ASPERGILLUS FLAVUS IN THE AIR OF WORKING ENVIRONMENTS

Aspergillus flavus Link has been reported as a common constituent of soil and plant materials, particularly grain[6]. Some of its metabolites were proved to be toxic to living organisms including man. Aflatoxins produced by the fungus are now recognized as the most potent carcinogenic substances produced by living organisms[12]. In addition to insects, which are commonly parasitized by *A. flavus*, animals and man also suffer from mycotic infections caused by the fungus[4]. The fungus is also reported to be a parasite of seedlings of several crop plants, particularly legumes[10]. *A. flavus* is reported as a common constituent of the air-spora of both indoor and outdoor environments. But most of the studies under report are those conducted with the help of Petri dish exposures and reliable quantitative data gathered by volumetric samplers is scanty. During the years 1971, 1972, 1976 and 1977 numerous air samples were collected with the help of an Andersen sampler[1], at 20 selected sites, and the aerial concentrations of *A. flavus* were determined on the basis of the colony counts[3].

While 9 of the sampling sites could be classified as indoor environments, 7 were outdoor sites and 4 sites of mixed nature, *i.e.*, with partial enclosures and subjected to influence of outdoor air. The concentrations of *A. flavus* recorded (Table I) varied from site to site Highest concentrations were recorded in places where the commodities handled are in the nature of grain, oil seeds, feeds, and fruits. At the sites which are either residential areas, or work places where commodities like wood, fodder and cooked food are handled, concentrations of *A. flavus* were significantly low. A great variation is also observed between the samples taken at each site and the same is related to the commodity handled, degree of *A. flavus* contamination and time of sampling. Lacey[3] recorded upto 10^7 conidia per cubic metre of air in the moist barley silos. Similarly high catches of *A. flavus* were also recorded in mills where infected maize was handled[13]. In the present study the highest catch recorded is 44,357/m³. Probably greater numbers would have been obtained if the samples had been taken in the immediate vicinity of the commodity under closed conditions as was done by Lacey[3].

TABLE I

Concentrations of Aspergillus flavus *in the air of* 20 *sites in Mysore City*

Locality	Environment	Number of of Samples	Average Concentration No./m³	Highest Catch	
				Date	No./m³
1. Regulated Market	Outdoor	59	5,709	27- 7-1977	44,357
2. Oil and Rice Mill	Indoor	35	1,659	10- 8-1977	20,512
3. Market (Fruit Section)	Indoor	40	1,148	7- 9-1977	25,286
4. Santhepet	Indoor	64	523	11- 8-1976	4,768
5. Poultry Shed	Mixed	335	365	13- 7-1972	22,833
6. Flour Mill	Indoor	8	362	2-11-1977	1,078
7. Coffee Curing Works	Indoor	33	180	12- 1-1977	1,624
8. Fire Wood Depot	Mixed	31	123	21-10-1977	565
9. Snuff Depot	Indoor	35	123	10- 8-1977	565
10. Bakery	Indoor	5	121	8- 9-1976	292
11. Paper Mill	Outdoor	29	73	11-8—1976	848
12. Saw Mill	Outdoor	1	70	1972	..
13. Agarbathi Factory	Indoor	30	58	1-6 -1977	468
14. Hostel Kitchen	Indoor	34	48	17-11-1977	380
15. Cow Shed	Mixed	10	44	1-12-1977	119
16. Zoological Garden	Outdoor	1	21	1972	..
17. Residential Area	Outdoor	2	16	1972	..
18. Match Factory	Outdoor	32	11	23- 7-1977	36
19. Manasa Gangothri	Outdoor	709	10	19-11-1971	299
				20-12-1972	686
20. Sanatorium (Hospital Ward)	Mixed	34	7	11- 8-1976	89

It could be visualized from these results, that infected material provides the source for air-borne conidia and these, in turn, play a very important role in the contamination of sound stocks handled in these places. At Manasa Gangothri (the University Campus) where samples were collected each day for a period of 2 years, high catches of *A. flavus* were obtained when the wind was blowing from North–East Direction. The Regulated Market and the mills, where very high concentrations were recorded, were found to be situated in North–East direction. So it was felt that these sites might be the chief sources for air-borne *A. flavus* conidia sampled at Manasa Gangothri, 2 km away from it. To verify this a series of samples was taken with Andersen sampler, 8 m above the ground level, at 5 sites and the catches 3,115, 1,044, 100, 70 and 35/m^3 were recorded at Regulated Market, 3 sites in between and at Manasa Gangothri. The data confirms our opinion that the grain markets and mills are the chief sources of air-borne *A. flavus* contamination. The fact that upto 72% of the air-borne conidia of *A. flavus* are toxigenic[8] makes us conclude that the fungus is a hazardous mold in the environment. Apart from contamination of healthy stocks of grain, biodeterioration and mycotoxin production in them, the fungus might play a hazardous role on the health of people exposed to its air-borne spores in the form of mycotic infections and allergic disorders. The statement of Sreenivasamurthy[12] that air-borne spores of toxigenic strains of *A. flavus* might contaminate the food materials is substantiated by the results of the present study.

