



BROWN & WILLIAMSON TOBACCO CORPORATION

RESEARCH & DEVELOPMENT

FILE NOTE

TITLE: DS SCAN RESULTS ON SEVERAL MENTHOL CIGARETTES (NOTE 7)/329.

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ABSTRACT

Tobacco (total blend) from six cigarette brands: KOOL KS, KOOL MILDS (KS), KOOL XL, Newport Box, Salem KS, and Salem Box was analyzed by DS scan.

The results indicated that Newport Box is not similar to the other menthol brands, except some similarities with KOOL XL. At least part of the Newport peculiarities are due to the paper recon used in these cigarettes.

Salem KS and Salem Box showed a series of differences between them. In the whole set of samples, these two RJR products are somehow closer to KOOL KS or KOOL MILDS.

INTRODUCTION

The purpose of this study was to find differences and similarities between the total blend from six menthol cigarettes: KOOL KS, KOOL MILDS KS, KOOL XL, Newport Box, Salem KS, and Salem Box. (Newport Box and Newport soft cup are supposed to have the same blend). The analyses applied were DS scan and several routine methods. The results of the study are described in this report.

This DS scan study will be continued with additional analyses on the blend components of the same cigarette brands.

RESULTS AND DISCUSSION

Six menthol cigarettes: KOOL KS, KOOL MILDS KS (KOOL MLD), KOOL XL, Newport Box, Salem KS, and Salem Box were analyzed by DS scan, and by several routine procedures.

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By directly inspecting the DS scan chromatograms there were several findings:

Most differences in chromatograms are only quantitative.

The chromatogram for Newport showed certain small peaks which were different from KOOL family or Salem family. The identification of these small peaks (which is still tentative) indicated that they are carbohydrate related compounds. Further work is needed to find if these differences may reveal anything special.

The only obvious qualitative difference was found in Salem KS which uses hydrogenated corn syrup (sorbitol and maltitol identified in the DS scan).

The quantitative comparison of the DS scan data for the total bland tobacco of the six samples, obtained by using the selected similarity index (SSI) is given in Table 1. The diagonal values of the SSI in Table 1 show the comparison between duplicates of the same recon sample (values above 92% - 93% of the SSI show no practical difference between the samples, or some differences in only very few compounds).

Table 1

Selected Similarity Index for several Menthol Brands

	KOOL KS	KOOL MLD	KOOL XL	Newport	Salem KS	Salem Box
KOOL KS	93.5	91.6	85.8	80.5	80.8	83.6
KOOL MLD		92.8	84.6	82.0	81.7	86.3
KOOL XL			97.6	87.3	75.1	78.6
Newport				95.6	76.5	80.9
Salem KS					92.9	83.4
Salem Box						95.4

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Table 1 showed that there are certain overall differences between the six analyzed cigarettes (regarding the compounds seen by DS scan). For the KOOL family Table 1 shows as expected good similarity between KOOL KS and KOOL MLD, and lower similarity with KOOL XL. KOOL XL is more similar to Newport. The RJR cigarettes are closer to KOOL KS than to KOOL XL or Newport. The two Salem cigarettes (KS and Box) showed also significant differences between them.

A more detailed evaluation of the data was required to identify the type of compounds where the differences are more pronounced. The normalized area count values for a series of compounds in the DS scan are given in Table 2. Some routine analytical data which were available are given in Table 3.

Inspecting the data from Table 1, Table 2 and Table 3, several conclusions can be drawn:

- Only KOOL XL and Newport showed signs of synthetic sugar ammonia chemistry. The levels of deoxyfructosazines (DF's) in these two products was about equal, and double the levels in the other brands. Although KOOL XL contains EBR which has elevated levels of DF's while the Newport paper recon has lower levels of DF's. The presence of higher phosphate level in the two brands (coming from the paper recon) probably determined the higher level of DF's in the total blend.
- The level of reducing sugars in all samples was rather similar except in Newport which was slightly higher.
- The level of sucrose showed a set of differences. KOOL XL had the highest levels, followed by KOOL KS and KOOL MLD (which were close together). Newport had a rather low level of sucrose, but not as low as RJR products.
- Citric, and malic acid levels were shown by DS scan slightly higher in Newport. This may come from its paper recon which contains higher levels of these compounds.
- Lactic acid was not found elevated by DS scan in any brand. However, KOOL MLD has 250 ppm lactic acid added in the top flavor (by use of MODATE), which was not identified by DS scan. The difference made by this addition, from the levels of lactic acid commonly found in cigarettes, was too small to be measured by DS scan. Possibly formation of dimers of lactic acid may also have occurred, and these are not measured in DS scan.
- Nicotine level in Newport is higher than in other brands.
- The level of menthol (in tobacco) is about equal in KOOL KS, KOOL MLD, and Salem KS. In the same time, KOOL XL, Newport and Salem Box are lower in menthol.

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In conclusion, DS scan results (confirmed by routine analyses), showed the following:

- ↳ Newport KS tobacco is not similar with other menthol brands, except some similarities with KOOL XL.
- It appears that part of Newport's peculiarities are due to the paper recon used.
- Salem KS and Salem Box showed a series of differences between them. In the whole set of samples, the two RJR products are somehow closer to KOOL KS or KOOL MLD.
- Additional analyses on the blend components of the same cigarette brands is needed for more detailed informations.



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Table 2

The Normalized Area Count for a Series of Compounds in DS Scan.

