. Watermelon grow well at day temperature between 25-350c. It tolerates cool climate better than musk melon. It cannot tolerate frost and strong winds. Low temperature and high relative humidity stimulate the development of female flowers. It may show slight photoreaction to short days for flowering. They are extremely sensitive to the slightest of frost and hence care must be taken to keep the frost away from the crop. 24-27⁰C is ideal for the seed germination and growth of watermelon plants. A cool night would ensure ample development of sugars in the fruit.

4. **Selection of crop/ Variety/Planting material:**

**Sugar Baby:**
- Small, round fruits
- Each fruit weighs 3-5 Kg
- Bluish-black outer skin
- Deep pink flesh
- Small seed
- Avg yield 72 Quintal per Acre
2. **Improved Shipper**:
   - Large fruits
   - Dark green outer skin
   - Moderately sweet
   - Avg yield 70-80 quintal per acre

3. **Asahi Yamato**:
   - Medium-sized fruits
   - 6-8 Kg per fruit
   - Ready to harvest in 95 days
   - Deep pink colored flesh

4. **Arka Manik**:
   - Round or oval-shaped fruits
   - Green rind with light green stripes
   - Deep red flesh
   - Very sweet to taste
   - Fruits weigh 6 Kg on average
   - Can withstand transport and storage stress
   - Resistant to powdery mildew
   - Tolerant to anthracnose disease

5. **Arka Jyoti**:
   - Round, medium-sized fruits.
   - Light green rind with dark green stripes.
   - Crimson-colored flesh.
   - Fruits weigh 6-8 Kg.
   - Mid-season variety.

6. **Durgapura Meetha**:
   - Round fruits
   - Thick rind
   - Light green colored skin
   - Dark red flesh
   - Late maturing variety
• Seeds have a black-colored margin and tip
• Sweet to taste
• Ready for harvest in 125 days

7. Durgapura Kesar:
  ❖ Round fruits
  ❖ Green-colored rind with stripes
  ❖ Yellow-colored flesh
  ❖ Fruits weigh 4-5 Kg
  ❖ Moderate sweetness
  ❖ Large seeds
  ❖ Late maturing variety

Some other varities:

Special No.1:
  It is developed by PAU, Ludhiana. Fruits are round and small in size, flesh is of red color. These are early maturing varieties. TSS is lower than Improved Shipper. Varun, Yuvaraj, Aayesha, Madhubala, Chetan, NS 295, NS 34, NS 450, Arjun, Sumo, KSP 1081, Lalima and Raja.

Exotic Varieties: China - Watermelon Hybrid Yellow Doll, Water Melon Hybrid Red Doll. USA - Regency, Royal Flush, Royal Majesty, Royal Sweet, Paradise, Ferrari, Sunrise etc.

4.1 Nursery Management:

  Nursery for watermelon can be prepared either with polythene bags of 200 gauge, 10 cm diameter and 15 cm height size or through protrays under protected nursery. In polybag nursery, fill the bags with 1:1:1 ratio of red soil, sand and farmyard manure mixture. Use protrays, each having 98 cells for raising seedlings. Transplant about 12 day’s old seedlings in the main field.

Seed treatment:

  Treat with Trichoderma viiirdi 4 g or Pseudomonas fluorescens 10 g or Carbendizim 2g/kg of seeds.

Methods of Planting & Spacing:

<table>
<thead>
<tr>
<th>Sowing Method</th>
<th>Spacing between Rows</th>
<th>Spacing between plants</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit Sowing</td>
<td>2-3.5m</td>
<td>60 cm</td>
<td>4 seeds sowed in a pit</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Pits filled with decomposed dung and soil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One seedling per pit after germination</td>
</tr>
<tr>
<td>Furrow Sowing</td>
<td>60-90 cm</td>
<td></td>
<td>Furrows are made and seeds sowed on both sides of furrows</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>3-4 seeds per furrow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One seedling after germination per furrow</td>
</tr>
</tbody>
</table>
5. Water management:

Watermelon is a dry season crop and it must be planted with irrigation. The watermelon beds are irrigated two days prior to sowing and then again 5 days after sowing the seeds. As the plant grows, irrigation is done on a weekly basis. Attention must be paid to water stress at the time of irrigation since it can lead to fruit cracking. While irrigating, water must be restricted to the root zone of the plant. Wetting of vines or other vegetative parts must be avoided especially during flowering or fruiting time as wetting can lead to withering away of the flowers, fruits or even the plant as a whole. In addition, wetting of the vegetative parts can also lead to development of fungal diseases. Moisture must be maintained near the roots so that the plants develop taproot system. As the fruits near maturity, irrigation frequency is reduced and it is completely stopped during the harvesting stage. This helps in developing flavor and sweetness in the fruit.

