The oncolites typically occur as discrete spheroids (Plate Figs. 5, 6). The constituting units are randomly stacked circular (to sub-elliptical) laminae, arranged concentrically around a central nucleus. The longest and the shortest axes of the forms are 4 cm. and 3·5 cm. respectively. These structures are seen on the upper surfaces of the beds, and are not seen in vertical section. They are closely associated with *Conophyton cylindricus* and *Collenia*.

Work on oncolites, though rare, reveals that they are distributed throughout the stratigraphic column (Konishi, 1949 ; Johnson, 1963 ; Laporte, 1963).

Conophyton cylindricus has been described from South Africa, Sahara, Siberia, North America and China. In India, they have been reported from the Vindhyans (Fawn Limestone of the Semri Series) (Valdiya, 1969), the Jammu Limestone (Raha and Sastry, 1973) and from the Bijawars of Madhya Pradesh (Krishna Murthy, 1972).

Conophyton has been regarded as an important and reliable index fossil of the Precambrian (Komar *et al.*, 1965 ; Bertrand–Sarfati, 1970, 1972 ; Koroljuk, 1960 ; Raaben, 1969). Particularly, the form *Conophyton cylindricus* is characteristic of Lower Riphean (Krylov, 1960 ; Keller *et al.*, 1960 ; Zhuravleva and Komar, 1962). As a particular case, the relatively smaller forms of *C. cylindricus* with 6–8 cm. diameter are taken to be typical of the Lower Riphean within the absolute age limits of 1450–1430 m.y. (Komar *et al.*, 1965).

On the basis of *Conophyton cylindricus,* the Kapkot formation of the Calc Zone of Tejam, can easily be assigned a Lower Riphean age, and now be easily be correlated with the Jammu Limestone, the Semri Series (Vindhyans) and the Bijawars. Further, by analogy, the possible equivalents of the Kapkot formation (Bhattacharya, 1973, p. 37), *viz.*, Thalkedar Limestone of the Calc Zone of Pithoragarh, Upper Shali Limestone of the Simla Himalaya and the Krol Limestone of the Solon–Tons area, may also be assigned a Lower Riphean age.

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CHANGES IN AMINO ACIDS AND AMIDES INDUCED BY PAPAYA MOSAIC VIRUS IN PAPAYA PLANTS

PAPAYA mosaic virus (PMV) causing a very serious disease of papaya was reported from this laboratory by Capoor and Varma (1958). PMV-infected papaya plants are stunted and bear mosaic mottled, feformed and reduced leaves. The virus is mechanically transmissible and aphid borne. PMV is transmitted by aphids in stylet borne manner (Capoor and Varma, 1958 ; Singh, 1972) and also infects many cucurbitaceous plants (Capoor and Varma, 1958). Twenty to twenty-five days old healthy and vigorously growing *Carica papaya* Linn. cv 'Washington' plants were used for extraction and determination of free amino acids and amides. Fifty plants inoculated with PMV by sap inoculation method and fifty uninoculated control were kept under insect proof glass house. After one month of inoculation leaf (four youngest), stem and root samples were collected from both control and diseased papaya plants and amino acids and amides were determined both qualitatively and quantitatively by the method described by Thankappan and Chacko (1970).

As obvious from Table I, the quantity of amino acids and amides was maximum in leaves and minimum in roots. In healthy papaya plants

TABLE I

Amino acids, and amides present in the leaves, stems and roots of healthy and PMV-infected papaya plants

Amino acids and amides	µg/g of tissue					
	Leaf		Stem		Root	
	H	D	H	D	H	D
Aspartic acid	112	163	30	47	19	12
Glutamic acid	146	152	48	55	9	18
Glycine-serine	10	10	7	10	Trace	1
Lysine	1	5	..	2	..	Trace
Aspargine	12	48	7	20	3	2
Threonine	25	37	10	7	15	13
Argenine	12	6	..	..	..	..
Alanine	57	190	71	65	..	..
Glutamine	..	..	15	27	3	9
B-alanine	..	..	5	..	..	..
Homoserine	Trace	Trace	3	6	..	2
Thryptopane	1	Trace	4	2	..	Trace
Methionine	..	6	Trace	Trace	Trace	..
Hystidine	..	3	..	..	—	2
Tyrosine	..	1	..	2	2	1
Proline	Trace	..	..	1	Trace	Trace
Y-amino butyric acid	2	1	Trace	Trace	1	7
Valine	6	9	..	..	2	1
Phenylalanine	9	11	..	..	3	5
Leucine, isoleucine	Trace	7	8	20	Trace	9
Total amount of amino acids and amides	393	649	208	264	58	82
Total number of amino acids and amides	12	15	11	13	10	13

