

Title            The use of carbon dioxide as an alternative to methyl bromide for the disinfestation of palm dates.  
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### Abstract

Trials in a Tunisian date processing facility were carried out with carbon dioxide as an alternative to methyl bromide for the control of the larvae of the carob moth, *Ectomyelois ceratoniae* [*Apomyelois ceratoniae*], and of eggs laid on dates during processing. Dates were transferred into plastic mesh crates used for regular storage. Bioassays of larvae-infested dates were included in treatments closely monitored for temperature and gas concentration, together with eggs of the mill moth, *Ephestia kuehniella*, used as a closely related model for the control of *Ectomyelois ceratoniae* eggs in various enclosures. In all trials, the concentration was kept at or more than 40% by the addition of gas when appropriate. Dates were treated in carefully sealed and vacuum-tested stacks, using either PVC [poly(vinyl chloride)] covering sheets and polyethylene base sheets or PVC covering and base sheets. At ambient temperatures of 15-25 deg C, exposure periods for larvae and eggs were 7 and 10 days, respectively. Two freight containers were modified into electrically heated fumigation chambers to allow dates to be heated before and during treatment to a maximum of 30 deg C to shorten exposure without impairing date quality. The containers were pressure-tested before and after sealing modifications. At 30 deg C, an exposure period of 4 days controlled both developmental stages. Vacuum chambers in the plant were not sufficiently gas-tight to carry out trials without re-establishing vacuum and modifying rates daily. Under such conditions, larval and egg bioassays showed survival in a 4-day exposure period. Trials conducted in a more gas-tight chamber showed that immature *Rhyzopertha dominica* survived a 5-day exposure period. Hence, the use of CO<sub>2</sub> under vacuum even in improved chambers at temperatures above 15 deg C appears to require an exposure of 6 days. There was little advantage in using high capital-cost vacuum treatments for the control of larvae, although it was beneficial for the control of eggs. Trials in chambers at atmospheric pressure showed that dates do not significantly sorb CO<sub>2</sub>. No impairment to the palatability of the dates was noted in any trial.