

reduction in chlorophyll content varied from 3–30% depending on the extent of infection.

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### DIFFERENTIAL SENSITIVITY TO VARIOUS FACTORS OF AKINETE AND VEGETATIVE CELL IN GREEN ALGA *STIGEOCLONIUM PASCHERI* (VISCHER) COX AND BOLD

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STUDIES relating to differential sensitivity to various factors of green algal spores and vegetative cells are meagre. The present work incorporates the differential sensitivity to factors such as penicillin, streptomycin, chloramphenicol and extreme temperature, of akinetes and vegetative cells in *Stigeoclonium pascheri*.

The alga isolated from a freshwater pond at Sarnath, Varanasi, was grown in Bold's basal medium<sup>1</sup> at  $22 \pm 1^\circ\text{C}$  under illumination of 2 K lux for 16 hr per day. The vegetative cells form discrete Caespitose or matted colonies on 1% agar plates. The akinetes appeared after 30 days from the day of inoculation of filaments and required another 30 days for maturation. The akinete harvested from the basal medium when transferred to fresh medium directly germinated into new filaments.

It has been reported that 8000 ppm of penicillin, and 400 ppm of each of streptomycin and chloramphenicol are lethal concentrations to the present alga<sup>2</sup>. In the present study akinetes were taken from 60-day old culture, whereas vegetative cells were obtained before the onset of sporulation from a 10-day old culture. Each sample was separately exposed at different time intervals, to a lethal concentration of penicillin, streptomycin and chloramphenicol. In another set of experiment they were at different time intervals exposed separately to extreme temperatures of 0, 45 and 50 °C. Later they were inoculated on fresh mineral agar plates and transferred to culture chamber. The sensitivity of akinetes was estimated by measuring the

percentage of germinated akinetes to the total number of akinetes. The sensitivity of vegetative cells was determined by counting the number of colonies that appeared on mineral agar plates.

The levels of sensitivity of akinetes soaked in each antibiotics for a particular time period to germinate and of vegetative fragments to form colonies were more or less similar (see table 1). The inhibition of the growth of the microorganisms by antibiotics is a result of interference with reactions that are essential for growth<sup>3,4</sup>. The same levels of sensitivity of akinetes and vegetative cells toward a particular antibiotic are probably due to the sensitivity toward the same levels of action of that antibiotic. It might also be due to the equal rate of penetration of a particular antibiotic into vegetative cells and akinetes responsible for the same level of sensitivity to that antibiotic.

The results of the exposure of akinetes and vegetative cells of *S. pascheri* to extreme temperature show that whereas the akinetes receiving exposure at 50°C for 6 hr retained viability, the vegetative cells exposed at 45°C for 12 hr died. The akinetes, similarly, were able to tolerate an exposure of 0°C for 3 days whereas the vegetative cells died when subjected to exposure with 0°C for only 1 day (see table 2). The akinetes of *S. pascheri*, therefore, can withstand extremes of temperature than the vegetative cells as seen in *Anabaena cylindrica*<sup>5</sup>.

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**Table 1** Effect of pretreatment of antibiotics on germination of akinetes and survival of vegetative cells of *S. pascheri*

Antibiotic	Time (hr)	Akinete germination (%)	Vegetative cell survival (%)
Penicillin (8000 ppm)	3	49.1	48.0
	24	13.6	13.2
	48	4.5	4.1
	72	2.7	2.3
	168	0.93	0.82
	240	0.00	0.00
Streptomycin (400 ppm)	3	42.9	41.3
	24	21.0	19.9
	48	0.82	0.87
	72	0.29	0.27
	168	0.00	0.00
Chloramphenicol (400 ppm)	3	40.3	39.7
	24	13.8	13.5
	48	2.1	2.4
	72	0.84	0.80
	168	0.00	0.00

**Table 2** Effect of heat shock on germination of akinetes and survival of vegetative cells of *S. pascheri*

Temperature (°C)	Time (hr)	Akinete germination (%)	Vegetative cell survival (%)
0	1	100.0	100.0
0	2	96.5	92.0
0	3	88.0	76.5
0	6	27.6	20.3
0	12	15.0	8.7
0	24	10.0	0.0
0	48	3.1	0.0
0	72	0.8	0.0
0	96	0.0	0.0
45	1	100.0	94.0
45	2	95.5	87.0
45	3	86.3	70.0
45	6	56.2	28.0
45	12	35.1	0.0
45	24	21.5	0.0
45	48	12.4	0.0
45	72	9.1	0.0
45	96	1.0	0.0
45	120	0.0	0.0
50	1	14.3	0.0
50	2	6.2	0.0
50	3	3.2	0.0
50	6	0.9	0.0
50	12	0.0	0.0

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## **NEOTTIANTHE CALCICOLA (W. W. SM, SCHLECHT (ORCHIDACEAE): NEW TO THE FLORA OF INDIA**

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MANY species which are either new to science or new records to the region have been reported<sup>1-4</sup> from India after J. D. Hooker published his Flora of British India (1872-1897). During extensive botanical explorations in the alpine regions of Kumaun Himalaya, some specimens of an interesting ground orchid were collected. Critical examination showed that these did not match with the description of any species occurring in India. A specimen was sent to Dr J. Renz, Basel, Switzerland, who identified it as *Neottianthe calcicola* (W. W. Sm) Schlecht belonging to Orchidaceae, originally described from China as *Gymnadenia calcicola* W. W. Sm. This species was recently reported from Nepal<sup>5,6</sup>. There is no published record regarding its occurrence in India and hence it is recorded in this note. A short description along with other relevant information is provided.

*Neottianthe calcicola* (W. W. Sm) Schlecht in Acta Horti. Gothoburg. 1:137, 1924; Hara, Stern & William in Enum. Pl. Nepal 1:49, 1978; Banerji & Pradhan in Orch. Nepal Himal. 82, Pl. 32, 1984. *Gymnadenia calcicola* W. W. Sm. in Notes Roy. Bot. Gard. Edin. 88:188. 1914.

Plants erect or slightly curved, 8-12 cm long. Leaves two, lanceolate or oblanceolate to sublinear, 4-8 cm long, obtuse to acute. Spike 4 cm long, 6-12 flowered, floral bracts ovate-lanceolate, smaller than the flowers but exceeding to ovary. Flowers secund, rose coloured. Sepals nearly 7 mm long, obliquely lanceolate, acute. Petals linear, 5 mm long. Lip about 7 mm long, three-lobed at the middle or near the base, lobes linear, mid lobes 3 mm long bent downwards. Spur 0.5 mm long, faintly incurved, apex contracted. Flowers and fruits, August to September. Frequent in alpine pastures between an elevation of 3000-3450 m in sheltered and well-protected rock crevices among mosses in Pindari (Almora district) and Chhiyalekh (Pithoragarh district). These collections are deposited in the Herbarium, D. S. B. College, Naini Tal with Herbarium No. 1510 and 1904.

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