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# ICAR-CTRI RESEARCH STATION, KANDUKUR, ANDHRA PRADESH

*At a Glance*

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**ICAR - CENTRAL TOBACCO RESEARCH INSTITUTE**  
**RESEARCH STATION**  
(ICAR-NATIONAL INSTITUTE FOR RESEARCH ON COMMERCIAL AGRICULTURE)  
**KANDUKUR 523 105, ANDHRA PRADESH**



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## **ICAR-CTRI Research Station, Kandukur, Andhra Pradesh - At a Glance**

*Published by*

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## CTRI RESEARCH STATION, KANDUKUR, ANDHRA PRADESH

ICAR-CTRI established a research station in an area of 42.45 ha at Kandukur, Prakasam district, Andhra Pradesh to conduct research on FCV tobacco for southern light soil (SLS) region and to address the crop specific needs of the farmers of this region in the year 1977. Since its inception, the station has been actively involved in the development and evaluation of tobacco crop specific technologies, trainings, crop advisories pertaining to the region. Further, in the year 2012 Krishi VigyanKendra was established in the station premises in an area of 20 ha as a knowledge and resource center for agriculture and allied sectors. Presently CTRI RS Kandukur has 22.5 ha of land with requisite farm infrastructural facilities to conduct research on FCV tobacco. The main focus of the research station is enhancement of yield and quality of FCV tobacco in this region.



### Mandate of the station

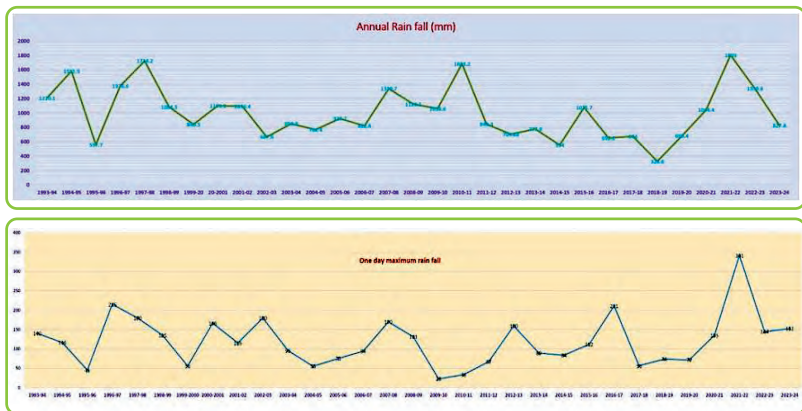
- Development of varieties suitable to SLS region with high yield, quality, tolerance to biotic and abiotic stresses
- Management interventions for enhanced productivity and quality
- Identification of alternative crops/ cropping systems for tobacco in SLS region
- Dissemination of technologies and capacity building.

### Uniqueness

- The location of the ICAR-CTRI Research Station, Kandukur is characterized by the occurrence of frequent droughts, extreme rainfall events, high temperatures and poor quality ground water
- The station has been serving the tobacco growers of SLS region since its establishment
- Designed micro-watershed with network of farm ponds for rain water harvesting
- Station supplies 100% FCV tobacco seed requirement of the region

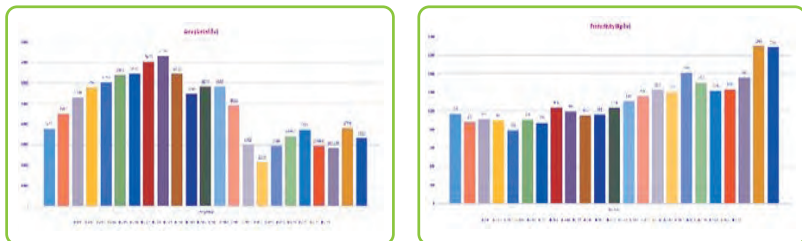
## Weather situation of the region

SLS tobacco growing regions of Andhra Pradesh are characterized by extreme weather conditions and unevenly distributed rain fall. The maximum share of rain fall is contributed by North East monsoon (October to February) during rabi and less rainfall during kharif season. The erratic rainfall distribution during crop season resulting in frequent crop failure due to occurrence of waterlogging and prolonged drought. Heavy to extremely high rain fall incidence in a single day lead to loss of rain water and non-availability of irrigation water for crop. The production of tobacco is often affected due to frequent occurrence of drought during grand growth stage.



