

# Package ‘HydroPonicsK’

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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).

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**Imports** ggplot2, pheatmap, stats

**Depends** R (>= 3.5)

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height_plot	<i>Plant Height Plot</i>
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### Description

Plant Height Plot

### Usage

```
height_plot(data)
```

### Arguments

data	Data frame
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### Value

Plot

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hydro_anova	<i>One-Way ANOVA</i>
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### 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")
```

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hydro\_cluster      *Cluster Analysis*

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**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*

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**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)
```

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hydro_heatmap	<i>Hydroponic Heatmap Visualization</i>
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**Description**

Creates a heatmap for hydroponic crop data.

**Usage**

```
hydro_heatmap(data)
```

**Arguments**

data            A numeric matrix or data frame.

**Value**

A heatmap plot.

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hydro_pca	<i>Principal Component Analysis for Hydroponic Data</i>
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**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 pcomp().

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hydro_summary	<i>Hydroponic Summary Statistics</i>
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**Description**

Hydroponic Summary Statistics

**Usage**

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

**Arguments**

data	Data frame
variable	Variable name

**Value**

Summary statistics

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hydro_tukey	<i>Tukey HSD Test</i>
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**Description**

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

**Usage**

```
hydro_tukey(model)
```

**Arguments**

model	An object of class "aov".
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**Value**

A TukeyHSD object.

**Examples**

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

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lettuce_data	<i>Lettuce Hydroponic Dataset</i>
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### 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.

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nutrient_stats	<i>Nutrient Solution Statistics</i>
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**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)
```

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relative_growth_rate	<i>Relative Growth Rate</i>
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**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)
```

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stress\_tolerance\_index

*Stress Tolerance Index*

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### 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))

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water\_use\_efficiency    *Water Use Efficiency*

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### 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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