(O'Brien, 1967). Insecticides with chlorinated hydrocarbons, *e.g.*, gamma hexane (Hexachlorocyclo hexane) leads to abnormalities in spindle fibre formation (Sharma and Chaudhuri, 1959, 1961; Sharma and Ghosh, 1969; and Dutta, 1966). Endrin also contains Hexachloro group which may be responsible for showing similar properties.

Endrin EC 20 is probably one of the cheapest pretreating chemicals known so far. Its application in other plant species is under investigation.

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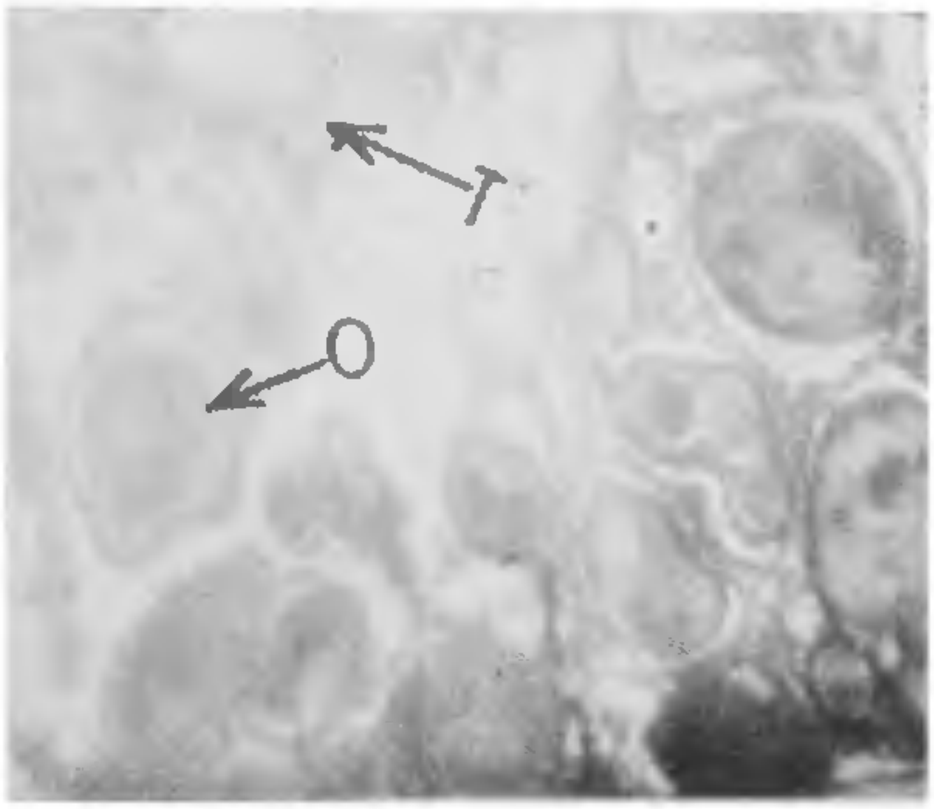
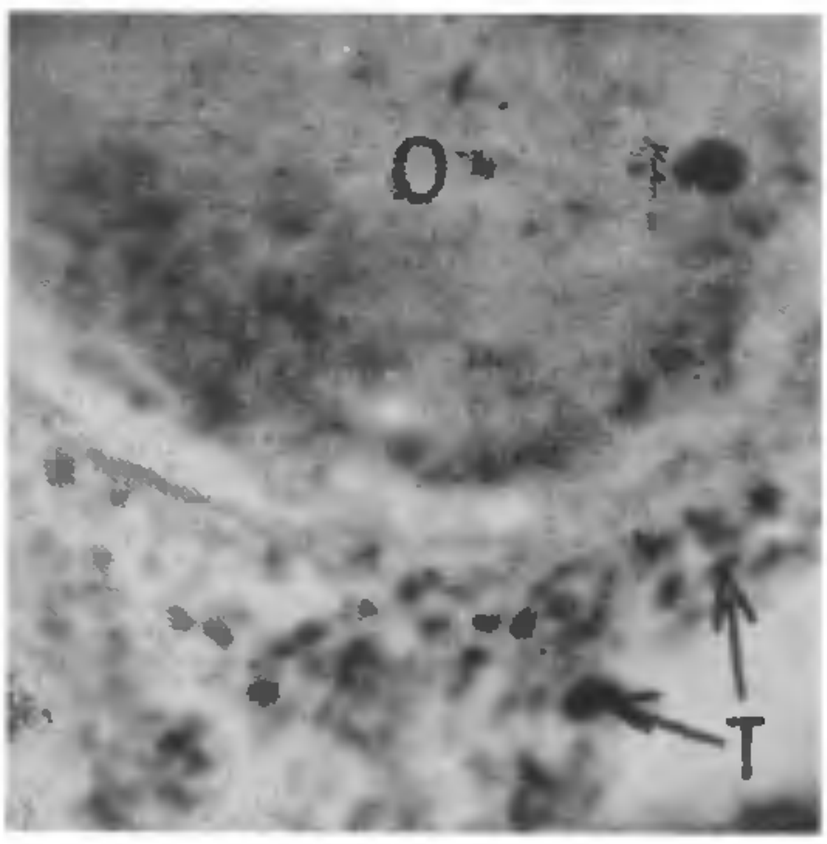
HERMAPHRODITISM IN THE MURREL, *CHANNA PUNCTATA* (BLOCH, 1793)

HERMAPHRODITISM has been reported in several teleostean fishes[1–3]. Among freshwater fishes of India, hermaphroditism has been reported in *Hilsa ilisha*[4] (an anadromous fish), *Cirrhina reba*[5], *Barbus* (*Puntius*) *sitgma*[3], *Mystus vittatus*[7], *Clarias bactrachus*[8], *Heteroneustes fossilis*[9] and *Channa striatus*[10]. However, this is the first report on hermaphroditism in *Channa punctata*.

