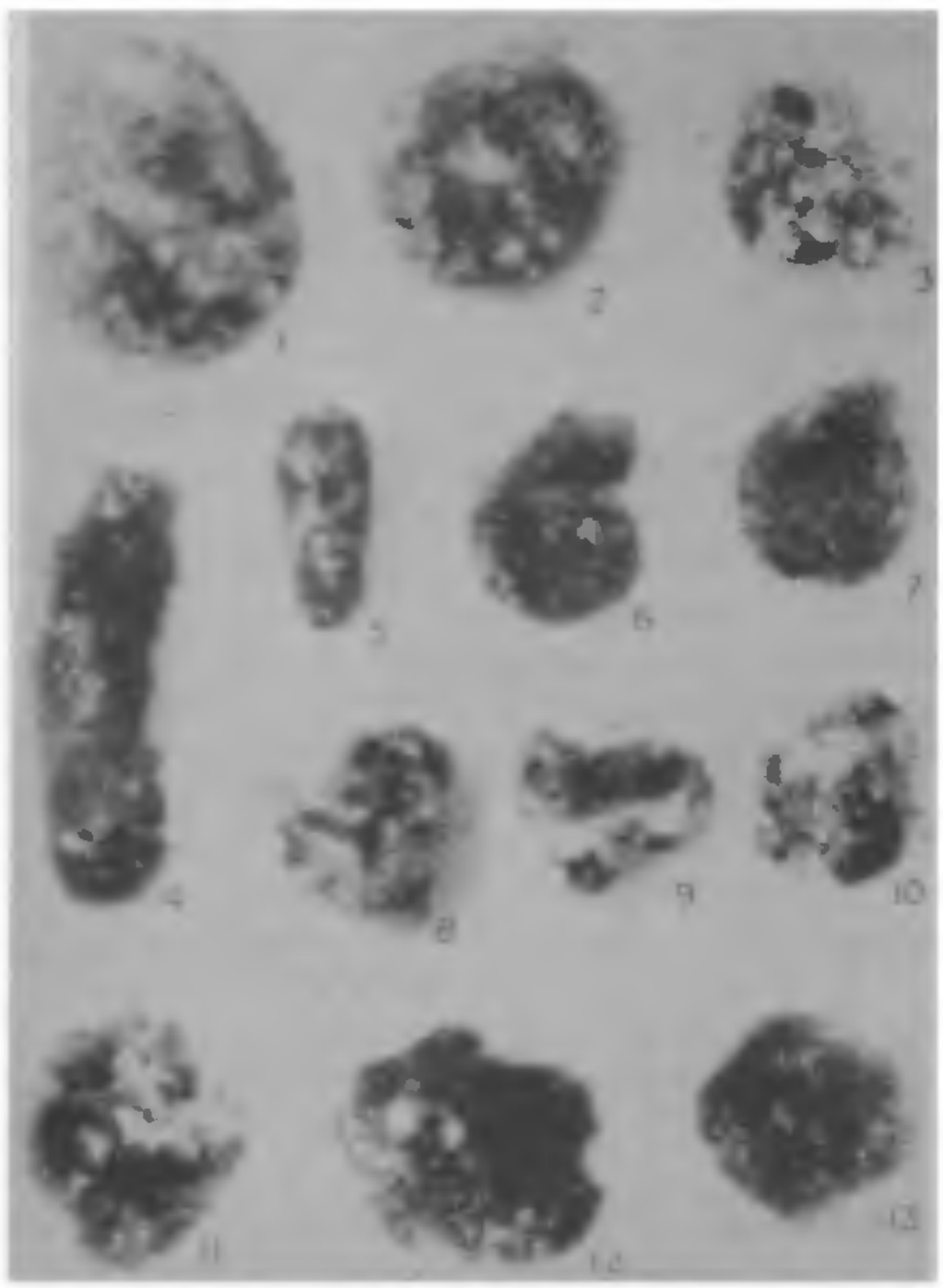

Figures 1–13 1. *Endothyra* sp. A. × 75 (sample no. 4). 2, 13. *Globivalvulina bulloides* Brady, 1875, × 76 (sample no. 4). 3. *Endothyra* sp. B. × 47 (sample no. 5). 4. *Nodosinella digatata* Brady, 1876. × 76. (sample no. 5). 5. *Nodosinella nodosariformis* (Cushman & Waters). × 47 (sample no. 6). 6. *Glomospiroides* sp. × 47 (sample no. 6). 7. *Tournayella* sp. × 76 (sample no. 6). 8, 9, 11, 12. *Tetrataxis conica* Ehrenberg, 1854. × 76 10. *Paraendothyra* sp. × 76 (sample no. 5).
The specimens are white stained for clarity.

