

# Standard Package of Practices of *Jati* and *Motihari* Tobacco Production in West Bengal



**Partha Saha**  
**Namita Das Saha**  
**S.K. Dam**  
**J.K. Roy Barman**  
**K. Satyanarayana**



**ICAR - CENTRAL TOBACCO RESEARCH INSTITUTE**  
**RESEARCH STATION**  
(ICAR-NATIONAL INSTITUTE FOR RESEARCH ON COMMERCIAL AGRICULTURE)

**Dinhata, Cooch Behar, West Bengal 736135**





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**Standard package of practices of *Jati* and *Motihari* tobacco production in West Bengal**

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**Dr. M. Sheshu Madhav**

**Director**

ICAR - Central Tobacco Research Institute  
Rajahmundry - 533105, Andhra Pradesh, India.  
Phone: 0883-2449871-4, Fax: 0883-2448341, 2410555  
e-mail :directorctri@gmail.com  
Website : <https://ctri.icar.gov.in>

**Authors**

**Partha Saha**

**Namita Das Saha**

**S.K. Dam**

**J.K. Roy Barman**


**K. Satyanarayana**

***Word process & Design***

**Md. Elias**

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## Preface

West Bengal plays an important role as tobacco producing state in the country occupying 12,505 ha area and producing around 19,732 tonnes of cured leaf annually. *Motihari (N. rustica)* and *Jati (N. tabacum)* tobacco are the main types grown mainly in the districts



of Cooch Behar, Alipurduar, Jalpaiguri, Malda and Murshidabad of North Bengal. The CTRI Research Station, Dinhatra was established in the year 1952 under the aegis of the then Indian Central Tobacco Committee (ICTC), Ministry of Agriculture, Govt. of India and in 1965-66, its function was taken over by the Indian Council of Agricultural Research (ICAR) under the direct administrative control of Central Tobacco Research Institute (CTRI) to cater to the needs of tobacco farmers of West Bengal. Since its inception, the research station has been carrying out basic and strategic research on different aspects of tobacco improvement, cultivation, management practices and has done a commendable work in the last seven decades. The station has developed many high yielding tobacco varieties, improved production technologies, plant protection practices for the farming community of this region. Required quantity of seed of notified varieties are being produced and distributed amongst the tobacco growers of the state. Many scientists served this station to pioneer research works and gave their valuable contributions to make it possible to carry forward research works on problems emerging time to time over the years. This publication highlights the advancement made on improved production technology of *Jati* and *Motihari* tobacco. At this juncture, I would like to compliment all the scientists and staff of this station for compiling and editing this valuable information. I hope this improved package of practices will be a highly useful document for tobacco farmers, researchers, students and extension workers and for those associated with tobacco crop in the country.

Date: 26-04-2024

  
(M. SHESHU MADHAV)  
DIRECTOR

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## Introduction

West Bengal occupies an unique place in tobacco cultivation in India. The area is mainly concentrated in northern districts viz., Cooch Behar, Jalpaiguri, Malda and Murshidabad. Tobacco is also grown in southern districts viz. Medinipur, Nadia, North 24 Parganas to a lesser extent. Out of two types, the *Jati* type belongs to *Nicotiana tabacum* and *Motihari* belongs to *N. rustica*. *Jati* tobacco is mostly grown in Adabari and Gosanimari areas of Cooch Behar. *Motihari* tobacco is cultivated in northern part of West Bengal and in some areas of southern part and this type is famous for its strong flavour. Both these tobaccos are used for chewing and hookah.

The research efforts on tobacco production technology, improved varietal development, pest and disease management practices, etc., had strong impact on quality tobacco production in the region. The acquired knowledge on scientific approaches in crop production, curing, grading etc. led this region to become self-sufficient in quality tobacco production accompanied with the enhancement in economic upliftment of the farming community. The detailed improved production technology is discussed below.

