RESEARCH HIGHLIGHTS

ICAR-CTRI, Rajahmundry

Project: Br-2 : Evolving superior varieties of FCV tobacco through hybridization

- V-5058 (1188 kgs/ha) and V-5061 (1090 kgs/ha) are found superior to checks with respect to cured leaf yield and grade index in replicated yield trial conducted
- 2. FCR-3 is found superior among the three bulks tested with higher cured leaf yield and grade index.
- Out of 13 advanced breeding lines tested in a replicated trial for third year along with two controls, VT 1158 and Siri, lines RS 23 and RS 27 found promising with more than 2000 kg/ha cured leaf yield at Katheru Farm.
- Several advanced interspecific cross derivatives having resistance/tolerance to tobacco aphid have been developed and evaluated for leaf yield potential in a number of preliminary and replicated evaluation trials.
- Among the derivatives, 86 new lines with TMV resistance were identified on artificial inoculation.
- Two replicated yield trials were conducted with 20 advanced cross derivatives and 12 lines having promise for leaf yield and quality were identified.
- Ten lines were contributed to AINPT trials; one line, TBST-2 was identified for release, pending manufacturing test.
- Seven CMS hybrids viz., CMSH Nos. 134, 135, 136, 138, 141 and 143 produced over 2296 kg/ha cured leaf yield as compared to 1825 kg in Siri, besides having high leaf quality were identified for further evaluation.
- New alloplasmic CMS source has been identified.
- Developed and maintained 67 CMS lines

Biotech-6 : Molecular Mapping of Important Tobacco Traits

- Immortal mapping populations developed for important tobacco traits viz., nicotine, solanesol, seed oil and TSNA

- A total of 24 polymorphic SSR markers were identified among the parents of RIL population developed for the mapping of nicotine and solanesol traits.

- Nicotine content of the mapping population found to be in the range of 0.66-5.27 % and its parents 2.11% (Nisnicotinony-121) to 4.25% (Candel).

- The ycf1 loci (intergenic spacer region) is found to be polymorphic and can act as candidate DNA barcode loci among the *Nicotiana* accessions.

Biotech-11: Biogenesis and regulation of TSNA (Tobacco Specific Nitrosamines) in Tobacco

- A total of 45 CYP genes/ CYP isoforms related to TSNA formation were identified from five *Nicotiana* sequenced genomes.

ICAR-CTRI RESEARCH STATION, JEELUGUMILLI

JL.Br.2.1 : Developing tobacco cultivars for high seed yield, oil content, high biomass and other phyto-chemicals

- Lines RT-113-2 (2665 kg/ha), RT137-2 (2022 kg/ha), RT-25-1 (2481 kg/ha), RT-118-1 (2409 kg/ha), RT-53-7 (2272 kg/ha) and RT-83-1 (2214 kg/ha) are found superior in replicated yield trials.
- FCJ-11 (2173 kg/ha) and FCJ-7 (1919 kg/ha) are the out yielders among them with superior quality of leaf with lemon to orange in colour and medium bodied leaf in bulk yield trials.
- In the bulk trial conducted at Jeelugumilli, entries viz., Tobios-6 and FCJ-11 recorded 27-55% higher cured leaf yields and grade index than Kanchan.

ICAR-CTRI RESEARCH STATION, KANDUKUR

KBr-6 : Breeding FCV tobacco varieties for yield and quality Characters under SLS conditions

- Forty eight Aphid tolerant selections made for further evaluation.
- Twenty caterpillar resistant lines selected.
- Fertile and CMS SH1 seed produced for further evaluation.
- Drought tolerant lines and foot rot resistant lines maintained and seed submitted for Physiological studies.

ICAR-CTRI RESEARCH STATION, HUNSUR

BR 19 : Development and evaluation of F_1 hybrids and advanced breeding lines of FCV tobacco suitable to Karnataka Light Soil region

- Two years of evaluation of eight advanced breeding lines against checks resulted in identification of two lines *viz.*, FCH 239 and FCH 242 as promising though the improvement was not statistically significant. The line FCH 239 was included in new crossing program.
- Based on row trial seven lines were selected for RYT in the current season.
- Hybrid KLSH 10 performed better than the checks in the bulk trial.

