
REPORT AND ACCOUNTS
OF
BOSE RESEARCH INSTITUTE
1938

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ANNUAL REPORT
OF
BOSE RESEARCH INSTITUTE
1937-38

THE following report of progress of work in different departments of the Bose Research Institute was presented by the Director.

Since the foundation of the Bose Research Institute in 1917, at each annual meeting the report of progress of work in the Institute was presented by the Founder Director Sir J. C. Bose. Today we mourn his loss and feel the absence of his inspiring personality.

A. DEPARTMENT OF PLANT PHYSIOLOGY

1. Effect of Reduced Atmospheric Pressure on the Growth of Plants.
By B. K. Dutt and A. Guha Thakurta.

Observations on the effect of reduced atmospheric pressures were separately recorded on the growth of both shoots and roots of different plants.

The growth of both shoots and roots is inhibited in reduced atmospheric pressure. The specimens which are fast growing and tender are more easily susceptible to reduced pressure than those of slow growing and hardier in nature.

The inhibition of growth in reduced pressure in both shoots and roots of plants was found to be due to the reduction of partial pressure of oxygen and not due to the reduction of pressure as such. When the partial pressure of oxygen was maintained equal to that of the normal atmosphere the growth was found to remain unaffected at a very low pressure which normally brings about a cessation of growth.

2. Investigation on the Influence of Light and Temperature on the Diurnal Variation of Growth. By B. K. Dutt and A. Guha Thakurta.

Attempts were made to discriminate the influence of light and temperature from the summated effects of both in the diurnal growth of plant. These external factors being variable within wide limits in different seasons, their influences were studied both in Summer and Winter.

It was found from the diurnal record of growth of *Cajanus* seedling that the rate of growth is greatly increased during the night in comparison with that during the day in Summer; while in Winter the rate of growth decreased during the night.

overpowers the antagonistic effect of temperature in Summer; while in Winter the effect of temperature overpowers the effect of light.

3. The Investigations on the Growth of *Vallisneria spiralis* with and without Roots. By B. K. Palit.

Investigations were carried out to ascertain the variation in longitudinal growth of a specimen of *Vallisneria spiralis* in culture solution (a) with roots intact and (b) fibrous roots cut off.

Two similar Oscillating Recorders having magnifications of $2\frac{1}{2}$ times and dot intervals of 15 minutes were used to record the variation in longitudinal growth of two specimens, in one of which the fibrous roots were cut off.

The specimen with roots showed progressive increase in longitudinal growth with the advancement of the age of the leaf, till on the 6th day of observation, when the leaf was nine days old, it attained the maximum activity, and the rate of growth during the day was greater than that during the night. After that there was a diminution of rate of growth till on the 15th day of the age of the leaf the growth elongation practically came to a stop. The longitudinal growth during the day in the entire life cycle is greater than that during the night.

The specimen having fibrous roots cut off exhibited rapid increase in longitudinal growth of the leaf till the latter was nine days old, the elongation then became maximum. When the leaf was ten days old the rate of growth during the day and the night became the same. The leaf was found to be fully matured now and the activity began to diminish till on the 15th day the elongation became practically arrested. The rate of growth during the day in the entire cycle is greater than that during the night excepting on the day when the leaf became ten days old.

B. DEPARTMENT OF BIO-CHEMISTRY AND AGRICULTURAL CHEMISTRY

Further Investigation of the Effect of feeding Albino Rats on *Pisum sativum* and then on mixed diet with *Cicer arietinum*. By N. C. Nag and A. K. Pain.

Observations carried on over a period of over two years show that *Pisum sativum* is deficient in Vitamin E, the procreative factor. A 50% mixed diet of *Pisum sativum* and *Cicer arietinum* did not affect the procreative power of the rats, but the litter were generally weak and most of them failed to survive the weaning period.

5. Cultivation of Soya Bean at the Falta Experimental Station. Yield, Comparative Chemical Examination and Physiological (Rat Feeding) Experiments. By N. C. Nag, H. N. Banerjee and A. K. Pain.

The observations were systematically started in 1935 (latter part). As regards yield and chemical constituents the products compared favourably

food by itself without admixture it leaves much to be desired. Young albino rats reared from parents fed on Soya Bean and themselves reared on Soya Bean failed to live for a year, most often they died within eight months. A mixed diet is absolutely necessary with a good admixture of starch.

6. Cultivation of *Phaseolus calcaratus* starting with a single seed. By N. C. Nag, with occasional collaboration of A. K. Pain.