## Soil and climate

Geographically the tobacco growing area of North Bengal falls under the '**TERAI**' zone of West Bengal. The agro-climatic condition of this zone is characterized by high rainfall during pre-kharif (April to May) and kharif season (June to September) and mild winter (November to January). Both *Jati* and *Motihari* tobacco prefer to grow under rain free cool climate. The optimum temperature for growth is 10-15°C which prevails during the month of end of November to January. The soil of the area is alluvial flood plain in origin formed from the material deposited by the Brahmaputra, Dharla and Teesta river water. The soil varies from sandy loams to silty loam with acidic in soil reaction (pH 5.1-6.4) which is primarily due to heavy rainfall (3000-3200 mm/year).

## Important varieties

### *Jati type*

The *Jati* tobacco is grown in restricted pockets in the banks of Singimari river of Adabari and Natabari area. This tobacco is mainly used for chewing purpose and is sun cured. Nicotine content in *Jati* tobacco varies from 3.5-4.5%.

**Manasi:** It has long petiole, broad leaves and has 9-10 leaves under topped condition. The potential yield is 1600-1700 kg/ha cured leaf.



Manasi

**Chama:** This variety thrives well under sandy alluvial soil of Adabari area situated on western side of Singimari river. The leaves are broad, thick, petiolate having medium spangles under topped condition. On an average, this variety yields about 1200 kg/ha of cured leaf.



Chama



**Podali:** The variety prefers to grow on eastern side of Singimari river having sandy loam soil. The leaves are oblong, petiolate, having more spangles under topped condition and yields about 1100 kg/ha of leaves after curing.



Podali

**DJ-1:** The leaves are long, boat shaped, petiolate, 50-53 cm under topped condition. It bears 10-11 leaves under topped condition. Leaves have sweet aroma, gummy leaf surface and satisfactory burning capacity. On an average, this variety yields about 1400-1500 kg/ha cured leaf.



DJ-1

### ***Motihari type***

*Motihari* tobacco is mainly grown in northern part of West Bengal as rabi crop. It is used for hookah and chewing purpose. It is sun and air cured tobacco. Nicotine content in *Motihari* tobacco varies from 5-6%.

**DD-437:** This is late maturing variety and suitable for growing under rabi season. Leaves are large and highly puckered, cordate, round in shape, thick, leathery, petiolate and good spangling under topped condition at 8-10 leaves. This variety yields about 2100-2200 kg cured leaf.



**DD-437**

**Bitri:** The leaves are round, and have medium spangling under topping at 7-8 leaves. The average yield is 1700 -1800 kg/ha.



**Bitri**

**Torsa:** The leaves are oval shaped, medium large in size, pungent taste, sweet aroma, more gummy with satisfactory chewing strength. The average yield is 2200-2300 kg/ha cured leaf.



Torsa

**Dharla:** It is a Hemti type and can be grown under sequential cropping system. The leaves are large, cordate and tapering towards the tip, thick, characterized by prominent maturity symptoms. It can produce 2600 kg cured leaf.



Dharla

## Nursery management

### Bed preparation

- As the tobacco nursery may coincide with rainy season, therefore, high lying, well-drained soil should be selected for nursery site.
- It is desirable to change the site every year to minimize incidence of diseases, pest and weeds.
- Green manuring crop *Dhaincha* (Sunhemp) should be grown which must be incorporated at 6-7 weeks old crop.
- Summer ploughing followed by covering the soil with tarpaulins helps to kill soil-borne pathogen, egg masses of insects and weed seeds.
- Before nursery bed preparation land should be ploughed and weeded thoroughly till it comes to a fine tilth.
- It should be leveled properly.
- Raised beds of 90 cm width, 15 cm height and convenient length (10 m) are mostly prepared.
- Drainage channels and path ways having a width of 50 cm are to be provided between the beds to facilitate drainage and intercultural operations.

### Manures and fertilizer application

- Apply well-rotten farm yard manure (FYM) @ 2 kg/m<sup>2</sup> area of nursery and mix with soil 7 days before sowing.
- Application of single super phosphate (SSP) @ 200 g/bed is recommended for healthy seedlings.

### Sowing time

- Optimum time of sowing for *Jati* varieties is first week of September.
- For *Motihari* types, sowing should be done by mid-October to first week of November.



