JS-62 AND JS-117: HIGH YIELDING AND LOW TAR FCV TOBACCO LINES

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A number of promising high yielding low tar tobacco lines were developed in a breeding programme at CTRI Research Station, Jeelugumilli and among them, nine selected lines were assessed in a replicated trial (2003-06) at the Station. Two entries JS-62 and JS-117 recorded significantly higher leaf yields of all types over both the controls viz., CM 12 and Kanchan. JS-62 recorded 24% increase in cured leaf yield (2290 kg/ha) and 21% in grade index (1456) over Kanchan. Line JS-117 recorded an increase of 18% in cured leaf yield (2167 kg/ha) and 16% in grade index (1393) over Kanchan. Based on the overall performance of lines during individual years and on the basis of pooled analysis, these two lines were promoted for multilocation testing under AINRP(T) during 2006-07. In the IVT and AVT trials conducted at CTRI RS, Jeelugumilli, performance of the lines JS-62 and JS-117 was found to be comparable to control, Kanchan with mean cured leaf yield of 2203 and 2205 kg/ha, respectively. In the bulk trial conducted during 2009-10 and 2010-11, JS-62 and JS-117 recorded 1276 and 1388 kg/ha mean cured leaf yield, respectively, against 1205 kg/ha in Kanchan.   These lines recorded an increase of 6 and 15% in cured leaf and 10 and 22% in grade index than Kanchan, respectively. The line JS-62 was developed from a cross between Mc Nair 135 x CM-12 and JS-117 from a cross between Kanchan and D1. Morphologically, JS-62 is broad leaf type like CM-12 and JS-117 is narrow leaf type like Kanchan. The tar content in these lines was found to be 13-20% lower than the check variety, Kanchan. Therefore, with low tar content and comparable yield levels to Kanchan, these lines can be released as low tar varieties for northern ligt soils of Andhra Pradesh. The lines can also be used in further breeding programmes aimed at reducing tar levels in FCV tobacco.

INTRODUCTION

In spite of its commercial importance, tobacco is considered to be harmful to the users. Higher concentrations of smoke tar (nicotine free total particulate matter), carbon monoxide and tobacco specific nitrosamines (TSNA) in tobacco products are the chemical substances responsible for tobacco related health problems. Reduction of tar and TSNA in tobacco varieties is essential for the production of safer tobacco (Lakshminarayana, 1998). Reduction of TSNA in burley tobacco and smoke tar in FCV tobacco are important research objectives (Sarala *et al.*, 2005) as these components are respectively high in those tobacco types. Tobacco grown in northern light soils (NLS) area of Andhra Pradesh is considered as semi-flavourful and has good demand in the international market. The smoke tar content in these tobacco ranges from 24-30 mg/cig (Gangadhar, 2010). A breeding programme was initiated for reducing tar content of NLS tobacco at CTRI Research Station (CTRI RS), Jeelugumilli and a number of low tar (18-20 mg/cigarette) and high yielding lines were developed. Assessment of selected promising lines for developing a low tar variety with high yield and better quality is discussed in the present paper.

MATERIALS AND METHODS

In the breeding programme intended for the development of promising high yielding low tar tobacco lines, number of advanced breeding lines were developed. Among them, nine selected lines were assessed in a replicated trial (2003-06) at CTRI RS, Jeelugumilli. Two promising entries identified from the replicated trial were promoted to AINRPT trials and tested under IVT (2006-07), AVT (2007-09) and bulk (2009-10) trials at CTRI RS, Jeelugumilli.

Chemical quality parameters of the breeding lines were estimated during 2005-2006. Tar content of cured leaf samples (middle picks) of the promising lines *viz.*, JS-62 and JS-117 during 2005-2006 were estimated by Filtrona Smoking Machine (CSM Model 400) after making cigarettes.

RESULTS AND DISCUSSION

In order to develop promising high yielding low tar lines, selected lines were crossed with popular varieties of NLS *viz.*, CM-12 and Kanchan. The segregating generations were handled by pedigree method. Number of advanced breeding lines was selected from the segregating generations. Among the breeding lines selected, nine stable lines viz., JS-62, JS-115, JS-119, JS-125, JS-96, JS-116, JS-117, JS-128 and JS-129 were assessed along with checks, Kanchan and CM-12 for three consecutive years in a replicated trial (2003-06) at CTRI RS, Jeelugumilli. Mean leaf yields over the years were significant among the lines (Table 1). The line JS-62 and The line JS-117 recorded significantly higher leaf yield over the controls CM-12 and Kanchan. JS-62 recorded 24% increase in cured leaf yield (2290 kg/ha) and 21% in grade index (1456) over Kanchan. JS-117 recorded 18% increase in cured leaf yield (2167 kg/ha) and 16% in grade index (1393) over Kanchan. Based on the overall performance of lines during individual years and on the basis of pooled analysis, the lines JS-62 and JS-117 were promoted for testing under AINRP (T) trials during 2006-07.

