

A significant prolongation of the cardiotropic effects of Epinephrine, while given in conjunction with the calcium agonist, could be of good clinical significance, especially during emergencies of cardiac crisis, like severe heart failure.

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THE FIRST RECORD OF THE GENUS *SPHAEROCHARA* (CHAROPHYTA) FROM THE UPPER SIVALIKS IN THE NORTH OF CHANDIGARH

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THE present communication places on record for the first time the charophyte taxon *Sphaerochara* from the Pinjor Formation of Upper Sivaliks. The rock units of Upper Sivaliks exposed in the northeast of Chandigarh are famous for their rich vertebrate fossil wealth since the first half of the nineteenth century.

The recent recovery of two significant cercopithecoids namely, *Procynocephalus pinjorii*¹ and *Theropithecus delsoni*² has upgraded the deposits of this area to the category of palaeoanthropologically significant areas, which are very few.

Recently, during the systematic collection of fossil vertebrates, rock samples from different rock units of the area in the north of Chandigarh were collected by the authors for micropalaeontological investigations. The greyish siliceous clay from two localities, about 6.5 km and 9 km in the north of Chandigarh yielded a large assemblage of charophyte gyrogonites in association with freshwater gastropods, ostracodes and siluroid fish. The fossiliferous clay stratum, which yielded these microfloral remains, lies at the base of a local section and is overlain by alternating units of brownish yellow clay and yellowish grey medium to coarse-grained sandstone.

The assemblage of charophyte gyrogonites revealed, among others, about 150 specimens of *Sphaerochara*. Though charophytes from this area have earlier been recorded by other workers³⁻⁵, the genus *Sphaerochara* remained hitherto unreported. Apart from being the first report from Upper Sivaliks, the present find is stratigraphically significant. Earlier, *Sphaerochara* was known from Lower and Middle Sivaliks only. The