Sowing of tobacco seed



Nursery bed of tobacco

### **Seed rate**

- A seed rate of 0.3 g/m<sup>2</sup> (3 kg/ha) for *Jati* varieties and 0.6 g/m<sup>2</sup> (6 kg/ha) for *Motihari* varieties is recommended.
- Higher seed rate results in lanky growth of transplantable seedlings and increase the incidence of damping off disease.

### **Sowing**

- Seed is to be mixed with sufficient quantity of fine sand and to be evenly distributed over seed beds.
- Covering of seed beds with straw mulch helps in early emergence of seedlings. Mulch should be removed immediately after germination.
- Watering of seed beds with rose cans should be done based on requirement.
- To facilitate proper aeration, soil need to be loosened by raking around the seedlings with the help of bamboo made knife.
- Covering of seed bed with low polytunnel or bamboo strip mats during rainy days is advisable to protect the seedlings.
- The covers should be removed during sunny days.

### **Watering and intercultural operation**

- Watering of seed beds with rose can is done immediately after sowing and watering during morning and evening in a day is sufficient.
- Water stagnation should be avoided to minimize damping off disease.
- To obtain healthy seedlings, thinning of dense seedlings and weeding at fortnight intervals are desirable.
- Top dressing with urea @ 2 g/sqm (mixed with 5 litre water) with rose can at 20 days after germination is advised for early growth of seedlings.
- Normally, *Jati* seedlings will be ready for transplanting by 7 to 8 weeks and *Motihari* by 4 to 5 weeks.
- For better establishment, the seedlings are to be hardened by withholding watering 3 to 4 days before transplanting.

## Plant protection measures

- Apply Bordeaux mixture @ 0.4% (40g of Copper sulphate + 40 g of lime in 10 L) or Copper oxychloride 50% @ 0.2% (20g / 10 L of water) with rose can to a bed of 10 sq. m. area immediately after germination. Repeat under wet and cloudy conditions.
- Spray either *Metaxyl* 4% + Mancozeb 64% (68% WP) or Fenamidone 10% + Mancozeb 50% (60% WP) @ 0.3% (30 g / 10 L) or Azoxystrobin 23% @ 0.1% (10 ml / 10L) of water twice at 15 and 25 days after germination. It should not be sprayed before 15 days after germination and not more than two times.

## Main field preparation and planting

- Select well drained and sunny area.
- Green manuring with *Dhaincha* preceding tobacco is beneficial for higher yield, low nitrogen requirement and good soil health.
- Deep summer ploughing during May-July for 3-4 times is highly useful to minimize weed population, insect pest and soil borne pathogens.
- It also helps in improving soil water and nutrient holding capacity.
- Ploughing the field 4-5 times by tractor is done followed by laddering and leveling.

## Manures and fertilizer application

### Jati tobacco

Organic/ inorganic	Dose per ha	Application schedule
FYM	20 tonnes	One month before transplanting
N	125 kg	65 kg during planting and remaining 60 kg at 55-60 days after planting
P <sub>2</sub> O <sub>5</sub>	50 kg	During transplanting
K <sub>2</sub> O	75 kg	During transplanting

## Motihari tobacco

Organic/ inorganic	Dose per ha	Application schedule
FYM	10 tonnes	One month before transplanting
N	125 kg	65 kg during planting and 60 kg at 40-60 days after planting
P <sub>2</sub> O <sub>5</sub>	50 kg	During transplanting
K <sub>2</sub> O	75 kg	During transplanting

- Application of well decomposed FYM one month before planting has been found to be beneficial in improving yield and quality of tobacco.
- Entire quantity of FYM should be incorporated in soil one month before planting.
- Application of lime @ 1000 kg CaO/ha depending on the soil requirement is recommended.



Pouch application of FYM and SSP

- In fields showing boron deficiency, application of Borax @ 10-15 kg/ha as soil application at the time of final ploughing is beneficial.
- On spot pouch application of FYM @15 tonnes/ha along with SSP and Potassium sulphate can be done for enhancing yield instead of broadcast application.