6. Integrated nutrient management:
A) Introduction:

Integrated Nutrient Management refers to the maintenance of soil fertility and of plant nutrient supply at an optimum level for sustaining the desired productivity through optimization of the benefits from all possible sources of organic, inorganic and biological components in an integrated manner.

6.1) Organic fertilizers:

- Apply FYM 20 t/ha.
- Apply vermicompost 2 bags
- Neem cake 100 kg before last ploughing.
6.2) Biofertilizers:

(Pseudomonas /Trichoderma/ Phosphate solubilizing bacteria (PSB) / Azospirillum).
Seed treatment: One container/ 500gm for an acre of seed (if seed rate is >10 kg. use two containers.). Soil Application: Mix 1 container (1liter) /5 kg (Solid) in 100 kg of farmyard manure and cover it for 7 days with polythene. Turn the mixture in every 3-4 days interval and then broadcast in the field. Foliar Spray: Dilute 1 container in 50 litre of water and spray to the crop of an acre. Seedling (Root Dipping): Dilute 1 container/500gm in 10 litres of water, keep the seedling roots in immersed condition for 30 minutes and transfer it to the field.

6.3) Chemical Fertilizers:

Fertigation Schedule
Recommended Dose: 200:100:100 Kg/ha

<table>
<thead>
<tr>
<th>Stage</th>
<th>Crop stage</th>
<th>Duration in days</th>
<th>Fertilizer grade</th>
<th>Total Fertilizer (kg/ha)</th>
<th>Nutrient supplied</th>
<th>% requirement</th>
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<tbody>
<tr>
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<td></td>
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<td></td>
<td>Nutrient</td>
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<td>N</td>
<td>P</td>
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<tr>
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<td>Crop establishment stage</td>
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<td>5.00 1.43 5.00</td>
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<td>1.47 5.72 7.49</td>
<td>30.00 7.50</td>
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<td>Subtotal</td>
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<td>19:19:19 + MN 13-0-45 Urea</td>
<td>26.31 78.00 97.52</td>
<td>5.00 10.14 5.00</td>
<td>30.00 5.00</td>
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</tbody>
</table>

*75% RD of Phosphorus applied as superphosphate = 469kg/ha.
1. 19:19:19 = 53 kg/ha
2. 13:0:45 = 199kg/ha
3. 12:61:0 = 25 kg/ha
4. Urea = 351kg/ha

**After cultivation**

Spray Ethrel 250 ppm (2.5 ml/10 lit of water) 4 times at weekly intervals commencing from 15 days after sowing. Weeding is done thrice.

6.4) Specialty fertilizer:

6.4.1) Soil application

**DNP-G**

**Special features:**
- DNP is a unique specialist fertilizer consisting of Organic carbon, Organic Booster like amino acids, Nitrogen fixing bacteria, Phosphorous solubilizing bacteria and plant disease controlling fungi Trichoderma viride and also trace amounts of essential minerals.

**Dosage and application**
- 2-3 bags as basal dose/acre.
- 2 bags as top dressing/acre.

**PH-50**

**Special features:**
- Improves nutrient uptake and important part of INM
- Provides carbon source for soil microorganisms to multiply
- Promotes vegetative growth and stimulates new root growth
- Promotes flowering and root setting
- Higher yield and better quality of the produce

**Dosage and application**: 25kg/acre

**BIO-NPK (Granules)**

**Special features:**
- BIO-NPK is a microbial formulation containing strains of bacteria able to synthesize/assimilate atmospheric nitrogen, solubilizes phosphate and potash into available form, thereby supplementing balance nutrition to the crops

**Dosage and application**: 10kg 2 bucket/acre
6.4.2) Foliar application :  
**Bio- Max**  
**Special features:**  
- It increases fruit size.  
- It stimulates flowering.  
- Improves Performance by reducing nutrient deficiency.  
- Improves stress tolerance ability.  
- Compatible with all Pesticides and Insecticides.  