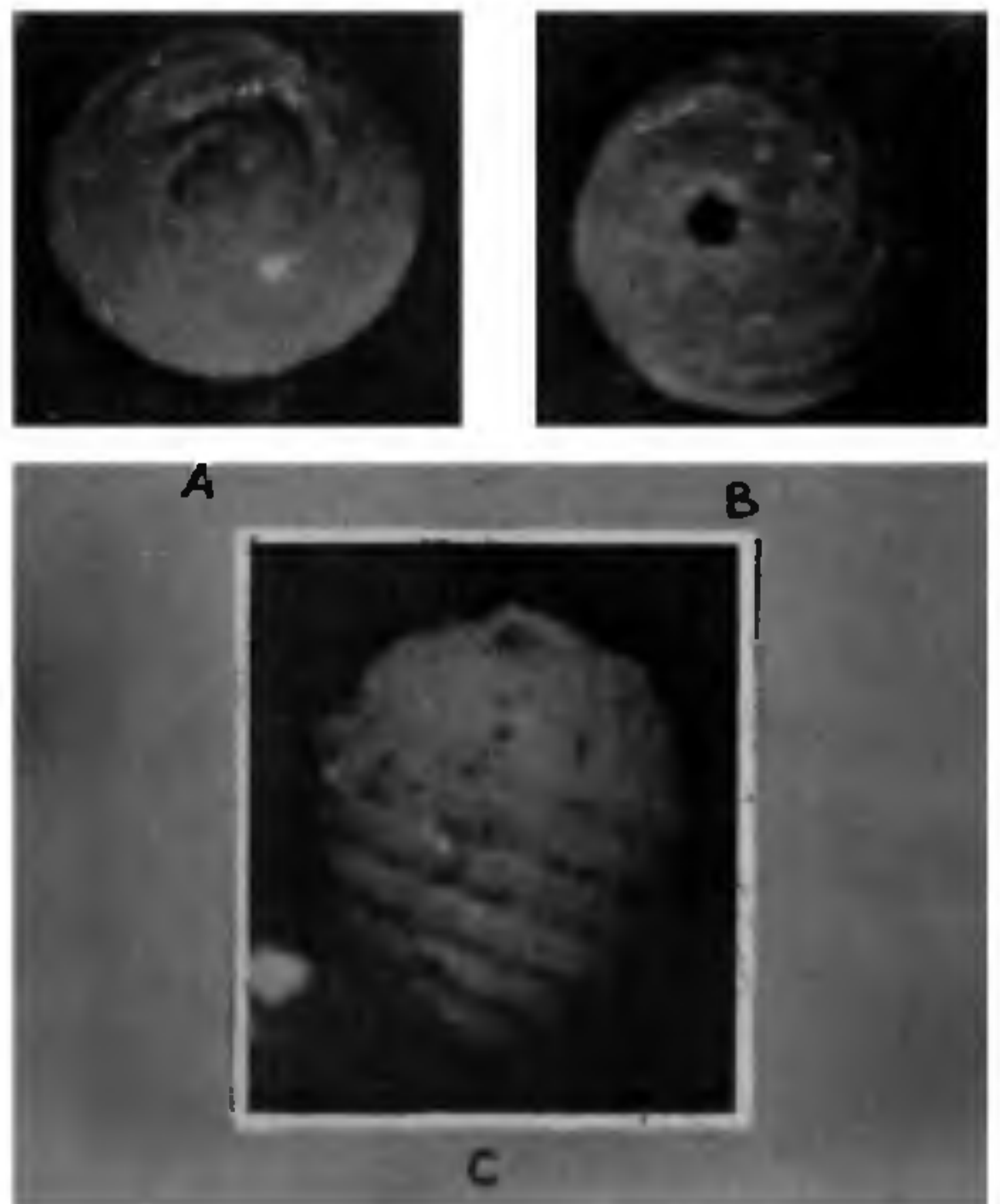


Figure 1. *Sphaerochara* sp. from Upper Sivaliks. (A) Apical view; (B) Basal view; (C) Lateral view. (All figures approximately $\times 65$).

present discovery extends the upper limit of this genus upto Pinjor Formation of Upper Sivaliks.

The gyrogonites of this find are small with a conical apex and with about 8-10 convex convolutions. Though, in some of its morphological features it resembles with *Sphaerochara tiwarii* known from the Dhokpathan Formation of Middle Sivaliks, yet there are some significant differences which might warrant its assignation to a new species. Further research work on this find, which entails the working out of the detailed morphology and its exhaustive comparisons with other known species of *Sphaerochara*, is underway and results will be reported separately. The present charophyte fructifications are assigned here to *Sphaerochara* sp. (figures 1A, B, and C).

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GROWTH AND NITROGEN FIXATION BY BACTERIAL ISOLATES FROM BARLEY ROOTS.

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DINITROGEN fixation in cereals and grasses is highly variable¹. The associative bacteria have been isolated mainly by culture techniques used for *Azospirilla* but no attempt has so far been made to see the type, number and features of nitrogen fixers isolated during various stages of plant growth and their behaviour under cultural conditions. The present studies were aimed at isolating the associative nitrogen-fixing bacteria of barley roots and to know the optimum conditions for nitrogen fixation.

Barley (*Hordeum vulgare*) Var. BG 25 was grown on the research farm of the university using normal agro-

nomical practices except the application of inorganic nitrogen. Root samples were collected from different locations at 30, 60 and 90 days of the plant growth. To estimate the most probable number (MPN) of nitrogen-fixing bacteria in the rhizosphere, the adhering soil was removed by gently shaking and 5 samples of 5 g each were taken at each stage of the plant growth and transferred to 45 ml sterile normal saline in conical flasks. The flasks were kept on a rotary shaker for 1 hr to suspend the bacteria of the root surface. To estimate the MPN of nitrogen-fixing bacteria within the roots, macerated root samples were prepared as reported earlier². MPN for nitrogen fixers was determined using Dobereiner's semisolid medium³. The acetylene reduction activity (ARA) was taken as the parameter for nitrogen fixation and was determined using a Nucon Gas chromatograph 5500. The cell protein was estimated by Lowry's method⁴.

The suspension from the tubes showing positive ARA was streaked on Dobereiner's medium plates and a total of 150 isolates were initially picked up based on colony morphology. All the isolates were checked for ARA on solid as well as semisolid media. Two isolates (2B and 3B) showing higher ARA and maximum frequency of occurrence were finally selected and identified⁵. The optimum temperature and the pH for nitrogen fixation were determined by selecting the temperature and the pH ranges between 28 and 45°C and 6 and 9.5, respectively. To know the most suitable carbon source, ribose, arabinose, glucose, mannose, mannitol (5 g/l) and malate, succinate, α -ketoglutarate (2 to 10 mM) were tested in the basal medium devoid of sodium malate. Nitrogen sources such as glutamate, glutamine, aspartate, asparagine,

TABLE I

Effect of sugars on in vitro nitrogenase activity of barley isolates.

Sugars	Nitrogenase activity			
	Solid medium*		Semi solid medium†	
	2B	3B	2B	3B
Basal medium	16	19.3	41	93
Glucose	ND	9.4	69	39
Mannose	ND	1.3	46	133
Mannitol	ND	ND	48	ND
Ribbose	ND	ND	ND	ND
Arbinose	ND	ND	ND	ND

ND Not detectable; * nM C₂H₂ red/hr/mg protein; † nM C₂H₂ red/24 hr/tube.