Holotype: On the living leaves of *Cordia* sp., India, 12–1–1981, K. N. Rao. HCIO 36259.

So far only 3 anamorphic rusts are known to parasitize the species of *Cordia*. These are *Aecidium brasiliensis* Diet., *A. poonensis* Sathe, and *A. Walayarensis* Ramakr., T. S. and Sund. *A. brasiliensis*, was proved as the aecial stage of *Uromyces setariae–italicae* Yoshino.

Uredo ochnae Niranjan Rao sp. nov.

Urediniis hypophyllis, sparsis, minutis, subepidermalibus, locularis, erumpentibus, cinnamomeo-brunneis, paraphysatus; paraphysibus periphericus, incurvatus, brunneolus; urediniosporis 18–28.5 × 14.5–21.5 μm, ovoideis vel ellipsoideis, membrana 1.5 μm crassa, hyalina, echinulata; poris germinationis equatorialibus, 3 vel 4.

Holotypus: In foliis vivis *Ochna lanceolata* Spr., India, 10–11–1981, K. N. Rao, HCIO 36260.

Uredinia hypophyllous, scattered, minute, round, subepidermal, borne in-locules, erumpent, light cinnamon brown, paraphysate; paraphyses peripheral, incurved, brownish; urediniospores 18–28.5 × 14.5–21.5 μm, ovoid or ellipsoid, wall 1.5 μm thck, hyaline, echinulate; germpores 3–4 equatorial.

Holotype: On the living leaves of *Ochna lanceolata* Spr., India, 10–11–1981, K. N. Rao HCIO 36260.

So far no rust species have been reported on *Ochna*. The present species represents by uredinia only, uredinia borne in locules. This character keeps it apart from other uredinial stages of rusts reported on the members of Teliaceae.

The author expresses his profound thanks to Dr P. Ramachar, Professor of Botany, Osmania University, Hyderabad for valuable guidance and to Prof. G. B. Cummins, University of Arizona, U. S. A., for reviewing the manuscript. The encouragment given by Dr M. V. Pattabhiraman, Principal, Nizam College, Hyderabad is gratefully acknowledged.

13 November 1986; Revised 13 January 1987

1. Sydow H. and Butler, E. J., *Ann. Mycol.*, 1907, 5, 485.
2. Mundkur, B. B. and Thirumalachar, M. J., The Imp. Mycol. Inst. Mycol. Pap. No: 16, pp. 27
3. Rangaswami, G., Seshadri, V. S. and K. A. Lucy Channamma, *Fungi of South India*, UAS, Bangalore, 1970, p. 193.