On the whole peak catches of *A. flavus* were recorded during the winter and rainy periods. This is in agreement with the earlier reports[5,11].

Even at sites where *A. flavus* was recorded in high concentrations, it was not found to be the dominant air-borne type as reported by some workers[2, 3, 7, 13] but it was found to occupy second, third or fourth positions among *Aspergillus* species.

The data reported in this study necessitates the recognition of *A. flavus* as a hazardous mold in the working environments such as mills, grain markets and poultry sheds. These areas provide the foci of air contamination, and this warrants due consideration in situating such places while planning cities and towns. It is suggested that people working in such areas should wear dust masks to protect themselves from the respiratory hazards.

Our sincere thanks to the persons who have permitted us to take air samples and to C.S.I.R. for the financial help.

P.G. Department of Botany,
University of Mysore,
Mysore 570 006, India,
May 23, 1978.

K. B. Jayaprakasii.
E. Rati.
A. Ramalingam.

1. Andersen, A. A., *J. Bact.*, 1958, **76**, 471.
2. Chute, H. L. and Barden, E., *Avian Dis*, 1964, **8**, 13.
3. Lacey, J, *Ann. appl. Biol.*, 1971, **69**, 187.
4. Lyso, A., *Meldinger fra Norges Land Brukshg-skole*, 1966, **45**, 1.
5. Mishra, R. R. and Kamal, *Mycopath. Mycol. appl.*, 1971, **45**, 301.
6. Onions, A. H. S., *Descriptions of Pathogenic Fungi and Bacteira*, Commonwealth Mycol. Inst, Kew, 1966, p. 91.
7. Rajan, B. S. V., Nigam, S. S. and Shukla, R. K., *Proc. Indian Acad. Sci.*, 1952, **35B**, 33.
8. Rati, E. and Ramalingam, A., *Indian J. Exptl. Biol.* (In press).
9. — and —, *J. Mysore Univ.*, 1973–74, **25** B, 168.
10. — and —, *Indian Phytopath.*, 1974, **27**, 579.
11. — and —, " Air-borne Aspergilli at Mysore," In *Aspects of Allergy and Applied Immunology*, 1976, **9**, 139.
12. Sreenivasamurthy, V., *Arogya–J. Health Sci.*, 1977, **3**, 4.
13. Stallybrass, F. C., *Br. J. Ind. Med.*, 1961, **18**, 41.

TEMPERATURE DEPENDENT OSMOTIC REMEDIAL MUTATION INDUCED IN THE ADENINE BIOSYNTHETIC PATHWAY IN *TORULOPSIS BOVINA*

The nature of the mutations induced in an auxotroph differs widely. These may be temperature sensitive or pH sensitive and a few may be osmotic remedial or temperature dependent osmotic remedial. In all these cases, the auxotrophic mutants may not require the growth factors in minimal medium and behave as prototrophs, when grown under the above specific conditions. Employing a purple diauxotrophic mutant of the yeast *Torulopsis bovina*, requiring purine (adenine/hypoxanthine) and sulfur amino acid (methionine/cysteine), the nature of the mutation induced in the adenine biosynthetic pathway was studied. In this report, evidence is presented for the possible occurrence of missense type of mutation in the adenine biosynthetic pathway.

The purple diauxotrophic mutant of *T. bovina* was examined for temperature sensitivity and for growth on hypertonic media to elucidate the possible nature of the genetic changes induced in the adenine biosynthesis (the mutant was found to have block in the conversion of 5-aminoimidazole ribonucleotide to 5-amino-imidazole-4-carboxylic acid ribonucleotide). Tests were carried out at 27°, 32° and 37° C on the modified Wickerham's minimal medium[1,2] made hypertonic with sucrose or potassium chloride[3]. Growth patterns observed for the mutant on media