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XII GROUP MEETING

ALL INDIA NETWORK PROJECT ON TOBACCO

ICAR-CTRI, Rajahmundry

27-28, January, 2023

RESEARCH ACHIEVEMENTS AND WORK PLAN - 2022



भाकृअनुप
ICAR

भा कृ अनु प – केन्द्रीय तम्बाकू अनुसंधान संस्थान
ICAR - CENTRAL TOBACCO RESEARCH INSTITUTE
(An ISO 9001 : 2015 Certified Institute)
RAJAHMUNDRY - 533 105, ANDHRA PRADESH, INDIA

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CROP IMPROVEMENT

A.VFC TOBACCO

COORDINATED EVALUATION OF FCV TOBACCO GENOTYPES

Project No.: VFJBRC/ VFKBRC/ VFHBRC/ VFSBRC 2

Research Project Title: Initial varietal trial on FCV tobacco

Year of start :2021-22

FCV tobacco Centres and Investigators

Centres	:	Investigators
Jeelugumilli	:	K. Sarala & K. Prabhakara Rao
Kandukur	:	Gangadhara K
Hunsur	:	C. Nanda
Shivamogga	:	Shashikala, S. Kolakar, T. M. Soumya& K. Rajashekharappa

I. Objectives of the Project

To evaluate the FCV tobacco entries for yield and qualityat four centres *viz.,* Jeelugumilli, Kandukur, Hunsur and Shivamogga with 3 entries along with respective checks.

Entries: 03 (Three)

1. FCK-8
2. FCK-9
3. FCK-10

Checks at different Centres:

Jeelugumilli	:	1. Kanchan	2. LT-Kanchan	3. CH 1
Kandukur	:	1. VT 1158	2. Siri	3. N-98
Hunsur	:	1. Kanchan	2. FCH-222	3. CH 3
Shivamogga	:	1. Thrupthi	2. Kanchan	3. Sahyadri

Design	:	RBD
Total treatments	:	03 + checks as given above
Replications	:	Five

II. Executive summary of the project for 2021-22 centre-wise

JEELUGUMILLI

A trial was conducted with three entries (FCK-8, FCK-9 AND FCK-10) along with three control varieties *viz.,* Kanchan, LT Kanchan and CH-1. The trial was laid out as per plot size and spacing, and followed all the standard cultural conditions.

Significant differences observed among the entries tested for all the three characters *viz.*, green leaf, cured leaf and grade index. The entry, FCK-10 recorded significantly higher green leaf (13275 kg/ha), cured leaf yield (2042 kg/ha) and grade index value (1645) than best control, CH-1. However, the entry found to be light cast in nature under NLS condition compared to green cast nature of NLS adopted varieties. The leaves of FCK-10 showed less puckering and leaf maturing was uneven compared to NLS varieties. In view of this, the entry was not promoted to AVT trials.

Morphological characterization: In general, the entries assessed (FCK-8, FCK-9 and FCK-10) recorded higher plant height, number of leaves and internodal length than controls. Most of the cases, the tested entries recorded higher leaf length and width values than Kanchan and LT Kanchan. However, leaf length was higher in CH-1 in most cases than the tested entries.

Disease /Pest incidence: Incidence of pests (caterpillar & aphids) and diseases (Black Shank, CMV & leaf curl) was observed under natural condition among the entries and controls. The entries, FCK-8, FCK-9 and FCK-10 recorded lower incidence of caterpillar and FCK-8 relatively higher incidence of black shank. Leaf curl incidence was more or less similar in all the entries. Kanchan (c) recorded higher CMV infected plants. Aphid incidence was nil in all the entries. Under artificial inoculation, the entry, FCK-8 recorded resistance reaction to TMV and others showed susceptible reaction.

Most Salient research findings/Achievements

- Out of three entries (FCK-8, FCK-9 and FCK-10) assessed, the entry, FCK-10 recorded significantly higher green leaf (13275 kg/ha), cured leaf yields (2042 kg/ha) and grade index values (1645) than best control, CH-1. However, the entry found to be light cast in nature under NLS condition compared to green cast nature of NLS adopted varieties and hence, **not promoted** to AVT trials.

KANDUKUR

Three lines *viz*., FCK-8, FCK-9 and FCK-10 were evaluated in a replicated trial along with three controls *viz*., Siri, VT-1158 and N-98. The results of analysis revealed that the entry FCK-10 recorded significantly superior green leaf yield and cured leaf yield of 11399 kg/ha and 1763 kg/ha over popular check Siri (9958 kg/ha and 1548 kg/ha) respectively. FCK- 10 recorded 14 % green leaf yield, 13% cured lead yield over check Siri. Hence entry FCK- 10 was proposed to advance further testing.

Most Salient research findings/Achievements

- The entry FCK-10 was superior to Siri and advanced to further testing

HUNSUR

Initial varietal trial (IVT) was conducted with three entries (FCK-8, FCK-9 and FCK-10) and three checks (Kanchan, FCH-222 and CH-3) in a RBD trial with five replications. Observations on morphological characters and incidence of pests and diseases were recorded. Data in respect of green leaf, cured leaf, bright leaf and TGE was recorded and subjected to statistical analysis using statistical package "design" and yields were expressed in terms of kg/ha. The results indicated significant differences among the entries however, none of the tested entries were significantly superior over the checks with respect to green leaf, cured leaf, bright leaf and TGE.

Most Salient research findings/Achievements

- None of the entries were found promising
- There was no major incidence of other diseases and pests

SHIVAMOGGA

Three entries (FCK-8, FCK-9 and FCK-10) were tested in replicated trial along with three checks. The results revealed that FCK- 10 has recorded significantly higher GLY (10495 kg/ha), CLY (1447 kg/ha) and TGE (1028 kg/ha) over Sahyadri.

Most Salient research findings/Achievements

- FCK–10 has recorded significantly higher GLY (10495 kg/ha),CLY (1447 kg/ha) and TGE (1028 kg/ha) over Sahyadri

Table 1 IVT VFC TOBACCO: Green leaf yield (kg/ha) in IVT at different centres (2021-22)

Entries	Jeelugumilli	Kandukur	Hunsur	Shivamogga
FCK-8	11342	9252	6177	7730
FCK-9	12131	10123	6652	7079
FCK-10	13275*	11399*	8558	10495
Kanchan (C)	10792		9210	10199
LT-Kanchan (C)	10983			
CH-1 (C)	11258			
N-98 (C)		9119		
Siri (C)		9958		
VT 1158 (C)		8730		
FCH 222 (C)			9048	
CH-3 (C)			9460	
Thrupthi (C)				10282
Sahyadri (C)				6888
G. Mean	11630	9763		8779
S. Em±	543	301	424	722
C.D. at 5%	1570	909	1250	2175
C.V. (%)	10.43	6.17	11.58	16

Table 2 IVT VFC TOBACCO: Cured leaf yield (kg/ha) in IVT at different centres (2021-22)

Entries	Jeelugumilli	Kandukur	Hunsur	Shivamogga
FCK-8	1745	1439	1060	1070
FCK-9	1866	1643	1147	999
FCK-10	2042*	1763*	1605	1447
Kanchan (C)	1660		1505	1429
LT-Kanchan (C)	1690			
CH-1 (C)	1732			
N-98 (C)		1405		
Siri (C)		1548		
VT-1158 (C)		1528		
FCH 222 (C)			1274	
CH-3 (C)			1758	
Thrupthi (C)				1408
Sahyadri (C)				958
G. Mean	1789	1554		1218
S. Em+	83	68.5	74	103
C.D. at 5%	241	206	219	309
C.V. (%)	10.43	8.83	11.95	17

**Significant at 5%;*

Table 3 IVT VFC TOBACCO: Bright leaf yield in IVT at different centres (2021-22)

	Bright leaf yield in kg/ha	
Entries	**Kandukur**	**Hunsur**
FCK-8	575	783
FCK-9	841	821
FCK-10	1241	1108
N-98 (C)	818	
Siri (C)	1037	
VT-1158 (C)	1022	
Kanchan (C)		1076
FCH 222 (C)		876
CH-3 (C)		1294
G. Mean	922	
S. Em±	74.09	51
C.D. at 5%	223	120
C.V. (%)	16.06	11.46

Table 4 IVT VFC TOBACCO: Grade index/TGE in IVT at different centres (2021-22)

Entries	**Grade index/TGE (kg/ha)**			
	Jeelugumilli	**Kandukur**	**Hunsur**	**Shivamogga**
FCK-8	1188	712	791	758
FCK-9	1242	956	867	694
FCK-10	1645*	1293	1219	1029
Kanchan (C)	1259		1133	1000
LT-Kanchan (C)	1249			
CH-1 (C)	1288			
N-98 (C)		887		
Siri (C)		1099		
VT-1158 (C)		1107		
FCH 222 (C)			944	
CH-3 (C)			1344	
Thrupthi (C)				1008
Sahyadri (C)				675
G. Mean	1312	1009		860
S. Em±	72	65	54	71
C.D. at 5%	209	196	159	213
C.V. (%)	12.33	12.9	11.47	16

**Significant at 5%*

Table 5 IVT VFC TOBACCO: Morphological characters of the entries of IVT at Jeelugumilli (2021-22)

Entries	Plant height	No. of leaves/ plant	Internodal length
FCK-8	168	27	6
FCK-9	165	27	5
FCK-10	143	31	4
Kanchan (C)	110	22	3
LT-Kanchan (C)	120	24	4
CH-1 (C)	100	20	4

Table 6 IVT VFC TOBACCO: Morphological characters of the entries of IVT at Hunsur (2021-22)

Entries	Plant height	No. of leaves/ plant	Internodal length
FCK-8	130.80	22.00	5.95
FCK-9	100.60	18.20	5.53
FCK-10	132.20	22.80	5.80
Kanchan (C)	107.00	18.00	5.94
FCH 222 (C)	105.40	20.80	5.07
CH-3 (C)	128.20	21.40	5.99

Table 7 IVT VFC TOBACCO: Incidence of pest and diseases in the entries of IVT at Jeelugumilli (2021-22)

Entries	Natural Condition (Mean No. of plants infected / plot (40 plants)					Artificial Inoculation With TMV (Reaction*)
	Caterpillar	Leaf Curl	Black Shank	CMV	Aphids	
FCK-8	6	15	2	5	NIL	R
FCK-9	6	13	0	7	NIL	S
FCK-10	8	10	0	8	NIL	S
Kanchan (C)	13	25	1	20	NIL	S
LT-Kanchan (C)	10	13	1	6	NIL	S
CH-1(C)	13	11	0	5	NIL	S

**R: Resistance; S: Susceptible*

Table 8 IVT VFC TOBACCO: Incidence of pest and diseases in the entries of IVT at Hunsur (2021-22)

Entries	Disease data					
	LC	TMV	F. wilt	CMV	Aphids	RKI
FCK-8	2	7	0	0	0	4.33
FCK-9	5	7	0	0	1	2.00
FCK-10	1	5	0	0	0	4.00
Kanchan (C)	0	6	0	0	0	3.66
FCH- 222 (C)	2	6	0	1	0	2.66
CH-3 (C)	2	8	0	0	0	3.00

Table 9 IVT VFC TOBACCO: Diseases reaction (%) in the entries of IVT at Shivamogga (2021-22)

Entries	Black shank	Frog eye leaf spot	Root knot
FCK-8	8.0 (MR)	38.0 (MR)	2.0 (MR)
FCK-9	9.0 (MR)	33.0 (MR)	2.0 (MR)
FCK-10	10.0 (MR)	39.0 (MR)	2.0 (MR)
Thrupthi (C)	27.0 (MS)	43.0 (MS)	3.0 (MS)
Kanchan (C)	24.0 (MS)	42.0 (MS)	3.0 (MS)
Sahyadri (C)	28.0 (MS)	43.0 (MS)	3.0 (MS)

MS: Moderately Susceptible *MR: Moderately Resistant*

Table 10 IVT VFC TOBACCO: Chemical quality parameters in IVT entries at Hunsur (2021-22)

Entries	Nicotine		Reducing Sugars		Chlorides	
	X	L	X	L	X	L
FCK-8	1.06	0.97	13.91	13.69	0.17	0.17
FCK-9	1.69	1.59	14.69	11.28	0.16	0.26
FCK-10	1.55	2.06	16.75	10.50	0.23	0.24
Kanchan (C)	1.24	1.26	16.62	14.11	0.11	0.16
FCH - 222 (C)	1.30	1.21	15.46	9.25	0.20	0.17
CH- 3 (C)	1.20	1.28	17.15	10.98	0.28	0.20

IHT ON VFC TOBACCO-HYBRIDS

Project No.: VFJBRC/ VFKBRC/ VFHBRC/ VFSBRC 3

Research Project Title: Initial Hybrid Trial on FCV tobacco

Year of start : 2021-22

FCV tobacco Centres and Investigators

Centres	**:**	**Investigators**
Jeelugumilli	:	K. Sarala and K. Prabhakara Rao
Kandukur	:	Gangadhara K
Hunsur	:	C. Nanda
Shivamogga	:	Shashikala S. Kolakar, T. M. Soumya and K. Rajashekharappa

I. Objectives ofthe Project

Initial Hybrid Trial (IHT) was conducted at four centres *viz.,*Jeelugumilli, Kandukur, Hunsur and Shivamogga, with 3 entries along with respective check varieties.

Entries: 3 (Three)

1. FCHH-1
2. FCHH-2
3. FCRH-13

Checks at different centres

Jeelugumilli	:	1. Kanchan	2. LT-Kanchan	3. CH 1
Kandukur	:	1. VT 1158	2. Siri	3. N-98
Hunsur	:	1. Kanchan	2. FCH-222	3. CH 3
Shivamogga	:	1. Thrupthi	2. Kanchan	3. Sahyadri

Design : RBD
Total treatments : 3 + checks as given above
Replications : Five

II. Executive summary of the project for 2021-22 centre-wise

JEELUGUMILLI

A replicated trial was conducted with three entries (FCHH-1, FCHH-2 and FCRH-13) along with three control varieties *viz*., Kanchan, LT Kanchan and CH-1. The trial was laid out as per plot size and spacing, and followed all the standard cultural conditions.

Significant differences observed among the entries tested for all the three characters *viz*., green leaf, cured leaf and grade index. Among the entries tested, FCRH-13 recorded higher green leaf (13387 kg/ha), cured leaf yields (2445 kg/ha) and grade index values (1630) than other lines and controls. FCRH-13 found to record significantly higher green (12%) and cured leaf (18%) and higher grade Index values (21%) than better control, Kanchan. In view of higher yield, FCRH-13 is promoted for testing under AHT in the ensuing season.

Morphological characterization: The entries, FCHH-2 and FCRH-13 recorded higher plant height, FCRH-13 more number of leaves and FCHH-2 higher internodal length than other lines and controls. The entry, FCHH-2 recorded higher leaf length and width values.

Disease /Pest incidence: Incidence of pests (caterpillar & aphids) and diseases (Black Shank, CMV & leaf curl) was observed under natural condition among the entries and controls. The entries, FCHH-1, FCHH-2 and FCRH-13 recorded lower incidence of caterpillar and FCHH-1 and CH-1 relatively higher incidence of black shank. Leaf curl incidence was more or less similar in all the entries. LT Kanchan (C) recorded higher CMV infected plats. Aphid incidence was nil in all the entries. Under artificial inoculation, all the entries recorded susceptible reaction to TMV.

Most Salient research findings/Achievements

- Out of three entries (FCHH-1, FCHH-2 and FCRH-13) assessed, FCRH-13 recorded significantly higher green leaf (13387 kg/ha), cured leaf yields (2445 kg/ha) and grade index values (1630) than better control, Kanchan and **promoted for testing** under AHT-I in the ensuing season.

KANDUKUR

Three hybrids *viz*., FCHH-1, FCHH-2 and FCRH-13 were evaluated in a replicated trial along with three controls *viz*., Siri, VT-1158 and N-98. The results revealed that none of the hybrid entries recorded significantly superior yield attributes compared to the better check Siri.

Most Salient research findings/Achievements

- Three hybrids FCHH-1, FCHH-2 and FCRH-13 were not significantly superior in yield attributes compared to better check Siri
- No hybrid was advanced further

HUNSUR

Three entries *viz*., FCRH-13, FCHH-1and FCHH-2 were evaluated along with two popular varietal checks Kanchan and FCH-222 and one hybrid check CH-3 in RBD. The data in respect of green leaf, cured leaf, bright leaf and TGE were recorded. Morphological characters like plant height, number of leaves, internodal length, leaf length and width of 5th, 7th and 9th leaf were recorded. Observations on the natural incidence of pest and diseases were recorded. Leaf quality parameters *viz*., Nicotine, Reducing sugars and chlorides were estimated. Yield data was subjected to statistical analysis and yields were expressed in terms of kg/ha.

Entry FCRH-13 exhibited significantly highest superiority in respect of, cured leaf yield (1851 kg/ha), bright leaf yield (1402 kg/ha) and top grade equivalent (1402) over the checks, followed by FCHH-2. The entry, FCHH-2 recorded cured leaf yield of 1845 kg/ha, bright grade leaf yield of 1399 kg/ha and TGE vale of 1407. FRCH-13 showed an improvement of 17.6%, 31% and 22.1% in terms of cured leaf yield, bright grade and TGE vales respectively, while FCHH-2 recorded 17.2% improvement in cured leaf yield, 30.9% improvement in bright grade and 22.6% in TGE values over check CH-3.

Most Salient research findings/Achievements

- Hybrids FCRH-13 and FCHH-2 were found promising as they have recorded higher green leaf yield, cured leaf yield, bright leaf yield and TGE and thus promoted to AHT-I
- Leaf chemical parameters were within the prescribed limit

SHIVAMOGGA

Among the three entries, FCRH-13 and FCHH-2 have recorded significantly higher GLY (9333, 9319 kg/ha), CLY (1307, 1304 kg/ha) and TGE (938, 941 kg/ha) over Kanchan and Sahyadri. FCHH-1 has recorded significantly higher GLY (9046 kg/ha), CLY (1266 kg/ha) and TGE (916 kg/ha) over Sahyadri. FCRH-13 has recorded 18.71% higher cured leaf yield over Kanchan and FCHH-2 has recorded 18.43% higher cured leaf yield over Kanchan.

Most Salient research findings/Achievements

- FCRH-13 and FCHH-2 have recorded significantly higher GLY (9333, 9319 kg/ha), CLY (1307, 1304 kg/ha) and TGE (938, 941 kg/ha) over Kanchan and Sahyadri
- FCHH-1 has recorded significantly higher GLY (9046 kg/ha), CLY (1266 kg/ha) and TGE (916 kg/ha) over Sahyadri
- **None** of the entries were superior over best check Thrupthi, hence the trial was **not advanced** further.

Table 1 IHT VFC TOBACCO: Green leaf yield (kg/ha) in IHT at different centres (2021-22)

Entries	Jeelugumilli	Kandukur	Hunsur	Shivamogga
FCHH-1	12075	6557	8792	9046
FCHH-2	12208	8310	9383*	9319
FCRH-13	13387* (12)	10520	9911*	9333
Kanchan (C)	11908		8851	7862
LT-Kanchan (C)	10758			
CH-1 (C)	10908			
FCH 222 (C)			8562	
CH-3 (C)			9147	
Sahyadri (C)				6704
Thrupthi (C)				9940
N-98 (C)		9310		
Siri (C)		11878		
VT 1158 (C)		9160		
G. Mean	11874	9289		8701
S. Em+	511	515	408	445
C.D. at 5%	1478	1553	NS	1343
C.V. (%)	9.63	11.09	10.02	10

**Significant at 5%* *Figures in Parenthesis indicate percentage increase over better check.*

Table 2 IHT VFC TOBACCO: Cured leaf yield (kg/ha) in IHT at different centres(2021-22)

Entries	Jeelugumilli	Kandukur	Hunsur	Shivamogga
FCHH-1	2055	1010	1545	1266
FCHH-2	2077	1328	1845* (17.2)	1304
FCRH-13	2445*(18)	1626	1851* (17.6)	1307
Kanchan (C)	2077		1572	1101
LT-Kanchan (C)	1966			
CH-1 (C)	1999			
Thrupthi (C)				1392
FCH 222 (C)			1415	
CH-3 (C)			1574	
Sahyadri (C)				939
N-98 (C)		1383		
Siri (C)		1828		
VT 1158 (C)		1457		
G. Mean	2103	1438		1218
S. Em+	103	79	84	62
C.D. at 5%	299	239	247	188
C.V. (%)	10.99	11.05	11.46	10

**Significant at 5%* *Figures in Parenthesis indicate percentage increase over better check.*

Table 3 IHT VFC TOBACCO: Bright leaf yield (kg/ha) in IHT at different centres(2021-22)

Entries	Kandukur	Hunsur
FCHH-1	676	1177
FCHH-2	936	1399* (30.9)
FCRH-13	1079	1402* (31)
Kanchan (C)		1065
FCH 222 (C)		1140
CH-3 (C)		1069
N-98 (C)	877	
Siri (C)	1234	
VT 1158 (C)	962	
G. Mean	961	
S. Em+	86	57
C.D. at 5%	261	168
C.V. (%)	18.05	10.51

**Significant at 5%* *Figures in Parenthesis indicate percentage increase over better check.*

Table 4 IHT VFC TOBACCO: Grade index/ TGE (kg/ha) in IHT at different centres (2021-22)

Entries	Jeelugumilli	Kandukur	Hunsur	Shivamogga
FCHH-1	1395	724	1178	916
FCHH-2	1415	989	1407* (22.6)	941
FCRH-13	1630 (21)	1137	1402* (22)	938
Kanchan (C)	1342		1157	799
LT-Kanchan (C)	1320			
CH-1 (C)	1323			
Thrupthi (C)				996
FCH 222 (C)			1104	
CH-3 (C)			1148	
Sahyadri (C)				673
N-98 (C)		931		
Siri (C)		1276		
VT 1158 (C)		1020		
G. Mean	1404	1013		877
S. Em+	86	82	54	44
C.D. at 5%	NS	248	160	133
C.V. (%)	13.65	16.2	9.83	10

**Significant at 5%* *Figures in Parenthesis indicate percentage increase over better check.*

Table 5 IHT VFC TOBACCO: Morphological characters of the entries of IHT at Jeelugumilli (2021-22)

Entries	Plant height	No. of leaves/ plant	Internodal length
FCHH-1	117	23	3
FCHH-2	145	23	6
FCRH-13	129	29	4
Kanchan (C)	115	22	3
LT-Kanchan (C)	118	23	5
CH-1 (C)	119	22	5

Table 6 IHT VFC TOBACCO: Morphological characters of the entries of IHT at Hunsur (2021-22)

Entries	Plant height	No. of leaves/ plant	Internodal length
FCHH-1	123.00	20.40	6.03
FCHH-2	120.40	19.20	6.27
FCRH-13	121.20	22.40	5.41
Kanchan (C)	94.80	18.00	5.27
FCH 222 (C)	124.20	20.80	5.97
CH-3 (C)	115.80	18.20	6.36

Table 7 IHT VFC TOBACCO: Incidence of pest and diseases in the entries of IHT at Jeelugumilli (2021-22)

Entries	Natural Condition (Mean No. of plants infected / plot (40 plants)					Artificial Inoculation With TMV (Reaction*)
	Caterpillar	Leaf Curl	Black Shank	CMV	Aphids	
FCHH-1	4	12	2	5	NIL	S
FCHH-2	4	17	1	7	NIL	S
FCRH-13	3	10	1	6	NIL	S
Kanchan (C)	6	13	1	6	NIL	S
LT-Kanchan (C)	5	11	1	14	NIL	S
CH-1 (C)	4	7	2	5	NIL	S

** R: Resistance; S: Susceptible*

Table 8 IHT VFC TOBACCO: Incidence of diseases in the entries of IHT at Hunsur (2021-22)

Entries	LC	TMV	*F. wilt*	CMV	Aphids	RKI
FCHH-1	1	3	0	0	0	4.66
FCHH-2	1	5	0	0	0	4.33
FCRH-13	2	7	0	1	0	5.00
Kanchan (C)	3	7	0	0	0	1.33
FCH 222 (C)	0	3	0	0	0	2.00
CH-3 (C)	2	4	0	2	0	2.30

Table 9 IHT VFC TOBACCO: Data on disease reaction of the IHT entries at Shivamogga (2021-22)

Entries	Black shank (%)	Frog eye leaf spot (%)	Root knot (%)
FCHH-1	4.0 (MR)	34.0	2.0 (MR)
FCHH-2	4.0 (MR)	35.0	2.0 (MR)
FCRH-13	6.0 (MR)	37.0	2.0 (MR)
Thrupthi (C)	25.0 (MS)	44.0	3.0 (MS)
Kanchan (C)	24.0 (MS)	42.0	3.0 (MS)
Sahyadri (C)	26.0 (MS)	45.0	3.0 (MS)

MS: Moderately Susceptible MR: Moderately Resistant

Table 10 IHT VFC TOBACCO: Chemical quality parameter (%) of the entries at Hunsur (2021-22)

Entries	Nicotine		R. Sugars		Chlorides	
	X	L	X	L	X	L
FCHH-1	1.00	1.14	17.23	10.81	0.21	0.31
FCHH-2	1.40	1.33	14.36	12.30	0.20	0.25
FCRH-13	1.59	1.24	16.10	10.88	0.41	0.18
Kanchan (C)	1.29	1.49	19.10	14.00	0.22	0.29
FCH 222 (C)	1.09	0.91	10.06	18.10	0.33	0.19
CH-3 (C)	1.11	1.26	17.17	13.22	0.15	0.21

ICAR-CTRI, JEELUGUMILLI

Project No.: VFJBRC3.1

Research project title	:	Advanced Hybrid Trial (AHT-I)
Investigators	:	K. Sarala &K. Prabhakara Rao
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ICAR-CTRI RS, Jeelugumilli

I. Objectives of the Project

- To assess further the yield performance of different identified lines under AHT-I
- To record the pest and disease incidence in identified FCV lines under AHT-I
- To analyze the chemical componentsof above identified lines

II. Executive Summary of the project for 2021-22

Two entries *viz*., FCRH-11 and FCRH-12 are tested in RBD along with three checks following standard cultural practices. Significant differences are observed among the entries for green leaf, cured leaf yield and grade index. Entries, FCRH-11 and FCRH-12 recorded higher green leaf (13433 kg/ha and 12867 kg/ha, respectively), cured leaf yields (2274 kg/ha and 2225 kg/ha) and grade index values (1435 and 1433) than other lines and controls. Both the entries, FCRH-11 and FCRH-12 found to record significantly higher green (16% & 11%, respectively) and cured leaf (14% & 11%, respectively) and grade Index values (12% & 12%, respectively) than better control, LT Kanchan. The entries, FCRH-11 and FCRH-12 recorded higher plant height, FCRH-11 more number of leaves and CH-1 higher internodal length than other lines. The test entries, FCRH-11 and FCRH-12 recorded lower leaf length and higher width values than best controls.

