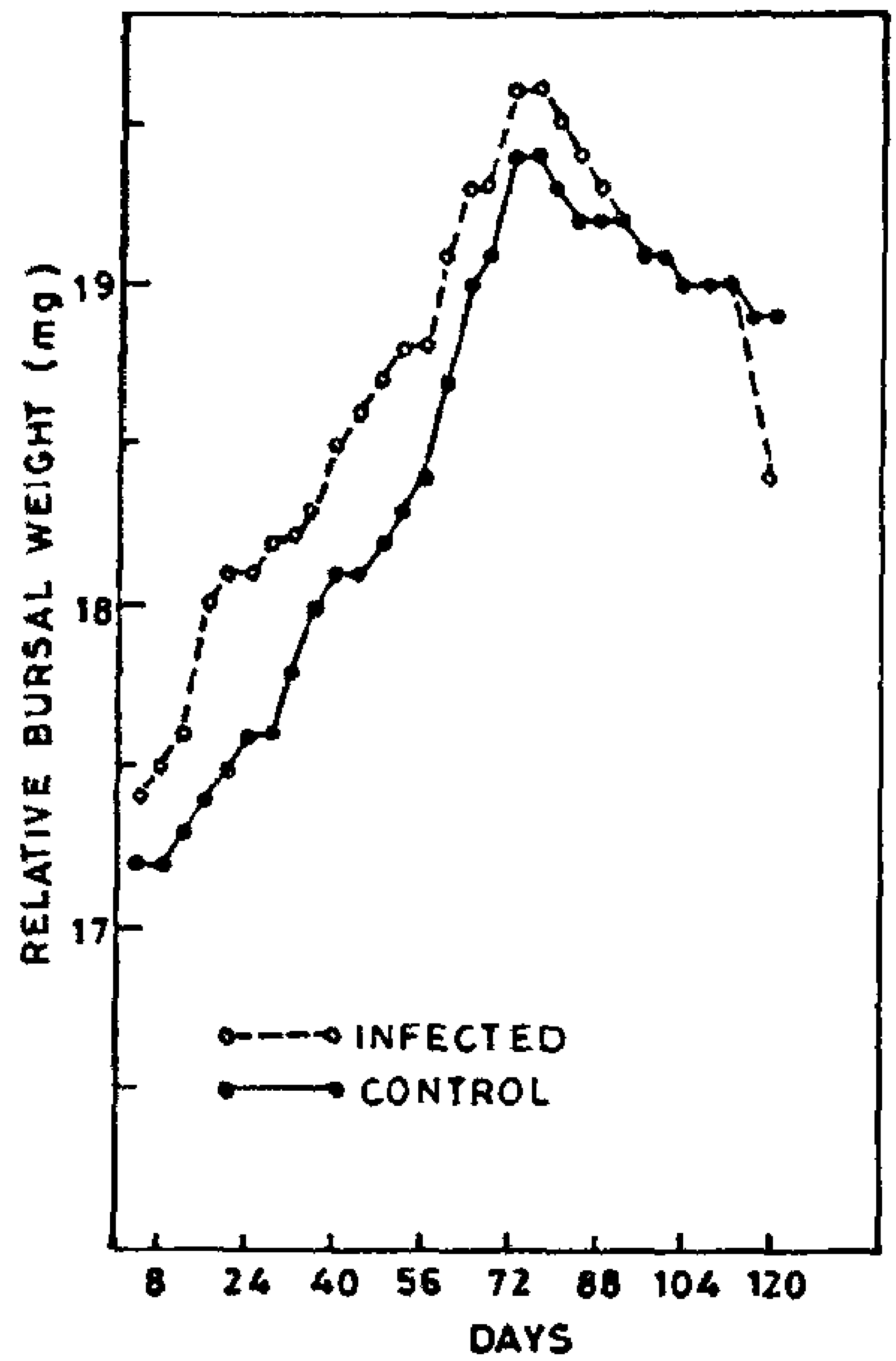


Figure 4. Relative weight of bursa at every 4 days interval until 120 days.

per 10 g of body weight) also steadily increases with growth from 15.1 mg (1 day-old) to 19.4 mg (76 days old) in control and from 16.6 mg (1 day-old) to 19.6 mg (72 days old) in challenged group of chickens. Relative weight then tends to decrease steadily after 30 days in control and 76 days in challenged group until sexual maturity at 120 days (figure 3 and 4). Increase in relative weight in challenged group of chickens, however, is more obvious than in control group at each stage of sacrifice.

Grateful thanks are due to CSIR for financial assistance.

