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EVALUATION OF ADVANCE BREEDING LINES OF FCV TOBACCO *(NICOTIANA TOBACCUM* .L) UNDER KLS CONDITIONS

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Tobacco (*Nicotiana tobaccum* L.) is one of the most important non-edible commercial crop in India. The quality of tobacco produced in Karnataka light soils (KLS) is on par with the best in the world and is in great demand for export purpose. However, Karnataka yield levels of FCV tobacco is lower than the national average and there is a very limited options for the famers in choosing the cultivars as only three cultivars are available for cultivation in KLS. Hence, with an aim to diversify the tobacco cultivation with newer high yielding varieties, evaluation of seven advanced breeding lines generated through crosses involving Bhavya, Rathna, Kanchan with Cocker 371 Gold and NC 89 through pedigree method was undertaken at ICAR- Central Tobacco Research Station, Hunsur, Karnataka during the crop season 2016-17, 2017-18 and 2018-19. Four advanced breeding lines *viz.*, FCH 245, FCH 246, FCH 247 and FCH 248 were identified as better performers after three years of evaluation. Two lines *viz.*, FCH 246 and FCH 248 performed consistently well in all the years and thus were contributed to IVT for further evaluation in ANIPT.

INTRODUCTION

Tobacco (*Nicotiana tobaccum* L.), a self pollinated crop, is one of the most important non-edible commercial crop in India. India is the world's third largest producer of FCV tobacco with an estimated annual production of around 800 million kilograms. Tobacco is being cultivated in an area of about 0.47 million hectares, accounting for 0.32 percent of the total arable land in the country. Flue-cured Virginia (FCV) tobacco in Karnataka is grown as rain fed crop in about 100 thousand hectares each year in the light soils comprising Mysore, Hassan, Davangere and Shivamoga districts popularly known as Karnataka Light Soils (KLS). The production of Flue-cured Virginia (FCV) tobacco in KLS amounted to approximately 107 million kilograms in the year 2018. The quality of tobacco produced in KLS is on par with the best in the world and is in great demand for export purpose. But in Karnataka, yield levels of FCV tobacco is around 1693kg/ha, which is lower than the national average. Tobacco in KLS is under cultivation with a single variety (Kanchan) for a long period (2000 to till now), which is not desirable. Hence, with an aim to diversify the tobacco cultivation with newer high yielding varieties, evaluation of seven advanced breeding lines generated through crosses involving Bhavya, Rathna, Kanchan with Cocker 371 Gold and NC 89 through pedigree method was undertaken at ICAR- Central Tobacco Research Station, Hunsur, Karnataka during the crop season 2016-17, 2017-18 and 2018-19. The relevant results are discussed in the present paper.

MATERIALS AND METHODS

Among the pedigree selections of crosses involving parents Rathna , Kanchan, Bhavya, C3716G and NC -98, a total seven breeding lines consisting of five lines from cross Rathna X C371G, and one line each from cross Kanchan x C371G and Rathna x NC9 were found to be homozygous, superior and stable in progeny row trials (Table 1) . These seven entries were evaluated along with two standard local checks Kanchan and FCH-222 in Randomized Block Design(RBD) with three replications during the crop season 2016-17, 2017-18 and 2018-19 at ICAR- Central Tobacco Research Station, Hunsur, Karnataka. Plant population of thirty six plants in each plot was maintained with the spacing of 100 cm between the rows and 55 cm between the plants. Standard agronomic package of practices of KLS were followed during crop growth period. Observation in respect of green leaf yield, cured leaf yield, bright

Key words: FCV tobacco, KLS, potential yield, advanced breeding lines

leaf yield, incidence of pests and diseases were recorded. Top Grade Equivalent (TGE) was estimated using the standard formula. Leaf samples were analysed at CTRI Rajahmundry for quality parameters *viz.*, nicotine, reducing sugars and chloride.

