

CLEISTOGAMY IN SOME OF THE FLOWERS OF *CAJANUS INDICUS* L.

CLEISTOGAMY is a common phenomenon among the different families of angiosperms and is chiefly characterised by autogamous type of pollination and seed production. The development of cleistogamic flowers in an otherwise normally developing chasmogamic form due to certain environmental change caused by drought, excess of moisture, shade, surrounding soil, etc., is separately grouped by Uphof² as "ecological cleistogamy". The exact edaphic factor concerned in inducing the production of cleistogamous flowers are in many cases difficult to determine.

In the course of the breeding work in *Cajanus indicus*, many cases of cleistogamic tendency was noticed in the majority of the flowers. The flowers of *Cajanus* are considered to become chasmogamic having insect visitors like *Megachile lanata* and *Apis florea*. Examination of the flower buds at various stages indicated that the pollen grains mature early and anthesis takes place 34 hours before the actual opening of the flower. The stigmatic surface gets profusely dusted with the pollen which begin to germinate and form pollen tubes, thus resulting in autogamy. Mehta and Dave¹ also observed a similar condition in their studies in *Cajanus indicus* and state that anthesis takes place at least 24 hours before the opening of the flowers. They do not attribute any significance to this interesting feature. Pollen grains were found to spontaneously germinate soon after anthesis on any surface of the flower such as petal, filaments, etc.; the stimulus of the stigma was not, therefore, necessary for initial germination, a character reminiscent of cleistogamous flowers. This feature is similar to Warming's³ observation in *Campanula uniflora* from Greenland. In this plant the pollen grains get deposited on the stigmatic surface in the bud condition itself developing pollen tubes and when further pollination is no longer possible the flowers become chasmogamic. In *Cajanus indicus* the author's observations indicate that the percentage of such ecological cleistogamic flowers goes up to 80 per cent. in the months of September to November. The exact edaphic factors responsible for such a feature have not been determined.

Department of Agriculture,
Bangalore,
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D. M. GOPINATH.

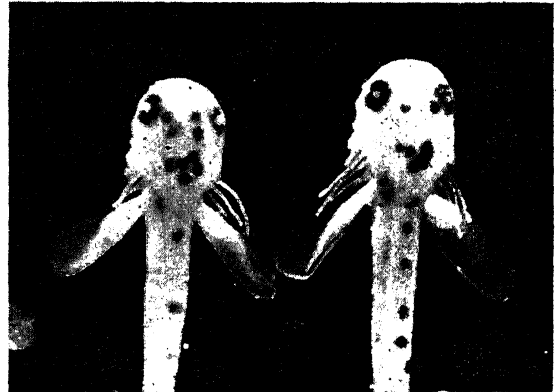
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ON THE OCCURRENCE OF 'EXTERNAL' GILLS IN THE LOACH—*LEPIDO- CEPHALUS THERMALIS* (C.V.)

TRUE external gills of ectodermal origin occur only in Crossopterygii, Dipnoi and Amphibia. The embryos of elasmobranchs possess long filamentous gill lamellæ projecting out of the

gill clefts. Such endodermal gill filaments have been noticed in the larvæ of *Gymnarchus* and *Heterotis* by Budget and *Misgurnus* by Gotte.

The occurrence of 'external' gill filaments in Teleosts is a rare feature. While studying the early development of the loach—*Lepidocephalus thermalis* (C.V.) it was noticed that the larvæ possessed long gill filaments projecting out of the opercular opening. Second day after hatching the larva was observed to develop a filamentous vascular loop projecting out



5 days old larva of *Lepidocephalus thermalis* (C.V.)
showing 'external' gill filaments

of the opercular opening. The loop gradually elongated in size. About the fifth day four such filaments were noticed on either side. During the third and the fourth weeks the filaments branched considerably. They were kept in constant movement by the opercular flaps. These filaments were gradually absorbed giving place to normal internal gills between the fourth and the fifth weeks. A microscopical examination of the sections of the head of the larva revealed that the 'external' gill filaments are derived from the endoderm covering the branchial bars.

It is well known that both *Misgurnus* and *Lepidocephalus* perform intestinal respiration taking air directly by the mouth and passing it out of the anus and that they are well adapted for living in muddy waters deficient in oxygen. The development of larval 'external' gills in these two loaches is probably intended to provide a greater respiratory surface to surmount the adverse conditions prevailing in such muddy waters.

Fisheries Section,
Department of Agriculture,
Bangalore,
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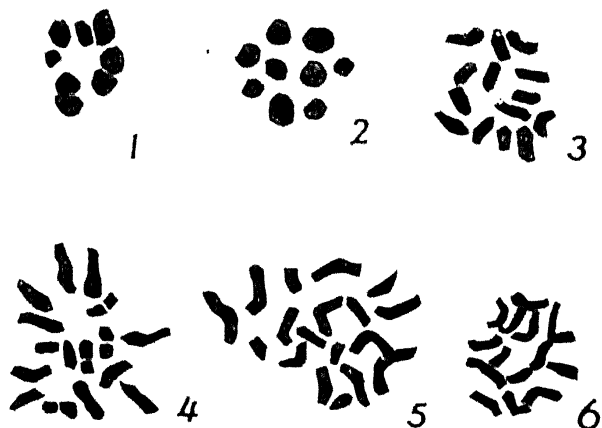
B. S. BHIMACHAR.
AUGUSTINE DAVID.

