present. Guard cells are placed at level with upper epidermis with clear sub-stomatal cavities.

In ripe fruit, epidermal cells show contraction and commissural framework gets highly sclerified so much so that the vascular tissue cannot be clearly marked out (Fig. 5).

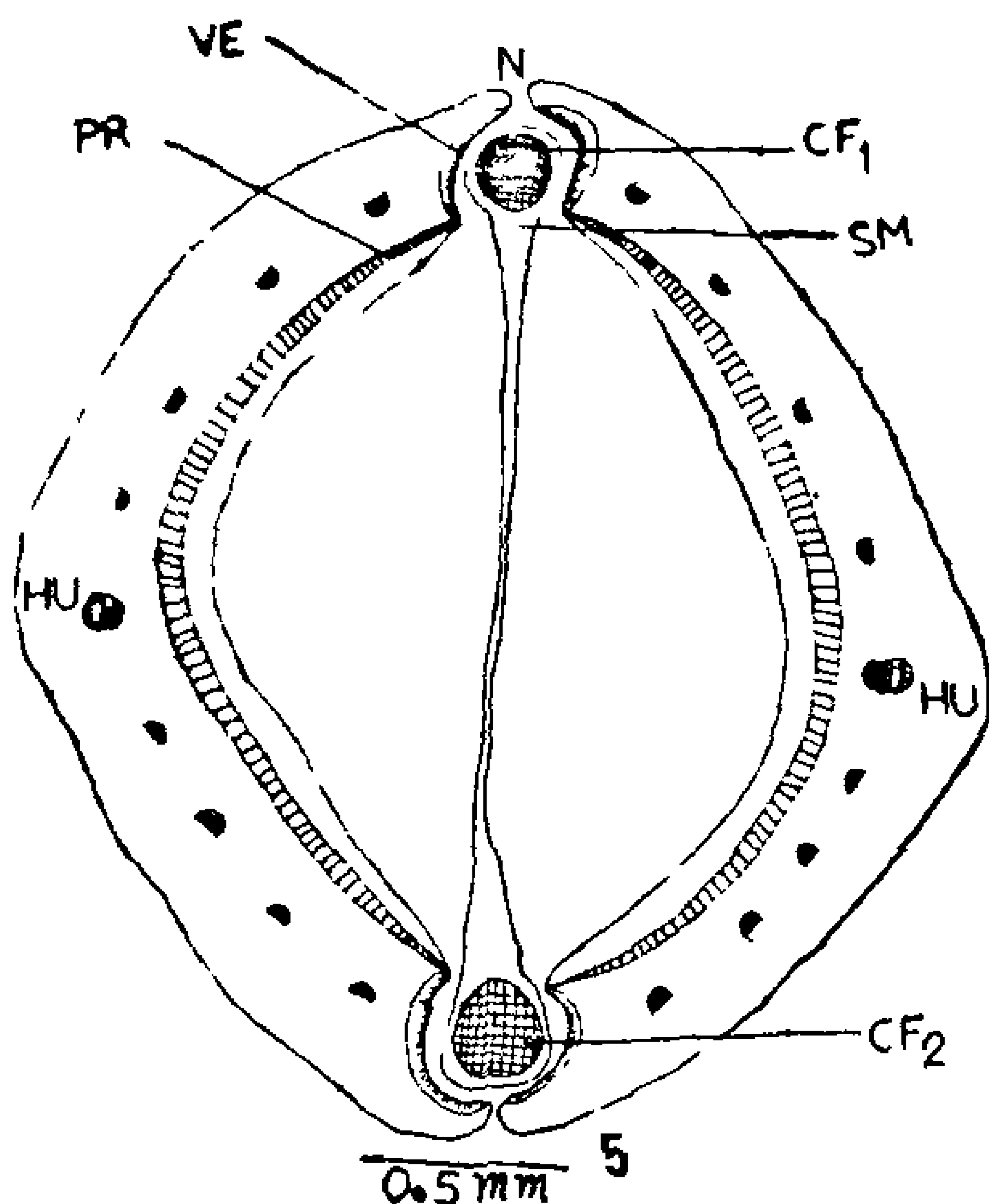

FIG. 5. T.S. field-ripe fruit.