The yields during the last two seasons have been very promising. In fact some physiological observations were completed by albino rat feeding experiments. In some of its properties *calcaratus* appeared to approach *Sona Mung* previously experimented with, as regards oil content and other chemical properties. Further work is being continued.

7. Rice Cultivation under different Manurial and Control Conditions at Falta. By A. K. Pain.

The effects of individual and mixed manures as also of no manure on productivity of rice and straw have been studied and conclusions arrived at. While Ammonium Sulphate gave apparently bigger plants and more straw, it was found necessary to add potash for a better yield of rice. Further experiments are being continued.

8. Investigation on the Chemical Constitution of the Active Bitter Principle of *Clerodendron Infortunatum*. By H. N. Banerjee.

This is a continuation of the work already started and partly published. Physiological experiments have confirmed the anthelmintic properties of the substance, which has been named Clerodin. Its constituents are being determined by different reactions. Certain groups have already been identified as being present.

C. DEPARTMENT OF GENETICS

9. Dr. H. K. Nandi has investigated the structure of the meiotic chromosomes of *Hosta Sieboldiana* Hosk. He finds indications that the chromosomes exist as spiral threads in all stages of the chromosome cycle. Convincing evidence has been found of the presence of coiled chromonema throughout all the phases of chromosome history, thereby substantiating the theory that the individuality and continuity of chromosomes is maintained from one cell generation to another.

10. He has also carried out cytogenetical study of jute. The diploid chromosome number of *Corchorus capsularis* Willd. is $2n=14$. A variant plant in the jute cultures has been discovered which is characterised by much smaller and deeply serrated leaves quite different from the normal varieties.

Cytological studies have revealed 15 chromosomes in the root-tip cells. This is further corroborated by studies of the pollen mother cells. The variant is therefore a trisomic mutation ($2n+1$).

Study of the pollen mother cells at diakinesis revealed six pairs of bival-

daughter cells. Sometimes a lagging univalent was noticed in the first and second division.

The trisomic thus produces dimorphic gametes with 8 and 7 chromosomes. The breeding behaviour of the mutant shows that when the trisomic is selfed, it produces a high percentage of mutants in the F_1 . When the trisomic is used as male and the normal as the female, the percentage of trisomic mutation is considerably reduced in the F_1 progeny. This shows that egg cells with one extra chromosome are more effective in fertilization and in the transmission of mutant characters.

Studies of the normal variety from which the mutant arose have shown failure of pairing one bivalent in the pollen mother cells. This gives rise to gametes with 8 and 6 chromosomes. Similarly, it is expected that such things happen in the megaspore division. The trisomic most probably arises from the union of an egg cell with 8-chromosome gamete and a 7-chromosome pollen.

Clear evidence of secondary association is observed for the first time in jute. The maximum association is two groups of two bivalents, the other three bivalents remaining separate. It is therefore suggested that the basic number of *C. capsularis* is $b=5$, the present number $n=7$, is secondarily balanced.

D. DEPARTMENT OF ANTHROPOLOGY

11. Mr. S. S. Sarkar continued his anthropometric investigations of the Santals in the district of Santal Perganas. In all 167 Santals were anthropometrically measured. Blood grouping investigations were also undertaken along with the above work and altogether 339 Santals, 235 Malers and 112 individuals of other castes were serologically grouped. Blood grouping investigations were also carried out among the Bagdis (80) of South Bengal and the Oraon immigrants in the suburbs of Calcutta. The possibility of linkage of blood groups with any somatic characters was specially investigated.

E. DEPARTMENT OF ZOOLOGY

Mr. G. Bhattacharya continued his investigations of the life habits of ants and spiders.

12. Nuptial relation of *Diacamma vagaus*, Smith.

It was found that *Diacamma vagaus*, Smith, have no winged female, only males and workers are discovered in their colony. It is said that when abundantly fed, a single worker of the colony may become gynacoid and this gynacoid phase is a physiological rather than a morphological one. By rearing the ants it is observed that actual mating between the male and the so-called worker took place.

13. The Moulting process of the spider *Myrmarachne platyleoides*, Camb.

Unlike most of the spiders, the antmimicking group specially the male

female, is transformed into a new being quite different from what it was before the final moult. The process of moulting and the change that occurs after the moult have been described.

F. DEPARTMENT OF PHYSICS

Dr. A. K. Dutta was given one year's study leave to work in Prof. Debye's laboratory in Berlin. He undertook both theoretical and experimental investigation of the dispersion of supersonic waves in liquids. The results obtained are given below:

14. Dispersion of supersonic waves in liquids.

The theory of Supersonic Dispersion in gases has been discussed and a modified formula to represent supersonic dispersion in liquids has been worked out on the same principle. From the value of the known constants the amount of dispersion in various liquids has been worked out, although the frequency at which the dispersion occurs could not be foretold.

