of each sterilised and distributed into sterile test-tubes (22 mm. × 150 mm.), and inoculated with 0·5 ml. of a uniform yeast suspension of a 24-hour culture containing 0·4 mgm. of wet yeast per ml. The tubes were placed at a slant and incubated at 28° C. for 24 hours.

Turbidities representing growths were photoelectrically measured and expressed as the percentages of absorption (see Table I).

The results show that:—

(1) Nicotinic acid and inositol are the essential vitamins for the growth of the organism; biotin and pantothen are stimulatory. Lack of these vitamins result in vacuolation or in a poor differentiation of cells.

(2) Other vitamins exert little effect on growth. This is supported by the fact that the growth-rate on a basal medium fortified with only niacin, inositol, biotin and pantothen is as good as that on the all-vitamin medium.

(3) The microscopic appearance of the two cultures are similar showing that the four vitamins satisfy all the normal requirements of the organism.

(4) Liver extract which has given a significantly higher growth and induced a distinctive microscopic picture, appears to contain a growth factor or factors essential to the organism—vitamin or amino acid—other than those investigated.

(5) The adaptability of this yeast as a test organism for the microbiological assay of niacin and inositol is indicated.

Our sincere thanks are due to Sir J. C. Ghosh for his kind interest.

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MICROBIOLOGICAL ASSAY OF NIACIN WITH A SACCHAROMYCES Sp.? ISOLATED FROM COCONUT TODDY

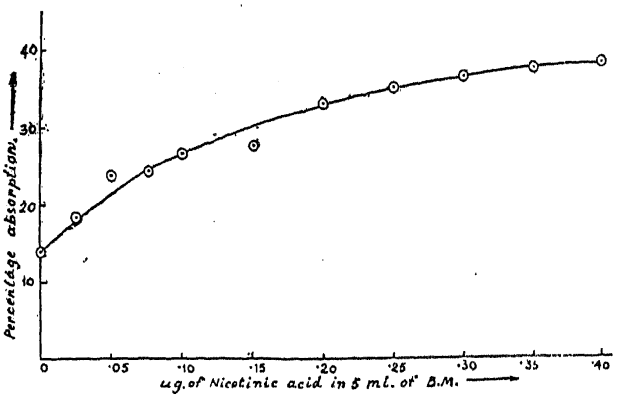
The vitamin requirements of this organism have been determined and the indispensability of niacin and inositol for its growth established.[1] It was of interest to examine the adaptability of the organism for the assay of niacin, and determine the range of concentration which could be estimated.

Basal media containing all vitamins but niacin were compounded. 100 ml. of the medium contained:—Glucose 5 gms., ammonium sulphate 0·4 gm., *l*-aspartic acid 10 mg., *l*-tryptophane 1·2 mg., *l*-cystine 4 mg., *dl*-methionine 4 mg., thiamin 80 μg, riboflavin 80 μg, pyridoxine 80 μg, pantothen 80 μg, *p*-amino-benzoic acid 80 μg, biotin 100m μg inositol 200 μg, solution of salts 12·5 ml. and citrate buffer (pH 4·6) 10·0 ml.

Aliquots of the medium (2 ml.) were distributed into sterile tubes (22 mm. × 150 mm.), graded amounts of niacin added and the volume made up to 4·5 ml. with sterile water. The tubes were inoculated with a washed and uniform suspension of the organism (previously grown on an all-vitamin medium for 24 hours) and incubated for 24 hours at 28° C. Growths of the organism were photoelectrically measured and the results expressed as percentages of absorption (see Table I and Fig. 1).

Medium with μg Niacin	0·0	9·025	0·05	0·075	0·1	0·15
Per cent. absorption	14·5	18·5	24·0	24·5	26·0	27·0

Medium with μg Niacin	0·20	0·25	0·3	0·35	0·4	0·5
Per cent. absorption	32·5	34·5	36·0	37·0	37·5	38·5



It is concluded that (1) the organism is adaptable for the assay of niacin and (2) the assay-range lies between 0 and 0·04 μg per ml., and this method appears to represent a more sensitive method of assay than others so far known.

Our grateful thanks are due to Sir J. C. Ghosh for his kind interest.

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1 Ramachandra Rao, Mistry and Sreenivasaya, *Curr. Sci.*, **1947, 16,** 145.

PHYTOPHTHORA PALMIVORA BUTLER ON *CYPHOMANDRA BETACEA* SENDT. AND *CARICA PAPAYA* LINN.

