Package 'gpbStat'

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Type Package

Title Comprehensive Statistical Analysis of Plant Breeding Experiments

Version 0.3.5

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Description Performs statistical data analysis of various Plant Breeding experiments. Contains functions for Line by Tester analysis as per Arunachalam, V.(1974) <http://repository.ias.ac.in/89299/> and Diallel analysis as per Griffing, B. (1956) <https://www.publish.csiro.au/bi/pdf/BI9560463>.

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LazyLoad true

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URL https://github.com/nandp1/gpbStat/

BugReports https://github.com/nandp1/gpbStat/issues

RoxygenNote 7.1.2

Imports stats, utils, data.table, dplyr, magrittr

Suggests testthat, knitr, rmarkdown, reshape2

VignetteBuilder knitr

NeedsCompilation no

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R topics documented:

`alphaltc` *Line x Tester data (only Crosses) in Alpha Lattice design.*

Description

The Line x Tester data of containing only crosses laid out in Alpha Lattice design.

Usage

```
data(alphaltc)
```

Format

A data frame of five variables of 15 crosses derived from five lines and three testers.

replication four replications

block five blocks

line five inbred genotype

tester three inbred genotype

yield trait of intrest

See Also

`rcbdltc` ,`alphaltcchk` ,`rcbdltcchk`

Examples

```
result = ltc(alphaltc, replication, line, tester, yield, block)
```

alphaltcchk *Line x Tester data (Crosses and Checks) in Alpha Lattice*

Description

The sample Line x Tester data of containing crosses and checks laid out in Alpha Lattice design. The data is composed of five lines, three testers and three checks.

Usage

```
data(alphaltcchk)
```

Format

A dataframe of six variables.

replication three replications

block six blocks

line five lines

tester three testers

check three check

yield trait of intrest

See Also

rcbdltc ,alphaltc ,rcbdltcchk

Examples

```
result = ltcchk(alphaltcchk, replication, line, tester, check, yield, block)
```

alphaltcmt *Line x Tester data (only Crosses) in Alpha Lattice design.*

Description

The Line x Tester data of containing only crosses laid out in Alpha Lattice design.

Usage

```
data(alphaltcmt)
```

Format

A data frame of 15 crosses derived from five lines and three testers.

replication four replications

block five blocks

line five inbred genotype

tester three inbred genotype

hsw hundred seed weight

sh shelling per cent

gy grain yield

See Also

rcbdltc ,alphaltcchk ,rcbdltcchk ,rcbdltcmt

Examples

```
result = ltcmt(alphaltcmt, replication, line, tester, alphaltcmt[,5:7], block)
```

---

check *Commercial check data*

Description

The sample data containing mean values of 3 maize Commercial checks for 7 variables.

Usage

```
data(check)
```

Format

A data frame of 7 variables of 3 maize Commercial checks.

Check Name of the check

DTP Days to anthesis

DTS Days to silking

DM Days to maturity

PH Plant Height

EH Ear Height

GY DGrain yield

See Also

alphaltcchk ,alphaltc ,rcbdltcchk

Examples

```
## Not run: # Standard Heterosis
library(gpbStat)
data(hybrid)
data(check)
df = hcc(hybrid, check)
df

## End(Not run)
```

---

dm2 *Analysis of Diallel Method 2 data containing only Crosses laid out in RCBD or Alpha Lattice design.*

Description

Analysis of Diallel Method 2 data containing only Crosses laid out in RCBD or Alpha Lattice design.

Usage

```
dm2(data, rep, parent1, parent2, var, block)
```

Arguments

data	dataframe containing following variables
rep	replication
parent1	parent 1
parent2	parent 2
var	trait of interest
block	block (for alpha lattice only)

Details

Analyzing the Diallel Method 2 data containing only crosses which are evaluated in RCBD & Alpha lattice design. All the factors are considered as fixed.

Value

Means	Two way mean table.
ANOVA	ANOVA for the given variable.
Coefficient of Variation	Coefficient of Variation of the variable.
Diallel ANOVA	Diallel ANVOA for the given trait.

`Genetic Variance`
: GCA & SCA varaince.

`Combining ability effects`
: Two way table containing Combining ability effects of parents and crosses

`Standard Error`
: Standard Errror for comining ability effects.