**Dosage and application:**  
- Dissolve 3 ml of “Bio Maxx” in 1 liter of water.  
- Spray 20-30 days before flowering  
- Second spray after fruit set. (i.e. when fruit attains bean size).  

**Total** :  
- “Total” is a unique micronutrient mixture along with other essential mineral nutrients which are required for comprehensive plant growth and development.  
- Nutrients present in “Total” are in readily available form both through phyllosphere and rhizosphere making the product highly economical and environmentally judicious.  

**Dosage and application:** Dissolve 5 g of “Total” in every liter of water or 1kg in 200 litres of water and spray on both surfaces of leaves. Repeat spray at monthly interval.

6.4.3) Drip application :  
**Bumper crop kit** :  
- Mainly it controls wilt and plant dieing.  
- Bumper Crop helps in production superior crops by providing balanced nutrition in available form by reducing the disease incidence.  

**Dosage and application:**  
- For Drenching: Mix 1 packet in 100 litre of water and drench the roots of plant for 30 minutes before sowing.  
- Drip Irrigation: Mix 1 packet with 100–200L of water and apply through Drip Irrigation.
6.5 Nutritional deficiency symptoms:

1. Nitrogen
   - The body thin, it made a hard and fibrous.
   - The leaves are usually light green color, especially older leaves are yellowish.
   - Fruits are short, light green and floral nose would be huddled in condition.

Management:
   - Apply recommended dose of nitrogen at the recommended time.
   - Spray 2% urea solution for proper growth and development.
   - It increases the fruit production by 15-20 per cent.

2. Phosphorus:
   Deficiency Symptoms:
   - The leaves are dark green and dull phosphorus deficiency in watermelon are small. Occasionally bronze-colored spots appear on the leaves.
   - They stop at a pale and flabby or they die early. The body is short and thin. Fruits are stained dull green and bronze.
   - In the months of old leaves, transparent-looking, brown and necrosis are seen petioles dry.

Management:
   - Bosphorus fertilizer requirement is smaller in rainy season (less sunshine smaller potential yield), larger in dry season (more sunshine, greater potential yield).
   - Phosphorus -Fertilizer should be applied before transplanting, since P2O5 is required in the initial stages of crop for root and branch development.

3. Potassium:
   Deficiency Symptoms:
   - Deficiency results in restricted plant growth. Small reddish brown spots develop on leaves. These spots spread from the leaf tip.
   - Interveinal and marginal yellowing of the leaves may also develop in addition to spotting.
Management:
- Apply basally 30 kg of potassium/ha.
- Spray 0.5 per cent (5 ml/lit.) potassium chloride when the deficiency is noted and repeat once again after 15 days.

4. Magnesium:

Symptoms:
Near the end of the growing season, older leaves develop interveinal chlorosis which initially appears at leaf margins and progresses inward. Eventually entire leaves become necrotic. Because magnesium deficiency develops late in the growing season, fruit yield is generally not reduced significantly.

Management:
- Foliar spraying of 2% MgSO4 twice at fortnightly interval or soil application of dolomite at 2 ton/ha or magnesium sulphate at 20 kg/ha.

7) Integrated pest management:
Introduction: Integrated pest management (IPM), also known as integrated pest control (IPC) is a broad-based approach that integrates practices for economic control of pests. IPM aims to suppress pest populations below the economic injury level (EIL).

Principles of IPM:
- Acceptable pest levels
- Preventive cultural practices
- Monitoring
- Mechanical controls
- Biological control
- Responsible use.

7.1) Insect pests:

1. 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/downy mildew is observed, take spray of Thiamethoxam and 15 days after spraying, spray with Dimethoate@250ml+Tridemorph h@100ml/200Ltr of water.

2. 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@300ml + Jaggery@100gm in 200litre of water 3-4times at 10 days interval.