Incidence of pests (caterpillar & aphids) and diseases (Black Shank, CMV & leaf curl) was observed under natural condition among the entries and controls. The entries, FCRH-11 and Kanchan (c) recorded lower incidence of caterpillar and FCRH-12 lower leaf curl and CMV. In FCRH-11, Kanchan and LT Kanchan (c) black shank incidence was not recorded. Aphid incidence was nil in all the entries. Under artificial inoculation, all the entries recorded susceptible reaction to TMV. The chemical quality parameters *viz*., nicotine and reducing sugars of tested entries in both 'X' and 'L' positions are comparable to controls and are in acceptable limits. Chlorides of tested entries are comparable to controls.

The trial is proposed to **continue as AHT-II** in the ensuing season.

III. Most salient research findings/Achievements

- Both the entries, FCRH-11 and FCRH-12 found to record significantly higher green (16% & 11%, respectively) and cured leaf (14% & 11%, respectively) and grade Index values (12% & 12%, respectively) than better control, LT Kanchan

Project No.: VFJBRC 3.2

Research project title	:	Advanced Hybrid Trial (AHT-II)
Investigators	:	K. Sarala & K. Prabhakara Rao
Year of start	:	2020
Year of completion	:	2022
Location of the project	:	ICAR-CTRI RS, Jeelugumilli

I. Objectives of the Project

- To assess further the yield performance of different identified lines under AHT-II
- To record the pest and disease incidence in identified FCV lines under AHT-II
- To analyze the chemical components of above identified lines

II. Executive Summary of the project for 2021-22

Two entries *viz*., FCRH-6 and FCRH-7 are tested in RBD along with three checks following standard cultural practices. Significant differences are observed among the entries for green leaf, cured leaf yield and grade index. Entries, FCRH-6 and FCRH-7 recorded higher green leaf (12017 kg/ha and 11900 kg/ha, respectively), cured leaf yields (1857 kg/ha and 1838 kg/ha, respectively) and grade index values (1259 and 1223, respectively) than other lines and controls. Both the entries, FCRH-6 and FCRH-7 found to record significantly higher green (13% & 12%, respectively) and cured leaf (14% & 13%, respectively) and grade Index values (20% & 16%, respectively) than better control, LT Kanchan. The entries, FCRH-6 and FCRH-7 recorded higher plant height, FCRH-6 more number of leaves and FCRH-6 & FCRH-7 lower internodal length than other lines. The test entries, FCRH-6 and FCRH-7 recorded lower leaf length and higher width values than best control, Kanchan. Incidence of pests (caterpillar & aphids) and diseases (Black Shank, CMV & leaf curl) was observed under natural condition among the entries and controls. The entries, FCRH-6 and Kanchan (c) recorded lower incidence of caterpillar and CH-1 lower leaf curl and FCRH-7 lower CMV. In FCRH-7 black shank incidence was not recorded. Aphid incidence was nil in all the entries. Under artificial inoculation, all the entries recorded susceptible reaction to TMV. The chemical quality parameters *viz*., nicotine and reducing sugars of tested entries in both 'X' and 'L' positions are mostly comparable to controls and are in acceptable limits. Chlorides of tested entries are comparable to controls.

Pooled Analysis: In pooled analysis of yield data of last two years (2020-22), significant differences are observed among the entries for all the three characters *viz.,* green leaf, cured leaf and grade index. Both the tested entries, FCRH-6 and FCRH-7 recorded higher green (14 %), cured leaf (14%) yields and grade out turn (17% & 16%, respectively) than better control, LT Kanchan. Based on the pooled data, the entries, FCRH-6 and FCRH-7 are recommended for further evaluation.

III. Most salient research findings/Achievements

- Both the tested entries, FCRH-6 and FCRH-7 recorded higher mean green (14 %), cured leaf (14%) yields and grade out turn (17% & 16%, respectively) than better control, LT Kanchan on pooled basis and recommended for further evaluation.

ICAR-CTRI RS, HUNSUR

Project No.: VFHBRC1.1

Research project title	:	Advanced Varietal/Hybrid Trial-I (AVT/AHT - I)
Investigators	:	C. Nanda
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ICAR-CTRI-RS, Hunsur

I. Objectives of the Project

- To evaluate hybrid entry FCRH-11 for yield and quality in KLS against checks Kanchan, FCH-222 and CH-3

II. Executive summary of the project for 2021-22

Advanced Hybrid Trial-I consisting of only one entry, FCRH-11 was evaluated against checks (Kanchan, FCH-222 and CH-3) in a RBD trial consisting of six replications. Morphological characters like plant height, number of leaves, intermodal length, leaf length and width of 5th, 7th and 9th leaf were recorded. Observations on the natural incidence of pest and diseases were recorded. Cured leaf quality parameters (Nicotine, Reducing sugars and chlorides) were estimated. Yield data was subjected to statistical analysis and yields were expressed in terms of kg/ha.

In Advanced Hybrid Trial-I (AHT-I) only one entry FCRH-11 was evaluated in RBD along with three checks Kanchan, FCH-222 and CH-3 and data analysis indicated that the hybrid entry recorded significantly higher cured leaf yield (2673 kg/ha) and bright leaf yield (1913 kg/ha) over the better hybrid check CH-3 with an improvement of 16.9% and 15.6% respectively. Advanced Hybrid Trial-I consisting of only one entry, FCRH-11 was evaluated.

III. Most salient research findings/Achievements

- Entry FCRH-11 was found to be promising with higher leaf yield potential
- All the leaf quality parameters *viz.,* Nicotine, Reducing sugars and chlorides were well within the prescribed limits in all the entries tested

Project No.: VFHBRC 1.2

Research project title	:	Advanced Varietal Trial-II (AVT-II)
Investigators	:	C. Nanda
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ICAR-CTRI-RS, Hunsur

I. Objectives of the Project

- To evaluate hybrid entry FCH-2 and FCRH-4 for yield and quality in KLS against checks Kanchan, FCH- 222 and CH-3

II. Executive summary of the project for 2021-22

In Advanced Varietal Trial-II two entries FCH-2 and FCRH- 4 and three checks were evaluated in a RBD trial with five replications. Morphological characters like plant height, number of leaves, intermodal length, leaf length and width of 5th, 7th and 9th leaf were recorded. Observations on the natural incidence of pest and diseases were recorded. Cured leaf quality parameters (Nicotine, Reducing sugars and Chlorides) were estimated. Yield data was subjected to statistical analysis and yields were expressed in terms of kg/ha. Pooled analysis of two years (2020-2022) was also carried out to draw conclusions.

Analysis of data for the year 2021-22 indicated significant differences among the entries tested for all the yield parameters. Both the entries under testing had recorded significantly higher cured leaf yield, bright leaf yield and TGE over the varietal checks, Kanchan and FCH-222 and were on par with the hydrid check CH-3. However, the difference in green leaf yield was not significant among the entries tested.

Pooled analysis of the data for two years (2020-2022) also indicated significant differences among the entries tested and the entries tested were significantly superior against the checks tested. Entry FCH-2 recorded significantly highest green leaf, cured leaf, bright leaf yield and TGE of 13471 kg/ha, 1928 kg/ha, 1369 kg/ha and 1479 respectively , followed by entry FCRH-4 which recorded green leaf yield of 13178 kg/ha, cured leaf yield of 1890 kg/ha, bright leaf yield of 1302 kg/ha and TGE value of 1419.

III. Most salient research findings/Achievements

- The two entries FCH-2 and FCRH-4 were superior to the checks and thus were promoted to the bulk trial and OFT
- All the leaf quality parameters *viz.,* Nicotine, Reducing sugars and chlorides were well within the prescribed limits in all the entries tested

SHIVAMOGGA

Project No: VFSBRC1.2

Research project title	:	Advanced Varietal Trial (AVT-II)
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya& K Rajashekharappa.
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To assess the yield performance of different identified FCV Tobacco lines from AVT-I
- To identify high yielding good quality FCV tobacco varieties for zone 7(KLS region)

II. Executive Summary of the project for 2021-22

Among the three entries (FCH-1, FCH-2 and FCR-67) tested in the replicated trial, FCH-1 has recorded significantly higher GLY (12580 kg/ha), CLY (1761 kg/ha) and TGE (1233 kg/ha) over all the three checks. FCH-2 has recorded significantly higher GLY (11750 kg/ha), CLY (1645 kg/ha) and TGE (1151 kg/ha) over Kanchan and Sahyadri. However, FCR-67 has recorded significant GLY (10525 kg/ha), CLY (1473 kg/ha) and TGE (1031 kg/ha) over Sahyadri.FCH- 1 has recorded19.95% higher cured leaf yield over high yielding check Thrupthi. FCH- 2 has recorded19.89 % higher cured leaf yield over Kanchan.

In **pooled analysis**, among the three entries, FCH-1 and FCH-2 has recorded significantly higher CLY (1743, 1652 kg/ha) and TGE (1220, 1157 kg/ha) over all the three checks. FCH-1 was significant over all the three checks for GLY (12925 kg/ha). FCH- 1 has recorded19.13% higher cured leaf yield over high yielding check Kanchan. FCH-2 has recorded12.92 % higher cured leaf yield over Kanchan. Both the entries were **forwarded for further evaluation.**

III. Most salient research findings/Achievements

- FCH-1 has recorded significantly higher GLY (12580 kg / ha), CLY (1761 kg/ha) and TGE (1233 kg/ha) over all the three checks
- FCH-2 has recorded significantly higher GLY (11750 kg/ha), CLY (1645 kg/ha) and TGE (1151 kg/ha) over Kanchan and Sahyadri
- FCH-1 and FCH-2 performed better in AVT-II and in pooled analysis

Project No: VFSBRC3.2

Research project title	:	Advanced Hybrid Trial- II (AHT-II)
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, & K Rajashekharappa
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To identify high yielding good quality FCV tobacco hybrids for zone 7(KLS region)
- To assess the yield performance of different hybrids

II. Executive Summary of the project for 2021-22

In the advanced hybrid trial –II, the entry FCRH-4 was tested with three checks *viz*., Thrupthi, Sahyadri and Kanchan. The result revealed entry FCRH-4 recorded significantly higher GLY (6570 kg/ha), CLY (887kg/ha) and TGE (652kg/ha) over check Sahyadri.In the pooled analysis the entry FCRH-4 was **non-significant** over all the three checks.

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III. Most salient research findings/Achievements

- The hybrid FCRH-4 has recorded significantly higher GLY (6570 kg/ha), CLY (887kg/ha) and TGE (652kg/ha) over check Sahyadri in AHT-II
- In pooled analysis, FCRH-4 has not performed better

Project No: BT

Research project title	:	Bulk Trial on FCV Tobacco
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, &K Rajashekharappa
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the project

- To know the performance of the entry in a larger area

II. Executive Summary of the project for 2021-22

The entry FCS-4 has recorded higher GLY (12715 kg/ha), higher CLY (1780 kg/ha) and TGE (1246 kg/ha) over the checks. There were no sufficient seedlings of FCJ-38 and trial was conducted with only FCS-4. The entry FCS-4 has recorded 10.35 % higher cured leaf yield over Kanchan.

III. Most salient research findings/Achievements

- The entry FCS-4 has recorded higher GLY (12715 kg/ha), higher CLY (1780 kg/ha) and TGE (1246 kg/ha) over the checks

Project No: VFSBRC 2 (REPEAT)

Research project title	:	IVT (Repeat)
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, &K Rajashekharappa
Year of start	:	2021
Year of completion	:	Continued trail
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the project

- To assess the suitability of FCV tobacco entries (IVT) for zone 7 (KLS region)

II. Executive Summary of the project for 2021-22

It was suggested to repeat IVT with entries *viz*., FCR-68, FCR-69 and FCR-70 but the germination of the entries were **not satisfactory**. None of the entries were germinated satisfactorily. Hence the experiment was **vitiated.**

Project No: VFSBR4.1

Research project title	:	Station Varietal Trial-I on FCV tobacco
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, & K Rajashekharappa
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To identify high yielding good quality FCV tobacco cultivars suitable for zone 7

II. Executive Summary of the project for 2021-22

Ten entries were tested in replicated trial along with three checks. Among the ten entries tested, none of the entry has recorded significantly higher GLY, CLY and TGE over the checks.

III. Most salient research findings/Achievements

- Among the ten entries with three checks tested, **none** of the entries have recorded significantly higher GLY, CLY and TGE over the checks

Project No.: VFSBR 4.2

Research project title	:	Station Varietal Trail –II on FCV tobacco
Investigators	:	Shashikala, S. Kolakar, T.M. Soumya, &K. Rajashekharappa
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To identify high yielding good quality FCV tobacco cultivars suitable for zone 7 (KLS region)

II. Executive Summary of the project for 2021-22

Among the five entries tested with checks, none of the entries have recorded higher GLY, CLY and TGE over the checks.

III. Most salient research findings/Achievements

- Among the five entries with checks, **none** of the entries have recorded higher GLY, CLY and TGE over the checks

Project No.: VFSBR5

Research project title	:	Evaluation, characterization, maintenance and utilization of FCV tobacco germplasm
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, &K Rajashekharappa
Year of start	:	2021
Year of completion	:	2022
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- Collection, evaluation, maintenance and utilization of tobacco germplasm

II. Executive Summary of the project for 2021-22

The experiment was laid out in a randomized completely block design with two replications. Each genotype in each replication consisted of a single row of ten plants. The spacing maintained was 90 cm between rows and 60 cm between plants. Crop was raised as per the recommended package of practices.

There were 113 entries and 3 checks evaluated for green leaf yield, cured leaf yield and TGE. Among 113 entries evaluated, VA-119 (2560.65 kg/ha), NC-2326 (2301.16 kg/ha), SPEIGHT NF -3(2270.83 kg/ha), YELLOW GOLD (2185.42 kg/ha), and A-23 (2113.19 kg/ha) recorded higher GLY (kg/ha) than the other entries. NC-2326 (322.16 kg/ha), VA-119 (358.49 kg/ha), SPEIGHT NF -3 (317.92kg/ha), YELLOW GOLD (305.96 kg/ha), A-23 (295.85 kg/ha) recorded higher CLY and the same entries recorded higher TGE.

III. Most salient research findings/Achievements

- ❖ NC-2326 (322.16 kg/ha), VA-119 (358.49 kg/ha), SPEIGHT NF -3 (317.92kg/ha), YELLOW GOLD (305.96 kg/ha), A-23 (295.85 kg/ha) recorded higher CLY and the same entries recorded higher TGE

Project No.: VFSBR6

Research project title	:	Back cross breeding programme: Conversion of Thrupthi, Sahyadri, Tobios-6, FCH- 222& Bhavya in to male sterile lines (BC-7)
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, & K Rajashekharappa
Year of start	:	2012
Year of completion	:	Continued trial
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- ❖ Conversion of Thrupthi, Sahyadri, Bhavya, Tobios-6 and FCH-222 into male sterile lines
- ❖ These transformed male sterile varieties will be utilized for development of hybrids

II. Executive Summary of the project for 2021-22

Conversion of Thrupthi, Sahyadri, FCH-222, Tobios-6 and Bhavya in to male sterile lines is in BC7 generation. These confirmed male sterile lines will be evaluated for combining ability.

III. Most salient research findings/Achievements

- ❖ Conversion of Thrupthi, Sahyadri, FCH-222, Tobios-6 and Bhavya into male sterile lines is going on

Project No: VFSBR7

Research project title	:	New crosses and early generation studies
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, &K. Rajashekharappa
Year of start	:	2012
Year of completion	:	Continued trial
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To develop/ identify high yielding good quality FCV tobacco varieties for Karnataka light soils
- To develop/ identify FCV tobacco varieties for moisture stress

II. Executive Summary of the project for 2021-22

Phenotypically superior genotypes are selected from early generations and carried forward to next generation. Five F5 (Tobios-6 x Thrupthi, Tobios-6 x Sahyadri, Tobios-6 x Kanchan, Tobios-5 x Thrupthi and Tobios-5 x Kanchan) and F6 (TB-70 x TB-102, TB-100 x TB-102, Tobios-6 x Sahyadri, Tobios-5 x Kanchan and NLST-2 x FCH-221) populations were raised and selections were made based on the phenotypic character.

III. Most salient research findings/Achievements

- Five F5 (Tobios-6 x Thrupthi, Tobios-6 x Sahyadri, Tobios-6 x Kanchan, Tobios-5 x Thrupthi and Tobios-5 x Kanchan)
- Five F6 (TB-70 x TB-102, TB-100 x TB-102, Tobios-6 x Sahyadri, Tobios-5 x Kanchan and NLST-2 x FCH-221) populations were raised and selections were made based on the phenotypic characters

Project No: VFSBR 8

Research project title	:	Develpoment of high yielding and quality hybrids in FCV tobacco using male sterility system
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, & K Rajashekharappa
Year of start	:	2021
Year of completion	:	Continued trial
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- Evaluation of combining ability among CMS lines (Thrupthi, Sahyadri, Bhavya, Tobios-6 and FCH-222)
- Utilisation of male sterile lines for development of hybrids

II. Executive summary of the project for 2021-22

In this experiment the following crosses were effected FCH-222 (C4 MS KANCHAN) X FCS- 4, TOBIOS -6 (C4 MS KANCHAN) X FCS- 4, SAHYADRI (C1 MS KANCHAN) X FCS- 4, SAHYADRI (C4 MS KANCHAN) X FCS-4. However it was suggested to study the combining ability of the CMS lines using FCS-4, FCJ-38, FCJ-11 and NLCR-7 due to the late receipt of the seeds of FCJ-38, FCJ- 11and NLCR-7 these crosses were not effected

III. Most salient research findings/ Achievements

- In this experiment crosses FCH-222 (C4 MS KANCHAN) X FCS- 4, TOBIOS -6 (C4 MS KANCHAN) X FCS-4, SAHYADRI (C1 MS KANCHAN) X FCS-4, SAHYADRI (C4 MS KANCHAN) X FCS- 4 were effected

Project No: VFSBR 9

Research project title	:	Hybridisation and Double Haploid (DH) production to identify resistant lines for black shank and TMV and for other agronomic traits
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, & K Rajashekharappa
Year of start	:	2021
Year of completion	:	Continued trial
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To develop high yielding good quality and resistant FCV tobacco hybrids for zone 7(KLS region
- Standardization of protocol for DH production and hybridization in FCV tobacco

II. Executive Summary of the project for 2021-22

The crosses attempted under this experiment were SAHYADRI X FCR-68, SAHYADRI X CTRI Sulakshana, SAHYADRI X VT-1158, TRUPTHI X FCR-68, TRUPTHI X CTRI Sulakshana, TRUPTHI X VT-1158, KANCHAN X FCR-68, KANCHAN X CTRI Sulakshana, KANCHAN X VT-1158. In the work shop held on 02-12-2021 the external expert opined that establishment of laboratory requires huge investments and skilled assistance when the facilities are created then only one can take up such (double haploid production) research work. Hence this objective was dropped.

III. Most salient research findings/Achievements

- The crosses attempted are SAHYADRI X FCR-68, SAHYADRI X CTRI Sulakshana, SAHYADRI X VT-1158, TRUPTHI X FCR-68, TRUPTHI X CTRI Sulakshana, TRUPTHI X VT-1158, KANCHAN X FCR-68, KANCHAN X CTRI Sulakshana, KANCHAN X VT-1158

Project No: VFSBR 10

Research project title with code	:	Breeding for high seed yield and oil yield in both FCV and Chewing tobacco
Investigators	:	Shashikala, S. Kolakar, T. M. Soumya, &K Rajashekharappa
Year of start	:	2021
Year of completion	:	Continued trial
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To identify high yielding FCV tobacco entries with respect to seed and oil yield for zone 7 (KLS region)

II. Executive Summary of the project for 2021-22

Among 113 germplasm evaluated, PULAWASAKA-13 (244.17), NC-13 (222.50), NC-3150 (216.67), RIWAKA-3 (215.83), SILVER DONAR (214.17) and F-220 (210.67) recorded higher number of capsules per plant. The lines VA-45 (0.296 g), Coller-3719 (0.249 g), L-1136(0.225g), VA-309(0.219 g), NC-11271 (0.219g), 3127-Albacueulatcy (0.219 g) and VA-259 (0.215g) recorded higher capsule weight, Capsule length was higher in TRC-1-96 (18.38mm), VA-259 (17.73 mm), Dixic Bright-101(17.34 mm), VA-45 (17.28 mm) and 3127-Albacueulatcy (17.00 mm), capsule width was higher in VA-45(11.45 mm), 3127 - Albacueulatcy (11.28 mm), RG-13 (11.26 mm), SPEIGHT NF -3(11.22mm) and VA -76 (11.17mm). Lines NC-11271 (18.67g), VA-309 (18.50 g), NC-567 (18.33 g), VA-76 (18.00 g), TANTA -1 (17.67 g) and VA-770 (17.67 g) recorded higher seed yield per plant (g) with respect to total capsule weight lines VA-76 (37.00 g), VA-309 (36.00 g), NC-567(35.83 g), TANTA-1 (35.50g), YELLOW SPECIAL A (35.50 g) and SPEIGHT G -58(34.83 g) recorded higher weight.

III. Most salient research findings/Achievements

- Among 113 germplasm evaluated, PULAWASAKA-13 (244.17), NC-13 (222.50) NC-3150 (216.67), RIWAKA-3 (215.83), SILVER DONAR (214.17) and F-220 (210.67) recorded higher number of capsules per plant and the lines NC-11271 (18.67g), VA-309 (18.50g), NC-567 (18.33g), VA-76 (18.00g), TANTA (17.67g) and VA-770 (17.67g) recorded higher seed yield per plant

B. *BIDI* TOBACCO

COORDINATED EVALUATION OF *BIDI* TOBACCO GENOTYPES

Project No.: BDABRC/ BDNBRC/ BDNyBRC 2

Research Project Title: Initial Varietal Trial on *Bidi* tobacco

Year of start: 2021-22

***Bidi* tobacco Centres and Investigators**

Centres	:	Investigators
Anand	:	J. N. Patel & D.R. Delvadiya
Nipani	:	B. Arun Kumar, P.S. Matiwade & Geeta H. Dandin
Nandyal	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar & K. Satish Babu

I. Objectives of the Project

To evaluate the Bidi tobacco entries for yield and quality at three centres *viz.,*Anand, Nipani and Nandyal with 5 entries along with respective check varieties.

Entries: (05) Three

1. ABD-226
2. ABD-228
3. ABD- 229
4. NyBD- 68
5. NyBD- 69

Checks at different centres

Anand	:	1. ABT-10	2. MRGTH-1	3. GT-7	4. A-119
Nipani	:	1. Vedaganga-1	2. A-119	3. Bhavyashree	4. NBD-209
Nandyal	:	1. A-119	2. Nandyala Pogaku-1		

Design : RBD
Total Treatments :05 + checks as given above
Replications : Three

II. Executive Summary of the project for 2021-22

ANAND

The results revealed significant yield differences among the entries tested. ABD-228 showed significantly superior for cured leaf yield over better check. None of the lines under testing was free from leaf curl and tobacco mosaic virus diseases.

Most salient research findings/achievements

- ABD-228 showed significantly superior for cured leaf yield over better check

NIPANI

The Initial Varietal Trial (IVT) trial consists of five test entries (ABD-226,ABD-228,ABD-229,NyBD-68 and NyBD-69) and four checks (Vedaganga-1, Bhavyashree, A-119 and NBD-209). None of the test entries registered superior leaf yield (kg/ha) over the best checks NBD-209 (1680 kg/ha) and A-119 (1422 kg/ha).

Most salient research findings/achievements

- None of the test entries registered superior leaf yield (kg/ha) over the best checks NBD-209 (1680.00 kg/ha) and A-119 (1422.22 kg/ha)

NANDYAL

Five entries are tested against two checks. ABD-229, ABD-226 and ABD-228 are having on par cured leaf yield when compared to best check NandyalPogaku-1 (2108 kg/ha).