ICAR-CTRI RESEARCH STATION, VEDASANDUR

B-50 : Breeding non FCV tobacco types for desirable traits

- NF4-13 (1268 kgs/ha) and NF4-1 (1221 kgs/ha), NF7-8 (1098 kgs/ha) and NF7-1 (973 kgs/ha) are found superior among the irrigated *Natu* entries test in replicated yield trial with high yield of total cured leaf (Melimi and Gulla) against check Kommugudem (894 kgs/ha).

- NB-4, NB-5, and NB-19 irrigated *Natu* entries test in Bulk yield trial with high yield of total cured leaf (Melimi and Gulla) against check Kommugudem.

- YB-28 (1285 kgs/ha) exhibited superior yields among all the burley entries tested in replicated yield trial.

- BSRB-2, YB-19 and YB-22 are proved superior among all the bulks tested.

- From the two promising crosses/ selections, the selection A.119 X Abirami (F6-3-6) recorded the highest seed yield of 1693 kg/ha under bulk evaluation.

- F8 populations of promising selection HV.2011-2 evaluated in a bulk trial along with Abirami as control at CTRI,RS, Vedasandur as well as farmers fields at two locations.

- Promising selection of HV.2009-3 derived from broad based populations grown in pre-release bulk trial at CTRI Research Station along with the best check variety of Abirami.

CROP PRODUCTION

ICAR-CTRI, RAJAHMUNDRY

A-83 : Integrated management of *Orobanche* in FCV tobacco

- *Orobanche* weight taken in different treatment plots revealed that it varied between 4.3 to 48.7% less when compared to control in vertisols which indicates the effectiveness of treatments against the parasite emergence in vertisols.
- Lower *Orobanche* weight and % infestation was observed when PEA of Glyphosate was given at 50 and 70 days to tobacco and was on par with Neemcake application to tobacco +PEA of Neem oil to *Orobanche* and Neemcake application to tobacco + PEA of Glyphosate at 50 days to tobacco to tobacco.
- In alfisols PPI of Alachlor+ Green gram and PPI of Pendimethalin+ Green gram recorded significantly lower *Orobanche* weight followed by Neemcake application to tobacco +PEA of Neem oil to *Orobabanche*, and PEA of Glyphosate at 50 and 70 DAP to tobacco.

A-84 : Studies on false maturity and its mitigation strategies in FCV tobacco growing zones of Andhra Pradesh. A. Vertisol conditions and B. Irrigated Alfisols

Vertisols

- Under Vertisol conditions, application of organic manure (FYM) + balanced NPK plot performed better and recorded increased cured leaf yield by 226 kg/ha (9.19%) and grade index by 131 kg/ha (11.74%) and did not express false maturity as compared to only N without FYM and PK. The higher yield in FYM + balanced NPK plot is due to higher SLW, moderate LAI, LWR. The absence of false maturity in this plot is supported by higher chlorophyll content.
- Regular inter-culture with complete weeding and *Orobanche* (broomrape) removal treatment performed better and increased cured leaf yield by 107 kg/ha (4.2%), grade index by 86 kg/ha (7.47%) and did not express false maturity as compared to weed control through chemicals and no inter-cultivation. The higher yield in regular inter cultivation with complete weeding and *Orobanche* removal plot is due to higher LAI, SLW, LWR. The absence of false maturity in this plot is supported by higher chlorophyll content.
- The ABL TBST-2 performed better followed by cv.VT-1158 without false maturity. Higher chlorophyll content was recorded in TBST-2 and cv.VT-1158. Though the cv. Siri recorded higher yields and nicotine content compared to TBST-2, false maturity was observed in cv. Siri. The better performance of TBST-2 is supported by higher SLW, LWR and chlorophyll content.

Irrigated Alfisols

- Under irrigated Alfisols application of FYM + balanced NPK (reco.) and FYM + (excess N) rec.PK plots performed better and recorded higher GLY, CLY, GI, GI/CL(%) and also recorded higher chlorophyll and nicotine content and did not express false maturity symptoms compared to balanced NPK (reco.) and (excess N) rec.PK plots.
- Among topping/ sucker control plots, decanal (2%) + pendimethalin (0.3%) performed better and showed healthy crop growth throughout the season followed by decanal (4%) and pendimethalin (0.6%) as is also indicated by higher chlorophyll and nicotine contents and did not express false maturity symptoms.
- Among irrigation water management plots excess irrigation during grand growth period, irrigation as per schedule showed healthy growth without false maturity and recorded higher GLY, CLY, GI, GI/CL (%) and chlorophyll content as compared to deficit irrigation during grand growth period.
- Among weed control/ intercultural treatments, regular inter-culture plot performed better and recorded higher GLY, CLY, GI and also showed higher LAI, SLW and higher chlorophyll content and thus maintaining healthy crop growth all through the crop season without false maturity as compared to reduced inter culture with post emergence spray of quizalofop ethyl and PPI of pendimethalin.

