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STANDARD PACKAGE OF PRODUCTION PRACTICES FOR FCV TOBACCO IN SLS REGION OF ANDHRA PRADESH

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FCV tobacco grown on red loamy soils in Prakasam and Nellore districts of Andhra Pradesh is known as Southern Light Soil (SLS) tobacco. These soils are neutral in soil reaction, low to medium in fertility, moderately well drained, low in permeability, moderate in water holding capacity and low to medium in cation exchange capacity. FCV tobacco under SLS is grown during *rabi* season on conserved soil moisture of North-East monsoon rains. Climatic conditions are highly unpredictable in this region.

Site selection and land preparation

- Select well-drained, moderately deep soils with gentle slope
- Avoid soils with shallow depths, hard laterites and saline soils. The chloride content in the soil should be less than 100 ppm
- Deep ploughing in the selected field during summer would destroy weed, soil pathogens and insect pests by exposing them to hot sun
- Apply organic manures *viz.*, FYM 10 t/ha or grow green manuring crop for improving soil organic matter and water holding capacity
- Plough the field 2-3 times with mould board or disc plough followed by two cross ploughings with cultivator and planking for levelling the field before planting

Recommended varieties

- Siri, N-98, VT-1158, CTRI Sulakshana and Hema

Seed bed preparation and seedlings selection

- Well-drained sandy or red loamy soils are suitable for raising tobacco nurseries
- Raised nursery beds are to be prepared 15 cm above the channels for good internal as well as surface drainage
- Application of 25 kg FYM, 300 g of single super phosphate, 50 g of ammonium sulphate, 100 g of potassium sulphate and 50 g of Dolomite or 50 g of magnesium sulphate per 10 sq.m. bed is recommended as basal dose
- Select healthy seedlings of 50-60 days duration with pencil thickness for transplanting
- Transplanting with tray seedlings will overcome the problem of diseases and preclude seedlings from transplantation shock. Tray nursery seedlings offer the unique advantage of ensuring crop uniformity with minimum gap fills and consequently increase cured leaf yield and quality as against the seedlings grown under conventional raised soil-bed nursery

Time and method of planting

- Ideal period for transplanting is between 15th October to 15th November
- After land preparation, mark the plant position by running a marker in cross directions at a spacing of 65 x 65 cm (23,669 plants/ha)
- Plant the tobacco seedlings manually in marked plant holes after watering
- Adopt flat planting, followed by ridging during intercultures
- Gap fills are minimum with tray seedlings and is to be completed within 7 days

Interculture

- Interculture with tyned harrow (gorru) 2-3 times during 20-50 DAT followed by blade harrowing (guntaka)

Irrigation

- If continuous dry spells exists, give one life saving irrigation at 40-50 DAT with good quality irrigation water (chlorides <50 ppm). Under excess moisture, excess water is to be drained out and interculture operations are to be carried out at optimum moisture condition

Fertilizer application

- Recommended fertilizers and their doses are given below:

Name of the Fertilizer	Dose (kg/ha)	N-P_2O_5-K_2O-Ca(kg/ha)
Di-Ammonium Phosphate	75	15.0 - 34.5 - 0
Calcium nitrate	50	8 - 0 - 0 - 9.5
Ammonium Sulphate	180	37.8 - 0 - 0 - 0
Sulphate of Potash	120	0 - 0 - 60 - 0
Sulphate of Potash (Podili)	150	0 - 0 - 80 - 0
Total		60- 35- 60 to 80 -9.5

- Apply the above fertilizers in plant row plough furrow method 15 days before planting to facilitate nutrients availability near the root zone

Interventions for water stress/ excess water management

- To increase water holding capacity of soils, apply organic manure/ new generation soil amendments, adopt mulching
- Foliar application of potassium nitrate @ 1% is recommended
- If monsoons are delayed, yield can be enhanced by high density planting

Pest Management

1. Ground beetle (*Mesomorphus villiger*)

- Spray chlorantraniliprole 18.5 SC @ 3 ml/10 L water one day before transplanting on the nursery bed or trays
- Apply 5 g of pongamia cake or neem cake powder (mixed in handful of sand) at the base of the seedling immediately after transplanting
- If seedlings are not treated before transplanting, apply imidacloprid 200 SL @ 2.5 ml/10 L in transplant water
- In the newly planted field, keep grassheaps 6-7 m distance apart between rows on a moist soil and destroy them next day