Do not use DDT, copper and sulphur dust, as these are phytotoxic
3. **Root knot nematode**

   The cucurbits are highly susceptible to nematode infestation especially root knot nematode *Meliodyge incognita acrita*. Poor growth and stunted plants are the usual symptoms, Muskmelon, cucumber, pumpkin are severely affected. The growth of pumpkin plants infected with root knot nematodes is reduced with galls found scattered on roots. There is marked reduction in root and shoot growth and fruit yield.

**Control**

1. Pre-plant application of Carbofuran (Furadan 3 G @ 10 kg per hectare) on planting holes controls the root-knot nematode and increases the yield.

2. Soil fumigation with D. D. (dichloropropene dichloropropane) and adopting long duration crop rotation can also control the nematodes.

**Diseases:**

1. **Cucurbit phyllody**

   **Symptom**

   The disease is characterized by shortening of internodes and phyllody of normal flowers. Some plants bear cluster of phyllody flowers. Infected plants remain stunted and usually do not bear fruits. The disease infects almost all cucurbit vegetables.

   **Control**

   1. All the disease plants must be rouged out from the field.

   2. Apply furadan 1.5 kg ai./ha at the time of sowing the seed.

   3. Spray systemic insecticides like Dimecron (0.05%) at 10 days interval.

2. **Downy Mildew: Pseudoperonospora cubensis**

   **Nature of Damage:**

   - This disease occurs wherein there are frequent rains and hence a high relative humidity. It also occurs when the moisture content in soil is high.

   - The affected plants have a stunted growth. The fruits produced by such plants do not mature and hence have a poor taste.
Symptoms:
- Yellow colored spots appear on the upper surface of leaves which spread upto the veins. It gets restricted at the veins. This gives the leaf a mosaic appearance.
- Owing to the presence of moisture, the corresponding lower surface of the affected leaves have a purplish growth.
- The leaves turn necrotic, yellow and ultimately fall off.

Management:
- While transplanting watermelons ensure that the plants are free of the disease.
- Apply fungicide before and after installing the row cover if any.
- There must be enough air circulation in the crop and the humidity level must be kept in check.
- Excess irrigation must be avoided- drip irrigation would ensure just enough water in the soil.
- The field must be constantly monitored.

3. Powdery Mildew: *Sphaerotheca fuliginea*

Symptoms
- Powdery, whitish, superficial growth on the growing parts, stems and foliage. The growth covers the entire area superficially.
- Diseased areas turn brown and dry.
- Fruits remain underdeveloped

Management:
- Ensure proper air circulation
- Aerate the soil before sowing
- Monitor the leaves constantly for appearance of superficial powdery white growth.
- Apply fungicide regularly.
4. Anthracnose: *Colletotrichum orbiculare*

**Symptoms**
- Begins with a thin film of water on the leaves
- The lesions gradually turn into yellow, dark brown and black irregular spots.
- Stem lesion girdle the stem.
- Vines wilt away.
- Fruits produce circular, sunken cankers that maybe about 6mm deep. This is the most diagnostic symptom of the disease.
- The center of the lesion which is the black in color is covered with a mass of spores (salmon colored) that is gelatinous in nature. This happens in presence of moisture.

**Management:**

It is hard to control the disease. One way to deal with it is to treat the affected plants with neem oil and crop rotation.

5. Alternaria Leaf Spot: *Alternaria cucumerina*

**Symptoms**
- Spots first appear on the topmost portion of the plant.
- The older leaves have broad spots on them that vary in shape from round to irregular.
Management:

Crop rotation and burning the debris after harvests are some of the ways to manage the disease. If detected during cultivation, then spraying chemicals like mancozeb (0.2%) or copper hydroxide would help keep the disease in check.

6. Fusarium Wilt: *Fusarium oxysporum*

**Symptoms**
- Chlorosis of leaves is the first symptom of the disease.
- Leaves wilt from bottom to top progressively.
- The infected stem exhibit a brown discoloration.

**Management**

Seeds and plants ready for transplantation must be free of infection. The soil must be fumigated before sowing. Using resistant varieties of the seeds would help deal with infection.