CF_1, CF_2—Commissural frameworks; HU—Hump; N—Notch; PR—Prosenchymatous layer; SM—Septum; VE—Valve and sclrenchyma.

As the mature fruit dries up, its various tissues contract differenally due to differential wall thickenings. Thus a force of tension is created which pulls apart the valves. Consequently the stomial tissue breaks down. Notches and replum-fruit wall junctions split open. The fruit dehisces by four longitudinal clefts which separate the two valves from the replum to which seeds are attached on parietal placentae. The split extends from bottom of the valves to the base of beak above which stomial tissue is absent. Dehiscence is further aided by absence of fibrous layer in the region of replum.

The authors are thankful to Dr. R. S. Mehrotra for facilities and to U.G.C. for financial assistance.

Plant Morphology and Aerobiology Laboratory,
Department of Botany,
Kurukshetra University,
Kurukshetra 132 119,
Haryana, India, *June* 4, 1979.

B. B. ARORA.
L. C. LAMBA.

1. Atal, C. K., *Curr. Sci.*, 1960, **29**, 56.
2. Berggren, G., *Svensk bot. Tidskr.*, 1962, **56**, 65.
3. Lamba, L. C., *J. Indian Bot. Soc.*, 1975, **54**, 225.
4. Murley, N. R., *Am. Midl. Nat.*, 1951, **46**, 1.
5. McGugan, J. M., *Can. J. Res.*, 1948, **26**, 520.
6. Vaughan, J. G., *Phytomorphology*, 1956, **6**, 363.
7. —, *Ibid.*, 1959, **9**, 107.
8. —, *The Structure and Utiilzation of Oil Seeds*, Chapman and Hall Ltd., London, 1970.
9. Prasad, K., *J. Indian Bot. Soc.*, 1974, **53**, 24.
10. Fahn, A., *Plant Anatomy*, Pergamon Press, Oxford, 1974.

THE EFFECT OF SUGARS ON THE RESPIRATION OF *PESTALOTIOPSIS VERSICOLOR*

RESPIRATORY studies have been carried out with a good number of fungi[1-4]. But there are only a few reports on the effect of substrates on the respiration[5,6,12]. It is known that among filamentous fungi, the rate of endogenous respiration is usually high as compated with the respiration in the presence of an exogenous substrate. Whether the substrate is oxidised at a rate higher than that of the endogenous, is often applied to identify the possible metabolic intermediate[7,8], and this helps in the understanding of the metabolic behaviour of the fungus. Such studies with *Pestalotiopsis versicolor* are reported in the present note.

Pure culture of *Pestalotiopsis versicolor* causing rot of *Citrus aurantium* fruits was grown in 100 ml liquid broth (Sucrose 30 g, $NaNO_3$ 2 g, KH_2PO_4 1 g, KCl 0·5 g, $MgSO_4$, $7H_2O$ 0·5 g, $FeSO_4$ H_2O 0·1 g, distilled water 1 litre) in 250 ml Erlenmeyer flasks at 25° C for 5 days. Mycelium was collected by filtration and washed with distilled water. Starvation was effected by keeping the mycelium in sterilized distilled water for 3 to 5 days. Active and starved mycelia were taken separately, weighed and homogenized in phosphate buffer (pH 7·2). Respiration was measured using Warburg's respirometer (Umbreit *et al.*[9]), at 30° C using homogenate (2·5 ml) in the main compartment, sugars (0·5 ml of 0·5 M) in the side arm and 4-NKOH (0·2 ml) in the centre well. Controls and thermobarometer controls were maintained. Experiments were repeated three times and mean values are expressed as μl O_2 uptake.

The results show that in active and starved mycelium, oxygen uptake increased in the presence of sugars (Table I), except in the case of lactose where it decreased. Glucose and fructose were the best respiratory substrates. These results agree with the carbohydrate requirements of the pathogen[10]. Nolan[11] has indicated that biologically, glucose is the most

TABLE I

Effect of sugars on the endogenous respiration of active and starved mycelium of Pestalotiopsis versicolor

