

Efficiency of cardboard solar heater boxes for disinfestations of stored grains against arthropod pest

ABSTRACT

The solar heater box is a modest technology that enables easy collection and retention of solar radiation as heat at levels lethal to stored product arthropod pest inside the box. This study was designed to construct solar heater boxes of appreciable capacities to hold large quantities of grains, assess their heat-trapping efficiency and the influence of beans quantity and exposure time on same. Solar heater boxes of five different sizes were constructed for this study. Their heat-trapping capacity was evaluated by exposure to the sunlight for 5h. The influence of bean quantity and exposure on heat capture capabilities of the best performing solar heater box was evaluated using five different quantities of cocoa beans (9, 12, 15, 18 and 21kg) for 2h of exposure period. The result for heat trapping capacity shows that the largest solar heater box trapped the highest mean between and within bean temperatures (69.38 ± 4.97 and $69.45\pm 3.97^{\circ}\text{C}$, respectively) in 5h of exposure time. The result of the experiment on the effect of bean quantity and exposure time on heat-trapping efficiency show the highest temperature was obtained at 120min exposure time using 9kg of cocoa beans for both between and within bean temperature (70.00 ± 0.73 and $71.23\pm 0.85^{\circ}\text{C}$, respectively). The implications of these findings in applying this technology for stored product arthropods pest management on durable commodities were discussed.

Keyword: Cocoa beans; Solar heater box; Solar heat treatment; Pest management