

Package ‘AgroTech’

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Type Package

Title Data Analysis of Pesticide Application Technology

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Maintainer Rodrigo Yudi Palhaci Marubayashi <marubayashi@uel.br>

Description In total it has 7 functions, three for calculating machine calibration, which determine application rate (L/ha), nozzle flow (L/min) and amount of product (L or kg) to be added. to the tank with each sprayer filling. Two functions for graphs of the flow distribution of the nozzles (L/min) in the application bar and, of the temporal variability of the meteorological conditions (air temperature, relative humidity of the air and wind speed). Two functions to determine the spray deposit (uL/cm²), through the methodology called spectrophotometry, with the aid of bright blue (Palladini, L.A., Raitano, C.G., Velini, E.D. (2005), <doi:10.1590/S0103-90162005000500005>) or metallic markers (Chaim, A., Castro, V.L.S.S., Correles, F.M., Galvão, J.A.H., Cabral, O.M.R., Nicolella, G. (1999), <doi:10.1590/S0100-204X1999000500003>). The package supports the analysis and representation of information, using a single free software that meets the most diverse areas of activity in application technology.

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Imports ggplot2, gridExtra, xlsx, readxl, ggrepel, stats, nortest, lmtest, crayon, utils

License GPL (>= 2)

Depends R (>= 3.6)

NeedsCompilation no

Author Rodrigo Yudi Palhaci Marubayashi [aut, cre]
(<<https://orcid.org/0000-0003-2778-8654>>),
Gabriel Danilo Shimizu [aut, ctb]
(<<https://orcid.org/0000-0001-8524-508X>>),
Otavio Jorge Grigoli Abi Saab [aut, ctb]
(<<https://orcid.org/0000-0002-1757-636X>>)

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Contents

example_markblue	2
example_markbluecurve	3
example_markmet	3
example_meteorological	4
flowgrap	5
flowpres	6
flowrat	7
markblue	9
markmet	11
product	12
vartemp	13
Index	15

example_markblue	<i>Dataset: Example markblue</i>
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Description

The data are part of an experiment that studied the spray deposit

Usage

```
data(example_markblue)
```

Format

```
data.frame containing data set
curva Vector with curves
TRATAMENTO Numeric vector with treatment
repe Numeric vector with repetition
Abs Numeric vector with absorbance
area Numeric vector with area
```

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>
 Gabriel Danilo Shimizu
 Otavio Jorge Grigoli Abi Saab

Examples

```
data(example_markblue)
```

example_markbluecurve *Dataset: Example markbluecurve*

Description

The data are part of an experiment that studied the spray deposit

Usage

```
data(example_markbluecurve)
```

Format

data.frame containing data set

curva Vector with curve

Amostra Numeric vector with sample

Abs Numeric vector with absorbance

ppm Numeric vector with concentration

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

Examples

```
data(example_markbluecurve)
```

example_markmet *Dataset: Example markmet*

Description

The data are part of an experiment that studied the spray deposit

Usage

```
data(example_markmet)
```

Format

data.frame containing data set
trat Vector with treatment
repe Numeric vector with repetition
ppm Numeric vector with concentration

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>
Gabriel Danilo Shimizu
Otavio Jorge Grigoli Abi Saab

Examples

```
data(example_markmet)
```

```
example_meteorological
```

Dataset: Example meteorological

Description

The data come from a meteorological station on a rural property in the city of Rolandia/PR

Usage

```
data("example_meteorological")
```

Format

data.frame containing data set
tempo Numeric vector with time
temp Numeric vector with air temperature
ur Numeric vector with relative humidity
vento Numeric vector with wind speed

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>
Gabriel Danilo Shimizu
Otavio Jorge Grigoli Abi Saab

Examples

```
data(example_meteorological)
```

`flowgrap`*Flow graphic of nozzles on spray bar*

Description

This is a function to check the conditions of the spray nozzles

Usage

```
flowgrap(  
  file,  
  pointsize = 3.5,  
  xsup = 1.1,  
  xinf = 0.9,  
  pointcolor = "red",  
  xlab = "Nozzle number",  
  ylab = NA  
)
```

Arguments

<code>file</code>	Numerical vector with the flows
<code>pointsize</code>	Point size (<i>default 3.5</i>)
<code>xsup</code>	Upper limit
<code>xinf</code>	Bottom limit
<code>pointcolor</code>	Point color (red)
<code>xlab</code>	x axis legend
<code>ylab</code>	y axis legend

Value

Returns graph of ggplot2

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

References

ANDEF Associação Nacional de Defesa Vegetal. Manual de tecnologia de aplicação de produtos fitossanitários. Campinas: Linea Creativa, 2004. 50p.

BOLLER, W.; RAETANO, C. G. Bicos e pontas de pulverização de energia hidráulica, regulagens e calibração de pulverizadores de barras. In: ANTUNIASI, U. R.; BOLLER, W. (Organizadores). Tecnologia de aplicação para culturas anuais. Passo Fundo: Aldeia Norte; Botucatu: FEPAF, 2011. p.51-82.

