Estrogen therapy.—A group of immature female rats (30 days) were kept on the following diet:—

Sugar 10, casein 14, butter 15, Osbourne Mandell salt mixture 5, and rice flour 56 parts. The diet was supplemented by ½ tablet of yeast and 2-3 drops of cod-liver oil per day per rat.

The experimental rats received 3-4 drops of the cress oil in addition to the above diet, whereas the control rats received only the above diet. All the rats were killed on the 72nd day, having received the oil for six weeks. The ovary, thyroid and thymus glands were removed and weighed.

The ovaries of the experimental rats weighed consistently more than that of the control rats. The average weight of the ovaries from the experimental rats was 0·45 gm. per Kg. body weight, whereas that of the control rats was 0·25 gm. per Kg. body weight. Macroscopic examination of the ovaries of the rats receiving the oil was very significant and exhibited several hæmorrhagic follicles on the surface. No such characteristics were observed on the ovaries from control series. The uterus, thymus, thyroid and other organs did not show any abnormality. The results along with the details of histological examination will be reported later.

There was no significant difference in growth rates of the rats. The rats receiving the oil weighed comparatively less (average 83 g.) than the control ones (average 88 g.) but were significantly more active than the control series.

Thanks are due to Dr. V. Subrahmanyan for his keen interest.

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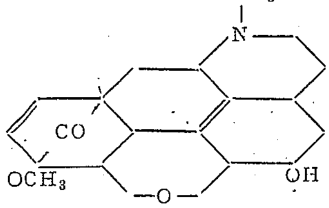
December 9, 1942.

A SEARCH FOR PORPHYROXINE IN BENGAL OPIUM

PORPHYROXINE $C_{16}H_{23}O_4N$ was isolated[1] by Rakshit from the Indian variety of *Papaver somniferum* L. He represented[2] the base as a derivative of a tetrahydro codeine with the carbonyl group in a bridge position in the aromatic ring of Pschorr's codeine formula:



Porphyroxine

Later, Machiguchi[3] isolated from Japanese opium, an identical product which, however, proved to be a mixture of codamine, laudanine and meconidine. Recently[4] the view has been expressed that the constitution proposed for porphyroxine can only be accepted with reserve. It was, therefore, considered necessary to re-investigate the occurrence of porphyroxine in Bengal opium, a specimen of which was purchased as a dry powder from the Government opium factory at Ghazipore.

Following Rakshit's method[1] the total water-soluble non-phenolic bases were isolated by ether-extraction of a lime-water extract of opium. Further treatment of the crude bases with dilute hydrochloric acid gave a sparingly soluble hydrochloride (A) in an yield of about 0·34 per cent. The same hydrochloride (m.p. 265°-269° d., after a slight darkening at 240° C.) was prepared in an yield of 2·6 per cent. by extracting the total alkaloids of opium with chloroform and subsequent treatment of the alcoholic solution of the bases with dilute hydrochloric acid. On recrystallisation from alcohol the hydrochloride (A) in colourless needles melted at 276°-277° c.d. after sintering at 270° C. The free base corresponding to this was crystallised from alcohol in colourless rectangular rods. (M.P. = 152°-153° C., unchanged on mixing with a genuine specimen of codeine for which the author is deeply indebted to Prof. B. B. Dey.)

The above yield of codeine from Bengal opium is much higher than Rakshit's estimate,[5] but agrees well with that of Annet[6] and Dunnicliff.[7]

Attempts to isolate porphyroxine from the mother-liquors of codeine hydrochloride have so far proved fruitless. Only a more intensive search can finally settle the possibility that Rakshit's porphyroxine might be an impure specimen of codeine.

As the author is at present unable to continue this work, owing to other preoccupations, he leaves this question to be settled by others interested in the subject.

The author is highly grateful to Prof. L. F. Small for suggesting this problem, and to Mr. J. N. Rakshit and Col. S. S. Sokhey for their kind interest.

S. RAJAGOPALAN.

Haffkine Institute,
Bombay,
December 28, 1942.

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PROTOGYNY IN UGANDA *SPONTANEUM*

THE wild species of *Saccharum spontaneum* has been of particular importance and use at the Imperial Sugarcane Station X CBE. Most of the Co. canes found useful in cultivation have in them the blood of some form of *Saccharum spontaneum* and sometimes of two forms of it. The Station now possesses one of the best collections of this species collected practically from all parts of the world. Recent additions to this collection are certain *spontaneums* from Uganda (East Africa). Two of these flowered last month and exhibited peculiarities which have so far not been recorded in any variety of *S. spontaneum* or in any species of *Saccharum*. While this is interesting in itself, the main point to which attention is now invited is their protogyny which enables their employment as ovule parents in sugarcane breeding.