## Area, production and productivity of the region

A total of 15,860 growers are registered for tobacco cultivation and 11,529 barns are licensed by Tobacco board (2023). Although area of planting is decided by the Government policy, the average area recorded for last 20 years is 33,220 ha. The production has been increased from 36.63 Mkg (2001) to 56.0 Mkg (2023). With release of high yielding FCV tobacco varieties and adaption of production technologies productivity of the region enhanced from 969 kg/ha (2001) to 1,686 kg/ha (2023).



## Major Constraints of the region

- Low and erratic distribution of rainfall – Mainly rain fed
- Perennial droughts and cyclones – almost every year
- Poor SOC (0.2 %) and available nitrogen
- Low soil depth, crusting and moderate erosion
- Soil compaction, surface crusting, soil hardening
- Low yields
- Poor ground water quality (highly saline and EC values often exceeds 10 dS/m)
- Prevalence of pest and diseases

## Research Accomplishments

Research Station has developed high yielding, biotic and abiotic stress tolerant varieties, crop production, protection and energy conservation technologies, and identified alternative crops and cropping systems for southern light soil region. Some of the significant contributions are furnished below.

## Germplasm maintenance

Severe droughts and occasional floods are the key characteristics of tobacco growing areas of SLS and SBS in Andhra Pradesh. Diverse germplasm plays an active role in improving tolerance to biotic and abiotic stress tolerance in response to climate change. The station has collections of more than 300 germplasm accessions consisting of indigenous and exotic FCV germplasm, advanced breeding lines, TMV resistant lines, drought tolerant lines and aphid resistant lines.



## Climate resilient cultivar development

Extreme climate situations viz., drought, floods, salinity, poor soil fertility levels and increased pest and disease pressure resulting in low tobacco productivity in the SLS areas. By sustained team efforts of long-term breeding programmes (1977 to 2023) through systematic evaluation of germplasm for drought stress tolerance, creation of improved genotypes over multiple breeding cycles and improvement in productivity have been achieved for diverse range of target water limited environments of southern light soils. Systematic plant breeding programmes could able to identify 13 novel germplasm sources and 11 new breeding lines for drought tolerance.



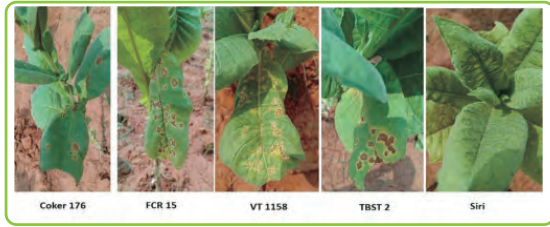
## Biotic stress tolerant varieties

Six breeding lines (KRB 1-6) with tolerance to Aphid infestation have been developed. Among them KRB 3 breeding line has higher yield potential with aphid tolerance.



## Reaction to TMV incidence

Two high yielding and TMV resistant varieties (VT 1158 and FCR 15) have been developed and popularized in the Southern light soil areas for cultivation.



## Varieties released for cultivation

Six FCV tobacco varieties were released for cultivation in SLS and SBS areas of Andhra Pradesh. Among them two improved varieties N 98 and CTRI-Shresta have high yield with drought tolerant capabilities. Three varieties viz., VT-1158, CTRI-Sulakshana and CTRI-Shresta have TMV resistance.



