
REPORT AND ACCOUNTS
OF
BOSE RESEARCH INSTITUTE
1936

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ANNUAL RERORT
OF
BOSE RESEARCH INSTITUTE
1935-36

THE detailed results of researches in different branches of science which have been carried out at the Bose Research Institute are in course of publication in Vol. X of the Transactions.

Among the physico-chemical investigations of plant-physiology may be mentioned :

The effect of age in modifying the internal physiological activities. In this the variations induced in the Contractility, the Apex time, the Latent period and the Velocity of Transmission of Excitation in the conducting tissue of the plant have been exactly determined.

The effects of continuous and of intermittent illuminations on phototropism. Special investigations that have previously been carried out at the Institute fully established the important discovery that, in regard to the photosynthetic action of light, intermittent illumination is, under certain circumstances, relatively more effective than continuous light. The particular modifying condition is the frequency of intermittence. In regard to phototropism also, the intermittent light is likewise found to be more effective than uninterrupted light. The relative efficiency of intermittent light, moreover, is at its maximum at a high frequency of intermittence. When the frequency of intermittence undergoes a decline, the effectiveness of intermittent light also exhibits a depression.

The effects of continuous and of intermittent lights on longitudinal growth. Special devices for recording rates of longitudinal growth and for the production of intermittent lights of various frequencies were successfully employed. It was found that the retardation induced in the rate of growth, generally speaking, is greater under intermittent illuminations than under continuous light. Even in regard to the relative efficiency of intermittent lights, quicker frequencies of intermission are found to be relatively more effective than these induced by slower frequencies. A wider generalisation is reached in regard to the action of

in these plants such as photosynthesis, phototropism and the activity of growth are found to undergo modifications which are essentially of a similar character.

Investigation on the 'after-ripening' of the seed led to the establishment of certain relations which existed between this particular process and the moisture content of the seed. It was found that there is an optimum condition of moisture content below or above which the period of germination undergoes a prolongation. The resting seed is, however, capable of immediate germination by absorption of water through a minute hole made by a pin prick. The time of germination which results from swelling by absorption of water, is greater the lower is the water content of the seed. But after the swelling has been attained, the actual time taken for germination is almost the same in all the seeds, though they may have different moisture contents. It is certain conditions in the seed-coat that prevent the absorption of water during the restins stage. This factor which confers impermeability is not extended throughout the whole thickness of the seed-coat, but is most effectively present in the outermost layer of the testa. The percentage of moisture of the resting seed has an important bearing on the length of the after-ripening period; the period is considerably lengthened when the percentage of moisture is low.

The effect of variation of temperature on the respiration of a flower. The respiratory activity is found to undergo a depression when the flower is subjected to the prolonged action of high temperature. The depression due to the time-factor has been successfully overcome by the employment of the *Respirograph* specially devised for the investigation, in which the time required for each investigation is reduced to a minimum. The results obtained show that the initial effect of rise of temperature is an enhancement of respiratory activity which increases with the rise of temperature till a maximum is reached at 52°C , this being the *critical temperature-maximum*. Above this critical point, the rate of respiration undergoes a marked decline till there is a total cessation of respiration at death of the organism, which occurs above 55°C . The seasonal variation has no effect on the critical temperature maximum which therefore remains the same in plants grown either in summer or winter. The temperature coefficient of respiration for the flower is found to be fairly constant over a range from 32°C to 52°C , the value of Q_{10} is comparatively higher, being as high as 2.1.

Chemical examination of the Indian medicinal plant Trichosanthes dioeca shows certain characteristic variations in the proportion of the mineral constituents present in the different parts of the plant. In the tubers there is a high percentage of the alkali K_2O as also a high percentage of phosphoric acid. In the stem there is present a high percentage of lime and almost an equal proportion of K_2O and Na_2O . The leaf ash is characterised by the presence of high percentage of silica and lime. In the fruit there is a very high percentage of K_2O and moderate high percentage of lime and phosphoric acid and very little of silica. In the roots the amount of Nitrogen is only 0.9 percent, while in the leaves it is as high as 4 percent. The different parts of the plant contain a bitter principle. A chemical and physical examination of the soil suitable for cultivation of *Trichosanthes* has also been carried out. The soil is silty and is also suitable for the growth of rice.

Examination of seeds of certain varieties of Meconopsis as source of oil and manure. In this paper the quantities of oil obtained from different species of *Himalayan Meconopsis* seeds grown at high altitudes have been determined. The residue left after oil extraction have also been examined chemically by estimating the different constituents present in them, particularly the amounts of total Nitrogen, phosphoric acid and alkali which are fairly high in every case. It has been possible to grow some of the species with advantage at somewhat lower altitudes. It was found that the oil yield from seeds of *Meconopsis Wallichii* grown at Darjeeling is fairly high, being about 44 percent of the seed weight.