A-85 : Leaf biomass and seed yield improvement in advanced breeding lines for alternative uses

- Line RT 51-1 recorded significantly higher plant height followed by HDBRG
- HDBRG produced more no. of leaves which on a par with RT 51-1 and RT 46-1 lines.
- Regarding spacing though significant differences were not observed between treatments

80x40 cm recorded higher plant height and 70x40 recorded more no. of leaves.

- HDBRG with 60 x40 spacing and 150:75:75 NPK kg/ha recorded higher leaf yields of 392.05 q/ha followed by 60 x40 spacing and 100:50:50 NPK kg/ha with an yield of 370.64 q/ha
- Line RT 51-1 followed by TI-163 X A-145 line recorded higher nicotine yields with 80 x40 spacing and 150:75:75 NPK kg/ha.
- Late sown crop produced significantly higher solanesol, protein and nicotine yield though not significant.
- HDBRG followed by TI-163 X A-145 with a spacing of 70 x40 and 150:75:75 NPK kg/ha gave higher solanesol yield.
- HDBRG with 70 x40 spacing and 150:75:75 NPK kg/ha recorded higher protein yield which was on par with TI-163 X A-145 at same spacing &fertiliser level.

Ag.Extension-50 : Technology Evaluation, Demonstration and Impact Analysis

- Evaluated Advanced Breeding Lines in real farm situation of NLS area. Farmers preferred Tobios-6 followed by NLST-4 over cv: Kanchan due to their high yielding potential
- Variety LT Kanchan gave yields similar to that of cv:Kanchan in FLD plots. Due to its low tar content, trade should encourage the farmers by offering market price in commensuration with quality.
- Adoption of CTRI Technologies contributed to improved yield & quality and net returns.

ARIS-15 : Tobacco Agridaksh : An online expert system

- The modules on tobacco varieties and insect pests were developed and linked to Agridaksh which provides global accessing of the information on various components related to insect pests and varieties.
- It is useful for the researchers and extension agencies working on tobacco

ICAR-CTRI RESEARCH STATION, JEELUGUMILLI

JLA-37 : Effect of drip irrigation and tray seedlings on the productivity of NLS tobacco

- The tray seedlings with drip fertigation and drip irrigation plot recorded increased cured leaf yield by 415 kg (16.47%) and grade index by 425 (23.5%) when compared with normal seedlings furrow irrigation and soil application of fertilizers.
- Different sources of nitrogen (urea/Ammonium sulphate) as basal dose and their combinations (AS/urea/urea+AS/ urea+AS+KNO_3/urea+AS+CN) as top dressing did not influence the yield parameters (green leaf yield, cured leaf yield and grade index), quality parameters (nicotine, reducing sugars and chlorides) and also nutrient (N,P and K) composition of FCV tobacco in northern light soils of Andhra Pradesh.

ICAR-CTRI RS, HUNSUR

A 38: Feasibility of producing organic tobacco in KLS

- The productivity gap between the organic and inorganic treatment reduced by 25.9% in the 5th year from gap of over 50% observed in the 1st year
- The organic treatment resulted in higher bright grade production to an extent of 5-6%
- The Incidence of root knot was drastically reduced by 42% in the organic cultivation while the INM treatments also effective in root knot reduction to an extent of 25-35 %.
- The organic: inorganic ratios @50:50 proved better and resulted in least reduction of both CLY and TGE compared to only organic treatment organic treatment.

A.41 : Studies on climate risk management in FCV tobacco based cropping systems in STZ of Karnataka