2. Leaf eating caterpillar (*Spodoptera litura*)

- Install 10 pheromone traps per hectare 20 days after planting
- Spray the hot spots thoroughly with 0.5% neem seed kernel suspension

- *Spodoptera* NPV (Nuclear Polyhedrosis Virus) can be sprayed @ 250 LE (prepared by mixing 250 infected larval mixture in 1000 litres of water per hectare by mixing with 2.5 kg jaggery)
- If the infestation is severe, spray emamectin benzoate 5 SG @ 5 g in 10 litres of water (or) Novaluron 10 EC @ 10 ml in 10 litres of water

3. Whitefly (*Bemisia tabaci*)

- Install 10 yellow sticky traps (12x15 cm size with 2 mm thickness) per hectare to monitor the whitefly population
- If the population of whitefly is 100 per trap, give the following spray schedule of insecticides
- 1st spray-Thiamethoxam 25 WG @ 2 g (or) pymetrozine 50 WG @ 4 g (or) flonicamid 50 SG @ 4 g (or) imidacloprid 200 SL @ 2.5 ml in 10 litres ofwater
- 2nd spray -15 days after 1st spray and 3rd spray -15 days after 2nd spray with any one of the above insecticides

4. Tobacco aphid (*Myzus nicotianae*)

- When 2 % of the plants are infested, use any one of the following insecticides *viz*., Imidacloprid 200 SL @ 2.5 ml (or) thiamethoxam 25 WG @ 2 g (or) flonicamid 50 SG @ 4 g (or) pymetrozine 50 WG @ 4 g in 10 litres of water

5. Budworm / Capsule borer (*Helicoverpa armigera*)

- Plant marigold as trap crop in two rows around the field to attract ovipositing female moths; this helps in easy collection and destruction of eggs and larvae
- One month after planting, install 10 Helicoverpa pheromone traps per hectare
- Arrange 10 bird perches per hectare in untopped fields, spray Helicoverpa Nuclear Polyhedrosis Virus (HaNPV) @ 250 LE/ha (prepared with 250 infected larvae in 1000 litres of water, add 2.5 kg jaggery)
- Apply *Bacillus thuringiensis* var. *kurstaki* (Bt) @ 10 g in 10 litres of water
- Spray Bt and NPV in the evening hours
- When the infestation is above 10 %, spray flubendiamide 480 SC @ 2.5 ml (or) chlorantraniliprole 18.5 SC @ 3 ml in 10 litres of water

Disease management

1. Brown spot (*Alternaria alternata*)

- Apply the recommended potash fertilizer dose
- Propiconazole @ 0.1% (10 ml/10 L water) is to be sprayed in such a way to cover the entire surface of the leaf

2. Black shank (*Phytophthora parasitica*)

- Crop rotation is to be followed in frequently infected fields
- Apply 75-100 ml of 0.4% Bordeaux mixture/ plant (40 g of Copper sulphate + 40 g of lime in 10 L of water)
- Spray copper oxychloride @ 0.2% concentration (20 g / 10 L of water) around the plant base (or) fenamidone + Mancozeb 60 WG (30 g in 10 L of water) (or)
- Spray metalaxyl + mancozeb combination (72 WP) @ 0.2% (20 g/ 10 L of water) but it must be restricted to two sprays

3. Fusarium wilt (*Fusarium oxysporum* (Schlecht) Wr.)

- Adequate organic matter in soil helps to reduce the Fusarium wilt disease
- Application of bio-agent enriched vermicompost/press mud/ FYM
- Green manuring with sun hemp
- Crop rotation with sorghum/ maize for at least two years is beneficial

4. Cucumber mosaic virus (CMV)

- Aphid, vector of this virus has to be controlled to prevent the spread of this disease
- For management of aphids, spray Imidacloprid 200 SL @ 2.5 ml (or) thiamethoxam 25 WG @ 2 g (or) flonicamid 50 SG @ 4 g (or) pymetrozine 50 WG @ 4 g in 10 litres of water
- Remove and destroy severely infected tobacco plants

5. Leaf curl virus (TLCV) (*Ruga tabaci*)

- Whitefly, vector of this virus has to be controlled to prevent the spread of TLCV disease
- Install yellow sticky traps of 12 x 15 cm size @ 12/ha for monitoring the vector, whitefly
- Spray imidacloprid 200 SL @ 2.5 ml (or) thiamethoxam 25 WG @ 2 g (or) flonicamid 50 SG @ 4 g (or) pymetrozine 50 WG @ 4 g/10 litres of water on ten days seedlings before pulling in the nursery
- Spray the above chemicals for 3-4 times on 10 days after transplanting in the field at an interval of 15 days
- Remove and destroy severely infected plants

