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VARIATION IN ETHER SOLUBLE EXTRACTIVES OF FLUE-CURED TOBACCO IN DIFFERENT PRIMINGS

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Flue-cured Virginia (FCV) tobacco (*Nicotiana tabacum* L.) is a highly quality conscious crop. Total ether soluble extractives (ESE) include almost all the lipid components and higher levels of ESE are considered to be a positive attribute for tobacco quality. ESE content was estimated in six FCV tobacco cultivars viz., Kanakaprabha, Jayasri, Jayasri (MR), Hema, Gauthami and VT-1158. In general, in all the six varieties significantly higher levels of ESE were observed from 2nd to 6th primings over 1st priming. The ESE content increased in cured leaves when compared to the corresponding green leaf in all the varieties and in all the primings. ESE content varied between 8.25 to 10.73% among the six cultivars when averaged over all the stalk positions. The variety Kanakaprabha showed significantly higher levels of ESE compared to other varieties followed by Jayasri, Gauthami, Jayasri MR, Hema and VT1158. The ESE content increased significantly from 1st to 4th priming but it was at a par among 4 th, 5 th and 6th primings. In all the varieties except VT1158, the ESE content was more than 10% in the 4 and 5th primings.

INTRODUCTION

Flue-cured Virginia tobacco (*Nicotiana tabacum* L.) is one of the important commercial crops grown in India and is a highly quality conscious crop. Quality of tobacco is influenced by quantity and source of manures, climatic conditions, cultural practices, genotypes, leaf position on the stalk and method of curing. Tobacco is multilevel harvesting crop and leaves are harvested from the bottom whenever the leaves mature. Hence, the leaves present in the middle (L position) and top (T position) will remain for more days on the plant and chemistry of these leaves will be different from the lower leaves. A wide variety of chemical constituents were reported in flue-cured tobacco leaf including lipids and sterols. The cell membrane constituents of tobacco influence the mildness of tobacco smoke (Bruckner, 1963). Sterols and lipids are the two major membrane components of tobacco (Mazliak, 1973). However, fatty acids influence the burn rate of tobacco and its smoke (Stedman, 1968). Lipids and sterols are under genetic (Davis, 1970) and environmental (Stedman, 1968) control and contribute to the major ether soluble extractives (ESE). Cultural practices and genotypes are known to influence the level of certain chemical constituents (Sims *et al.*, 1975). The levels of tobacco lipids increase as the leaves mature (Grunwald *et al.* 1977). Total ether soluble extractives include almost all the lipid components and the total ESE content represents the quality of a particular type of tobacco. In this paper, an attempt has been made to study the variability in the levels of total ESE due to genetic composition and the leaf position on stalk in cultivars of flue-cured tobacco grown in traditional black soils.

MATERIALS AND METHODS

Six FCV tobacco cultivars *viz.*, Kanakaprabha, Jayasri, Jayasri (MR), Hema, Gauthami and VT-1158 were grown in a randomized block design with three replications, at CTRI Farm, Katheru during 2005-06 adopting the recommended package of cultural practices. Leaves were primed as and when they matured from bottom to top. All leaves on the plant were harvested in 6 primings and were kept separate throughout the curing and processing. Cured leaf samples were collected from all the six primings *viz.*, 1st (bottom), 2nd, 3rd, 4th, 5th and 6th (top). Midribs of all the leaf samples were removed, lamina portion was dried in the hot air oven at 60°C for 6 hours, powdered, passed through 40 micron mesh and used for estimation of ESE. Leaf powder (5 g) was taken into a Whatman thimble, cotton plug was placed at the top to evenly distribute the solvent as it drops on sample during extraction and the thimble was placed in the butt tubes of the Soxhlet extraction apparatus. The extraction was carried

for 7 h with 150 ml of ether by gentle heating. After extraction, the flasks were cooled and ether was removed using rotary flash evaporator. The flasks were dried in the oven to remove traces of ether at 70°C, cooled in a desiccator and weight was recorded after attaining constant weight. Values of ESE are expressed in per cent (Grunwald *et al.*, 1977) and results were statistically analyzed (Panse and Sukhatme, 1957).

RESULTS AND DISCUSSION

The data (Table 1) showed wide variation in the levels of ESE with respect to the variety and leaf position on the stalk in both green and cured tobacco. In the green leaf, ESE content increased with increase in the leaf position except in a few cases. In all the varieties, higher ESE content was recorded in the samples from 3rd, 4th, and 5th primings compared to samples from 1st and 2nd primings. However, in the varieties Jayasri, Jayasri MR and VT 1158, the ESE content decreased in the samples from 6th priming compared to 5th priming. There was no significant variation between 4th and 5th primings in all the varieties except the variety Kanakaprabha. The variety Kanakaprabha showed maximum ESE content in the 1st priming whereas it was lowest in the variety Hema. The maximum content of ESE was in the 6th priming of Kanakaprabha among all the varieties and primings. The ESE content decreased significantly from 5th to 6th primings in the variety Jayasri whereas it significantly increased from 5th to 6th primings in the variety Hema and non-significant increase was observed in the varieties Kanakaprabha and Gauthami. The ESE content increased in cured leaves when compared to the corresponding green leaf in all the varieties and in all the primings.