H = Healthy, D = Diseased.

respective concentration of amino acids and amides per gm. of leaves, stems and roots were 393, 208 and 58 µg and the quantities present in the leaves, stems and roots of PMV-infected papaya plants were 649, 264 and 82 µg per g. of tissue respectively. Thus PMV infection greatly increased the quantity of the amino acids and amides. In general leaves and stems contain large quantities of aspartic acid, glutamic acid, aspargine, threonine, argenine and alanine. The other major amino acids present in leaves were glycine-serine, valine and phenylalanine. Stems also contain considerable amounts of glycine-serine, glutamin, leucine and iso-leucine. Glutamic acid was higher in the roots of the infected than the healthy papaya plants. In addition to aspartic acid, glutamic acid and threonine, roots also contained considerable amounts of aspargine, glutamine and phenylalanine. It was also observed that total number of amino acids and amides present in leaves, stems and roots of PMV-infected papaya plants were much greater than those present in the corresponding part of healthy papaya plants (Table I). Similar results have also been obtained by other workers in other host-virus combinations (Diener, 1960; Narayanswamy and Ramakrishnan, 1960; Welkie *et al.*, 1967; and Thankappan and Chacko, 1970).

Accumulation of amino acids in virus-infected plants may be due either to the increased proteolytic activity or due to the inhibition of normal protein synthesis. For accelerated synthesis of virus protein large quantities of amino acids are required and virus infection increases the amino acids both qualitatively and quantitatively so that synthesis of virus protein may occur without any hindrance.

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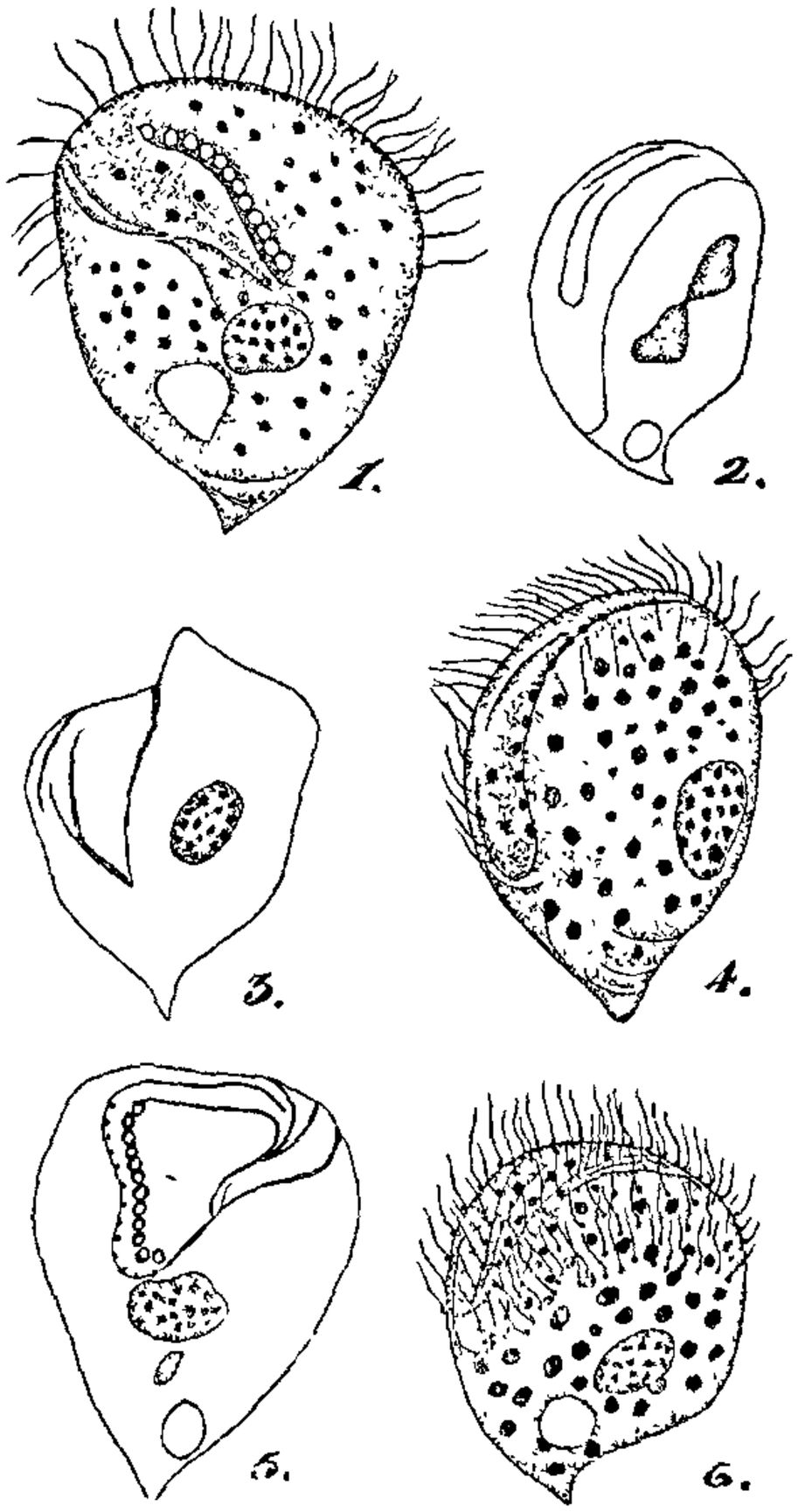
A NEW PARASITIC CILIATE *CYATHODINIUM INDIAE* N. SP., FROM THE GUINEAPIG, INDIA

