conidia was estimated for the first time in this pathogen. Toxin content of conidia was more than that of the mycelium produced per unit quantity of medium. These results further substantiate that there is a definite positive correlation between sporulation and toxin production.

The senior author is grateful to the Indian Council of Agricultural Research for the award of a Junior Research Fellowship during the period of which the work was carried out. The supply of FA by Prof. H. Kern of Zurich, Switzerland, is gratefully acknowledged.

Microbiology Laboratory, K. RAMASAMY.*
Faculty of Agriculture, N. N. PRASAD.
Annamalai University,
Annamalainagar-608101, *August* 21, 1974.

* Present address : Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore-641003.

1. Bhaskaran, R. and Prasad, N. N., *Indian J. Expt. Biol.*, 1971, **9**, 516.
2. Kesavan, R., *M.Sc. (Ag.), Thesis, Annamalai Univ.*, 1973, p. 245.
3. Mahadevan, A. and Chandramohan, D., *Phytopath. Medit.*, 1967, **6**, 86.
4. Chandramohan, D. and Mahadevan, A., *Experientia*, 1968, **24**, 427.
5. Booth, C., *Methods in Microbiology*, Academic Press, New York, 1971, **4**, 49.
6. Sandhu, R. S., *Phytopath. Z.*, 1959, **37**, 273.

A BIOLOGICAL APPROACH TO THE CONTROL OF MAIZE BORER *CHILO ZONELLUS* (SWINHOE)

ISOLATIONS made from the body surface of the borer, *Chilo zonellus* (Swinhoe), its frass deposits and rotted maize stalk in the vicinity of borer tunnels gave the following fungi : *Cephalosporium acremonium, Fusarium moniliforme, Aspergillus* sp., *Cladosporium* sp., *Penicillium* sp., *Mucor* sp., *Rhizopus* sp., *Trichoderma* sp., *Botrytis* sp. and a *Fusarium* sp., Among the bacterial forms were *Pseudomonas* sp., and *Bacillus* sp.

A species of *Fusarium* which was identified as *Fusarium aleyrodis* Petch was found to be pathogenic on this insect, others were not.

For confirmation of the pathogenicity of *F. aleyrodis*, originally isolated from the insect body surface, field collected larvae ranging from 2nd to 4th instar were individually immersed in fungal spore suspension. A control was maintained. The larvae were fed with finely chopped pieces of maize stem. Whitish fungal mat appeared gradually on the insect's body. Single spore isolation from this hyphal mat yielded *F. aleyrodis* Petch. Repeated pathogenicity tests also confirmed it. The larvae during fungal colonisation became sluggish, stopped feeding, turned brown and succumbed within 2–3 days of infection. Toxicity of the fungus is believed to be responsible for pathogenic action on the insects[2,3,6]. Mechanism of fungal action could be ascertained by observing separately the effect of fungal spore spray and its crude toxin on the insect larvae.

Spore spraying showed that by the 7th day the insects were killed (Table I). Fungal mat appeared on the 8th day and on the 9th day the entire insect body was covered with sporulating hyphae.

TABLE I

Effect of fungal spore spray on larvae of Chilo zonellus (*20 larvae were used in each replication*)

Days	Number of larvae dead			
	Replications			
	1	2	3	4
1	..	..	..	..
2	..	..	..	..
3	..	..	..	..
4	..	..	..	1
5	5	7	6	6
6	8	8	9	7
7	All	All	All	All
8	Fungal mat seen on the insect			
9	Fungal mat as well as spores found on all the insects.			

Crude toxin obtained from *F. aleyrodis* culture grown in Richard's liquid medium, when applied topically on the larvae, killed them. The toxin-treated insects stopped taking food, showed tetanic reaction and subsequently died. The larvae started dying right from the very beginning reaching the maximum on the 13th day (Table II). Mortality rate progressed with number of days of incubation.

Chilo zonellus has been found to be attacked and pathogenically colonized by another fungus *Beauveria densa* Link.[4,5]. *Chilo partellus* was effected by *Aspergillus flavus* and a *Fusarium* sp.[1]. The pathogenic attack of *Chilo zonellus* by *Fusarium aleyrodis* Petch, adds to the list of fungi parasitic on insects. Spraying of the insect with spore suspension or treatment with crude toxin of this fungus could be of biological control value.

TABLE II

Effect of fungal toxin on Chilo zonellus

Period of exposure to toxin (Days)	Average number of larvae dead when sprayed with toxin (20 larvae)						
	Days of incubation						
	0	3	5	7	9	11	13
1	..	..	..	..	..	..	1
2	1	..	2	3	3	5	7
3	1	4	4	11	13	13	14
4	1	4	9	15	15	15	18
5	5	4	10	16	16	19	20
6	5	4	11	16	16	19	20
7	5	4	14	18	18	19	20

The authors are grateful to Professor R. K. Sharan, Professor Y. L. Nene and Professor J. P. Sinha, of Patna, Pantnagar and Ranchi Universities, respectively, for their critical evaluation and the facilities extended.