COMPOUNDS	KOOL KS	KOOL MLD	KOOL XL	Newport	Salem KS	Salem Box
1) Propylene Glycol	1.66	1.62	2.15	1.89	1.55	1.51
2) Lactic Acid	0.04	0.04	0.04	0.04	0.04	0.05
3) Glycolic Acid	0.03	0.03	0.04	0.05	0.05	0.04
4) Prolifne + Sorbic Acid	0.11	0.12	0.13	0.06	0.04	0.00
5) Phosphate	0.38	0.35	0.55	0.46	0.32	0.32
6) Glycerine	6.62	6.74	6.97	9.05	5.53	5.55
7) Phenyl Acetic + Nicotinic Acid	0.28	0.27	0.30	0.25	0.20	0.31
8) Succinic Acid	0.09	0.10	0.09	0.09	0.07	0.07
9) Nicotina	1.70	1.56	1.57	2.14	1.76	1.77
10) Glyceric Acid	0.26	0.24	0.28	0.29	0.25	0.24
11) Menthol	0.64	0.72	0.49	0.51	0.72	0.42
12) Free Malic Acid	1.85	1.03	1.98	2.38	1.78	1.80
13) Pyroglutamic Acid	0.35	0.32	0.41	0.36	0.25	0.28
14) Trihydroxybutanoic Acid(1)	0.17	0.17	0.21	0.19	0.16	0.17
15) Trihydroxybutanoic Acid(2)	0.53	0.52	0.56	0.61	0.46	0.47
16) Arabitol	0.07	0.07	0.08	0.11	0.07	0.06
17) Free Citric Acid	0.14	0.15	0.17	0.18	0.13	0.13
18) Fructose(1)	4.22	4.29	4.28	4.66	3.95	4.45
19) Fructose(2)	2.43	2.65	2.74	2.65	2.42	2.43
20) Fructose(3)	0.12	0.14	0.13	0.16	0.12	0.16
21) Glucose(1)	0.68	0.76	0.73	0.69	0.72	0.79
22) Quinic Acid	1.56	1.45	1.64	1.50	1.30	1.36
23) Glucose + Fructose	2.62	2.90	2.70	2.64	2.48	2.94
24) iso-Inositol	0.49	0.45	0.39	0.59	0.43	0.81
25) Beta-D-Glucose	3.64	4.07	3.78	3.62	3.50	4.09
26) Palmitic Acid	0.09	0.09	0.09	0.09	0.10	0.10
27) Gluconic Acid	0.23	0.22	0.27	0.19	0.20	0.21
28) Inositol	1.37	1.43	1.40	1.55	1.39	1.51
29) Unknown	0.11	0.11	0.11	0.10	0.11	0.11
30) Unknown	0.14	0.16	0.16	0.17	0.17	0.19
31) al-Cambretrienediol	0.04	0.04	0.04	0.04	0.04	0.05
32) be-Cambretrienediol	0.06	0.06	0.07	0.06	0.06	0.06
33) Sac I.S.	0.34	0.36	0.36	0.35	0.35	0.34
34) Sucrose	2.20	1.81	3.44	1.27	0.96	0.95
35) 2,5-Deoxyfructosazine	0.11	0.09	0.16	0.18	0.07	0.08
36) 2,6-Deoxyfructosazine	0.07	0.06	0.14	0.14	0.05	0.06
37) 2,5-Fructosazine	0.02	0.01	0.04	0.05	0.00	0.01
38) 2,6-Fructosazine	0.03	0.03	0.06	0.04	0.00	0.05
39) iso-Chlorogenic Acid	0.10	0.10	0.11	0.11	0.12	0.11
40) Chlorogenic Acid	1.01	1.09	0.95	0.94	0.89	1.04

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Table 3

Routine Analysis Results

ANALYTE	KDDL KS		KDDL HLD		KDDL XL		Newport		Salem KS		Salem Box	
	%	S.D.	%	S.D.	%	S.D.	%	S.D.	%	S.D.	%	S.D.
Acidial pH	5.42		5.52		5.49		5.46		5.31		5.40	
Alkaloids	2.25 ± 0.01		2.07 ± 0.03		1.96 ± 0.00		2.49 ± 0.04		2.37 ± 0.00		2.18 ± 0.04	
Nitrates	1.32 ± 0.02		1.26 ± 0.00		1.03 ± 0.02		1.26 ± 0.05		1.30 ± 0.04		1.24	
Chlorides	0.61 ± 0.00		0.57 ± 0.01		0.56 ± 0.01		0.38 ± 0.00		0.59 ± 0.00		0.58	
Ammonia	0.17 ± 0.00		0.18 ± 0.00		0.23 ± 0.00		0.20 ± 0.00		0.17		0.17	
Fructose	2.83		3.00		2.79		3.61		3.51		2.89 ± 0.02	
Glucose	2.03		2.55		2.55		2.70		2.57		2.05 ± 0.26	
Sucrose	1.98		1.75		2.69		0.94		0.79		0.76 ± 0.01	
Reducing Sugars	6.75 ± 0.41		5.15 ± 0.17		7.61 ± 0.07		9.10		6.8		7.26 ± 0.13	
Total Sugars	10.68 ± 0.15		11.02 ± 0.09		11.76 ± 0.02		11.20		9.8		9.06 ± 0.21	
Phosphates	0.60 ± 0.01		0.53 ± 0.02		0.83 ± 0.01		0.76		0.51		0.46	
Propylene Glycol	0.97 ± 0.02		0.95 ± 0.02		1.28 ± 0.02		1.14		0.85		0.80 ± 0.01	
Glycerin	2.03 ± 0.04		2.16 ± 0.07		1.94 ± 0.04		2.41		1.70		1.59 ± 0.03	
Cocoa	0.28 ± 0.00		0.20 ± 0.00		0.59 ± 0.15		-		0.77		0.71	
Licorice	-		-		1.28		0.48		0.62		0.59	
Menthol	0.42 ± 0.00		0.47 ± 0.02		0.33 ± 0.01		0.34		0.43		0.26 ± 0.01	

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