Most salient research findings/achievements

- None of the test entries showed superior leaf yield (kg/ha) over the best checks

Table 1 IVT *Bidi* tobacco: Cured leaf yield and morphological characters in IVT entries at different centres (2021-22)

Entry	Yield (kg/ha)			No. of leaves/ plant	
	Anand	Nipani	Nandyal	Anand	Nipani
ABD- 226	2407	864	2142	19	14.87
ABD-228	3385*	1322	2131	25	15.27
ABD- 229	2105	1107	2152	22	12.93
NyBD- 68	1465	844	2014	22	13.53
NyBD- 69	1605	922	1990	24	13.27
Vedaganga-1 (C)		1294			13.20
Bhavyashree (C)		1400			10.33
NBD -209 (C)		1680			13.37
GT-7 (C)	2607			20	
MRGTH-1(C)	3042			17	
GABT-11 (C)	2828			22	
A-119 (C)	2292	1422	1522	17	9.73
Nandyal Pogaku-1 (C)			2108		
Grand Mean		1206	2008		13
S.Em. ±	103.5	14	68.63	1.30	12.77
C.D. at 5%	310.3	288	279.38	3.90	2.86
C.V. %	7.42	96	6.83	10.66	0.95

Table 2 IVT *Bidi* tobacco: Morphological characters of IVT entries at different centres (2021-22)

Entries	Plant height (cm)			Leaf length (cm)			Leaf width (cm)		
	A	N	Ny	A	N	Ny	A	N	Ny
ABD- 226	79.8	83.80	90.3	52.3	47.76	48.7	21.4	17.99	19.8
ABD-228	80.7	49.53	77.8	54.7	46.89	45.4	22.1	17.31	18.8
ABD- 229	75.9	99.40	106.8	51.4	44.69	48.9	22.5	17.89	21.3
NyBD- 68	105.7	98.20	100.6	53.1	50.60	42.6	21.7	20.88	16.5
NyBD- 69	102.5	107.20	94.9	58.6	50.03	43.0	26.8	19.24	16.2
A-119 (C)	77.7	103.40	76.3	53.1	49.61	41.5	22.3	18.89	14.8
Nandyal Pogaku-1(C)			95.9			47.9			19.3
Vedaganga-1 (C)		123.60			53.97			19.43	
Bhavyashree (C)		121.80			49.03			18.20	
NBD-209 (C)		118.67			53.72			20.29	
GT-7 (C)	87.2			52.5			20.5		
MRGTH- 1(C)	80.1			55.7			22.9		
GABT-11 (C)	81.7			56.3			24.5		
Grand Mean		100.62	91.8		49.59	45.4		18.9	18.1
S.Em. ±	1.73	10.17	3.14	2.37	7.21	1.63	1.30	8.86	1.06
C.D. at 5%	5.18	17.71	9.33	NS	6.18	4.85	NS	2.9	3.16
C.V. %	3.49	5.91	6.85	7.56	2.06	7.18	9.93	0.97	11.77

A: Anand; N: Nipani; Ny: Nandyal

Table 3 IVT *Bidi* tobacco: Some morphological data of IVT entries at Anand, Nipani & Nandyal centres (2021-22)

Entry	Anand			Nipani	Nandyal		
	Days to flower	Leaf thick-ness (mm)	Days to maturity	Inter-nodal length (cm)	Days to 50% flowering	Leaf thickness (mm)	Spangle score
ABD- 226	72	10.96	171	4.03	146	10.03	6.0
ABD -228	108	9.83	182	1.91	146	9.55	6.0
ABD- 229	89	10.16	177	5.09	132	11.40	6.3
NyBD- 68	93	8.14	179	5.16	125	10.23	6.0
NyBD- 69	108	11.89	180	5.17	124	9.55	7.5
A- 119 (C)	66	11.89	173	6.44	125	8.78	7.5
Nandyala Pogaku-1 (C)					126	10.33	8.8
Vedaganga-1 (C)				6.13			
Bhavyashree (C)				6.48			
NBD-209(C)				5.80			
GT- 7 (C)	60	11.06	171				
MRGTH-1(C)	65	12.20	168				
GABT-11 (C)	93	10.11	182				
Grand Mean				5.13	132	9.98	6.9
S.Em. ±	5.30		2.47	17.89	0.75	0.66	0.44
C.D. at 5%	15.88		7.41	1.59	2.22	NS	1.31
C.V. %	10.94		2.44	0.53	1.13	13.20	12.89

Table 4 IVT *Bidi* tobacco: Pest & Disease incidence among IVT entries at Anand centre (2021-22)

ENTRIES	TMV (%)	Aphid	Caterpillar	CMV	LEAF CURL (%)				
					LCA	LCB	LCC	LCD	LCX
ABD- 226	90.00	-	-	-	-	-	-	-	Yes
ABD-228	93.33	-	-	-	-	-	-	-	Yes
ABD- 229	78.33	-	-	-	-	-	-	-	Yes
NYBD- 68	66.67		-	-	-	-	-	-	Yes
NYBD- 69	68.33		-	-	-	-	-	-	Yes
A-119 (C)	68.33		-	-	-	-	-	-	Yes
GT-7 (C)	76.67	-	-	-	-	-	-	-	Yes
MRGTH-1(C)	68.33	-	-	-	-	-	-	-	Yes
GABT-11 (C)	80.00	-	-	-	-	-	-	-	Yes

Where, LCA = Low, LCB = 10%, LCC = 10-20%, LCD = 20-30%, LCX = highly affected/Severe

Table 5 IVT *Bidi* tobacco: Chemical quality parameters in IVT at Anand (2021-22)

Entries	Nicotine (%)	Reducing Sugars (%)	Chlorides (%)
ABD- 226	5.85	4.86	0.674
ABD-228	5.10	4.15	0.461
ABD- 229	4.90	4.35	0.639
NYBD- 68	4.51	4.45	0.532
NYBD- 69	6.57	6.13	0.781
A-119 (C)	6.08	5.20	0.461
GT-7 (C)	7.50	6.10	0.604
MRGTH- 1(C)	5.75	4.97	0.639
GABT-11 (C)	5.12	4.18	0.710

Table 6 IVT *Bidi* tobacco: Pests & Diseases incidence among IVT entries at Nipani centre (2021-22)

Entries	Pests	Diseases				
	Aphids (0-5)	Frog Eye Spot (0-5)	Brown Leaf Spot (0-5)	Leaf Curl (%)	Blank Shank (%)	TMV (%)
ABD- 226	5	1	2	0	0	0
ABD -228	5	0	2	0	0	0
ABD- 229	5	0	1	0	0	0
NyBD- 68	5	1	1	0	0	0
NyBD -69	5	0	1	0	0	0
Vedaganga-1 (C)	5	0	0	0	0	0
A-119 (C)	5	1	1	0	0	0
Bhavyashree (C)	5	1	1	0	0	0
NBD- 209 (C)	5	0	1	0	0	0

ANAND

Project No.: BDABRC 1.1

Research project title	:	Advance Varietal Trial-I on *bidi* tobacco
Investigators	:	J.N. Patel, D. R. Delvadiya
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	BTRS, AAU, Anand

I. Objectives of the Project

- To identify suitable *bidi* cultivars superior to the local check in terms of yield, quality and disease reactions and promising entries will be tested in AVT II

II. Executive Summary of the project for 2021-22

Two entries with four checks were tested and results revealed significant yield differences among the entries tested. ABD 211 (3148*) showed significant superior for cured leaf yield over better check. None of the lines under testing was free from leaf curl and tobacco mosaic virus diseases.

III. Most salient research findings/Achievements

- ABD 211 (3148*) showed significant superior for cured leaf yield over better check.

Project No.: BDABRC 1.2

Research project title	:	Advance Varietal Trial-II on *bidi* tobacco
Investigators	:	J. N. Patel, D. R. Delvadiya
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	BTRS, AAU, Anand

I. Objectives of the Project

- To identify suitable *bidi* hybrid, superior to the local check in terms of yield, quality and disease reactions in AVT. Promising entries will be tested in Large scale Varietal Trials and farmers field

II. Executive Summary of the project for 2021-22

Five entries with four checks were tested and results revealed significant yield differences among the entries tested. ABD 199(3191*) showed significant superior for cured leaf yield over better check. None of the lines under testing was free from leaf curl and tobacco mosaic virus (except MR GTH 1) diseases.

III. Most salient research findings/Achievements

- ABD 199 (3191*) showed significant superior for cured leaf yield

NIPANI

Project No.: BDNBRC 1.1

Research project title	:	Advance varietal trial-I on *bidi* tobacco
Investigators	:	B. Arunkumar P.S. Matiwade & Geeta Dandin
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- Identification of superior *bidi* entries for Karnataka

II. Executive Summary of the project for 2021-22

The Advanced Varietal Trial-I (AVT-I) trial consists of two test entries *viz.*, ABD-209 and ABD-190 and four checks *viz.*, A-119, Vedaganga-1, Bhavyashree and NBD-209. None of the test entries registered superior leaf yield (kg/ha) over the best checks NBD-209 (1638 kg/ha) and A-119 (1653 kg/ha).

III. Most salient research findings/Achievements

- None of the test entries registered superior leaf yield (kg/ha) over the best checks NBD-209 (1638 kg/ha) and A-119 (1653 kg/ha) in AVT-I

Project No.: BDNBRC 1.2

Research project title	:	Advance varietal trial-II on *bidi* tobacco
Investigators	:	B. Arunkumar P.S. Matiwade & Geeta Dandin
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- Identification of superior *bidi* entries for Karnataka

II. Executive Summary of the project for 2021-22

A total of five test entries *viz.*, ABD-196, ABD-197, ABD-199, NyBD-62 and NyBD-63 and four checks *viz.,* Vedaganga, Bhavyashree, A-119 and NBD-209 were evaluated in Advanced Varietal Trial-II (AVT-II). None of the test entries were superior to the checks in terms of leaf yield kg/ha.

III. Most salient research findings/Achievements

- None of the test entries were superior to the checks NBD 209 (789 kg/ha) and A 119 (767 kg/ha) in terms of leaf yield in AVT-II

Project No.: BT

Research project title	:	Bulk Trial on *Bidi* Tobacco
Investigators	:	B. Arunkumar, P.S. Matiwade & Geeta Dandin
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- Breeding for high yield and quality coupled with disease resistance

II. Executive Summary of the project for 2021-22

Two entries *viz.*, NBD-316 and NBD- 277 were evaluated with two checks A-119 and NBD-209 in plot size of 8 m x 37.5 m (400 plants) to identify promising line for leaf yield over the popular and best check varieties. The promising entry NBD-316 has recorded highest leaf yield of 1323 kg/ha followed by best check NBD- 209 (1183 kg/ha).

III. Most salient research findings/Achievements

- The promising entry NBD 316 has recorded highest leaf yield of 1323 kg/ha followed by best check NBD 209 (1183 kg/ha).

Project No.: BDNBR4

Research project title	:	Station varietal trial (SVT-I, SHT ,PHT and PVT) on *bidi* tobacco
Investigators	:	B. Arunkumar, P.S. Matiwade & Geeta Dandin
Year of start	:	2020-21
Year of completion	:	2020-21
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- Breeding for high yield and quality coupled with disease resistance

II. Executive Summary of the projects for 2021-22

Five station Trials *viz.,* SVT-I, SVT-II, PVT, SHT and PHT were conducted.

BDNBR4.1: Station Varietal Trial-I (SVT-I)

The Station Varietal Trial-I consisted of four test entries (NBD-337, NBD-338, NBD-340 and NBD-341) and four checks (Vedaganga, Bhavyashree, A-119 and NBD-209). Among the test entries, entry NBD-337 (1189 kg/ha) registered significant superior leaf yield over the best check NBD-209 (922 kg/ha). Pooled analysis of this trial also revealed the significant superiority of **NBD-337** (1194 kg/ha) over the best check NBD-209 (1023kg/ha).

BDNBR4.2: Station Varietal Trial – II

The Station Varietal Trial -Repeat consisted of ten test entries and four checks. Among the test entries, entry NBD-330 (1111 kg/ha) registered numerically superior leaf yield over the best check NBD-209 (1006 kg/ha). Pooled analysis **NBD-334** (1454 kg/ha), registered numerically superior leaf yield over the best check NBD-209 (1282kg/ha).

BDNBR 4.4: Station Hybrid Trial (SHT)

The Station Hybrid Trial (SHT) consists of 17 entries (five test hybrids, eight parents and four checks). Test hybrid NBTH-1003 (1683 kg/ha) was numerically superior to the best check NBD-209 (1400 kg/ha) in leaf yield. In Pooled analysis over three years, hybrids **NBTH-1003** (1578 kg/ha) and **NBTH-1016** (1506) were numerically superior over the best check NBD-209 (1260 kg/ha),

BDNBR 4.5: Preliminary Varietal Trial (PVT)

The Preliminary Varietal Trial consisted of 18 test entries and four checks. Among the test entries, NBD-342 (1378 kg/ha), NBD-343 (1481 kg/ha),NBD-344 (1393 kg/ha), NBD-345 (1393 kg/ha), NBD-346 (1244 kg/ha),NBD- 347 (1259 kg/ha), NBD-349 (1289 kg/ha), NBD-351 (1230 kg/ha) and NBD-356 (1407 kg/ha) recorded significant superiority over the best check NBD-209 (889 kg/ha) for leaf yield.

BDNBR 4.6: Preliminary Hybrid Trial (PHT)

The Preliminary Hybrid Trial (PHT) consists of 17 entries (six test hybrids, seven parents and four checks). Test hybrids NBTH-1024 (1933 kg/ha) and NBTH-1028 (1900 kg/ha) were numerically superior to the best check NBD-209 (1767 kg/ha) in leaf yield.

III. Most salient research findings/Achievements

- The best test entry, NBD-337 will be evaluated in Station Varietal Trial-II during 2022-23

- The best test entries *viz.*, NBD-342 (1378 kg/ha), NBD-343 (1481 kg/ha), NBD-344 (1393 kg/ha), NBD-345 (1393 kg/ha), NBD-346 (1244 kg/ha),NBD-347 (1259 kg/ha), NBD-349 (1289 kg/ha), NBD- 351 (1230 kg/ha) and NBD-356 (1407 kg/ha) will be evaluated in **Station Varietal Trial-I** during 2022-23

- Test hybrids NBTH-1024 and NBTH-1028 will be evaluated as SHT-I during 2022-23 along with the four checks *viz.*, Vedaganga-1, A-119, Bhavyashree and NBD-209

Project No.: BDNBR 5

Research project title	:	Generation of Breeding material (Varietal Improvement)
Investigators	:	B. Arunkumar, P.S. Matiwade & Geeta Dandin
Year of start	:	2014-15
Year of completion	:	Long-term
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- Development of varieties for high yield with quality coupled with disease resistance

II. Executive Summary of the project for 2021-22

BDNBR 5.1: New crosses made

A total of 32 new inter varietal crosses and 46 MS based crosses were generated for leaf yield, quality and disease and pest resistance.

BDNBR 5.2: $F_1 \rightarrow F_2$

A total 12 F_1s evaluated along with four checks *viz.*, Vedaganga-1, A-119. Bhavyashree & NBD-209 in a randomized block design with three replications. The potential heterotic cross combinations *viz.,* Vedaganga x NBD-277 (1418 kg/ha), A-119 x NBD-277 (1498 kg/ha), A-2 x NBD-277 (1577 kg/ha) and NBD- 209 x NBD-277 (1631 kg/ha) selected based on yield performance will be advanced to next generation.

BDNBR 5.3:$F_2 \rightarrow F_3$

Four F_2 populations *viz.*, Bhavyashree X ABD-174, Vedaganga-1 X ABD- 174, Bhavyashree X NBD-316 and NBD-209 X ABD-190 were evaluated.

BDNBR 5.4:$F_3 \rightarrow F_4$

Six F_3 families of the two crosses NBD-209 X ABD-166 and NBD-209 X ABD- 167 were evaluated for leaf yield and its attributes.

BDNBR 5.5: Evaluation of advanced generation breeding material (F_4 generations)

Twelve F_4 lines evaluated in an unreplicated yield trial. Superior lines *viz.*, (2020-5-6-5 (NBD-209 X Vedaganga-1)), (2020-7-10-6 (NBD-209 X A-2)), 2020-8-3-10 (NBD-209 X A-2)) and (2020-8-5-9 (NBD-209 X A-2)) were selected and and plants selected from these F_4 lines will be tested in PVT during 2022- 23

III. Most salient research findings/Achievements

- Thirty two new inter varietal crosses and fourty six MS based new cross combinations will be evaluated for their yield and agronomic characters during 2022-23

- ❖ Potential heterotic cross combinations (F_1s) Vedaganga-1 x NBD-277, A-119 x NBD-277, A-2 x NBD-277 and NBD-209 x NBD-277 will be advanced to F_2 generation during 2022-23
- ❖ A total of 40 plants were selected from Four F_2 populations namely, Bhavyashree X ABD-174 ,Vedaganga-1 X ABD-174, Bhavyashree X NBD-316 and NBD-209 X ABD-190 based on the visual observation and will be advanced to F_3 generation
- ❖ Twenty six superior progenies selected from six F_3 families of NBD-209 X ABD-166 and NBD-209 X ABD-167 will be advanced to next generation (F_4).
- ❖ Plants selected from four F_4 entries, 2020-5-6-5 (NBD-209 X Vedaganga-1), 2020-7-10-6 (NBD-209 X A-2), 2020-8-3-10 (NBD-209 X A-2), and 2020-8-5-9 (NBD-209 X A-2) will be forwarded to PVT from F4 generation

Project No.: BDNBR 6

Research project title	:	Evaluation of early generation breeding material **(F_4progenies seeds)**
Investigators	:	B. R. Patil, P. S. Matiwade & Geeta Dandin
Year of start	:	2014-15
Year of completion	:	Long-term
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- ❖ Development of varieties for high yield with quality coupled with disease resistance

II. Executive Summary of the project for 2021-22

BDNBR 6: Evaluation of early generation breeding material (F_4Progenies-Seeds)

Twenty, F_4 progenies were evaluated for seeds purpose with two checks A-145 and A-119 in an un-replicated yield trial. Ten F_4 progenies *viz.*, 2020-2-10-6 (A-119 X ArBD-7), 2020-5-6-10 (ABD-119 X ABD-69), 2020-5-8-3 (ABD-119 X ABD-69), 2020-5-8-4 (ABD-119 X ABD-69), 2020-6-7-4 (ABD-119 X ABD-69), 2020-10-4-2 (Bhagyashree x ArBD-7), 2020-10-4-4 (Bhagyashree x ArBD-7), 2020-10-5-4 (Bhagyashree x ArBD-7), 2020-10-6-3 (Bhagyashree x ArBD-7) and 2020-12-10-2 (NBD-259 x TI-525) were found to be good with respect to seed yield.

BDNBR 6.5: Induced Mutation Trial (M_4)

Eighteen M_4 progenies were evaluated with checks A-145 and A 119 and parents NBD 122, NBD 119 and ArBD 7 with an un-replicated yield trial. Three Plants were selected from entry 2020-3-1-2 (NBD 122-450 Gy) based on leaf yield and agronomic characters.

III. Most salient research findings/Achievements

- Plants selected from Ten F_4 progenies (seeds) *viz.,* 2020-2-10-6 (A-119 X ArBD-7), 2020-5-6-10 (ABD-119 X ABD-69), 2020-5-8-3 (ABD-119 X ABD- 69), 2020-5-8-4 (ABD-119 X ABD-69), 2020-6-7-4 (ABD-119 X ABD-69), 2020-10-4-2 (Bhagyashree x ArBD-7), 2020-10-4-4 (Bhagyashree x ArBD-7), 2020-10-5-4 (Bhagyashree x ArBD-7), 2020-10-6-3 (Bhagyashree x ArBD-7) and 2020-12-10-2 (NBD-259 x TI-525) will be evaluated in preliminary trial during 2022-23
- Three plants selected from M_4 progeny entry 2020-3-1-2 (NBD-122-450 Gy) will be evaluated in preliminary varietal trial during 2022-23

Project No.: BDNBR-5

Research project title	:	**Collection, evaluation and maintenance of germplasm lines in *bidi* tobacco**
Investigators	:	B. Arunkumar, P.S. Matiwade & Geeta H. Dandin
Year of start	:	2017-18
Year of completion	:	Long-term
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- Collection, conservation and Evaluation of germplasm
- Maintenance of A/B lines and released varieties

II. Executive Summary of the project for 2021-22

Germplasm lines: A total of 245 germplasm lines were maintained and evaluated their reaction against various diseases during the year 2021-22.

Varieties and Hybrid parental lines: Totally 8 A lines, B lines and 8 released varieties were evaluated and maintained during the year 2021-22.

III. Most salient research findings/Achievements

- Total 245 germplasm lines were evaluated for their reaction against major diseases of tobacco under natural conditions. Few NBD and ABD entries have expressed symptoms of frog eye spot and brown leaf spot and aphids (as shown in the table). Regarding other diseases, no symptoms were observed at scorable level may be due to the late scoring because of rains during scoring time and also during the cropping season

NANDYAL

Project No.: BDNyBRC1.1

Research project title	:	Advanced Varietal Trial-I on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evaluate the performance of promising *bidi* tobacco entries under Nandyal conditions in a two-tier system

II. Executive Summary of the project for 2021-22

Two entries (ABD-209 and ABD-211) were tested against two checks. ABD-211 recorded high cured leaf yield (2034 kg/ha) with yield advantage of 8% over best check NandyalPogaku-1 (1889 kg/ha).

Project No.: BDNyBRC1.2

Research project title	:	Advanced Varietal Trial-II on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evaluate the performance of promising *bidi* tobacco entries under Nandyal conditions in a two-tier system

II. Executive Summary of the project for 2021-22

Five entries along with two checks were evaluated. The entry ABD-196 (1964 kg/ha) and NyBD-63 (1926 kg/ha) recorded on par cure leaf yield with best check Nandyal Pogaku-1 (1924 kg/ha). Based on pooled data for two years,NyBD-62 (1597 kg/ha) and ABD-196 (1577 kg/ha) recorded on par yield with best check Nandyal Pogaku-1 (1570 kg/ha).

Project No.: BDNyBRC3.1

Research project title	:	Advanced Hybrid Trial-I on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evaluate the performance of promising *bidi* tobacco hybrids under Nandyal conditions in a two-tier system

II. Executive Summary of the project for 2021-22

Two hybrids are tested along with three checks. The entries NyBTH-170 (2260 kg/ha) and NyBTH-171 (2223 kg/ha) have recorded higher cured leaf yield with an improvement of 10% and 8% when compared to the best check A-119 (2063 kg/ha).

III. Most salient research findings/Achievements

- The hybrids NyBTH-170 and NyBTH-171 showed surperiority over the check A-119. The trial will be evaluated as **AHT–II** during 2021-22

Project No.: BDNyBRC 3.2

Research project title	:	Advanced Hybrid Trial-II on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectivesof the Project

- To evaluate the performance of promising *bidi* tobacco hybrids under Nandyal conditions in a two-tier system

II. Executive Summary of the project for 2021-22

Three entries are tested along with three checks. The hybrids NyBTH-152 (2283 kg/ha), NyBTH-155 (2279 kg/ha) and NyBTH-157 (2267 kg/ha)) have recorded significantly higher cure leaf yield with yield advantage of 16%, 16% and 15% when compared to the best check MRGTH- 1 (1973 kg/ha).

Based on thetwo years pooled data, NyBTH-157 (2140 kg/ha), NyBTH-155 (2119 kg/ha) and NyBTH- 152 (2058 kg/ha) recorded significantly higher yield with yield advantage of 39%, 38% and 34% over best check MRGTH- 1 (1534 kg/ha).

III. Most salient research findings/Achievements

- The three hybrid entries *viz*., NyBTH-152, NyBTH-155 and NyBTH-157 will be forwarded to **On-Farm Trail** testing during 2022-23.

Project: BT

Research project title	:	Bulk Trial on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectivesof the Project

- To evaluate the performance of promising *bidi* tobacco entries under Nandyal conditions in a two-tier system.

II. Executive Summary of the project for 2021-22

Five entries NBD316, NyBD 61, ABD 189, ABD 169 &ABD 174 were evaluated along with two checks, Nandyal Pogaku-1 & A 119. Entries were evaluated in bulk yield plot with a size of 300 m^2.Among the entries tested the entry NBD 316 recorded on par yield (1518.41 kg/ha) with best check Nandyal Pogaku 1 (1476.80 kg/ha).

III. Most salient research findings/Achievements

The entry NBD 316 recorded on par yield (1518.41 kg/ha) with best check Nandyal Pogaku 1 (1476.80 kg/ha).

Project No.: OFT

Research project title	:	On Farm Trial on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evaluate the performance of promising *bidi* tobacco entries under Nandyal conditions in a two-tier system.

II. Executive Summary of the project for 2021-22

Three entries NBD-289, ABD-163 & ABD-145 were evaluated along with two checks, Nandyal Pogaku-1 & A 119. Entries are tested against two checks in a plot size of 1000 m^2. None of the entries performed better than the check variety A 119 (1349 kg/ha).Hence these entries will not promote for further evaluation.

III. Most salient research findings/Achievements

None of the entries performed better than the check variety A 119 (1349 kg/ha).

BDNyBR4: Hybridization and selection to evolve superior *bidi* tobacco varieties/hybrids

Introduction: Development and evaluation of *bidi* tobacco varieties and hybrids with higher yield and better quality than existing varieties/hybrids of the tract can contribute to substantial improvement in productivity and net economic returns to the Bidi Tobacco farmers in Kurnool Dt. As there is worldwide concern over the harmful effects of tobacco on consumer's health, there is a need to evolve varieties/hybrids which emit with low level of smoke toxicants like Carbon monoxide (CO), Polyphenols, tar, smoke nicotine and tobacco specific nitrosamines (TSNA).

I. Objectives of the Project

- To evolve high yielding and better quality *Bidi* tobacco hybrids with good aroma
- To develop *bidi* hybrids with lower levels of smoke toxicants like tar, CO, polyphenol and smoke nicotine

Experiments

1. Station Trials: Evaluation of both varieties / hybrids.
2. Hybridization and study of segregating generations in *bidi* tobacco

Hybridization Programme was followed for

i) **Development of bidi tobacco Hybrids:** Hybrids developed by using CMS lines. These crosses will be evaluated under station hybrid trials.
ii) **Improvement of bidi tobacco varieties:** New genotypes will be developed by pedigree method. These crosses will be studying under segregating generations and advanced genotypes will be evaluating under station varietal trials.

Project No.: BDNyBR 4.1

Research project title	:	Station Hybrid Trial-I on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

II. Objectives of the Project

- To evolve high yielding and better quality *bidi* tobacco hybrids with good aroma
- To develop *Bidi* hybrids with lower levels of smoke toxicants like tar, CO, polyphenol and smoke nicotine

III. Executive Summary of the project for 2021-22

Nine hybrids, NyBTH-193, NyBTH-194, NyBTH-195 NyBTH-196, NyBTH-197, NyBTH-198, NyBTH-199, NyBTH-200 and NyBTH-201were evaluated along with three checks, MRGTH1, Nandyal Pogaku- 1& A 119 in RBD design with 3 replications. Out of nine hybrids tested, the hybrid NyBTH 201 (2048 kg/ha) has recorded on par cure leaf yield with best check hybrid MRGTH 1 (2030 kg/ha).

IV. Most salient research findings/Achievements

- The hybrid NyBTH 201 (2048 kg/ha) has recorded on par cure leaf yield with best check hybrid MRGTH 1 (2030 kg/ha).

Project No.: BDNyBR 4.2

Research project title	:	Station Hybrid Trial-II on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2021-22
Year of completion	:	Continous
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evolve high yielding and better quality *bidi* tobacco hybrids with good aroma
- To develop *bidi* tobacco hybrids with lower levels of smoke toxicants like tar, CO, polyphenol and smoke nicotine

II. Executive Summary of the project for 2021-22

Twelve hybrids NyBTH-181, NyBTH-182, NyBTH-183, NyBTH-184, NyBTH-185, NyBTH-186, NyBTH-187, NyBTH-188, NyBTH-189, NyBTH-190, NyBTH-191 and NyBTH-192 were evaluated along with three checks, MRGTH 1, Nandyal Pogaku -1 & A 119 in RBD design with 2 replications. Out of twelve hybrids NyBTH-183 (2122 kg/ha) and NyBTH-185 (2107 kg/ha) has recorded 10% and 9% yield advantage over best check Nandyal Pogaku-1 (1931 kg/ha). Based on two years pooled data, none of the hybrids recorded significantly higher yield over best check Nandyal Pogaku- 1 (1654 kg/ha).