CTRI Shresta

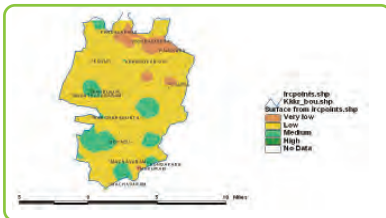
Siri

VT-1158

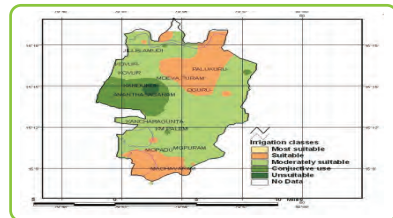
N-98

## Soil fertility and ground water quality Studies

Geographical information system for water quality ( $\text{Cl}^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{Na}^+$ ,  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$ ) and soil quality ( $\text{Cl}^-$ , OC, P and K) with thematic spatial maps was developed for 17 villages and 13 villages in Kandukur and Tangutur mandals, respectively to identify/delineate areas with water quality and soil fertility best suitable for FCV tobacco nurseries and main crop in southern light soils and southern black soils of Andhra Pradesh.



Spatial variation of soil organic carbon in Kandukur mandal



Irrigation water classes in Kandukur based on WQI

## Nursery management

- Standardized the management practices for healthy seedling production
- Irrigation water used for nursery should contain less than 200 ppm chlorides for better germination and more number of healthy transplantable seedlings.
- Application of farm yard manure to nurseries was beneficial for producing healthy, seedlings when they are irrigated with waters of high salt content.
- Damping off disease can be effectively controlled and maximum number of transplantable seedlings can be obtained with Rabbing + Drenching with Bordeaux mixture (BM) or copper Oxy Chloride (COC) @ 0.2% as and when required + 0.2% Ridomil spray at 20 and 30 days after germination.



FYM application in nursery beds



Damping off disease



Nursery

## Field crop management

- *In situ* green manuring with sunhemp improved the cured leaf and bright leaf yields and saved the nitrogen fertilizer up to 12.5 kg/ha.
- Flat planting followed by ridging is better for the crop planted early i.e. First week of October to minimize damage due to heavy cyclonic rains. For normal planting time flat planting is better.
- Fertiliser application in the form of organic: inorganic in the ratio of 25:75 by pant-row-plough furrow method is best suited to this region.
- Agronomic practices viz., fertiliser requirement and spacing are standardized for all the released varieties.
- Resource conservation through live bed system (Gliricidia raised on live beds were used as green leaf manuring and mulching during crop growth) improved the productivity.
- Application of new generation soil amendments viz., hydrogel @ 5 kg/ha and Biochar @ 5 tons/ha increased the cured leaf yield and retained soil moisture more time in the root zone.



- Foliar application of Gibberellic acid @ 50 ppm or potassium nitrate spray @ 1% during grand growth period enhanced the productivity of flue-cured tobacco.
- Higher water productivity was recorded with drip irrigation in paired row method of planting.
- Customized fertilizers were evaluated and found best option to enable balanced application of nutrients.
- Ridomil spray @ 0.2% at the time of planting and 20 days after planting (basal application of 100 mL/plant) effectively controlled the black shank disease and gave higher yields.
- Neem Azal 50 ppm, Pymetrazine 50 WG @ 4 g/10 L were effective in reducing white fly population in main crop.
- Imidacloprid 200 SL @ 3 mL /10 L and Ethan @ 0.1% were effective in reducing white fly population.
- IPM Module consisting of Jowar as barrier crop, NSKS spray @ 0.5%, NPV (*Spodopetera*) 250 LE spray, need based application of Emamectin benzoate @ 5 g/10 L spray, Imadacloprid @ 3 mL/10 L spray is recommended.
- Topping and sucker control enhanced the yield and quality of the crop. Judicious topping is recommended for this region. Topping at flower bud initiation stage and use of contact type of suckericide Decanol @ 4% and locally systemic chemicals Stomp (Pendimethalin) @ 1.5% and Prime<sup>+</sup> (Flumetralin) @ 1.25% effectively control the suckers.



