SYMPOSIUM 2: MICROFLORA AND MYCOTOXINS
Convener: C. Fanelli, Italy.

During the Session on Microflora and Mycotoxins five papers were presented. Three papers described widely some important factors related to mould and microflora formation such as the influence of water and oxygen deficiency under airtight conditions. The last two papers described some important stimulating and inhibiting factors strictly related to aflatoxin biosynthesis.

Dr Lacey's paper clearly showed how fungi colonizing stored products differ in their response to water availability (or water activity) and temperature. Normally the "field fungi" (such as Alternaria, Cladosporium, Fusarium) required very high levels of water activity (higher than 0.9) both for growth and sporulation. By contrast, some "storage fungi" such as Aspergillus, Penicillium, Absidia, Mucor, Rhizopus, tolerate as low as 0.7 water activity.

The population of storage fungi may change during storage as a result of spontaneous heating together with the combination of water activity, temperature, and intergranular gas composition that determined which fungi were able to grow in the substrate. Water activity and temperature also affected toxin production; usually the conditions limiting toxin output were more restricted than those permitting fungal growth differing both for various mycotoxins produced by one fungus and for the same mycotoxin produced by different fungi.

The papers of Dr. Richard-Molard described oxygen consumption by the wet grain ecosystem in hermetically sealed silos at various water activities, and then the susceptibility of cereal microflora to oxygen deficiency and carbon dioxide concentrations. Dr Richard-Molard showed how the rate of oxygen decrease under airtight conditions and was related to the water activity of the grains. At high values of water activity (higher than 0.9) the oxygen presence in the intergranular atmosphere was sufficient to allow microbial growth of microaerophyllic species. Only at low values was the oxygen consumption low and oxygen progressively disappeared without microbial change. The problem of the absorbtion of carbon dioxide was considered and related to water activity; at low values of water activity carbon dioxide absorption increased.

The last two papers of the session reported some important factors strictly related to aflatoxin production both 'in vitro' and 'in vivo'. In the experiments 'in vivo' it was demonstrated that the natural oxidation of lipids, lipid peroxidation, played a key role in aflatoxin production. 'In vitro' the addition of endoplasmic reticulum of fungi highly enhanced aflatoxin output, in some cases by two hundred times as compared with control. Also 'in vivo', aflatoxin production in seeds of different ages inoculated with Aspergillus parasiticus paralleled the peroxide number of their oil contents or the degree of peroxidation of the seeds.

As regards the studies 'in vivo' it is interesting to note that many methods were reported to detect fungal growth on seeds. In the paper by Dr Passi et al., fungal growth was measured by gas chromatography on capillary column, using derivatives of hexosamines.

The authors reported the remarkable levels of galactosamine in addition to glucosamine among the breakdown products of chitin which is one of the major constituents of fungal cell wall. The other methods, colorimetric or by HPLC developed for detection of hexosamines in fungal cell wall chitin were not capable of differentiating glucosamine from galactosamine.

After the clarification of some key factors related to aflatoxin biosynthesis it was thought worthwile investigating the effect of the most common anti-oxidants on growth and aflatoxin production with the hypothesis that they could possibly be used succesfully for control of aflatoxin production 'in vivo'. 'In vitro' BHT, BHA, cysteamine and sodium thiosulfate were capable of reducing or blocking aflatoxin output induced by lipoperoxides or halomethanes in cultures of Aspergillus without affecting fungal growth. Moreover, under some culture conditions other antioxidants (vitamin C, vitamin E, cysteine and reduced glutathione) further enhanced aflatoxin biosynthesis.

'In vivo' the results reported were different: BHA, BHT and sodium thiosulfate alone or in association, were capable of inhibiting both aflatoxin output and fungal growth as compared with control. Relative humidity of the seeds affected the stability of antioxidants added to them; the drier the seeds, the lower the rate of decomposition of antioxidants. This influence on the stability of antioxidants was taken into account.

In conclusion, it seems evident that the use of different methods for preventing fungal contamination such as controlled atmospheres or by using chemical compounds to reduce the presence of microflora is a good approach to limiting microflora and mycotoxin production in food and feed.

SYMPOSIUM 3: PHYSICAL AND ENVIRONMENTAL CONTROL

H.J. Banks, Australia.

Three review papers were presented in this Symposium - that of Annis on CO2 and nitrogen based controlled atmospheres (CA) and their effect on insects, that of Evans on the limitations to the use of heat and cold in the control of stored product pests, and that of Banks on the potential of shock, physical removal and exclusion for insect control. There was no review paper presented on the very topical subject of radiation disinfestation, but two of the submitted papers covered many of the important points concerned with its use.

Annis gave an integrated summary of the literature data on the effect of CAs on stored grain insects. His survey was limited to data for between 20 and 30°C and he noted particularly the lack of data below 20°C. His survey highlighted the extensive deficiencies in the data, notably on the response of Trogoderma granarium, one of the more tolerant pests. Sitophilus oryzae pupae were clearly the most difficult pest and stage to kill with CA. The framework he set up should be useful for logical planning of future data gathering.

Reichmuth provided some much needed data on response of stored-product insects to 0.5-4%O_2 atmospheres at temperatures below