The chemical and physiological investigations on presence of Vitamin C in certain substances in plants. A rapid method for detection and estimation of Ascorbic acid has been employed, and its presence in the juices of Date Palm, Palmyra Palm and Cocoanut Palm quantitatively determined. Additional investigations established the stability of these juices even under fermentation. Anti-scorbutic property of the Cocoanut fruit has been established by physiological experiments on Guinea Pigs. The Ascorbic acid contents of different *Gurs* obtained by boiling Date Palm juice, have been found to be very high. Indications have been found of the presence of a mannose dehydrogenase in the juices of the different Palms. The presence of certain thermo-labile protective agent for the Ascorbic acid in Cocoanut water has been established. Investigations on the transference of Ascorbic acid from Water to the Kernel and

from the Kernel into the growing Embryo via the Follicle have been carried out. That Ascorbic acid plays a very important part in the growth of the Embryo has also been established by observing the growth of Isolated Emryo in an Ascorbic acid medium. It has been found that green cocoanut fibre exerts a destructive action on Ascorbic acid. Investigations have also been carried out in regard to the stability of Ascorbic acid in the Cocoanut Water and Kernel in contrast with the instability of Ascorbic acid present in the juice of *Citrus decumana*.

In the Department of Anthropology special studies have been carried out on the *Human remains from a Malar cemetery*.

In the Department of Physics the following investigations have been carried out :

The Spectrum of Zinc at different stages of Ionisation.

The Absorption Spectra of the Alkali Halides and their Constituents in Solution.

Absorption Spectra of Zinc and Cadmium Halides in Vapour State.

J. C. Bose

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INCOME AND EXPENDITURE ACCOUNT

BALANCE SHEET

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BOSE
INCOME AND
For the year ended

INCOME

		Rs.	a.	p.	Rs.	a.	p.
A. INCOME ON GOVERNMENT GRANT ACCOUNT—							
Amount of Grant from the Government of India for 1935-36 —							
For Research Work (including Government Pension of Sir J. C. Bose).		50,000	0	0			
For Publication		<u>3,000</u>	<u>0</u>	<u>0</u>	53,000	0	0
B. INCOME ON TRUST FUND ACCOUNT—							
Interest	Rs. 49,645	6	5				
less Income Tax deducted	<u>892</u>	<u>2</u>	<u>0</u>	48,753	4	5	
Divident	Rs. 1,500	0	0				
less Income Tax deducted	<u>245</u>	<u>7</u>	<u>3</u>	1,254	8	9	
Refund of Income Tax deducted last year				591	7	0	
Income Tax on Interest accrued on new securities up to dates of purchases				288	7	9	
House Rent				1,860	0	0	
Ground Rent				<u>1,560</u>	<u>0</u>	<u>0</u>	54,307 11 11

Rs. 1,07,307 11 11

Central Bank Buildings,
100, Clive Street,
Calcutta.
The 17th April, 1936.

Examined and found correct,
S/d P. K. GHOSH,
B. SC. R., F. S. A. A. (Lond.),
Incorporated Accountant,
Auditor.

INSTITUTE

EXPENDITURE ACCOUNT

31st March, 1936.

EXPENDITURE

	Rs.	a.	p.	Rs.	a.	p.
A. EXPENDITURE ON GOVT. GRANT ACCOUNT—						
Scholarships and Allowances—						
Sir J. C. Bose (including Government Pension of Rs. 6,600/-)	1,800	0	0			
Staff (including bonus)	37,344	13	6			
	55,344	13	6			
Wages of Mistries and Menials (including bonus)	3,952	13	6			
Provident Fund Contrn.	1,349	7	0			
Laboratory Expenses	12,525	4	9			
Purchases of Physical Apparatus	961	8	0			
Purchases of Books	2,623	14	9			
Purchases of Furniture	1,335	6	0			
General Charges (including Printing, Stationeries, Telephone, Electric etc.)	2,000	14	9			
Travelling Expenses	705	15	9			
Rents, Rates and Taxes	524	13	6			
Repairs to Buildings etc.	1,479	10	9			
Publication Expenses	3,000	0	0	85,804	10	3*
Less Deficit transferred to Trust Fund Account as below				32,804	10	3
				53,000	0	0
B. EXPENDITURE ON TRUST FUND ACCOUNT—						
Scholarship	1,392	0	0			
Bank Charges, Renewal Fees, etc.	1,013	3	0			
Municipal Taxes	419	6	0			
Less on maturity of Treasury Bonds ¹ ,	1,165	13	4			
Depreciation	15,784	12	9			
Deficit on Government Grant Account as above written off	32,804	10	0			
Less Capital Expenditure transferred to Balance Sheet	4,920	12	9	27,883	13	6
				47,659	0	7
Balance carried to Balance Sheet				6,648	11	4
				Rs. 1,07,307	11	11