III. Most salient research findings/Achievements

- The hybrids NyBTH 183 (2122 kg/ha) and NyBTH 185 (2107 kg/ha) has recorded 10% and 9% yield advantage over best check Nandyal Pogaku-1 (1931 kg/ha).

Project No.: BDNyBR 4.3

Research project title	:	Observational Varietal Trial on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu & C. Chandra SekharaRao
Year of start	:	2020-21
Year of completion	:	Continous
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evolve high yielding and better quality *Bidi* Tobacco varieties with good aroma
- To develop *Bidi* varieties with lower levels of smoke toxicants like tar, Co, polyphenol and smoke nicotine

II. Executive Summary of the project for 2021-22

Ten entries are tested against two checks. Out of ten entries, NyBD-86 (2059 kg/ha) has recorded 6% yield advantage over best check variety A-119 (1937 kg/ha).

III. Most salient research findings/Achievements

- ❖ The ten entries along with two checks *viz*., NyBD-78, NyBD-79, NyBD-80, NyBD-81, NyBD-82, NyBD- 83, NyBD-84, NyBD-85, NyBD-86, NyBD-87, Nandyalpogaku-1(C) & A-119(C) are subjected to be tested in SVT-Ii*bidi* trial in 2022-23.

Project No.: BDNyBR 4.4

Research project title	:	Preliminary Yield Trial on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2020-21
Year of completion	:	Continous
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- ❖ To evolve high yielding and better quality *bidi* tobacco varieties with good aroma
- ❖ To develop *bidi* varieties with lower levels of smoke toxicants like tar, CO, polyphenol and smoke nicotine

II. Executive Summary of the project for 2021-22

Six entries are tested against two check varieties. **None** of the entries performed better than the best check variety NandyalPogaku- 1 (1534 kg/ha).

Project No.: BDNyBR 4.5

Research project title	:	Advanced Yield Trial on *bidi* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu
Year of start	:	2020-21
Year of completion	:	Continous
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- ❖ To evolve high yielding and better quality *bidi* tobacco varieties with good aroma
- ❖ To develop *bidi* varieties with lower levels of smoke toxicants like tar, CO, polyphenol and smoke nicotine

II. Executive Summary of the project for 2021-22

Four entries are tested against two check varieties. NyBD-66 (2045 kg/ha) has recorded on par yield with best check variety A-119 (2046 kg/ha).

Project No.: BDNyBR 5

Research project title	:	Study and generation of breeding material in *bidi* tobacco
Investigators	:	P. Pulli Bai & K. Satish Babu
Year of start	:	2017-18
Year of completion	:	Continous
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evolve high yielding and better-quality *bidi* tobacco varieties with good aroma.
- To develop *bidi* tobacco varieties with lower levels of smoke toxicants like tar, Co, polyphenol and smoke nicotine.

II. Executive Summary of the project for 2021-22

New crosses made: A total of 12 crosses were made out of 6 crosses under varietal improvement for specific traits (leaf quality, drought tolerant, high yielding etc.,) and 6 crosses for hybrid development.

$F_1 \rightarrow F_2$: 6 F_1 crosses were evaluated for leaf yield and other traits; these will be evaluated under F_2 generation during 2022-23

$F_2 \rightarrow F_3$: 6 F_2 crosses were evaluated. In these, 60 single plants are selected and these will be advanced to F_3 generation during 2022-23

$F_3 \rightarrow F_4$: 6 F_3 *bidi* crosses were evaluated from 64 single progenies. 28 superior single plants were selected and promoted to F_4 generation during 22-23.

$F_4 \rightarrow F_5$: 18 F_4 *bidi* crosses were evaluated from 86 single progenies. 77 superior single plants were selected and promoted to F_5 generation during 22-23.

$F_5 \rightarrow F_6$: from 23 progenies of 2 crosses, 11 single plant selections were made and promoted to F_6 generation during 22-23.

$F_6 \rightarrow$ SVT-1: 7 *bidi* F_6 s were evaluated from 15 single progenies. Out of these 27 superior uniform bulks were promoted to SVT-1 during 22-23.

III. Most salient research findings/Achievements

- A total of 12 crosses were made.
- 6 F_1 crosses were evaluated and advanced to F_2.
- 6 F_2 crosses were evaluated, 60 single plants are selected and advanced to F_3.
- 6 *bidi* F_3s were evaluated 64 single progenies were studied out of these 28 superior single plant selections were made and advanced to F_4.
- 18 *bidi* F_4s were evaluated and 86 single progenies were studied out of this 77 superior single plant selections were made and advanced to F_5

- 2 *bidi* F_5s were evaluated and 23single progenies were studied out of these 11 superior single plant selections were made and advanced to F_6
- 7 *bidi* F_6s were evaluated and 15 single progenies were studied out of these 27 superior uniform bulks were selected, these will be evaluated under SVT -1 during 2022-23

Project No.: BDNyBR 1

Research project title	:	Collection, evaluation and maintenance of germplasm lines in *bidi* tobacco
Investigators	:	S. Rama Devi & P. Pulli Bai
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To maintain and study *bidi* germplasm lines for utilization in future breeding programmes
- To evaluate and isolate superior *bidi* tobacco lines for direct release
- To collect local land races, varieties and lines by undertaking expeditions in *Bidi* tobacco growing areas of the tract

II. Executive Summary of the project for 2021-22

One thirty six *bidi* tobacco germplasm lines were maintained. During *kharif* 2021-22, Out of which 59 *bidi* tobacco germplasm lines are evaluated. Data pertaining to the characters *i.e.*Days to 50% flowering:114 days (Nandyal Pogaku-1) to 158 days (ABD-228), inter-nodal length:range 2-3 cm; leaf length: 48 cm (NyBD-87, ABD-196) to 75 cm (NyBTH-171), leaf width: 13.2 cm (NyBD-87) to 32 cm (NyBTH-171, NyBTH-157, NyBD-85, NyBTH-155, ABD-132): Suckering habit: low (21 entries), medium (21 entries) and high (34 entries); plant height: 85 cm (ABD-228) to 132 cm (NyBD-62); leaf thickness (mg/cm^2): 7.09 (NyBD-3) to 13.41 (NyBTH-152); leaf colour: light green to dark green, leaf shape: lanceolate, oblong and ovate; Gummyness: low (10 entries), medium (63 entries) and high (3 entries); days to maturity: 142 days (GT-4) to 188 days (ABD-228) and cured leaf yield per plant (g/pl.):52.5 (NyBD-73) to 91 (NyBTH-152).

III. Most salient research findings/Achievements

- A total of 59 *bidi* tobacco germplasm lines were evaluated.

C.*NATU/ PIKKA* TOBACCO

NANDYAL

Project No.: NTNyBR 1

Research project title	:	Collection, evaluation andmaintenance of germplasm lines in *natu* tobacco
Investigators	:	S. Rama devi & P. Pulli Bai
Year of start	:	2021-22
Year of completion	:	Continue
Location of the project	:	AINPT,RARS Nandyal

I. Objectives of the Project

- To maintain and study *Natu* germplasm lines for utilization in future breeding programmes
- To evaluate and isolate superior *Natu* tobacco lines for direct release
- To collect local land races, varieties and lines by under taking expeditions in *Natu*tobacco growing areas of the tract

II. Executive Summary of the project for 2021-22

76 *natu* tobacco germplasm lines were maintained. During kharif 2021-21, 17 *natu* tobacco germplasm lines are evaluated. Data pertaining to the characters *i.e*.Days to 50% flowering: 112 days (NyNT- 94) to 139 days (WAF); inter nodal length- 42 cm (NyNT- 64) to 72 cm (Bhairavi); 13.2 cm (NyNT-92) to 30 cm (NyNT-94); Suckering habit–89 cm (NyNT-65) to 132 cm (Bhairavi); leaf thickness (mg/cm2) –7.35 (NG-50) to 12.25 (II 1870); days to maturity –142 days (NyNT -94) to 165 (Bhairavi) and cured leaf yield per plant (g/pl.)– 45.5 (NyNT- 89) to 80 (WAF).

Project No: NTNyBR 5

Research project title	:	Observtaional Yield Trail on *natu* tobacco
Investigators	:	S. Rama Devi, P. Pulli Bai, K. Prabhakar, K. Satish Babu & C. Chandra SekharaRao
Year of start	:	2020-21
Year of completion	:	Continue
Location of the project	:	AINPT,RARS Nandyal

I. Objectives of the Project

- To evolve high yielding and better quality *bidi* tobacco varieties and hybrids with good aroma
- To develop *bidi* varieties and hybrids with lower levels of smoke toxicants like tar, Carbon monoxide (CO), polyphenol and smoke nicotine

II. Executive summary of the project 2021-2022

Six entries are tested against natu check variety Bhairavi. Out of six entries, **none** of the entries performed better than the check variety (1384 kg/ha).

The six entries along with one check *viz*., NyNT- 88, NyNT- 89, NyNT -90, NyNT -91, NyNT- 92, NyNT- 93, Bhairavi (C) are subjected to evaluate in second year in **SVT-II** *natu* trial during the year 2022-23.

Project No: NTNyBR 4.5

Research project title	:	**Advanced Yield Trial-II on *natu* tobacco**
Investigators	:	P. Pulli Bai & K. Satish Babu
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	AINPT,RARS Nandyal

Advanced Yield Trial-I on *Natu* tobacco was not promoted to AYT-II during 2021-22. Due to low chemical quality and lower cured leaf yield improvement 6.8 % than check Bhairavi

Project No: NTNyBR 5

Research project title	:	Study and generation of breeding material in *natu* tobacco
Investigators	:	P. Pulli Bai & K. Satish Babu
Year of start	:	2021-22
Year of completion	:	Continue
Location of the project	:	AINPT,RARS Nandyal

I. Objectives of the Project

- To evolve high yielding and better quality *natu* tobacco varieties and hybrids with good aroma.
- To develop *natu* varieties and hybrids with lower levels of smoke toxicants like tar, CO, polyphenol and smoke nicotine.

II. Executive Summary of the project for 2020-21

NTNyBR 5.1: New crosses made

Two crosses were made under varietal improvement for specific traits (leaf quality, drought tolerant, high yielding *etc*.)

NTNyBR 5.2: $F_1 \rightarrow F_2$

Two F_1 crosses were evaluated for drought tolerant and higher cured leaf yield and other traits; these will be evaluated under F_2 generation during 2022-23.

NTNyBR 5.3: $F_2 \rightarrow F_3$

Two F_2 crosses were evaluated. In these, the superior single plants were selected and these will be evaluated under F_3 generation during 2022-23.

NTNyBR 5.4: $F_3 \rightarrow F_4$

During 2021-22, 35 superior single plant progenies of two *natu* tobacco crosses were evaluated under F_3 generation. 11 superior single plantswere selected and to be evaluated during 2022-23.

NTNyBR 5.5: $F_4 \rightarrow F_5$

During 2021-22, 21 progenies of 2 crosses were evaluated under F_4 generation. 11 superior single plantswere selected and to be evaluated during 2022-23.

NTNyBR 5.6: $F_5 \rightarrow F_6$

During 2021-22, 16 single plant progenies of 2 *natu* tobacco crosses were evaluated under F_5 generation. 11 superior single plantswere selected and to be evaluated during F_6 in 2022-23.

NTNyBR 5.7: $F_6 \rightarrow$ SVT-I

In F_6 generation, 16 progenies evaluated during 2021-22. 32 uniform bulkswere selected. The entries namely, NyNT-94, NyNT-95, NyNT-96, NyNT-97, NyNT-98, NyNT-99, NyNT-100, NyNT-101, NyNT-102, Bhairavi (C) are going to be evaluatedin SVT-1 natuduring 2022-23.

BERHAMPUR

Project No.: PBBR2

Research project title	:	Collection, evaluation and maintenance of tobacco germplasm.
Investigators	:	A. M. Prusti
Year of start	:	1987
Year of completion	:	Continuing
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To collect, evaluate and maintain tobacco germplasm for future use

II. Executive Summary of the project for 2021-22

One hundred twelve numbers of genotype were maintained for future breeding programme.

III. Most salient research findings/Achievements

- One hundred twelve numbers of genotype were maintained for future breeding programme

Project No.: PBBR5

Research project title	:	Bulk evaluation in *pikka* tobacco.
Investigators	:	A. M.Prusti
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To evaluate superior *pikka* tobacco genotypes selected from Replicated Yield Trial (RYT) in larger plots for on farm testing or MLT

II. Executive Summary of the project for 2021-22

A bulk trial was conducted during 2021-22 at AINPT, Berhampur with three entries *viz*. NF-4-27-3, NF-4-20-2 and NF-4-10-2 and one local check (Gajapati) for cured leaf yield and yield attributing characters such as topped plant height (cm), no. of leaves /plant, leaf length (cm) and leaf width (cm). Among genotypes, NF-4-27-3, recorded higher cured leaf yield (1322 kg/ha) followed by NF-4-20-2 (1192 kg/ha), with an increase of 24.4% and 12.1% respectively over check variety

Gajapati (1063 kg/ha). Genotype NF-4-27-3 exhibited higher leaf length (6.3 cm) and leaf breadth (25.5 cm) andNF-4-20-2 expressed higher number of leaves /plant (15.2) and leaf width (24.8 cm).

III. Most salient research findings/Achievements

- Genotype NF-4-27-3 (1322 kg/ha) and NF-4-20-2 (1192 kg/ha) were found superior over check variety Gajapati (1063 kg /ha) with yield improvement of 24.4% and 12.1% respectively

Project No.: PBBR 9

Research project title	:	Replicated yield trial in *pikka* tobacco.
Investigators	:	A. M. Prusti
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To evaluate superior *pikka* tobacco genotypes selected from yield evaluation trial (YET) for testing in bulk evaluation trial

II. Executive Summary of the project for 2021-22

Five *pikka* tobacco genotypes along with check variety, Gajapati were evaluated during 2021-22 in RBD with four replications for cured leaf yield and ancillary characters such as topped plant height (cm), no. of leaves / plant, leaf length (cm) and leaf width (cm). Significant differences are observed among the entries for all characters.

Genotype 1072-IT recorded higher cured leaf yield (1368 kg/ha) followed by Natu Yelamanchali (1353 kg/ha), NatuNoonepalli(1270 kg/ha) and *Natu* Ankapalli (1249 kg/ha) compared to check check variety Gajapati (1105kg/ha) with yield improvement of 23.8, 22.4, 14.9 and 13% respectively.

III. Most salient research findings/Achievements

- Genotype1072-IT (1368 kg/ha) and NatuYelamanchali (1353 kg/ha) were found superior over check variety Gajapati (110 kg/ha) with yield improvement of 23.8 and 22.4% respectively

Project No.: PBBR8

Research project title	:	Yield evaluation trial of advanced breeding lines in *Pikka* tobacco.
Investigators	:	A. M.Prusti
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To evaluate *pikka* tobacco genotypes and to identify superior genotypes for testing in Replicated Yield Trial (RYT)

II. Executive Summary of the project for 2021-22

Twenty *pikka* tobacco genotypes along with two check varieties, Gajapatiand JP Local were evaluated during 2021-22 in RCBD with two replications for cured leaf yield and ancillary characters such as topped plant height (cm), no. of leaves / plant, leaf length (cm) and leaf width (cm).

Among treatments, genotype NGP-89 recorded higher cured leaf yield (1464 kg/ha) followed by II- 1068 (1424 kg/ha), KFC (1413 kg/ha), II-1873 (1404 kg/ha), Kommipaduvittanam (1386 kg/ha) and NG-61 (1376 kg/ha) with yield improvement of33.5, 29.8, 28.8, 28.0, 26.3 and 25.4 per cent respectively over check variety Gajapati (1097 kg/ha). Genotypes Chebrolu recorded higher number of leaves /plant (21.8) whereas II-1068 produced higher leaf length (60.8 cm) and leaf width (21.9 cm). Genotypes Chebrolu expressed 0.3% more number of leaves / plant, and II 1068 exhibited 42.4% higher leaf length and 44.1% more leaf width over check variety Gajapati.

III. Most salient research findings/Achievements

- Genotype NGP-89 (1464 kg/ha), II-1068 (1424 kg/ha), KFC (1413 kg/ha), II-1873 (1404 kg/ha), Kommipaduvittanam (1386 kg/ha) and NG-61 (1376 kg/ha) were found superior over check variety Gajapati (1097 kg/ha) with more than 25% yield improvement

Project No.: PBBR 11

Research project title	:	Exploratory trial on Tobacco
Investigators	:	A. M. Prusti
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To evaluate *Rustica*and *jati*tobacco varieties under Odisha condition

II. Executive Summary of the project for 2020-21

***Rustica*tobacco:** During 2021-22, cured leaf yield of *rustica*tobacco varieties ranged from 1480 kg/ha (GC-1) to 1664 kg/ha (DCT-4). All four varieties *viz.,* DCT- 4 (1664 kg/ha), GCT- 2 (1647 kg/ha), GCT- 3 (1566 kg/ha) and GC-1 (1480 kg/ha) with more than 1400 kg /ha cured leaf yield were found promising. *Rustica* varieties Torsa, DD-437, Dharla and Bitri were not included in the trial as their performance during 2020-21, was not satisfactory under Odisha condition. Two years pooled results revealed that among four rustica varieties DCT- 4 recorded maximum cured leaf yield of 1841 kg/ha followed by GCT- 2 (1804 kg/ha) and GCT- 3 (1694 kg/ha). Rustica variety GC-1 produced lowest cured leaf yield of 1530 kg/ha. Since all four varieties produced cured leaf yield of more than 1500 kg/ha, their performancewas satisfactory under Odisha condition.

***Jati*tobacco:** All three varieties of *jati* tobacco were produced cured leaf yield more than 1400 kg/ha and found promising Table 1 PBBR 11. Among three varieties, Manasi recorded 1672 kg/ha cured leaf yield followed by Chama (1504 kg/ha) and Podali (1456 kg/ha). It was revealed from two years pooled results that among three *Jati* varieties Manasi recorded maximum cured leaf yield of 1855 kg/ha followed by Chama (1646 kg/ha) and Podali (1574 kg/ha). Since all three varieties produced cured leaf yield of more than 1500 kg/ha, their performance was satisfactory under Odisha condition.

***Bidi*tobacco:** Among four *bidi* tobacco tested during 2020-21, Performance of Vedaganga-1 and GT- 7 was satisfactory. However, there was very little demand of bidi tobacco in the local market, therefore they were not included in the experiment.

III. Most salient research findings/Achievements

- *Rustica* and*Jati* tobacco's performance was satisfactory under Odisha condition

Project No.: PBBR 12

Research project title	:	MLT in *pikka* tobacco genotype
Investigators	:	A. M. Prusti, P. Sial & M. R. Mohanty
Year of start	:	2021-22
Year of completion	:	2023-24
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To evaluate promising genotypes in different locations for Yield and yield attributing characters and identify suitability for general cultivation

II. Executive Summary of the project for 2021-22

Two *pikka* tobacco genotypes along with check varieties, Gajapati and JP Local were evaluated during 2021-22 in RBD with five replications for cured leaf yield and ancillary characters such as topped plant height (cm), no. of leaves / plant, leaf length (cm) and leaf width (cm). Significant differences are observed among the entries for all characters.

Genotype BPT-7 exhibited significantly higher leaf number (14.8), leaf length (60.7 cm) leaf width (26.3 cm) and cured leaf yield (1195 kg/ha) than check variety Gajapati (13.2, 53.4 cm, 22.9 cm and 999kg/ha respectively) at Berhampur. This entry also showed significant increase over check variety Gajapati in leaf number, leaf width and cured leaf yield at Semiliguda, Jeypore and location pooled.

Genotype BPT-50 showed significantly higher cured leaf yield than check variety Gajapati at all locations and in pooled result. It also had significantly higher leaf number at all locations and pooled data except Jeypore. Leaf width was found significantly higher at Semiliguda and Jeypore locations.

III. Most salient research findings/Achievements

- GenotypeBPT-7 expressed 19.6, 23.3, 21.1 and 21.3 percent higher cured leaf yield at Berhampur (1195 kg/ha), Semiliguda (1238 kg/ha), Jeypore(1204 kg/ha) and locations pooled (1212 kg/ha)respectively than check variety Gajapati

- BPT-50 exhibited 12.7, 17.3, 15.0 and 15.0 percent higher cured leaf yield at Berhampur (1126 kg/ha), Semiliguda (1178 kg/ha), Jeypore (1143 kg/ha) and locations pooled (1149kg/ha) respectively than check varietyGajapati

Project No.: PBBR 13

Research project title	:	Morphological characterisation in *pikka* tobacco
Investigators	:	A. M. Prusti
Year of start	:	2021-22
Year of completion	:	2023-24
Location of the project	:	AINP on Tobacco, CPR, Berhampur

I. Objectives of the Project

- To study the diversity pattern among twenty genotypes collected from AINPT Nandyal and to identify genotypically divergent parents for hybridization programme

II. Executive Summary of the project for 2021-22 :

Twenty *pikka* tobacco genotypes along with two check varieties, Gajapati and JP Local were evaluated in RBD with three replications for 23 characters and 58 states to identify genotypically divergent parents.

III. Most salient research findings/Achievements :

- No variability was observed for intermodal length, leaf stalk, capsule length and capsule width, and low variability for topped plant height, plant width, leaf length, days to flowering and flower colour. All other fourteen characters exhibited medium to high phenotypic variability

D. *RUSTICA* TOBACCO

COORDINATED EVALUATION OF RUSTICA TOBACCO GENOTYPES

Project No.: RUABRC/ RULdBRC/ RUDBRC/ RUArBRC 2

Research Project Title: Initial varietal trial on *Rustica* tobacco

Year of start:2021-22

***Rustica*tobacco Centres and Investigators**

Centres	**:**	**Investigators**
Anand	:	J. N. Patel & D.R. Delvadiya
Araul	:	A.K. Srivastava
Dinhata	:	Sunil Mandi
Ladol	:	D.R. Chaudhari

I. Objectives of the Project

- To evaluate the *rustica* tobacco entries for yield and quality at four centres Anand, Araul, Dinhata and Ladol with 4 entries along with respective check varieties

Entries: 04 (Four)

1. ArR-96
2. ArR-98
3. LR-96
4. LR-97

Checks at different centres :

Anand Centre	:	1. GC 1	2. GCT 2	3. GCT 3
Araul Centre	:	1. Azad Kanchan	2. SK 417	
Dinhata Centre	:	1. DD 437	2. Dharla	
Ladol Centre	:	1. GCT 3	2. DCT 4	

Design : RBD
Total treatments : 4 entries + checks
Replications : Four

II. Executive Summary of the project for 2021-22

ANAND

Four entries with three checks were tested and yield differences were significant among the entries tested. None of the entry showed their superiority over better check for cured leaf yield. None of the entries was free from tobacco mosaic and leaf curl disease.

Most salient research findings/achievements

- None of the entries showed significant superiority over check varieties

ARAUL

The four entries were tested with two checks in randomized block design with four replications. The yield differences were significant among the entries tested. The entries ArR-96 (3631 kg/ha) followed by entry ArR-98 (3609 kg/ha) found significantly superior over the best check Azad Kanchan (3110 kg/ha) with 161% and 15% increase yield respectively.

Most salient research findings/achievements

- The entries**ArR-96 and ArR-98** showed significant superiority for cured leaf yield over the best check variety Azad Kanchan and may be approved for AVT-I to be conducted during *rabi* 2022-23

DINHATA

In IVT four lines *viz*., ArR-96, ArR-98, LR-96 and LR-97 were tested with two local varieties i.e. DD-437 and Dharla for their cured leaves and first grade leaf yields. Among four lines none of them recorded significantly higher yield than local control Dharla. However, line ArR-96 and ArR-98 recorded cured leaf yield more than DD-437. The DD-437 showed highest quality outturn (42.48%) followed by ArR-96 (41.37%). No major incidence of diseases were noticed in the trial.

Most salient research findings/achievements

- None of the entries were found promising
- There was no major incidence of other diseases and pests

LADOL

Significant differences for cured leaf yield, plant height and no. of leaves per plant, leaf length and leaf width were found for the entries tested in IVT. Entry LR-96 (5335 kg/ha) was first rank and gave 12% high cured leaf yield followed by entries LR-97 (5276 kg/ha) reflecting 10.82% respectively higher cured leaf yield over best check DCT- 4(4761 kg/ha).