26 April 1982; Revised 13 October 1982

1. Bhopale, M. K. and Johri G. N., *J. Helminthol.* 1975, **49**, 179.
2. Bhopale, M. K. and Johri, G. N., *J. Hyg. Epidemiol. Microbiol., and Immunol.*, 1976, **20**, 464.
3. Agarwal, R. K. and Johri, G. N., *J. Helminthol.*, 1980, **54**, 109.
4. Agarwal, R. K. and Agarwal, S. M., *Rivista di Parasitologia*, 1981, **42**, 387.
5. Goyal, P. K., Apte, S. D. and Johri, G. N., *Bioresearch*, 1979, **3**, 49.

CONTRIBUTIONS TO THE REPRODUCTIVE BIOLOGY OF THE FERN *LYGODIUM FLEXUOSUM* (L.) SW.

NAND LAL AND S. K. ROY
Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi 221 005, India.

LYGODIUM *flexuosum* is a climbing fern and grows in many natural and artificial Teak-Sal forest of India at lower altitudes. In Mirzapur district it is sparingly found in a Sal forest called Hathinallah and in Gorakhpur it is rather abundant in Teak-forest called Kusumhi. The distribution of the fern, though never growing in plenty in any one place throughout India, is interesting and therefore a study of the mating system and distribution of *L. flexuosum* was undertaken.

The spores were collected from both the sources mentioned above and stored in a desiccator and then surface sterilized with 2% sodium hypochlorite solution before sowing on 50 ml of autoclaved sterilized inorganic nutrient medium[1] gelled with 1% agar at pH 5.8 in petridishes. The plates were maintained at 24 ± 2° C under continuous-white fluorescent illumination at an intensity of 250–300 ft.C. in a culture room. Immature prothalli were randomly selected and were placed in fresh solidified nutrient agar medium in petridishes to give rise to three kinds of population, namely, single, pair and composite. Crossing programme for the gametophytes is mentioned below.

A : Consisted of 21 singly isolated gametophytes from Hathinallah.

B : Consisted of 26 singly isolated gametophyte from Kusumhi.

A × A : Consisted of 24 pairs of gametophytes from Hathinallah.

B × B : Consisted of 20 pairs of gametophytes from Kusumhi.

A × B : Consisted of 20 crosses of gametophytes. Each plate contained two gametophytes, one from Hathinallah and other from Kusumhi.

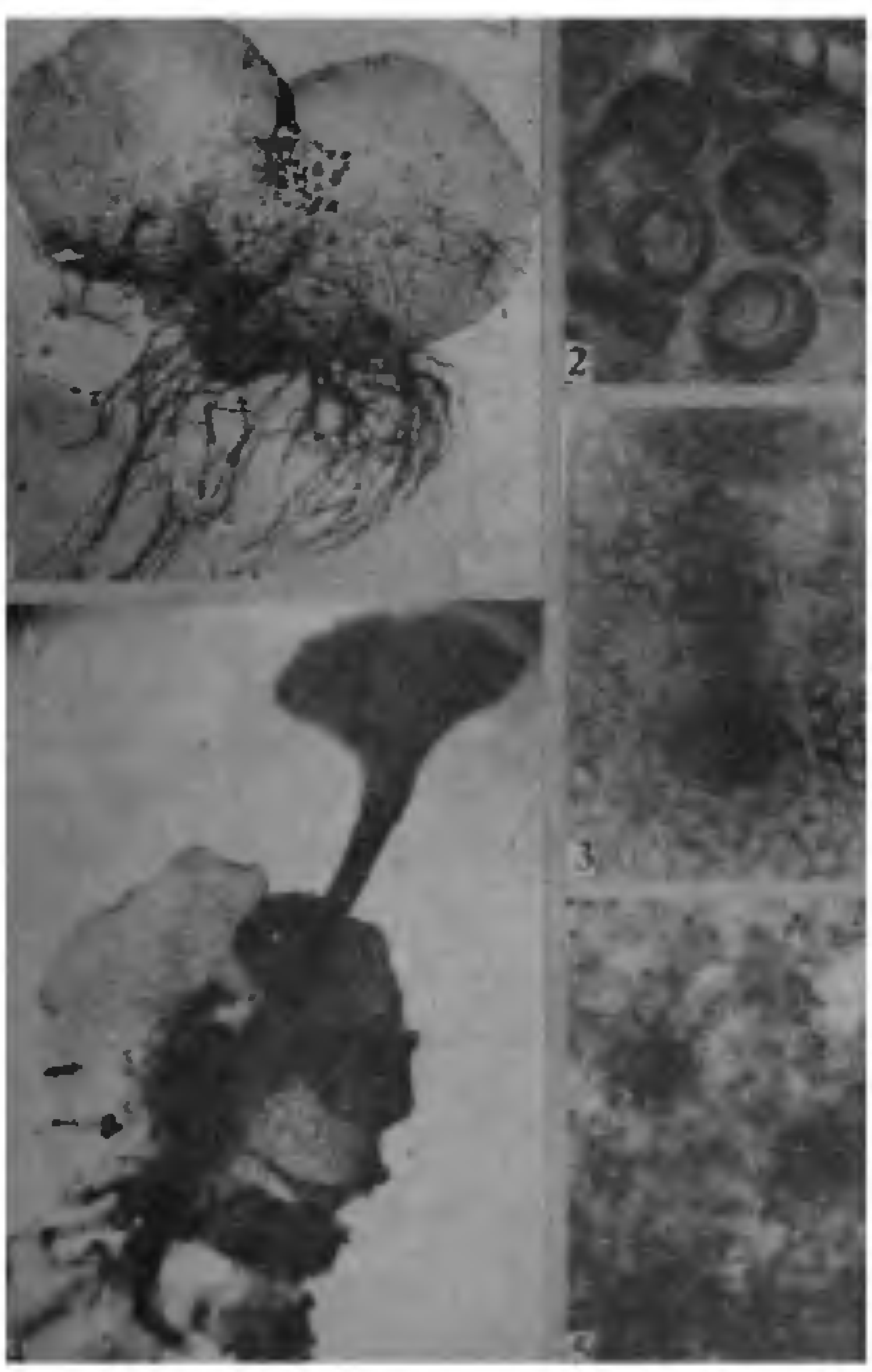
A′ × B′ : Consisted of 25 composite cross-cultures. Each plate contained 20 gametophytes, half from Hathinallah and the other half from Kusumhi.