DURING the course of the systematic survey of the parasitic protozoa in the birds and mammals of the Hyderabad region, a very interesting ciliate of the genus *Cyathodinium* was found in the laboratory bred guineapig *Cavia cutleri* which died of some unknown cause. This ciliate was encountered along with some other flagellates. However, the infection was very heavy. Subsequently a few more guineapigs were dissected but the infection was negative. Davine[1] (1875), Nie[2] (1950) and others have extensively studied the parasites of guineapig and have reported a number of flagellates and a few ciliates. However, the present *Cyathodinium* differs totally from the species so far described and this is the first report from India.

Cyathodinium n. sp. was fixed in Schaudinn's fixative and stained in iron haematoxylin. Few specimens were studied under vital stains. It is funnel shaped abruptly ending into a pointed tip which sometimes curved to one side (Figs. 1, 2, 3, 5, 6). It measures 55 μ in length and 20 μ in width. Rarely the nipple-like tip is also observed (Fig. 4). The pseudoperistome extends from one side of the anterior part of the parasite to half or more than half of the body length (Figs. 2, 4). The pseudoperistome has two conspicuous lips of which the left one appears to overlap the right (Fig. 3). Endosprits, which are in a definite number of twelve, are situated either on the left lip or on the right lip. The cilia are present on both the lips (Figs. 1, 4–6), but they do not arise from the endosprits. The cytostome is at the terminal end of the pseudoperistome as against the statement of Cunha and Freitas[3] (1940), who regarded this parasite as an Astomatous ciliate. The cilia restricted to the anterior part only and are arranged clearly in three to four rows (Fig. 6). The position of the macronucleus is variable and is at the middle or at the posterior third of the body (Figs. 1 and 4). It is oval in shape with large clear chromatin granules. The micronucleus is spherical and is very close to the macronucleus (Fig. 6). Divisional forms are also noticed. In these forms a deeply stained rod which Cunha and Freitas called as 'cristalide" is also seen. The two separated macronuclei are connected by this rod (Fig. 2). During division the nuclei are irregular in shape. Cysts are not observed.



FIGS. 1–6 fixed in Schaudinn's fluid and stained with iron haemotoxylin. Fig. 1. Showing endosprits, nucleus and contactile vacuole. Fig. 2. Showing the dividing nucleus. Fig. 3. Showing the cytostomal lips. Fig. 4. Showing the pseudoperistome and cilia. Fig. 5. Showing the funnel-shaped body and endosprits. Fig. 6. Showing the cilia.

Though *Cyathodinium* species are described by Lucas[4] (1932), Cunha[5] (1914) and Nie[2] (1950) from guineapig, there is no record of it from India. The new species comes very close to *C. piriforme* Cunha and *C. cunhai* Nie. However in shape it