Selection and evaluation of materials for solar heater boxes and their capacity in trapping solar energy

ABSTRACT

The selection and evaluation of solar heaters for trapping and using solar energy to disinfest legume grains are described. The effectiveness of five materials (cardboard, plywood, Perspex timber and metal) in collecting heat as temperature from the sun was investigated two different linings materials were used to coat solar heater boxes aluminium foil, and black paint. Solar heater boxes were covered with clear plastic to trap solar radiation. Cardboard and plywood were the best materials to construct the solar heater boxes as they trap and retained more heat due to their high thermal diffusivity compared to perspex and timber solar heater boxes. In addition, these materials are cheaper and easier to handle compared to metal. It was also concluded that, aluminium foils combined with black paint was the best lining than aluminium foil or black paint used separately. The effect of seed depth on solar energy collection inside cardboard and plywood solar heater boxes was also evaluated. Temperatures trapped in cardboard solar heater boxes with 7 kg of seeds was 13.9% higher than temperatures trapped in plywood solar heater boxes. Therefore, cardboard solar heater boxes were better than plywood solar heater boxes.

Keyword: Vigna angularis; Solar heaters; Seed disinfestations; Seed depth