`Critical Difference`
: Critical Difference at 5 pecent for combining ability effects.

Note

The blocks are mentioned at end of the function if the experimental design is Alpha Lattice. For RCBD no need mention the blocks.

Author(s)

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References

Griffing, B. (1956) Concept of General and Specific Combining Ability in relation to Diallel Crossing Systems. Australian Journal of Biological Sciences, 9(4), 463-493.

Dabholkar, A. R. (1999). Elements of Bio Metrical Genetics. Concept Publishing Company, New Delhi.

Singh, R. K. and Chaudhary, B. D. (1977). Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers, New Delhi.

See Also

`ltcchk`,`ltc`

Examples

```
## Not run: #Diallel Method 2 analysis containing only crosses in RCBD.
library(gpbStat)
data(dm2rcbd)
result1 =  dm2(dm2rcbd, rep, parent1, parent2, DTP)
result1

#Diallel Method 2 analysis containing only crosses in Alpha Lattice
library(gpbStat)
data(dm2alpha)
result2 =  dm2(dm2alpha, replication, parent1, parent2, TW, block)
result2

# Save results to csv file
lapply(result2, function(x) write.table(data.frame(x), 'result2.csv'  , append= T, sep=','))

## End(Not run)
```

dm2alpha *Diallel Method 2 data in Alpha Lattice.*

Description

The Diallel Method 2 data laid out in Alpha Lattice Design.

Usage

```
data(dm2alpha)
```

Format

A data frame for Diallel analysis Method 2 containing 105 crosses and 15 parents.

replication two replications
block twelve blocks
parent1 fifteen inbred genotype
parent2 fifteen inbred genotype
TW data for test weight

See Also

alphaltcchk ,alphaltc ,rcbdltcchk ,dm2rcbd

Examples

```
result2 =  dm2(dm2alpha, replication, parent1, parent2, TW, block)
```

dm2rcbd *Diallel Method 2 data in RCBD*

Description

The Diallel Method 2 data laid out in Randomized Complete Block Design (RCBD).

Usage

```
data(rcbdltc)
```

Format

A data frame for Diallel analysis Method 2 containing four variables of 105 crosses and 15 parents.

rep four replications
parent1 five inbred genotype
parent2 three inbred genotype
DTP data for days to pollen shed

See Also

alphaltcchk ,alphaltc ,rcbdltcchk ,dm2alpha

Examples

```
result2 =  dm2(dm2rcbd, rep, parent1, parent2, DTP)
```

---

hcc *Estimation of Standard Heterosis.*

Description

Estimation of Standard Heterosis.

Usage

```
hcc(hybrid, check)
```

Arguments

hybrid	Data set containing the mean values of experimental genotypes.
check	Data set containing the mean values of commercial checks.

Details

Estimating Standard heterosis between mean values of experimental genotypes and commercial checks.

Value

Standard Heterosis

A data set containing per cent Standard heterosis between experimental genotypes and checks for all the variables.

Note

The name of variables in both the data sets should be identical.

Author(s)

Nandan Patil <patilnads@gmail.com>

References

Singh, R. K. and Chaudhary, B. D. (1977). Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers, New Delhi.

See Also

ltcchkltc

Examples

```
## Not run: # Standard Heterosis
library(gpbStat)
data(hybrid)
data(check)
df = hcc(hybrid, check)
df

## End(Not run)
```

---

hybrid *Experimental Hybrid data*

Description

The sample data containing mean values of 65 experimental maize hybrids for 7 variables.

Usage

```
data(hybrid)
```

Format

A data frame of 7 variables of 65 experimental maize hybrids.

Hybrid Name of the hybrid

DTP Days to anthesis

DTS Days to silking

DM Days to maturity

PH Plant Height

EH Ear Height

GY DGrain yield

See Also

alphaltcchk ,alphaltc ,rcbdltcchk

Examples

```
## Not run: # Standard Heterosis
library(gpbStat)
data(hybrid)
data(check)
df = hcc(hybrid, check)
df

## End(Not run)
```

`ltc` *Analysis of Line x Tester data containing only Crosses laid out in RCBD or Alpha Lattice design.*

Description

Analysis of Line x Tester data containing only Crosses laid out in RCBD or Alpha Lattice design.

