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T. Seerangurayar, A. Manickavasagan, Abdulrahim M. Al-Ismaili, Yaseen A. Al-Mulla



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Effect of carrier agents on flowability and microstructural properties of foam-mat freeze dried date powder

T. Seerangurayar ^a, A. Manickavasagan ^b, Abdulrahim M. Al-Ismaïli ^{a,*}, Yaseen A. Al-Mulla ^a

^a Department of Soils, Water and Agricultural Engineering, College of Agricultural and Marine Sciences, Sultan Qaboos University, Al-Khoud 123, Muscat, Oman

^b School of Engineering, University of Guelph, Guelph, Ontario, Canada

*Corresponding author: abdrahim@squ.edu.om

Abstract

Date powder was produced without (control) and with carrier agents at three ripening stages of dates (khalal, rutab and tamr) by foam-mat freeze drying method. Maltodextrin (MD) DE 10 and gum arabic (GA) were used as carrier agents at two concentration levels (40% and 50%). The effect of carrier agents on flowability and microstructural properties of the date powder was investigated. The ripening stage, carrier type and their concentration levels had significant effect on almost all the flow parameters. Control powder particles had more clumps resulted in nil flowability. Date powders produced with GA had lower moisture content (7.1-9.7%), angle of repose (32-37°), bulk density (0.6-0.7 g/cm³), tapped density (0.8-0.9 g/cm³), particle density (1.5-1.6 g/cm³), Carr Index (20-24%) and Hausner ratio (1.3) and also relatively smaller particles (47±20 µm) compared to powders produced with MD. Microstructural analysis of powder particles revealed that carrier agents were imperative to get free-flow powder. Overall, date powders produced with GA had relatively good flowability and lower cohesiveness. Similarly, 50% carrier agent-added powder had relatively better flowability.

Keywords: Date powder, foam-mat freeze drying, angle of repose, flowability, cohesiveness, microstructure

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