strong band at 4620 Å as the result of a transition in the CCl_4 molecule from the ground level of CCl which is also known by its discrete bands, to the repulsive curve of CCl_2; and the weak band at 3340 Å, similarly to the transition from the same initial level to the repulsive curve of CCl_3, in complete analogy to the continuous spectra in $SnCl_4$.

College of Science,
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June 9, 1943.

R. K. Asundi.
Nand Lal Singh.
Jagdish Prosad Mishra.

1. Asundi and Karim, *Proc. Ind. Acad. Sci.*, 1937, **6**, 328. 2. Cameron and Elliot, *Proc. Roy. Soc.*, 1937, **158 A**, 681; 1939, **169A**, 463. 3 Asundi, Karim and Samuel, *Proc. Ind. Acad. Sci.*, 1940, **12**, 513.

SPERM DIMEGALY IN *ICHTHYOPHIS GLUTINOSUS* LINN.

Sperm dimegaly or polymegaly appears to be unknown in the Apoda. Examination of *Ichthyophis* material revealed a number of dimegalous sperms of this animal. Scattered amongst the normal sperms in the testis, there occasionally is a sperm with a conspicuously large nucleus and which, on closer examination is seen to be double in respect of the "middle piece" and axial filament but single in respect of the nucleus and the acrosome. Such a sperm is shown in Fig. 1.

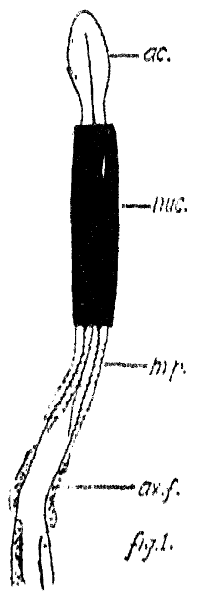

Fig. 1

Dimegalous sperm of *Ichthyophis glutinosus* × 2250

ac.—acrosome. *ax. f.*—axial filament. *m. p.*—middle piece. *nuc.*—nucleus.

It is generally known that in dimegaly, whether pathological or physiological, one or both divisions are suppressed in meiosis with the result that large-sized cells (primary or secondary spermatocytes) proceed to give rise to sperms by spermateleosis. Such di- and polymegaly has been known among insects, particularly the Hemiptera, where large giant spermatids derived from spermatocytes, either without any division or by fusion after division, proceed to give rise to giant spermatozoa.

The sperm figured above is a typical dimegalous one of *Ichthyophis*. The axial filament as well as the 'middle piece' is double while the nucleus and acrosome are single. But the noteworthy fact about both the nucleus and the acrosome is that they are double the normal size of these structures. The nuclear volume of a normal sperm of *Ichthyophis glutinosus* has been determined by me* to be about 25·1 cubic microns, while that of the dimegalous sperm described above is 49·9 cubic microns, nearly double that of the normal sperm. In the matter of the acrosome also, its size is very much larger than that of the normal sperm though I have had no means of calculating the actual volume of this structure.

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June 19, 1943.

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* Seshachar, B. R., *Proc. Ind. Acad. Sci.*, 1943, **27**, Sec. B. No. 5, 138.

DEGRADATION OF CHLOROPHYLL DURING TEA FERMENTATION

In the manufacture of black tea the fermenting leaf changes its green colour to a coppery red tone. A rough estimation of this change of chlorophyll has been carried out by Carpenter,[1] Bokuchava,[2] as also in this laboratory, which show that the leaf loses about three-fourths of its chlorophyll during a four-hour fermentation.

Steaming arrests these changes completely, which indicates that an enzyme is concerned in the breakdown of the chlorophyll.

The degradation of chlorophyll may involve (1) formation of pheophytin by removal of Mg by plant acids, (2) hydrolysis by chlorophyllase whereby phytol is removed and (3) oxidation as a result of which the phase test is no longer obtained. Of these, that which tea leaf chlorophyll undergoes during fermentation appears to be limited to the last-mentioned. There was no evidence for the presence of chlorophyllase in tea. No pheophytin was detectable in the acetone extract of crushed leaf either before or after fermentation. During *in vitro* experiments the disappearance of green colour coincided with lack of response to the phase test, indicating an oxidation reaction. This was further confirmed by the fact that hot saponification of the 'fermented' chlorophyll product followed by treatment with acid did not yield phytochlorin *e* and phytorhodin *g*.