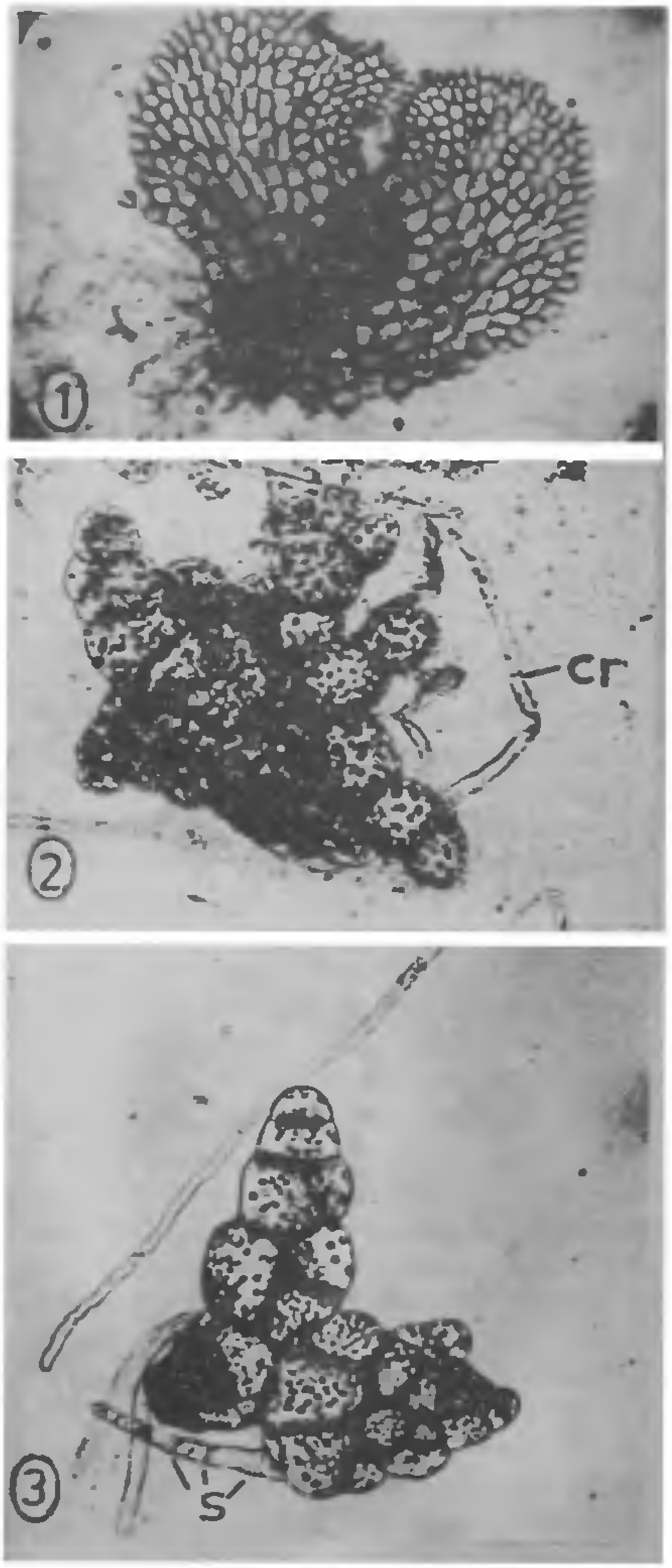
METHYL ISOCYANATE AND FERN GAMETOPHYTE

I. P. SINGH and S. K. ROY
Department of Botany, Banaras Hindu University, Varanasi 221 005, India.

From the unending reports, both political and scientific on the effects of methyl isocyanate (MIC) gas on biological objects, it has now become abundantly clear that MIC could be carcinogenic as well as mutagenic. While the former property is apparent by mortality, the latter may constitute some interesting departures from the normal form and structure of the organism affected by MIC. In this context a few fern leaves dried up due to exposure to MIC gas leaked from Union Carbide Factory on the fateful day of 2nd December 1984 were collected from the private garden of a resident doctor working at Indian Railways in Bhopal. The spores from these leaves were tapped out and later cultured in the laboratory in culture room at 24 ± 2°C under continuous white fluorescent illumination on nutritive agar gel plates[1]. The spores thus prepared eventually germinated and gave rise to some aberrant gametophytes which are recorded (figures 2-5). A couple of plants belonging to the same species also happened to grow in the botanical garden of this university which served as control for comparison purposes (figure 1).

Most control spores of *Thelypteris augescens* (Link) Munz and Johnston germinated within 4 days, showing 90% germinability. Normally bilobed mature prothallus is produced in 31 days whereupon antheridia initiated in about a week's time and thereafter these prothalli turned bisexual in another 7 days. The MIC affected spores, however, showed delayed germination, in 8 days, with less germinability (41%). The length of protonema, cell number and chlorophyll contents decreased in comparable stages of control prothalli. The lengths of rhizoids were also affected and these showed septation, chlorophyllousness and spiralization. The young and old protonema showed excess branching and no sex organs ever appeared on them whereas sporophytes regularly initiated, after sexual union on control prothalli in 52 days of germination.

It is noteworthy that the aberrations noted above showed some kind of similarity with those induced by mutagenic agents such as benomyl[2], maleic hydrazide[3,4] and colchicine[5]. On the basis of such observations on mutagenesis it appears that MIC



Figures 1-5. **1.** Normal chordate gametophyte; **2.** Highly branched gametophyte with chlorophyllous rhizoids; **3.** Branched protonema with septate rhizoids; **4.** Gametophyte showing spiral rhizoids; **5.** Abnormal gametophyte showing lack of chlorophyll. sr—spiral rhizoid; s—septation; cr—chlorophyllous rhizoid; achl—achlorophyllous cells.

under milder doses may act as a powerful mutagen.

One of the authors (IPS) is thankful to CSIR, New Delhi for financial assistance.

12 December 1986

1. Dyer, A. F. In: *The experimental biology of*

ferns, (ed.) A. F. Dyer, Academic Press, New York, 1979, p. 253.
2. Schedlbauer, M. D., *Am. J. Bot.*, 1978, **65**, 864.
3. Khare, P. B. and Roy, S. K., *Indian J. Exp. Biol.*, 1977, **15**, 419.
4. Niranjan, A. R. S. and Roy, S. K., *Acta Bot. India*, 1980, **8**, 129.
5. Mehra, P. N., *Ann. Bot.*, 1952, **16**, 49.