Table 1: Leaf yields of breeding lines (2003-06)

S.No	Line / Variety	Green leaf (kg/ha)	Cured leaf (kg/ha)	Grade index
1	JS-62	13957*[2](25)	2290*[2](24)	1456*[2](21)
2	JS-96	10420*[1]	1745*[1]	1108*[1]
3	JS-115	11061*[1]	1827*[1]	1142*[1]
4	JS-116	9451	1568	990
5	JS-117	12907*[2](16)	2167*[2](18)	1393*[2](16)
6	JS-119	9759	1619	1005
7	JS-125	10407*[1]	1705*[1]	1101*[1]
8	JS-128	9481	1590	1000
9	JS-129	11315*[1]	1873*[1]	1231*[1]
10	CM-12	8981	1497	935
11	Kanchan	11167	1841	1202
	Grand mean	10810	1793	1142
	SEm±	**333**	**58**	**44**
	CD (P=0.05)	**923**	**160**	**122**
	CV (%)	**6.91**	**6.97**	**10.70**
Seasons				
	2003-04	8396	1301	796
	2004-05	12789	2164	1377
	2005-06	11244	1913	1253
	SEm±	**130**	**22**	**21**
	CD (P=0.05)	**450**	**75**	**74**
	CV (%)	**9.24**	**9.63**	**11.55**
Seasons x Entries				
	SEm±	**577**	**100**	**76**
	CD (P=0.05)	**1599**	**276**	**211**

*[1] Significantly superior over CM 12
*[2] Significantly superior over Kanchan
Figures in the parentheses are percent increase over Kanchan.

Morphologically, JS-62 is broad leaf type like CM-12 and JS-117 is narrow leaf type like Kanchan. The line JS-62 was developed from the cross between McNair 135 x CM-12 and JS-117 from Kanchan x D-1, through pedigree method of breeding. In the IVT and AVT trials conducted at CTRI RS, Jeelugumilli, performance of the lines JS-62 and JS-117 was comparable to control, Kanchan with a mean cured leaf yield of 2203 kg/ha and 2205 kg/ha, respectively (Table 2). In the bulk trial conducted during 2009-10 and 2010-11, JS-62 and JS-117 recorded 1276 kg/ha and 1388 kg/ha mean cured leaf yield,

respectively, against 1205 kg/ha in Kanchan (Table 3). These lines recorded an increase of 6 and 15% in cured leaf and 10 and 22% in grade index than Kanchan, respectively. Chemical quality parameters *viz.*, nicotine, reducing sugars and chlorides were estimated in all the lines during 2005-06 (Table 4) were in acceptable limits (Prasad Rao, 1999). The tar content in promising lines JS-62 (18.64 mg/cig) and JS-117 (20.92 mg/cig) was lower than than Kanchan (24 mg). The reduction in tar in these lines ranged from 13-22% over Kanchan. The leaf yield of JS-62 and JS-117 is either slightly higher or comparable to

Table 2: Performance of JS 62 AND JS 117 in co-ordinated varietal trials at CTRI RS, Jeelugumilli (2006-09)

Trial	Green leaf (kg/ha)			Cured leaf (kg/ha)			Grade Index		
	JS-62	JS-117	Kanchan (C)	JS-62	JS-117	Kanchan (C)	JS-62	JS-117	Kanchan (C)
IVT(2006-07)	13444	13000	13722	2398	2335	2476	1426	1267	1480
AVT-I(2007-08)	13958	14135	13500	2070	2042	2029	1373	1231	1361
AVT-II(2008-09)	12760	13635	13094	2142	2238	2204	1471	1474	1417
Average	13387	13590	13439	2203	2205	2236	1423	1324	1419

Table 3: Performance of JS 62 and JS 117 under bulk trial (2009-11)

Season	Green leaf (kg/ha)			Cured leaf (kg/ha)			Grade index		
	JS-62	JS-117	Kanchan (c)	JS-62	JS-117	Kanchan (c)	JS-62	JS-117	Kanchan (c)
2009-10	10150	12358(18)*	10508	1549	1919(20)	1604	875(6)	1049(27)	828
2010-11	6538(21)	5569(3)	5394	1003(25)	856(6)	806	465(20)	436(12)	388
Average	8344(5)	8964(13)	7951	1276(6)	1388(15)	1205	670(10)	743(22)	608

*Values in parenthesis are increase over controll

Table 4: Chemical quality parameters (%) of breeding lines (2005-06)

S. No.	Line/ entry	Nicotine	Reducing sugars	Chlorides
1	JS-62	2.38	14.17	0.76
2	JS-96	2.83	15.95	0.66
3	JS-115	2.67	11.41	0.55
4	JS-116	3.45	12.93	1.31
5	JS-117	2.07	10.32	0.74
6	JS-119	2.60	1078	1.17
7	JS-125	2.50	13.67	0.74
8	JS-128	4.82	8.66	0.42
9	JS-129	3.59	13.34	0.64
10	CM-12	3.98	9.62	0.80
11	Kanchan	3.84	12.82	0.56

Kanchan and the tar contents are relatively low. Hence, these lines after due testing can either be released as low tar varieties for northern light soils area of Andhra Pradesh and can also be used as parents in breeding programmes for reducing tar levels.

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