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STUDIES IN SUGARCANE JAGGERY

V. Macro-Structure of Jaggery.

BY T. VARAHALU, B.A., M. Sc.,

Agricultural Research Institute, Coimbatore.

In previous communications (1, 2) the probability was suggested that the good and bad jaggeries might show marked differences in their gross structure as well as in their micro-texture. In verification of this suggestion, a large number of samples of Jaggery, collected from several parts of the presidency, were examined for their macro-structure and micro-texture. In addition to these, several other jaggeries, the conditions attending the preparation of which were known, were similarly examined. This examination revealed that both structurally and texturally, the two types of jaggery distinguish themselves strikingly from each other. The present paper deals with macro-structure.

The jaggeries collected were classified into good and bad ones on the basis of the physical tests indicated previously (2). Cross sections of the samples were cut, and their photographs taken after smoothening the cut faces. An examination of the sections reveals the mode of distribution of crystalline sucrose and the ground mass of the matrix within the bulk of the jaggery (plate I) and the tendencies in the two types seem to be characteristic of them.

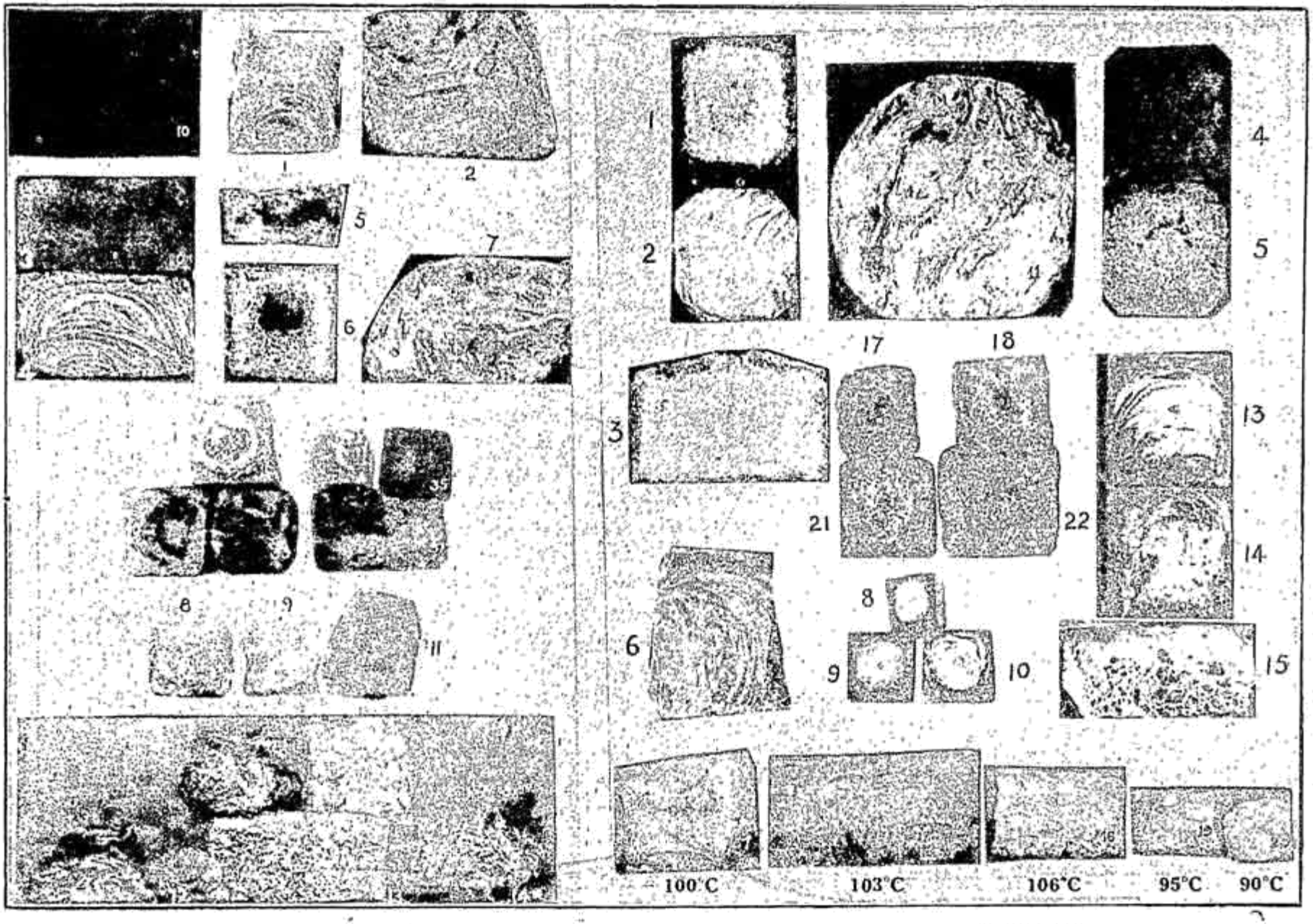
GOOD JAGGERY (Plate 1.)