An experiment was carried out to find out if there is any dispersion in liquids in the frequency region from 10^6 to 3×10^7 cycles. A small dispersion was found in the case of water and this could not be explained on the basis of the gas dispersion principles. The dispersion in water was explained to be due to the difference in configuration in the different forms of associated water molecules.

15. Dr. R. C. Majumdar has continued his theoretical investigation of the propagation of radio waves in the Ionosphere. In order to obtain precise information as to nature of the constituents of the Ionosphere and of the mechanism of their interaction with electromagnetic radiation, the rigorous methods of mathematical analysis of the quantum gas theory has been applied. In a series of papers it is shown that such a theoretical investigation together with the theory of molecular dissociation when applied to the observations on the reflection co-efficient and on the night sky spectra will give complete information as to the state of the Ionosphere.

In addition to the paper published in Vol. XI of the Transactions of the Bose Institute, the following papers on this subject have been published.

- (I) Die Theorie der Ionosphere Teil I Zeit. f. Phys. vol. 107, 1937.
- (II) The Theory of Molecular Dissociation and the fundamental mechanism in the Ionosphere, Ind. Jour. of Physics, vol. 12, 1937.

16. Dr. Radhesh Chandra Ghosh continued his investigations of cosmic rays in Darjeeling. He measured the azimuthal distribution of intensity north and south of the zenith at intervals of 15° up to 60° with vertical. The point of dip in the azimuthal distribution curve found by Johnson was not found by him.

Angular distribution of showers in lead was measured in Darjeeling and in Calcutta with two Counters. In both the altitudes a maximum at 20° is found. The general nature of the curves in both places are the same. But when corresponding readings for both stations are compared it is found that the divergent rays predominate relatively more in higher altitudes than that at lower one.

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BOSE

INCOME AND

For the year

INCOME.

	Rs.	A. P.	Rs.	A. P.
A. INCOME ON GOVERNMENT GRANT ACCOUNT—				
Amount of Grant from the Government of India for Research Work (includnig Govt. pension of late Sir J. C. Bose)	50,000	0 0		
For Publication Expenses	3,000	0 0		
			53,000	0 0
B. INCOME ON TRUST FUND ACCOUNT—				
Interest <i>less</i> Income Tax deducted	48,827	8 0		
Dividend <i>less</i> Income Tax deducted	1,279	15 0		
Refund of Income Tax	1,645	1 0		
House Rent	1,800	0 0		
Ground Rent	1,560	0 0		
Miscellaneous Receipts	248	2 6		
			55,360	10 6

INCOME AND EXPENDITURE
ACCOUNT

Rs. 1,08,360 10 6

INSTITUTE

EXPENDITURE ACCOUNT

ended 31st March, 1938.

EXPENDITURE.

		Rs.	A.	P.	Rs.	A.	P.
A. EXPENDITURE ON GOVERNMENT GRANT ACCOUNT—							
Scholarship and Allowances—							
Late Sir J. C. Bose	..	Rs. 12,000	0	0			
Staff	.. .. .	„ 39,782	3	9			
		51,782	3	9			
Less payable from Trust Fund		1,500	0	0			
					50,282	3	9
Wages of Mistries and Menials	.. .. .				4,515	6	0
Provident Fund Contribution	.. .. .				1,279	8	0
Income Tax on Staff's Pay for previous years (Bonus)	.. .. .				837	14	0
Staff Retirement Bonus Fund	.. .. .				1,500	0	0
Laboratory Expenses	.. .. .				7,549	7	3
Purchase of Apparatus	.. .. .				12,187	9	0
Purchase of Books	.. .. .				3,668	0	3
Purchase of Furniture	.. .. .				723	6	0
General Expenses (including Printing, Stationery, Electric, Telephone, Staffs' Tiffin, etc.)	.. .. .				2,293	14	3
Travelling and Conveyance	.. .. .				459	6	3
Rents, Rates and Taxes	.. .. .	Rs. 941	10	9			
Less payable from Trust Fund	.. .. .	„ 430	2	0	511	8	9
Repairs to Buildings etc.	.. .. .				6,455	8	6
Publication Expenses	.. .. .				3,000	0	0
					95,263	12	0
Less Deficit recouped from Trust Fund	.. .. .				42,263	12	0
							53,000 0 0
B. EXPENDITURE ON TRUST FUND ACCOUNT—							
Scholarship as above	.. .. .				1,500	0	0
Bank Charges, Renewal Fees, etc.	.. .. .				131	9	4
Municipal Taxes as above	.. .. .				430	2	0
Law Charges	.. .. .				46	8	0
Depreciation	.. .. .				22,505	15	3
Deficit on Govt. Grant A/c. as above	.. .. .	Rs. 42,263	12	0			
Less Capital Expenditure	.. .. .	16,578	15	3	25,684	12	9
							50,298 15 4
Balance carried to Balance Sheet	.. .. .						5,061 11 2