SPRAYING SYSTEMS CO. Catálogo 51A-PT - Produtos de pulverização para agricultura. Wheaton: Spraying Systems Co., 2014. 160p.

Examples

```
resp=c(881,854,865,876,906.3,
874.7,868.3,878.7,872.7,901.7,
823.3,889.7,861.3,900.3,890.3,
886.7,916.7,872,912.7,894)
flowgrap(resp)
# flowgrap("file.xlsx")
```

flowpres

Flow calculation as a function of working pressure

Description

This is a function to determine the flow rate of a spray nozzle as a function of the working pressure

Usage

```
flowpres(q1, q2, p1, p2)
```

Arguments

q1	Nozzle flow 1 (L/min)
q2	Nozzle flow 2 (L/min)
p1	Nozzle pressure 1 (bar)
p2	Nozzle pressure 2 (bar)

Details

Nozzle flow 1:

$$q1 = \frac{\sqrt{p1}}{\sqrt{p2}} * q2$$

Nozzle flow 2:

$$q2 = \frac{q1}{\frac{\sqrt{p1}}{\sqrt{p2}}}$$

Nozzle pressure 1:

$$p1 = (\sqrt{p2} * \frac{q1}{q2})^2$$

Nozzle pressure 2:

$$p2 = (\frac{\sqrt{p1}}{\frac{q1}{q2}})^2$$

Value

Returns values of flow (L/min) or pressure (bar)

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

References

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SPRAYING SYSTEMS CO. Catalogo 51A-PT - Produtos de pulverizacao para agricultura. Wheaton: Spraying Systems Co., 2014. 160p.

See Also

[flowrat product](#)

Examples

```
flowpres(q1=NA, q2=0.80, p1=1.00, p2=2.80)
```

```
flowpres(q1=0.48, q2=0.80, p1=1.00, p2=NA)
```

flowrat

Calculation of required spray nozzle flow

Description

This is a function to determine the required flow rate of a spray nozzle

Usage

```
flowrat(Q, q, V, W = 50)
```

Arguments

Q	Application rate (L/ha)
q	Nozzle flow (L/min)
V	Sprayer speed (km/h)
W	Spacing between spray nozzles (cm)

Details

Application rate (L/ha):

$$Q = \frac{60000 * q}{V * W}$$

Nozzle flow (L/min):

$$q = \frac{Q * (V * W)}{60000}$$

Sprayer speed (km/h):

$$V = \frac{60000 * q}{Q * W}$$

Spacing between spray nozzles (m):

$$W = \frac{60000 * q}{Q * V}$$

Value

Returns values for flow, application rate, sprayer speed, spacing between spray tips

Note

60000 Units conversion factor

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

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SPRAYING SYSTEMS CO. Catalogo 51A-PT - Produtos de pulverização para agricultura. Wheaton: Spraying Systems Co., 2014. 160p.

See Also[flowpres product](#)**Examples**

```
flowrat(Q = 190,q = NA,V = 10,W = 50)
```

markblue

Spray deposit (glowing blue marker)

Description

This is a function to determine spray deposit using bright blue marker and then after performing tests of assumptions, analysis of variance and comparison of means

Usage

```
markblue(  
  d1,  
  d2,  
  v1,  
  ci,  
  ncu2 = 1,  
  ntrat2 = 2,  
  nrep2 = 3,  
  nresp2 = 5,  
  naf2 = 6,  
  analysis = TRUE,  
  design = "DIC",  
  transf = 1,  
  quali = TRUE,  
  grau = 1,  
  test = "parametric",  
  mcomp = "tukey",  
  ylab = expression(mu ~ cm^2),  
  save.xlsx = FALSE  
)
```

Arguments

d1	Curved worksheet
d2	Experiment worksheet
v1	Wash volume (mL)
ci	Initial marker concentration
ncu2	Column referring to the curve (<i>default</i> is 1)

ntrat2	Column referring to treatment
nrep2	Column referring to repetition
nresp2	Column referring to absorbance
naf2	Sheet area (cm ²)
analysis	Perform statistical analysis
design	Experiment design
transf	Data transformation
quali	Qualitative or quantitative treatment (<i>default</i> is TRUE)
grau	degree of the polynomial (when treatment is quantitative)
test	Parametric or Nonparametric (<i>default</i> is "parametric")
mcomp	Mean comparison test (<i>default</i> is "tukey")
ylab	y axis name (<i>default</i> is expression($\mu \sim \text{cm}^2$))
save.xlsx	Want to export in excel format (<i>default</i> is FALSE)

Value

Returns the comparison between the treatments of the experiment

Note

Curve name on the curve worksheet (d1) must be the same as the curve name on the experiment worksheet (d2)

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

References

No reference

See Also

[markmet](#)