The mechanism of oxidation of chlorophyll appears to be as follows:

$$\text{Tea tannin} + O_2 \xrightarrow{\text{Polyphenol oxidase}} \text{O-Quinones}$$

$$\text{O-Quinones} + \text{Chlorophyll} \longrightarrow \text{Tea tannin} + \text{chlorophyll oxidation products}$$

Evidence for this lies in the fact that in the absence of tea tannin, chlorophyll is practically unaffected by tea enzyme. Moreover pure p-Quinone can effectively replace the system tea tannin + oxidase to give the same reaction as the latter with chlorophyll.

The disappearance of the green chlorophyll is a valuable indication of the progress and completion of tea fermentation which proceeds contemporaneously. It is easier to decide whether the greenish tint has disappeared than to judge whether a particular colour intensity of the insoluble oxidation products has been attained by the leaf residue. Tea tasters use this empirical colour test, the relevance of which this note explains, and deprecate any tea whose "infusion" (*i.e.*, spent leaf in their terminology) shows green tint after pressing out the liquor.

The insoluble 'infusion' pigment cannot, as suggested by Popatov[3] be a melanin produced by an enzymic oxidation of tyrosin which is supposed to arise from the breakdown of leaf proteins; for tea leaf not only does not contain tyrosinase but also the quantity of tyrosin liberated would be, if any, extremely small. The degradation of chlorophyll and the production of insoluble and coloured tannin oxidation products during the course of fermentation provide a more satisfactory explanation of the brown pigment in spent leaf.

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of Ceylon,
Talawakelle,
Ceylon, H. B. SREERANGACHAR.
June 10, 1943.

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INFLUENCE OF THE SIZE OF EXCHANGEABLE IONS ON THE PERMEABILITY OF SOILS*

IT is well known that the colloid-chemical properties of soils are greatly influenced by ions that enter the base exchange complex. Analogous ions affect these properties in a regular manner. Various lyotropic series have been formulated with reference to some specific property of the soil. Thus soils saturated with monovalent cations show a tendency to disperse in the order:

$$Li > Na > NH_4 > K > Rb > Cs.$$

Ram Das and Mallik[1] report that the swelling effect decreases with the atomic weight of the metallic radical, that is, in the order:

$$Li > Na > K > Rb > Cs.$$

A similar variation in the ζ-potential of the soil colloids saturated with these ions has been noticed by Hans Jenny,[2] according to whom the ζ-potential is an exponential function of the adsorbability of the ion which saturates the soil complex.

We have attempted to study the influence of the size of cations on the permeability of a soil. The soil was leached with N/20 HCl to remove $CaCO_3$ and to saturate the soil with hydrogen ion. After being washed with water it was divided into five portions. Each portion, which weighed approximately 15 to 20 gms., was leached with 2 litres of normal solutions of the chlorides of Lithium, Sodium, Ammonium, Potassium and Rubidium. These samples were then washed first with water and finally with alcohol until free from chloride and dried at 100° C.

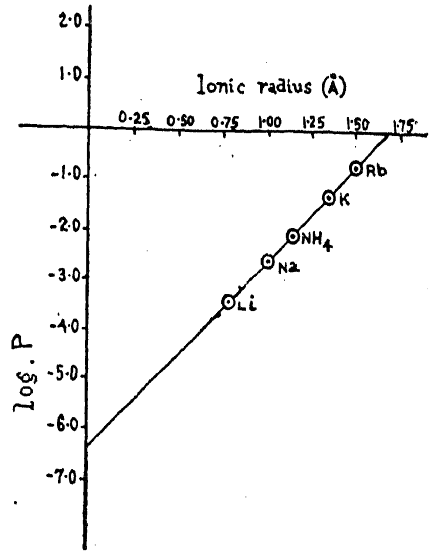

FIG. 1

The rate of percolation of water in each soil was then determined. For this purpose 10 gms. of the soil were placed between layers of sand in the experimental tube which was closed by a piece of muslin tied at the lower end. After wetting the sand and soil the same head of water (5 inches) was maintained in each and the rate of percolation was measured by noting down the sinking of the level of water. (To minimise the effects of evaporation the upper end of the tube was closed by a cork provided with a capillary tube). Table I gives the values obtained:

TABLE I

Ion	Radius Å	Rates of percolation (inch/hour)	
		Observed	Calculated
Li	0·78	·0005	·00048
Na	0·98	·0027	·00272
NH_4	1·14	·0115	·01084
K	1·33	·0600	·05598
Rb	1·49	·2250	·2239

It is evident that the rate of percolation follows the order of increasing ionic radius. If P be the rate of percolation and r the radius of the ion, the observed values can be correlated by the exponential equation $P = \lambda e^{\mu r}$. The constants λ and μ are determined graphically and the values of P recalculated from the equation $P = (50 \times 10^{-8})\, e^{8 \cdot 63 r}$ are given in the last column of Table I.