6. Tobacco mosaic virus (TMV) (*Marmor tabaci*)

- Strictly follow the sanitary measures and should not touch the infected plants
- Workers should wash their hands with soap water before and after entering infected fields
- Prophylactic sprays of plant extract like Basella or Bougainvillea or neem @ 1% or 0.5% skimmed milk on 30th, 40th and 50th DAP to prevent spread of the disease to some extent

7. Broomrape (*Orobanche cernua*)

- Deep summer ploughing is recommended
- Instead of growing tobacco continuously, grow non-host or trap crops (Jowar, Sesamum, Blackgram & Greengram)
- Incorporation of 100 kg of neem cake/acre in the last ploughing
- Careful removal of spikes before flowering or seed setting reduces the *orobanche* seed load
- Above said measures if followed in integrated manner, *orobanche* infestation can be reduced

Topping and sucker control

- Follow need based topping
- Apply 10 ml of Decanol @ 4% or Rayalten @ 4% to control the suckers

Harvesting

- Each time harvest 2-3 matured leaves
- Harvest bottom leaves (1&2 primings) when they are light green & turning towards yellow. Middle leaves (3-6 primings) may be harvested when they are ripe and light yellow. Harvest top leaves (7 and above primings) when they are fully ripe & yellow
- First harvest commences from 70-75 DAT

Time of Harvest

- Complete harvests before 9.00 am
- Do not expose harvested leaf to hot sun and contact with soil
- Delay harvesting for 3-4 days, if there is a rain

Curing

- After stringing and loading of the the harvested leaves, curing is to be practiced in the below mentioned schedule and bulk the cured leaf

Stages	Temperature		Ventilators	Time (hrs)
	Dry bulb	*Wet Bulb*		
Yellowing	90 to 105 °F	80 to 94°F	Top and bottom ventilators are gradually opened to 2 inches	36-48
Colour fixing	105 to 120°F	94 to 98°F	Bottom ventilators are opened to 3-5 inches at the base and top ventilator is raised to a height of 3-5 inches from the roof	5-11
Leaf drying	120 to 145°F	98 to 110°F	Top and bottom ventilators are gradually closed	**25-40**
Midrib drying	145 to 160°F	110 to 114°F	Ventilators closed	24-36

Fuel for flue-curing

- Traditional fuel: Fire wood, coal
- Alternative fuel: Coconut fronds/husk, hulled maize cobs, Agri biomass briquettes and solar energy

Problems in Flue-curing and their management

1) Barn rot

- Occurs when moist leaves are harvested and loaded in the barn. It can be managed by avoiding leaf harvesting when they are moist

2) Sponging

- Avoid rapid drying at high temperatures during yellowing and overloading of barn

3) Barn scald

- Avoid increasing the temperature by not more than 1 to 2^0F per hour

4) Dark Green grades

- Avoid curing of immature leaves and raising temperatures beyond 105^0F before yellowing is completed

5) Cooked / caramelized leaf

- Avoid increasing temperature beyond 160^0F during midrib drying and loading of leaf nearer to flue pipes

6) Run back

- Maintain the required temperature during midrib drying stage

Grading, Baling and NTRM

- Bulking is very essential for maintaining the desired quality and proper moisture in the leaf. Turn the bulks once in a week depending upon the moisture content in the leaf
- Grade the cured leaves into 10 farm grades based on colour, texture and blemish
- Bale the cured leaf grade-wise at optimum moisture condition
- Avoid mixing of different grades while baling as it may fetch lower price during auction
- Avoid non-tobacco related materials (NTRM) like sand, weeds, plastics, hessian cloth / gunny pieces, paper bits, broomstick pieces, etc. in bales

Crop Rotation

- Crop rotation is essential in tobacco cultivation. However, precautions need to be taken in selection of crops
- If soils are poor in fertility, grow and incorporate crops *viz.*, greengram, blackgram, sunnhemp for soil fertility improvement
- If rainfall is received during kharif, growing short duration millets like Korra, preceding to tobacco will increase the farmers income

NOTE: Cultivation of tobacco as per the crop size and area fixed by Tobacco Board will ensure fair price to the farmers

For further details please contact Director, ICAR-CTRI, Rajahmundry

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