1. Sucrose occurs as an extensive internal core, and the matrix, as a thin compact envelope or shell over the core (Nos. 1—5, 7—10, 12, 16—18, 21 and 22).

2. Sucrose sometimes disposes itself in wide concentric bands which tend to rapidly coalesce into what approaches an extensive core, and the matrix ranges itself as narrow veins or as envelope on the outside (Nos. 2, 6, 10, 13 and 14).

3. Occasionally sucrose occurs also as wide or extensive patches inter-spersed by thin compact veins or patches of matrix (Nos. 6,7,11, 13, 14 & 19.)

4. Cellular and vesiculer conditions within the sucrose core or its patches seems to be general.



BAD JAGGERIES

GOOD JAGGERIES

Other properties.

5. The sucrose core or patches are dry, hard and highly crystalline. The crystals are cemented together very firmly. The crystals are coarse to the feel, being with sharp angles and well formed edges.

6. The matrix is also hard, compact and adheres strongly to the adjoining core or crystalline patches.

7. The good jaggeries are rigid solids and strongly resist compressional as well as shearing and other forms of stress.

8. In their preparation, the boiling was smooth, the empirical test was answered normally and the temperature of setting was higher and the time taken was short.

BAD JAGGERY (Plate 1.)

1. The bad jaggeries are massive and frequently there exists no well defined structure. The tendency for the differentiation of sucrose into core, and matrix into compact outer shell or envelope, is not quite marked, and where any tendency for this is exhibited, it is very imperfect.

2. Sucrose occurs as scattered patches (Nos 2,5,7 & 10)

3. Sometimes sucrose disposes itself as thin veins separated by wider layers of matrix (Nos 1 & 4)

4. The tendency for sucrose to appear as incipient concentric bands, with, however, no indication to coalesce into extensive cores is noticeable, contrasting thus strikingly with good jaggeries (Nos 1,4 & 31—33.)

5. The very rudimentary character of what corresponds to the extensive crystalline core of the good jaggeries is interesting to notice (Nos 34–37.)

6. Matrix occurs either as extensive patches within the bulk of the jaggery (Nos. 5.) or as wide and less compact outer envelope or as both (Nos. 10, 31—37).

7. Vasicular condition is absent.

8. Sucrose crystals are in general embedded within the matrix.

Other properties.

9. The matrix as well as the sucrose patches are generally damp.

10. Neither the sucrose crystals within a patch or vein, nor the sucrose and the surrounding matrix portions within the jaggery, are adhering to each other with any degree of firmness.

11. The outer shell or the envelope, where one such is present, is plastic and easily yields.

12. Under compressional stress they collapse and react quickly and easily to all other forms of stresses.

13. On grinding they yield pastes of varying degrees of consistency.

14. The sucrose crystals are frequently smooth and soft to the feel.

15. The empirical test was answerd well enough in all cases; but in those which yielded the worst types of jaggeries the test was either not answered at all, or was answered only imperfectly, when it did. The boiling

in these cases was abnormal and is attended with considerable frothing, charring and the production of fumes.

15. The temperatures of setting were low and the times taken were longer.

Both types of jaggeries contain specimens which are of light yellow or brown or of other finer shades of pleasing colours as well as those which are very dark and most unattractive. Obviously the keeping quality of a jaggery seems to be independent of its colour.

The foregoing considerations lead to the inference that the conditions where the good jaggeries are formed were such that the crystallisation of sucrose could proceed quickly, freely and unhampered, and that this process must have met with considerable resistence where bad jaggeries are formed. These and other conditions have already been discussed in the earlier paper (1, 2). This argues for the fact that some at least of the impurities or other foreign materials accompanying sucrose in the two types of jaggeries must be possessing highly contrasting properties ; in the one case, they seem to permit the free crystallisation of sucrose, while in the other, they adversely interfere with the process.

That this is so, and that what these impurities comprise of and where to locate them will be considered in subsequent communications when the chemical composition of jaggeries will be taken up for discussion.

Summary. 1. Macro-structures of several good and bad jaggeries were studied.

2. The structural and other differences noted were found to be typical of the two kinds.

3. It was inferred that the degree of resistance offered for the free crystallisation of sucrose by the impurities accompanying it was the main factor controlling the structure of jaggery. In the bad jaggeries this resistance is great and their structures are therefore ill defined and imperfect, in the good ones, on the other hand, such resistance is either absent or is only negligible, such that the crystallisation of sucrose, and its separation from the matrix are carried to as near completion as possible.

4. The temperature of moulding seems to be an additional factor controlling structures.

5. The drying capacity of the matrix is yet another important factor, but this is mainly determined by the character of the impurities.

6. The hardness of some of the bad jaggeries was shown to be only apparent. It is simply mechanical rigidity maintained by fluid film pressures, but which is mistaken for true hardness.

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