Helical Fibrillar Arrangements in Jute

THE results described by Chakrabarti and Nodder in their communication entitled "Some Effects of the Helical Fibrillar Structure of Vegetable Fibres"[1] appear to be based on incorrect fibrillar arrangements. The following comments on the observed effects are, therefore, offered in an endeavour to clarify the issues involved.

The difference between the mean breaking twists, as reported, namely, 4·14–4·05, is about 2·0 per cent, which has no doubt statistical significance, but in view of the possible large error of measurements cannot be accepted as real. Assuming that the twist measurements have been made within an accuracy of 0·1 turns per inch, the error of measurement will then be about 5·0 per cent. Also, the figures for bundle diameters cannot be taken as really different, because in this case the difference between the two figures 1·78 and 1·76 is only about 1 per cent, which is again much less than the possible error of measurements. Increase in the number of observations reduces only the error of sampling ; whereas the error of measurements, being dependent upon the instrument used, cannot be reduced by such means.

Calculating the standard error of the difference of the means for the breaking loads, it will be seen that the difference is significant only with sample A. Similar calculations indicate that the difference in the torsional rigidities is not significant in either of the samples C and D. It appears, therefore, that the differences in the mechanical properties are too small to be of any consequence.

An interpretation of this inappreciable difference can be given on the basis of the observed fibrillar arrangements for jute. X-ray and polarizing microscopic observations tend to confirm the previous results from microscopic study due to Hock[2], according to which the fibrillar arrangements in jute consist of a highly orientated structure of the secondary wall enveloped in a sheath of flat Z-twisted fibrillar wrapping of the primary wall. In flax, the S-twisted secondary wall is enveloped inside the Z-twisted primary wall. Since the drying twist reflects only the direction of the restoring torque tending to bring the fibrils back to their original spiral configurations, it should be clockwise for flax and counter-clockwise for jute. Laboratory observations and also Hock's report confirm this order of the drying twist in the case of jute. With flax, the influence of the primary wall in determining the drying twist is counterbalanced by the overwhelming influence of the secondary wall ; with jute, however, on account of the absence of the spiral arrangement in the secondary wall, the drying twist is decided by the fibrillar arrangement in the primary wall. It does not follow, however, as a necessary consequence that the mechanical properties of jute will be decided by such a thin layer of primary wall, which constitutes only a small fraction of the total cellulose content of the fibres. Inasmuch as the properties, breaking twist, twisted diameter, and breaking load after twisting, are the properties of the bulk of the materials, they should be naturally dependent on the structure of the secondary wall, which in the case of jute is composed of highly oriented cellulose chains. The order of twist, clockwise or counter-clockwise, will, however, have very little, if any, effect on any of these properties. The figures given by Chakrabarti and Nodder indicate, if anything, that the influence of the sense of twist on the mechanical properties is negligible.

The conclusions derived by the authors do not, therefore, seem valid for the following reasons : (1) the observed differences lie within the errors of measurements ; (2) the interpretations of the data have been given on the basis of wrong fibrillar arrangements ; and (3) the explanation given for the contrary relation between the breaking load and the direction of twist is highly improbable.

Another mistake committed by the authors is in regard to the interpretations of the results on torsional rigidity. According to the fundamental definition, rigidity is an intrinsic property of a material depending only upon the shape and the internal structure. It is difficult to understand, therefore, why rigidity values should be different in the two cases of Z- and S-twists. In fact, the rigidity figures given by the authors do not show any such differences, and that is what one would expect.

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[1] Nature, **163**, 19 (1949).
[2] Hock, Amer. Dyes. Rep., **31**, 334 (1942).

Competitive Inhibition of Sulphate Reduction by Selenate

Butlin, Adams and Thomas[1] have described methods for the isolation and cultivation of pure strains of *Desulphovibrio desulphuricans*. In order to grow large numbers of cells for manometric work, it is preferable to use a richer medium than any of those described, and one based on peptone and glucose has been found capable of supporting massive growth of certain strains (up to about 0·8 mgm. dried cells/ml.) in about seventy-two hours, growth being visible in less than twenty hours. Its composition is : glucose 10·0 gm. ; $MgSO_4.7H_2O$, 1·5 gm. ; Na_2SO_4, 1·5 gm. ; 'Difco' peptone, 20 gm., *or* 'Difco' peptone, 5 gm., and yeast extract, 4 gm. ; tap water, 1,000 ml. ; pH 6·3. No addition of iron is necessary, and no ferrous sulphide is precipitated during growth.
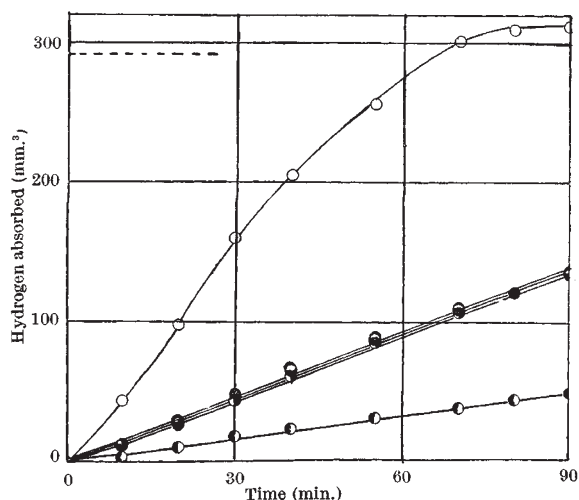

Fig. 1. Competitive antagonism of sulphate reduction by selenate.
○, Na_2SO_4, 1·3 × 10^{-3} M.
◑, Na_2SO_4, 2 × 10^{-1} M ; Na_2SeO_4, 4 × 10^{-3} M.
◕, Na_2SO_4, 2 × 10^{-2} M ; Na_2SeO_4, 4 × 10^{-4} M.
◔, Na_2SO_4, 2 × 10^{-3} M ; Na_2SeO_4, 4 × 10^{-5} M.
◕, no added substrate.
Broken line, theoretical uptake of hydrogen with 1·3 × 10^{-3} M Na_2SO_4