

Effect of surface roughness and temperature on the performance of low-temperature vacuum drying with induced nucleation boiling method in dewatering stingless bees honey

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ABSTRACT

The Low-Temperature Vacuum Drying with Induced Nucleation Boiling (LTVD-NB) was developed to dewater honey. However, the effects of surface roughness (SR) and temperature of the LTVD-NB for honey are still unknown. Thus, the objective of this study is to investigate the effect of SR and temperature on dewatering rate and heat transfer performance. The honey sample was heated at 40-50 °C using heater pipes with SR 0.80-11.33 μm at a 5 kPa. It was found that the dewatering rate obtained at the highest SR and temperature was five times higher than the lowest SR and temperature. By increasing the SR from 0.80 to 11.33 μm, the Heat Transfer Coefficient (HTC) increased by 143% as more nucleation sites were present on the surface. Besides, when temperature increased heat flux, bubble frequency and HTC also increased. In conclusion, the dewatering rate increases when SR and temperature increase, which is correlated with nucleation sites and bubble frequency.

KEYWORDS

Stingless bees honey; Dewatering; Vacuum drying; Nucleat boiling; Surface roughness; Temperature

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