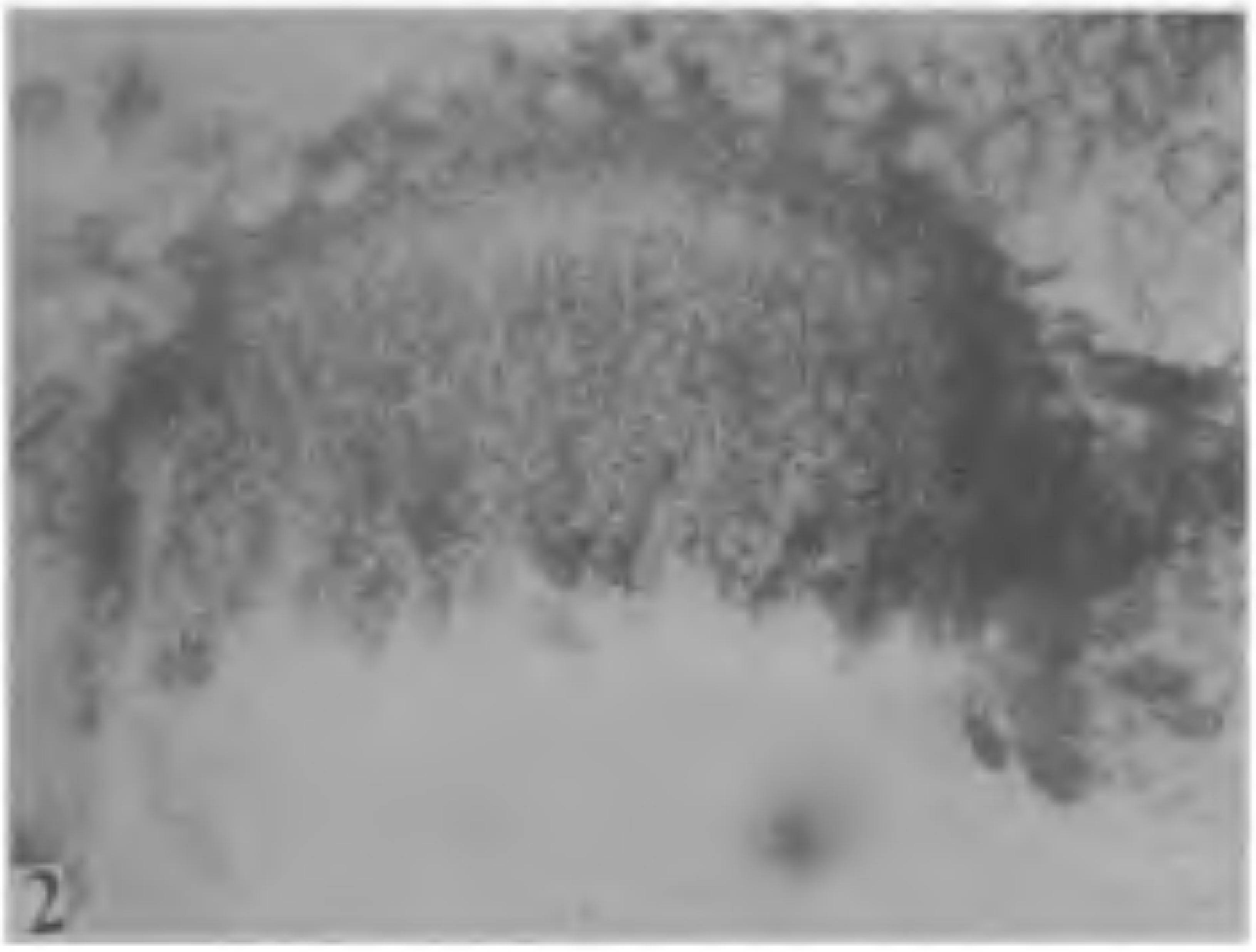

Figures 2 & 3. **2.** V. S. of Aecial cup. **3.** Aeciospores.

So far three species of *Aecidium* have been reported on *Elaeocarpus* L. namely *A. puspa* Racib., *A. elaeocarpi* Racib. and *A. elaeocarpicola* Cummins. *A. puspa* is an aecial stage of *Puccinia puspa* Racib. Among all these three species only *A. elaeocarpi* Racib. produces galls on leaves, stem and branches[1,2]. The present fungus differs from it in possessing the smaller aecial cups, larger aeciospores and in producing bigger galls of different sizes (1–4 inches in diameter) only on stems and peduncles but not on the leaves.

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NITRIFICATION POTENTIAL IN SUCCESSIONAL COMMUNITIES AND DESERTIFICATION OF CHERRAPUNJI

P. S. RAMAKRISHNAN and K. G. SAXENA,
Department of Botany, School of Life Sciences, North-Eastern Hill University, Shillong 793014, India.

