

Modified atmosphere as an alternative to MBr in the dried fig sector in Turkey

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Abstract

Dried figs are grown in Aegean part of Turkey and are among the traditional agricultural products of Turkey. Turkey leads the field both in terms of quantity and production in the World. For this reason from point of view of Turkish agricultural exports, dried figs have very important economic value. Annually approximately 45-55 thousand tons of dried figs are produced in Turkey, which equals to 50-55 % of the total world production. Generally 70 % of the fresh production in Turkey is exported. In 2001, 39.284 tons of dried figs were exported with a total value of US \$ 66 Million (Source: Export Promotion Center of Turkey, IGEME; www.igeme.org.tr)

The main pests infesting dried figs are *Ephesia cautella* Walk., *Plodia interpunctella* Hbn. (Pyralidae:Lep.) *Carpophilus* spp. (Nitidulidae:Col.) *Oryzaephilus surinamensis* L. (Silvanidae:Col.), and *Carpoglyphus lactis* (L.) (Carpoglyphidae:Acari). Although, several other methods such as deep freezing, high carbon dioxide (CO₂), high pressure plus carbon dioxide, cold storage, and phosphine are being currently used to control those pests in the processing facilities, Methyl bromide (MBr), still constitutes the main part of the control measures. Thus, the ban on use of methyl bromide will have serious impacts on industries and consumers that rely on it for post-harvest commodity treatments.

The purpose of this study was to evaluate of the effectiveness of high CO₂ applications for eradication of dried fig pests in the field conditions as an alternative to MBr in Turkey. In this series of experiment carried out at TARIS dried fig processing & storage plant (Izmir/Turkey), CO₂ fumigation of dried figs was performed in flexible storage units (36 m³ capacity) over five days of exposure periods. The units were loaded approximately with 15 tones of dried figs in the perforated plastic boxes. Test insects introduced in perforated PVC containers were *Ephesia cautella*, *Plodia interpunctella*, and *Oryzaephilus surinamensis*. Heavily infested figs with the mixed life stages of *Carpophilus hemipterus* and *Carpoglyphus lactis* were also introduced into the PVC storage units in the perforated PVC containers. The units were equipped with temperature/relative humidity loggers (Onset Co. USA, model: Hobo[®]). CO₂ from steel cylinder were flushed into the units from the base section of the cubes. CO₂ & O₂ gas concentrations in the PVC units were then daily monitored by an analyzer equipped with a thermal conductivity detector, and electrochemical detector for the entire exposure period of 5 days.

The results showed that oxygen concentrations in the containers decreased below 1% and carbon dioxide concentrations increased above 95% (Fig. 1). For the following 5 days, both O₂ & CO₂ concentrations remained stable. The level of gas tightness of the PVC units was contributed to a minimal change in gas composition during the experiments. Temperature and relative humidity data recorded during the entire exposure period are shown in Table 1. Mortality record showed that the main pests of

dried figs in Turkey were totally killed by high CO₂ applications in gas-tight conditions after 5 days of exposure (Table 2). This study clearly indicates that dried figs can be effectively disinfested by high carbon dioxide without the use of MBr.

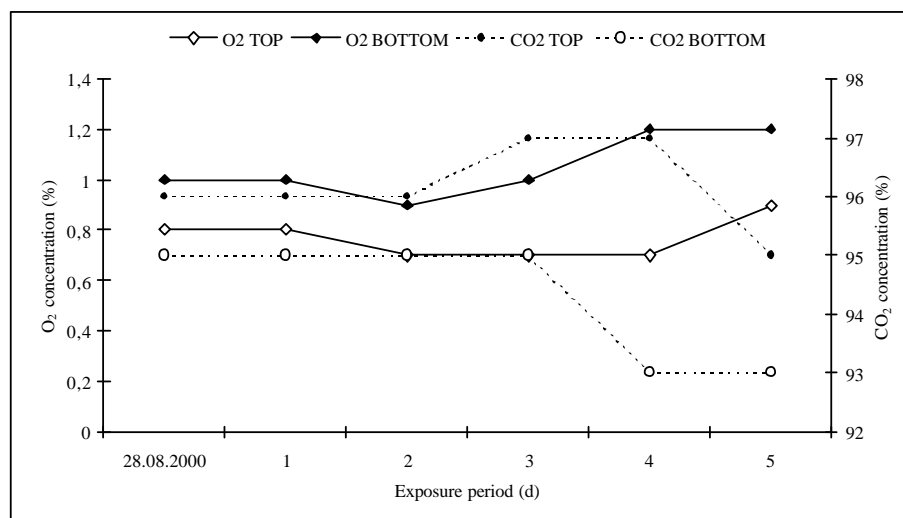


Figure 1. CO₂ & O₂ concentrations obtained over 5 days of exposure period inside the PVC unit.

Table 1. Temperature and relative humidity data recorded over the exposure period.

Exposure period (Hours)	Temperature (°C)		Humidity (% rh)	
	Mean	Range	Mean	Range
120	27,97	27,42 - 28,53	52,57	47,24 - 56,36

Table 2. Mortality rates of test insects over 5 days of exposure periods

Species	Stage	Age (days)	Mortality (%)
<i>Ephestia cautella</i> ^(a)	egg	1-3	100
	larvae	mature	100
<i>Plodia interpunctella</i> ^(a)	pupae	1-3	100
	adult	1-2 ^(a) ; 7-14 ^(b)	100
<i>Carpophilus hemipterus</i>	mixed	mixed	100
<i>Carpoglyphus lactis</i>			

Acknowledgement: Partially supported through the projects entitled “Project to Phase-Out Methyl Bromide in the Dried Fig Sector in Turkey (TTGV-P2/30m)” funded by the World Bank through the Multilateral Funds for the Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer; “Reduction of MBr emission on the fumigation of dried fruits and development of an alternative fumigation method (TUBITAK-TARP 2274)” funded by The Scientific and Technical Research Council of Turkey (TUBITAK); “Investigations on the use of new postharvest storage technologies (98-11-02-04)” funded by Ankara University Research Foundation; “Mites infesting stored products in Diyarbakir and Sanliurfa provinces and their control (TUBITAK-TARP 1848)” funded by The Scientific and Technical Research Council of Turkey (TUBITAK)