

duction early in 1942, only a matter of months after the original approaches to produce a black sheet metal and plywood substitute were made.

As regards the uses to which the product has been put, only a few need be mentioned as examples. Hundreds of thousands of grease drums have been made and many hundreds of thousands of tea-chests. Some three-quarters of a million "Jutlac" liners for supply-dropping equipment have been produced and hundreds of thousands of square feet supplied and used in the fabrication of military vehicles. As regards jettison petrol tanks for aircraft, several hundred were fabricated which passed all tests satisfactorily; these tanks were chiefly of 45 gallon capacity but also larger tanks of 90 gallon capacity were made. Plans were ready to expand production of these tanks but such did not have to come into operation because of a fortuitous change in the situation. "Jutlac" has been used by the British Military and Air Force Services and by the U.S.A.A.F.; it has been used by the tea industry, the oil industry and by other large industries. It has been used in building construction, for panelling, for racking and for boxes. It also makes serviceable suitcases. Moreover, it has been successfully used, and complaints from the users have been practically nil, perhaps a fitting tribute after three years' experience in usage for so many different purposes. As already stated the material is 100 per cent. an Indian indigenous product, evolved, developed and put into production during a very difficult period. A large-scale research and development plan is in course of projection, which will open out possibilities for the establishment of a new industry entirely indigenous to India.

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 Indian Jute Mills Association,  
 Calcutta, W. G. MACMILLAN.  
 June 6, 1945.

### DETERMINATION OF TOTAL SOLIDS IN MILK

DURING our experience of examination of milk for the prevention of adulteration under the Bombay Prevention of Adulteration Act, it has been found that the Total Solids of milk, when calculated by means of Richmond formula, is generally in excess than that determined by direct gravimetric method. Moreover, when the milk is adulterated either by abstraction of fat, watering, or both, this discrepancy between the two methods is found to be high (see table).

This is so, because the specific gravity of milk is raised by the abstraction of fat and lowered by the addition of water. Hence, by partial skimming and watering, an adulterated sample may possess the same specific gravity as that of genuine milk. In such a case, the Total Solids calculated by Richmond formula will be found higher than the actual present in milk, inasmuch as it will not take into account the adulteration of water, as the specific gravity will be that of genuine milk, even

though abstraction of fat will be accounted for. For such cases, no formula, either for buffalo or cow milk will satisfactorily work,

Sample No.	Specific Gravity, at 60°F.	Fat %	Total Solids % by Richmond formula	Total Solids % by gravimetric method	Excess. By formula
1	1.027	3.4	10.9	8.6	2.3
2	1.023	2.8	9.2	7.0	2.2
3	1.033	3.8	12.9	9.9	3.0
4	1.025	3.0	10.0	8.2	1.8
5	1.023	2.6	9.0	5.8	3.2
6	1.023	2.8	9.2	7.3	1.9
7	1.036	6.8	16.3	15.0	1.3
8	1.037	5.4	15.9	12.6	3.3
9	1.029	4.8	13.1	10.6	2.5
10	1.033	5.6	15.1	12.2	2.9
11	1.034	5.1	14.7	10.9	3.8
12	1.029	4.4	12.6	10.0	2.6
13	1.026	4.2	11.6	9.1	2.5
14	1.042	6.0	17.8	14.2	3.6
15	1.042	6.8	18.8	15.2	3.6
16	1.027	2.3	9.6	8.1	1.5

because specific gravity of milk varies directly as abstraction of fat and inversely as addition of water. Whether, therefore, the specific gravity is normal or otherwise, it is necessary to determine the fat and total solids by gravimetric method.

In this Province Total Solids in milk are calculated on the Richmond formula, in some of the Public Health Laboratories, while in others, by the direct gravimetric method. In view of this, when milk samples under Bombay Prevention of Adulteration Act are sent for analysis from one part of the Province to another, the results are found to be different. Due to this, the accused is given benefit of doubt and acquitted. Hence uniformity of standards as well as methods of analysis and calculation should be laid down by the Central Advisory Board for Food Adulteration, Government of India, for milk and its products.

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 Borough Municipality, C. M. DESAI.  
 Surat, A. H. PATEL.  
 June 26, 1945.

### TAMARIND SEED "PECTIN"

NANJI *et al.*<sup>1</sup> pointed out in a recent issue of this *Journal* that the "pectin" prepared from tamarind seed according to the method of Krishna and Ghose<sup>2</sup> is "not a pectin as ordinarily understood" as it fails to give some of the characteristic pectin reactions and as it contains nitrogenous material. We had occasion to deal with this substance in the course of a systematic investigation on pectins from Indian plant materials completed in this laboratory some time ago and, after examining it in some detail, reached the conclusion that it was not a pectin. The investigation was undertaken mainly with the object of discovering a source of galacturonic acid required for the

technical synthesis of vitamin C. Tamarind seed was the first raw material to be examined as it was stated to contain 60 per cent. of pectin and was available in quantity. But the substance prepared according to the directions given by Krishna and Ghose<sup>2</sup> failed to yield on acid hydrolysis any appreciable quantity of galacturonic acid. When analysed for the calcium pectate number by the quantitative method of Carreé and Haynes,<sup>3</sup> tamarind seed meal gave a zero value indicating the absence of pectin. For further study the material prepared as above was hydrolysed with acid. Hydrolysis with 3 per cent. sulphuric acid for eight hours gave the maximum yield of reducing sugar, viz., 83 per cent. of the weight of substance taken. In this hydrolysate the only sugars that could be identified were l-arabinose and d-glucose. The following quantitative estimations were carried out on the preparation: methoxyl (micro-Zeisel), uronic acid by determination of the carbon dioxide evolved on decarboxylation (Dickson, Otterson and Link),<sup>4</sup> pentose from the amount of furfuraldehyde formed on hydrolysis with 12 per cent. hydrochloric acid (Doree).<sup>5</sup> From these analyses the substance was found to contain methoxyl 1.08 per cent., uronic acid residues 12.59 per cent., araban 33.22 per cent., glucosan 53.11 per cent. Krober's<sup>6</sup> tables were used for calculating the pentosan content; the correction for the furfuraldehyde derived from uronic acid was based upon Norris and Resch.<sup>6</sup>