Examples

```
data("example_markbluecurve")
data("example_markblue")
markblue(d1=example_markbluecurve,
         d2=example_markblue,
         v1=20,
         ci=1500,
         ncu2 = 1,
```

```

ntrat2 = 2,
nrep2 = 3,
nresp2 = 4,
naf2 = 5)

```

markmet

Spray deposit (metallic marker)

Description

This is a function to determine spray deposit using metallic markers and then after performing tests of assumptions, analysis of variance and comparison of means

Usage

```

markmet(
  ppm,
  white,
  VL,
  AL,
  analysis = TRUE,
  trat,
  block,
  design = "DIC",
  transf = 1,
  quali = TRUE,
  grau = 1,
  test = "parametric",
  mcomp = "tukey",
  ylab = expression(mu ~ cm^2),
  save.xlsx = FALSE
)

```

Arguments

ppm	Concentração
white	White reading
VL	Wah volume (mL)
AL	blade area (cm2)
analysis	Perform statistical analysis
trat	Vector with treatment
block	Vector with block (if design = "DBC")
design	Experiment design
transf	Data transformation
quali	Qualitative or quantitative treatment (<i>default</i> is TRUE)

grau	degree of the polynomial (when treatment is quantitative)
test	Parametric or Nonparametric (<i>default</i> is "parametric")
mcomp	Mean comparison test (<i>default</i> is "tukey")
y1ab	y axis name (<i>default</i> is expression($\mu \sim cm^2$))
save.xlsx	Want to export in excel format (<i>default</i> is FALSE)

Value

Returns the comparison between the treatments of the experiment

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

References

No reference

See Also

[markblue](#)

Examples

```
library(AgroTech)
data("example_markmet")
with(example_markmet,
      markmet(ppm = ppm,
             white = 0.02,
             VL = 35,
             AL = 63.61,
             analysis = TRUE,
             trat=trat))
```

product

Amount of phytosanitary product per spray tank

Description

This is a function to determine the amount of commercial product to be placed in the sprayer tank at each fill

Usage

```
product(Ct, Dose, Q)
```

Arguments

Ct	Spray tank volumetric capacity (L)
Dose	Product dose to be applied (L/ha, mL/ha, kg/ha, g/ha)
Q	Application rate (L/ha)

Value

Returns values for amount of product (L or kg)

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@ue1.br>
Gabriel Danilo Shimizu
Otavio Jorge Grigoli Abi Saab

References

ANDEF Associacao Nacional de Defesa Vegetal. Manual de tecnologia de aplicacao de produtos fitossanitarios. Campinas: Linea Creativa, 2004. 50p.

BOLLER, W.; RAETANO, C. G. Bicos e pontas de pulverizacao de energia hidraulica, regulagens e calibracao de pulverizadores de barras. In: ANTUNIASSI, U. R.; BOLLER, W. (Organizadores). Tecnologia de aplicacao para culturas anuais. Passo Fundo: Aldeia Norte; Botucatu: FEPAF, 2011. p.51-82.

SPRAYING SYSTEMS CO. Catalogo 51A-PT - Produtos de pulverizacao para agricultura. Wheaton: Spraying Systems Co., 2014. 160p.

See Also

[flowpres](#) [flowrat](#)

Examples

```
product(Ct = 800,Dose = 200,Q = 100)
```

vartemp

Temporal variability graph of weather conditions

Description

This is a function to check weather conditions in agricultural spraying

Usage

```
vartemp(  
  file,  
  nx = 1,  
  ny = 2,  
  variable = NA,  
  ylab = "Dependent",  
  xlab = "Independent",  
  size.text = 12,  
  size.title = 12,  
  size.strip = 12,  
  size.lty = 0.7  
)
```

Arguments

file	Excel file (xlsx)
nx	Time
ny	Weather conditions
variable	Variable name
ylab	y axis (Dependent)
xlab	x axis (Independent)
size.text	Size text (<i>default</i> is 12)
size.title	Size title (<i>default</i> is 12)
size.strip	Size strip (<i>default</i> is 12)
size.lty	Size line (<i>default</i> is 0.7)

Value

Returns graph of ggplot2

Author(s)

Rodrigo Yudi Palhaci Marubayashi, <marubayashi@uel.br>

Gabriel Danilo Shimizu

Otavio Jorge Grigoli Abi Saab

References

No reference

Examples

```
data("example_meteorological")  
vartemp(example_meteorological)
```

Index

* datasets

- example_markblue, 2
- example_markbluecurve, 3
- example_markmet, 3
- example_meteorological, 4

- example_markblue, 2
- example_markbluecurve, 3
- example_markmet, 3
- example_meteorological, 4

- flowgrap, 5
- flowpres, 6, 9, 13
- flowrat, 7, 7, 13

- markblue, 9, 12
- markmet, 10, 11

- product, 7, 9, 12

- vartemp, 13