STUDIES IN THE ANATOMY OF SUGARCANE STALK*

Part II. Milling Characteristics of Varieties


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I. INTRODUCTION

In sugarcane, all the matter insoluble in water is known as fibre, the quantity of which is distinctly a varietal character affected, to some extent, by the age and conditions of growth. That the efficiency of milling was determined by this quantity was well known long time back, and as a general rule, it was stated that the higher the fibre content of a cane was, the greater was the difficulty in milling it.

It was only recently that the effect of the quality of fibre was noted. Dymond (1942) found that although Co 290 contained less of fibre than Co 281, the former was markedly inferior to the latter, because the fibre of Co 290 retained 24-25% more of juice per unit weight of fibre than that of Co 281. Puertas (1943) also noted that juice was more easily expressible from the fibre of some varieties than from that of others. Lower extraction necessitates addition of greater amount of water of imbibition, to evaporate which larger quantity of fuel is required, with the result that the cost of production is increased, unless the variety yields sufficient bagasse for the purpose. Besides, the quality of fibre affects the economy of factory working also directly in that the bagasse of some varieties is good as fuel, because it burns well and is sufficient for the purpose. Camden Smith as reported by Hedlay (1936) found that bagasse of varieties like Co 301, P.O.J. 2714 and P.O.J. 2725 did not burn well. Dymond (loc. cit.) noted that the bagasse of Co 290 was poorer than that of Co 281, so far as its steam raising quality was concerned.

It thus becomes essential to determine both quantity and quality of fibre so that these characteristics receive due consideration in the score-card for ultimate selection of seedlings. As would appear from what has been stated above, the problem concerns largely with the study of structural variations in different varieties and in order, therefore, to understand how far

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the anatomical makeup of a cane stalk would be an index of its milling
propensities, varieties dominant at one time or other in the province, viz.,
Co 210, Co 213, Co 299, Co 313 were selected for this study. Co 419 and
Rheora, the latter being one of the main varieties before the introduction
of Coimbatore canes, were also included because considerable difficulty
in obtaining maximum extraction from them was generally reported from
different factories. The bagasse of these varieties was also found to contain
uneconomical quantities of sugar. These six varieties together covered
fairly wide range of milling characteristics.

The present contribution deals only with the quantity of fibre in rela-
tion to major anatomical features. Besides, an attempt has been made to
set out the problem in its various details with a view to focus pointed atten-
tion of workers in the line.

II. MATERIAL AND METHODS

Transverse sections taken from middle internodes of normal healthy
looking stalks of each variety were stained in 1% solution of safranin in 50%
alcohol and mounted in Canada balsam after the usual process of dehydra-
tion. In the preliminary stage the following characters were taken into
consideration.

1. Vascular Bundles—Average number and size in (a) peripheral and
(b) central regions.

2. Thickness of cell walls in (a) Parenchymatous matrix at 0·6 mm.
and 1·2 mm. from epidermis and in centre and (b) Sclerenchymatous vascu-
lar sheaths in peripheral and central regions.

The number and size of vascular bundles were noted in 48 unit areas
(the field of microscope being taken as a unit) in each region. In order that
the unit areas were comparable to one another in different varieties, care
was taken to keep the edge of a microscope-field always touching the
epidermis. The size of vascular bundles was measured in terms of radial
and tangential axes, the product of which gave a highly reliable idea of its
area in cross-section, as reported elsewhere (Khanna and Sharma, 1947).
The thickness of cell walls was measured for two adjacent walls in both the
tissues, averages being taken from 16 readings for each tissue at each depth.

III. RESULTS OF INVESTIGATIONS

The six varieties selected for the study could be placed (Table I) in three
distinct groups, viz., (i) the high-fibre group having Co 299 as an example
(ii) the medium-fibre group to which Co 210, Co 213 belonged and (iii) the
low-fibre group which included Co 313, Co 419 and Rheora.