The ESE content of cured leaf was maximum in the 6th priming of variety Kanakaprabha whereas it was lowest in the 1st priming of the variety Hema (Table 1). The ESE content increased from 1st to 5th priming, whereas it decreased from 5th to 6th primings with the exception of Kanakaprabha where the increase was non-significant. In the variety Kanakaprabha, the ESE content was at a par in the first three primings and was significantly higher in the 6th priming compared to 4th and 5th primings. In the variety Jayasri, the ESE content was at a par among 3rd to 6th primings whereas there was a significant decrease from 5th to 6th primings. The ESE content was at a par among 3rd to 6th primings in the variety Jayasri MR. Jayasri is one of the parents to Jayasri MR and showed significantly higher levels of ESE over Jayasri MR. The ESE content was at a par among the 4th to 6th primings In the varieties Hema, Gauthami and VT1158.

The interaction between varieties and primings was significant (Table 2). Total ether soluble extracts varied between 8.25 to 10.73% among six cultivars when averaged over all the primings. The variety Kanakaprabha showed significantly higher levels of ESE compared to other varieties. In respect of ESE content, varieties Hema and VT1158 were at a par whereas varieties Jayasri and Gauthami were at a par with significantly higher ESE content than Hema, VT1158 and Jayasri MR. Jayasri MR, a TMV resistant variety, showed significantly lower levels of ESE over its parent Jayasri. The ESE content increased significantly from 1st to 4th priming but it was at a par among 4th, 5th and 6th primings. The increase in ESE content was non-significant from 4th to 5th primings. In all the varieties except VT1158, the ESE content was more than 10% in the 4th and 5th primings and also in the 6th priming with the exception of variety Jayasri where the ESE content was 9.17%. The variety Kanakaprabha was considered as a dark cast variety based on the dark green colour of the leaf which indicates the higher levels of chlorophyll pigments, which may be responsible for the higher ESE content (Grunwald *et al.*, 1977).

It is concluded that the ESE content was low in the leaf of 1st priming whereas no specific trend was observed after 4th priming. There was an increase in the levels of ESE from 1st to 6th priming with an exception of 6th priming where there was a non-significant decrease in ESE content when compared to 5th priming in some varieties. ESE content was at a par among 4th, 5th and 6th primings indicating that the good quality leaf will be from the middle and top positions of the plant. The differences among flue-cured varieties in ether soluble extractives and fatty acids have been reported (Chu *et al.*, 1972). Grunwald *et al.* (1977) reported lower levels of crude lipids in bottom

Table 1: Variation in total ether soluble extractives (%) in green and cured FCV tobacco grown in TBS

Priming	Kanakaprabha		Jayasri		JayasriMR		Hema		Gauthami		VT1158	
	Green	Cured	Green	Cured	Green	Cured	Green	Cured	Green	Cured	Green	Cured
1	9.04	9.23	6.76	6.98	6.08	6.26	5.22	5.46	8.11	8.46	6.04	6.14
2	9.08	9.64	9.20	9.75	7.04	8.50	7.20	7.34	8.26	8.58	7.12	7.72
3	9.09	9.96	9.46	10.40	8.28	9.02	6.66	7.76	10.09	10.50	7.98	8.31
4	10.12	10.86	10.10	11.028	9.80	10.12	10.02	10.14	9.88	10.12	8.76	8.81
5	10.98	12.00	10.58	11.32	9.90	10.20	8.88	10.09	9.55	10.04	8.66	9.53
6	11.10	12.69	8.69	9.71	9.60	10.34	10.32	10.60	10.66	10.88	8.46	9.00
CV (%)	**3.17**	**6.44**	**5.40**	**7.55**	**5.97**	**8.24**	**5.78**	**6.49**	**6.49**	**7.17**	**5.53**	**6.24**
SEm±	**0.18**	**0.39**	**0.28**	**0.43**	**0.29**	**0.43**	**0.26**	**0.32**	**0.35**	**0.4**	**0.25**	**0.29**
CD (P=0.05)	**0.57**	**1.25**	**0.89**	**1.36**	**0.90**	**1.36**	**0.84**	**1.01**	**1.11**	**1.2**	**0.78**	**0.93**

Table 2: Effect of genotype and priming number on total ether soluble extractives (%) in tobacco cured leaf

Varieties	Priming No.						Mean
	1	2	3	4	5	6	
Gauthami	8.46	8.58	10.70	10.12	10.04	10.88	9.76
Hema	5.46	7.34	7.76	10.14	10.09	10.60	8.56
Jayasri	6.98	9.75	10.40	11.28	11.32	9.17	9.90
J ayasriMR	6.26	8.50	9.02	10.12	10.20	10.34	9.07
Kanakaprabha	9.23	9.64	9.96	10.86	12.00	12.69	10.73
VT1158	6.14	7.72	8.31	8.81	9.53	9.00	8.25
Mean	7.08	8.59	9.32	10.22	10.53	10.53	
		SEm±		**CD (P=0.05)**		**CV (%)**	
Varieties		**0.16**		**0.45**		**7.4**	
Priming		**0.17**		**0.46**			
Variety X Priming		**0.4**		**1.12**			

leaves and an increase with ascending stalk position and observed that higher levels of ESE are positively correlated with aroma in FCV tobacco.

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