NECTAR DILUTION PATTERN OF BEES IN SEMI-ARID ENVIRONMENTS

D. P. ABROL and R. P. KAPIL*
Division of Entomology, S. K. University of Agricultural Sciences and Technology, Shalimar Campus, Srinagar 191 121, India.
** Director, Indian Lac Research Institute, Namkum, Ranchi 834 010, India.*

BESIDES physical and biological factors[1], bee-flower interaction depends upon the concentration in which the caloric rewards are available. In semi-arid environments where more concentrated nectars are produced by flowers, the pollinators which can metabolize nectars of such high concentrations with more water economy would make a suitable partner for bringing effective pollination. The present report deals with certain aspects of this problem. In this paper differential nectar dilution capabilities of two sub-tropical bees have been presented. This study was conducted for four different days on *Pongamia glabra* vent during its flowering period in May 1986. The concentration of total sugars in the nectars sampled directly from the flowers as well as from the honey storing organ of *Apis mellifera* L. and *Megachile cephalotes* Smith was estimated with the help of pocket refractometer. The nectars were estimated at the beginning of each hour from 0700–1800 hr on all the days of observation. The average of 5 observations constituted the reading for each hour.

The data presented in figure 1 indicate that nectar concentration in *P. glabra* flowers ranged from

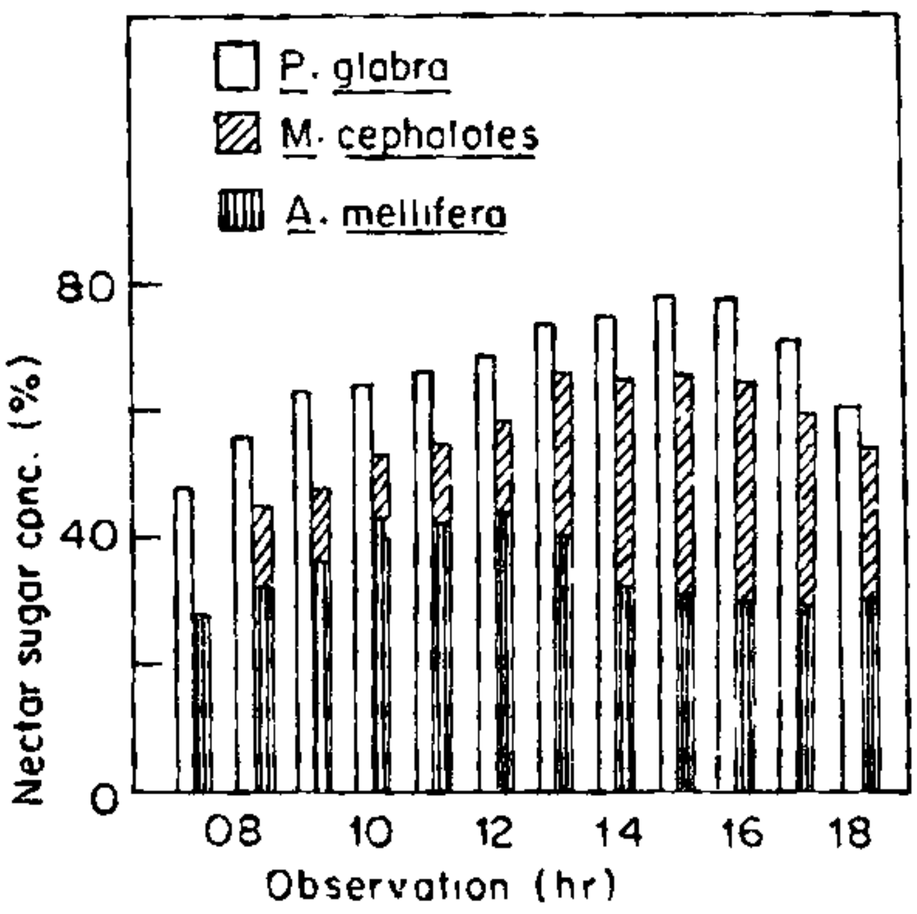


Figure 1. Histogram exhibiting dissolved solids in floral nectars and the honeysac of the bees.

48-78%, while it was 28–45% in *A. mellifera* and 45–66% in *M. cephalotes*. The dilution of nectars by each bee species may be due to water produced from the metabolization of the sugars as reported by Simpson[2]. The results clearly reveal that *M. cephalotes* exhibits greater water economy over *A. mellifera* as the former diluted the nectars to a lower extent than the latter. The differences exhibited in dilution of nectars may probably be due to the different physiology of two bee species. The present study clearly reveals that *M. cephalotes* is physiologically better adapted to pollinate flowers in semi-arid environments. Further research is needed in this direction to characterize the efficient pollinators of crops which grow in semi-arid environments and secrete concentrated nectars.

One of the authors (DPA) thanks ICAR, New Delhi for financial assistance.

29 December 1986; Revised 12 March 1987

1. Abrol, D. P., Ph.D. thesis, Haryana Agricultural University, Hisar, India, 1985, p. 286.
2. Simpson, J., *J. Apic. Res.*, 1964, **30**, 37.