- Seedlings of *Jati* tobacco are planted during first week of November at 90 cm × 75 cm spacing.
- The optimum time of planting of *Motihari* tobacco is mid November at 60 cm × 45 cm spacing.
- Biocidal treatment with *Trichoderma viride* + *Pseudomonas fluorescens* + SSP of seedlings enhances cured and first grade leaf and bio-management of brown spot.



Biocidal treatment of tobacco field

### Intercultural operation and weeding

- Pre planting application of Pendimethalin 30% EC @ 8-10 ml per litre of water will keep the field weed free for 20-30 days.
- After the establishment of seedlings, raking the soil with hand held rake is useful in loosening soil as well as uprooting of weed plants.
- Four intercultural operations by hand plough is essential to minimize the loss of available soil moisture and for good plant growth.
- Depending on weed infestation, weeding and clod crushing operations are done with the help of *khurpi*.
- Weeding should be done before top dressing.
- Earthing up is beneficial in case of *Jati* tobacco to prevent the plants from lodging.

### Irrigation, topping and desuckering

- During first top dressing light irrigation is given.
- The critical stage of irrigation is 40-45, 55-60 days after planting. Irrigation should be done immediately after topping and desuckering.



- Topping and desuckering are important operations to achieve quality leaf production.
- The stage of topping for *Jati* and *Motihari* tobacco is between 50-60 and 40-45 days after planting, respectively.
- Topping at the stage of first flower opening for *Jati* tobacco leaving 7-8 leaves (Chama) or 8-9 leaves (Podali), or 8-10 leaves (*Motihari*) on the plant excluding sand leaves is recommended.
- Spraying of Copper Oxychloride 50% WP (0.2%) should be done after topping and desuckering.
- Desuckering is to be done 2 or 3 times based on need.

### Tobacco based cropping system

Pre Kharif	Kharif	Rabi
Boro paddy	Aman paddy	Tobacco
Jute	Aman paddy	tobacco

### Harvesting and curing

- Formation of yellow spangles on leaf lamina, subsequently turning to reddish brown spot/tinge is an indication of maturity.
- *Jati* tobacco is ready for harvest in about 120-130 days after transplanting.
- Matured leaves with green colour and brown spot are harvested in 2 to 3 installments.
- *Motihari* tobacco is ready for harvesting around 80-90 days after transplanting.
- Fully matured leaves of *Motihari* tobacco which develop yellow tinge and copper brown colour spots are harvested by priming in 3 or 4 installments.



Harvesting of tobacco leaves

- The leaves are primed in the morning and spread flat on the ground.



Spreading of tobacco leaves on ground

- Late in the afternoon, these leaves are tied in bunches of 4-5 leaves with a thin bamboo splinter and lifted in to the curing barn and heaped on the floor.
- On the next day morning, the primed leaves are hung on bamboo sticks and loaded in country barn made of bamboo mats wall and GI sheet roof for curing.
- Curing is completed with the drying of leaf lamina, mid ribs and petioles.
- Thereafter, the leaves are unloaded, spread on the floor and tied with bamboo splinter having 20-25 leaves in each bundle.



Curing of tobacco leaves in curing barn

- Then they are arranged in bulk for fermentation.
- The bundles are turned periodically at an interval of 8-10 days to facilitate fermentation process and development of reddish brown colouration on leaf lamina.
- A temperature of 35-40°C is ideal for desired fermentation and colouration process of leaf and for good marketability.
- After bulking, the tobacco is graded for marketing.

## Yield

- The average yield of *Jati* tobacco is 1000-1500 kg cured leaf per hectare.
- Yield of *Motihari* tobacco varies between 1800-2200 kg/ha cured leaf.

## Grading

Grading of *Jati* and *Motihari* tobacco is done on the basis of thickness, aroma and maturity.

**Pan patta (Special grade):** Oily surface, thick uniform leaves, coppery brown colour and good puckering and free from blemishes.

**No 1 grade (good quality):** Medium thick leaves, coppery brown colouration with satisfactory oiliness, minor physical injuries also included.

**Niras (khunda):** Thin bodied leaves, slightly dark appearance with dry texture, devoid of puckering. Considerable physical injuries and blemishes not more than 10% of the total area may be present.

