

X-RAY ANALYSIS OF RAGI STARCH

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Crystallinity of starch from six different varieties of Ragi have been studied from X-ray diffraction pattern. The brown varieties B7-7-43, B4-10-56 and T20 are found to be more crystalline than white varieties C09, Indaf-5 and C09 (Mut 23).

INTRODUCTION

X-ray is a powerful method for identification of materials and for their structural characterization. In the present investigation Ragi starch has been analysed by X-Ray diffraction pattern. Adelaide Beleia *et al* [1] studied the peaks of Pearl millet starch. They have observed slight variation in the crystallinity and crystal size of ragi starch has been made in the present case.

Materials : Six varieties of Ragi Eleusine Coracana (L) Gaertn, *i.e.*, B7-7-43, B4-10-56, Indaf-5, T20, C09 and C09 (Mut-23) were used as per the experimental materials. T20 is an early matured brown ragi, B4-10-56, B7-7-43 are brown and mid matured varieties. Indaf-5 is a blackish ragi and belongs to late matured group and C09, C09 (Mut-23) are white and mid matured ragi. Starch was extracted and purified from these Ragi varieties following the method of Adelaide Beleia *et al.* (1980).

EXPERIMENTAL AND DISCUSSION

X-Ray diffraction profiles of the different starch samples were recorded with a Rigaku X-ray diffractometer using nickel filtered CuK radiation in the angular range 5 to 45° 2 θ at a scanning speed of 1/2° 2 θ per minute. The samples were passed in to the sample holders and the conditions of measurement were kept identical for all the samples. The X-ray tube was maintained at 30kV and 10 mA. A portion of the diffractogrammes in the range 10 to 30°C 2 θ for the different starch samples is shown in fig. 1. Peaks are observed at about 15, 17, 18° 2 θ , 23 and 26° 2 θ with slight samples is shown in fig. 1. Adelaide Beleia *et al.* (1980) have also observed slight variation in the crystallinity but have not made any quantitative measurements. Observations of peaks at similar positions shows that all these varieties of Ragi

contain type A Starch. A quantitative analysis of their crystallinity and crystal size has also been made.

B 7-7-43, Co 9, 3. B 4-10-56, 4 Indaf-5, 5, T20, 6, Co 9 (Mut)

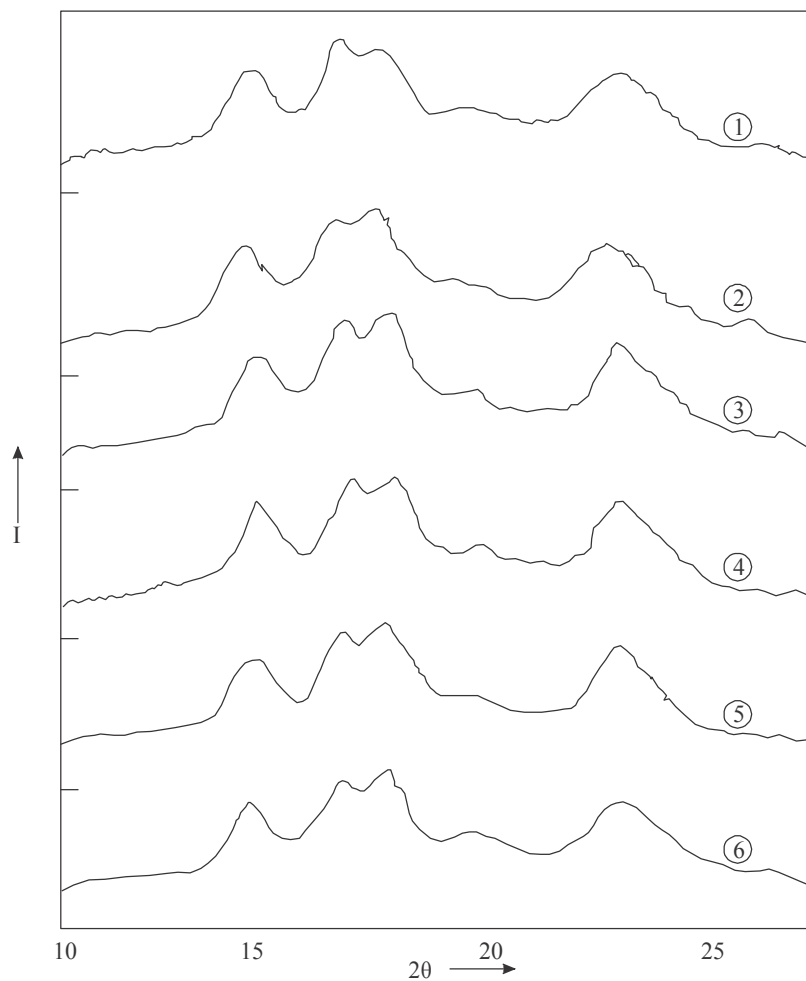


Fig. 1. Portions of the diffractograms for the different Starch Samples.

The degree of crystallinity has been determined from the diffractograms following the methods of Hermans and Weidinger [2]. A plot of the X-ray intensities scattered by the crystalline and amorphous regions of different samples is shown in fig. 2. The different points nicely fit to a straight line establishing that the crystalline peaks have been properly separated from the amorphous halo in each case. The size of the crystalline regions is related to the sharpness of the profiles. The X-ray diffraction peaks are very sharp for samples containing large crystallites. A quantitative estimation of the size of the crystalline domains was made from the half width of the line profiles by using Schener's formula $^3T = K\lambda/\beta \cos \theta$, where β is the half width (in radians) of the X-ray peaks, λ - the wavelength of the radiation, and θ is the Bragg angle. K is a constant take as unity.

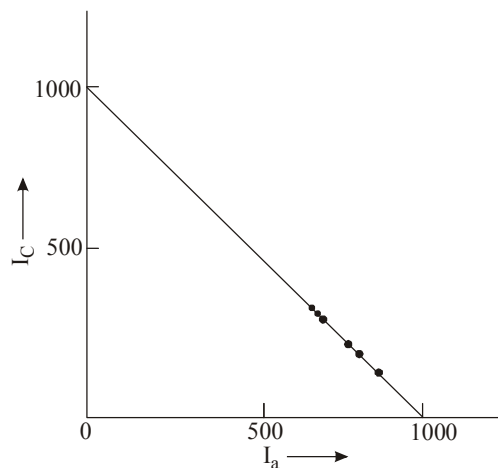


Fig. 2. A plot of the crystalline intensity versus the amorphous intensity in the diffractograms.

The different values of the degree of crystallinity and the size of the crystalline regions is given table-1.

Table 1. Degree of crystallinity and the size of the crystalline regions.

Samples	Varieties of ragi.	Degree of crystallinity (%)	Crystallite size (A.U.)
1.	B 7-7-43	33	120
2.	C 09	15	98
3.	B 4-10-56	32	130
4.	Indaf-5	31	102
5.	T 20	21	90
6.	C 09(Mut-23)	23	120

Thus, it is observed that though the starch samples obtained from different ragi varieties have the same type of structure and give diffraction peaks at same angles, their extent of crystallinity and size of the crystalline regions varies. The varieties B 7-7-43, B 4-10-56 and Indaf-5 have higher crystallite sizes and crystallinity.

REFERENCES

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