

five points were allotted to each, the pair difference here being zero. The order of tasting was at random, as was the distribution of the pairs to each taster. The subsequent statistical analysis follows the model laid down by Yates³.

During the first series, six samples were examined by a panel of six tasters, and the analysis of variance takes the following form, in terms of pair difference throughout:

Table 1

Factor	Degrees of freedom	Sums of squares	Mean square	Variance ratio (F)
Samples	5	88.03	17.61	2.652*
Error	85	563.97	6.64	
Total	90	652.00		

* Significant effect $P < 0.05$

If the samples are A, B, C, etc., the 'sample' sum of squares is derived from the expression $\frac{1}{st} (T'_A{}^2 + T'_B{}^2 + T'_C{}^2 \dots + T'_F{}^2)$. Each of the totals T'_A, T'_B , is the sum of pair differences, no correction for the mean being required, where s is the number of samples, t is the number of tasters and the totals T'_A , etc., are derived from a table of the form shown as Table 2.

Table 2

—	S(B-A)	S(C-A)	.....	.....	.....
S(A-B)	—	S(C-B)	.....	.....	.....
S(A-C)	S(B-C)	—	.....	.....	.....
S(A-D)	S(B-D)	S(C-D)	—	.....	.....
S(A-E)	.....	.....	.....	—	.....
S(A-F)	.....	.....	.....	.....	—
Totals	T'_A	T'_B	T'_C	T'_D	T'_E

Mean sample effects are given by $\frac{1}{st} T'_A, \frac{1}{st} T'_B$, etc., and these may be presented as mean scores by the addition of the general mean, that is, 5. The standard error of the difference between these values is:

$$\sqrt{\frac{2 \times \text{error mean square}}{st}}$$

In the first series, bean samples from West African Amelonado, Gold Coast selection E1 and Upper Amazon selection T60 (Parinari × Nanay) were sorted into fully fermented and insufficiently fermented lots, the lack of 'nibbing' and presence of purple pigments being the criteria of insufficient fermentation. The bulk samples from which these were drawn were obtained from basket fermentations containing 40 lb. wet beans⁴. In the second series, unsorted beans of West African Amelonado and T60 were each roasted for 50, 60 and 70 min., and the results are summarized in Table 3 as mean scores.

From these results, it appeared to the local panel that the quality was not affected by the degree of fermentation. With the standard roast (series 1), T60 is markedly inferior to the other types. With an increase in roasting time no significant differences could be detected.

It would therefore appear feasible to apply the incomplete block lay-out to the design of a laboratory assessment panel where a large number of samples have to be submitted to subjective tests.

We wish to acknowledge the help given by the Director of Cacao Research and other members of the staff of this Institute who constituted the assessment panels; and also the British Food Manufacturing Industries Research Association Cocoa

Table 3

	Series 1 Standard roast (55 min.)		Series 2 Length of roast		
	Under fermented	Fully fermented	50 min.	60 min.	70 min.
W.A.A.	5.56	5.22	5.20	5.27	5.13
T.60	4.11	3.00	4.33	5.27	4.80
E1	5.61	5.50	—	—	—
S.E. of a difference	±0.607		±0.445		
Significant difference ($P = 0.05$)	±1.20		±0.886		

Panel for supplying details of a method of preparation of liquors.

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¹ MacLean, J. A. R., *Nature*, **166**, 910 (1950).

² B.F.M.I.R.A. (private communication).

³ Yates, F., *Ann. Eug.*, **7**, 121 (1936).

⁴ Anon., Pamphlet No. W11758/31 Dept. Agric., Nigeria (June 1947).

Distribution of British Freshwater Amphipoda

CONTRIBUTIONS by Hynes¹, Spooner² and Reid³ have recently appeared in *Nature* on this subject. In referring to the spread of *Eucrangonyx gracilis* (S. I. Smith) Spooner states: "It is clear that the canal system has provided this species with an easy means of dispersal. It would be interesting, by a systematic examination of canals, to ascertain the northward limits of its range". It is therefore worthy of placing on record that I found *E. gracilis* in the Huddersfield-Ashton canal at Golcar near Huddersfield (Yorkshire) in July of the present year, this being apparently the most northerly record of this species in Britain to date. In one stretch of the canal it was the only amphipod found after considerable search and was present in some numbers. In an adjoining stretch it was found in company with *Gammarus pulex* (L.) and was considerably outnumbered by this species. Preliminary search of the canal at Marsden, some three miles to the south-west, revealed its presence there, so it is probably distributed throughout that section of the canal which lies to the east of the Pennines.

In an earlier series of communications, Cain and Cushing⁴, and Reid⁵ directed attention to the apparent increase in range of the semi-terrestrial amphipod *Orchestia botta* (M. Edws.). Since that time I have established the existence of a more northerly station for this species, namely, at Huddersfield, and have placed this on record elsewhere⁶. Whether, as Reid suggests, these organisms have been present for some time but have remained undiscovered, or are indeed rapidly spreading northwards, is as yet undecided. Mr. D. M. Reid kindly checked the identity of both the above-mentioned amphipods.

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¹ Hynes, H. B. N., *Nature*, **167**, 152 (1951).

² Spooner, G. M., *Nature*, **167**, 530 (1951).

³ Reid, D. M., *Nature*, **168**, 126 (1951).

⁴ Cain, A. J., and Cushing, D. H., *Nature*, **161**, 483 (1948).

⁵ Reid, D. M., *Nature*, **161**, 609 (1948).

⁶ Fryer, G., *Naturalist*, No. 835, 148 (1950).