

# Package ‘seedwater’

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**Type** Package

**Title** Models for Drying and Soaking Kinetics of Seeds

**Version** 2.0

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**LazyLoad** yes

**LazyData** yes

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**Depends** rpanel, tcltk, stats, graphics, grDevices

**Suggests** tkrplot

**Description** Bringing together tools for modeling drying and soaking (rehydration) kinetics of seeds. This package contains several widely used predictive models (e.g.: da Silva et al., 2018). As these are nonlinear, the functions are interactive-based and easy-to-use. Least squares estimates are obtained with just a few visual adjustments of the initial parameter values.

Reference: da Silva AR et al. (2018) <doi:10.2134/agronj2017.07.0373>.

**License** GPL (>= 2)

**NeedsCompilation** no

**Repository** CRAN

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## R topics documented:

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seedwater-package

*Models for Drying and Soaking Kinetics of Seeds*

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### Description

Bringing together tools for modeling drying and soaking (rehydration) kinetics of seeds. This package contains several widely used predictive models (e.g.: da Silva et al., 2018). As these are nonlinear, the functions are interactive-based and easy-to-use. Least squares estimates are obtained with just a few visual adjustments of the initial parameter values.

### Details

Package: seedwater  
Type: Package  
Version: 2.0  
Date: 2020-12-04  
License: GPL (>= 2)

### Note

*seedwater* is an ongoing project. Any and all criticism, comments and suggestions are welcomed.

### Author(s)

Anderson Rodrigo da Silva

Maintainer: Anderson Rodrigo da Silva <anderson.silva@ifgoiano.edu.br>

### References

da Silva, A. R. et al. (2018) Modeling the Three Phases of the Soaking Kinetics of Seeds. *Agronomy Journal*, 110:164-170. doi:10.2134/agronj2017.07.0373

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dryingmodels

*Modeling Seed Drying Kinetics*

---

### Description

An interactive function to fit nonlinear models for seed drying kinetics.

### Usage

```
dryingmodels(moisture, time)
```

**Arguments**

|          |   |
|----------|---|
| moisture | a numeric vector containing values of seed water content of weight of seed sample. See Details. |
| time     | a numeric vector containing values of drying time.  |

**Details**

dryingmodels is set to fit curves of *moisture ratio* (MR) rather than moisture. It is automatically calculated through the equation:

$$MR = \frac{\text{moisture} - Mf}{Mi - Mf}$$

where  $Mi$  and  $Mf$  are the initial and final values of seed moisture.

These are the currently available models:

(Page)  $MR = \exp(-K * x^n)$

(Henderson and Pabis)  $MR = A * \exp(-K * x)$

(Henderson and Pabis modified)  $MR = A * \exp(-K * x) + b * \exp(-K0 * x) + \exp(-K1 * x)$

(Midilli)  $MR = A * \exp(-K * x^n) + b * x$

(Diffusion approximation)  $MR = A * \exp(-K * x) + (1 - A) * \exp(-K * b * x)$

(Two terms exponential 1)  $MR = A * \exp(-K0 * x) + b * \exp(-K1 * x)$

(Two terms exponential 2)  $MR = A * \exp(-K * x) + (1 - A) * \exp(-K * A * x)$

(Logarithmic)  $MR = A * \exp(-K * x) + b$

(Thompson)  $MR = \exp(-A - \text{sqrt}(A^2 + 4 * b * x)) / (2 * b)$

(Newton)  $MR = \exp(-K * x)$

(Verma)  $MR = A * \exp(-K * x) + (1 - A) * \exp(-K1 * x)$

(Wang and Sing)  $MR = 1 + A * x + b * x^2$

where  $x$  represents time and  $A, K, n, b, K0$  and  $K1$  are the model parameters.

**Value**

An object of class `nls` containing the parameter estimates.

**Side Effects**

An interactive graphic is displayed for selecting the model and the initial values for the parameters.

**Author(s)**

Anderson Rodrigo da Silva <anderson.silva@ifgoiano.edu.br>

**See Also**

[nls](#), [soakingmodels](#)

**Examples**

```
data(waterloss)
if (interactive()) {
  res <- with(waterloss, dryingmodels(moisture = WaterContent, time = Time))
  summary(res)
}

# End (not run)
```

---

onionseeds

*Onion Seed Soaking Kinetics Data*

---

**Description**

Data from a lab experiment containing observations of onion seed sample weight (g) subjected to a soaking process for 96 hours.

**Usage**

```
data("onionseeds")
```

**Format**

A data frame with 23 observations on the following 2 variables:

Time a numeric vector containing values of soaking time, in hours.

Weight a numeric vector containing values of weight (g) of a onion seed sample.

**Examples**

```
data(onionseeds)
str(onionseeds)
summary(onionseeds)
plot(Weight ~ Time, data = onionseeds)
```

---

soakingmodels

*Modeling Seed Soaking Kinetics*

---

**Description**

An interactive function to fit nonlinear models for seed soaking kinetics.

**Usage**

```
soakingmodels(moisture, time)
```

**Arguments**

|          |   |
|----------|---|
| moisture | a numeric vector containing values of seed water content or weight of seed sample. See Details. |
| time     | a numeric vector containing values of soaking time.   |

**Details**

soakingmodels is set to fit curves of *water absorption* (WA%) rather than moisture. It is automatically calculated through the equation:

$$WA = \frac{\text{moisture} - Mi}{Mi}$$

where  $Mi$  is the initial value of seed moisture.

These are the currently available models:

(Peleg)  $WA = x / (k1 + k2 * x)$

(Logistic)  $WA = a / (1 + \exp(-b1 * (x - c1)))$

(Logistic adapted)  $WA = a / (1 + \exp(-b1 * (x - c1))) + \exp(b2 * (x - c2))$

(Peleg adapted)  $WA = x / (k1 + k2 * x) + \exp(b2 * (x - c2))$

where  $x$  represents time and  $a$ ,  $k1$ ,  $k2$ ,  $b1$ ,  $b2$ ,  $c1$  and  $c2$  are the model parameters. Check da Silva et al. (2018) for more details and description of parameters.

**Value**

An object of class nls containing the parameter estimates.

**Side Effects**

An interactive graphic is displayed for selecting the model and the initial values for the parameters.

**Author(s)**

Anderson Rodrigo da Silva <anderson.silva@ifgoiano.edu.br>

**References**

da Silva, A. R. et al. (2018) Modeling the Three Phases of the Soaking Kinetics of Seeds. *Agronomy Journal*, 110:164-170. doi:10.2134/agronj2017.07.0373

**See Also**

[nls](#), [dryingmodels](#)

**Examples**

```
data(onionseeds)
if (interactive()) {
  res <- with(onionseeds, soakingmodels(moisture = Weight, time = Time))
  summary(res)
}

# End (not run)
```

---

waterloss

*Seed Water Loss Data*

---

**Description**

Hypothetical data from an experiment containing observations of water content (g/g) of seeds in a drying process for 2 hours.

**Usage**

```
data("onionseeds")
```

**Format**

A data frame with 11 observations on the following 2 variables:

Time a numeric vector containing values of drying time, in hours.

WaterContent a numeric vector containing values of water content (g/g) of a seed sample.

**Examples**

```
data(waterloss)
str(waterloss)
summary(waterloss)
plot(WaterContent ~ Time, data = waterloss)
```

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