*N. B.—As is evident from the above account, a sum of Rs. 32,804/10/3 had to be paid out of the Trust Fund to meet the deficit on the Government Grant Account. The Trust Fund was created by the Founder, Sir J. C. Bose, to ensure the financial stability of the Institute. The condition laid down by him at the time of making over the Fund to the Governing Body of the Institute, was that the income of the Trust Fund should be accumulated until it totals up to a capital amount of Rupees Twenty Lacs as has previously been reported to the Government of India on several occasions. But in spite of that we have been compelled to spend a very large proportion of the Trust Fund Income as stated above.

Superintendent,

BOSE

BALANCE

As at 31st

LIABILITIES

	Rs.	a.	p.	Rs.	a.	p.
LIABILITIES FOR EXPENSES				3,007	0	0
SECURITY DEPOSIT FROM TENANT				80	0	0
INVESTMENT DEPRECIATION FUND as per last Balance Sheet				1,29,104	5	7
BUILDING REPAIRS FUND as per last Balance Sheet				3,500	0	0
RESERVE FOR DOUBTFUL DEBT				1,250	0	0
PHYSICAL AND BIOLOGICAL DEPARTMENTS CAPITAL ACCOUNT as per last Balance Sheet				10,000	0	0
DONATIONS as per last Balance Sheet				11,03,114	12	5
AMOUNT ACCUMULATED FOR TRUST FUND— as per last Balance Sheet (during 18 years 1917-35)	4,48,160	11	6			
add balance of income and expenditure Account for 1935-36	6,648	11	4	4,54,809	6	10

Rs. 17,04,865 8 10

I have examined the above Balance Sheet and beg to report that such Balance Sheet is correctly stated according to the best of my information and the explanations given to me and as shown by the books of the Institute I have also verified the Investments with the Bankers' safe custody receipts.

Central Bank Buildings,
100, Clive Street, Calcutta,
The 17th April, 1936.

Sd/- P. K. GHOSH,
B.Sc., R.A., F.S.A.A. (Lond.)
Incorporated Accountant,

INSTITUTE

SHEET

March, 1936.

ASSETS		Rs. a. p.	Rs. a. p.
FIXED ASSETS—			
Land			
at Calcutta	1,70,000 0 0		
at Darjeeling	16,000 0 0	1,86,000 0 0	
Building at cost less depreciation			
at Calcutta	2,62,294 0 0		
at Darjeeling	23,914 0 0		
at Falta	43,372 0 0	3,29,580 0 0	
Furniture at cost less depreciation		9,494 0 0	
Apparatus at cost less depreciation		15,262 0 0	
Physical Apparatus at cost less deprn.		10,428 0 0	
(There is a large number of highly specialised instruments manufactured in the Institute, the value of which cannot now be ascertained and is not, therefore, included in above)			
Books at cost less depreciation		6,479 0 0	5,57,243 0 0
FLOATING ASSETS—			
Investments (some at face values and others at cost)—			
Rs. 1,08,800 3½% G. P. Notes	1,08,800 0 0		
Rs. 10,40,400 3½% G. P. Notes	7,77,049 6 4		
Rs. 1,35,100 4% Loans	1,27,585 1 0		
Rs. 70,000 4½% Loans	66,450 12 6		
Rs. 10,000 5% Loans	9,787 8 5		
Rs. 20,000 7½% Birla Jute Manufacturing Co., Pref. Shares	20,000 0 0	11,09,672 12 3*	
Interest accrued on Investments		12,137 7 8	
House and Ground Rents outstanding		1,720 0 0	
Deposit for supply of Electric current		50 0 0	
Cash—			
Trust Fund Account—			
at Bank	20,107 5 11		
Establishment Account—			
in hand and at Bank	3,934 15 0	24,042 4 11	11,47,622 8 10
			Rs. 17,04,865 8 10

*N. B.—The main source of income of the Trust Fund of the Institute is the investments shown above. Unless it is possible to gradually increase the investments, the future stability of the Institute cannot be assured.

Superintendent,

Rose Institute

Proceedings of the Annual Meeting of the Bose Institute held
on the 22nd June 1936 at 7. p.m.

Present

Sir. J. C. Bose (In the Chair)

Lady Abala Bose

Dr. D. M. Bose

Prof. N. C. Nag

Mr. A. N. Mitter

Mr. S. M. Bose

* * * * *

Mr. A. N. Mitter presented audited account for 1935-36.

Resolved that the audited account be passed.

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