During my studies on *Channa punctata* from Guntur (Andhra Pradesh), I have come across a 202 mm long (TL) hermaphrodite. Though Dehadrai *et al.*[11] reported some colour difference between males and females of this species, I do not find it to be a reliable secondary sexual character in the large number of specimens (2,400) examined from Guntur. On dissection, it is easy to identify the sex of even juveniles measuring 70 mm TL, because both ovaries extend behind the vent, whereas the testes do not. In the present hermaphrodite, the gonad looks like a testis externally and does not extend behind vent. However, when examined microscopically, both gonads are observed to be ovotestes. The ovarian and testicular tissues are mixed, without any particular position for each (Fig. 1 *a*). All the ova are immature; yolk deposition has started in a few of the larger ova The diameter of the ova ranges from 0·023 mm to 0·230 mm. The spermatocytes can be made out only under high magnification (× 1.000) (Fig. 1 *b*).



a



b

FIG. 1 *a* and *b*. Microphotograph of section of ovotestis to show (*a*) arrangement of ovarian (O) and testicular (T) tissues, × 100. (*b*) spermatocytes (T) and part of an ovum (O), × 1,000.

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RESPONSE OF COWPEA [*VIGNA UNGUICULATA* (L.) WALP.] TO *RHIZOBIUM* SEED INOCULATION

THE importance of rihzobia in increasing legume yields and nitrogen economy of soils is well known. In countries like Australia, New Zealand, U.K. and U.S.A., inoculation of grain and forage legumes with appropriate rhizobial inoculant has become a common practice. In India, *Rhizobium* cultures are now becoming popular amongst farmers. Work done so far in different parts of the country indicated significant increases in the grain yields of soybean, Bengal gram, lentil and pea [7,8]. In other grain legumes, particularly cowpea, no consistent and significant yield increase due to inoculation was obtained[3,5,6]. Important pulses cultivated in India are nodulated by cowpea group of rhizobia. Although most of the Indian soils contain the rhizobia nodulating cowpea, per hectare yield of cowpea without inoculation has remained very low. Response of cowpea to incolation with some of the selected strains of *Rhizobium*, indigenous and imported, under field conditions is reported here.

The experiment was conducted at the farm of the Main Research Station, University of Agricultural Sciences, Bangalore, with red loamy soil of pH 6·5. Cowpea, C–152, seeds were treated with peat-based *Rhizobium* cultures using sticker made of 5% sucrose solution. Three indigenous strains, *viz.*, UASB 94, UASB 120 and UASB 125, and one imported CB 756 strain obtained from CSIRO, Brisbane, Australia, were tested. The individual strains and also a composite culture consisting of equal quantities of all the four strains were tested for their performance. Seeds treated with only sterile peat served as control. The five treatment plots were laid out in randomized block design with three replications. The seeds were sown in 4·5 × 3·15 M plots giving 45 cm and 15 cm spacing between rows and plants, respectively. The experiment was carried out in monsoon season and hence no irrigation was provided. Observations on the number and fresh weight of nodules, and dry weight of plant tops were recorded 45 days after plant growth. Grain yield was recorded at maturity of the crop. Results are presented in Table I.

TALLE I

Effect of Rhizobium *inoculation on nodulation status, dry matter weight of plant top and grain yield of cowpea*

Treatment	Nodule number/ plant	Fresh nodule weight (g/plant)	Dry matter weight (g/plant)	Grain yield (Q/ha)	Increase in yield over control (%)
UASB 94	26·33	0·740	3·03	12·24	53·96
UASB 120	33·33	0·947	4·35	8·76	10·18
UASB 125	26·33	0·837	3·13	6·25	..
CB 756	25·67	0·927	4·23	5·95	..
Composite culture	19·75	0·723	2·88	10·61	33·45
Control	25·50	0·860	2·70	7·95	..
C.D. at 5% level	NS	NS	NS	2·20	..

Seed incoulation of cowpea C–152 with UASB 94 strain and composite culture resulted in significant increase in grain yield over uninoculated control. Although increased nodulation and weight of dry matter have been obtained in *Rhizobium* inoculated plants over control, the differences were statistically not significant. No correlation between the number of nodules per plant and the grain yield could be observed. Such absence of correlation between yield and nodule number in cowpea has been reported earlier[5]. Studies on the performance of the composite cultures over single strain cultures have given varied results in different crops and soils[1,4,5]. In the present study single strain inoculant with UASB 94 resulted in maximum grain yield followed by the composite