It is obvious from these results that the substance is not a pectin although it shares with pectin the useful physical property of forming sugar-acid-jellies. Pectin is now known to be a macro-molecule consisting essentially of a chain of galacturonic acid residues in glucosidic union with each other, some of the galacturonic acid units being in the form of the methyl ester (cf. Morrell, Bauer and Link,<sup>7</sup> Schneider *et al.*<sup>8,9,10</sup>). There is at present insufficient evidence to conclude whether the arabinose and galactose usually obtained from pectin preparations are in true chemical combination with the galacturonic acid or only arise from associated galactants and arabans which are not removed in the course of preparation. For the uronic acid content, values as high as 96%<sup>9</sup> has been claimed for specially purified pectins. Ordinary commercial preparations usually contain about 68%<sup>11</sup> uronic acid. The corresponding methoxyl values are 11.6%<sup>9</sup> and 6%<sup>11</sup> respectively.

The low methoxyl and uronic acid content of the tamarind seed preparation as well as the nature of the sugars derived from it preclude the possibility of it being classed with the pectins. It has greater similarity in chemical composition to the mucilages isolated from certain seeds (cf. mucilages from Psyllium,<sup>12</sup> rib grass seed,<sup>13</sup> Indian wheat<sup>14</sup>) which contain in general pentose and hexose sugars in combination with only a small proportion of uronic acid.

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Madras,  
July 12, 1945.

1 Nanji *et al.*, *Curr. Sci.*, 1945, **14**, 129. 2. Krishna and Ghose, *Jour. Ind. Chem. Soc.*, Ind. and News Edn., 1942, **5**, 114. 3. Carreé and Haynes, *Biochem. Jour.*, 1922, **16**, 60. 4. Dickson, Otterson and Link, *Jour. Amer. Chem. Soc.*, 1930, **52**, 1174. 5. Doree, *Methods of Cellulose Chemistry*, London, 1933, 354. 6. Norris and Resch, *Biochem. Jour.*, 1935, **29**, 1590. 7. Morrell, Bauer and Link, *J.B.C.*, 1934, **105**, 1. 8, 9 and 10. Schneider *et al.*, *Ber.*, 1936, **69**, 309, 2530, 2537; 1937, **70**, 1611, 1617; 1938, **71**, 1353. 11. Norman, *Biochemistry of Cellulose, Polyuronides, Lignins, etc.*, Oxford 1937, 75. 12. Anderson and Fireman, *J.B.C.*, 1935, **109**, 437. 13. Mullan and Percival, *J.C.S.*, 1940, **15**, 1501. 14. Anderson and Seeley, *J.B.C.*, 1941, **140**, 560.

### PROCESSING OF SOYA-BEAN FOR THE PRODUCTION OF MILK

DURING recent years, milk shortage in India has assumed alarming proportions. Attention of the public to this important point has been focussed by the daily press. *Indian Farming*<sup>1</sup> has published some important statistical information regarding the extent of shortage. The annual production of milk in India is estimated to be 800,000,000 maunds; but the per capita consumption of milk is only 7 ozs. per day compared to 35 ozs. in U.S.A. The minimum requirement of milk for a growing child is 32 ozs. and 16 ozs. for an adult; so, the supply of milk should be increased to at least three times the present production. This production cannot be achieved for several years to come; so, our attention was directed to the possible utilisation of soya-bean to make up the deficit in our milk supply.

The soya-bean milk has been extensively used throughout the Orient since its discovery by the Chinese philosopher, Wahi Nain Tze-lang, some time before the Christian era. In China the soya-milk is being prepared and used in every household as a daily routine. The soya-bean milk is usually prepared by first soaking the beans for a few hours in water. They are then crushed into a fine texture mash. This is boiled for some thirty minutes in the proportion of three parts water to one of mash. The 'milk' is then filtered through cloth. The 'milk' thus obtained is not very palatable and is slightly coloured. Prepared in the above manner, the nutritive value is also not high. In view of these, we concentrated our attention on the improvement of processing and have been able to prepare a 'milk' which has an agreeable taste and has, at the same time, a good nutritive value.

The nutritive value of soya-bean milk has already been the subject of some study. Tso<sup>2</sup> fed infants successfully with soya-bean milk prepared in the ordinary way and found that in 8 months an average child grew 20.7 cm. and gained 4.1 kg. in weight, a growth record which compares favourably with the average development of breastfed infants. Rittinger and Dembo<sup>3</sup> fed fifty infants for a period of one year with addition of sugar and various salts and they concluded that soya-milk can be made into an adequate food for infants. Recently, Cahill *et al.*<sup>4</sup> studied the biological value of soya-milk prepared by Borden & Co,