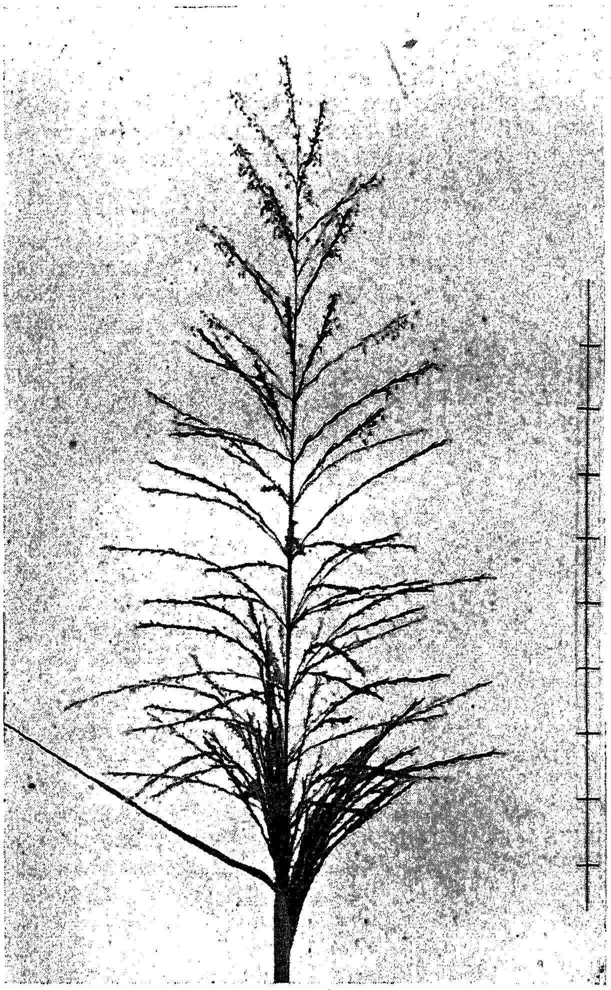

FIG. 1

The arrow of Uganda *Saccharum spontaneum*

The spikelets have opened in the upper portion. In the lower portion the stigmas are protruding from the tips of the unopened spikelets and can be made out with the help of a hand lens. The scale alongside shows inches.

In the other forms of *S. spontaneum* the spikelets begin to open only after the arrows have emerged about four inches from the leaf-sheath and the sequence of exsertion of essential organs is that the sigmas protrude as soon as the glumes are thrust apart by the swelling of the lodicules; and after an interval of about 15 minutes anthers also come out of the glumes. In the Uganda *spontaneum,* on the other hand, the stigmas begin to come out of the glumes while the arrow is still inside the leaf-sheath in the top two to three inches of the arrow. The spikelets do not open till four or five days after the protrusion of the stigmas. In Uganda *spontaneum* the flowers are thus protogynous which renders self-fertilization difficult.

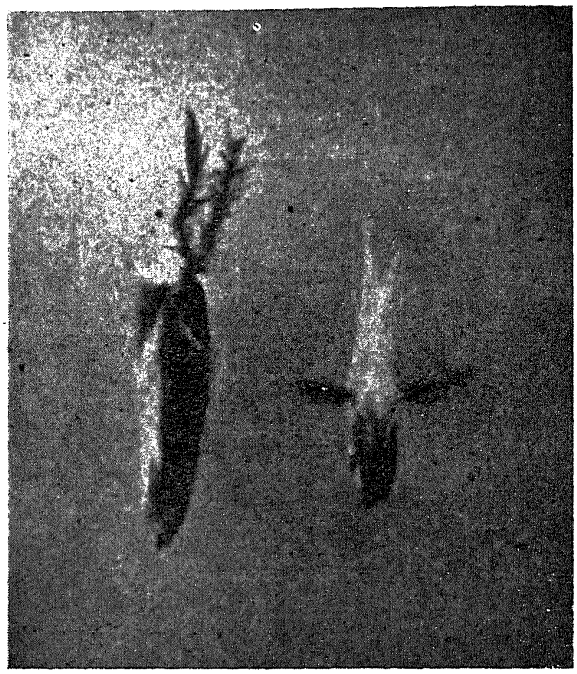

FIG. 2

The spikelets of the Uganda and Coimbatore *spontaneums*

Note the stigmas protruding from the apex of the Uganda spikelet and from the sides of the Coimbatore spikelet. Note also the difference in the size of stigmas.

The diurnal opening of the *S. spontaneum* spikelets is between 7-00 and 7-15 a.m., but the Uganda *spontaneum* spikelets open only at about 9-00 a.m. Its anthers are yellow like the other *spontaneums* though somewhat deeper in colour and the tips are reddish-brown. In all the other *spontaneums* the pollen flows out easily and very little remains inside of the anther-sac. The Uganda spikelets close at 11-00 a.m., so that they remain open for two hours while in the other *spontaneums* spikelets close one hour after their opening. It will be seen in Fig. 2 that the stigmas of the Uganda *spontaneum* protrude from the apex of the spikelet while those of *S. spontaneum* Coimbatore protrude from the sides of the spikelet.