Most salient research findings/achievements

- ❖ Entry LR-96 (5335 kg/ha) was first rank and gave 12.05 percent high cured leaf yield fallowed by entries LR-97(5276 kg/ha) reflecting 10.82 percent respectively higher cured leaf yield over best check DCT-4 (4761 kg/ha)

Table 1 IVT *RUSTICA* TOBACCO: Yield data of IVT *rustica* entries at different centres (2021-22)

Entries	Cured leaf yield at different centres (kg/ha)			
	Anand	Araul	Dinhata	Ladol
ArR-96	2912	3631	1798	4559
ArR-98	2309	3609	1641	4462
LR-96	2000	3090	1390	**5335**
LR-97	2498	2468	1460	**5276**
GC 1 (C)	2523			
GCT 2 (C)	2703			
GCT 3 (C)	3094			4612
DCT 4 (C)				4761
Azad Kanchan (C)		3130		
SK-417 (C)		2550		
DD 437 (C)			1556	
Dharla (C)			1871	
Grand Mean				4834
S.Em ±	194.8	153.70	113.21	154
C.D. at 5%	578.7	471.0	331.19	463
C.V. (%)	15.12	9.95	0.14	6.36

Table 2 IVT *RUSTICA* TOBACCO: Morphological characters of IVT entries of *rustica* tobacco at different centres (2021-22)

Entries	No. of leaves/ plant				Plant height (cm)				Leaf length (cm)				Leaf breadth (cm)			
	A	Ar	D	L	A	Ar	D	L	A	Ar	D	L	A	Ar	D	L
ArR-96	15	12	7	11	51.8	55.68	26.25	58.8	43.0	36.14	25.77	41.1	27.2	30.10	24.29	40.8
ArR-98	13	12	7	11	47.8	52.18	30.73	49.3	41.9	33.64	25.42	40.0	30.3	29.18	21.32	40.9
LR-96	13	11	7	12	41.5	44.90	23.47	46.9	39.9	30.13	30.05	40.8	27.7	27.33	22.7	40.3
LR-97	13	10	6	12	47.4	45.89	31.42	48.7	40.5	29.87	24.32	40.0	27.5	26.18	20.12	39.5
GC-1 (C)	13				41.8				45.3				34.4			
GCT- 2 (C)	14				51.6				45.2				30.1			
GCT-3 (C)	14			11	48.4			75.1	44.4			34.0	28.8			35.7
DCT- 4 (C)				12				67.0				37.2				36.1
DD- 437 (C)			7				34.82				25				20.5	
Dharla (C)			7				34.82				28				20.55	
Azad Kanchan(C)		10				56.33				30.33				25.18		
SK-417 (C)		11				54.32				29.18				26.68		
S.Em ±	0.31		0.32	0.38	1.63		1.40	1.97	1.18		1.53	0.84	1.36		1.58	0.85
C.D. at 5%	0.93		0.95	1.15	4.84		4.10	5.94	3.50		4.47	2.52	4.04		4.62	2.56
C.V. (%)	4.57		0.10	6.61	6.91		0.09	6.84	5.49		0.12	4.31	9.25		0.15	4.37

A: *Anand* ***Ar:*** *Araul* ***D:*** *Dinhata* ***L:*** *Ladol*

Table 3 IVT *RUSTICA* TOBACCO: Data on morphological characters in IVT *rustica* entries at different centres (2021-22)

Entries	Leaf thickness	Days to flower	Days to maturity		Inter-nodal length	Plant stand
	Anand	Anand	Anand	Araul	Dinhata	Ladol
ArR-96	6.67	55	120	113	5.67	39
ArR-98	10.01	47	120	109	6.85	38
LR-96	9.90	58	121	110	3.95	40
LR-97	13.05	54	119	114	4.92	40
GC- 1 (C)	15.18	50	121			
GCT- 2 (C)	12.30	62	123			
GCT-3 (C)	16.47	54	125			39
DCT-4 (C)						39
Azad Kanchan (C)				110		
SK-417 (C)				111		
DD-437 (C)					7.6	
Dharla (C)					5.9	
S.Em ±	-	1.36	1.10		0.75	0.47
C.D. at 5%	-	4.05	3.26		2.19	NS
C.V. (%)	-	5.03	1.81		0.26	2.41

Table 4 IVT *RUSTICA* TOBACCO: First grade leaf yields and quality leaf outturn at Dinhata Centre (2021-22)

Treatments	First grade leaf (kg/ha)	Quality leaf(%)
ArR-96	744	41.37
ArR-98	571	33.79
LR-96	506	36.40
LR-97	533	36.50
DD-437 (C)	661	42.48
Dharla (C)	700	37.41
S.Em ±	74.29	
C.D. at 5%	217.33	
C.V. (%)	0.24	

Table 5 IVT *RUSTICA* TOBACCO: Disease incidence and quality parameters in IVT *rustica* entries at Anand Centre (2021-22)

Entries	TMV (%)	Leaf curl (%)			Nicotine (%)	R. Sugars (%)	Chlorides (%)
		LCA	LCB	LCC			
ArR-96	48.75	-	-	Yes	6.50	3.70	1.313
ArR-98	43.75	-	Yes	-	5.08	4.33	1.243
LR-96	40.00	-	Yes	-	4.50	3.78	1.065
LR-97	35.00	Yes	-	-	4.55	3.75	1.526
GC -1 (C)	42.50	Yes	-	-	5.25	4.75	1.243
GCT -2 (C)	46.25	Yes	-	-	5.35	3.75	0.887
GCT- 3 (C)	38.75	Yes	-	-	5.67	3.78	1.420

***Where, LCA** = Low, **LCB** = 10%*

Table 6 IVT *RUSTICA* TOBACCO: Data on chemical and disease incidence in IVT *rustica* entries at Ladol Centre (2021-22)

Entries	Chemical parameters (%)			Disease (%)	
	Nicotine	Reducing Sugars	Chlorides	LCV	LMV
ArR-96	2.47	4.21	1.23	0.00	3.25
ArR-98	2.09	4.91	0.85	0.00	2.65
LR-96	3.79	3.85	1.25	0.00	0.63
LR-97	3.76	2.36	0.92	0.00	0.63
GCT-3 (C)	3.63	2.21	1.58	0.00	0.00
DCT-4 (C)	2.51	1.76	1.21	0.64	0.00

ANAND

Project No.: RUABRC 1.1

Research project title	:	Advance Varietal Trial-I on *rustica* tobacco
Investigators	:	J. N. Patel & D. R. Delvadiya
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	BTRS, AAU, Anand

I. Objectives of the Project

- To identify suitable rustica cultivars superior to the local check in terms of yield, quality and disease reactions in AVT and and promising entries will be tested in AVT II

II. Executive Summary of the project for 2021-22

Four entries with three checks were tested and the yield differences were significant among the entries tested. None of the entry showed significant superiority for cured leaf yield over better check. None of the entries was free from tobacco mosaic and leaf curl disease.

III. Most salient research findings/Achievements

- None of the entry showed significant superiority for cured leaf yield over better checks

Project No.: RUABRC 1.2

Research project title	:	Advance Varietal Trial-II on *rustica* tobacco
Investigators	:	J. N. Patel & D. R. Delvadiya
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	BTRS, AAU, Anand

I. Objectives of the Project

- To identify suitable *rustica* cultivars superior to the local check in terms of yield, quality and disease reactions in AVT. Promising entries will be tested in Large Scale Varietal Trials and Farmers field

II. Executive Summary of the project for 2021-22

Four entries with three checks were tested and the yield differences were significant among the entries tested. Line ArR-83(2510*) showed significant superiority for cured leaf yield over better checks. None of the entries was free from tobacco mosaic and leaf curl disease.

III. Most salient research findings/Achievements

- Line ArR-83 (2510*) showed significant superiority for cured leaf yield over better checks

ARAUL

Project No.: RUArBR- 1.1

Research project title	:	Advanced Varietal Trial (AVT-I)
Investigators	:	A.K. Srivastava
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	Tobacco Research Station, Araul

I. Objectives of the Project

- To assess the yield performance of identified hookah tobacco lines under AVT-I.
- To carry out detailed studies with the promising entries for possible release of variety

II. Executive Summary of the project for 2021-22

Two entries *viz.*, ArR-91 and LR-95 were evaluated in RBD with Five replications along with two checks *viz*, Azad Kanchan and SK-417 for yield and quality. The data revealed that line ArR-91 (4060 kg/ha) followed by entry LR-95 (3960 kg/ha) found significantly superior over the best check Azad Kanchan (3212 kg/ha) in respect of cured leaf yield with 26.40% and 23.29% increase respectively.

III. Most salient research findings/Achievements

- The entries ArR-91 and LR-95 found superior to the best check Azad Kanchan for cured leaf yield with 26.40% and 23.29% increase respectively.

Project No.: RUArBR- 1.2

Research project title	:	Advanced Varietal Trial (AVT-II)
Investigators	:	A. K. Srivastava
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	Tobacco Research Station, Araul

I. Objectives of the Project

- To assess the yield performance of different identified lines under AVT-II.
- To carry out detailed studies with the promising entries for possible release of variety

II. Executive Summary of the project for 2021-22

Three selected entries were evaluated along with checks, Azad Kanchan and SK-417 for yield potential and leaf quality in randomized block design with 5 replications. The differences among the entries were significant for cured leaf yield. The entry ArR-79 (3582 kg/ha) found significantly superior over the best check Azad Kanchan (2843 kgs/ha) in respect of cured leaf yield with 25.99% increase.

Pooled analysis indicated significant differences among the entries for cured leaf yield.ArR-79 is found significantly superior for the cured leaf yield and is proposed for bulk evaluation during the ensuing season.

III. Most salient research findings/Achievements

- The line ArR-79 showed significant superiority for cured leaf yield with 25.99% increase

Project: BT

Research project title : Bulk Trial on *Hookah* tobacco
Investigators : A. K. Srivastava
Year of start : 2020-21
Year of completion : 2021-22
Location of the project : Tobacco Research Station, Araul

I. Objectives of the Project

- To evaluate the performance of hookah tobacco entries in bulk trial

II. Executive Summary of the project for 2021-22

In bulk yield trial (2020-21) of hookah tobacco, the entry ArR-69(4113 kg/ha) recorded higher cured leaf yield when compared to check Azad Kanchan(3155 kg/ha).

III. Most salient research findings/achievements

- The entry ArR-69(4113 kg/ha) recorded higher cured leaf yield when compared to check Azad Kanchan (3155 kg/ha)

Project No.: RUArBR5

Research project title : Preliminary Yield Evaluation Trial-I
Investigators : A.K. Srivastava
Year of start : 2021-22
Year of completion : 2021-22
Location of the project : Tobacco Research Station, Araul

I. Objectives of the Project

- To identify the high yielding advanced breeding lines with good quality leaf for their inclusion in co-ordinated trial

II. Executive Summary of the project for 2021-22

The trial consist of eight entries were evaluated in RBD with three replications along with two checks *viz*., in PYET-I trial which showed significant differences among all the entries were noticed for cured leaf yield. Entry, ArR-111 (3815 kg/ha) and entry ArR-116 (3610 kg/ha) recorded highest cured leaf yield reflecting 26.32% and 19.54% increase over check variety Azad Kanchan(3020 kg/ha) respectively.

III. Most salient research findings/Achievements

- ❖ Entry ArR-111 and ArR-116 exhibited significant superiority with 26.32% and 19.54% increase in yield over the check variety Azad Kanchan

Project No.: RUArBR-5A

Research project title	:	Preliminary Yield Evaluation Trial-II
Investigators	:	A.K. Srivastava and
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	Tobacco Research Station, Araul

I. Objectives of the Project

- ❖ To identify the high yielding advanced breeding line with good quality leaf for their inclusion in coordinated trial

II. Executive Summary of the project for 2021-22

In PYT (IInd year) trial, eight entries were evaluated with two checks in randomized block design with three replications. Combined statistical analysis of the data collected over two seasons *Rabi* (2020-21 and 2021-22) was done for identifying most promising lines. Results indicated significant differences among the entries for cured leaf yield. Entry ArR-104 (3478 kg/ha) followed by entry ArR-105 (3084 kg/ha) showed significant superiority over check Azad Kanchan (2763 kg/ha) for the cured leaf yield traits with 25.87% and 11.61% increase respectively.

III. Most salient research findings/Achievements

- ❖ Entry ArR-104 and ArR-105 exhibited significant superiority with 25.87% and 11.61% increase in yield over the check variety Azad Kanchan, therefore contributed for approval to testing in IVT to be continued during *rabi* 2022-23.

LADOL

Project No.: RULdBRS 1

Research project title	:	Initial evaluation trial (IET) on *rustica* tobacco
Investigators	:	D. R. Chaudhari
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	Tobacco Research Station, S.D.A.U., Ladol

I. Objectives of the Project

- To identify the high yielding advanced breeding line with good quality leaf for their inclusion in co-ordinated trial

II. Executive Summary of the project for 2021-22

In IET, seven entries were included in which Entry LR 20-4 and LR 20-1 were found significantly superior and gave 11.12 and 10.61 percent higher cured leaf yield than best check DCT- 4 (4901 kg/ha).

III. Most salient research findings/Achievements

- Two entries, LR 20-4 and LR 20-1 were found significantly superior and gave 11.12 and 10.61 percent higher cured leaf yield than best check DCT- 4 (4901 kg/ha)

Project No.: RULdBRS2

Research project title	:	Preliminary yield trial (PYT) on *rustica* tobacco
Investigators	:	D. R. Chaudhari
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	Tobacco Research Station, S.D.A.U., Ladol

I. Objectives of the Project

- To identify the high yielding advanced breeding line with good quality leaf for their inclusion in co-ordinated trial

II. Executive Summary of the project for 2021-22

In PYT, Out of eleven entries, two entries were significantly superior and gave better performance than best check DCT-4. Entry LR 21-5 and LR 21-7 were gave 12.66 and 11.02 percent respectively higher cured leaf yield than best check DCT-4 (4875 kg/ha). These two entries will be promoted for testing in station trial-1.

III. Most salient research findings/Achievements

- Entry LR 21-5 and LR 21-7 were gave 12.66 and 11.02 percent respectively higher cured leaf yield than best check DCT-4 (4875 kg/ha)

Project No.: RULdBRS3

Research project title	:	Large Scale Varietal Trial on *rustica* tobacco
Investigators	:	D. R. Chaudhari
Year of start	:	2021-22
Year of completion	:	2021-22
Location of the project	:	Tobacco Research Station, S.D.A.U., Ladol

I. Objectives of the Project

- To identify varieties superior to the local check in terms of yield, quality and disease reactions

- To carry out detailed studies with the promising entries for possible release of variety

II. Executive Summary of the project for 2021-22

In LSVT trial, six entries were included in which significant differences among all the entries were noticed for cured leaf yield. Entry LR-94 (5370 kg/ha) recorded highest cured leaf yield fallowed by entry LR-96 (5323 kg/ha) reflecting 11.23 and 10.25 percent respectively high cured leaf yield over best check DCT- 4 (4828 kg/ha). Significant difference was found in plant height, no. of leaves and leaf length and leaf width.

III. Most salient research findings/Achievements

- Entry LR- 94 (5370 kg/ha) recorded highest cured leaf yield fallowed by entry LR- 96 (5323 kg/ha) reflecting 11.23 and 10.25 percent respectively high cured leaf yield over best check DCT- 4 (4828 kg/ha)

CROP PRODUCTION

A. VFC TOBACCO

HUNSUR

Project No.: VFHAG 17

Research project title	:	Integrated management of *Orobanche* in FCV tobacco in KLS
Investigators	:	M. Mahdevaswamy
Year of start	:	2021-2022
Year of completion	:	2023-2024
Location of the project	:	CTRI RS, Hunsur

I. Objectives of the project

- To find out the effect of integrated management practices on *Orobanche* infestation and growth
- To study the effect of integrated management practices of *Orobanche* on tobacco yield and quality

II. Executive Summary of the project for 2021-22

Field Experiment was conducted to assess the effectiveness of various integrated weed management practices for the control of *Orobanche* in FCV Tobacco in KLS during the 2021-22 crop season in farmer's field location. The integrated weed management treatments included the soil application of neem cake, plant oil applications and Post emergence spraying of herbicides and cultural practices and compared with control. The tobacco crop was planted during the third week of May with spacing of 100 x 55 cm and raised with recommended crop management practices. The treatments were imposed as per the treatment schedule and the observations on *Orobanche* weed infestation and weed bio-mass production were recorded. The various yield parameters like Green leaf yield, Cured leaf and Bright grade leaf productivity were recorded for various treatments. The cured leaf chemical parameters like nicotine, sugars and chlorides were determined.

III. Most salient research findings/Achievements

- All the treatments involving neem cake application at 30 DAT reduced the *Orobanche* infestation by 27-37.0% and also the *Orobanche* weed biomass by 28.0-39.5% at 50 days. At 65 days stage of crop, all the integrated *Orobanche* weed management practices were found to reduce the *Orobanche* weed infestation and weed biomass production by 38.0 -70.0% and 58.0-79.7% respectively
- However the *Orobanche* weed infestation and weed biomass production was minimum with the integration of neem cake at 30 DAT + PE application of imazethapyr (70 & 79.7 %) followed by neem cake + PE application of paraqaut (53.5 & 73 %) while the manual control by hand removal of *Orobanche* weeds resulted in 39 & 60.7% weed control over the check

- ❖ The integrated weed management practices involving neem cake at 30 DAT + PE application of imazethapyr and neem cake + PE application of paraqaut increased the cured leaf productivity by 29.6 and 24.0 % respectively over the check treatment where as neem cake + hand removal of *Orobanche* and only hand removal of *Orobanche* treatments resulted in 20.9 and 18.8% increased productivity
- ❖ The cured leaf quality parameters were not much altered by the various integrated *Orobanche* weed management practices and were found to be in the normal range

SHIVAMOGGA

Project No.: VFSAG 70

Research project title	:	Effect of hydrogel on FCV tobacco yield and quality in KLS.
Investigators	:	T. M. Soumya, K. Rajashekharappa, Shashikala & S. Kolakar
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the project

- ❖ To standardize the quantity of hydrogel application in FCV tobacco under KLS
- ❖ To study the performance of FCV tobacco with the application of hydrogel for moisture conservation

II. Executive Summary of the project for 2021-22

Application of hydrogel at different rates and time significantly influenced growth and yield. Soil application of hydrogel @ 5 kg/ha(0.30 g plant/hole) after a rainy day recorded significantly higher plant height at final picking (148.4 cm), Number of leaves harvested per plant was significantly higher in the treatment receiving hydrogel @ 5 kg/ha(0.30 g plant/hole) after a rainy day (26.1). Soil application of hydrogel @ 5 kg/ha (0.30 g plant/hole) after a rainy day recorded significantly higher leaf area for leaf at X position (915.3 cm^2) and at L position (773.2 cm^2). Application of hydrogel @ 5 kg/ ha (0.30 g plant/hole) after a rainy day recorded significantly higher green leaf yield (12062 kg/ha), cured leaf yield (1432 kg/ha) and top grade equivalent (993 kg/ha). During final harvest significantly higher soil moisture content was recorded in soil application of hydrogel @ 5 kg/ha (0.30 g plant/hole) after a rainy day (13.5%).

III. Most salient research findings/Achievements

- Soil application of hydrogel @ 5 kg/ha (0.30 g plant/hole) after a rainy day recorded significantly higher leaf area of leaf at X position (915.3 cm^2) and at L position (773.2 cm^2)
- Application of hydrogel @ 5 kg/ha (0.30 g plant/hole) after a rainy day recorded significantly higher green leaf yield (12062 kg/ha), cured leaf yield (1432 kg/ha) and top grade equivalent (993 kg/ha)
- During final harvest significantly higher soil moisture content was recorded in soil applied with hydrogel @ 5 kg/ha (0.30 g plant/hole) after a rainy day (13.5 %)

Project No.: VFSAG71

Research project title	:	Study on influence of different moisture conservation materials on FCV tobacco
Investigators	:	T. M. Soumya, K. Rajashekharappa, Shashikala & S. Kolakar
Year of start	:	2019-20
Year of completion	:	2021-22
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the project

- To conserve soil moisture during crop growth period in FCV tobacco
- To know the effectiveness of biodegradable agro wastes as moisture conservation material

II. Executive Summary of the project for 2021-22

Experiment on moisture conservation materials indicated that the application of moistureconservation materials significantly influence the crop growth parameters. Significantly higher plant height was recorded with application of areca husk (dry) as crop residue mulch @ 10 t/ ha on the ridge (49.6 cm, 61.2 cm and 155.0 cm at 45 DAP, first picking and at final picking, respectively), higher number of leaves per plant (12.7 and 16.3 at 45 DAP and first picking respectively), and higher leaf area (797.9 cm^2 at X position and 648.5 cm^2 at L position) respectively.

Yield performance of FCV tobacco was influenced significantly with the application of different moisture conservation materials. The data revealed that significantly higher green leaf yield (12280 kg/ha) and cured leaf yield(1696 kg/ha) was recorded with the application of areca husk (dry) as crop residue mulch @ 10 t/ ha on the ridge. Leaf quality in terms of TGE also followed the similar trend. Significantly higher soil moisture content was recorded in the treatment with the application of areca husk (dry) as crop residue @ 10 t/ ha on the ridge at 10 days after cessation of rainfall (8.8%) and at final picking(12.2 %).

III. Most salient research findings/Achievements

- ❖ Application of areca husk (dry) as crop residue mulch @ 10 t/ha on the ridge recorded higher plant height (61.2 cm), leaf area (797.9 cm^2) for leaf at X and (648.5 cm^2) at L position
- ❖ Application of areca husk (dry) as crop residue mulch @ 10 t/ha on the ridge recorded significantly higher green leaf yield (12280 kg/ha) and cured leaf yield (1696 kg/ha)

Project No.: VFSAG 72

Research project title	:	Crop intensification in FCV tobacco for additional farm income
Investigators	:	T. M. Soumya, K. Rajashekharappa and Shashikala, S. Kolakar
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the project

- ❖ To study different pulses as compatible inter crops in FCV tobacco
- ❖ To calculate the economic viability of inter cropping of pulses in FCV tobacco under *rainfed* condition of KLS region

II. Executive Summary of the project for 2021-22

Experiment on feasibility of crop intensification through intercropping of legumes in FCV tobacco indicated that the component crops in an intercropping system influence the crop growth parameters. Significantly higher plant height was recorded in FCV tobacco grown with groundnut as an intercrop at 45 DAP, first picking and final picking (59.1 cm, 84.6 cm and 116.4 cm respectively). Higher leaf area was recorded in the FCV tobacco grown with groundnut as intercrop at X position (992.5 cm^2) and at L position leaves (722.1 cm^2). Highest number of leaves harvested per plant was 22.2 in the FCV tobacco grown with groundnut as intercrop. Higher cured leaf yield (1771 kg/ha) was recorded in the FCV tobacco grown with groundnut. Higher land equivalent ratio (1.62) and monetary advantage index (Rs.147472) were recorded in the FCV tobacco grown with groundnut as intercrop.

III. Most salient research findings/Achievements

- ❖ Higher leaf area was recorded in the FCV tobacco grown with groundnut as an intercrop leaf at X position (992.5 cm^2) and at L position leaves (722.1 cm^2)
- ❖ Higher cured leaf yield (1771 kg/ha) was recorded in the FCV tobacco grown with groundnut as intercrop
- ❖ Higher land equivalent ratio (1.62) and monetary advantage index (Rs.147472) were recorded in the FCV tobacco grown with groundnut as an intercrop

B. *BIDI* TOBACCO

ANAND

Project No.: BDAAG 164

Research project title	:	Effect of variety and planting dates on yield and quality of *bidi* tobacco varieties
Investigators	:	K. M. Gedia&Jalpa Panchal
Year of start	:	2020-21
Year of completion	:	2022-23
Location of the project	:	BTRS, AAU, Anand

I. Objectives of the project

- To find out a suitable transplanting date of *bidi* tobacco in middle Gujarat condition

II. Executive Summary of the project for 2021-22

Different dates of transplanting established their significant influence on tobacco cured leaf yield, leaf size and plant height except dry weight per unit leaf area. Tobacco transplanted during 1st week of September registered significantly higher cured leaf yield being at par with 3rd week of August and showed its superiority over rest of transplanting dates. Similar trend was also observed in case of leaf length, leaf width and plant height. Both tobacco varieties gave significant effect on tobacco cured leaf yield, leaf size, plant height and dry weight per unit leaf area. Significantly the highest cured leaf yield and leaf size were noticed in variety GABT-11 whereas, significantly the highest plant height and leaf thickness were recorded in variety MRGTH-1.

Tobacco transplanting during 3rd week of August registered significantly the highest nicotine and lowest reducing sugar contents. Significantly lower value of chloride content was found when tobacco transplant during 1st week of October. Whereas, GABT-11 gave significantly highest nicotine and lowest values of reducing sugar as well as chloride contents.

III. Most salient research findings/Achievements

- Transplanting date of 1st week of September registered significantly higher cured leaf yield followed by 3rd week of August
- *Bidi* tobacco variety GABT-11 gave significantly the highest cured leaf yield as compared to MRGTH-1

NIPANI

Project: BDNAG 56

Research project title	:	Evaluation of pre and post emergence herbicide molecules against weeds in tobacco ecosystem
Investigators	:	P. S. Matiwade, B. Arun Kumar & Geeta H. Dandin
Year of start	:	2019-20
Year of completion	:	2022-23
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- To evaluate the herbicide molecules against monocot and dicot weeds and in turn impact on tobacco yield and quality

II. Executive Summary of the project for 2021-22

Though the tobacco leaf yields are very low, there is a significant variation between the treatments imposed. The significantly higher leaf yield of tobacco (465 kg/ha) was recorded in the treatment, where the weeds in the crop are sprayed (pre and post emergent) with Metribuzine @ 0.75 g/ha. as compared to weedy check (170 kg/ha) and other pre-emergent weedicides. However, it was on par with weedicide propaquizofop Ethyl 10EC @ 0.5lit/ha (459 kg/ha), one intercultivation followed by 2 hand weedings (382 kg/ha) and Quizalofop ethyl 5EC @ 0.5 lit/ha (374 kg/ha). Similar trend was followed in growth and yield parameters.

III. Most salient research findings/Achievements

- Significantly higher leaf yield of tobacco (465 kg/ha) was recorded in the treatment, where the weeds in the crop sprayed (pre and post emergent) with Metribuzine @ 0.75 g/ha. as compared to weedy check (170 kg/ha) and other pre-emergent weedicides

Project: BDNAG 57

Research project title	:	Doubling of farmer's income by tobacco based cropping system under mulches
Investigators	:	P. S. Matiwade, B. Arun Kumar & Geeta H. Dandin
Year of start	:	2020-21
Year of completion	:	2023-24
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the Project

- To study the tobacco cropping system under mulches to double the farmer's income

II. Executive Summary of the project for 2021-2022

There is significant impact of mulches and cropping systems on tobacco leaf yield. The maximum leaf yield of 1761 kg/ha was produced when tobacco was planted on crop residue mulch and it was significantly higher than the tobacco yield when planted on black plastic mulch (1470 kg/ha), soil mulch (1357 kg/ha) and trash (1164 kg/ha). Similar trend was followed in growth and yield parameters of tobacco, but did not differ significantly each other.

Under various tobacco based sequence cropping systems, tobacco planted alone gave maximum leaf yield of 1657 kg/ha) and it was significantly higher than the yield obtained by the tobacco in Soybean-Tobacco-Maize (1309 kg/ha), Soybean-Tobacco-Sugarcane (1295 kg/ha) and Sunnhemp-Tobacco-Sugarcane (1159 kg/ha) sequence cropping systems. However, it was on par with tobacco obtained in Tomato-Tobacco- Summer groundnut (1631 kg/ha) and Groundnut-Tobacco-Summer soybean (1578 kg/ha) sequence cropping systems. Similar trend was followed in growth and yield parameters of tobacco, but did not differ significantly each other. However, only plant height did vary significantly due to various tobacco based sequence cropping systems.

