AN ELECTROLYTE-FREE MEDIUM FOR THE FROG HEART AND GRADED RESPONSES OF THE HEART MUSCLE

RINGER has shown that for the proper functioning of the heart, the external medium must contain suitable amounts of sodium, calcium and potassium. It is generally believed that for the contraction of all kinds of muscle, these ions are necessary. Singh (1944) has, however, shown that the frog stomach contracts spontaneously and remains irritable to electric current for about 4-6 hours in a half tonic solution of sucrose.

It has been found that the electrolyte-free medium for the frog stomach is equally good for the frog hearts used in this series of investigations. When perfused with half tonic sucrose solution, the frog heart presents the same series of phenomena as the frog stomach. At first there is a contracture followed by depression of excitability. The heart then recovers and continues to beat from half an hour to two hours; the rhythm and relaxation are, however, slow (Fig. 1). For some hearts,

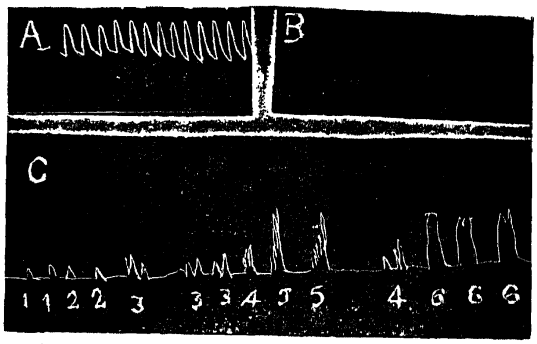

FIG. 1. A. Beating of the frog heart in Ringer. B. Beating of the same heart in isotonic solution of sucrose, after 25 minutes immersion. The heart may continue beating slowly for about two hours in the absence of electrolytes. It may remain irritable to induction shocks for another two hours.

C. Frog heart. Graded responses. Contractions No. 1 by 1·5 v for 5 sec. (D.C.).

Contraction No. 2 by 3 v D.C.
do 3 do 4·5 v D.C.
do 4 do 6·0 do
do 5 do 7·5 do
do 6 do 9 v do

In contraction Nos 1, 2 the heart has only responded to make. In contractions No. 3, 4, 5, the heart has responded by rhythmic contractions. In contraction No. 6, the heart has responded by tetanus.

an isotonic solution of sucrose was found to be better than half tonic sucrose, but if the heart had come to a standstill in the isotonic sucrose, it was revived by the half tonic sucrose solution. After the heart had stopped beating in the electrolyte-free medium, it remained irritable to induction shocks for a considerable time (one to two hours). It is thus remarkable that the heart should contract in the absence of all electrolytes; this shows that excitation in the heart muscle is produced by ions within the muscle fibres, and that the function of ions in the Ringer solution is to mutually antagonise one another.

Another remarkable phenomenon presented by these hearts was, that they behaved like plain muscle, in responding by contracture to acetylcholine and excess of potassium. As plain muscle does not obey the "All and None" law, it is to be expected that the same law would not hold good for these hearts. This was actually found to be the case. When stimulated with direct current by voltages ranging from 1·5 to 20, the responses were graded [Fig. 1 (c)]. The contraction produced by break induction shock was bigger than that produced by make shock.

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CHROMOSOME NUMBER OF *SESAMUM LACINIATUM*, KLEIN.

ONLY three species of *Sesamum* are reported in the Indian flora (Hooker). Of these, *Sesamum orientale* Linn. (*Sesamum indicum* D.C.) is the commercial til. Both *Sesamum prostratum* Ret. and *Sesamum laciniatum* Klein. are prostrate, perennial weeds. They closely resemble one another but for the fact of the leaves of *Sesamum laciniatum* being deeply pinnatifid. The capsules of *Sesamum laciniatum* are smaller than those of *S. prostratum*. The chromosome number of *Sesamum orientale* has already been determined to be $2n = 26$ in this laboratory (Sreenivasan, 1942). Cytogenetical work in this genus has been in progress here for some years now. Interspecific hybridisation between *Sesamum orientale* and *Sesamum prostratum* has been effected and the sterile hybrid has been made fertile by the artificial induction of amphidiploidy. Cytological and cytogenetical details connected with this work will appear elsewhere as a paper. The fertile amphidiploid is being grown through several generations and its seeds compared with those of *Sesamum orientale* in all respects, quality, quantity, oil yield, etc. It has been found that while *Sesamum orientale* is a seasonal herb, this fertile amphidiploid is perennial, flowering and fruiting throughout the year. In connection with these studies, the chromosome number of *Sesamum prostratum* ($2n = 32$, $n = 16$) both somatic and meiotic, has been determined in this laboratory (Krishnamurthy). The chromosome number of *Sesamum radiatum*, an Argentine species, was reported some years ago to be $2n = 64$ (John and Narasingha Rao). So far as we are aware, the chromosome number of the other Indian species of *Sesamum*, namely, *Sesamum laciniatum* has not been recorded. Specimens of this species were collected from several parts of India and are being grown in the University Botanical Gardens. We are carrying on hybridisation work between this