Protogeny is essentially a device to secure cross-pollination. As is well known, protandry is the more frequent form of dichogamy and occurs in most plants.[1] Even in grasses protandry is characteristic of the majority of the genera and though protogyny is rather rare, it is met with in a few genera like *Anthoxanthum, Pennisetum,* etc.[2]

One very good characteristic of the Uganda *spontaneums* is their erect habit. Advantage has, therefore, been taken of the protogynous nature of the Uganda *spontaneums* and one of them has now been crossed with different species of *Saccharum.* It is also proposed to cross them with certain of the *Sorghum* and

Bamboo seedlings to yield a few more tri-generic hybrids of desirable characteristics.

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Imperial Sugarcane Station,
Coimbatore,
November 2, 1942.

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ON AKINETE FORMATION IN *ZYGNEMA TERRESTRIS* RANDH.

THE object of this communication is to describe a peculiar method of akinete-formation in *Zygnema terrestris* Randh. from material collected near Dhakuri in Kumaon Himalayas, and to record the presence of this alga in Kashmir.

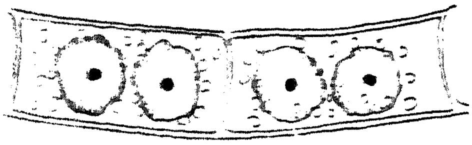
AKINETE-FORMATION

The following three modes of reproduction have been described by the present author[2,3] in this alga, so far.

1. Scalariform conjugation.
2. Lateral conjugation.
3. Aplanospore formation.

The material was collected by the author from near Dhakuri in Almora district at an altitude of about 9,000 feet above sea level in the middle of September 1939. In this material no conjugation lateral or scalariform was observed, and akinete-formation appears to be the exclusive mode of perennation.

Prior to akinete-formation cell-wall becomes thickened and lamellated. In mature akinetes cell-wall is about 6 μ thick, while in ordinary vegetative cells, it is only about 2 μ



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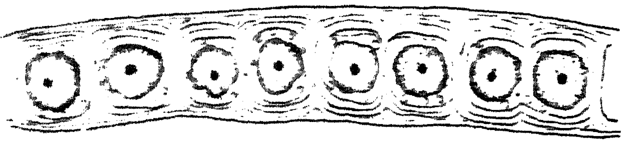

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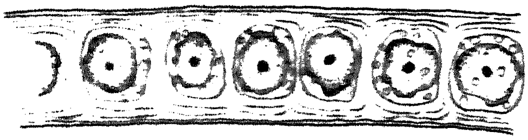

3

Zygnema terrestris Randhawa

FIG. 1. Vegetative cells. Mark the thin cell-wall. FIG. 2. Early stages in akinete formation. FIG. 3. Mature akinetes. Mark the single chloroplast in each akinete.

thick (Fig. 1). **The peculiarity of this form lies in the fact that akinetes are not formed by the direct conversion of vegetative cells into** akinetes, as in *Zygnema giganteum* Randh. or oher forms, but the vegetative cells divide into two more or less equal halves by the ingrowth of septa from the side walls, which ultimately meet in the middle (Fig. 2). So each half contains one chloroplast only surrounded by food-reserves, like starch and oil (Fig. 3). The cell-contents stain more or less black with iodine, and deep blue with Nile Blue. The akinetes are 24-27 μ broad and 18-21 μ long, *i.e.*, half as long as an average vegetative cell. There is greater economy of material in this mode of akinete-formation, for double the number of akinetes is formed. Akinete-formation is a mode of perennation in this alga in the high altitudes.

As regards the cause of their formation, it is very likely that low temperatures prevailing in high altitudes are responsible. This is partly borne out by the fact that no akinetes were ever observed in the material of this alga collected from the plains. According to Fritsch[1] in species of *Mougeotia* and *Zygnema*, which inhabit mountain-lakes in Europe with relatively low temperatures, akinete-formation is common. This alga too was collected from the alpine zone in the Himalayas and intense cold may be the cause of akinete-formation.

It is remarkable that this alga in the plains and at an altitude between 5,000 to 6,000 feet shows scalariform conjugation, between 7,000-8,000 feet shows lateral conjugation exclusively, and higher up shows akinetes only.

DISTRIBUTION

Originally collected from certain fields in Fyzabad district, in the plains of Oudh, this alga was later on collected from Kausani and Binsar in Kumaon Himalayas, Almora district. A laterally conjugating form of this alga was found near Dhakuri, at an altitude of about 8,000 feet. The material showing akinete-formation described in this paper was collected higher up in the alpine zone above Dhakuri.

On 4th August 1941, the author collected this alga from the shores of Sheshnag, an alpine lake, with glaciers on two sides, at an altitude of about 12,100 feet. This lake which is the source of Sheshnag river, a tributary of Liddar, lies on the pilgrim route to Amar Nath Cave. There was a pure growth of this alga, visible from the bridle-path in the form of a yellowish-green belt contrasting with the turquoise blue water of the lake. It formed a mat-like covering over a huge area. It was found in a purely vegetative stage, and it is likely that akinetes or conjugating material may be found in September. It is of interest to find this alga so widely distributed in the Western Himalayas from Kumaon to Kashmir.

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Deputy Commissioner's House,
Rae Bareli (U.P.),
November 28, 1942.

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