

Effect of ambient conditions on drying of herbs in solar greenhouse dryer with integrated heat pump

ABSTRACT

An even span solar greenhouse dryer was built and applied to dry Java tea (*Orthosiphon aristatus*) and Sabah snake grass (*Clinacanthus nutans* Lindau). Findings showed that the solar greenhouse dryer performs satisfactorily during clear weather except at nighttime and rainy day due to product rehydration which is heavily influenced by high relative humidity from ambient air. Integrating of heat pump into the solar greenhouse dryer has successfully reduced the room relative humidity by 10–15%. Also, heat pump has mitigated the product rehydration issue by maintaining room relative humidity at maximum of 65% throughout the drying period. The drying rate of Java tea was improved three to fourfold, i.e., from 0.004–0.008 to 0.018–0.025 g H₂O/g DM min, whereas 10% of drying time was saved for both Java tea leaf and Sabah snake grass leaf with the assistance of heat pump system. Meanwhile, the supply of dry air from the heat pump system with a magnitude of 0.25–0.50 m/s helps in enhancing the drying rate of the herbs as well as minimizing the nonuniformity of drying temperature and relative humidity inside the solar greenhouse dryer.

Keyword: Clinacanthus nutans Lindau; Heat pump drying; Orthosiphon aristatus; Relative humidity; Solar greenhouse dryer; Weather conditions