Package 'AgroTech'

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Type Package

Title Data Analysis of Pesticide Application Technology

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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., Raetano, 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

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R topics documented:

`example_markblue` *Dataset: Example markblue*

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)

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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)

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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)

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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)

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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

`file`	Numerical vector with the flows
`pointsize`	Point size (*default* 3.5)
`xsup`	Upper limit
`xinf`	Bottom limit
`pointcolor`	Point color (red)
`xlab`	x axis legend
`ylab`	y axis legend

Value

Returns graph of ggplot2

Author(s)

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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.

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)

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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):

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

Spacing between spray nozzles (m):

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

Value

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

Note

60000 Units conversion factor

Author(s)

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SPRAYING SYSTEMS CO. Catalogo 51A-PT - Produtos de pulverizacao 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,
  vl,
  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
`vl`	Wash volume (mL)
`ci`	Initial marker concentration
`ncu2`	Column referring to the curve (*default* is 1)

ntrat2	Column referring to treatment
nrep2	Column referring to repetition
nresp2	Column referring to absorbance
naf2	Sheet area (cm2)
analysis	Perform statistical analysis
design	Experiment design
transf	Data transformation
quali	Qualitative or quantitative treatment (*default* is TRUE)
grau	degree of the polynomial (when treatment is quantitative)
test	Parametric or Nonparametric (*default* is "parametric")
mcomp	Mean comparison test (*default* is "tukey")
ylab	y axis name (*default* is expression(mu~cm^2))
save.xlsx	Want to export in excel format (*default* 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)

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References

No reference

See Also

markmet

Examples

```
data("example_markbluecurve")
data("example_markblue")
markblue(d1=example_markbluecurve,
         d2=example_markblue,
         vl=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 (*default* is TRUE)

grau	degree of the polynomial (when treatment is quantitative)
test	Parametric or Nonparametric (*default* is "parametric")
mcomp	Mean comparison test (*default* is "tukey")
ylab	y axis name (*default* is expression(mu~cm^2))
save.xlsx	Want to export in excel format (*default* is FALSE)

Value

Returns the comparison between the treatments of the experiment

Author(s)

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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)

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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

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 (*default* is 12)
size.title	Size title (*default* is 12)
size.strip	Size strip (*default* is 12)
size.lty	Size line (*default* is 0.7)

Value

Returns graph of ggplot2

Author(s)

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Gabriel Danilo Shimizu

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References

No reference

Examples

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

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