Dept. of Plant Path., SATISH KUMAR SINHA.
Ranchi Agricultural College,
Rajendra Agricultural Univ.,
Kanke Campus, Kanke, Ranchi,
and
Department of Botany. MAHENDRA PRASAD.
Ranchi College,
University of Ranchi,
Ranchi-834008. *August* 14. 1974

1. Atwal, A. S., Singh, B. and Battu. G. S., *Curr. Sci.*, 1973, 42 (16), 585.
2. Burnside, C. E., *U.S. Dept. Agri. Tech. Bull.*, 1930, 43.
3. Kodaira, Y. and Fac, J., *Textile Sericult. Shinshu Univ.*, 1961, Ser. E., 5.
4. Mathur, S. B., Srivastava, R. P. and Subba Row, B. R., *J. Invert. Path.* 1966, 8, 274.
5. Srivastava, R. P. and Mathur, S. B., *Indian J. Ent.*, 1970, 32, 87.
6. Toumanoff, C., *Ann. Parasitol.*, 1931, 11, 129.

NOTE ON THE OBSERVATION OF THE FUNGUS *GONGRONELLA BUTLERI* (LINDN.) PEYRONEL AND DALVESCO IN COCONUT ROOT

WHILE examining the longitudinal sections of coconut roots in connection with the investigations on the root (wilt) disease, it was observed that the vascular tissue of the coconut root contained sporangia-like bodies (Fig. 1). Attempts were made to culture the organism by different methods. Root tissue containing the sporangium as well as sporangia separated by mixing the root tissue in Waring blender and squeezing through cotton wool were plated on potato-dextrose agar medium containing yeast extract and thiamine. 0·1% streptomycin was added to suppress the bacterial growth.

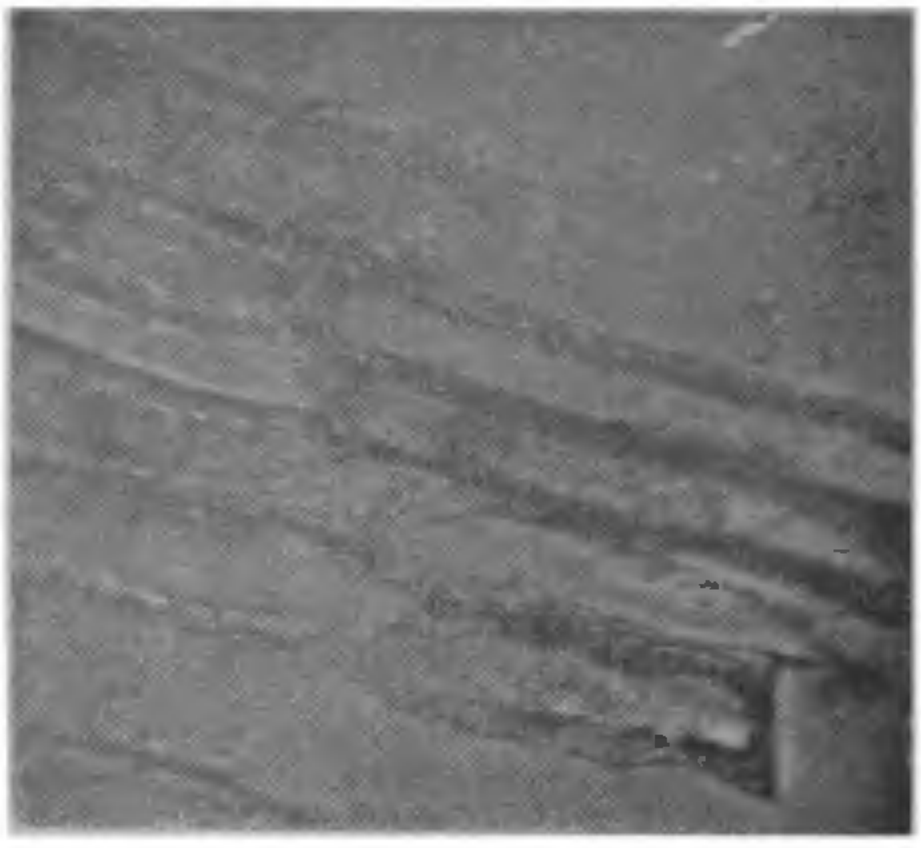

FIG. 1. Sporangium inside the cell, × 125.

Fluffy growth with aerial mycelium was observed and the hyphae 2·0 to 3·5 mμ in width, were aseptate. Sporangium was apical with a diameter of 4 to 16 mμ. The fungus was identified as *Gongronella butleri* (Lindn.) Peyronel and Dalvesco belonging to the family Mortierellaceae of the order Mucorales under Phycomyceies. This appears to be the first report in cocconut from India and is an addition to the list of fungi occurring in South India (Rangaswamy *et al.*, 1970). Further study to find out the association of the fungus, if any, with the root (wilt) disease complex is in progress.

Thanks are due to the Director, Commonwealth Mycological Institute, Kew, England, for the identification of the fungus and to Dr. K. Radha and Dr. P. Shanta, of the Central Plantation Crops Research Institute, Regional Station, Kayangulam, for suggestions in this line of work.

CPCRI, Regional Station, V. G. LILY.
Kayangulam, Krishnapuram 690533,
Kerala. *July* 10, 1974.

1. Rangaswamy, G., Seshadri, V. S. and Lucy Channamma, K. A., *Fungi of South India*, Univ. Agri. Sci. Publ., Bangalore, 1970.