*In situ* green manuring



Gliricidia loppings as green manure



PRPF method of fertiliser application



Drip irrigation in paired row method of planting

## Climate resilient technologies

**A drought proofing technology for SLS region:** Farm Pond technology was developed to supplemental irrigation using harvested rainwater. This region receives rain during *rabi* season due to cyclones. The intensity of the rain is high during cyclonic period and the ponds get filled. Normally there is possibility of two filling in one season. One filling can be used for raising nursery and another for supplemental irrigation to tobacco field crop.

**Dense Planting-A Climate Resilient Strategy for FCV Tobacco production under delayed monsoon situation:** Dense planting (increase in plant population) enhanced the cured leaf yield to an extent of 11-26% under low productivity areas and or situation when planting is delayed due to late onset of monsoon.

**Soil amendments, mulching and foliar feeding:** Soil application of hydrogel + Mulching + Foliar application of Gibberellic acid @ 50 ppm/potassium nitrate @ 1% could mitigate the drought situation in SLS region.

**Conservation furrow:** It helps to conserve moisture during dry spells and drain out water during the periods of excess rainfall.

**Application of nutrients:** Soil and Foliar application of nutrients (nitrogen and potassium) and providing aeration could mitigate the ill effects of waterlogging situation.



Farm Pond



Dense Planting



Soil amendments, mulching and foliar feeding



Safe disposal of excess water

## Farm mechanization

- Tractor drawn implements for making seed beds, sub soiling, marking @ 65 cm spacing for planting, spraying equipment and interculture reduced the drudgery and labour cost.
- Tobacco seed threshing using multicrop thresher made threshing of tobacco seed capsules easy and labour saving.
- Tobacco transplanter, leaf stitching machine in collaboration with ICAR-CIAE Research Station, Coimbatore and evaluation and standardization of modern leaf curing structures in collaboration with Tobacco Board and ITC are in progress.



Marking at a spacing of 65 cm



Transplanter



Spraying



Interculture



Leaf stitching machine



Loose leaf barn

## Post harvest technologies

- Fuel saving technology: Blackening of barn roof with black paint absorbs the solar radiation and raises the barn temperature during day time and consumes less fuel for each charge of curing. Saving of fuel with roof treatment is 12.5%.
- Glass wool insulation to roof and doors of the barn and fixing of turbo fan on the top of the barn helped to save 9-22% of wood used for curing.



Glass wool insulation



Turbo fan

## Alternate crops and cropping systems

- Ground nut, green gram, and cluster bean can be grown as kharif crops before rabi tobacco cultivation. Groundnut-Tobacco recorded maximum net returns.
- Fast growing tree species viz., eucalyptus and subabul with tobacco and other crops like black gram, Kalmegh, guinea grass can be grown in this region.
- Medicinal and aromatic crops (Lemon grass, Palmorosa, Field mint, Bhutulasi, Neelavemu, Aswagandha, Aleo vera) Senna can be grown as alternative crops to tobacco on soils with low productivity and quality.
- Red gram intercropped with ground nut, mustard under rainfed conditions and chillies under irrigated conditions are promising alternative crops to tobacco in red soils.
- Two-year cropping system Sunhemp-Tobacco and Korra-Bengal gram is remunerative in southern black soil region.



Agroforestry



Chilli



Aswagandha

## Revenue generation

**Farm returns :** The station contributes significantly (~Rs.25 lakhs per annum) to the financial resource generation of the Institute through the sale of tobacco cured leaf, marigold seedlings as a component of IPM.



