

Composition Studies on Tobacco.

X. Total Paraffins and Total Sterols in Relation to Burley Tobacco Grades

Introduction

Attempts by workers to correlate chemical composition and quality of tobacco leaves have been numerous. Perhaps one of the most worthwhile efforts has been a continuing collaborative study initiated some time ago by the Tobacco Division, Agricultural Marketing Service, United States Department of Agriculture and undertaken by several government and industrial tobacco laboratories. Recently, the results obtained by this group for the 1951 and 1952 crops of domestic burley tobacco have been published (Phillips and Bacot, 1958). The data in this report include values for forty-four chemical constituents or physical properties obtained on twenty-three U. S. grades of burley leaves. Correlations between composition and grade were found in some instances.

Unfortunately, studies of this type are frequently handicapped by the lack of specific analytical methods for a given chemical compound or class of compounds. Although no correlation may be observed between quality and levels of substances obtained by non-specific analytical procedures, e.g. waxes, it may be that a correlation actually exists with a specific compound or class of compounds within the broad group of substances responding to the analytical procedure, e.g. paraffinic hydrocarbons in waxes. The present paper investigates this point in the case

of waxes and paraffins. In addition, the levels of total 3- β -sterols in various United States grades of burley tobacco are reported.

It should be noted that surveys of paraffinic hydrocarbon and sterol levels in various aged and fermented tobacco have been previously reported (Stedman and Rusaniwskyj, 1959a, b). These results indicated that the paraffinic contents of various tobacco types were relatively constant. Since this work was performed on commercially acceptable tobaccos of good (and possibly uniform) quality, it appeared desirable to extend the survey to various grades of a given tobacco type even though constant values were found in previous work.

Methods

The samples of burley grades were the same as those employed in the collaborative study cited above. These samples had been obtained from auction markets and carefully selected and graded by United States Department of Agriculture tobacco inspectors and buyers from the tobacco industry. All samples were ideal representatives of the 1952 crop and consisted of leaf webs ground to pass a 1 mm mesh sieve.

Total paraffinic hydrocarbons and total (free and bound) 3- β -sterols in twelve of the samples were determined by the methods specific for these compounds which have been previously described. In the present work, 10 g and 5 g samples of tobacco were extracted for the hydrocarbon and sterol analyses, respec-

tively; in most cases, the reported values represent single determinations.² A sample of aged B3F burley tobacco analyzed in a past study (Stedman and Rusaniwskyj, 1959a) was run concurrently with each set of current samples as a control in the sterol analyses. This was necessary since it was found that a slow rate of siphoning of the extractors gave values lower than those obtained in past work. Six siphonings per hour gave values equivalent to previous levels and were used in the current study.

Values for waxes were taken from the collaborative study discussed above. The analytical method for waxes used by the collaborator consisted of the following: extraction of ground tobacco with petroleum ether, evaporation of the solvent, dissolution of the residue in warm absolute ethanol, chilling of the alcoholic solution, filtration of the resulting precipitate, dissolution of the precipitate in diethyl ether, weighing of the residue after evaporation of the ether and oven-drying.

All analytical values reported herein were corrected for moisture contents. A check of random tobacco samples showed that their moisture levels³ had not changed significantly (<1 percent) since being determined in the collaborative study; therefore, corrections for moisture were made

¹Eastern Utilization Research and Development Division, Agricultural Research Service, United States Department of Agriculture.

²The limited amounts of tobacco samples available prohibited extensive replicate determinations.

³Determined by heating for 3 hours at 100° C in a forced-draft oven.

using these previously determined levels (Agricultural Marketing Service, personal communication). Also, the analytical value for sample X4L was corrected for sand using the value reported in the study (Agricultural Marketing Service, personal communication).

Results and Discussion

Table 1 lists the values obtained for total waxes, paraffinic hydrocarbons and sterols.

The levels of paraffins varied from 0.25 to 0.34 percent for all grades. The flyings and cutters showed a striking uniformity of paraffin concentration, the different grades and colors varying by less than ± 10 percent. Among the pairs of samples having the same group and color, some tendency was noted for the lower grades to show higher paraffin levels; however, the differences were not sufficiently large to establish a conclusive correlation. These findings are in contrast to those of Kurilo (1930) and Bruckner (1936) who reported a significant, direct relationship between quality and paraffin level using non-specific analytical procedures.

Comparison of wax and paraffin levels is of interest. Waxes were generally higher in concentration and showed a wider range of variability than paraffins. In one instance (C2F) the level of waxes was less than that of paraffins, and in another instance (B2FR) both showed the same value. Since the method for waxes should include paraffins⁴ plus other substances, an anomaly is evident. The cited values for waxes may be too low since the petroleum ether extract from which the waxes were obtained had the second highest concentration of all the grades.⁵ Although petroleum ether and Skellysolve B⁶ were used as extracting solvents in the wax and paraffin determinations, respectively, similar if not identical substances should be extracted with these solvents; thus, it is improbable that this difference in solvents would invalidate direct comparisons of wax and paraffin levels and contribute to the anomaly.

The range of levels of total phytosterols was quite similar to that of the paraffinic hydrocarbons. The cutters appeared to have slightly more

⁴The method used here for waxes is sometimes employed to determine "paraffin waxes"; the non-specificity of this procedure has been previously discussed (Stedman and Rusaniwskyj 1959b).

⁵Phillips and Bacot, *loc. cit.*, p. 79.

⁶Use of a specific commercial product does not constitute endorsement by the United States Department of Agriculture.

Table 1. Levels of paraffinic hydrocarbons, sterols and waxes in various U. S. grades of burley tobacco, 1952 crop

Grade	Waxes**	Percentage*	
		Paraffins	Sterols
Flyings X2L	0.43	0.30	0.31
	X4L	0.35	0.31
	X4R	0.45	0.34
Cutters C2L	0.39	0.31	0.35
	C4L	0.40	0.33
	C2F	0.24	0.34
	C4F	0.43	0.33
Leaf	B2F	0.37	0.29
	B4F	0.42	0.32
	B2FR	0.27	0.27
	B4FR	0.35	0.33
	B4R	0.31	0.25

*Moisture-free basis. The value for paraffins in X4L was also corrected for sand content since this grade was the only sample in which sand exceeded 2 percent.

**Data from Phillips and Bacot, 1958, p. 81.

phytosterols than the flying and leaf grades. No correlation between grade and total phytosterol concentration was observed.

Summary

Levels of paraffinic hydrocarbons and 3- β -sterols (free and bound) in various United States grades of cured burley tobacco were determined. The tobacco samples were those previously investigated in a collaborative study initiated by the Agricultural Marketing Service, United States Department of Agriculture.

The levels of paraffinic hydrocarbons in the various grades did not vary widely. Among samples having the same group and color but different quality factors, a tendency for the lower grades to show higher paraffin concentrations was noted. However, the differences were not sufficiently large to establish a conclusive correlation.

The range of values for total phytosterols approximated that found for paraffins, and no correlation was found between United States leaf grade and phytosterol concentration.

Literature Cited

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