Abstract

The hypobaric method (LP = low pressure) adjusts [O_2] to any value ±0.08% by regulating the atmospheric pressure, and it automatically purifies the incoming air change by expansion without imposing a significant refrigeration load. The high gaseous diffusion rate at a low pressure exposes a commodity's surface and center to the same O_2 partial pressure, and causes different commodity types to have nearly identical low [O_2] tolerances, below 0.14%. Enhanced gaseous conductivity through low density air promotes outward diffusion of intercellular CO_2, ethylene, and NH_3, and air changes flush the released metabolic gases from the storage area. The [O_2] is low enough to intensely inhibit ethylene production and respiration, and respiration CO_2 inversion point is not reached, even at 0.14% [O_2]. Without injuring the commodity, LP lowers [O_2] sufficiently to prevent most bacteria and molds from developing, and by removing CO_2 it slows the growth of some bacteria. At the same O_2 partial pressure the presence of CO_2 causes CA to be less effective than LP in inhibiting fungal growth. Other LP effects resulting from low [CO_2] include dark stomatal opening, prevention of CO_2-damage and succinate formation; ascorbic acid retention; and inactivation of ethylene forming enzyme. Differences between insect and plant gas-exchange systems cause insect life stages to perish at the low hypobaric pressures which benefit the storage of horticultural commodities. Experimental errors which have caused excessive weight loss in some published laboratory LP studies are reviewed. Hypobaric intermodal containers are structurally less demanding than the simplest ISO class of tank containers and do not pose an insurance or implosion problem. They consume the same amount of energy as standard refrigerated containers, and are mechanically simpler than CA. The cost per shipment is similar in LP and CA.