III. Most salient research findings/ Achievements

- There is significant impact of mulches and cropping systems on tobacco leaf yield

Project: BDNAG 58

Research project title	:	Integrated management of *Orobanche* in *bidi* tobacco
Investigators	:	P. S. Matiwade, B. Arun Kumar & Geeta H. Dandin
Year of start	:	2021-22
Year of completion	:	2023-24
Location of the project	:	Agricultural Research Station, Nipani

I. Objectives of the project

- To find out the effect of integrated management practices on *Orobanche* infestation and growth
- To study the effect of integrated management practice of *Orobanche* on tobacco yield and quality
- The project will be continued

II. Executive Summary of the project for 2021-2022

Though the tobacco leaf yields are very low, there is a significant impact on the *Orobanche* incidence due to various treatments imposed. The treatment where tobacco was planted on fallow land applied with neem cake @ 30 DAP followed by post emergent application of Imazethapyr on *Orobanche* spikes recorded the tobacco leaf yield of 885 kg/ha and was significantly higher than the tobacco planted on fallow land followed by hand removal of *Orobanche* spikes(385 kg/ha) and non-removal of the *Orobanche* spikes (285 kg/ha). However, it was on par with the treatments where in tobacco was planted on fallow land applied with neem cake @30DAP followed by hand removal of *Orobanche* (635 kg/ha), post emergent application of neem oil (678 kg/ha), pongamea oil (761 kg/ha), paraquet (760 kg/ha), Glyphosate (770 kg/ha) to *Orobanche* spikes, green manuring of bulk sesamum (693 kg/ha) and sunhemp (652 kg/ha) before planting tobacco similar trend is seen in all the growth and yield parameters.

III. Most salient research findings/ Achievements

- The treatment where tobacco was planted on fallow land applied with neem cake @ 30 DAP followed by post emergent application of Imazethapyr on *Orobanche* spikes recorded the maximum tobacco leaf yield

NANDYAL

Project No.: BDNyAG 18

Research project title	:	Response of *bidi* tobacco to different drought mitigation measures
Investigators	:	K. Sathish Babu, K. Prabhakar, P. Pulli Bai & S. Ramadevi
Year of start	:	2019-20
Year of completion	:	
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To find out the effect of different drought management measures on growth and cured leaf of *bidi* tobacco
- To find out the effect of different drought management measures on leaf chemical quality of *bidi* tobacco

II. Executive Summary of the project for 2021-22

Field experiment was conducted in vertisols under rainfed condition at Regional Agricultural Research Station, Nandyal during 2021-22. Experiment was conducted in split plot design and replicated thrice. Treatments consist of two planting methods as main plots and five drought mitigation measures as sub plots. Nursery was sown in raised beds on 2.8.2021 and transplanted on 6.10.2021 with Nandyal Pogaku-1. Crop was harvested on 24.2.2022. Results indicated that higher leaf length (34.3 cm), leaf width (14.1 cm), RWC (64.9%), Dry weight/unit leaf area (12.6) were observed in high density planting method compared to normal planting method. There is no significant difference among the planting methods. Higher cured leaf yield was observed in high density planting (1859 kg/ha) compared to normal planting (1268 kg/ha).

Among the drought mitigation measures application of foliar spray with Gibberellic acid @ 20 ppm during drought period has recorded higher leaf length (45.3 cm), leaf width (17.1 cm) and relative water content (75.5 %) at 90 DAP and Cured leaf yield (2136 kg/ha) which is on par with foliar spray with Triacontanol 0.1%EW @ 2ml /L (2015 kg/ha) during drought period.

III. Most salient research findings/Achievements

- High density planting – 60 cm x 60 cm treatment recorded significantly higher cured leaf yield (1859 kg/ha) compared with Normal planting –75 cm x 75 cm treatment (1268 kg/ha). Among drought mitigation measures Foliar spray with Gibberellic acid @ 20 ppm during drought period treatment recorded significantly higher cured leaf yield (2136 kg/ha) followed by Foliar spray with Triacontanol 0.1%EW @ 2ml /L during drought period (2015 kg/ha)

Project No.: BDNyAG 17

Research project title	:	Management of broomrape (*Orobanche* spp) in *bidi* tobacco
Investigators	:	K.Sathish Babu, K. Prabhakar, P. Pulli Bai & S. Ramadevi
Year of start	:	2020-21
Year of completion	:	
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To study the effect of management practices on growth and control of *Orobanche*
- To study the effect of different *Orobanche* management methods on cured leaf yield and quality of *bidi* tobacco
- To study the effect of different *Orobanche* management methods on net returns

II. Executive Summary of the project for 2021-22

Field experiment was conducted at Regional Agricultural Research Station, Nandyal during 2021-22 under rain fed situation in vertisols. Experiment was conducted in split plot design and replicated thrice. Treatments consist of three cropping systems as main plots and five *Orobanche* management methods as sub plots. Nursery was sown in raised beds on 10.9.2021 and transplanted on 11.11.2021 with Nandyal Pogaku-1. Crop was harvested on 15.3.2022. Results indicated that higher plant height (60.2 cm), leaf length (35.5 cm), leaf width (14.7 cm), dry weight/unit leaf area (8.1 mg/cm^2), leaf yield (1703 kg/ha), net returns (Rs.64400 / ha) and B:C ratio (2.0) were observed in sorghum followed by *bidi* tobacco cropping system. There is no significant difference among the cropping systems. Lower weed count observed in sorghum followed by *bidi* tobacco cropping system.

Among *Orobanche* management methods neem cake @ 200kg/ha application followed by Imazethapyr10% SL has recorded higher plant height (62.4 cm), leaf length (37.9 cm), leaf width (16.6 cm), dry weight/unit leaf area (9.5 mg/cm^2) and cured leaf yield (1826 kg/ha) which is on par with hand weeding of whereas higher net returns and benefit cost ratio were observed in application of Neem cake @200kg/ha followed by Imazethapyr10% SL. Lower weed count was observed in hand weeding which is on par with application of Neem cake @200kg/ha followed by Imazethapyr10% SL.

III. Most salient research findings/Achievements

- Sorghum-*bidi* tobacco cropping system recorded significantly higher cured leaf yield (1703 kg/ha) which is on par with gingelly –*Bidi* Tobacco cropping system (1655)kg/ha.

- However, Fallow Bidi Tobacco cropping system recorded significantly lower cured leaf yields of 1204 kg/ha. Among *Orobanche* management methods Neemcake@ 200kg/ha followed by Imazethapyr 10% SL recorded significantly higher cured leaf yield (1826 kg/ha) followed by hand weeding (1769)kg/ha. Weedy check treatment recorded significantly lower cured leaf yield (1015) kg/ha, which is onpar with neem cake @200kg/ha followed by Paraquat 24% SL 1244 kg/ha

Project No.: BDNyAG 19

Research project title	:	Enhancing the productivity of *bidi* tobacco-based cropping systems
Investigators	:	K. Sathish Babu, K. Prabhakar, P. Pulli Bai & S. Ramadevi
Year of start	:	2020-21
Year of completion	:	
Location of the project	:	RARS, Nandyal

I. Objectives of the Project

- To evaluate different *bidi* tobacco-based cropping systems for higher productivity and monetary returns
- To find out the different *bidi* tobacco-based cropping systems on quality of *bidi* tobacco

II. Executive Summary of the project for 2021-22

Field experiment was conducted at Regional Agricultural Research Station, Nandyal during 2021-22 under rain fed situation in vertisols. Experiment was conducted in Randomized Block design and replicated thrice. Treatments consist of 9 *bidi* tobacco cropping systems including fallow- *bidi* tobacco cropping system as check. Nursery was sown in raised beds on 10.9.2021 and transplanted on 07.11.2021 with Nandyal Pogaku-1. Crop was harvested on 15.3.2022. Results indicated that Onion followed by *bidi* tobacco cropping system has recorded higher plant height (65.5 cm), leaf length (42.6 cm), leaf width (19.5 cm) and bidi tobacco equivalent yield (2624 kg/ha) which is on par with sweet corn followed by *bidi* tobacco cropping system whereas higher net returns (Rs 87308/ha) and benefit cost ratio (2.28) was observed in sweet corn followed by *bidi* tobacco cropping system.

III. Most salient research findings/Achievements

- Onion –*bidi* tobacco cropping system recorded significantly higher *bidi* tobacco cured leaf yield (2017 kg/ha) followed by Greengram-*bidi*-tobacco cropping system(1855 kg/ha). *Bidi* tobacco equivalent yields were higher with Onion-*bidi* tobacco cropping system (2624 kg/ha) followed by Sweet corn-*bidi* tobacco Cropping system (2548 kg/ha)

C. *RUSTICA* TOBACCO

ARAUL

Project No.: RUArAG 30

Research project title	:	Studies on the economics of Tobacco – Potato Intercropping system (Bulk Plot Trial)
Investigators	:	A. K. Srivastava & N. B. Singh
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	Tobacco Research Station, Araul.

I. Objectives of the Project

- To asses the best ratio of Potato to be grown with tobacco for high remuneration

II. Executive Summary of the project for 2021-22

In order to work out economics of tobacco-potato inter cropping system, an experiment was conducted during 2020-21 and 2021-22 at Tobacco Research Station, Araul, Kanpur, U.P. The soil of experiment site was sandy loam. The experiments consist of three treatments. The pooled analysis indicated that tobacco equivalent yield was significantly affected under various treatments. The higher tobacco equivalent yield recorded under the Treatment-3 (Potato as sole crop) *i.e.* 2401 kg/ha followed by Treatment-1 [Tobacco + Potato (2:4)] *i.e.* 2062 kg/ha. Economics of the treatment revealed that highest monitory return of Rs. 47,540/- was recorded by Treatment-1 with benefit cost ratio of 1.05 and it will go as remunerated recommendation to farming community.

III. Most salient research findings/Achievements

- Economics of the treatment revealed that highest monitory return of Rs. 47,540/- was recorded by Treatment-1 with benefit cost ratio of 1.05 and it will go as remunerated recommendation to farming community

D. *CHEWING* TOBACCO

VEDASANDUR

Project No.: CHVsAG 7

Research project title	:	Effect of natural sweeteners and astringent tasteners on the quality of *chewing* tobacco
Investigators	:	M. Kumaresan, D. Damodar Reddy, P. Manivel, S. Kasturi Krishna & M. Venkatesan
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	ICAR CTRI Research station , Vedasandur

I. Objectives of the Project

- To find out a suitable natural sweetner and astringent tasteners for improving the chewing quality
- To analyse for biochemical components
- To test for chewing quality

II. Executive Summary of the project for 2021-22

Different natural sweeteners *viz*. White sugar, Coconut palm jaggery, Sugarcane jaggery, Palmyrah jaggery at 10% solution and astringent tasteners *viz*., Coconut mesocarp, Banana peduncle, Banana pseudo stem at 5% solution with a control was tested in a CRBD design with 3 replications.

Results of the year 2021-2022 revealed that the cured leaf of chewing tobacco treated with palmyrah jaggery treatment 10% in combination with 5% solution of coconut mesocarp or banana peduncle or banana pseudostem improved the chewing quality. The chewability scores for the chewing characters *viz*., body, aroma, whitish encrustation, taste, pungency, saliva secretion, duration of pungency, stiffness in the mouth were higher with the palmyrah jaggery treatment 10% in combination with 5% solution of coconut mesocarp or banana peduncle or banana pseudostem. The expenditure was higher for the treatment 10% solution of coconut palm jaggery with different astringent tasteners (Rs.426.93/33 kg) followed by Palmyrah jaggery 10% solution with different astringent tasteners (Rs. 412.97/33 kg). The net return was higher (11 to 12%) for the treatment palmyrah jaggery treatment 10% in combination with 5% solution of coconut mesocarp as compared to the control.

Pooled Results

Pooled result of chewability scores revealed that the sweetner Palmyrah jaggery at 10% solution with 5% solution of different astringent tasteners increased the chewability scores *viz.,* body, aroma, whitish encrustation, taste, pungency, saliva secretion, duration of pungency, stiffness in the mouth, there by improved the chewing quality. The expenditure was higher for the sweetener coconut palm jaggery 10% in combination with 5% astringent tasteners(Rs. 416.77/33 kg) followed by Palmyrah jaggery 10% in combination with 5% solution of different astringent tasteners (Rs.403.14 /33kg). The net return was higher (12 to 13%) for the treatment palmyrah jaggery treatment 10% in combination with 5% solution of coconut mesocarp as compared to the control.

III. Most salient research findings/Achievements

- The sweetener Palmyrah jaggery at 10% solution with 5% solution of different astringent tasteners *viz*., coconut mesocarp or banana peduncle or banana pseudostem increased the chewability scores *viz*., body, aroma, whitish encrustation, taste, pungency, saliva secretion, duration of pungency, stiffness in the mouth, there by improved the chewing quality
- Treating the cured leaves with palmyrah jaggery 10% solution in combination with 5% solution of astringent tasteners the net returns increased to the tune of 13% as compared to control

Project No.: CHVsAG 8

Research project title	:	Integrated Management of Orobanche in Chewing tobacco
Investigators	:	M. Kumaresan, S. Kasthuri Krishna P. Manivel, M. Venkatesan & V. Annadurai
Year of start	:	2021-22
Year of completion	:	2022-23
Location of the project	:	ICAR CTRI Research station ,Vedasandur

I. Objectives of the Project

- To find out the effect of integrated management practices on *Orobanche* infestation and growth
- To study the effect of integrated management practices of *Orobanche* on Chewing tobacco yield and quality

II. Executive Summary of the project for 2021-22

Field experiment was conducted on different *Orobanche* management practices *viz.*, Fallow-tobacco + Neem cake application at 30 DAP + Hand removal of *Orobanche*; Fallow- tobacco + Neem cake application at 30 DAP + Post emergence application of neem oil on *Orobanche* Spikes; Fallow - tobacco + Neem cake application at 30 DAP + Post emergence application of pongamia oil on *Orobanche* Spikes; Fallow- tobacco + Neem cake application at 30 DAP + Post emergence application Paraquat on *Orobanche* Spikes; Fallow - tobacco + Neem cake application at 30 DAP + Post emergence application of Imazethapyr on *Orobanche* Spikes; Sesamum– tobacco; Sesamum - tobacco + Neem cake application at 30 DAP + Hand removal; Fallow - tobacco + Hand removal of *Orobanche* (*Orabanche* free); Fallow - tobacco + Non removal of *Orobanche*.

The results of the year 2021-22 revealed that the different integrated *Orobanche* management practices did not influence the number of spikes/plant. The per plant *Orobanche* weight significantly increased with fallow-Tobacco+ non removal of *Orobanche* (26.06 g/plant). Fallow- tobacco + Hand removal of *Orobanche* recorded the lowest dry weight of *Orobanche*/plant (3.12 g/plant). Sesame in kharif, chewing tobacco in *rabi* or tobacco in *rabi* + neem cake application at 30 DAP + hand removal of *Orabanche* at 65 days recorded a lower *Orobanche* dry weight (5.0 to 9.58 g/plant). Sesame-Tobacco+ Neem cake application at 30 DAP+ Hand removal of *Orobanche* at 65 days and fallow-tobacco + hand removal of *Orobanche* (*Orobanche* free) recorded a lower dry weight of *Orobanche*/plot (5.02 to 32.17 g/plot) as compared to the control. Application of pongamia oil, Paraquat and Imazethapyr on *Orobanche* spikes reduced the *Orobanche* dry weight /plot (38.0 to 142.73 g) as compared to the control (360.33 g). *Orobanche* infestation

percentage was lower with the treatments, sesamum- tobacco+ neem cake application at 30 DAP + hand removal *Orobanche* at 65 days (1.1 %) as compared to the control. The FGLY significantly increased by 22% with fallow- Tobacco+ hand removal of *Orobanche* (*Orobanche* free) as compared to the control. Total cured leaf yield significantly increased by 39% with fallow- Tobacco+ hand removal of orabanche (*Orobanche* free) as compared to the control. TCLY recorded with fallow-tobacco + hand removal of *Orobanche* (*Orobanche* free) was comparable with sesame-tobacco, sesamum-tobacco + neem cake application at 30DAP + hand removal of *Orobanche* at 65 days and fallow tobacco + neem cake application at 30 DAP + post emergence of neem oil at 65 days.

The cost of cultivation was higher with the treatment, Fallow-tobacco + Hand removal of *Orobanche* (*Orobanche* free). Higher gross return (Rs.299552/ha) and net returns (Rs.171836/ha) was recorded with Fallow-tobacco + Hand removal of *Orobanche* (*Orobanche* free).

III. Most salient research findings/Achievements

- Sesame in kharif- Tobacco in *rabi* + Neem cake application at 30 DAP+ Hand removal of *Orobanche* at 65 days and fallow-tobacco + hand removal of orabanche (*Orobanche* free) recorded a lower dry weight of *Orobanche*/plot (5.02 to 32.17 g/plot) as compared to the control

- Application of pongamia oil, Paraquat and Imazethapyr on *Orobanche* spikes reduced the *Orobanche*dry weight /plot (38.0 to 142.73 g) as compared to the control (360.33 g)

- Total cured leaf yield significantly increased by 35% with fallow- Tobacco+ hand removal of *Orobanche* (*Orobanche* free) as compared to the control

CROP CHEMISTRY AND SOIL SCIENCE

A. VFC TOBACCO

ICAR-CTRI, RAJAHMUNDRY

Project No.: VFRCHC 1

Research project title	:	Leaf quality evaluation of different tobaccos
Investigators	:	C. Chandra Sekhara Rao
Year of start	:	1999-2000
Year of completion	:	Long Term
Location of the project	:	ICAR-CTRI, Rajahmundry

I. Objectives of the Project

- Analysis of chemical quality parameters of tobacco leaf samples related to different experiments
- Smoke analysis for *Bidi* tobacco

II. Executive Summary of the project for 2021-21

A total no. of **549 (FCV and Non-FCV)** tobacco leaf samples received from different AINPT centres were processed and analysed for chemical quality parameters *viz*., nicotine, reducing sugars and chlorides and **10** samples of ***Bidi*** tobacco are received for Smoke analysis

A. FCV TOBACCO: A total of **272** FCV tobacco leaf samples received from different centres and were analysed for chemical quality parameters. The centre wise results are presented below:

- **ICAR-CTRI RS, Hunsur:** FCV tobacco leaf samples (42) pertaining to AINPT (on-farm trials), AVT-I, AVT-II, IHT, IVT experiments were analysed. The leaf nicotine varied from 1.00 to 1.69% in 'X' position, 0.91 to 2.06 % in 'L' position, while the per cent reducing sugars varied from 10.06 to 19.10 % in 'X' position, 9.25 to 18.10 % in 'L' position and the chlorides ranged from 0.11 to 0.51 % in 'X' position and 0.17 to 0.73 % in 'L' position

- **ICAR-CTRI RS, Kandukur:** FCV tobacco leaf samples (48) pertaining to IVT, IHT were analysed. The nicotine content varied from 0.54 to 1.85 % while the reducing sugars varied from 9.15 to 18.08 % and the chloride content varied from 0.12 to 0.24 %

- **ICAR-CTRI RS, Jeelugumilli:** FCV tobacco leaf samples (20) pertaining to AHT-1, AHT-2 were analysed. The leaf nicotine varied from 1.58 to 2.72% while the percent reducing sugars varied from 5.62 to 15.18% and the chlorides ranged from 1.25 to 1.92%

- **AINPT Centre, Shivamogga**:FCV tobacco leaf samples(162) pertaining to VFSAG-70, VFSAG-71, VFSBR-1(AVT-1) experiments were analysed. The leaf nicotine varied from 0.53 to 2.76%, while the per cent reducing sugars varied from 3.69 to 18.99 and thechlorides ranged from 0.10 to 0.41%

B. **Non-FCV Tobacco:** A total No. of **277** leaf samples of non-FCV tobacco were analysed for quality parameters. The centre wise results are presented below:

- **AINPT Centre, Nandyal:** A total number of 30 *bidi* tobacco samples pertaining to Agronomy experiment BDNyAg18 of RARS, Nandyal were analysed during the year 2021-22. The leaf nicotine varied from 0.71 to 4.63%

- **AINPT Centre, Nipani:** *Bidi* tobacco leaf samples (57) pertaining to Farmers field and AVT-II experiments of ARS, Nipani were analysed. The leaf nicotine content varied from 0.56 to 3.96% while the reducing sugars varied from 0.96 to 9.80 % and the chloride content varied from 0.71 to 2.66 %.

- **AINPT Centre, Ladol:** A total number of 62 *Rustica* tobacco leaf samples pertaining to IVT, IET (ST-1), PYT (ST-2), LSVT and "*Effect of Phosphorous and Potash on yield and Quality of Rustica tobacco"* experiments of ARS, Ladol were analysed. The leaf nicotine, reducing sugars and chlorides varied from 1.69 to 3.79 %, 1.76 to 6.77 % and 0.35 to 1.64%, respectively

- **AINPT Centre, Berhampur:** Tobacco leaf smaples (44) pertaining to DTGE and leaf samples (20) pertaining to MLT experiments conducted during the year 2021-22 were analysed. The leaf nicotine content varied from 0.11 to 2.95% while the reducing sugars varied from 0.38 to 2.85% and the chloride content varied from 0.45 to 2.83%

C. **Smoke analysis:***Bidi* samples (10) received from NANDYAL centre were analysed for Smoke Parameters *viz*., NFDPM, Nicotine and Carbonmonoxide during the session 2021-22. Tar value is low (19.17 mg/bidi) in the entry Nandyal Pogaku-1 (C) of BYT and it is high (51.28 mg/*bidi*) in the entry ABD-163 of OFT. Nicotine value is low (0.95mg/*bidi*) in the entry Nandya Pogaku-1 (C) of BYT and it is slightly high (2.02mg/*bidi*) in the entry ABD- 163 of OFT. The value of Carbonmonoxide is low (11.96mg/*bidi*) in the entry Nandyal Pogaku-1 (C) of BYT and it is slightly high (23.90 mg/*bidi*) in the entry ABD- 189 of BYT.

III. Most salient research findings/Achievements

- Total No. of samples analysed in tobacco for chemical quality parameters were 272in FCV and 277 in Non-FCV
- Total No. of samples analysed in tobacco for Smoke analysis were 10 in *Bidi* tobacco

CROP PROTECTION

I. ENTOMOLOGY

A. VFC TOBACCO

SHIVAMOGGA

Project No.: VFSEN 34

Research project title	:	Population dynamics of insect pest complex and their natural enemies in tobacco ecosystem
Investigators	:	Rajashekharappa K
Year of start	:	2021-22
Year of completion	:	2025-2026
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To record the insect pests occurring in tobacco ecosystem

II. Executive Summary of the project for 2021-22

Totally five insect pests *viz.,* Aphids, Whiteflies, *Spodoptera litura*, *Helicoverpa armigera* and Semi looper were observed in tobacco *ecosystem*. Whiteflies and aphids had significantly negative correlation with rainfall and significantly positive correlation with maximum temperature. Whereas, it was negatively non significant with minimum temperature and negatively significant with morning relative humidity. Whiteflies were negatively significant with evening relative humidity and aphids were negatively non significant with evening relative humidity. *S. litura* and *H. armigera* were negatively significant and negatively non significant with rainfall, whereas positively significant and positively non significant with maximum temperature, respectively. Minimum temperature, morning and evening relative humidity were negatively correlated. Semilooper had negatively significant association with rainfall and positively significant with maximum temperature whereas positively non-significant with minimum temperature and negatively significant with morning and evening relative humidity.

III. Most salient research findings/Achievements

- Whiteflies and aphids have significantly negative correlation with rainfall and positively significant with maximum temperature
- Whiteflies were negatively significant with evening relative humidity and aphids were negatively non-significant with evening relative humidity. *S. litura* and *H. armigera* were negatively significant and negatively non-significant with rainfall, whereas positively significant and positively non-significant with maximum temperature, respectively
- The project will be continued

Project No.: VFSEN 35

Research project title	:	Screening of tobacco cultivars against leaf curl virus transmitted by whitefly, *Bemisia tabaci*
Investigators	:	Rajashekharappa. K,T. M. Soumya, Shashikala S. Kolakar
Year of start	:	2021
Year of completion	:	Long term
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To identify the resistant cultivar for the management of Tobacco Leaf Curl Virus

II. Executive Summary of the project for 2021-22

Among the different cultivars evaluated, lowest mean number of whiteflies were recorded in the cultivar Aurea (0.79/leaf), followed by Sahyadri (1.02/leaf), Kanchan (1.22/leaf) and Thrupti (1.33/leaf). Whereas, highest numbers of whiteflies were recorded in VA-770 (3.26/leaf), followed by VA-310(3.08/leaf), VA-21 (3.05/leaf)and VA-509 (3.04/leaf). Among the different cultivars evaluated against TLCV, lowest per cent disease incidence was recorded in the cultivar Aurea (3.8 per cent) at 120 days after transplanting, followed by Sahyadri (4.4 %) and Kanchan (5.0%). Whereas, highest per cent disease incidence was recorded in VA-770 (18.9 %), followed by VA-21 (17.2 %) andVA-310 (16.0 %). Among the different cultivars, there was no significant difference for leaf length, thickness and number of leaves per plant recorded. Highest leaf width was recorded in SPEIGTT-G-28 (28.6 mm) followed by RG-13 (27.3 mm), NC-37-NF (25.6 mm) and lowest leaf width was recorded in Rhomas-7(22.7 mm) followed by VA-770 (22.9 mm). Trichome density was maximum in cultivar, Aurea (1.4 /cm^2) followed by Sahyadri (1.3 /cm^2) and Kanchana (1.3/cm^2). Whereas, lowest density was observed in VA-770 (0.8/cm^2) and VA-310 (0.80/cm^2). Trichome density had significantly negative correlated with per cent disease incidence and Leaf width having negatively non-significant correlation with PDI.

III. Most salient research findings/Achievements

- Highest leaf width was recorded in SPEIGTT-G-28 followed by RG-13, NC-37-NF and lowest leaf width was recorded in Rhomas-7 followed by VA-770.
- Trichome density was maximum in cultivar, Aurea followed by Sahyadri and Kanchan.
- Trichome density had significantly negative correlation with per cent disease incidence and Leaf width having negatively non-significant with PDI.

Project No.: VFSEN 36

Research project title	:	Management of Tobacco Leaf Curl Virus transmitted by whitefly, *Bemisia tabaci*
Investigators	:	Rajashekharappa. K, T. M. Soumya, Shashikala S. Kolakar
Year of start	:	2021
Year of completion	:	Long term
Location of the project	:	ZAHRS, Shivamogga

I. Objectives of the Project

- To evaluate the different modules for the management of Tobacco Leaf Curl Virus

II. Executive Summary of the project 2021-22

Among the different modules evaluated against whitefly, *B. tabaci*, module-1 (IPM module) found to be superior with 62.90 % reduction in whitefly population over control, followed by module-2 (52.41 %) and module-3 (41.61 %). Among the different treatments evaluated against TLCV, module-1 (IPM module) found to be superior with highest per cent reduction of TLCV (76.6) over control, followed by module-2 (73.4 %) and module-3 (52.4 %). The maximum number of natural enemies were recorded in untreated control plot (3.1/plant), followed by module-3 (2.28/plant) and module-1 (1.9/plant). Whereas, lowest number of natural enemies (1.32/plant) were recorded in module-2 (Chemical module). The highest cured leaf yield was recorded in module-2 (1797 kg/ha) with a per cent increase of (8.62) followed by module-1 (1762 kg/ha) with per cent increase of 6.81. Lowest cured leaf yield was recorded in untreated control (1663 kg/ha).