- The crop growth from the beginning was very poor and establishment was slow due to cool temperature regimes and weather prevailed during Dec/Jan. The crop looked squatting.
- Shoot borer incidence was very high to an extent of 80% due to dry and cool weather.
- TMV incidence observed to an extent of 27% while wilt incidence was around 6-7%.
- The average plant height recoded was 30.1 cm with average leaf no/plant at 17. The leaf area of 5th, 9th and 12th leaf ranged from 262.0 to 520.3cm^2 with poor LAI.
- The no. of days taken for 50% flowering was more than 100 days.
- The green leaf weight was 1300 kg/ha while the dry weight of the leaves at 201kg/ha
- The regression equation indicated that the productivity followed sigmoid / bell shape curve where in much of the yield points are concentrated at rainfall range of 100-120 mm (which should be well distributed). However Rainfall in excess of > 120 mm was not conducive and looked detrimental for the crop as indicated by the graph.
- The cured leaf nicotine tends to decrease with the increase in July RF.
- However the reducing sugars tend to increase with the increase in July RF
- The leaf chlorides showed negative trend with increase in the July Rainfall
- The drought management practices involving supply of starter dose of N through application of Calcium nitrate at planting coupled with foliar nutrition of N and K at 45 and 60 DAT or individually proved effective in maximizing the productivity (Ist year).
- The response to drought management practices were observed to be better in dry regions (22.5%) compared to semi-dry (14.5%) zones
- The leaf area index was favored significantly by drought management treatments.
- The cured leaf quality were not influenced by treatments and were in the normal range`
- The preliminary trails on high density planting indicated that productivity of cured leaf can be enhanced up to 12% by increasing the population to 24,691plants/ha (90 x 45 cm) compared to 18,181 plants/ha (100x 55 cm) in the dry and drought affected areas
- In case of semi dry regions the productivity could be enhanced up to a level of 10.0 %.
- The bright grade production increased by 13.0 % to 17.5% in dry and semi dry regions respectively at spacing of 90 x 45 cm compared to 100 x 55 cm.
- The nicotine content tends to be slightly lower at higher population density levels. In general all the quality parameters were in the normal acceptable range

A. 42 : Evaluating the alternative nutrient sources to provide balanced nutrition for flue-cured tobacco grown in KLS region

- Various nutrient sources tried did not show any significant differences with respect to cured leaf productivity or bright grade production in all the locations.
- However N from calcium nutrient fertilizer source and application of Potassium nitrate fertilizer as Potassium source (in top dress or basal + top dress) were better with respect to both cured leaf productivity and bright grade production during this season.
- The cured leaf quality parameters were not altered by the different sources of nutrients.

BTRC, KALAVACHARLA

AB-30 : Evaluation of set row planting in burley tobacco for efficient resource conservation and utilization

- SRP 100% RDF showed significantly higher cured leaf yields over others treatments. SRP with 50% RDF and CP with 100% RDF being at par showed significantly higher cured leaf yield over SRP with 25% RDF and SRP with no fertilisers
- Nicotine content in conventional planting was lower than SRP with different fertiliser doses. Variable fertiliser doses in SRP being at par showed significantly higher Reducing sugars over CP with 100% RDF.
- Soil properties viz., soil pH, Chlorides and soil organic carbon were not significantly influenced by different treatments. Set row planting with 100% RDF showed significantly higher soil available P and K compared to conventional planting.
- Soil dehydrogenase activity was high in SRP 100% RDF and 75% RDF compared to conventional planting.

ICAR-CTRI RESEARCH STATION, VEDASANDUR

A 102 : Crop productivity, soil quality and economic returns under chewing tobacco + Annual moringa intercropping system in response to nutrient management

- *Annual moringa at different population levels did not affect the yield of chewing tobacco.*
- *Recommended dose of fertilizer at 125% to chewing tobacco and Annual moringa increased the TEY and net returns.*

ICAR-CTRI RESEARCH STATION, DINHATA

A-10 : Permanent manurial trial on *Motihari* tobacco

- Application of Nitrogen along or with Potassium and Phosphate recorded more quantity and quality also profitable than P and K alone or its combination. Among the organic treatments 50t FYM recorded more green, cured and first grade leaf yield.

External funded projects

DBT : Nutritional Security in Tribal Areas of East Godavari District Through Community Based Approaches

- The nutrition education has played a key role in reducing anaemia and malnutrition of women and children to an extent of 60% in the adopted tribal villages.
- The tribal women were empowered with multiple skills and their capacities were strengthened.
- After introduction of drudgery reducing implements, the drudgery was reduced to an extent of 30% and farm efficiency was improved.
- The components of packages of practices in poultry, live stock, and horticulture have intensified the tribal farming system and enhanced the family income level in tribal area.
- The SHGs of tribal area of East Godavari District were strengthened and coordinated for their socio- economic up- liftment.

