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ArR-27: A PROMISING *HOOKAH* TOBACCO LINE FOR SANDY LOAM SOILS OF UTTAR PRADESH

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ArR-27, is a high yielding *Hookah* tobacco line developed through hybridization between Azad Kanchan x Patiyali during 2003. The plants are about 65-85 cm (topped), internodes are 5-6 cm, stem thick with medium dark green colour, leaves are moderately puckered dark green very long, broad, thick body, creamish brown coloured with prominent light coppery brown midrib. The line has yield potential of 3400 kg/ ha in sandy loam soils under irrigated conditions. In the Station replicated trials (2009-11), ArR-27 gave 27.36 and 23.85% increase in cured leaf yield respectively over the popular check variety Azad Kanchan and SK-417. The line ArR-27 showed significant superiority over the popular checks viz; Azad Kanchan and SK-417 in multi-location trial's conducted under All India Network Research Project on Tobacco during 2011-14. In station bulk trial's and on-farm trials, it was superior over the ruling variety Azad Kanchan. In the physical and chemical leaf quality characters, smoke character and manufacturing quality , ArR-27 was better than the check variety, Azad Kanchan. In view of the high yield and good leaf quality the line ArR-27 was identified for release for commercial cultivation in *Hookah* tobacco growing sandy loam soils of Uttar Pradesh.

INTRODUCTION

Tobacco is an important commercial crop grown under irrigated conditions of Uttar Pradesh. It is grown in about 23,112 ha with a production of 28614 mt. of cured leaf. The average yield of tobacco in Uttar Pradesh is 1238 kg/ha due to unpredictable and extreme climatic conditions and low soil fertility. Of late, due to the abnormal increase in cost of cultivation with low productivity, the *hookah* tobacco cultivation is becoming uneconomical. Hence, there is an urgent need to improve the productivity of tobacco to make its cultivation viable in Uttar Pradesh. In the current study, performance of ArR-27 an improved line developed through hybridization between Azad Kanchan x Patiyali during 2003 at Tobacco Research Station, Araul, C.S. Azad University of Agriculture and Technology, Kanpur (U.P.) was presented.

MATERIALS AND METHODS

The ArR-27 is a high yielding *hookah* tobacco variety developed through hybridization between Azad Kanchan x Patiyali during 2003. After identifying its phenotypic superiority and performance in preliminary studies, a station varietal trial was conducted from 2009-11 and on the basis of performance, it was promoted to multi-location testing under the All India Network Research Project on Tobacco (AINRPT) during 2011-14. The data recorded were subjected to statistical analysis (Gomez and Gomez, 1984). The line ArR-27 was evaluated in bulk trials (2014-15) and on-farm trials (2016-17). It was evaluated under varying agronomical conditions like, planting method, time of planting, spacing, on fertilizer levels and topping levels. Observations on morphological characters and yield parameters were recorded. Cured leaf samples were analysed for physical and chemical quality (Hanumantharao, *et.al.* 1980) characters at CTRI, Rajahmundry (A.P).

RESULTS AND DISCUSSION

Performance of ArR-27 in yield trials

In the station varietal trials, cured leaf yield of ArR-27 were significantly superior over the check varieties in 2009-10 and 2010-11 and in combined analysis (Table 1). The highest cured leaf yield of 3755 kg/has was recorded during 2010-

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11. On average ArR-27 produced 3053 kg/has cured leaf yield which were 27.36 and 23.85% more than the popular check variety Azad Kanchan and SK-417, respectively. ArR-27 also exhibited significantly superior performance in the multi-location trials conducted under AINRPT during 2011-14 (Table 2). The bulk trials results (2014-15 and 2015-16) indicated the superiority of ArR-27 which produced 10% and 4.53% higher yield of cured leaf over the Azad Kanchan while 13.79% and 6.58% over the SK-417 (Table 3). On-farm trials conducted during 2016-17 recorded

Table 1: Performance of ArR-27 in Station varietal trials at Tobacco Research Station, Araul, CSAUA&T, Kanpur (2009-11)

Test Variety	Cured leaf yield (kg/ha)			% increase over	
	2009-10	2010-11	Mean	Azad Kanchan	SK-417
ArR-27	**2350**	**3755**	**3053-I**	**27.36**	**23.85**
Azad Kanchan (C)	1750	3044	2397		
SK-417(LC)	1800	3130	2465		
CD (P =0.05)	290	225	235		
SE(±)m	120	105	112		
CV%	9.5	12.5	10.37		