Table 1: Details of the lines tested and their parentage

Sl no.	ABL	Parentage
1	FCH 245	Rathna Cocker 371Gold
2	FCH 246	Rathna Cocker 371Gold
3	FCH 247	Rathna Cocker 371Gold
4	FCH 248	Rathna Cocker 371Gold
5	FCH 249	Kanchan Cocker 371Gold
6	FCH 250	Rathna Cocker 371Gold
7	FCH 251	Rathna NC 89

RESULTS AND DISCUSSION

Seven advance breeding lines *viz.*, FCH 245, FCH246, FCH 247 FCH 248, FCH-249, FCH 250 and FCH251 were evaluated for their performance in RBD trials during the crop seasons 2016-17, 2017-18 and 2018-19 against standard checks Kanchan and FCH222 for yield and quality at ICAR- Central Tobacco Research Station, Hunsur. The results of individual crop seasons are presented in table 2. The results revealed that in the first year of evaluation (2016-17), two lines viz., FCH 245 and FCH 248 were found to be significantly superior in terms of all the yield parameters. Line FCH 245 recorded highest green leaf yield of 16015 kg/ha, cured leaf yield of 2300 kg/ha, bright leaf yield of 2377 kg/ha and TGE of 1058, while line FCH248 was second best with 1549kg/ha green leaf yield, 2079 kg/ha cured leaf yield,1361 kg/ha bright leaf yield and 1523 TGE. Second year crop season (2017-18) results also revealed significant differences among the lines tested. Even though, none of the advanced breeding lines were significantly superior to checks, the line FCH248 was found to be numerically superior over checks in terms of all yield parameters. Third crop season (2018-19) results indicated that four lines *viz.*, FCH245, FCH 246, FCH247 and FCH248 were found to be significantly superior in all yield parameters over the standard checks.

The results of the pooled analysis of variance (2016-17, 2017-18 and 2018-19) indicated

Table 2: Performance of advance breeding lines in individual years under KLS conditions.

Genotypes	Green Leaf Yield (kg/ha)			Cured Leaf Yield (kg/ha)			Bright Leaf Yield (kg/ha)			TGE		
Year	2016-17	2017-18	2018-19	2016-17	2017-18	2018-19	2016-17	2017-18	2018-19	2016-17	2017-18	2018-19
FCH 245	13758	15273	15506* (26)	1891	2011	2209* (27)	1302	1312	1479* (26)	1379	1430	1635* (27)
FCH 246	16015* (20)	15303	15186* (24)	2036* (18)	2036 (3.5)	2161* (25)	1377* (18)	1336 (4)	1468* (25)	1508* (19)	1467 (3.8)	1615* (25)
FCH 247	13727	15621	15252* (24)	1839	2038	2229* (28)	1276	1335	1508* (28)	1358	1444	1661* (29)
FCH 248	15849* (19)	16393 (12)	14873* (21)	2079* (20)	2103 (7)	2168* (25)	1361* (16)	1382 (8)	1450* (23)	1523* (20)	1489 (5)	1597* (24)
FCH 249	13712	12985	14020	1791	1691	2049	1183	1089	1376	1315	1215	1515
FCH 250	13500	13652	11514	1750	1786	1724	1147	1130	1147	1279	1283	1273
FCH 251	13318	14836	14121	1804	1938	2047	1218	1273	1406 (20)	1341	1385	1539* (19)
Kanchan (C)	13364	14636	11205	1730	1968	1567	1170	1283	1035	1265	1414	1147
FCH 222 (C)	13319	14864	12265	1720	1967	1736	1179	1236	1177	1247	1376	1292
S.E.M ±	630	628	711	79	79	107	48	57	75	61	58	79
CD at 5%	1889	1883	2132	238	237	321	145	171	225	182	NS	237
CV%	7.76	7.33	8.94	7.43	7.03	9.33	6.72	7.82	9.71	7.73	7.25	9.28

* Significant at p=0.05, Figures in parenthesis indicate percent improvement over better check

significance of treatments and seasons indicating variation in performance of lines and seasons (Table 3). The variance of season treatment was significant for all characters indicating that the seasons are affecting the performance of lines due to variability in climatic conditions which is of common occurrence in FCV tobacco crop as reported by Gopalachari, (1984). Significant season treatment effect was documented for green leaf yield, cured leaf yield, (Murthy *et al*, 2014a; Murthy *et al.,* 2014b; Panda *et al*, 2010), grade index (Murthy *et al*, 2014a; Panda *et al*, 2010), yield and grade index (Sadeghi. *et.al.,* 2011; Qaizar Ahmed *et al.*, 2016).