Rs. 1,08,360 10 6

BOSE

BALANCE

As at 31st

LIABILITIES.

	Rs.	A.	P.	Rs.	A.	P.
Liability for Unpaid Salary				154	13	6
Security Deposit from Tenant				80	0	0
Provision for Contingent Liabilities				4,257	0	0
Staff Retirement Bonus Fund				4,500	0	0
Building Repairs' Fund				3,500	0	0
Investment Fluctuation Fund				1,29,104	5	7
Physical and Biological Dept. Capital A/c.				10,000	0	0
DONATIONS—						
As per last Balance Sheet	11,03,114	12	5			
Addition this year	51	0	0			
AMOUNT ACCUMULATED FOR TRUST FUND—						
As per last Balance Sheet (during 20 years —1917-37)	4,61,168	10	4	11,03,165	12	5
Add Balance of Income and Expenditure Account for 1937-38	5,061	11	2			
				4,66,230	5	6

Rs. 17,20,992 5 0

(Sd.) A. N. MITTER,
Superintendent.

INSTITUTE

SHEET

March, 1938.

ASSETS.					Rs.	A.	P.	Rs.	A.	P.
LAND—										
At Calcutta ..	..	..	..	..	1,70,000	0	0			
At Darjeeling ..	..	..	..	..	16,000	0	0			
								1,86,000	0	0
BUILDINGS at Cost less Depreciation										
At Calcutta ..	..	..	..	..	2,48,064	0	0			
At Darjeeling ..	..	..	..	..	22,268	0	0			
At Falta ..	..	..	..	..	38,731	0	0			
								3,09,063	0	0
FURNITURE AND FIXTURES at Cost less Depreciation								8,829	0	0
Apparatus at Cost less Depreciation	..	..	..	..				30,779	0	0
Books at Cost less Depreciation	..	..	..	..				9,906	0	0
INVESTMENTS—										
Rs. 1,08,800 3½% G. P. Notes ..	..	..	..	..	1,08,800	0	0			
Rs. 10,65,400 3½% G. P. Notes ..	..	..	..	..	8,02,065	0	4			
Rs. 1,35,100 4% Govt. Loans ..	..	..	..	..	1,27,585	1	0			
Rs. 70,000 4½% Govt. Loans ..	..	..	..	..	66,450	12	6			
Rs. 10,000 5% Govt. Loans ..	..	..	..	..	9,787	8	5			
Rs. 20,000 7½% Preference Shares ..	..	..	..	..	20,000	0	0			
								11,34,688	6	3
Interest accrued on Investments ..	..	..	..	..				12,502	1	0
House and Ground Rents Outstanding ..	..	..	..	..				540	0	0
Security Deposit ..	..	..	..	..				50	0	0
Suspense ..	..	..	..	..				27	0	0
Trust Fund Account at Bank ..	..	..	..	..	26,862	13	6			
Establishment Account in hand and at Bank ..	..	..	..	..	1,745	0	3			
								28,607	13	9
								Rs. 17,20,992	5	0

I have examined the above Balance Sheet of the Bose Institute and beg to report that the same is correctly stated according to the best of the information and explanations given to me and as shown by the books of account of the Institute. I have also verified the Investments with the Bankers' Safe Custody receipt.

(Sd.) P. K. GHOSE, & Co.
Incorporated Accountants (London),
Registered Accountants

The Annual Meeting of the Governing Body of the Bose Institute held on Friday the 15th July, 1938 at the Bose Institute at 7 p.m.

Present :

Mr. S. C. Mookerjee (in the Chair)
Lady Abala Bose
Mr. S. M. Bose
Mr. S. K. Mandal
Dr. D. M. Bose
Prof. N. C. Nag
Mr. A. N. Mitter

Mr. A. N. Mitter, Superintendent, presented audited Account for 1937-38.
Resolved that the audited account be passed.

Donation received this year from Jatindra Nath Sen Rs. 51.

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