III. Most salient research findings/ Achievements

- Five insect pests were observed in tobacco ecosystem *i.e.,* Aphids, Whiteflies, *Spodoptera litura*, *Helicoverpa armigera* and Semilooper
- Among the different cultivars evaluated against TLCV, lowest per cent disease incidence was recorded in the cultivar, Aurea (3.3%) at 120 days after transplanting, followed by Sahyadri (4.4 %) and Kanchan (5.0 %)
- Among the different modules evaluated against TLCV, module-1(IPM module) found to be superior with highest percent reduction of TLCV (76.6) over control, followed by module-2 (73.4 %) and module-3 (52.4 %)
- Among the different cultivars evaluated, lowest mean number of whiteflies were recorded in the cultivar, Aurea (0.79/leaf), followed by Sahyadri (1.02/leaf), Kanchan (1.22/leaf) and Thrupti (1.33/leaf)
- Among the different modules evaluated against whitefly, *B. tabaci*, module-1 (IPM module) found to be superior with 62.90 % reduction in whitefly population over control, followed by module-2 (52.41 %) and module-3 (41.61 %)

II. PLANT PATHOLOGY

A. *BIDI* TOBACCO

ANAND

Project No.: BDAPP 126

Research project title	:	Monitoring of resistance development in *Pythium aphanidermatum* to fungicides
Investigators	:	Y. M. Rojasara
Year of start	:	(A) 2001-02 B) 2015-16
Year of completion	:	Long term
Location of the project	:	BTRS Farm, AAU, Anand

I. Objectives of the Project

- To monitor the resistance in *P. aphanidermatum* against metalaxyl MZ
- To monitor the resistance in *P. aphanidermatum* against azoxystrobin

II. Executive Summary of the project for 2021-22

(A)Monitoring resistance development in *Pythium aphanidermatum* to metalaxyl MZ revealed that in nursery conditions 13% damping-off disease incidence in comparison with control was recorded in the treatment of metalaxyl MZ. The pathogen survived in fungicide treated beds, was further screened in laboratory and 100 % inhibition of the pathogen was observed after 72 hrs. This showed that resistance has not been developed in the pathogen.

(B) Monitoring resistance development in *P. aphanidermatum* to azoxystrobin revealed that in nursery conditions 40% and 36% damping-off disease incidence in comparison with control was recorded in the treatment of azoxystrobin and azoxystrobin + difenoconazole, respectively. The pathogen survived in fungicide treated beds, was further screened in laboratory and 100% inhibition of the pathogen was observed after 72 hrs. This showed that resistance has not been developed in the pathogen.

III. Most salient research findings/Achievements

- Resistance has not been developed in *Pythium aphanidermatum* to metalaxyl MZ and azoxystrobin

Project No.: BDAPP 128

Research project title	:	Screening for resistance to damping-off and Root-knot in tobacco
Investigators	:	Y. M. Rojasara
Year of start	:	2002-03
Year of completion	:	Long term
Location of the project	:	BTRS Farm AAU, Anand

I. Objectives of the Project

- To identify damping-off and Root-knot resistant/tolerant genotype(s)

II. Executive Summary of the project for 2021-22

In a trial on screening for resistance to damping-off and Root-knotin tobacco, results revealed that out of 14 genotypes/lines, 11th and 3rd lines showed moderately susceptible and susceptible reaction, respectively to damping-off disease in the nursery conditions. Out of 16 lines/varieties, 5th line showed resistant reaction including ABT-10 (Check) while 2nd, 6th and 3rd lines showed moderately resistant, moderately susceptible and susceptible reaction, respectively to Root-knot disease in pots.

III. Most salient research findings/Achievements

- 11th and 3rd line showed moderately susceptible and susceptible reaction, respectively to damping-off disease in the nursery conditions
- 5th line showed resistant reaction including ABT-10 (Check) to Root-knot disease

Project No.: BDAPP 135

Research project title	:	Efficacy of ready mix fungicides for the management of damping-off disease in *bidi* tobacco nursery
Investigators	:	Y. M. Rojasara
Year of start	:	2020-21
Year of completion	:	2022-23
Location of the project	:	BTRS Farm AAU, Anand

I. Objectives of the Project

- To evaluate the efficacy of ready mix fungicides for effective management of damping-off disease in *bidi* tobacco nursery

II. Executive Summary of the project for 2021-22

In a trial on efficacy of ready-mix fungicides for the management of damping off disease in *bidi* tobacco nursery, results indicated that germination counts were uniform before impose of the treatment as statistical difference was non-significant. The fresh weight of 100 seedlings were also non-significant. Significantly minimum damped-off seedlings was registered in Metiram 55% + Pyraclostrobin 5% WG (0.105 %) (53/m^2) and it was at par with Metalaxyl MZ 72 WP (59/m^2) followed by Metiram 55% + Pyraclostrobin 5% WG (0.131%) (69/m^2) and Metiram 55% + Pyraclostrobin 5% WG (0.079%) (75/m^2). Maximum transplantable seedlings were recorded in treatment of Metalaxyl MZ 72 WP (553/m^2) and it was at par with Metiram 55% + Pyraclostrobin 5% WG (0.131%) (507/m^2) and Metiram 55% + Pyraclostrobin 5% WG (0.105%) (447/m^2). Similar trend was observed in total transplantable seedlings.

III. Most salient research findings/Achievements

- Minimum damped-off seedlings was registered in Metiram 55% + Pyraclostrobin 5% WG (0.105 %) (53/m^2) and it was at par with Metalaxyl MZ 72 WP (59/m^2) followed by Metiram 55% + Pyraclostrobin 5% WG (0.131%) (69/m^2) and Metiram 55% + Pyraclostrobin 5% WG (0.079%) (75/m^2). The maximum transplantable seedlingswere recorded in treatment of Metalaxyl MZ 72 WP (553/m^2) and it was at par with Metiram 55% + Pyraclostrobin 5% WG (0.131%) (507/m^2) and Metiram 55% + Pyraclostrobin 5% WG (0.105%) (447/m^2). Similar trend was observed in total transplantable seedlings

Project No.: BDAPP 811

Research project title	:	Validation of prediction model for frog eye spot disease
Investigators	:	Y. M. Rojasara
Year of start	:	2020-21
Year of completion	:	2021-22
Location of the project	:	BTRS Farm AAU, Anand

I. Objectives of the Project

- To validate the model developed for frog-eye spot disease in nursery and field

II. Executive Summary of the project for 2021-22

In a trial on validation of incidence and severity of frog-eye spot disease on *bidi* tobacco in relation to agro-meteorological parameters, results on prediction of FES disease in nursery and field revealed that according to the model it was true to the tune of 80% and 52.63% in nursery and field, respectively.

III. Most salient research findings/Achievements

- Prediction model on frog-eye spot disease was true to the tune of 80 % and 52.63 % in nursery and field, respectively

Project No.: BDAPP 811

Research project title	:	Screening of Advanced Breeding Materials/ Introductions/Genotypes for Major Diseases of Tobacco under Field and Controlled Conditions
Investigators	:	Y. M. Rojasara
Year of start	:	2018-19
Year of completion	:	Long term
Location of the project	:	BTRS Farm AAU, Anand

I. Objectives of the Project

- To locate the source of resistance for major diseases of tobacco

II. Executive Summary of the project 2021-22

In a trial on screening of advanced breeding materials/ introductions/ genotypes for major diseases of tobacco under field and control conditions, eighty-six entries of advanced breeding materials /crosses of *bidi* tobacco and forty entries of *rustica* tobacco were examined for leaf curl and *Cercospora* leaf spot diseases. Observations revealed that out of eighty-six *bidi* tobacco and forty *rustica* tobacco entries, none of the entries were found free from leaf curl infection during 2021-2022. During the year leaf spot disease was not noticed.

Sixty-six (including twenty-four mosaic resistant cultures) entries grown in different generations were artificially inoculated with tobacco mosaic virus and evaluated for resistance to mosaic. Out of these, 64 entries including segregation materials showed resistance to the disease

Screening of tobacco cultures for resistance to tobacco leaf curl virus (TLCV) during the year 2020-21 revealed that the entry found free from the disease in field condition they were infected in previous year.

Out of 74 genotypes screened, 20 genotypes were found free from Root-knotindex in Root-knotsick field and selected for further screening in the next year.

III. Most salient findings/Achievements

- Out of eighty-six *bidi* tobacco and forty *rustica* tobacco entries, none of the entries were found free from leaf curl infection during 2021-2022
- Out of sixty sixentries, 64 entries including segregation materials showed resistance to the disease under artificially inoculated conditions
- Out of 74 genotypes screened, 20 genotypes were found free from Root-knot index in Root-knot sick field

III. NEMATOLOGY

A. *BIDI* TOBACCO

ANAND

Project No.: BDAPP 684

Research project title	:	Rotational study with resistant *bidi* tobacco to manage root-knot disease in *bidi* tobacco
Investigators	:	Y. M. Rojasara
Year of start	:	2017-18
Year of completion	:	2022-23
Location of the project	:	BTRS Farm, AAU, Anand

I. Objectives of the Project

- To find out minimum effective duration of rotation with resistant *bidi* tobacco variety to minimize Root-knot disease on susceptible variety

II. Executive Summary of the project for 2021-22

Rotational study with resistant *bidi* tobacco to manage Root-knot disease in *bidi* tobacco revealed that a significant difference among the treatments for yield and root-knot index was observed. Three years of rotation in which first, second and third year were transplanted with a resistant variety (ABT-10) followed by susceptible variety A-119 registered 1825 kg/ha cured leaf yield while a susceptible variety (A-119) transplanted continuously, which yielded significantly lower cured leaf yield (1556 kg/ha) with Root-knot index 1.78. Three year rotation with resistant variety (ABT-10) reduced Root-knot index and increase yield compare to continuous planting of susceptible variety (A-119). Final population of Root-knot nematodes was found minimum in ABT-10 compared to A-119.

III. Most salient research findings/Achievements

- Three year rotation with resistant variety (ABT-10) reduced root-knot index and increase yield compare to continuous planting of susceptible variety (A-119)
- Final population of root-knot nematodes was found minimum in ABT-10 compared to A-119

Project No.: BDAPP 685

Research project title	:	Effects of antagonistic crop for management of Root-knot nematode in *bidi* tobacco nursery
Investigators	:	Y. M. Rojasara
Year of start	:	2020-21
Year of completion	:	2022-23
Location of the project	:	BTRS Farm, AAU, Anand

I. Objectives of the Project

- To manage Root-knot nematode through antagonistic crop

II. Executive Summary of the project for 2020-21

In a trial on effect of antagonistic crop on Root-knot nematode in *bidi* tobacco nursery, results indicated that germination count was uniform in all the treatments. The Rove beetle count in treatments do not differ significantly with each other. The fresh weight remain at par with each other as treatment difference is non-significant. The maximum healthy transplantable seedlings were registered in a plot with sunnhemp (609/m^2) followed by mustard (509/m^2) as source of antagonistic crop. The treatment of mustard as green manure significantly reduced Root-knot disease compared to other treatments at 90 DAS. While sunhemp as green manure yielded maximum number of transplantable seedlings than the rest of the treatments. Mustard remain next best treatment.

The pooled data on effect of different antagonistic crop on germination count revealed non-significant results among treatments in individual years and pooled. The Rove beetle counts remain at par with each other indicated that different bio fumigant crop does not have any impact on its population.The fresh weight per 100 seedlings was registered in mustard (793 g) which numerically followed by sunhemp (788 g) and marigold (678 g).The total transplantable seedlings revealed that maximum transplantable seedlings (618/m^2) registered with sunnhemp followed by mustard (538/m^2). The minimum transplantable seedlings were found in fallow treatment (388/m^2) which is at par with sesamum (397/m^2) and marigold (437/m^2). Root-knot index was significantly reduced in all the treatments compared to control. The treatment of mustard as antagonistic crop significantly reduced Root-knot disease compared to other treatments.

III. Most salient research findings/Achievements

- The total transplantable seedlings revealed that maximum transplantable seedlings (618/m^2) registered with sunnhemp followed by mustard (538/m^2). The minimum transplantable seedlings were found in fallow treatment (388/m^2) which is at par with sesamum (397/m^2) and marigold (437/m^2). Root-knot index was significantly reduced in all the treatments compared to control. The treatment of mustard as antagonistic crop significantly reduced Root-knot disease compared to other treatments

COORDINATION UNIT

Project No.: AINPT 01

Research project title	:	Development of Mobile Application for Non-FCV tobacco
Investigators	:	C.C.S. Rao, H. Ravisankar, B. Krishna Kumari, T. Anuhya Jayaprada
Year of start	:	2021-22
Year of completion	:	2023-24
Location of the project	:	Co-Unit, Rajahmundry

I. Objectives of the Project

- To develop an Android based Mobile Application for Non-FCV tobacco grown in India for effective instant technology transfer

II. Executive Summary of the project for 2021-22

Android Based Static Mobile App was developed using Java and XML languages on Good Agricultural Practices (GAPs) of NON-FCV tobacco for global accessing of the information through smart phones by tobacco farmers and stake holders. This app provides complete information on 11 types of Non-FCV tobaccos, state-wise which includes Research Infrastructure, Varieties and GAPs. This quick and instant accessing assist the tobacco farmers in raising their crop in a more scientific way for achieving higher yields. It also assists the Institute in transferring the latest technology in no time and improves the Institute visibility at the national level.

III. Most salient research findings/Achievements

- It is an icon based user-friendly menu driven application for easy and instant accessing of the complete information on NON-FCV tobaccos
- Template designing, software development and content management completed
- Testing and debugging are in progress

BRIEF TECHNICAL PROGRAMME FOR 2022-23

A. VFC TOBACCO

JEELUGUMILLI

PLANT BREEDING

Experiment No.	**VFRBRC 2 :** IVT
No. of Entries	FCR-71, FCR-72, FCR-73, FCR-74, FCR-75
Checks	Kanchan, LT-Kanchan, CH-1
Design	RBD
Replications	05
Remarks	Approved

Experiment No.	**VFJBRC 3.1:**AHT-I
No. of Entries	FCRH-13
Checks	Kanchan, LT-Kanchan, CH-1
Design	RBD
Replications	05

Experiment No.	**VFJBRC 3.2:** AHT-II
No. of Entries	FCRH-11, FCRH-12
Checks	Kanchan, LT-Kanchan, CH-1
Design	RBD
Replications	05

Experiment No.	**OFT** :On-Farm Trial
No. of Entries	FCRH-6, FCRH-7
Checks	Kanchan, LT-Kanchan, CH-1

KANDUKUR

PLANT BREEDING

Experiment No.	**VFRBRC 2** :IVT
No. of Entries	FCR-71, FCR-72, FCR-73, FCR-74, FCR-75
Checks	Siri, VT-1158, N-98
Design	RBD
Replications	05
Remarks	Approved

Experiment No.	**OFT** :On-Farm Trial
No. of Entries	FCR-60
Checks	Siri, VT-1158, N-98

HUNSUR

PLANT BREEDING

Experiment No.	**VFRBRC 2** :IVT
No. of Entries	FCR-71, FCR-72, FCR-73, FCR-74, FCR-75
Checks	Kanchan, FCH 222, CH 3
Design	RBD
Replications	05
Remarks	Approved

Experiment No.	**VFHBRC 3.1:**AHT-I
No. of Entries	FCRH-13, FCHH-2
Checks	Kanchan, FCH 222, CH 3
Design	RBD
Replications	05

Experiment No.	**VFHBRC 1.2:**AHT-II
No. of Entries	FCRH-11
Checks	Kanchan, FCH 222, CH 3
Design	RBD
Replications	06

Experiment No.	**OFT** :On-Farm Trial
No. of Entries	FCH-2, FCRH-4
Checks	Kanchan, FCH 222, CH 3

CROP PRODUCTION

Experiment No.	**VFHAG 17:** Integrated management of *Orobanche* in FCV tobacco in KLS.
No. of treatments	T1: Tobacco + Neem cake application at 30 DAP + Hand removal of *Orobanche* T2: Tobacco + Neem cake application at 30 DAP + Post emergence application of neem oil on *Orobanche* spikes T3: Tobacco + Neem cake application at 30DAP + Post emergence application of pongamia oil on *Orobanche* spikes T4: Tobacco + Neem cake application at 30DAP + Post emergence application of paraquat on *Orobanche* spikes T5: Tobacco + Neem cake application at 30 DAP + post emergence application of Imazethapyr on *Orobanche* spikes T6: Control T7: Tobacco + Hand removal of *Orobanche*
Design	RCBD
Replications	03
Remarks	Approved

SHIVAMOGGA

PLANT BREEDING

Experiment No.	**VFRBRC 2** :IVT
No. of Entries	FCR-71, FCR-72, FCR-73, FCR-74, FCR-75
Checks	Sahyadri, Kanchan, Thrupthi
Design	RBD
Replications	04
Remarks	Approved

Experiment No.	**VFRBRC 2** : IVT (R)
No. of Entries	FCR-68, FCR-69, FCR-70
Checks	Sahyadri, Kanchan, Thrupthi
Design	RBD
Replications	05

Experiment No.	**BT** :Bulk Trial and **OFT** :On-Farm Trial
No. of Entries	FCHH-1, FCHH-2
Checks	Sahyadri, Kanchan, Thrupthi

Experiment No.	**OFT**:On-Farm Trial
No. of Entries	FCS-4
Checks	Sahyadri, Kanchan, Thrupthi

Experiment No.	VFSBR 4.1: Station Trial-I
No. of Entries	**F_6 generations** TB-70 × TB-102 TB-100 × TB-102 Tobios-6 × Sahyadri Tobios-5 × Kanchan NLST-2 × FCH-221
Checks	Sahyadri, Kanchan, Thrupthi

Experiment No.	**VFSBR 5**:Evaluation, characterization, maintenance and utilization of FCV tobacco germplasm
No. of Entries	113 genotypes will be mainatined & High yielding 25 lines will be selected
Checks	Sahyadri, Kanchan, Thrupthi

Experiment No.	**VFSBR 6**:Back cross breeding programme: Conversion of Thrupthi, Sahyadri & Bhavya in to male sterile lines (BC_8)
No. of Entries	Thrupthi, Sahyadri, Bhavya, Tobios-6, FCH-222

Experiment No.	**VFSBR 7**:New crosses and early generation studies
No. of Entries	**F_6 generations** Tobios-6 × Thrupthi Tobios-6 × Sahyadri Tobios-6 × Kanchan Tobios-5 x Thrupthi Tobios-5× Kanchan

Experiment No.	**VFSBR 8** :Development of high yielding and quality hybids in FCV tobacco using male sterile system
No. of Entries	The F_1's will be evaluated and the CMS lines will again be crossed with entires FCJ-38, FCJ-11, NLCR-7

Experiment No.	**VFSBR 9:**Hybridization and Double haploid (DH) production to identify resistant lines for Black shank and TMV and for other agronomic traits
No. of Entries	The F_1's of: SAHYADRI x FCR-68 SAHYADRI x CTRI Sulakshana SAHYADRI x VT-1158 TRUPTHI x FCR-68 TRUPTHI x CTRI Sulakshana TRUPTHI x VT-1158 KANCHAN x FCR-68 KANCHAN x CTRI Sulakshana KANCHAN x VT-1158 will be evaluated for yield and disease resistance

Experiment No.	**VFSBR 10** :Breeding for high seed oil and oil yield in both FCV and chewing tobacco
No. of Entries	Top 10 high yielding lines will be selected based on their performance for seed yield to confirm the consistency for performance of the genotypes during 2022-23

CROP PRODUCTION

Experiment No.	**VFSAG 70:** Effect of hydrogel on FCV tobacco yield and quality in KLS.
No. of treatments	T8: Soil application of Hydrogel @ 2.5 kg/ha (0.14g plant/hole) before planting T9: Soil application of Hydrogel @ 3.75 kg/ha (0.20 g plant/hole) before planting T10: Soil application of Hydrogel @ 5 kg/ha (0.30 g plant/hole) before planting T11: Soil application of Hydrogel @ 2.5 kg/ha (0.14g plant/hole) after a rainy day (30 DAT) T12: Soil application of Hydrogel @ 3.75 kg/ha (0.20 g plant/hole) after a rainy day (30 DAT) T13: Soil application of Hydrogel @ kg/ha (0.30 g plant/hole) after a rainy day (30 DAT) T14: Control
Design	RCBD
Replications	03
Remarks	Approved

Experiment No.	**VFSAG-72: Crop intensification in FCV tobacco for additional farm income**
No. of treatments	T1 : FCV Tobacco + Green gram (Skip row 1:3) T2: FCV Tobacco + Black gram (Skip row 1:3) T3 : FCV Tobacco + Cowpea (Skip row 1:2) T4 : FCV Tobacco + Field bean (Skip row 1:2) T5 : FCV Tobacco + Groundnut (Skip row 1:3) T6 : Sole FCV Tobacco T7 : Sole Green gram T8 : Sole Black gram T9 : Sole Cowpea T10 : Sole Field bean T11: Sole Groundnut
Design	RCBD
Replications	03
Remarks	Approved

ENTOMOLOGY

Experiment No.	**VFSEN 34:**Population dynamics of insect pest complex and their natural enemies in tobacco ecosystem
	Ongoing project

Experiment No.	**VFSEN 35:**Screening of tobacco cultivars against leaf curl disease and its vector whitefly, *Bemisia tabaci* (*Hemiptera: aleyrodidae*)
	Ongoing project

Experiment No.	**VFSEN 36:**Management of Tobacco leaf curl vector, Whitefly, *Bemisia tabaci* (Hemiptera: Aleyrodidae) using different modules
	Ongoing project

B. *BIDI* TOBACCO

ANAND

PLANT BREEDING

Experiment No.	**BDABRC 2 :** IVT
No. of Entries	ABD-239, ABD-241, ABD-244
Checks	GT 7, MRGTH 1ABT 10, A 119
Design	RBD
Replications	03

Experiment No.	**BDABRC 1.1:**AVT-I
No. of Entries	ABD- 226, ABD- 228, ABD- 229,NyBD-69
Checks	A 119, GT 7, MRGTH 1,GABT-11
Design	RBD
Replications	03

Experiment No.	**BDABRC 1.2:**AVT-II
No. of Entries	ABD- 209, ABD 211
Checks	GT- 7, ABT- 10,GABT-11, MRGTH 1
Design	RBD
Replications	04

CROP PRODUCTION

Experiment No.	**BDAAG 164** : Effect of variety and planting dates on yield and quality of *bidi* tobacco varieties
No. of treatments	**Main plots: Planting dates (D): Four** D1: August 3rd week D2: September 1st week D3: September 3rd week D4: October 1st week **Sub plot: Variety (V) : Two** V1: GABT 11 V2: MRGTH 1
Design	SPD
Replications	04
Remarks	Ongoing

Experiment No.	**BDAAG 168: Effect of different levels of phosphorus and potash on growth, yield and quality of *bidi* tobacco grown in middle Gujarat**
No. of treatments	**Treatments: 2 x 4 =8 combinations** **(A)Phosphorus levels (P) (kg/ha)** P_0 = 0 P_1 = 50 P_2 = 100 **(B)Potassium levels (K) (kg/ha)** K_0 = 0 K_1 = 50 K_2 = 100
Design	RBD (Factorial)
Replications	04
Remarks	Ongoing

ENTOMOLOGY

Experiment No.	**Remarks**
BDAEN 86: Establishment of entomophage bio–diversity park	Ongoing project

PLANT PATHOLOGY

Experiment No.	**Remarks**
BDAEN 88: Study of population dynamics of important pests of tobacco	Ongoing project
BDAPP 126 (A) : Resistance Development in Pythium aphanidermatum to Metalaxyl MZ	Ongoing project
BDAPP 126 (B) : Resistance Development in *Pythium aphanidermatum* to Azoxystrobin	Ongoing project
BDAPP 128 : Screening for resistance to damping-off and root knot in tobacco	Ongoing project
BDAPP 135 Efficacy of ready mix fungicides for the management of damping-off disease in *bidi* tabacco nursery	Ongoing project
BDAPP 811: Validation of prediction model for frog eye spot disease	Ongoing project
NEMATOLOGY	
BDAPP 684: Rotational study with resistant *bidi* tobacco to manage root-knot disease in *bidi* tobacco	Ongoing project

NEW PROJECT PROPOSALS

BDAPP 685: EVALUATION OF FUNGICIDES AGAINST FROG-EYE LEAF SPOT AND ALTERNARIA LEAF SPOT IN BIDI TOBACCO

Objective: To manage frog-eye leaf spot and alternaria leaf spot in bidi tobacco with fungicides

Borwn leaf spot caused by Alternariaalternata usually appears during later stage of plant growth in the field and causes both qualitative and quantitative loss of cured leaf yield of bidi tobacco. The brown spot disease caused by A. alternata is a significant foliar disease that limits tobacco production worldwide (Cheng et al. 2011; Stavely 1975). The fungus mainly infects the leaves of tobacco, although the stems, pedicels, and capsules may also be damaged in severe cases (Lucas 1975; Shew and Lucas 1991). Tobacco leaves infected by this disease normally become incomplete, uneven baking leaf color and leaf thickness which results in poor quality of tobacco leaves and low value of industrial use (Jenninget al., 2002; Yakimovaet al., 2009). Losses can reach more than 60% if disease management practices are not utilized.

The experiment is planned with a view touse of single as well as combi productto manage the disease and improve quality.