7. Bud Necrosis: Watermelon Bud Necrosis Virus

**Symptoms**
- Leaves develop chlorotic rings and mottling.
- Plants are stunted in growth.
- The ring spots turn brownish black and leaves become brown and distorted.
- Fruit surface have ring spots ta tan, become necrotic and develop lesions.
Management

One of the best ways to check the spread of diseases is to check the plants, leaves, soil, weather etc. on weekly basis. Action must be taken when needed such as removing the infected plants, collecting the egg masses, etc.

8) Weed management:

Weeding is needed only in the initial stages of watermelon growth. Being a vine, use of herbicides must be done very carefully else the healthy plants may get affected. The first weeding is done about 25 days after sowing. Subsequently, weeding is done once a month. Once the vines begin to spread, weeding is not necessary as the vines take care of the weeds

9. Cultural Practices:

Solarisation:

Solarisation of soil is generally not necessary if watermelon cultivation is being done during dry season. However, solarisation can rid the soil of unwanted moisture content and even pests.

Pollination in Watermelon Farming

This is a very important step in watermelon cultivation. Unlike most other crops, flowers on watermelon plants cannot develop into fruits on their own. As mentioned earlier, male and female flowers grow on the same plant, but, separately. The male flowers are smaller in size and appear first while female flowers are huge and appear later. The female flowers have a small fruit at the base. In case it shrivels, it means there would be no pollination. In nature, bees carry the pollen while hopping from flower to flower gathering nectar. Therefore, setting up an artificial beehive in the watermelon field is a good idea. One hive per acre of watermelon field is more than enough.

Manual pollination is done early morning. For manual pollination the steps to be followed are:

- Pluck the male flowers
- Remove the petals around it
- The stamen of the male flower (which contains pollen) is brushed against the stigma of the female flower (which is at the center). This helps the pollen stick to the female flower

It is said that the initial female flowers give the best fruits. Some farmers pinch out the tip of the branch once the fruits are set. This helps them attain large fruits.

Crop Rotation with Watermelon:

Owing to the risk of developing various diseases, watermelon is grown on the same soil only after a period of 3 years. It is usually rotated with paddy or with vegetables like tomato, chillies, etc.
Rouging

(1). Before flowering.- This is done for rouging of plants showing different growth habit, stem and leaf characters(shape, size and colour) and diseased plants. Rouge out all virus affected plants.

(2). Flowering and immature fruit stage. Rouge out all those pants which are non identical in flowering and fruit characters and virus infected plants.

(3). Mature fruit stage. Rouge out all the plants which are different in fruit characters at maturity. Rouge out all diseased and virus affected plants.

10. Harvesting:

- The crop is ready for harvest in about 75-100 days after sowing depending upon cultivar and season.
- Fruits are harvested when it produces dull sound upon tapping or the fruits surface on the ground level produces light yellow colour are the harvest index for watermelon.

Yield:
25 – 30 t/ha of fruits in 120 days can be obtained.
11. Post-harvest handling:

Grading is done on basis of size of fruit. It can be store for 14 days at temperature of 15°C. Do not store watermelon with apples and banana as it developed off flavor along with softening of fruit.

Storage and packing:

Apart from seed and seed treatment, the next most important aspect of seed storage is seed container. Container can be chiefly differentiated as moisture pervious and moisture impervious types. Cloth, paper, gunny bags are moisture pervious as the moisture from outside atmosphere can enter and exit freely. Hence, even if the seed is dried to safe moisture, but stored in a humid climate, then seed gains moisture during storage and looses vigour. So, to safely store seeds in moisture previous bag, then the outside humidity must be low.

In Tamil Nadu, most of the months are hot and humid, hence after drying the seed to safe moisture limit, seeds can be safely stored in moisture impervious bag like thick polythene bag of 700 g or in tin/plastic containers that are sealed tightly. In case of short term storage (4-6 months) cloth or gunny will be sufficient.