**Zala patta grade (fired leaves):** Leaves are not matured properly and are partially burnt on the plant before harvest. Blemishes not exceeding 25% of the total area and dark coloured are allowed.

## Management of pests and diseases

### Leaf eating caterpillar

- The larvae feed voraciously making lot of holes on the leaves.
- Deep ploughing of nursery area during April-May will facilitate the exposure of pupae to high temperature and thus destroy them.
- Sowing of castor around tobacco nursery 10 days before sowing of tobacco so that castor develops sufficient foliage by the time caterpillars are built up. The castor seedlings attract female moths.

- Clip leaves having egg masses and tiny caterpillars and destroy them.
- Placing of 18-20 pheromone traps per hectare helps to control the pest.
- Application of Emamectin Benzoate 5% SG @ 1g per litre is beneficial.



Leaf eating caterpillar

### Stem borer

- The tiny caterpillars bore inside the stem and midribs and feed on internal tissues of the seedlings.
- Swelling appears where borer remains and causes stunting and unusual branching of the seedlings.
- Affected seedlings should be removed.
- In nursery, spraying of Chloropyriphos 20% EC @ 2 ml per litre of water at 30 and 40 days after germination is effective.
- After harvesting of the main crop, stem borer affected plants should be uprooted and buried to prevent carryover of pest to the next season.

### Cutworm

- The adults and caterpillars are nocturnal in nature and mostly active at night.
- Hibernation can occur either in the larval stage and cut the plants above ground level after transplanting resulting in death of the plant
- Flooding of the infested fields helps to control the pest.
- Handpicking and destruction of the larvae in morning and evening hours will reduce pest population.
- Plough the soil during summer months to expose larvae and pupae to predators.
- Setting up of light traps @ 10 traps/ha is highly beneficial.
- Pheromone traps @18-20/ha can be installed to attract male moths.
- Spray insecticides like Chlorpyriphos 20% EC @1 lit/ha or neem oil @ 3% to control the pest.

- Application of Carbofuran 3 G@ 10 kg/ acre is recommended.

### **Aphid and whitefly**

- They suck the sap from leaves and make the plant pale and sickly causing reduction in growth.
- Aphid secrete honey dew on the leaves which results in sooty mould rendering the leaves unfit for curing.
- Whitefly spread the leaf curl virus from infected plants to healthy seedlings.
- Spraying of Acetamiprid 20% SP @ 1 g per litre of water or Imidacloprid 200 SL (17.8 % w/w) @ 0.5 ml per lit of water is effective.
- Spraying should be done preferably in the evening hours.

### **Diseases**

#### **Fungal diseases**

#### **Damping off**

- Most common and serious disease in nursery.
- Brown watery soft rot of young seedlings, girdling of hypocotyls and finally toppling and death of the plants are the common symptom.
- The pathogen spreads very quickly and affects the entire seed beds.
- High humidity, high soil moisture, cloudiness are the favourable factors for high incidence of the disease.
- Deep ploughing during summer destroys the fungus.
- Avoid water stagnation in the nursery.
- Avoid dense sowing.
- Drenching of nursery bed with Copper Oxychloride 50% WP @ 2 g per litre of water.
- Spraying has to be repeated once in 4 days if cloudy weather persists.
- Spray either *Metalaxyl* 4% + Mancozeb 64% (68% WP) or Fenamidone 10% + Mancozeb 50% (60% WP) @ 0.3% (30 g / 10 L) or Azoxystrobin 23% @ 0.1% (10 ml / 10 L of water) twice at 15 and 25 days after germination. It should not be sprayed before 15 days after germination and not more than two times



Damping-off disease in nursery

### **Black shank**

- This is a soil borne disease and occurs when there is heavy and continuous rain.
- The blackening of the stem is noticed upto 30 cm height from the base.
- At the black end portion inside the stem, the pith transforms into black round plate like disks.
- Roots also become black and finally rotting is seen.
- The leaves become yellow, wilt and death of the plant occurs.
- Spray either *Metalaxyl* 4% + Mancozeb 64% (68% WP) or Fenamidone 10% + Mancozeb 50% (60% WP) @ 0.3% (30 g / 10 L) during the initiation of disease

