Package: HydroPonicsK (via r-universe)

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Type Package

Title Hydroponic Data Analysis Tools

Version 1.0.3

Description Provides statistical and graphical tools for the analysis of hydroponic crop production data. The package includes functions for descriptive statistical analysis, data visualization, correlation analysis, heatmap generation, and graphical summaries of plant growth and nutrient-related variables. These tools support researchers, students, and practitioners in evaluating crop performance and environmental conditions in hydroponic cultivation systems. The package utilizes standard statistical methods implemented in R for data exploration and visualization. Methods are described in James et al. (2021, ISBN:9781071614172) and Wickham (2016, ISBN:9783319242750).

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Imports ggplot2, pheatmap, stats

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Author Khalid Ul Islam Rather [aut, cre]

Maintainer Khalid Ul Islam Rather <drkhalidulislam@gmail.com>

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Contents

`height_plot` *Plant Height Plot*

Description

Plant Height Plot

Usage

```
height_plot(data)
```

Arguments

`data`	Data frame

Value

Plot

hydro_anova *One-Way ANOVA*

Description

Performs one-way analysis of variance (ANOVA) for a response variable across treatment groups.

Usage

```
hydro_anova(data, response, treatment)
```

Arguments

data	A data frame.
response	Character. Name of response variable.
treatment	Character. Name of treatment/grouping variable.

Value

An object of class "aov".

Examples

```
hydro_anova(lettuce_data, "Height_cm", "Treatment")
```

hydro_cluster *Cluster Analysis*

Description

Performs hierarchical clustering using Ward's method on scaled numeric variables.

Usage

```
hydro_cluster(data)
```

Arguments

data	A data frame containing numeric variables.

Value

An object of class "hclust".

Examples

```
hydro_cluster(lettuce_data)
```

hydro_correlation *Correlation Matrix*

Description

Computes a correlation matrix for numeric variables in a dataset.

Usage

```
hydro_correlation(data)
```

Arguments

data	A data frame containing numeric variables.

Value

A correlation matrix.

Examples

```
hydro_correlation(lettuce_data)
```

hydro_heatmap *Hydroponic Heatmap Visualization*

Description

Creates a heatmap for hydroponic crop data.

Usage

```
hydro_heatmap(data)
```

Arguments

data	A numeric matrix or data frame.

Value

A heatmap plot.

hydro_pca *Principal Component Analysis for Hydroponic Data*

Description

Performs principal component analysis on hydroponic crop data.

Usage

```
hydro_pca(data)
```

Arguments

data	A numeric data frame or matrix.

Value

A PCA object produced by prcomp().

hydro_summary *Hydroponic Summary Statistics*

Description

Hydroponic Summary Statistics

Usage

```
hydro_summary(data, variable)
```

Arguments

data	Data frame
variable	Variable name

Value

Summary statistics

hydro_tukey *Tukey HSD Test*

Description

Performs Tukey Honest Significant Difference post-hoc test on an ANOVA model.

Usage

```
hydro_tukey(model)
```

Arguments

model	An object of class "aov".

Value

A TukeyHSD object.

Examples

```
model <- hydro_anova(lettuce_data, "Height_cm", "Treatment")
hydro_tukey(model)
```

lettuce_data *Lettuce Hydroponic Dataset*

Description

A controlled hydroponic lettuce experiment dataset used for demonstrating statistical analysis and visualization functions in the package.

Usage

```
lettuce_data
```

Format

A data frame with 50 observations and 12 variables:

Plant_ID Unique identifier for each plant

Treatment Experimental treatment applied

Replication Replication number of experimental unit

Days Days after transplanting

Height_cm Plant height in centimeters

Root_Length_cm Root length in centimeters

Leaves Number of leaves per plant

Fresh_Weight_g Fresh biomass weight in grams

Dry_Weight_g Dry biomass weight in grams

pH Nutrient solution pH level

EC_mScm Electrical conductivity (mS/cm)

Temp_C Ambient temperature (°C)

Source

Simulated/experimental hydroponic lettuce growth dataset used for package examples and method validation.

`nutrient_stats` *Nutrient Solution Statistics*

Description

Computes summary statistics for hydroponic nutrient solution parameters.

Usage

```
nutrient_stats(data)
```

Arguments

`data`	A data frame containing pH, EC_mScm, and Temp_C variables.

Value

A data frame with mean and standard deviation values.

Examples

```
nutrient_stats(lettuce_data)
```

relative_growth_rate *Relative Growth Rate*

Description

Computes the relative growth rate (RGR) based on initial and final weight and time measurements.

Usage

```
relative_growth_rate(W1, W2, T1, T2)
```

Arguments

W1	Numeric. Initial weight (> 0).
W2	Numeric. Final weight (> 0).
T1	Numeric. Initial time.
T2	Numeric. Final time.

Value

Numeric value of relative growth rate.

Examples

```
relative_growth_rate(10, 20, 1, 5)
```

stress_tolerance_index *Stress Tolerance Index*

Description

Computes the Stress Tolerance Index (STI) for yield under stress and non-stress conditions.

Usage

```
stress_tolerance_index(Ys, Yp)
```

Arguments

Ys	Numeric vector. Yield under stress condition.
Yp	Numeric vector. Yield under non-stress (optimal) condition.

Value

Numeric vector of STI values.

Examples

```
stress_tolerance_index(c(10, 12, 9), c(15, 18, 14))
```

`water_use_efficiency` *Water Use Efficiency*

Description

Computes Water Use Efficiency (WUE) as Yield per unit of water consumed.

Usage

```
water_use_efficiency(Yield, Water)
```

Arguments

`Yield`	Numeric vector. Crop yield values.
`Water`	Numeric vector. Water consumption values.

Value

Numeric vector of WUE values.

Examples

```
water_use_efficiency(c(10, 12, 15), c(2, 3, 5))
```

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