<table>
<thead>
<tr>
<th>Item</th>
<th>No. of unit</th>
<th>Cost / unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Preparatory tillage</strong></td>
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</tr>
<tr>
<td>1.1 Ploughing by tractor with (1 time) M.B. plough</td>
<td>4 hour</td>
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<td>2000</td>
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<tr>
<td>1.2 Ploughing by tractor with (2 times) cultivator</td>
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<td>1.3 Ploughing by tractor with (1 times) Rotavator with planting</td>
<td>2 hours</td>
<td>600</td>
<td>1200</td>
</tr>
<tr>
<td><strong>2. Layout</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.2 Planting material (1.5kg seeds/acre)</td>
<td>1.5kg</td>
<td>800</td>
<td>1302</td>
</tr>
<tr>
<td>2.3 Sowing (4 labours for 1 days)</td>
<td>4 labours</td>
<td>300</td>
<td>1200</td>
</tr>
<tr>
<td><strong>4. Manures and fertilizers</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3.1 FYM</td>
<td>20t</td>
<td>Rs. 600/t</td>
<td>12000</td>
</tr>
<tr>
<td>3.2 Urea</td>
<td>200kg</td>
<td>Rs. 6/kg</td>
<td>1200</td>
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<tr>
<td>3.3 SSP</td>
<td>100kg</td>
<td>Rs. 9/kg</td>
<td>900</td>
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<tr>
<td>3.4 MOP</td>
<td>100kg</td>
<td>Rs. 15/kg</td>
<td>1500</td>
</tr>
<tr>
<td>3.5 DNP-G</td>
<td>100 kg</td>
<td>Rs 16/kg</td>
<td>1600</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>3.6 PH-50</td>
<td>20 kg</td>
<td>Rs 70/kg</td>
<td>1400</td>
</tr>
<tr>
<td>Amino-G</td>
<td>10 kg</td>
<td>Rs 70/kg</td>
<td>700</td>
</tr>
<tr>
<td>3.5 Expenditure on manures application</td>
<td>5 labours</td>
<td>Rs. 200/ t of FYM</td>
<td>4000</td>
</tr>
<tr>
<td>3.6 Expenditure on fertilizer application (for 1 day)</td>
<td>4 labours</td>
<td>200 / labour</td>
<td>800</td>
</tr>
<tr>
<td>3.7 Neem cake</td>
<td>150 kg</td>
<td>600/bag</td>
<td>1500</td>
</tr>
</tbody>
</table>

5. Intercultural operations

| 4.1 Weeding (for 1 day) Two times | 6 labours | 250 | 1500 |
| 4.3 Mulching sheet              | 1        | 4500 | 4500 |

6. Irrigation application

| 5.1 Labour charges (1men for irrigation of 35days) | 35 | 200 | 7000 |
| 5.2 Drip water system (Used for further)            |     |    | 20000 |

7. Plant protection

| 6.1 Labour for spraying (3 men per spray) | 3 labours | 300 | 900 |
| 6.2 Malathion300ml                    | 1000ml   | 600 | 600 |
| 6.3 Carbofuran                       | 1000g    | 600 | 600 |
| 6.4 G. lilacinu                       | 1000g    | 450 | 450 |
| 6.4 Trichoderma viride                | 2kg      | 400 | 800 |
| 6.5 Bumper crop kit                   | 1 kit    | 800 | 800 |
| 6.6 Dithen M 45                       | 500g     | 500 | 500 |
| 6.7 Mancozeb & Metalaxyl             | 1000g    | 580 | 580 |
| 6.8 Carbendazim                       | 1000g    | 550 | 550 |
| 6.9 Miscellaneous cost                | 1        | 3538 | 3538 |

7. Harvesting and Marketing

| 7.1 Harvesting                  | 5 labours | 500 | 2500 |
| 7.3 Transportation              |           | 1500 | 1500 |

<table>
<thead>
<tr>
<th>Total</th>
<th>79120</th>
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</table>

<table>
<thead>
<tr>
<th>Yield / acre</th>
<th>25 tonns</th>
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</thead>
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<tr>
<td>Market value/kg</td>
<td>13 rupees</td>
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<tr>
<td>Total Revenue</td>
<td>325000</td>
</tr>
</tbody>
</table>
Profit/loss = Total revenue - total expenses

| profit | 245880 |

References:
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- TNAU, Portal.
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- IIHR, Varanasi.
- IIHR, Bangalore.