SOIL nitrogen dynamics during successional development of ecosystems has been a matter of considerable debate since the work of Rice and Pancholy[1] who suggested that nitrification gradually slowed down in more mature communities due to allelopathic effects in the soil. Such a trend in nitrification was supported by others[2] and it was even suggested that preference for ammonium nitrogen by late successional communities would help in conserving the otherwise more labile nitrate-nitrogen[3,4]. More recently this hypothesis has been questioned[5] on the basis that nitrate/ammonium level and population size of nitrifiers may not always be indicative of the relative rates of nitrification. Perhaps, it may be worth looking at both soil nitrogen pool and nitrifying potential[6] to arrive at more valid conclusions in this regard.

The study sites at Cherrapunji (25.1°N and 91.5°E) are at an elevation of 1200 m in the Khasi Hills of north-eastern India. The area is characterized by high rainfall (monsoonic) with an average annual of 1150 cm and with an above average going upto 2250 cm in an exceptional year as in 1974. The area is generally highly degraded due to a combination of geologic, climatic and anthropogenic factors of which slash and burn agriculture (jhum) in the past is an important causative factor[7]. The different grassland types represent this degradation into arrested succession with relict vegetation in sacred groves indicative of the climax type[8]. The present study deals with a comparative assessment of nitrification potential of seral grassland types with the climax forest represented by a sacred grove.

Three grassland types (referred to as 1, 2 and 3, of increasing levels of disturbance) and a protected sacred grove forest were identified. Grassland 3 had *Drocera* sp., *Carex cruciata*, *Bulbostylis* sp. *Cyperus* spp. and *Eriocaulon brownianum*. Grassland 2 had *Anaphalis*

Table 1. *Mean soil chemical characteristics (mean values ± S.E.) for Cherrapunji*

Characteristics	Sites: Grassland 3	Grassland 2	Grassland 1	Sacred grove
Organic carbon (%)	0.91 ± 0.08	1.68 ± 0.10	2.46 ± 0.24	3.18 ± 0.26
Nitrate-nitrogen (ppm)	0.80 ± 0.30	0.87 ± 0.15	1.30 ± 0.23	5.05 ± 0.42
Ammonium-nitrogen (ppm)	3.10 ± 0.39	3.60 ± 0.42	5.66 ± 0.14	6.38 ± 0.45
Total organic nitrogen (%)	0.12 ± 0.01	0.20 ± 0.01	0.27 ± 0.02	0.39 ± 0.09
Available phosphorus (ppm)	1.38 ± 0.15	1.52 ± 0.15	1.63 ± 0.20	2.95 ± 0.67

Standard error values are given in parentheses.