Table 2 : Performance of ArR-27 under multi location trials in AINRPT (2011-14)

Trial/ Year	Test Variety	Cured leaf yield (kg/ha)	% increase over	
			Azad Kanchan	SK-417
IVT (2011-12)	ArR-27	3350	13.06	22.58
	Azad Kanchan	2963	—	—
	SK-417	2733	-	-
	(P= 0.05)	244		
	SE(±)m	105		
	CV%	5.23		
AVT-1(2012-13)	ArR-27	2777	19.54	13.35
	Azad Kanchan	2323	—	—
	SK-417	2450		
	(P= 0.05)	240.32		
	SE(±)m	111.12		
	CV%	9.50		
AVT-2(2013-14)	ArR-27	2436	11.28	12.05
	Azad Kanchan	2189	—	—
	SK-417	2174		
	(P= 0.05)	187.78		
	SE(±)m	82.33		
	CV%	6.71		
Combined	ArR-27	2607	15.56	12.76
Analysis	Azad Kanchan	2256	—	—
(2013-14	SK-417	2312		
	(P= 0.05)	190.75		
	SE(±)m	73.93		
	CV%	9.12		

Table 3 : Performance of ArR-27 under bulk trials and on-farm trials.

Trial/ Year	Test Variety	Cured leaf yield (Kg/ha)	% increase over Azad Kanchan	% increase over SK-417
Bulk Trial (2014-15)	ArR-27	1650	10.0	13.79
	Azad Kanchan	1500	—	—
	SK-417	1450		
Bulk Trial (2015-16)	ArR-27	2995	4.53	6.58
	Azad Kanchan	2865	—	—
	SK-417	2810		
On-farm trial(2016-17)	ArR-27	3385	13.02	17.13
	Azad Kanchan	2995	—	—
	SK-417	2890		

13.0% and 17.13% increase in cured leaf yield over the popular check variety Azad Kanchan and SK-417, respectively (Table 3).

Response to spacing and fertility levels

The performance of ArR-27 with three doses of N, P and K fertilizers (F_1 = 140-50-50, F_2 = 160-50-50 kg/ ha and F_3= 180-50-50 kg/ha), two spacing (S_1 = 45 x 45 cm and S_2 = 60 x 45 cm) is presented in Table 4. The cured leaf increased with the increase in fertilizer does. Highest yield of cured leaf (3412 Kg/ha) was recorded in the treatment of 180 Kg N/ha. A spacing of 45X45 cm recorded higher cured leaf yield (31021kg/ha) with respect to spacing of 60x45 cm (2922 Kg/ha).

Table 4: Effect of fertilizers and spacing on yield parameters on (2017-18)

Item	Cured leaf yield kg/ha ArR-27	Azad Kanchan	SK-417
Spacing cum fertilizer experiment Yield, kg/ha (Under recommended dose) N-180 Kg N/ha) spacing 45x45cm			3412 2965 2910
FERTILIZER (%) gain when under other doses			
F_0	-	-	-
F_1 (140 Kg/ha)	2650	2450	2480
F_2 (160 Kg/ha)	2975 (+12.26%)	2710 (+10.61%)	2750 (+10.88%)
F_3 (180 Kg/ha)	3412 (+14.69%)	2965 (+9.41%)	2910 (+5.82%)
SPACING			
S_1 (45 x 45 cm)	3102	2806	2765
S_2 (60 x 45 cm)	2922	2610	2661

F_1: 140:50:50, F_2: 160:50:50, F_3: 180:50:50 NPK kg/ha

Table 5: Average Reaction against viral disease.

Varieties	Disease Incidence (%)	
	TMV	Leaf Curl
ArR-27	2.20	3.10
Azad Kanchan	2.90	3.30
SK-417	2.75	4.16

Average reaction against insect pest (%) under natural condition Pest incidence

Year	Variety	No. of plants scored/ year	Aphids			Leaf eating cater pillar
			High	Medium	Low	
2014-15	ArR-27	100	-	-	5	3
	Azad Kanchan	100	-	-	5	5
	SK-417	100	-	-	5	4
2015-16	ArR-27	100	-	-	4	6
	Azad Kanchan	100	-	-	5	5
	SK-417	100	-	-	6	5
Average	ArR-27	100	-	-	4.5	4.5
	Azad Kanchan	100	-	-	5	5
	SK-417	100	-	-	5.5	4.5

Pest and Disease Incidence

The line ArR-27 was moderately resistant to tobacco mosaic virus and tobacco leaf curl virus . Further the reaction of ArR-27 against the major disease and insect under natural and artificial conditions was less to the popular check variety, Azad Kanchan.