After attaining sexual maturity the cultures were subsequently watered twice weekly with sterilized double distilled water to facilitate fertilization and zygote formation was scored till the termination of experiment. Two sets of stock-culture were left unwatered to serve as apogamous control. At the end of the experiment those gametophytes which failed to produce a sporophyte were examined morphologically for the presence of male, female gametangia and indication of fertilization by mounting in Hoyer's medium[2] and staining with acetocarmine.

The trilete and tetrahedral spores germinated in four days after sowing and prothalli attained cordate form after 15 days of sowing. Initially antheridia were formed in 19 days old prothalli and hermaphroditism was attained within a week. Antheridia developed in the central region of the prothallus and the archegonia were produced just below the apical notch orienting their necks downward (figures 1, 2 and 3). Details of the sex expression in random samples are shown in table 1.

First sporophytic leaf initiation started in composite culture after 37 days of germintion while the same in isolate and pair culture formed after 38th and 46th days of germination (figure 4), respectively. The percentage of sporophyte production was highest in cross — A × B, followed by cross A′ × B′ and then the pairs A × A, B × B (table 2).

The gametophytes without apparent sporophyte were bisexual and exhibited abortive embryos



Figures 1-5 1. Normal sexually matured cordate gametophyte bearing antheridia and archegonia-×10, 30 days old. **2.** Antherozoids ×1000. **3.** Normal Archegonium ×400. **4.** Gametophyte with sporophyte ×10, 45 days old. **5.** Abortive embryos ×200.

TABLE 1

Chronological changes in sex-ratio of a stock-culture of L. flexuosum.

Days after germination	Sample size	Sterile	male	Female	Hermaphrodite
16	20	20	...	...	...
20	20	12	8	...	...
31	20	...	4	...	16
33	20	...	2	...	18
37	20	...	...	...	20
42	20	...	...	...	20

TABLE 2

Breeding test for L. flexuosum populations: Percentage of gametophytes not producing sporophyte in the isolates, pairs and crosses.

Populations	No. of gametophytes studied	No. sporophyte produced	% gametophyte not producing sporophyte	Mean (%)
A	21	17	19.2	18.6
B	26	22	18.2	
A × A	48	46	4.1	4.5
B × B	40	38	5.0	
A × B	40	40	0.0	3.4
A′ × B′	500	483	3.4	

showing that fertilization had occurred repeatedly but growth of sporophytic tissue was terminated early (figure 5). No sporophyte appeared in the unwatered population confirming sexual nature of the plant.

