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Mating behaviour in the homosporous fern, *Cyclosorus parasiticus* (Linn.) Tardieu

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Abstract. Mating behaviour of *Cyclosorus parasiticus* studied from isolate, pair and composite populations showed potentially intergametophytic mating behaviour and capacity for intragametophytic selfing which helps in wide distribution of the species in different environmental niches. The study also indicates lesser genetic diversity in *C. parasiticus*.

Keywords. Mating behaviour; intergametophytic mating; intragametophytic selfing; intergametophytic selfing; homozygous.

1. Introduction

Two types of mating systems, intragametophytic and intergametophytic, are reported in Pteridophytes (Klekowski and Lloyd 1968), the former resulting from the fusion of gametes produced by a single gametophyte and the latter from the fusion of gametes from two different gametophytes. The best reproductive system for a homosporous pteridophyte, from evolutionary point of view, is regarded as one which is initially adapted for intergametophytic mating with the capacity for intragametophytic selfing in the course of time (Klekowski 1969). A fern with such a reproductive system is likely to be a good coloniser and its reproductive system less charged with genetic load, which helps in the wide distribution of the species in different environmental niches (Khare and Roy 1977).

In the light of these, the mating behaviour of the widespread tropical fern *Cyclosorus parasiticus* was studied on the basis of optimal conditions for maximum fertilization.

Spores were collected from a single sporophyte growing in the fernery of National Botanical Research Institute, Lucknow and surface sterilised spores (sterilisation done with 2% sodium hypochlorite) sown on Parker's macro- and Thompson's micro-nutrient media solidified with 1% agar. The agar plates were incubated at $25 \pm 2°$ C under 12 hr daily white fluorescent illumination of 250–300 ft.c. intensity. Prior to initiation of gametangia the gametophytes were randomly isolated into 3 sets of populations, viz., (i) 10, singly isolated gametophytes; (ii) 20, pairs of gametophytes; and (iii) 10, composite pairs of gametophytes (25 gametophytes in each). After the formation of sex organs in these populations,

the plates were flooded with sterilised distilled water twice in a week to facilitate fertilisation. The frequency of sporophyte production was later estimated. Stock cultures were kept unwatered throughout the course of experiment.

2. Observations

Acetocarmine squash preparation of young sporangia showed 72 bivalents at meiosis (figure 1) indicating that the plant used in present study is a tetraploid. Stock cultures of gametophytes, which were kept unwatered so as to prevent fertilisation, failed to produce sporophytes indicating that the taxon is sexually reproducing. The germination frequency of spores was *ca* 90%.

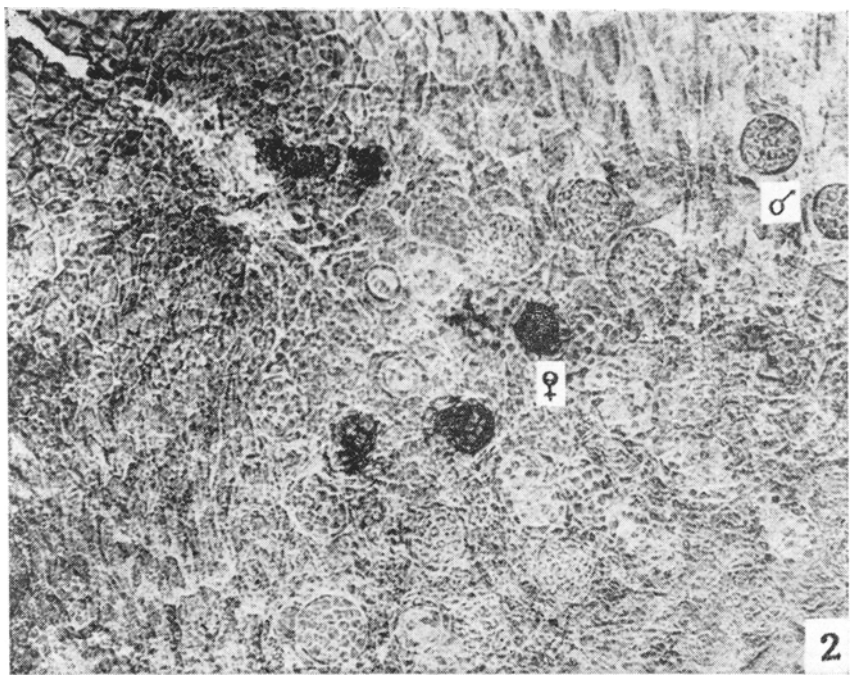
Sex organs were developed on the gametophytes below the apical notch and gametangial distribution was mixed (figure 2). Antheridia appeared first and within a week the gametophytes became bisexual, thus increasing the possibilities of intragametophytic selfing.

Sporophytes appeared first in composite populations, followed by paired populations and finally in populations of isolated gametophytes. In composite population sporophyte production was 94·4%, whereas in paired and singly isolated gametophytes sporophyte production was 77·5% and 70% respectively. As compared to composite and pair populations, sporophyte production in isolated gametophytes was delayed and was observed only after repeated watering, indicating that all isolated gametophytes which produced sporophytes possess leaky lethal genotypes (Klekowski 1972).

3. Discussion

Klekowski's (1972) studies on *Pteridium aquilinum* have shown that as the number of self-incompatibility loci decreases, the occurrence of sporophytes in pair population of gametophytes increases. The frequency of sporophyte production in this taxon was maximum in composite and lowest in isolate populations, as observed in the present studies in *C. parasiticus*. Sporophyte production was 77·5% in pair populations and 70% in isolates in *C. parasiticus* indicating a self-compatibility system in this taxon. In isolates the production of 70% homozygous sporophytes is indicative of the presence of fewer deleterious genes in this plant, thus showing a high probability of intragametophytic selfing. It indicates that the native area was initially colonised by homozygous sporophytes developing from self-compatible gametophytes. Ontogeny and distribution of the sex organs also support the occurrence of intragametophytic selfing in *C. parasiticus*.

As revealed by the present studies, *C. parasiticus* is initially adapted for intergametophytic selfing and possesses the capacity for intragametophytic selfing during development, thus leading one to believe that populations of this species possess less genetic diversity. As reported in *Osmunda regalis* (Klekowski 1973; Lloyd 1974), intragametophytic selfing predominates during the early stages of colonisation of a new habitat. Thus it could be concluded that *Cyclosorus parasiticus* could be a good coloniser for the barren lands but its mating system seems to be of little value in as far as the improvement of the species is concerned.



Figures 1–2. 1. Sporangial squash showing 72 bivalents × 1,000. **2.** The arrangement of antheridia (♂) and archegonia (♀) on a gametophyte of *Cyclosorus parasiticus* × 800.

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