

Session 1

Biological Responses of Microflora to Treatment with CA
and/or Fumigation

Chairpersons

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EFFECT OF MODIFIED ATMOSPHERES ON MICROFLORA AND RESPIRATION OF CALIFORNIA PRUNES

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We investigated the possibility that California prunes stored in modified atmospheres (MAs) will tolerate higher water activity (a_w) levels than those required at normal atmospheres and that the naturally occurring microfloral infection level on the prunes may generate the MAs that inhibit mold activity in airtight conditions. Dry prunes were moisturized to a range from 18% to 38% moisture content (m.c.) to acquire samples with 0.575 to 0.858 a_w . In unsealed conditions at 35°C, there was a level of naturally occurring microorganisms (aerobic plate count, yeast count and mold count) that generally increased above 0.70 a_w . However, incubating these samples in a sealed container for 35 days at 35°C indicated that levels of the naturally occurring microorganisms remained unchanged throughout the range of water activities. Microfloral respiration as a function of temperature was determined by incubating similarly moisturized prune samples at 25°, 30° and 35°C and then measuring the declining O₂ concentrations through time. Results showed that the higher both the water activity and the temperature, the more intense the O₂ consumption by the product. A nearly linear relationship was observed between O₂ depletion and time. Anaerobic conditions were reached in less than 2 days at 25°C only at 0.858 a_w , the highest water activity tested. At higher temperatures, anaerobic conditions were achieved at $\geq 0.824 a_w$. These results indicate that under aerobic conditions microorganisms can flourish on and cause deterioration of prunes if the water activity of the fruit is above 0.7 (m.c. of 24.6%). However, under sealed conditions, prunes can tolerate a higher water activity without microorganism growth or deterioration of the fruit.

EFFECTS OF PHOSPHINE ON THE DEVELOPMENT OF *Aspergillus flavus* AFLATOXIN PRODUCTION IN MAIZE GRAINS STORED AT DIFFERENT MOISTURE CONTENTS

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The objective of this research was to investigate the effect of phosphine on the growth of *Aspergillus flavus* and aflatoxin production in maize stored at different moisture contents (m.c.). In this experiment samples were previously inoculated with an *A. flavus*

toxigenic strain. The experimental design used surface-of-response methodology to assess the various effects of different m.c. (water activities from 0.85 to 0.98), phosphine concentrations (from 0 to 4 g m⁻³) and exposure periods (from 1 to 15 days) to the fumigant. Analyses of m.c., water activity, mycological composition, ergosterol content and aflatoxins were carried out on the samples subjected to the different treatments. Previous results had shown that as the exposure time increased, more complete control of *A. flavus* was achieved. An increase in the phosphine exposure period is more important than increasing the concentration to achieve good control of *A. flavus* at lower water activities. As m.c. increases, the increase in phosphine concentrations becomes more important. *Fusarium verticillioides* seems to be particularly tolerant of phosphine mainly under the high m.c. conditions which also favor its development. Since this species is a potential fumonisins producer, more information is needed to aid in the formulation of practical control recommendations. The *Penicillium* species tolerant to phosphine were those found mainly in freshly harvested maize. It is encouraging that aflatoxin production was severely affected by phosphine even at low concentrations.

The present project was funded by FAPESP, the State funding body for research.