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THE CHROMOSOME NUMBERS IN THE FAMILY ANONACEÆ

THE family Anonaceæ is one of the little known families in respect of its chromosome numbers. In 1936, Locke¹ noted that the haploid number of chromosomes in *Asimina triloba* was probably nine. One of us (R. D. A.), in 1937,

found² that the haploid number of chromosomes in *Anona squamosa* and *A. reticulata* was seven. Kumar and Ranadive³ (1941) also found the same number in meiosis in these two species, as also in the two other species they investigated, namely, *A. cherimoliana* and *A. muricata*.



Very recently the present authors investigated some more members of this family and found that the haploid number of chromosomes was eight in *Artabotrys odoratissimus* and nine in *Polyalthea longifolia*. A study of the somatic divisions in the root-tips revealed that the diploid number of chromosomes is fourteen in *Anona squamosa* and *A. reticulata*, sixteen in *Artabotrys odoratissimus* and eighteen in *Polyalthea longifolia*. This confirmed the haploid number of chromosomes previously noted by us in these plants.

One of us (R.D.A.) wishes to express his best thanks to Prof. S. V. Shevade, Dr. T. S. Mahabale and Prof. V. G. Phatak for their keen interest and help in the work.

Gujarat College, Ahmedabad, J. J. ASANA,
Wilson College, Bombay, R. D. ADATIA
January 20, 1945.

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ON SOMATIC DIVISION, REDUCTION DIVISION, AUXOSPORE FORMATION AND SEX DIFFERENTIATION IN *NAVICULA HALOPHILA* (GRUNOW) CLEVE

Navicula halophila occurs in good quantity at Madras. The life-history of the Diatom was studied by the author with the help of laboratory cultures. Special attention was devoted to its auxospore-formation and the nuclear details connected with the process.

Somatic division takes place in the usual manner, the chromosomes being arranged in a ring around the spindle at metaphase as is characteristic of Diatoms. The chromosome number appears to be 48-52 ($2n$). After cytokinesis, two new valves are secreted by the daughter protoplasts inside the old valves.

During auxospore-formation two cells come near each other (Fig. 1) and secrete a common mucilaginous envelope. The nucleus of each cell divides meiotically and forms two nuclei. All the stages of the meiotic division were observed. The haploid number of chromosome appears to be 24-26. The contents of each cell then divides into two protoplasts, each protoplast receiving one haploid nucleus. The haploid nucleus in each daughter-protoplast undergoes the second division and forms two nuclei. Of these two nuclei in each daughter-protoplast, one degenerates and the other remains functional, so that ultimately, each daughter-protoplast (gamete) has one single haploid nucleus. Finally two gametes are organised in each of the conjugating cells (Fig. 4).

The two gametes of one of the cells escape out of the valves and fuse with the two gametes of the other cell. The latter gametes remain passive and do not move out of the parent valves. Both the zygotes are formed in the latter cell (Fig. 5).

The zygotes (auxospores) germinate after a few hours of rest and form two new Diatom cells (Fig. 6). The two gametic nuclei inside each auxospore do not fuse for a long time and fuse only after the auxospore has reached its full size.

The nuclear details connected with auxospore-formation among the Pennate Diatoms have been recorded only in a few forms (*Cymbella lanceolata*, Geitler 1927a; *Cocconeis placentula*, Geitler 1927b; *Nitzschia subtilis*, Geitler 1928; *Synedra ulna*, Geitler 1939; *Rhoicosphenia curvata*, Cholnoky 1927; *Anomoeoneis sculpta*, Cholnoky 1928; *Cymbella cistula*, Cholnoky 1933; and *Gomphonema geminatum*, Meyer 1929). But nothing is known regarding the nuclear details connected with auxospore-formation in the very common genus, *Navicula*, though auxospore-formation has been previously recorded in the genus [*Navicula Grevillei* (Smith 1856); *N. serians* and *N. rhomboides* (Carter 1865); *N. cuspidata* var. *ambigua* and *N. elliptica* (Pfitzer 1871); *N. viridula* and *N. scopulorum*, (Karsten 1896); *N. crucigera* (Karsten 1897); *N. didyma*, *N. ramosissima*, *N. directa*, *N. subtilis* and *N. pygmaea* (Karsten 1899); and *N. seminulum* (Geitler 1932)]. In the present form the author was able to follow all the details of the nuclear changes connected with the auxospore-formation. This appears to be the first complete account of the nuclear changes connected with auxospore-formation in this genus.

Again, in the Pennate Diatoms, previously, both isogamous conjugation [e.g., *Rhopalodia gibba* (Klebahn 1896); *Epithemia zebra* var. *saxonica* and *Denticula Vanheurekii* (Geitler 1932)] and anisogamous conjugation [e.g., *Cymbella lanceolata* (Geitler 1927a); *Nitzschia subtilis* (Geitler 1928); *Gomphonema parvulum* var. *micropus* (Geitler 1932)] have been recorded. In the former the gametes of both the cells are equally active and as a result, the two zygotes are formed between the two pairing cells. In the latter type of conjugation, of the two gametes that are formed in each pairing cell, one is active and motile,