	Substrate added	$\mu l\ O_2$/min/g mycelium	
		Active	Starved
1.	None (Buffer only)	4·7	1·4
2.	Glucose	10·2	6·5
3.	Fructose	9·8	6·3
4.	Galactose	8·6	2·9
5.	Sorbose	7·5	3.2
6.	Arabinose	4·8	2·7
7.	Xylose	4·9	3·8
8.	Lactose	2·8	1·2
9.	Maltose	6·9	4·4
10.	Sucrose	7·4	4·1
11.	Raffinose	4·9	1·9
12.	Starch	6·1	4·2

important carbon source. When other carbon sources are supplied, only those related to glucose (fructose, mannose) or composed of glucose units with a-1,4 linkage (maltose, starch) are readily utilized by the fungus. Glucose, maltose, and fructose were the best to be oxidised and supported good growth of the fungus, whereas arabinose and xylose supporting poor growth were low in oxygen uptake. Increased rate of respiration with glucose and fructose perhaps indicates that Embden Meyerhoff pathway is operative with the present fungus[12,13]. Lactose supported negligible growth and was not at all utilized. Lactose and its derivative (glucose and galactose) perhaps could not be converted into phosphorylative derivative and thus were unable to enter the main respiratory pathway[14].

Author is grateful to Dr. G. P. Agarwal, Head, Department of Bio-Science, University of Jabalpur, Jabalpur, for encouragement and providing laboratory facilities.

Department of Bio-Science, (MRS.) KIRAN HASIJA.
University of Jabalpur,
Jabalpur 482 001,
July 14, 1979.

1. Sen, C. and Ghosh, S. K. *Indian J. Biochem. Biophys.*, 1973, **10**, 127.
2. Blumenthal, H. J., *The Fungi*, Vol. I., Acad. Press Publication, 1965.
3. Bard, M. D. and Fergus, C. L., *Mycopath. Mycol. Appl.*, 1967, **33**, 167.
4. Darby, R. T. and Goddard, D. R., *Amer. J. Bot.*, 1950, **37**, 167.
5. Thakurji, *Indian Phytopath.*, 1969, **22**, 466.
6. Wolf, F. T. and Shoup, C. S., *Mycologia*, 1943, **35**, 192.
7. Aldoory, Y., *Ibid.*, 1959, **51**, 851.
8. Ramachandran, S. and Gottleib, D., *Biochem. Biophys. Acta*, 1963, **69**, 74.
9. Umbreit, W. W., Burris, R. H. and Stauffer, J. F., *Manometric Technique*, Burgess Publ. Co., 1964.
10. Hasija, K., *Ph.D. Thesis*, University of Jabalpur, 1977.
11. Nolan, R. A., *Ann. Bot.*, 1970, **34**, 927.
12. Hasija, S. K. and Batra, S., *Nat. Acad. Sci. Letters*, 1978, **1** (2), 439.
13. Berkely, R. C. W. and Campbell, R., *Micro-organism, Function Form and Environment*, Edward Arnold Publication, U.K., 1971.
14. Cochrane, V. W., *Physiology of Fungi*, John Wiley and Sons Publication, 1958.

BIODEGRADATION OF PAPER BAGS BY *ASPERGILLUS* AND *MUCOR* SPECIES

IT is of great importance to sterilize papers and paper bags used for the wrapping of many foods notably bread, butter, sugar, fruits and food grains[1]. The problem of spoilage and biodeterioration of the paper bags, which is communicated here, was characterized by the greenish colouration and deterioration of the paper bags and the spoilage was predominant along the line of sealing. In the present study, the biodeteriogens were isolated and the effect of a few of the antimicrobial compounds studied.

For the isolation of biodeteriogens, spoiled paper bags were streaked on Sabouraud's plates. The plates were incubated at 30° C for 72 hrs. The mould cultures obtained were identified. To see the effect of antifungal compounds on *A. flavus*, the mould was grown in the synthetic medium[2] with and without antifungal compounds. The incubation was carried out at 30° C for 7 days, the mycelia were filtered out, dried at 50° C and weighed.

Cellulase was assayed according to the method of Miller[3]. The test system per 2 ml contained: 100 μ Moles of sodium acetate buffer (pH 5·0), 5 mg of CMC, or 10 mg of cotton or filter-paper or brown paper and 0·5 ml of enzyme. The incubation was carried out at 50° C for one hour. The reaction was stopped by boiling the solution for 10 min. after the addition of 1·0 ml of 3-5 dinitrosalicylic acid. Enzyme unit is defined as the amount of enzyme which liberates 1 mg of reducing sugars at 50° C per hour.