The results of pooled analysis of data (Table 4) indicated that the four lines *viz.*, FCH 245, FCH 246, FCH 247 and FCH 248 were significantly

Table 3: Combined analysis of variance over three seasons (2016-19)

Source	DF	Greenleaf yield	Cured leaf yield	Bright leaf yield	TGE
Season (S)	2	39.9284*	1.3373*	0.3141*	0.4380*
E(A)	6	4.1203	0.5310	0.0515	0.0320
Treatment (T)	8	47.6436*	7.1354*	0.4706*	0.5365*
S T	16	12.5874*	3.8896*	0.1037*	0.1412*
E(B)	48	6.2765	5.5800	0.0544	0.0643

* Significant at p=0.05

Table 4: Performance of lines in terms of yield parameters pooled over three years (2016 to 2019) under KLS conditions (kg /ha).

S.N.	Entry	Green LeafYield	Cured leafYield	Bright Grade	TGE
1	FCH 245	14845*(10)	2037*(12.5)	1364*(14)	1481*(13)
2	FCH 246	15502*(15)	2078*(14.7)	1394*(16.8)	1530*(17)
3	FCH 247	14867*(10)	2035*(12.4)	1373*(15)	1487*(13)
4	FCH 248	15705*(16)	2117*(17)	1398*(17)	1559*(19)
5	FCH 249	13572	1843	1216	1348
6	FCH 250	12888	1754	1141	1278
7	FCH 251	14092	1930	1299*(8.8)	1422*(8.5)
8	Kanchan (C)	13053	1752	1165	1269
9	FCH 222 (C)	13498	1811	1194	1311
	S.E.M±	379.6	52	35.3	38
	CD at 5%	1052	143	98	107
	CV%	8.01	8.04	8.26	8.18
	Seasons				
	2016-17 Mean	14062	1848	1246	1365
	2017-18 Mean	14840	1949	1264	1389
	2018-19 Mean	13771	1988	1338	1475
	S.E.M±	178	26	20	16
	CD at 5%	614	90	69	54
	CV%	6.49	7.01	8.04	5.77
	S Treatments				
	S.E.M±	658	90	61.2	67
	CD at 5%	1822	248	170	184

* Significant at p=0.05, Figures in parenthesis indicate percent improvement over better check

Table 5: Chemical quality traits (%) in cured leaf of the lines tested

Variety	Nicotine		R. Sugars		Chlorides	
	Xposition	Lposition	Xposition	Lposition	Xposition	Lposition
FCH 245	1.58	1.96	14.14	13.96	0.32	0.25
FCH 246	1.09	2.07	13.79	16.31	0.25	0.38
FCH 247	1.28	1.5	10.20	18.11	0.40	0.40
FCH 248	1.10	1.62	12.58	13.89	0.40	0.34
FCH 249	1.77	1.89	9.54	11.23	0.28	0.33
FCH 250	1.45	2.00	14.26	16.93	0.30	0.30
FCH 251	1.25	1.55	13.03	13.55	0.38	0.30
Kanchan (C)	1.24	1.77	11.50	17.44	0.42	0.31
FCH 222 (C)	1.02	1.32	9.81	12.11	0.25	0.47

superior to standard checks in terms of all the four yield parameters (green leaf, cured leaf and bright leaf and TGE). Percent improvement over the better check ranged from 10-15 in green leaf yield, 12-17 in cured leaf yield and 14-17 in bright leaf yield. Among the seasons, 2018-19 was found to be the better season. Among these four lines, FCH 246 and 248 performed consistently well by recording higher cured leaf yields in all the years. Cured leaf yield increment over the standard checks in line FCH248 and FCH 246 and were in the range of 17-19% and 15-17% over the years. The leaf chemistry measured in terms of Nicotine, Reducing sugars and Chlorides of lines tested (Table -5) were in the acceptable range.

Four advanced breeding lines *viz.*, FCH 245, FCH 246, FCH 247 and FCH 248 were identified as better performers after three years for evaluation of which two lines *viz.*, FCH248 and FCH 246 performed consistently well in all the years and thus were contributed to IVT for further evaluation in ANIPT.

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