The age of the Mussoorie Phosphorite horizon was deciphered as Upper Palaeozoic on the basis of the record of Moravamminids by Patwardhan[5]. The presence of endothyriids provides the definitive basis for the age determination of this formation as Upper Palaeozoic. The precise age would be confirmed only after the systematic study of the foraminiferal assemblage is completed, although the presence of *Nodosinella digitata* and *N. nodosariformis* indicates Permian age. Recently[6] Lower Palaeozoic condonts have been reported from the phosphorites of this area. The condorts are resistant fossils which can withstand transportation without any marked sign of wear and tear. It is possible that these may have been reworked from the Lower Plaeozoic Provenance into the Upper Palaeozoic phosphorites.

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A NEW SEED-BORNE DISEASE OF RADISH CAUSED BY *ALTERNARIA ALTERNATA*

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DURING a study of various diseases on vegetable crops, radish (*Raphanus sativus* L.) was found heavily infected with *Alternaria* sp. at the Experimental Farm of Indian Institute of Horticultural Research, Bangalore. The infection occurs on all the above ground parts of the plant including capsules. The symptoms consist of water-soaked circular spots on leaves which at later stages coalesce becoming dull yellow and turn light brown to dark in colour, concentric rings appearing on the dead tissue of the old spots. On the stem and branches, irregular streaks, black in colour are formed. The infected capsules are shrivelled, when infection takes place at the initial stages of the capsule development, resulting in underdeveloped and shrivelled seeds. The seeds collected from such cap-

Figure 1. Showing the infection of *Alternaria alternata* on radish seedlings.

sules are also shrivelled, light in weight and discoloured. The infected seeds on germination develop greyish to brownish necrotic spots near the collar region which in advanced stages girdle the stem (figure 1) and results in the death of the seedling or the spots later spread towards the stem, branches and leaves.

Such seeds after microscopic examination were found infected with *Alternaria* sp. Such seeds were further asseyed by agar and blotter plate methods.[1] The seeds were surface-sterilized with 0.1% mercuric chloride for studying the extent of internal infection. The percentage of external and internal infection was 17 and 21 in potato dextrose agar (PDA) and 8 and 13 in blotter paper method respectively. The *Altenaria* sp. isolated was purified by single spore isolation technique and maintained on PDA medium.

The characteristics of the pathogen which was isolated from the seeds show greyish colonies turning olive green to black, effuse, conidiophores simple, straight, pale to dark brown, smooth, septate, geniculate with one or more conidial scars 25-55 μm ×. 3-5 μm. Conidia catenulate simple or branched ovoid, ellipsoidal obclavate obpyriform, pale to dark brown rostrate, smooth or verriculose with upto 6 or 7 transverse and or also longitudinal and oblique septa 20-40 μ m × 10-12 μ m beak pale measuring 3-10 μ m ×3 μm. On the basis of these characters the fungus was identified as *Alternaria alternata* (Fr) Keissler.

The pathogenicity of the fungus was proved by inoculating the seeds and leaves with actively sporulating culture from PDA medium. Typical symptoms of the disease develped after 8-11 days on leaves and on collar region of the seedlings. The pathogen was reisolated from these infected tissues which resembled the original fungus used for inoculation. *A. brassicae, A. brassicicola, A. raphani* and *A. cheiranthi* have been reported on seeds of radish[2,3] and mustard[4,5]. The present report describes internal seed borne nature of *A. alternata* in radish for the first time. *Alternaria* sp. nearing to *A. tenuis* group has also been reported on radish[6].

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ULTRASTRUCTURE OF GERMINATING SPORANGIOSPORES OF *RHIZOPUS RHIZOPODIFORMIS* (GOHN) ZOPF, A THERMOPHILE

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BROCK[1] had suggested that the ability of eukaryotic thermophiles to grow only upto 62° C is due to the membrane disintegration at elevated temperatures. However, a few studies of ultrastructural organization among thermophilic moulds have been undertaken[2]. We have earlier reported[2,3] that the thermophile *Rhizopus rhizopodiformis* (Gohn) Zopf can serve as a good experimental material due to synchrony in spore swelling and germination. While mesophilic species of *Rhizopus* have been examined at ultrastructural