Two isolates of *Phytophthora* were obtained from two independent sources, one from the stem of tree tomato (*Cyphomandra betacea* Sendt.) with a patch canker from the Fruit Station at Burliar at the foot of the Nilgiris, the other from a rotten hollow stem of a papaw tree in Coimbatore.

Both these isolates did not produce any oospores in pure culture even after three months although sporangia and chlamydospores were produced in abundance in old cultures. Therefore, they were grown in paired cultures with known plus and minus strains of *P. palmivora* available in the Government My-

Isolate with which the *C. betacea* and *Carica papaya Phytophthoras* were grown in paired cultures	Plus strain					Minus strain			
	Areca, S. Kanara	*Areca*, Bombay	*Colocasia*, S. Kanara	*Tomato*, Coimbatore	*C. betacea* Burliar	*Ca. papaya* Coimbatore	*H. ecsulentus*, Coimbatore	*Spondias* S. Kanara	*Areca*, Bombay
Cyphomandra betacea isolate	0	0	0	0	0	X	X	X	X
Carica papaya isolate	X	X	X	X	X	0	0	0	0

X — Oospores formed within four days; 0 — no oospores formed.

cologist's stock culture collection at Coimbatore. The results of these trials are set down below in a tabular form:

These results show that the *C. betacea* isolate is a plus strain of *P. palmivora* and the other a minus strain.

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ON THE ANALYSIS OF BLOOD-GROUP DATA OF PUNJABIES AND MALDIVIANS

KALRA[1] has examined the blood groups of 2,500 Punjabies at I.M.H., Rawalpindi, and of 211 Maldivians at Adder Atoll. This note gives the results of statistical analysis of the data collected by him.

Let p, q and r represent the true gene probabilities of the three allelomorphic genes A, B and O respectively, so that $p+q+r=1$. These true values for Punjabies and Maldivians are, however, unknown, and have, therefore, to be estimated from the samples examined by Kalra. The most efficient estimates of the true gene probabilities are readily obtained by the use of the method of maximum likelihood which has been discussed in full detail by Stevens.[2]

Using the maximum likelihood estimates of the true gene probabilities, the conformity of the blood-group data for Punjabies and Maldivians with the genetical theory advanced by Bernstein[3,4] has been tested by applying the χ^2-test with one degree of freedom. For Punjabies, $\chi^2 = 2{\cdot}25782$ ($0{\cdot}20 > P > {\cdot}10$) and for Maldivians, $\chi^2 = 0{\cdot}10361$ (${\cdot}90 > P > {\cdot}80$). Neither of these values is, therefore, significant at the customary 5 per cent. level of probability. Thus, for both Punjabies as well as Maldivians, the blood-group data are in good agreement with Bernstein's genetical theory.

The maximum likelihood estimates of gene probabilities for Punjabies and Maldivians, along with their standard errors, are presented in the annexed table.

Column 3 of this table gives the estimated gene probabilities, Column 4 the corresponding variances and Column 5 the estimated gene probabilities and their standard errors, both multiplied by 100. It would appear from this table that the proportions of A and B genes in the case of Punjabies are significantly higher than in the case of Maldivians. However, the proportion of O genes for Punjabies is significantly lower than that for Maldivians.

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April 25, 1947.

1. Kalra, S. L., *Curr. Sci.*, 1947, **16**, 92. 2. Stevens, W. L., *Ann. Eugenics*, 1938, **8**, 362. 3. Bernstein, F., *Klin Wschr.*, 1924, **3**, 1495. 4. —, *Z. indukt. Abstamm. -u. Vererblehre*, 1925, **37**, 237.

Caste	Gene	Estimated Probability	Variance	Percentage and standard error
1	2	3	4	5
			$\times 10^{-5}$	
Punjabies	O	·5942048	5·6601849	59·420±0·752%
	A	·1752423	3·1879764	17·524±0·565%
	B	·2305529	4·0625955	23·055±0 637%
			$\times 10^{-4}$	
Maldivians	O	·7653750	4·58493	76·538±2·141%
	A	·1051228	2·35898	10·512±1·536%
	B	·1295022	2·86833	12·950±1·694%

EFFECT OF CERTAIN FACTORS ON THE PULSE FREQUENCY OF A RELAXATION OSCILLATOR

AN audio-pulse frequency oscillator working on the relaxation oscillations of a thermionic valve controlled by the constant 'CR' of the time circuit has manifold applications. The device is usually a condenser shunted by a high resistance suitably placed in the oscillator valve circuit. A number of arrangements have been described by many authors,* but none seem to have paid much attention to the effect of other factors on the pulse frequency apart from the constant 'CR'. The object of the present communication is to give the effect of