The present investigation deals with the mating system which govern the pattern of distribution of the plant and its colonizing potentiality. Frequency of sporophyte production was highest in cross cultures followed pairs and lowest in isolates. As the mating system is of intergametophytic crossing and selfing with the preservation of intragametophytic selfing, the allelic lethals would have been paired in the selfing culture (A × A), (B × B) which were reflected in the lower frequency of sporophytes formed. This pattern suggests that the parental sporophytes were heterozygous for recessive sporophytic lethals. It has been observed that the intragametophytic selfing and intergametophytic selfing were influenced very much by gametangial ontogeny of a species. Male to hermaphrodite sequence conferred a high degree of probability of intragametophytic selfing[3,4] which has a considerable frequency in the isolate population to eliminate all genetic variants which form lethal homozygous combinations. It indicates that the native areas were initially colonized by homozygous sporophytes developing from self compatible gametophytes. While this character was maintained and helped the species to spread in widely differing environmental niches, there has been an attempt to encourage a little outbreeding as the natural selection operates to favour heterozygotes rather than homozygous sporophytes under most conditions[5] Thus the gene pool of *Lygodium flexuosum* being surcharged with less mutational load is a good colonizer but certain unfavourable ecological conditions diminish its wide distribution.

We express our gratitude to U.G.C., New Delhi for providing financial assistance to N. Lal.

5 June 1982; Revised 5 March 1983

1. Klekowski, E. J., Jr. *Bot. J. Linn. Soc.*, 1969b. **62**, 361.
2. Beeks, R. M. *Aliso.*, 1955, **3**, 131.
3. Klekowski, E. J., Jr. *Bot. J. Linn. Soc.*, 1969a, **62**, 347.
4. Lloyd, R. M. *Ann. Mo. Bot. Gard.*, 1974b. **61**, 318.
5. Ganders, F. R. *Bot. J. Linn. Soc.*, 1972, **65**, 211.

CHEMOTAXONOMY OF A FEW COMPOSITAE

H. MAHESWARI DEVI AND A. R. GIRIJA
Department of Botany, Andhra University, Waltair 530 003, India.

THE family Compositae, one of the largest families of angiosperms shows diversity in its habit and habitat. A study of the herbals of the family reveals that a large number of plants were used for their curative purposes. The wide medicinal use of many composites inspires organic chemists to explore their chemistry to find out the active constituents. Several species of the family have been investigated for their chemical constituents. Considering the size of the family, the information on the chemistry of the family is meagre. In the present investigation an attempt has been made to study the chemistry of 4 genera and 6 species. The species investigated are —*Melampodium divaricatum* (Rich in Pers) DC, *Tridax procumbens* L., *Gaillardia picta* (Fougeroux), *Gaillardia picta* var. *picta*, *Gaillardia lutea*, L., *Tagetes patula* L. (golden yellow, lemon yellow and orange red flowered varieties) and *Tagetes erecta* L. (lemon and golden yellow varieties). Further, it is planned to study the splitting of these colour variants into different species or subspecies.

Standard tests[1] with fresh material have been carried out to detect the presence of various chemical constituents and the results are tabulated in table 1. (See next page).

The results are uniformly positive in all the species for hot water test, saponin test and phenols. However, negative results are observed in all the species for leuco-anthocyanin test, tannins, quinones, juglone test 'A', Labat test, Lignans, Indoles and Noller's test. Except *T. erecta*(lemon yellow variety) all the plants reacted negatively for syringin test. *M. divaricatum*, *G. picta*, *T. patula* (orange red variety) and *T. erecta* (lemon yellow variety) have shown positive reactions and the other species reacted negatively for HCl/Methanol test. Flavonoids are absent in *G. lutea* and are present in the remaining plants. Liebermann-Burchand test for triterpenoids/steriods is positive for *G. picta* and *G. picta* var *picta*. These two plants showed positive results for Salakowski reaction (Steriods) and negative results for Noller's test (triterpeniods). Other species reacted negatively for all these three tests. *G.picta* and all the flower types of the species of *Tagetes* alone are positive for Maule test. Lignans are absent in all the taxa investigated. Similarly all plants are negative for Noller's test.

From table 1 it is evident that all the plants share a number of common chemical characters with a few minor differences. It may be concluded that due to these minor differences it is not possible to create a new species or sub-species based on paired affinity values[2]. Further, based on these phytochemical diferences, these flower colour variants may be termed as chemotypes.

ARG is thankful to the CSIR for the award of a Fellowship.

21 April 1982; Revised 28 January 1983.

1. Ellison, W. L., Alston, R. E. and Turner, B. L., *Am. J. Bot* 1962, **49**, 599.
2. Gibbs, R. D., *Chemotaxonomy of flowering plants*, McGill Queen's University Press, Montreal, London 1974.