

17th July, 1979

THE GR&DC PROGRAMME ON SMOKE TASTE AND
FLAVOUR IMPROVEMENT

INTRODUCTION

The purpose of this note is to explain the approach that is being adopted to improving smoke taste and flavour, the relevance of individual programme items to particular types of product, and the kind of time scales that are envisaged.

GENERAL APPROACH

With the deliberate and drastic lowering of smoke deliveries that has taken place in many markets, it is inevitable that there has been a reduction in the amount of taste formerly associated with a cigarette. There is no obvious or easy solution to the problem of putting back some of the taste that has been lost. For this reason the approach that has been decided upon aims to explore, simultaneously, a number of different avenues, fully realising that the chances of success from any one of them are limited.

In most cases the projects itemised in Sheet 14 aim to result in flavour additives for application to the product. However, in items 1 and 2, which are concerned with the precursors of smoke flavour that are naturally present in tobacco leaf, an alternative approach of attempting to maximise the formation of these precursors through field treatment, or variety selection, or even by plant breeding, will not be overlooked. Elements of this approach are included in item 1(d) of Sheet 14 and in item 2 of Sheet 15.

There is a deliberate emphasis on attempts to develop flavour additives based on materials that are naturally present in the

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tobacco leaf, or in tobacco smoke, on the assumption that such materials offer the best chance of enhancing smoke flavour without imparting "artificial" notes. However, strict adherence to this approach would rule out any consideration of materials such as menthol, which is not without success in some markets. Indeed, it is inevitable that many of the flavour fractions that are generated by the research programme, and that go forward for in-house sensory testing, will be perceived as imparting unusual flavour notes to the cigarette. Rejection based merely on unfamiliarity could throw out some potentially useful flavours, and it is intended to explore consumer reaction to cigarettes carrying examples of unfamiliar flavours in item 4(b) of Sheet 12.

In-house sensory assessment will play a large part in deciding whether individual flavour fractions have potential for commercial use. Suitable sensory techniques will have to be developed, particularly for assessing the effect of materials added to low delivery products whether Virginia, blended or air-cured - cf. items 1 and 2 of Sheet 13. The opinions of others in the Company with expertise in this area will also be sought. It is realised that individual compounds, generated by the research programme, are unlikely by themselves to form the basis for commercial additives, and that successful flavour enhancement is likely to require the formulation of complex mixtures derived from many different types of compound including selected synthetic elements.

INDIVIDUAL PROGRAMME ITEMS

1. Role of Labdanoids/Thunberganoids as Flavour Presursors

Partly through the past work of Dr. W.W. Reid, it is known that these two classes of diterpenes are important precursors of smoke flavour in some types of tobacco. Extensive degradation takes place during the curing and ageing of tobacco to yield a

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whole range of volatile compounds that have been identified in aged Burley and Virginia tobaccos by several groups of workers independently (notably Firmenich, the Swedish Tobacco Company, R.J. Reynolds, Japan Tobacco and Salt Corporation).

Item 1(b) represents the start of an investigation which aims to mimic, in the laboratory, the degradation processes (thermal, chemical, photochemical) that occur during the curing and ageing of tobacco. The starting material will be pure thunberganoids or labdanoids, where available, or suitable extracts of tobacco. Reported sources other than tobacco, e.g. the resin from certain conifer species (item 1(a)), may prove to give higher yields of starting material than tobacco leaf itself. The products of laboratory degradation will be assessed subjectively after addition to cigarettes. Any promising results will offer two alternatives: (1) to develop into a full-scale process, (2) to formulate a similar mixture based on detailed analysis of the products. This is a medium-term investigation, and it would be unreasonable to expect commercially usable flavours in under two years.

Item 1(c) covers two field experiments being conducted in Brazil, the results of which will be available by September, 1980. The first aims to explore the extent to which diterpene levels in the leaf can be manipulated by changes in field practice. Understanding how to maximise the yield of diterpenes could make a contribution in the area of growing tobacco that is more suitable for incorporation into low delivery cigarettes. The second experiment is a preliminary assessment of the flower heads of a particular oriental tobacco strain as a source of a flavour additive. This strain is grown commercially in France, and a flavour extract prepared from the flower heads is added to one of their low delivery air-cured brands. If the first year's experiment is successful, a concerted effort will be made to develop a flavour additive from this source.