**Seed production and sale :** In association with seed production unit of the Institute, the Station has successfully implemented quality seed production and distribution in SLS and SBS regions. Over the eighteen years (2006-2023), the station supplied 99,857 kg of quality tobacco seed to tobacco growers and realized Rs 11,43,86,600. Further CTRI Research station Kandukur contributed 19,765.3 kg of quality seed of different FCV tobacco varieties to seed production unit of ICAR-CTRI for subsequent supply to the farmers.



Seed sale (kg)



Seed sale (Amount Rs)



Seed production Plot



Tobacco growers during seed sale

## Transfer of technology and other extension activities

**Transfer of technology :** Organized on farm testing and demonstrations of different varieties viz., Hema, VT-1158, CY-78, Ratna, Siri, CTRI-Sulakshana, CTRI-Shresta and technologies viz., in situ green manuring, farm pond technology, INM and IPM practices, mitigation measures to counteract the ill effects of water deficit and waterlogging in farmers' fields and popularized. Workshops, farmers days, field days and diagnostic visits are being organized during the crop season to impart technical know-how to tobacco farmers time to time.



Demonstrations



Workshops and field days



Diagnostic visits

**Capacity building programmes:** Organized capacity building programmes to Auctions superintendents, SGOs, field officers and field assistants of different auction floors of tobacco board present in southern region on best management practices in FCV tobacco cultivation and related integrated production systems for production sustainability and profitability. In addition, training programmes were also organized on FCV tobacco cultivation practices to outsourcing extension staff of Tobacco Board and Agriculture department.



**Schedule Caste Sub Plan (SCSP):** The station implemented the SCSP programmes with the aim to create awareness by organizing demonstrations and training programmes of latest varieties and production technologies and providing critical inputs for improving the socio economic conditions of the intended farmers. An exposure visit is also organized to ICAR-CTRI, KVK, Kalavacherala and tobacco regions of northern light soils.



Demonstrations and training programmes



Supply of inputs



Exposure Visit

**Tribal Sub Plan (TSP):** The station implemented TSP programme in Veerepalli village of Prakasam district. Training programme on Tailoring to unemployed women, awareness programme on kitchen gardening and income generation activities were organized. The inputs distributed were fishing nets, kitchen garden kits and sewing machines.



## Recognitions and Publications

The scientists of the station received many awards from Indian Society of Tobacco science and other reputed societies. The scientists have published more than 100 research papers/technical bulletins/popular articles etc.



## Infrastructure

- Administrative building, Research farm with farm ponds well connected with water ways, farm equipment, micro irrigation systems, drought screening structure, farm office, stringing shed, grading shed, barns of different dimensions, meeting facility, parking shed, threshing floor etc.
- Laboratories for seed testing and leaf processing with incubator, hot air oven, weighing balances etc.
- Instruments viz, Portable Photosynthetic system, canopy analyzer, chlorophyll content meter, Infrared thermometer.



Administrative Building



Farm Office



Barns



Instruments



Meeting facility



Drought screening structure

## Valued Partners

The major partners of the station for transfer of technology to the tobacco farmers are tobacco board and tobacco trade. Field days, Field friend's programmes and diagnostic visits are being carried out during the crop season in collaboration with these partners. The station also closely working with the Krishi Vigyan Kendra located in the same premises, Horticultural college, Chinalatarapi and state Agriculture and Horticulture departments.

### Way Forward

In the changing milieu of climate relating to the region, the research station will keep continued emphasis on the development of climate resilient varieties and technological interventions to counteract the harsh effects of prolonged drought, waterlogging, and extreme temperatures. In addition, as a measure of cost cutting and labour saving, the station is keen to strengthen its research efforts in mechanization and energy saving technologies. The advisory system and supply of quality tobacco seed will remain focused and further strengthened. In a move to cater to the needs of non FCV tobacco (Burley), the station initiated research on Burley tobacco as it is gaining importance in this region. In accordance with the changing mandate of the Institute, the station also geared up and initiated research on Castor and Chilli.

## Acknowledgements

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**ICAR-CTRI**  
**Research Station**  
**Kandukur**