Usage

```
ltc(data, replication, line, tester, y, block)
```

Arguments

`data`	dataframe containing following variables
`replication`	replication
`line`	line
`tester`	tester
`y`	trait of interest
`block`	block (for alpha lattice design only)

Details

Analyzing the line by tester data only using the data from crosses which are evaluated in alpha lattice design. All the factors are considered as fixed.

Value

`Overall ANOVA` ANOVA with all the factors.

`Coefficient of Variation`
ANOVA with all the factors.

`Genetic Variance`
Phenotypic and Genotypic variance for the given trait.

`Genetic Variability`
Phenotypic coefficient of variability and Genotypic coefficient of variability and Environmental coefficient of Variation.

`Proportional Contribution`
: Propotional contribution of Lines, Tester and Line x Tester interaction.

`GCA lines`
: Combining ability effects of lines.

`GCA testers`
: Combining ability effects of testers.

`SCA crosses`
: Combining ability effects of crosses

`Line x Tester ANOVA`
: ANOVA with all the factors.

`GV Singh & Chaudhary`
: Genetic component of Variance as per Singh and Chaudhary, 1977.

`Standard Errors`
: Standard error for combining ability effects.

`Critical Difference`
: Critical Difference at 5 pecent for combining ability effects.

Note

The block variable is inserted at the last if the experimental design is Alpha Lattice. For RCBD no need to have block factor.

Author(s)

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References

Kempthorne, O. (1957), Introduction to Genetic Statistics. John Wiley and Sons, New York. , 468-472. Singh, R. K. and Chaudhary, B. D. (1977). Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers, New Delhi.

See Also

`ltcchk`, `dm2`, `ltcmt`

Examples

```
## Not run: #Line Tester analysis data with only crosses in RCBD
library(gpbStat)
data(rcbdltc)
result1 = ltc(rcbdltc, replication, line, tester, yield)
result1

#Line Tester analysis data with only crosses in Alpha Lattice
library(gpbStat)
data(alphaltc)
result2 = ltc(alphaltc, replication, line, tester, yield, block)
result2

## End(Not run)
```

`ltcchk` *Analysis of Line x Tester data containing crosses and checks laid out in RCBD or Alpha Lattice experimental design.*

Description

Analysis of Line x Tester data containing crosses and checks laid out in RCBD or Alpha Lattice experimental design.

Usage

```
ltcchk(data, replication, line, tester, check, y, block)
```

Arguments

`data`	dataframe containing following variables
`replication`	replication variable
`line`	line variable
`tester`	tester variable
`check`	check variable
`y`	trait of interest
`block`	block variable (for alpha lattice design only)

Details

Analyzing the line by tester data only using the data from crosses which are evaluated in alpha lattice design. All the factors are considered as fixed.

Analyzing the line by tester data only using the data from crosses which are evaluated in alpha lattice design. All the factors are considered as fixed.

Value

`Overall ANOVA`	ANOVA with all the factors.
`Coefficient of Variation`	ANOVA with all the factors.
`Genetic Variance`	Phenotypic and Genotypic variance for the given trait.
`Genetic Variability`	Phenotypic coefficient of variability and Genotypic coefficient of variability and Environmental coefficient of Variation.
`Proportional Contribution`	Propotional contribution of Lines, Tester and Line x Tester interaction.
`GCA lines`	Combining ability effects of lines.
`GCA testers`	Combining ability effects of testers.

`SCA crosses` Combining ability effects of crosses

`Line x Tester ANOVA`
ANOVA with all the factors.

`GV Singh & Chaudhary`
Genetic component of Variance as per Singh and Chaudhary, 1977.

`Standard Errors`
Standard error for combining ability effects.

`Critical Difference`
Critical Difference at 5 percent for combining ability effects.

Note

The block variable is inserted at the last if the experimental design is Alpha Lattice. For RCBD no need to have block factor.

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References

Kempthorne, O. (1957), Introduction to Genetic Statistics. John Wiley and Sons, New York. , 468-472. Singh, R. K. and Chaudhary, B. D. (1977). Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers, New Delhi.