CROP PROTECTION

ICAR-CTRI, Rajahmundry

ENTOMOLOGY

E-81: Bio-efficacy and field evaluation of new pesticides against tobacco pests

- Novaluron 5.25 % + Emamectin benzoate 0.9 SC @ 0.012% & 0.009 was found promising against *S.litura* in tobacco nurseries.
- Persistent toxicity studies against *S.litura* on tobacco showed that chlorfluazuron 5.4 % EC @ 0.03% recorded 100 per cent mortality up to 6 DAS with a mean period of persistency of 12 days, mean persistent toxicity (PT) of 66.66 and a mean persistent toxicity index (PTI) of 799.62.
- Chlorantranaliprole 25 SC @ 0.0075%, spinosad 45 SC @ 0.018%, flubendiamide 480 SC @ 0.012% were found to be highly promising against budworm in FCV tobacco.
- Bulk trial on management of ground beetle revealed that the east seedling damage (1.51, 2.06 & 2.47%) was observed in seedling root dip in imidacloprid 70 AF @ 0.14% followed by planting of tray seedlings treated with imidacloprid 200 SL @ 0.005% (1.92, 2.19 & 3.15) and transplant water treatment with imidacloprid 200 SL @ 0.005 %. (2.06, 4.97 & 5.21%) as against 19.23, 24.03 & 24.72 in untreated plot at 7, 15 & 21 DAP respectively.
- Planting of tray seedlings treated with chlorantranaliprole 25 SC @ 0.0075% recorded least seedling damage (1.11, 3.33) at all the observations followed transplant water treatment with chlorantranaliprole 25 SC @ 0.0075% and transplant water treatment with imidacloprid 200 SL @ 0.005%.
- Integration of barrier crop and three sprays of insecticides could protect FCV tobacco from leaf curl virus disease transmitted by whitefly as shown by less whitefly population as well as leaf curl infected plants.
- For management of capsule borer, *H.armigera* in seed crop, the chemical control module consisting of three sprays at flowering, capsule formatioin and seed filling stages recorded least infestation, seed capsule damage and higher seed yield followed by IPM module (spray of NSKS 2% and Ha NPV at flowering and capsule formation, and need based spray of insecticides).

- Studies on base line resistance of *S.litura* on tobacco showed low LC 50 values for spinosad (0.0019 mg/ml) and chlorantraniliprole (0.0039 mg/ml).
- Application of fenamidone + mancozeb 60WG @ 0.3% was found highly promising for the management of leaf blight disease in tobacco nurseries.All the recommended fungicides against *Cercospora nicotianae* were found compatible with insecticides, emamectin benzoate, flubendiamide and imidacloprid at their respective recommended doses.
- Application of fenamidone + mancozeb 60 WG @ 0.3% is a promising alternative to metalaxyl + mancozeb 68% WP @ 0.2% for the management of black shank disease in FCV tobacco.

ICAR-CTRI RESEARCH STATION, JEELUGUMILLI

E-82 : Evaluation of insecticide application technology for effective spray coverage on FCV tobacco in NLS

- Battery operated sprayers were characterised by extremely higher nozzle discharge rate of 1400-2250 ml/min through different nozzles and showed good performance for 4-5 hours. Studies revealed superiority of Hi tech sprayer with nozzle discharge rate of 550 ml/min at 40 PSI over battery operated sprayers as shown by spray characteristics and effective management of insect pest infestation.
- Studies on influence of varied nozzle discharge rates on spray fluid requirement, spray characters and insect pest infestation on tobacco indicated that Hi tech sprayer with nozzle discharge rate of 550 ml/min was superior over 650 - 1200 ml//min. in providing uniform coverage and effective management of insect pest infestation. Nozzles with higher discharge rates (beyond 550 ml/min) resulted in poor spray spectrum due to run off from leaf surface and wastage of insecticide.

ICAR-CTRI RS, GUNTUR

EG.14 : Validation of IPM module against tobacco aphid, *Myzus nicotianae* under CBS conditions

- The bio-intensive IPM module with two rows of maize border as barrier crop, one spray of *Verticillium lecanii* @ $3X10^{12}$ CFU/ha at 50 DAP and one spray of imidacloprid @ 50g a.i./ha at 60 DAP exhibited 94.87% reduction of infestation by tobacco aphid and 4.63% increase of cured leaf yields over untreated control.
- Farmers practice consisting of two recommended pesticides viz., imidacloprid 0.03% and thiomethaxam 0.02% applied at 50 and 60 days of planting, respectively reduced aphid infestation by 100% and increased yields by 5.36%over untreated control.

