Equilibrium Moisture of Grain (Modified Henderson Equation)

Equilibrium moisture of grain or seed in air of a given temperature and relative humidity by the modified Henderson equation, and the humidity for a moisture.

Method: Modified Henderson equilibrium moisture equation (constants for rough rice as listed in ASABE D245)

Input parameters

Unit system: SI

Parameter	Value	Unit
Air temperature	30.000	°C
Air relative humidity	65.000	%
Constant K	1.9187e-05	
Constant N	2.4451	
Constant C (°C)	51.161	
Grain moisture to find the equilibrium humidity for (dry basis)	16.000	%

Calculated results

Parameter	Value	Unit
Equilibrium moisture (dry basis)	14.352	%
Equilibrium moisture (wet basis)	12.551	%
Equilibrium relative humidity at the grain moisture	74.575	%

Notes for this case

• The modified Henderson equation 1 − φ = exp[−K(T + C) Mⁿ], with T in °C and M in per cent dry basis, describes how much moisture a grain holds in equilibrium with the surrounding air. It tells how far air of a given state can dry grain, and the safe storage humidity for a moisture. The default constants are those listed for rough rice; use the constants for your crop (wheat, maize, soybean and others have their own).

Formula and method

$$1-\varphi=\exp\left[-K(T+C)M^{N}\right],\quad M_e=\left[\frac{-\ln(1-\varphi)}{K(T+C)}\right]^{1/N}$$

Variables

T	Air temperature	K
φ	Air relative humidity	-
K	Constant K	-
N	Constant N	-
C	Constant C (°C)	-
M	Grain moisture to find the equilibrium humidity for (dry basis)	-
M_e	Equilibrium moisture (dry basis)	-
$M_{e,wb}$	Equilibrium moisture (wet basis)	-
φ_e	Equilibrium relative humidity at the grain moisture	-

Method and standards

Modified Henderson.

Assumptions and limits

- Desorption isotherm; T in °C, M in % dry basis.

References

Modified Henderson equilibrium moisture equation (constants for rough rice as listed in ASABE D245)

Report details

Report reference	FCC-1Y0Q-9YT1 (the same inputs always give the same reference)
Generated	23 November 2026, 17:34 UTC
Calculator	Equilibrium Moisture of Grain (Modified Henderson Equation)
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/chemical/drying/modified-henderson-equilibrium-moisture

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.