### **Fusarium wilt**

- Wilting and yellowing of leaves followed by drooping of the plants are characteristic symptoms.
- The plants die as a result of clogging of vascular bundles and xylem tissues.
- At advance stage the roots rot and whole plant dies.
- Summer ploughing can reduce fungal spore in the soil.
- Root treatment of seedlings with Mancozeb 75% WP for 10-15 minutes is advised.
- A solution of Carbendazim 12% and Mancozeb 63% WP @2- 3 g per litre when poured at the base of infected and surrounding plants can minimize spread of the disease.

## Brown spot

- The disease occur when there is high relative humidity and atmospheric temperature is around 20-25°C
- Dark brown spot separately or coalesced appears on the leaves.
- The spot will be like small water-soaked spot first, later extending to one cm size in 5-6 days with brown colouration.
- Sometimes yellow rings are seen around the spot just like frog eye spot.



Brown spot disease

- The disease appears first on lower leaves and spreads to the upper leaves.
- The affected leaves dry up and do not cure properly.
- Dark brown, sunken, elongated spot appears on stem, petioles also.
- Avoid excess Nitrogenous fertilizer application.
- Spray Mancozeb 75% WP @ 0.2% (20 g / 10 L of water) or Propiconazole 25% EC @ 0.1% (10 ml / 10 L water) in such a way as to cover the entire surface of the leaf.

## Bacterial diseases

### Hollow Stalk

- Hollow stalk usually occur during topping and desuckering time in the main field.
- The disease initiates at any entry in the wound but it is usually seen at the point of break made during topping.

- Browning of the pith develops followed by soft rotting and collapse of tissue.
- The top leaves wilt and the infection spreads downwards.
- The leaves droop, hang down and fall off, leaving the stalk bare.
- The field should not be irrigated immediately after topping and desuckering.
- Ensure cleaning of hand of the field workers to avoid transmission of contaminated soil during topping and desuckering.



Hollow stalk disease

- Application of lime @1000 kg per hectare is beneficial.
- Avoid topping and desuckering during damp and cloudy weather.
- Small split cutting of the stem in the infected area and pasting of Blitox 50% paste can reduce spreading of disease.

### **Bacterial wilt**

- Drooping of young leaves during day time followed by recovery in the evening.
- On slow progression of the disease, the affected leaves become flaccid and large leaves may droop in an umbrella like fashion.
- Growing green manuring crops before tobacco is beneficial.
- Application of lime @1000 kg/ha one month before transplanting is recommended.



## Viral disease

### Leaf curl

- Diseased leaves show vein clearing, puckering and downward curling.
- Leaves become brittle with thickening of veins.
- Remove the infected plants and destroy them.
- Do not use infected seedlings for transplanting in the field.
- Remove and destroy alternate weed host.
- Crops like chilli and brinjal should not be grown in the vicinity of the tobacco field.
- Install 12-15 yellow sticky traps per hectare to monitor white fly population.
- If whitefly population reaches 100 per trap, then spraying should be done immediately.
- Spraying has to be done preferably in the evening hours (4-6 pm).
- It should be ensured that both sides of the leaves are sprayed.
- Spray Imidacloprid 200 SL @ 2.5 ml or Thiomethoxam @ 2 g/10 litres of water ten days before pulling in the nursery, 2-3 times 10 days after transplanting in the field at an interval of 10 days.



Leaf curl disease

### Tobacco mosaic

- The disease spreads through contact by field workers and implements used for intercultural operation.

- The leaves of the affected plants show dark or light green patches.
- The plants show stunted growth reducing yield and quality of the leaf.
- Unclean cultivation, indiscriminately touching diseased and healthy plants, presence of susceptible weeds and crops near field are some of the factors for disease development.
- Washing and cleaning hands before and after field operation should be followed.
- Uprooting of affected plants and destroying them.
- Prophylactic spray of virus inhibitors of plant origin like *Basella alba* or neem leaf extract @1% at 30, 40 and 60 days after planting is beneficial.