See Also

`ltc`,`dm2`,`ltcmt`

Examples

```
## Not run: #Line x Tester analysis with crosses and checks in RCBD
library(gpbStat)
data(rcbdltcchk)
results = ltcchk(rcbdltcchk, replication, line, tester, check, yield)
results

#Line X Tester analysis with crosses and checks in Alpha Lattice
library(gpbStat)
data(alphaltcchk)
results1 = ltcchk(alphaltcchk, replication, line, tester, check, yield, block)
results1
## End(Not run)
```

`ltcmt` *Analysis of Line x Tester data for multiple traits containing only Crosses laid out in RCBD or Alpha Lattice design.*

Description

Analysis of Line x Tester data for multiple traits containing only Crosses laid out in RCBD or Alpha Lattice design.

Usage

```
ltcmt(data, replication, line, tester, traits, block)
```

Arguments

`data`	dataframe containing following variables
`replication`	replication
`line`	line
`tester`	tester
`traits`	multiple traits of interest
`block`	block (for alpha lattice design only)

Details

Analyzing the line by tester data of multiple trais only using the data from crosses which are evaluated in RCBD and Alpha lattice design. All the factors are considered as fixed.

Value

`Mean`	Table of means.
`ANOVA`	ANOVA with all the factors.
`GCA.Line`	GCA effects of lines.
`GCA.Tester`	GCA effects of testers.
`SCA`	SCA effects of crosses.
`CV`	Coefficent of Variation.
`Genetic.Variance.Covariance`	Genetic component Variance and covariance.
`Std.Error`	Standard error for combining ability effects.
`C.D.`	Critical Difference at 5 pecent for combining ability effects.
`Add.Dom.Var`	Additive and Dominance component of Variance.
`Contribution.of.Line.Tester`	Contribution of Lines, Testers and Line x Tester towards total variation.

Note

The block variable is inserted at the last if the experimental design is Alpha Lattice. For RCBD no need to have block factor.

Author(s)

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References

Kempthorne, O. (1957), Introduction to Genetic Statistics. John Wiley and Sons, New York. , 468-472. Singh, R. K. and Chaudhary, B. D. (1977). Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers, New Delhi.

See Also

ltcchk

Examples

```
## Not run: #Line Tester analysis data with only crosses in RCBD
library(gpbStat)
data(rcbdltcmt)
result1 = ltcmt(rcbdltcmt, replication, line, tester, rcbdltcmt[,4:5])
result1

#Line Tester analysis data with only crosses in Alpha Lattice
library(gpbStat)
data(alphaltcmt)
result2 = ltcmt(alphaltcmt, replication, line, tester, alphaltcmt[,5:7], block)
result2

## End(Not run)
```

---

rcbdltc *Line x Tester data in RCBD*

Description

The sample Line x Tester data containing only crosses laid out in Randomized Complete Block Design (RCBD).

Usage

```
data(rcbdltc)
```

Format

A data frame of four variables of 15 crosses derived from five lines and three testers.

replication four replications

line five inbred genotype

tester three inbred genotype

yield trait of intrest

See Also

alphaltcchk ,alphaltc ,rcbdltcchk

Examples

```
result = ltc(rcbdltc, replication, line, tester, yield)
```

---

rcbdltcchk *Line x Tester data (Crosses and Checks) in RCBD*

Description

The sample Line x Tester data of containing crosses and checks laid out in Randomized Complete Block Design (RCBD). The data is composed of five lines, three testers and three checks.

Usage

```
data(rcbdltcchk)
```

Format

A dataframe of six variables.

replication four replications

line five lines

tester three testers

yield trait of intrest

See Also

rcbdltc ,alphaltc ,alphaltcchk

Examples

```
result = ltcchk(rcbdltcchk, replication, line, tester, check, yield)
```

rcbdltcmt *Line x Tester data (only Crosses) in Randomized Complete Block design.*

Description

The Line x Tester data of containing only crosses laid out in Randomized Complete Block design.

Usage

```
data(rcbdltcmt)
```

Format

A data frame of 15 crosses derived from five lines and three testers.

replication four replications

line five inbred genotype

tester three inbred genotype

ph plant height

eh ear height

See Also

rcbdltc ,alphaltcchk ,rcbdltcchk ,alphaltcmt

Examples

```
result = ltcmt(rcbdltcmt, replication, line, tester, rcbdltcmt[,4:5])
```

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