

Package ‘seedwater’

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Type Package

Title Models for Drying and Soaking Kinetics of Seeds

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Author Anderson Rodrigo da Silva

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

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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.

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

License GPL (>= 2)

NeedsCompilation no

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seedwater-package

Models for Drying and Soaking Kinetics of Seeds

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: 1.0
Date: 2019-01-30
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

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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