

Mr. Hugh D. Anderson, May 25, 1960,

3.

extract is removed: $\frac{E_v}{M} > \frac{E}{T}$ there will be, as you point out, a decrease in equilibrium moisture content. These relations mean that, for our example, since the equilibrium moisture content increased, the volatile extract comprised less than 3.6% of the apparent moisture content or less than $.036 \times 14 = 0.504\%$ of whole tobacco.

All these arguments assume that the removal of "waxy" or "oily" materials with hexane does not alter the affinity of dry tobacco substance for water. This seems a rather extreme assumption. We should expect that the removal of this type of compound would render the tobacco somewhat more permeable to water vapour and possibly expose a greater number of active sites for the binding of water. Regardless of the proportion of volatile extract, then, we should expect an increase in equilibrium moisture content.

We are not exactly clear on the meaning of your last paragraph, but we have interpreted it to mean loss in weight of tobacco substance during a process drying operation (for example redrying) and the answer to this is that we have not attempted to measure it.

With kindest regards,

Yours sincerely,

L.C.
L. C. Laporte
RESEARCH & DEVELOPMENT

LCL/FF

c.c. - D. S. F. Hobson, Esq.
Sir Charles Ellis

If volatiles are removed by drying, it would seem that there are good chances of noticing that equilibrium moisture contents are different, and it would be of much value to know which way they go.

Thus with hexane extraction, for example, the equil. conditions was higher m.c. after extraction. (14.2 before, 14.52 after) which confirms the extraction of a volatile material to the extent of 0.52.

Have you ever seen anything similar with tobacco air dried & conventionally dried?

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I am pulling a simple experiment in hand to test this point.

The Newkum cigarette (extracted with CH_2Cl_2) and, assuming they were *dry*, in correctly coded, show that extracted tobacco has an equil. m.c. higher by 0.5% (10.3 vs 10.8%).

Equilib. m.c. of CR1 @ a given T.R.H. is usually higher than ref.

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Mr. Hugh D. Anderson, May 25, 1960,

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Your figure of 10.7% moisture before extraction is therefore incorrect. We do agree, however, that if the extracted portion is not a determining factor in the moisture equilibrium of the tobacco, then the residue after equilibration under the same conditions as the unextracted tobacco will show a higher moisture content of the order of 0.5%.

The calculation could then be modified to:

Before extraction:

82.4 parts dry tobacco substance
3.6 parts non-volatile extract
<u>14 parts "moisture"</u>
100

After extraction: Following your line of reasoning:

82.4 parts dry tobacco substance
<u>14.0 parts "moisture"</u>
96.4

and the moisture content of this is $\frac{14}{96.4} \times 100 = 14.5\%$ with the same end result as your calculations.

With regard to the question of whether we are extracting a volatile component together with the non-volatile extract, it is possible to derive quantitatively the relationship linking volatile extract with equilibrium moisture content after extraction.

t: tobacco substance
Ev: volatile extract
En: non-volatile extract
E: total extract (E = Ev + En)
M: Total apparent moisture
w: Actual water
T: Total tobacco before extraction = t + E+w

Before extraction:

$$\text{"Moisture" content} = \frac{M \times 100}{T} = \frac{100 (t+E+w)}{t + E + w}$$

After extraction (assuming the extraction does not in any way modify the hygroscopicity of tobacco substance).

$$\text{"Moisture" content} = \frac{w \times 100}{t + w} = \frac{100 (M-Ev)}{T - E}$$

When $\frac{Ev}{M} = \frac{E}{T}$ no change in equilibrium moisture content will be observed. If the volatile extract is small so that $\frac{Ev}{M} < \frac{E}{T}$ there will be an increase in equilibrium moisture. If a significant amount of volatile

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IMPERIAL TOBACCO COMPANY OF CANADA, LIMITED

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Research & Development
Recd: 30 MAY 1960
46D

May 25, 1960.

LAST HAD
REF
S. AW
RMB

Mr. Hugh D. Anderson,
 Research & Development Establishment,
 Regent's Park Road,
 Southampton, England.

Dear Hugh:

I wish to reply to the various points raised in your letter of April 27 on extracted tobacco.

Our attorneys have just now completed the preparation of a patent application on the extraction of tobacco for the purpose of reducing the solids content of the smoke. The formal application should be made within the next few days and it is proposed to apply in Canada, Great Britain and the United States. Since the experimental data which we have on the increase in filling resulting from solvent extraction is not as complete as we would like it to be, we have decided to omit any mention of this point in the patent application, but we are preparing to file a caveat on this point in the same countries and this will give us a maximum of one year in which to complete our work and file a patent application. In the event of another application being filed by someone else the date of our caveat gives us priority.

ie -> lower
polymer content

We are not clear what you mean by alteration of the smoke in the direction we should like. As we have mentioned before, the cigarettes made with n-hexane extracted tobacco yield a milder smoke which is, at least partially, a reflection of the lower tar and nicotine yield. As far as we are concerned at the present time, the reduction of tar and nicotine in the smoke is, we believe, the proper direction to alter smoke.

We have done some preliminary breakdown of the extract itself but have not carried it to any detailed extent. For the time being we have put this work aside but hope to return to it after we have obtained more information by means of the micro-tar technique and gas chromatography, on extracted tobacco fractions which appear to have a more predominant influence on tar reduction and taste. We feel that it is these fractions on which we should concentrate our efforts as they should yield a direct relationship between tobacco constituents and tar and taste effects.

With regard to the moisture of the tobacco before extraction it was actually 14% (i.e. as received directly from the factory). From 90 lbs. of tobacco the weight of extract after drying was 3½ lbs. Therefore, the per cent extract was:

$$\text{On a wet basis: } \frac{3.25}{90} \times 100 = 3.6\%$$

$$\text{On a dry basis: } \frac{3.25}{90(1-0.14)} \times 100 = 4.2\%$$

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