Name of Scientists involved:

1. Dr. Y. M. Rojasara, Asso. Research Scientist
2. Shri. N. A. Bhatt, Assi. Research Scientist (Ento.)

Methodology:

Year of start: 2022-23 Location: BTRS Farm Design: RBD
Replication: 3 (Four) Variety: GT 7 Spacing: 90 x 75 cm
Plot size: Gross: 3.6 x 7.5 m Net : 1.8 x 6.0 m

Treatments:

Sr. no.	Treatments	Conc. (%)	g a.i. /ha	Quantity of formulation required (g/10 litre water)
1	Carbendazim 12%+ Mancozeb 63% WP	0.20	1000	26.25
2	Carbendazim 12% + Mancozeb 63% WP	0.26	1312.5	35
3	Carbendazim 12% + Mancozeb 63% WP	0.33	1650	43.75
4	Azoxystrobin 11% + Tebuconazole 18.3% SC	0.329	164.81	11.25
5	Azoxystrobin 11% + Tebuconazole 18.3% SC	0.04395	219.75	15
6	Azoxystrobin 11% + Tebuconazole 18.3% SC	0.0549	275	18.75
7	Zineb 68% + Hexaconazole 4% WP	0.108	540	15
8	Zineb 68% + Hexaconazole 4% WP	0.144	720	20
9	Zineb 68% + Hexaconazole 4% WP	0.18	900	25
10	Zineb 75% WP	0.144	1.125	20
11	Control			

Observations to be recorded:

1. Brown spot disease index (0-5)
2. Frog-eye spot disease index (0-5)
3. Cured leaf yield (kg/ha)

NIPANI

PLANT BREEDING

Experiment No.	**BDABRC 2** :IVT
No. of Entries	ABD-239, ABD-241, ABD-244
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	03

Experiment No.	**BDABRC 1.1** : AVT-I
No. of Entries	ABD-226, ABD-228, ABD-229, NyBD-68, NyBD-69
Checks	Vedaganga-1, A-119, Bhavyashree, Bhavyasree, NBD-209
Design	RBD
Replications	03

Experiment No.	**LST** :Large Scale Trial
No. of Entries	NBD-316
Checks	A-119, NBD-209,A 119

Experiment No.	**BDNBR 4.1**:SVT-I
No. of Entries	NBD-342, NBD-343, NBD-344, NBD-345, NBD-346 NBD-347, NBD-349, NBD-350, NBD-351, NBD-356, NBD-358
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	03

Experiment No.	**BDNBR 4.2**:SVT-II
No. of Entries	NBD-337, NBD-338, NBD-340, NBD-341
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	03

Experiment No.	**BDNBR 4.4**:SHT-II
No. of Entries	NBTH-1023, NBTH-1024,NBTH-1026,NBTH-1027,NBTH-1028 **Parents:** MS NPN 22 MS Bhagyashgree MS Vedaganga MS PL-5 NBD- 316 ABD-196 NBD 277
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	02

Experiment No.	**BDNBR 4.5** :PVT
No. of Entries	NBD-360, NBD-361, NBD-362, NBD-363, NBD-364, NBD-365, NBD-366, NBD-367, NBD-368, NBD-369,NBD-370, NBD-371,NBD-372,NBD-373,NBD-374, NBD-375, NBD-376, NBD-377, NBD-378, NBD-379, NBD-380
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	02

Experiment No.	**BDNBR 4.6: PHT**
No. of Entries	NBTH-1029, NBTH-1030, NBTH-1031, NBTH-1032, NBTH-1033, NBTH-1034, NBTH-1035, NBTH-1036, NBTH-1037, NBTH-1038, NBTH-1039, NBTH-1040, NBTH-1041, NBTH-1042, NBTH-1043, NBTH-1044, NBTH-1045, NBTH-1046, NBTH-1047, NBTH-1048, NBTH-1049, NBTH-1050, NBTH-1051, NBTH-1052, NBTH-1053, NBTH-1054, NBTH-1055, NBTH-1056, NBTH-1057, NBTH-1058, NBTH-1059, NBTH-1060, NBTH-1061, NBTH-1062, NBTH-1063, NBTH-1064, NBTH-1065, NBTH-1066
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	02

BDNBR 5: Generation breeding material (generation of new crosses)

Experiment No.	**BDNBR 5.1** New crosses made Based on the performance of the varieties over years for yield and yield attributes (leaf thickness, shy suckers, resistance to diseases and pests), the varieties will be selected for the crossing programme.

Experiment No.	**BDNBR 5.2**:Evaluation of early generation material (F_1's evaluation)
No. of Entries	A-119x114-4 (RPK Type), A-119 x S-20 , A-119 x Gundsurti, A-119 x NBD-111, A-119 x ABD-101, A- 119 x ABD-92, A-119 x Red Russian, NBD-277 x 114-4(RPK Type), NBD-277x S-20, NBD-277 x Gundsurti, NBD-277x NBD-111, NBD-277 x ABD-101, NBD-277 xABD-92,NBD-277 xABD-95, NBD-277 x Red Russian, NBD-209 x114-4 (RPK Type), NBD-209 x S-20, NBD- 209 x Gundsurti, NBD-209 x ABD-101, NBD-209 x ABD-92,

	NBD-209 x ABD-95, NBD-209 x Red Russian, NBD-316 x S-20 ,NBD-316 x Gundsurti, NBD-316 x NBD-111, NBD-316 x ABD-101, NBD-316 x ABD-92, NBD-316 x ABD-95
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209
Design	RBD
Replications	03

Experiment No.	**BDNBR 5.3:** Evaluation of early generation material (F_2 populations)	
No. of Entries	A-119 x NBD-277, NBD-209 x NBD- 277, Vedaganga x NBD 277, A-2 x NBD- 277, PL- 5 x NBD- 277, NPN- 22 X NBD-276	These crosses were generated for high leaf yield and quality and resistance to pests and diseases
Checks	Vedaganga-1, A-119, Bhavyashree, NBD-209	

Experiment No.	**BDNBR 5.4:** Evaluation of advanced breeding material (F_3 progenies)	
No. of Entries	**Entry code**	**Pedigree**
	2021-1-5-2 2021-1-5-3 2021-3-5-2 2021-3-5-2	Bhavyashree X ABD 174
	2021-1-1-8 2021-3-1-2 2021-4-2-5	Vedaganga-1 X ABD 174
	2021-1-1-2 2021-2-6-3 2021-4-5-8	Bhavyashree X NBD 316
	2021-1-3-1 2021-3-1-3 2021-1-1-6	NBD 209 X ABD 190

Experiment No.	**BDNBR 5.5:** Evaluation of advanced breeding material (F_4 lines)	
No. of Entries	**Entry code**	**Pedigree**
	2021-1-5-2 2021-1-5-3 2021-3-5-2 2021-3-5-2	Bhavyashree X ABD 174
	2021-1-1-8 2021-3-1-2 2021-4-2-5	Vedaganga-1 X ABD 174
	2021-1-1-2 2021-2-6-3 2021-4-5-8	Bhavyashree X NBD 316
	2021-1-3-1 2021-3-1-3 2021-1-1-6	NBD 209 X ABD 190
Checks	C1 C2 C3 C4	Vedaganga-1 A-119 Bhavyashree NBD-209

BDNBR 1: Collection, Evaluation and maintenance of germplasm lines in *bidi* tobacco

Experiment No.	Collection, Evaluation and maintenance of germplasm lines in *bidi* tobacco	
No. of Entries	190	
Experiment No.	Maintenance of A and B lines	
No. of Entries	**A lines**	**B lines**
	1. MS A-119 × A-119 2. MS NBD-209 × NBD 209 3. MS Bhavyashree × Bhavyashree 4. MS Bhagyashree × Bhagyashree 5. MS Vedagandga × Vedaganga 6. MS A-2 × A-2 7. MS PL-5 × PL-5 8. MS GT-5 × GT-5	1. A-119 2. NBD-209 3. Bhavyashree 4. Bhagyashree 5. Vedaganga 6. A-2 7. PL-5 8. GT-5

CROP PRODUCTION

Experiment No.	**BDNAG 56:** Evaluation of pre and post emergent herbicide molecules against weeds in tobacco ecosystem
No. of treatments	T1: Pendimethalin 30 EC @ 3.25 lit/ha T2: Pendimethalin 38.7 CS @ 1.5 lit/ha T3: Clomazone 50 EC @ 0.5 lit/ha T4: Chlorimeron Ethyl 25 WP @ 4 g/ha T5: Butachlor 5% @ 0.5 lit/ha T6: Quizalofop ethyl 5EC @ 0.5 lit/ha T7: Propaquizofop Ethyl 10 EC T8: Fenoxapop-p-ethyl 9 EC 0.5lit/ha T9: Metribuzine @ 0.75 g/ha T10: One inter cultivation followed by 2 HW T11: Weedy check
Design	RBD
Replications	03
Remarks	Ongoing

Experiment No.	**BDNAG 57:** Doubling of the farmer's income by tobacco based cropping system under mulches
No. of treatments	**Main Factor (Mulches)** 1. Black plastic mulch 2. Trash mulch 3. Crop residue mulch 4. Soil mulch **Sub-factor (Tobacco based cropping systems)** 1. Tomato-Tobacco-Summer groundnut 2. Groundnut-Tobacco-Soybean 3. Soybean-Tobacco-Maize 4. Sunnhemp-Tobacco-Sugarcane (Relay crop) 5. Soybean-Tobacco-Sugarcane (Relay crop) 6. Tobacco alone 7. Banana alone 8. Turmeric alone
Design	Factorial RBD
Replications	06
Remarks	Ongoing

Experiment No.	**BDNAG 58:** Integrated management of *Orobanche* in *bidi* tobacco
No. of treatments	**T1:**Fallow-tobacco + Neem cake application at 30 DAP+ Hand removal of *Orobanche* **T2:**Fallow-tobacco + Neem cake application at 30 DAP + Post emergence application of Neem oil on *Orobanche* spikes **T3:**Fallow-tobacco + Neem cake application at 30 DAP+ Post emergence application of Pongamia oil on *Orobanche* spikes **T4:** Fallow-tobacco + Neem cake application at 30 DAP + Post emergence application of Paraquat on *Orobanche* spikes **T5:**Fallow-tobacco + Neem cake application at 30 DAP + Post emergence application of Imazethapyr on *Orobanche* spikes **T6:**Fallow-tobacco + Neem cake application at 30 DAP + Post emergence application of Glyphosate on *Orobanche* spikes **T7:**Green manuring of Black sesamum-tobacco + Neem cake application at 30 DAP + Hand removal of *Orobanche* **T8:** Green manuring of Sunnhemp-tobacco + Neem cake application at 30 DAP + Hand removal of *Orobanche* **T9:** Fallow-tobacco + Hand removal of *Orobanche* **T10:** Fallow-tobacco + Non removal of *Orobanche*
Design	RBD
Replications	03
Remarks	Ongoing

NANDYAL

PLANT BREEDING

Experiment No.	**BDNyBRC 2 :**IVT
No. of Entries	ABD-239, ABD-241, ABD-244
Checks	Nandyal pogaku-1, A119
Design	RBD
Replications	03

Experiment No.	**BDNyBRC 1.2 :** AVT-II
No. of Entries	ABD -209, ABD 211
Checks	Nandyal pogaku-1, A119
Design	RBD
Replications	06

Experiment No.	**BDNyBRC 3.2:**AHT-II
No. of Entries	NyBTH 170, NyBTH 171
Checks	Nandyal pogaku-1, A-119, MRGTH-1
Design	RBD
Replications	05

Experiment No.	**OFT:**On-Farm Trial
No. of Entries	NyBTH-152 ,NyBTH-155, NyBTH-157
Checks	Nandyal pogaku-1, A119, MRGTH-1

BDNyBR 4: Hybridization and selection to evolve superior *bidi* tobacco varieties/ hybrids

Experiment No.	**BDNyBR 4.1:**SHT-I
No. of Entries	NyBTH-202, NyBTH-203, NyBTH-204, NyBTH-205, NyBTH-206, NyBTH-207
Checks	Nandyal pogaku-1, A119, MRGTH 1
Design	RBD
Replications	03

Experiment No.	**BDNyBR 4.2:**SHT -II
No. of Entries	NyBTH 193, NyBTH 194, NyBTH 195, NyBTH 196, NyBTH 197, NyBTH 198, NyBTH 199, NyBTH 200, NyBTH 201
Checks	Nandyal pogaku-1, A119
Design	RBD
Replications	03

Experiment No.	**BDNyBR 4.1: SVT-I**
No. of Entries	NyBD- 88, NyBD- 89, NyBD-90, NyBD-91, NyBD-92, NyBD-92, NyBD-93, NyBD-98
Checks	Nandyal pogaku-1, A119
Design	RBD
Replications	03

Experiment No.	**BDNyBR 4.2: SVT-II**
	NyBD-78, NyBD-79, NyBD-80, NyBD-81, NyBD-82, NyBD-83, NyBD-84, NyBD-85, NyBD-86, NyBD-87
Checks	Nandyal pogaku-1, A119
Design	RBD
Replications	03

Experiment No.	**BDNyBR 5:**Study and generation of breeding material in *bidi* tobacco
No. of Entries	Previous year breeding material will be advanced to next generations

Experiment No.	**BDNyBR6:**Evaluation of newly developed *bidi* tobacco genotypes for seed oil

Experiment No.	**BDNyBR 1:**Collection, evaluation and maintenance of germplasm lines in *Bidi* tobacco
No. of Entries	New germplasm lines received from different centers and already existing germplasm lines will be evaluated during 2022-23.

CROP PRODUCTION

Experiment No.	**BDNyAG 18:** Response of *bidi* tobacco to different drought mitigation measures
No. of treatments	**Main Plot: Plant density** M1: Normal planting – 75 × 75 cm (17,777/ha) M2: High density planting – 60 × 60 cm (27,777/ha) **Subplot: Drought mitigation measures** D1: No foliar Spray D2: Foliar spray with water during drought period D3: Foliar spray with KNO_3 @ 2.5% during drought period D4: Foliar spray with Gibberellic acid @ 20 ppm during drought period D5: Foliar spray with Triacontanol 0.1% EW @ 2ml/L during drought period
Design	Split plot
Replications	03
Remarks	On going
Experiment No.	**BDNyAG 17 :** Management of broomrape (*Orobanche spp*) in *bidi* tobacco
No. of treatments	**Main Plots – Cropping systems** 1. Gingelly – *bidi* tobacco 2. Sorghum – *bidi* tobacco 3. Fallow – *bidi* tobacco **Sub Plots – *Orobanche* management methods** T1: Neem cake @ 200 kg/ha fb Paraquat 24 % SL T2: Neem cake @ 200 kg/ha fb Imazethapyr 10%SL T3: Neem cake @ 200 kg/ha fb Ethoxysulfuron 15% WDG T4: Hand weeding T5: Weedy Check
Design	Split plot
Replications	03
Remarks	On going
Experiment No.	**BDNyAG 19:** Enhancing the productivity of *bidi* tobacco-based cropping systems
No. of treatments	T1: Foxtail millet – *Bidi* tobacco T2: Greengram – *Bidi* tobacco T3: Blackgram – *Bidi* tobacco T4: Sweet corn – *Bidi* tobacco T5: Cluster bean – *Bidi* tobacco T6: Cowpea – *Bidi* tobacco T7: Bajra – *Bidi* tobacco T8: Onion – *Bidi* tobacco T9: Fallow – *Bidi* tobacco (C)
Design	RBD
Replications	03
Remarks	On going

C. NATU/PIKKA TOBACCO

NANDYAL

PLANT BREEDING

Experiment No.	**NTNyBR 4.4** :SVT-I
No. of Entries	NyNT-94, NyNT-95, NyNT-96, NyNT-97, NyNT-98, NyNT-99, NyNT-100, NyNT-101, NyNT-102
Checks	Bhairavi
Replications	03

Experiment No.	**NTNyBR 4.4** :SVT-II
No. of Entries	NyNT-88, NyNT-89, NyNT-90, NyNT-91, NyNT-92, NyNT93
Checks	Bhairavi

Experiment No.	**NTNyBR5**:Study and generation of breeding material in *natu* tobacco
No. of Entries	Previous year breeding material will be advanced to next generations

Experiment No.	**NTNyBR 1**: Collection, evaluation and maintenance of germplasm lines in *natu* tobacco
No. of Entries	Existing germplasm lines of *natu* tobacco will be evaluated during 2022-23

BERHAMPUR

PLANT BREEDING

Experiment No.	**PBBR 2** :Collection, evaluation and maintenance of tobacco germplasm
No. of treatments	110
Checks	Gajapati, JP Local
Design	Augumented

Experiment No.	**PBBR 5** :Bulk evaluation trial on *pikka* tobacco
No. of treatments	NF 4-27-3, NF 4-20-2, NF4-10-2
Checks	Gajapati, JP Local
Replications	Unreplicated

Experiment No.	**PBBR8** :Yield evaluation trial in *pikka* tobacco
No. of treatments	20
Checks	Gajapati, JP Local
Design	RBD
Replications	03

Experiment No.	**PBBR 9**:Replicated yield trial in pikka tobacco
No. of treatments	05
Checks	Gajapati, JP Local
Design	RBD
Replications	04

Experiment No.	MLT of *pikka* tobacco genotype
No. of treatments	05
Checks	Gajapati, JP Local
Design	RBD
Replications	04

Experiment No.	Morphological Characterisation in *pikka* tobacco
No. of treatments	22
Checks	Gajapati, JP Local
Design	RBD
Replications	04

Experiment No.	**PBBR 10**:Exploratory trial on tobacco
No. of treatments	*Rustica* GC 1 GCT 2 GCT 3 DCT 4 *Jati* Manasi Chama Podali
Checks	Gajapati, JP Local
Design	Unreplicated

D. *RUSTICA* TOBACCO

ANAND

PLANT BREEDING

Experiment No.	**RUABRC 2:** IVT
No. of treatments	AR-177, AR-182, AR-184,ArR-104, ArR-105, LR-98, LR-99, LR-100
Checks	GC- 1, GCT- 2, GCT- 3
Design	RBD
Replications	03
Remarks	Approved

Experiment No.	**RUABRC 1.1:** AVT-I
No. of treatments	LR-96, LR-97 ArR-96, ArR-98
Checks	GC- 1, GCT- 2, GCT- 3
Design	RBD
Replications	04

Experiment No.	**RUABRC 1.2:** AVT-II
No. of treatments	LR-94, LR-95 ArR-89, ArR-91
Checks	GC- 1, GCT- 2, GCT- 3
Design	RBD
Replications	04

ARAUL

PLANT BREEDING

Experiment No.	**RUArBRC 2** :IVT
No. of Entries	AR-177, AR-182, AR-184,ArR-104, ArR-105, LR-98, LR-99, LR-100
Checks	Azad Kanchan, SK 417
Design	RBD
Replications	03
Remarks	Approved

Experiment No.	**RUArBRC 1.1:**AVT-I
No. of Entries	ArR-96, ArR-98
Checks	Azad Kanchan, SK 417
Design	RBD
Replications	05

Experiment No.	**RUArBRC 1.2:**AVT-II
No. of Entries	ArR-91, LR-95
Checks	Azad Kanchan, SK 417
Design	RBD
Replications	05

Experiment No.	**OFT: On Farm Trial**
No. of Entries	ArR-69
Checks	Azad Kanchan, SK 417
Design	RBD
Replications	05

Experiment No.	**RUArBR 5** :PYT-I
No. of Entries	ArR-119, ArR-120, ArR-121, ArR-122, ArR-123, ArR-124, ArR-125, ArR-126
Checks	Azad Kanchan, SK 417
Design	RBD
Replications	03

Experiment No.	**RUArBR 5A** :PYT-II
No. of Entries	ArR-111, ArR-112, ArR-113, ArR-114, ArR-115, ArR-116, ArR-117, ArR-118
Checks	Azad Kanchan, SK 417
Design	RBD
Replications	03

CROP PRODUCTION

NEW PROJECTS

RUArAG 31: Studies on Economical viability of Tobacco/ Non- Tobacco crop of *Rabi*.

Objective: To find out the best cost benefit ratio among different *Rabi* crops with comparison *Rustica* Tobacco variety ArR-27 (Nath).

Year of start : *Rabi* 2022-23

Statistical Design & Layout Out
Design : RBD
Replication : 04
Plot Size : 5.0 x 4.0 m^2
Spacing : As per crop

Treatments : 05
T1: Tobacco
T2: Wheat
T3: Barley
T4: Linseeds
T5: Mustard

RUArAG 32: Studies on Economical of Tobacco- Bengalgram inter-cropping system.

Objective: To assess the best ration of Bengalgram to be grown with tobacco for high remuneration.

Year of start: Rabi 2022-23

Statistical Design & Layout Out
Design : RBD
Replication : 04
Plot Size : 5.0 x 4.0 m^2
Spacing : 60x60 cm

Treatments : 05
T1: Tobacco + Bengalgram (4:2)
T2: Tobacco+ Bengagram (3:3)
T3: Tobacco + Bengalgram (2:4)
T4: Tobacco as sole crop
T5: Bengalgram as sole crop

DINHATA

PLANT BREEDING

Experiment No.	**RUDBRC 2** :IVT
No. of Entries	AR-177, AR-182, AR-184,ArR-104, ArR-105, LR-98, LR-99, LR-100
Checks	DD-437, Dharla
Design	RBD
Replications	03
Remarks	Approved

LADOL

PLANT BREEDING

Experiment No.	**RULdBRC 2** : IVT
No. of Entries	AR-177, AR-182, AR-184, AR-104, AR-105, LR-98, LR-99 LR-100
Checks	GCT-3, DCT-4
Design	RBD
Replications	03
Remarks	Approved

Experiment No.	**RULdBRC 2** : AVT-I
No. of Entries	LR-96, LR-97
Checks	GCT-3, DCT-4
Design	RBD
Replications	05

Experiment No.	**RULdBRS 1**:ST-1 (IET)
No. of Entries	LR 21-5, LR 21-7, LR 21-8, LR 21-1, LR 21-9
Checks	GCT-3, DCT-4
Design	RBD
Replications	03

Experiment No.	**RULdBRS 2**:ST-2 (PYT)
No. of Entries	LR-22-1, LR-22-2, LR-22-3, LR-22-4, LR-22-5, LR-22-6, LR-22-7, LR- 22-8, LR -22-9,LR- 22-10, LR- 22-11, LR- 22-12
Checks	GCT-3, DCT-4,GCT-5
Design	RBD
Replications	03

Experiment No.	**RULdBRS 4**:LSVT
No. of Entries	LR-98, LR-99, LR-100, LR-94, LR-96, LR-97
Checks	GCT-3, DCT-4
Design	RBD
Replications	03

E. *CHEWING* TOBACCO

VEDASANDUR

CROP PRODUTION

Experiment No.	**CHVsAG 8**:Integrated management of Orobanche in Chewing Tobacco
No. of treatments	T1: Fallow - tobacco + Neem cake application at 30 DAP + Hand removal of *Orobanche* T2: Fallow - tobacco + Neem cake application at 30 DAP + Post emergence application of neem oil on *Orobanche* Spikes T3: Fallow - tobacco + Neem cake application at 30 DAP + Post emergence application of pongamia oil on *Orobanche* Spikes T4: Fallow - tobacco + Neem cake application at 30 DAP + Post emergence application Paraquat on *Orobanche* Spikes T5: Fallow - tobacco + Neem cake application at 30 DAP + Post emergence application of Imazethapyr on *Orobanche* Spikes T6: Sesamum - tobacco T7: Sesamum - tobacco + Neem cake application at 30 DAP + Hand removal T8: Fallow - tobacco + Hand removal of *Orobanche* T9: Fallow - tobacco + Non removal of *Orobanche*
Design	RBD
Replications	03

COORDINATION UNIT

RAJAHMUNDRY

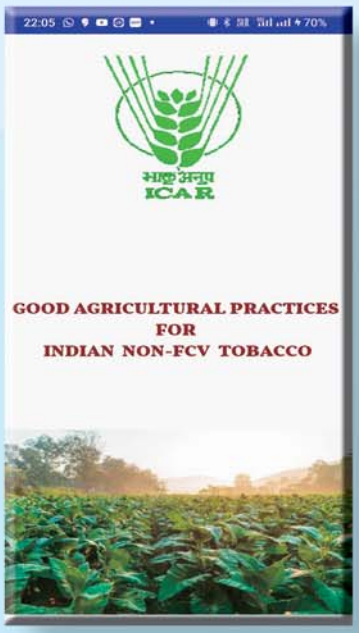
Project No. AINPT 01	Development of Mobile Application for Non-FCV tobacco

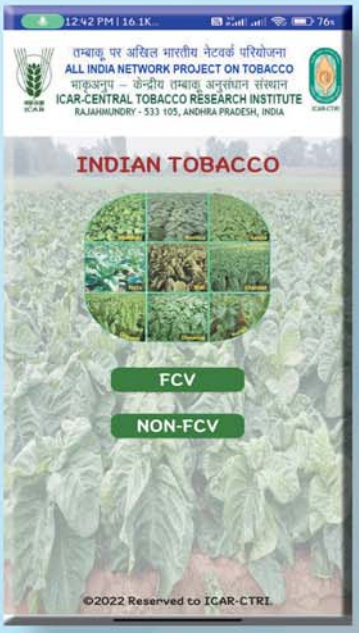
COORDINATION EVALUATION OF THE HUMIC ACID FOR HEALTHY FCV SEEDLINGS

Project No. AINPT 02

New Experiments proposed under AINP on Tobacco (Crop Production)

1.	Research Project Title:	:	Effect of humic acid as bio-stimulants for healthy tobacco seedling production
2	Investigators	:	S. Kasturi Krishna, T. Kiran Kumar, S.V. Krishna Reddy, M. Anuradha, M. Mahadeva swamy
3	**Year of Start:**	:	**2023**
4	**Year of Completion**	:	2025.
5	Location of the project:	:	CTRI, Rajahmundry, CTRI RS Jeelugumilli, CTRI RS Kandukur, CTRI RS Hunsur
I	Objectives of the Project	:	1. To study the effect of humic acid as biostimulants on healthy seedling production 2.To study the effect of humic acid on soil fertility
II	**Experimental details**	:	Treatments:5 Replications: three Design : RBD Varieties: Kanchan, Siri, FCR 15 Observations : No.of seedlings, dry wt of seedlings, root volume, root dry weight, Transplantable seedlings
III	Treatment details	:	T_1:Soil application of humic substances @ 1.25 kg/ha T_2: Soil application of humic substances @ 1.25 kg/ha + Foliar spray @ 0.05% at 30DAS T_3: Soil application of humic substances @ 1.25 kg/ha + Foliar spray @ 0.05% at 30 DAS and 45 DAS T_4: Soil application of humic substances @ 1.25 kg/ha + Foliar spray @ 0.05% 10 days after resetting in poly trays T_5: Package of practices Design; RBD Replications: Three







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