

**Title** Methyl bromide alternatives for dates disinfestations  
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### **Abstract**

Methyl bromide (MB) is a fumigant that has been used to control a wide range of pests in agriculture and for disinfestations of durables and perishable commodities. At the moment, MB is the main fumigant in use for dates' disinfection. Fumigation must not be carried out when the fruit is fresh, harvested at the khalal stage or when stored under deep refrigeration. The average practical dose is 15 g/m<sup>3</sup> for 12-24 hours at 15-16°C. However, MB is one of the most powerful chemicals that deplete the stratospheric ozone layer. In 1997, the Meetings of the Parties required that developed countries phase out MB by 2005 and by 2015 in developing countries. According to 2006 Assessment Reports of the UNEP's MB Technical Options Committee, alternatives to MB have been identified for about 95% of controlled uses. However, no technically and economically effective alternatives are identified for high-moisture dates. Many feasible alternatives to MB for dates' disinfestations are known of which are heat treatments, heat and carbon dioxide, phosphine (PH<sub>3</sub>), sulfuryl fluoride, ethyl formate, modified atmosphere and phosphine/CO<sub>2</sub> mixture. In this respect, two laboratory experiments were conducted to evaluate the effect of modified atmospheres (MAs) as well as MAs/PH<sub>3</sub> mixture on controlling *Oryzaephilus surinamensis* and *Tribolium confusum* in stored dates. The results of the first experiment indicated that application of MAs alone achieved 100% mortality of tested pests after 36-48h, depending on the type of the pest and CO<sub>2</sub> concentration. The second experiment indicated that 100% mortality of tested pests' stages was achieved after 6h only when CO<sub>2</sub> was combined with half the recommended dose of PH<sub>3</sub>. It can be concluded that the use of CO<sub>2</sub> in combination with PH<sub>3</sub> significantly shortened the time required to achieve complete mortality of infesting pests. Simultaneously, this treatment did not cause any noticeable changes in the tested chemical properties of treated fruits.