Table 6: Leaf Chemistry characters of ArR-27 in comparison to checks.

Name Trial	Name of Entry	Nicotine %	TRS%	Chlorides %
IVT	**ArR-27**	4.00	-	-
	Azad Kanchan	-	-	-
	SK-417	-	-	-
AVT-I	**ArR-27**	-	-	-
	Azad Kanchan	-	-	-
	SK-417	-	-	-
AVT-II	**ArR-27**	-	-	-
	Azad Kanchan	-	-	-
	SK-417	-	-	-
Bulk Trial	**ArR-27**	**4.09**	**0.18**	**2.10**
	Azad Kanchan	4.82	2.63	1.66
	SK-417	4.36	2.85	0.78
ON –FARM TRIAL	**ArR-27**	**4.09**	**0.18**	**2.10**
	Azad Kanchan	4.85	2.63	1.66
	SK-417	4.36	2.85	0.78
AGRONOMICAL TRAIL	**ArR-27**	**4.55**	**0.42**	**0.73**
	Azad Kanchan	3.60	0.23	0.77
	SK-417	3.78	0.38	0.53

Table 7: Physical quality appraisal of ArR-27 with checks.

Characters	Max. Marks	ArR-27	Azad Kanchan	SK-417
Size	10	9	6	8
Body	10	10	6	7
Aroma	10	9	7	8
Colour	20	17	15	16
Total Marks	**50**	**45**	**34**	**39**

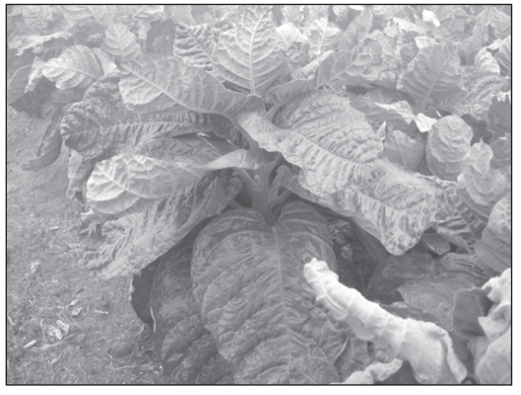
Physical and Chemical Characters

The chemical and physical quality characters ArR-27 and ruling variety Azad Kanchan are presented in Table 6. nicotine, reducing sugars and chlorides levels were well within the acceptable ranges (Gopalachari, 1984). The leaf constituents viz; nicotine reducing sugars and Chlorides and comparable with ArR-27 and Azad Kanchan (Table 6)

Distinguished features of ArR-27

The plants of ArR-27 grow about 90-110 cm height with open habit and 65-85 cm height when topped. Internodes are medium (5-6 cm), stem is thick with medium dark green leaf lamina is very long (42-50 cm), broad (32-36 cm), dark green. The plant produces a total of 20-22 leaves with 12-14 economic leaves. Average weight of 100 cured leaves of ArR-27 is about 1.5-2.0 kg against 1.25 to 1.50 kg in Azad Kanchan and SK-417. Cured leaf have good ripeness and aroma.

In view of the superior performance of ArR-27 in a number of locations both in experiments and in farmer's field over years and favourable manufacturing characters, the line was identified by Varietal Identification Committee in during X Tobacco Group Meeting at ICAR-CTRI,



Single Plant View

Performance of ArR-27 at Farmers Field

Cured Leaf Sample

Performance of ArR-27 at Farmers Field

Rajahmundry (A.P.)- 2018 for release to the *Hookah* tobacco growing sandy loam soils of Uttar Pradesh

Farmer's Feed Back

Farmers who visited the FLD plots were convinced with the performance of newly released variety ArR-27 under real farm situation. Farmers have shown interest to grow the variety ArR-27 because of its vigorous growth and high yield potential. Majority of the farmers were impressed with the performance of the variety ArR-27 and expected to occupy 35-45% tobacco growing zone of Uttar Pradesh during 2019-20

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