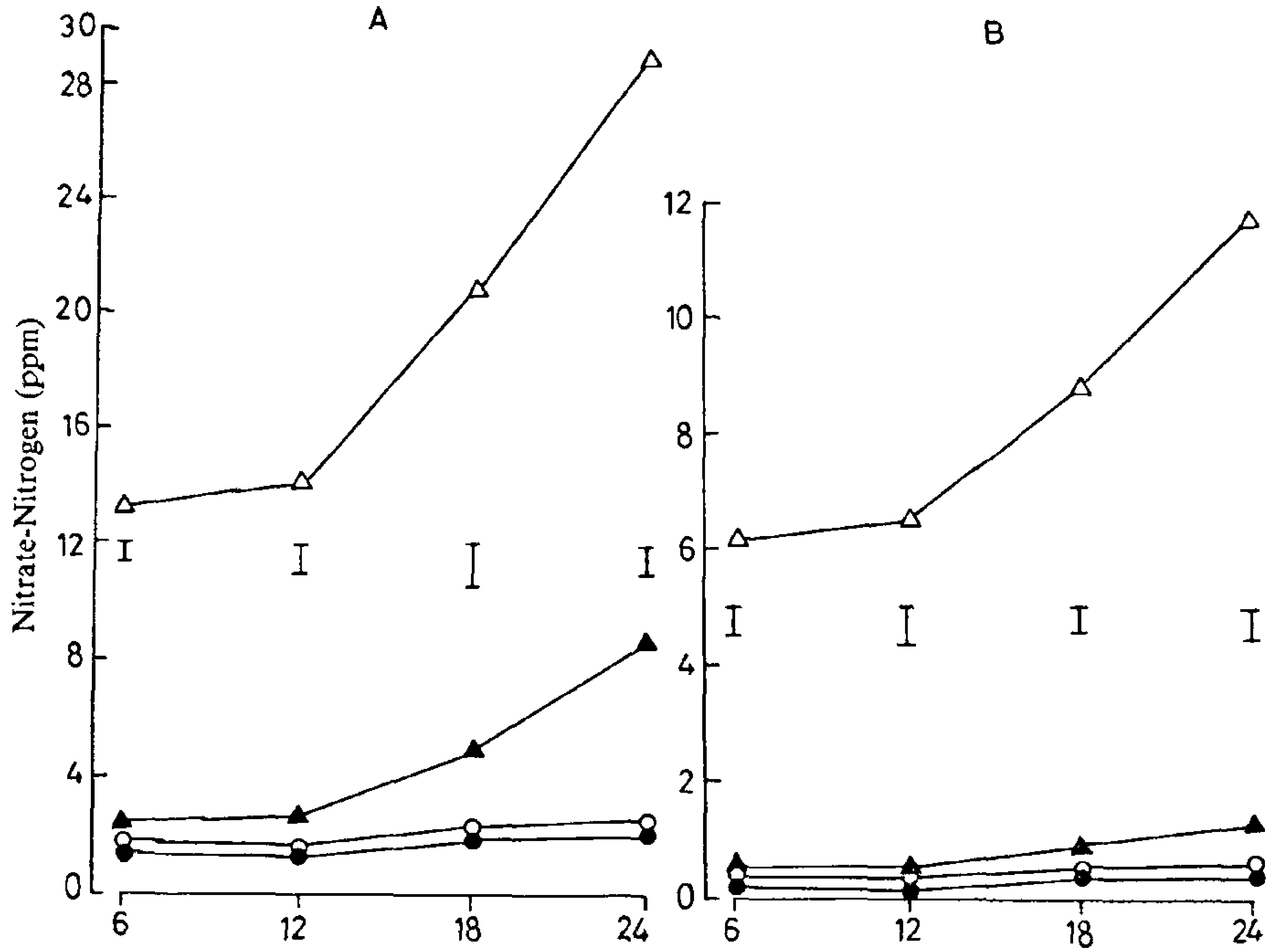

Figure 1. Nitrification potential expressed as increase in nitrate-nitrogen concentration during incubation of soils from forest, Δ ; Grassland types 1, ▲; 2, ○. and 3; ● . **A**, dry period (February); **B**, wet period, (June). Vertical bars represent least significant differences ($P = 0.05$).

adnata, *Chrysopogon* sp., *Borreria articularis*, *Arundinella benghalensis* and *Fimbristylis* sp. while Grassland 1 had *Paspalum notatum*, *Osbeckia crinata* and *Imperata cylindrica* as dominant species. The forest had high species diversity with *Quercus* spp. and *Castanopsis* spp. as dominant trees and with many shrubs such as *Photinia*, *Eriobotrya* and *Pyrus* spp.

Soil analyses are based on 15 randomly collected samples of the 0–7 cm horizon, from each community type, during February 1981. Soil was chemically analysed by standard methods[9,10] nitrate-nitrogen by the phenol disulphonic acid method, ammonium-nitrogen by the kjeldahl method, available phosphorus by the molybdenum blue method using Bray's extraction solution, and organic carbon by Walkley and Black method. Soil pH was measured in a soil:water suspension. Nitrification potential of the soil was measured as the increase in nitrate-nitrogen concentration after aerobically incubating the fresh sample (250 g) at 25 ± 2°C for periods of 6, 12, 18 or 24 days, with a maintained moisture level of 75% of the water holding capacity of the soil.

All the soil types were acidic but acidity was more pronounced $P<0.05$) in the highly leached grassland soils than in the humus rich forest soil. Organic carbon and all the nutrient concentrations were significantly higher in the forest soil ($P < 0.05$) with significant decline ($P < 0.05$) with increase in the degree of disturbance of the grassland types. This is to be expected as the impact of rain both through run-off and infiltration losses would be obviously heavier in the disturbed sites of seral grasslands[11,12].

Nitrification rate was markedly higher in the forest soil than in grassland soils ($P < 0.05$). The highly disturbed sites had least level of nitrification though there were no significant differences ($P > 0.05$) between types 3 and 2. Further, nitrification was higher in the dry month of February than in June. While this seasonal difference may be related to heterotrophic activity which is likely to be higher during the wet month of June which in turn would immobilize ammonium ions due to rapid uptake and thus reduce nitrifier activity[13], the results on nitrification related to ecological succession is in contrast to earlier prediction by Rice and Pancholy[1] and more in agreement with subsequent studies[5,6,14]. The possibility of allelopathic inhibition of nitrification[1] could be ruled out in view of the higher nitrification rates during the dry month when allelopathic effect should be higher due to higher concentration of allelochemics in drier soils. The more sandy soil with low humus content and thereby reduced water holding capacity of the soil and the frequent burning[14] of the sites under grassland would reduce nitrifier population, in contrast to the forest soil. Nitrification in these sites seems to be more related to soil fertility level and heterotrophic potential determining production and availability of ammonium nitrogen to nitrifiers[15]. The fragility of the forest ecosystem in a region of very high rainfall such as Cherrapunji could be at least in part be due to disruption of nitrification in the soil after perturbation and the inability of the fertility recovery to occur due to the extreme environmental conditions such as high rainfall and Krantz topography[7] leading to desertification of the landscape.

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