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Thermal Properties of Grain and Grain Products

American Society of Agricultural and Biological Engineers

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Thermal Properties of Grain and Grain Products

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Keywords: Grain, Thermal

1 Purpose and Scope

1.1 This Data contains values of thermal properties and equations for estimating the thermal properties of several cereal grains, cereal flours, and oil seeds. Properties included are Specific heat, Thermal Conductivity, and Thermal Diffusivity. (Information not in specified order for publication purposes.) The properties are for bulk samples rather than individual kernels. Thermal properties are highly moisture dependent and somewhat temperature dependent. Therefore, ranges in moisture content and temperature for which the data are applicable are included and equations for predicting thermal properties use moisture content as the independent variable.

Thermal Diffusivity (α):

Grain or Grain Product	Moisture Content, % wb	Temperature Range or Mean, K	Thermal Diffusivity, $\times 10^4$ m^2 / h*	Reference
Corn, Yellow dent	0.9 to 20.1	282 to 297	3.6778 – 0.0286 *M*	(9)
Corn, Yellow dent	24.7	282 to 297	3.20	(9)
Corn, Yellow dent	30.2	282 to 297	3.33	(9)
Flour, Defatted Soy	9.2 to 39.1	403	0.0936 + 0.1823 *M* + 0.0000024 M^2	(18)
Gram	10.3 to 21.4	283	2.077 + 0.1794 *M*	(6)
Gram	10.3 to 21.4	299	2.3404 + 0.1304 *M*	(6)
Gram	10.3 to 21.4	312	2.3426 + 0.0962 *M*	(6)
Rapeseed	0.75 to 10.5	293	3.6043 - 0.0331 *M*	(11)
Rapeseed	0.75 to 10.5	275	3.7162 - 0.0278 *M*	(11)
Rapeseed	0.75 to 10.5	269	3.4384 - 0.0114 *M*	(11)
Rice, Milled (MA2)	10 to 20	—	3.9566 – 0.0638 *M*	(7)
Rice, Medium Rough	10 to 20	—	4.86 + 0.0897 *M*	(20)
Rice, Short Rough	10 to 20	—	4.51 - 0.0585 *M*	(10)
Wheat, Hard	9.2	—	4.14	(3)
Wheat, Soft White	0.7 to 20.3	282 to 296	3.34 - 0.0245 *M*	(9)
*Where regression equations are presented, M represents moisture content in percent wet basis				

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