

Canada

Report on Visit to Delhi Research Station, and
Ottawa Research Station, Agriculture Canada 27 - 29 July 1981

The visit was proposed at the Montreal meeting of the Leaf Steering Committee, the main objective being to observe the tobacco breeding programme in operation at Delhi and, specifically, their use of modern genetic techniques.

1. Visit to Delhi Research Station

The authors were accompanied by Mr. R.S. Wade from Imperial Tobacco, Montreal.

a) Plant Breeding

This was discussed with Dr. R.S. Pandeya and Mr. F.H. White. The authors were impressed by the vigour and enthusiasm shown by Dr. Pandeya, who will be responsible for all breeding work with the retirement of Mr. White at the end of this year.

The primary objective of the breeding work is new varieties to meet the needs of Canadian growers, with particular concern being shown for maturity. In relation to the latter, topping date is defined as when at least 1 flower is open on 50% of plants of that variety. Selection of varieties is made after topping and harvest of the first two primings on the basis "that is where the dollar is".

The potential advantages of high nicotine tobaccos in relation to other aspects of smoke delivery are recognised and one variety, M-26, was claimed to have a 6% nicotine content overall. Its tar delivery is normal, yield rather low (1600 - 1800 lbs/acre) and the first results from smoke evaluation in Montreal are considered encouraging. Source of M-26 is irradiated seed of Delhi 34.

Anther culture facilities are available at Delhi; Pandeya considers the technique valuable in speeding up breeding work, but echoes the views expressed by U.S. scientists on its limitations particularly in the first generation.

Somatic hybridization is not in use at Delhi, but plants obtained by it in Ottawa from crossing N. rustica and N. tabacum in this way have been made available to them.

Pandeya also spoke enthusiastically about the extra possibilities from the use of the embryo rescue technique, which allows plants to be obtained from sexual crosses which do not produce fertile seed, and the N. africana crossing which is reported to result in automatic selection for haploid plants without recourse to the laboratory culture stages of anther culture. Neither of these methods is currently in use at Delhi, but Pandeya is obviously keen to apply them when they appear appropriate.

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a) Plant Breeding (continued)

In order to increase knowledge of individual chemical markers in different tobacco types, which can then be used to aid plant selection in a breeding programme, Pandeya has obtained support for a graduate student (Michael Coulthart) at McMaster University. He is studying enzyme patterns of young plants in the hope of finding distinctions to be applied to selection at an early stage of growth.

b) Tobacco Flavour

Dr. W.A. Court has an extensive programme embracing the chemistry of tobacco lipids including those components currently considered to be flavour precursors. He stated that he considered major changes in these components would only be achieved genetically, a view which somewhat contradicted his immediate programme on cultural factors. Two varieties have been identified as having higher than normal concentrations of diterpenes - Queensland A (about double) and Japanese BY-4. Dr. Court showed some reluctance to working collaboratively on the subject. As, in addition, Pandeya requires greater evidence of commitment to enhanced levels of substances other than nicotine before serious plant breeding programmes are established, progress at Delhi towards breeding lines with high levels of flavour precursors is likely to be slow.

Dr. Court supplied preprints of two papers related to flavour precursors, which are of interest to both the Hamburg and GR & DC research programmes. He also undertook to supervise the small experiment involving application of herbicides to tobacco in place of curing.

2. Ottawa Research Station

Somatic hybrids of N. rustica and N. tabacum had been produced originally in Ottawa and then supplied to Delhi. Dr. Keller, head of the Cytogenetics Section, described their work and introduced his greatly enlarged staff. He presented a number of plantlets of their somatic hybrids to Dr. Wilberg, but in the longer term, their work and aims are likely to be more concerned with developing and extending these techniques than applying them to the needs of the tobacco industry. A graduate student, Steve Gleddie, has worked on somatic hybrids involving N. sylvestris and will take up this work again later this year.

There was also an opportunity for a brief visit and discussion with Prof. G. Setterfield of Carleton University, Ottawa. His students are using Nicotiana merely as tools and comparing somatic with sexual hybrids. He appeared amenable to collaboration and it is hoped that it may be possible to obtain samples from some of his plants (through Imperial Tobacco, Montreal) for chemical analysis. The immediate interest would be in relation to smoke flavour, but it may also offer opportunities in breeding for disease resistance.

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3. Conclusions

It was clear that, technically, there was a full understanding of modern genetic techniques at Delhi and, in Dr. Pandeya, a person both willing and able to take advantage of them. In practical terms, there may be some limitations in the extent to which this can happen:

- a) the immediate demands of the plant breeding programme for what the farmer requires now.
- b) the demands on Pandeya's time will increase considerably if a further geneticist is not recruited on White's retirement.
- c) the inability of us (and the industry as a whole) to focus clearly on real targets for the geneticist at the present time.

It was also evident that, at the academic level, plant cell research is being actively pursued in Canada and some of these laboratories may offer useful opportunities for us in allowing access to novel plant material. Participation in such collaboration would strengthen our own know-how and possibly shorten the time required to produce a specific answer. Inevitably, at some time it would also require more practical support such as financing of programmes.

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