

WATER-MELON (CITRULLUS VULGARIS SCHRAD.) AND FOOD-POISONING

UNLIKE in the other countries, notably U.S.A and U. K., the problem of food-poisoning in India has received little attention so much so a large number of instances occur even without our ever recognizing them. That the food-poisoning may occur in the least suspected source as fresh grapes has been pointed out earlier.² On May 6, 1948.³ "The Times of India", reported that eight persons who ate a water-melon were removed to the hospital for treatment of food-poisoning, and added that one of them succumbed to the infection. It was of interest to examine if water-melon could serve as a suitable medium for the growth and distribution of at least the common organisms responsible for food-poisoning.

Bharucha and Bharucha¹ have already studied water-melon in connection with *V. cholerae*. We have now tested the suitability of water-melon juice as a medium for the growth of typhoid and paratyphoid group of bacteria. Water-melon juice was obtained by cutting open triangular pieces from the scrupulously cleansed and sterilized (alcohol) surface portions of the fruits specially selected for the purpose. It was possible to collect sterile juice (as tested by inoculation on MacConkey's agar only) necessary for the experiment by this procedure. The juice collected from each fruit was distributed in 10 ml quantities in sterile tubes and inoculated with 0.1 ml of thin culture-suspensions (made in saline and matching approximately to Opacity Tube No. 1) of surface-grown agar cultures (24-hrs. old) of *E. typhosa* (Watson V. strain N.C.T.C. 5761), *S. paratyphi* (N.C.T.C. 5702), *S. schottmuelleri* (N.C.T.C. 5705), *S. enteritidis* (N.C.T.C. 5765), and *E. coli communis* (N.C.T.C. 415). The tubes were then incubated at the room temperature (30-31° C.) after 0.01 ml portions from each tube were removed for the quantitative estimations of the bacteria seeded in them. Further 0.01 ml aliquots removed from each tube at the end of 3-hrs., 6-hrs., and 24-hrs. were also, after suitable dilutions, employed for the enumeration of the bacteria. In all the cases plates of MacConkey's agar were utilized and the colonies developing on them were counted after incubation for 24-hrs. at 37° C. In every experiment the pH of the juice was also determined. The following table gives the results obtained from a few typical experiments.

The results show that all the tested bacteria grow well in the juice upto the period to which the test lasted. The growths of the *Salmonella* species representing the food-poisoning group (Para B and the enteritis strains) were particularly heavy. The juice samples inoculated with these two bacteria began to give rise to small but visible bubbles of gas within even 2-4 hours after incubation, and the turbidity produced by them in the juice after 24-hrs. growth was of the magnitude of Opacity Tube No. 3 or even No. 4. Moreover these two bacteria indicated some conspicuous cultural changes not exhibited by the other test bacteria. These changes, however, re-

main to be studied in detail. Another important feature in these findings is the influence of the initial pH of the juice on the multiplication of the bacteria and which is evident from the figures above. In conclusion, it may be said that water-melon, if and when contaminated, affords an excellent substratum for the growth of the intestinal bacteria, specially the organisms of the food-poisoning group; it is not therefore surprising that this fruit is known to be associated with outbreaks of food-poisoning.

Expt.	pH	Species	Colony counts per ml of the juice			
			Initial	3 hrs.	6 hrs.	24 hrs.
1	5.6	T	×10 ⁵ 95	×10 ³ 112	×10 ⁴ 25.7	×10 ⁵ 26
		A	108	156	31.1	11.2
		B	168	401	605	181
		E	144	199	294	117
2	5.8	C	94	175	105	360
		T	90	110	115	159
		A	35	255	263	202
		B	290	785	943	651
3	5.9	E	545	935	2790	1943
		C	10	60	300	540
		T	190	205	290	201
		A	230	600	805	203.5
4	6.4	B	14	880	1100	331
		E	95	155	460	299
		C	140	160	580	257.5
		T	150	180	90	985
5	6.6	A	160	525	470.5	657
		B	95	380	342	960
		E	60	730	1388	1888
		C	10	145	116	380
		T	940	1060	6570	960
		A	290	550	4920	660
		B	610	1285	8080	1160
		E	305	695	1180	1260
		C	755	915	4780	689

Legend: T = *E. typhosa*; A = Para A; B = Para B; E = *enteritis*; C = *E. coli*.

