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Water Diffusion Coefficients of Selected Legumes Grown in Turkey As Affected by Temperature and Variety

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Abstract: The kinetics of water absorption by chickpeas (Koçbaşı, Kuşbaşı), lentils (green Pul) and beans (Battal, Dermason, Horoz, Şeker) grown in Turkey were studied by a gravimetric method during soaking at 15, 25 and 40ºC to determine moisture diffusivity of these selected legumes. The water diffusion coefficients of the legumes were in the range $9.71x10^{-11}$ - $5.98x10^{-10}$ m^2/s for the chickpeas, $3.53x10^{-10}$ - $1.33x10^{-9}$ m^2/s for the lentils and $4.35x10^{-11}$ - $3.79x10^{-9}$ m^2/s for the beans. An Arrhenius-type equation described the strong temperature effect on the diffusion coefficient with activation energies of 48.6-49.8 kJ/g-mol for chickpeas, 39.7 kJ/g-mol for lentils, and 33.6-50.8 kJ/g-mol for beans. It was shown that a satisfactory prediction of water absorption during soaking of the selected legumes was possible by using the analytical solutions to Fick's law of diffusion.

Key Words: diffusion coefficient, chickpeas, lentils, beans, soaking, modeling

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