species and *Sesamum orientale* on the one hand and between this species and *Sesamum prostratum* on the other. Full cytological and cytogenetical details relating to this investigation will be published in due course. In the meantime the chromosome number of *Sesamum laciniatum* has been determined to be $2n = 28$ (Fig. 1). Prochromosomes which were a com-

mon feature in the other species of *Sesamum* are found to be very prominent in this species also. A full account of the prochromosome-chromosome relationship, based on observations on these species, and their correlation to the nucleolar cycle, will form the subject of a separate paper.

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March 6, 1945.

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ON THE OCCURRENCE AND DISTRIBUTION OF *POTHOS SCANDENS* LINN., VAR. *HELFERIANUS*, ENGL. IN BENGAL

IN the province of Bengal *Pothos scandens* Linn., an epiphytic climber is found growing upon several kinds of plants. Prain[3] in 1903 reported that *Pothos scandens* Linn. occurs in North Bengal and Chittagong but there is no mention of any other variety or species of the same genus from any other part of the province, though other species were reported by Hooker[2] in 1893 from the whole of India. The latter author also corroborated Prain and stated that the only species of *Pothos*, found in Bengal, is *Pothos scandens* Linn. Prain[4] further in 1905 in his survey of the flora of 24-Pergannhas, Hoogly and Howrah districts did not mention the occurrence of any species or variety of *Pothos*.

Pothos angustifolius Hook. f. (non-Presl.), as recorded by Hooker,[2] is according to the latest nomenclature is reduced to a variety of *Pothos scandens* Linn. by Engler[1] and is named *Pothos scandens* Linn., var. *Helferianus* Engl.

In the latter part of December 1944, and in the beginning of March 1945, the present writer came across in course of excursions in the suburban villages of the city of Dacca (Bengal) and collected *Pothos scandens* Linn. var. *Helferianus* Engl., and found it climbing on the bases of several trees in shady places. Since the first collection, Mr. Murari Prosad Guha, Lecturer in Botany of this College, collected this plant from Jamuria, Tangail (Dist. Mymensingh) in the latter part of January 1945 for the writer's anatomical studies. He also brought the flowering specimens of *Pothos scandens* Linn. Both Mr. Guha and the writer could not procure any flowering specimens of this variety during this period.

Dr. S. K. Mukherjee, Curator of the Herbarium, Royal Botanic Gardens, Sibpore, Calcutta, very kindly informs the writer that the *Helferianus* variety of *Pothos scandens* was collected from Agartalla (Dist. Tipperah) and the neighbourhood of Calcutta. But it is likely that the plant was collected after Prain[3] had recorded his observations in his careful survey.

Rendle[5] wrote that the genus *Pothos* with its fifty species is chiefly Malayan. Hooker[2] collected *Pothos angustifolius* Hook. f. (non-Presl.) (= *Pothos scandens* Linn. var. *Helferianus* Engl.) from Tennasserim, Burma—a place 950 miles away (coast to coast) from the border of the province of Bengal and where the Malayan vegetation is dominant. From the nature of distribution it becomes evident that the plant had migrated from Tennesserim (Burma) and entered into the province *via* Chittagong and gradually spread over other districts, *e.g.*, Tipperah, Mymensingh, Dacca, etc., in course of about fifty years. Afterwards it has become naturalised and formed a unit of the local vegetation. The writer also surmises that this plant was brought and introduced as a garden climber in the neighbourhood of Calcutta for its nice small unifoliate leaves and from there it had become an escape and spread over that locality after Prain's[3] survey.

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March 7, 1945.

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HAIRINESS OF COTTON LEAVES AND ANTI-JASSID RESISTANCE

THE evolution of resistant varieties has been regarded as the most effective line of defence against the jassid, *Empoasca devastans* Dist., which is a major pest of cotton in the Punjab, Sind and Madras. It has been generally believed that varieties with hairy leaves are more resistant to jassid attack than those not possessing this character. For this reason cotton breeders have bred for hairiness in evolv-