EG.15 : Survey for assessment of insect pest incidence in tobacco and tobacco based cropping systems of CBS and SBS

- A survey covering major tobacco growing areas of SBS during 2015-16 revealed that leaf curl caused by whitefly, *Bemecia tabaci* and caterpillar, *Spodoptera litura* were the main pests in planted crop and nursery with 9.5 and 3.54% infestations, respectively.

ICAR-CTRI RESEARCH STATION, KANDUKUR

EK-19 : Evaluation of IPM Modules for management of caterpillar and aphid in FCV tobacco under SLS condition

- All the yield parameters differ significantly in showing the differences of the treatments.
- The IPM Module gave highest green leaf, cured leaf, bright leaf and grade index.
- The cured leaf yield in this IPM module is 1811 kg/ha, which is 33.18% higher than control.
- The cost benefit ratio was 1: 1.3836 for IPM module.

ICAR-CTRI RESEARCH STATION, HUNSUR

N.20 : Integrated management of root knot nematodes in FCV tobacco

- Integrated application of *Trichoderma viride* & *Paecilomyces lilacinus, Trichoderma viride* and *Pochania chlalymdosporia* along with ridomil and furadon in solarised nursery beds were on par with each other in recording decreased root knot index to the tune of 46.9 and 47.1 percent respectively and also decreased damping-off + blight disease incidence in nursery beds to the tune of 61.1 and 59.0 percent respectively over untreated check.
- Results revealed that, *T.viride* (50g) + *P.lilacinus* (50g) enriched tray seedlings, *T.viride* (50g) + *P. chlamydosporia* (50g) enriched tray seedlings and *T. viride* (30g) + *P.lilacinus* (30g) + *P. chlamydosporia* (30g) were on par with each other in increasing the Cured Leaf Yield by 7.8, 9.3 and 10.4 per cent respectively over check.
- These effective treatments also decreased the root knot index by 45.0, 45.4 and 50.0 per cent respectively and decreased the wilt disease incidence by 52.5, 52.3 and 50.0 per cent respectively over check.
- The chemical control schedule, furadon + carbendazim at the time of planting was found to be the best in decreasing the Fusarium wilt disease by 60.0 per cent over check under field conditions.
- The lines RKR 2, RKR 6, RKR 7, RKR 10, RKR 12 and RKR 13 were found promising against root knot nematode with RKI $\leq$ 1.0.
- The lines FCH 240, FCH 243 and FCH 244 with RKI $\leq$ 2.0 will be further tested, since they recorded comparatively lesser RKI.

CROP CHEMISTRY AND SOIL SCIENCE

ICAR-CTRI, RAJAHMUNDRY

SS-31 : Evaluation of Crop Residue and Wood Ashes - Effects on Soil Fertility and Potassium Nutrition of Tobacco

- Crop residue/wood ashes applied either alone or in combination with SOP (50% + 50%) on 100 kg K ha^{-1} equivalent basis exhibited the potential to significantly increase tobacco cured leaf yield and K uptake without adversely affecting leaf quality. The tobacco cured leaf yield with biomass ash and ash+SOP treatments, relative to the yield obtained with SOP alone, ranged from 88 to 99% at Hunsur and from 93 to 112% at Jeelugumilli. These results imply that the biomass ashes can serve as potential sources for K supplementation for FC tobacco on light textured Alfisols.
- Use of biomass ashes as K sources for FC tobacco on light textured Alfisols in KLS and NLS regions led to enhanced use efficiency of applied K, apparently due to reduced K leaching. Use of biomass ashes as sources for K supplementation can not only increase the tobacco productivity but also reduce the dependency on costly SOP fertilizer.
- The pH of soils treated with biomass ashes with or without SOP was relatively greater than its value for the no-ash control soil, indicating the liming effect of ashes. Organic carbon content and chlorides were more or less identical across all treatments. In contrast, the K availability in surface soil was significantly improved with the application of biomass ashes.
- All the treatments with various split applications of K were significantly superior compared to no K (control) with respect to cured leaf as well top grade leaf production.
- Application of 120 kg K_2O/ha in 4 splits(10, 25, 40 and 55 DAT) recorded the maximum cured leaf yield and top grade equivalent yields and was significantly superior to the same dose applied in one split application only as basal
- The Productivity was improved by 10.6% while the bright grade production was further enhanced by more than 15. 0% by application of 120 g K_2O/ha in 4 splits indicating the usefulness of more split applications of K nutrient for enhancing the leaf productivity and bright grade production in KLS.
- The cured leaf quality parameters were not altered by the treatments and were in the normal range.

