Package 'HTSeed'

January 20, 2025

Type Package

Title Fitting of Hydrotime Model for Seed Germination Time Course

Description The seed germination process starts with water uptake by the seed and ends with the protrusion of radicle and plumule under varying temperatures and soil water potential. Hydrotime is a way to describe the relationship between water potential and seed germination rates at germination percentages. One important quantity before applying hydrotime modeling of germination percentages is to consider the proportion of viable seeds that could germinate under saturated conditions. This package can be used to apply correction factors at various water potentials before estimating parameters like stress tolerance, and uniformity of the hydrotime model. Three different distributions namely, Gaussian, Logistic, and Extreme value distributions have been considered to fit the model to the seed germination time course. Details can be found in Bradford (2002) <https://www.jstor.org/stable/4046371>, and Bradford and Still(2004) <https://www.jstor.org/stable/23433495>.

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Imports dplyr

NeedsCompilation no

RoxygenNote 7.3.1

Repository CRAN

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Contents

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seed.extreme   *Title Extreme value distribution of base seed water potential*

Description

The distribution of base seed water potential is following the extreme value distribution. Here, the stress tolerance parameter is characterised by 63 percentile in the distribution of base seed water potential.

Usage

```
seed.extreme(psi, time, c.germinated, N, d=NULL, theta)
```

Arguments

psi	Soil water potential
time	Time taken to germinate
c.germinated	Cumulative number of seeds germinated
N	Total number of seeds under each soil water potential
d	Proportion of viability
theta	Hydrotime constant

Value

- parameters: mu (stress tolerance parameter)and sigma (uniformity of germination parameter)
- Result_fitting: Actual cumulative seed germination fraction (Actual_CGfraction) and Fitted cumulative seed germination fraction (Fitted_CGfraction)

References

- Bradford, K. J. (2002). Applications of Hydrothermal Time to Quantifying and Modeling Seed Germination and Dormancy. Weed Science, 50(2), 248–260. http://www.jstor.org/stable/4046371.
- Bradford, K. J., & Still, D. W. (2004). Applications of Hydrotime Analysis in Seed Testing. Seed Technology, 26(1), 75–85. http://www.jstor.org/stable/23433495

Examples

```
psi<-c(rep(0, 19), rep(-0.2, 6), rep(-0.4, 10))
time<- c(1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6, 7, 9, 10, 12, 16, 18, 20, 23, 26,
30, 4.5, 5, 6, 20, 23, 30, 3, 3.5, 4, 4.5, 5, 6, 7, 9, 12, 16)
c.germinated<- c(1, 2, 6, 11, 20, 24, 30, 34, 39, 41, 43, 47, 56, 58, 59, 63,
67, 72, 73, 29, 31, 35, 63, 64, 65, 11, 13, 18, 21, 22, 25, 26, 28, 29, 30)
d<- c(0.8, 0.8, 0.6)
my.extreme<-seed.extreme(psi= psi, time= time, c.germinated= c.germinated, N=100, d=d, theta= 90)
```

---

seed.logit   *Title Logistic distribution of base seed water potential*

Description

The distribution of base seed water potential is following the logistic distribution. Here, the stress tolerance parameter is characterised by 50 percentile in the distribution of base seed water potential.

Usage

```
seed.logit(psi, time, c.germinated, N, d=NULL, theta)
```

Arguments

psi   Soil water potential

time   Time taken to germinate

c.germinated   Cumulative number of seeds germinated

N   Total number of seeds under each soil water potential

d   Proportion of viability

theta   Hydrotime constant

Value

- parameters: mu (stress tolerance parameter)and sigma (uniformity of germination parameter)

- Result_fitting: Actual cumulative seed germination fraction (Actual_CGfraction) and Fitted cumulative seed germination fraction (Fitted_CGfraction)

References

- Bradford, K. J. (2002). Applications of Hydrothermal Time to Quantifying and Modeling Seed Germination and Dormancy. Weed Science, 50(2), 248–260. http://www.jstor.org/stable/4046371.

- Bradford, K. J., & Still, D. W. (2004). Applications of Hydrotime Analysis in Seed Testing. Seed Technology, 26(1), 75–85. http://www.jstor.org/stable/23433495

Examples

```
psi<-c(rep(0, 19), rep(-0.2, 6), rep(-0.4, 10))
time<- c(1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6, 7, 9, 10, 12, 16, 18, 20, 23, 26,
30, 4.5, 5, 6, 20, 23, 30, 3, 3.5, 4, 4.5, 5, 6, 7, 9, 12, 16)
c.germinated<- c(1, 2, 6, 11, 20, 24, 30, 34, 39, 41, 43, 47, 56, 58, 59,
63, 67, 72, 73, 29, 31, 35, 63, 64, 65, 11, 13, 18, 21, 22, 25, 26, 28, 29, 30)
d<- c(0.8, 0.8, 0.6)
my.logit<-seed.logit(psi= psi, time= time, c.germinated= c.germinated, N=100, d=d, theta= 90)
```

---

seed.probit   *Title Normal distribution of base seed water potential*

Description

The distribution of base seed water potential is following the normal distribution. Here, the stress tolerance parameter is characterised by 50 percentile in the distribution of base seed water potential.

Usage

```
seed.probit(psi, time, c.germinated, N, d=NULL, theta)
```

Arguments

psi	Soil water potential
time	Time taken to germinate
c.germinated	Cumulative number of seeds germinated
N	Total number of seeds under each soil water potential
d	Proportion of viability
theta	Hydrotime constant

Value

- parameters: mu (stress tolerance parameter)and sigma (uniformity of germination parameter)
- Result_fitting: Actual cumulative seed germination fraction (Actual_CGfraction) and Fitted cumulative seed germination fraction (Fitted_CGfraction)

References

- Bradford, K. J. (2002). Applications of Hydrothermal Time to Quantifying and Modeling Seed Germination and Dormancy. Weed Science, 50(2), 248–260. http://www.jstor.org/stable/4046371.
- Bradford, K. J., & Still, D. W. (2004). Applications of Hydrotime Analysis in Seed Testing. Seed Technology, 26(1), 75–85. http://www.jstor.org/stable/23433495

Examples

```
psi<-c(rep(0, 19), rep(-0.2, 6), rep(-0.4, 10))
time<- c(1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6, 7, 9, 10, 12, 16, 18, 20, 23, 26,
30, 4.5, 5, 6, 20, 23, 30, 3, 3.5, 4, 4.5, 5, 6, 7, 9, 12, 16)
c.germinated<- c(1, 2, 6, 11, 20, 24, 30, 34, 39, 41, 43, 47, 56, 58, 59,
63, 67, 72, 73, 29, 31, 35, 63, 64, 65, 11, 13, 18, 21, 22, 25, 26, 28, 29, 30)
d<- c(0.8, 0.8, 0.6)
my.probit<-seed.probit(psi= psi, time= time, c.germinated= c.germinated, N=100, d=d, theta= 90)
```

Index