Further work on viability and the cultural, antigenic and other characteristics of these bacteria in the juice is in progress.

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THE REFRACTIVE CONSTANT OF WHOLE AND SKIM MILK

THE measurement of refraction in milk as a means of detecting adulteration has already been reported.¹ The studies on adulteration with skim milk¹⁻² showed that while the refractive index remains unaltered,³⁻⁴ the rising density of the product steadily decreases

TABLE I
Limits of Refractive Constant of Whole and Skimmed Cow and Buffalo Milk

Density (20° C.)		R. I. (40° C.)	Refractive Constant	
Whole	Skim.		Whole	Skim
Cow 1.0274-1.0314	1.0342-1.0376	1.3458-1.3471	0.2065-0.2075	0.2059-0.2057
Buffalo 1.0258-1.0330	1.0324-1.0410	1.3471-1.3492	0.2076-0.2033	0.2058-0.2055

the value of the refractive constant. It was felt that elimination of fat, the most variable constituent of milk, might further narrow down the limits of the refractive constant. From the resulting data it would be possible to assess the advantage or otherwise of this value as compared with the refractive constant of whole milk.

45 samples of cow and buffalo milk of various grades of refractive index and density were used for this experiment. After taking the density (lactometer reading) of whole milk, the latter was separated in a hand-worked cream separator up to an upper limit of 0.2 per cent. fat in the skim milk. The density and refractive index (Abbe' refractometer) of the skim milk was then tested. The determinations on both skim and whole milk are given in Table I.

The data show that the limits of the refractive constant of average samples of milk are appreciably lowered and narrowed down by skimming. While for samples of whole cow milk the limits ordinarily lie between 0.2065 to 0.2075,³ for defatted milk they lie between 0.2059 to 0.2065. For buffalo whole milk the constant lies between 0.2076 to 0.2088,³ for defatted milk it is narrowed to 0.2060 to 0.2065 for average samples.

Now, it will be observed that the range of variation of the constant of skim milk of both cow and buffalo are almost identical. This is, of course, to be expected, as the solids-not-fat of the two milks do not differ to the same degree as do their fat contents. But this overlapping in the range of the constant of skim milk robs the advantage of distinguishing the two types of milk, possessed by the non-overlapping refractive constant of whole milk.³ Further, the determination of the constant for skim milk denies the chance of detecting even gross adulteration with skim milk or of defatting.²

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VISCOSITY OF LIQUIDS AND TEMPERATURE

A SIMPLE exponential relationship between viscosity and temperature has been proposed by different authors¹ in various forms, *viz.*,

$$\eta = A \cdot e^{B/T}$$

where η = Viscosity

A and B are constants characteristic of each liquid.

T = absolute temperature.

Recently, certain limitations of this equation have been pointed out by Leontieva.²

In the present note, an empirical relationship between viscosity and temperature has been proposed. When viscosity is plotted against temperature, a curve is obtained. The curvature is substantially diminished on plotting logarithm of viscosity against temperature. On plotting logarithm of logarithm of viscosity against temperature, straight lines were obtained for many liquids. An equation of the following type is, therefore, proposed:

$$\log(\log \eta) = A - BT$$

where η = Viscosity in millipoises,

A and B are constants for each liquid

T = absolute temperature.

In the following table some typical examples are taken and the maximum differences between observed³ and calculated values recorded:

TABLE I

Compound	Temperature range in °C.	A	B × 10 ³	Maximum Per-centage +	Difference
Octane	0-100	0.8036	3.20	1.4	0.7
Nonane	0-100	0.8568	3.16	0.2	1.0
Benzene	0-70	0.9353	3.50	0.3	0.5
Chloroform	0-60	0.6283	2.57	0.5	0
Acetone	0-50	0.7953	3.71	1.4	0.3
Ethyl Iodide	0-70	0.6018	2.45	0	0.2
Ethyl Formate	0-53	0.7864	3.43	1.0	0.1
Butyl acetate	0-100	0.8628	3.16	0	1.0
Acetic acid	25-95	0.8085	2.63	0.8	0.3
Methyl alcohol	0-60	0.9710	3.70	1.8	0.7
Trimethyl carbinol	32-77	1.9385	5.80	1.1	0.5
Ethyl propyl-ether	0-60	0.9470	4.26	2.3	1.0

The case of water deserves special attention. Andrade⁴ found that equation (1) expresses