SS-32 : Evaluation of organic and inorganic soil amendments to minimize nutrient leaching losses and enhance nutrient use efficiency under NLS tobacco production system

- Application of tobacco stalk biochar (TSB) inhibited the leaching losses of ammonium and potassium by 28.10 and 25.28 per cent, respectively.
- The increment in soil pH differed between different soil amendments and followed order: T_6 (1 t ha^{-1} TSB+250 kg ha^{-1} SZ)> T_7 (1 t ha^{-1} TSB)> T_4 (100 % RDF+1 t ha^{-1} TSB+250 kg ha^{-1} SZ)> T_3 (100 % RDF+ 250 kg ha^{-1} SZ)> T_2 (100 % RDF+1 t ha^{-1} TSB)> T_5 (100 % RDF +0.5 t ha^{-1} TSP).
- Application of TSB with 100% RDF and TSB+SZ+100% RDF caused a significant increase in GLY and CLY compared to the 100% RDF. The relative yield of soil amendments ranged from 96 to 114% of the yield obtained with 100 % RDF.
- Application of TSB along with 100 % RDF has significantly improved the nitrogen and potassium uptake with the recovery efficiency of 46.06 and 66.88 per cent of N and K applied as against 100 % RDF with 32.82 and 59.57 percent, respectively.

SSK-2 :Assessment of leaf quality of FCV tobacco using hyper-spectral remote sensing and growth parameters

- Models were developed for non destructive estimation using hyper spectral reflectance data for physiological and quality parameters.
- A model was developed for Nicotine in leaf at different positions (R^2 values = 0.974 - 0.980).
- New spectral vegetation indices were developed for retrieving some of the bio physical parameters in FCV tobacco.

SSMB-12 : Tobacco *(Nicotiana tabacum* L.*)* leaf assisted green synthesis of silver nanoparticles and evaluation of its antimicrobial activity against agricultural plant pathogens

- XRD diffractogram shows peaks corresponding to elemental silver. All diffraction peaks correspond to the characteristic face centered cubic silver lines. XRD patterns were analyzed to determine peak intensity, position and width of green synthesis of tobacco nano particles.
- Antibacterial characterization of silver nanoparticles has been demonstrated against *E. coli* ATCC- 10536, *Staphylococcus aureus* ATCC- 29737, *Salmonella abactetuba* ATCC-35640, *Pseudomonas aeruginosa* ATCC- 27853 on both liquid as well as solid growth media. Silver nanoparticles with concentrations as low as 60 µg/ml have demonstrated a complete cytotoxicity of bacterial strains.
- In the *in vitro* experiment, mycelia growth inhibition rates calculated based on the radial fungal growth recorded on 3, 5, 7 and 10 days revealed that the most sensitive fungus to nanoparticles was *Pythium aphanidermatum* which exhibited 100% inhibition during the 10 days of observation at all tested concentrations. The second most sensitive fungus was *Sclerotium rolfsii*, since it was able to grow only at concentration of 20 µg/ml and *Cercospora nicotianae* was the third in sensitivity since its growth was inhibited in all concentrations after three days.

Present findings indicate that silver nanoparticles have the potential to control plant fungal pathogens and needs to be tested in the field.

OC 24 : Studies on chemical constituents responsible for smoke flavor in tobacco grown under different agro-climatic zones

- Neutral volatile aroma compound in variety Kancan were identified.
- Maximum formation of NVAC was observed in the yellowing stage.
- In Flue-curing, the duration of yellowing stage play an important role in the formation of NVAC

ICAR-CTRI RS, KANDUKUR

PHYK-1 : Abiotic stress management interventions for climate resilient flue cured tobacco production in SLS Domain of A.P.

- Among the new soil amendments tested performance of hydrogel and biochar is better compared to zeolite.
- Increase in plant population by 100% and N and K fertilizer by 50% enhanced the cured leaf yield by 45.6%.
- Productivity of flue-cured tobacco decreased as the planting date advanced from October 3rd week on wards.

External funded project : Characterization, value addition and utilization of tobacco seed oil and its by- products

- Tobacco seed oil is free from TSNA and heavy metals
- Aflotoxins are below the recommended level
- Proximate analysis of tobacco seed of different type

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