Dr. Reid will continue his survey of Nicotiana species and different tobacco types under item 1(d), which will probably

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terminate towards the end of 1980. This should point to useful sources of material, either for direct extraction or for breeding purposes.

2. Role of Carotenoids as Flavour Precursors

In a similar way to the diterpenes, the carotenoids have also been shown to be important precursors of smoke flavour. It is aimed to produce, before the end of 1979, a literature survey on tobacco carotenoids and a report on the analysis of the parent carotenoids in tobacco leaf. The main investigation, under item 2(c), will be an attempt to develop flavour additives from carotenoid degradation products. The approach, and the time scale, will be similar to those already discussed above under item 1(b).

3. Development of Tobacco Flavour Enhancers

The attitude of the Hunter Committee towards cocoa, together with sharply increasing world prices, have led to a search for synthetic alternatives to cocoa under item 3(a). Formulations developed in GR&DC have already found acceptance in some operating companies. Obviously these developments are aimed at blended cigarettes.

In addition to formulating flavours for individual associates on a contract basis, attempts are being made under 3(b) to develop flavour enhancers of more general application to (a) low delivery Virginia products, (b) low delivery blended products. Progress will be reviewed twice yearly.

Samples of commercial flavours will be assessed on a continuing basis under 3(c). In addition, agreement has been reached with one flavour house to cooperate on a more formal basis in developing flavours that are compatible with specific tobacco types. Progress will be reviewed twice yearly.

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4. Evaluation of Tobacco Extract Fractions

Following the successful use by BAT Germany of flavour extracts developed by Bertrand Frères in France, a number of different tobaccos have been submitted to Bertrand Frères for extraction. The extracts are currently being evaluated under 4(a). It should be possible to tell by the end of the year whether this approach is worth pursuing.

Also under evaluation are tobacco extracts obtained using supercritical carbon dioxide in collaboration with a university research team (item 4(b)). The time-scale is similar to 4(a).

Direct aqueous extraction of tobacco in GR&DC has proved unsuccessful as a source of flavour, as reported in 1978. As an extension of that approach, a process that results in the extraction and hydrolysis of a lipid fraction is being examined, and will be reported in August, 1979.

5. Study of Flavour Transfer

On theoretical grounds, flavours for application to the filter of a cigarette appear an attractive alternative to flavours that are added to the tobacco portion, since in low delivery products the latter are attenuated by ventilation/filtration along with the smoke. Ideally, a flavour that is intended to be applied to the filter tow should (a) remain on the tow and not equilibrate with the tobacco and (b) transfer to the smoke when the cigarette is puffed. As a first stage towards developing such flavours, the equilibration process between filter tow and tobacco will be studied using model compounds. Progress will be reviewed in September, 1979.

6. Objective Aroma Assessment

The headspace technique has proved useful in identifying the sources of taints inadvertently picked up by tobaccos, and should be capable of identifying the volatile constituents that

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are responsible for a tobacco's natural aroma. Enhancement of these constituents is one possible approach to flavour improvement. A handbook describing the existing technique, which is based on packed column gas chromatography, is currently being produced (6(a)). Under 6(b) the introduction of capillary columns is intended to increase the resolving power of this technique: progress will be reviewed in August, 1979.

7. Flavour/Irritation Balance

The perception of flavour is affected not only by the concentration of flavour compounds in the smoke but also by the level of other sensations that may tend to mask the flavour. Excessive irritation is likely to have a masking effect, and the importance of the balance between irritation and flavour will be investigated. Progress will be reviewed in December, 1979.

8. Expanded Tobacco

There is no guarantee that casings and flavourings developed for conventional tobacco will be equally effective when used on expanded tobacco. The investigation will be aimed at optimising the casings and flavourings for specific addition to expanded tobacco. Practical work is due to start at the beginning of 1980 and progress will be reviewed twice yearly.

9. Production of Flavourants by Micro-Organisms

Allied to item 1, items 9(a) and 9(b) are attempts to degrade some of the terpenes and norterpenes naturally present in tobacco to volatile flavour constituents, but using specific microorganisms rather than purely chemical degradation. In 9(c) moist tobacco is inoculated with individual species of fungi, and the products assessed for any useful flavour effects. In any of these approaches the experimental work leading up to the stage where a decision is taken to continue or to abandon occupies a matter of months. Successful development of a process leading to a flavour additive would take not less than two years.

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10. Additives Guidance Panel

Any additives for use on tobacco products have to be considered in terms of possible adverse effects. This is a continuing activity.

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