

T1-E01-Iogurt.R

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```
setwd("~/Documents/CURS 2018-2019/PIE2")
dd<-read.csv2("./Dades/Iogurt.csv")
head(dd)
```

```
##   Ferm dia   pH strep lactob
## 1  T42  21 4.10  7.43   7.46
## 2  T42   0 4.44  7.65   7.75
## 3  T42  21 4.02  7.10   7.35
## 4  T42   7 4.24  7.54   7.62
## 5  T42   7 4.27  7.54   7.66
## 6  T42  28 4.01  7.25   7.41
```

```
library(car)
```

```
## Loading required package: carData
```

```
library(tables)
```

```
## Loading required package: Hmisc
```

```
## Loading required package: lattice
```

```
## Loading required package: survival
```

```
## Warning: package 'survival' was built under R version 3.4.4
```

```
## Loading required package: Formula
```

```
## Loading required package: ggplot2
```

```
##
```

```
## Attaching package: 'Hmisc'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

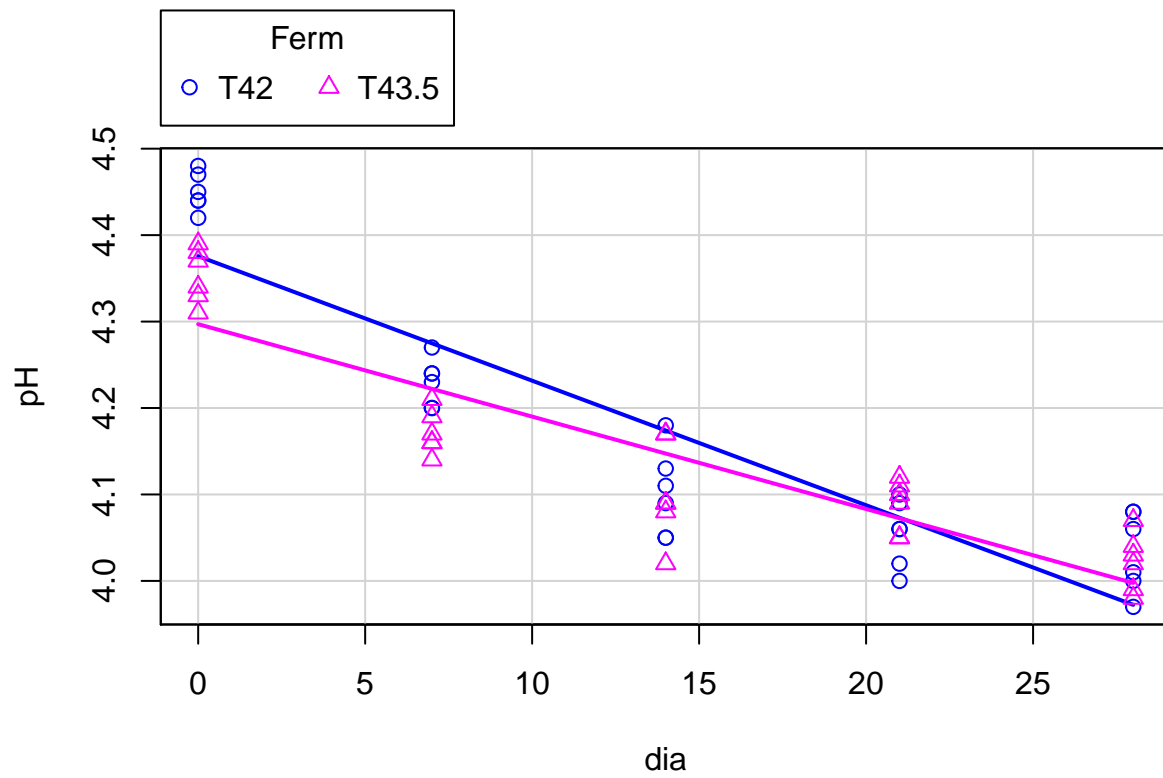
```
##      format.pval, units
```

```
#####
```

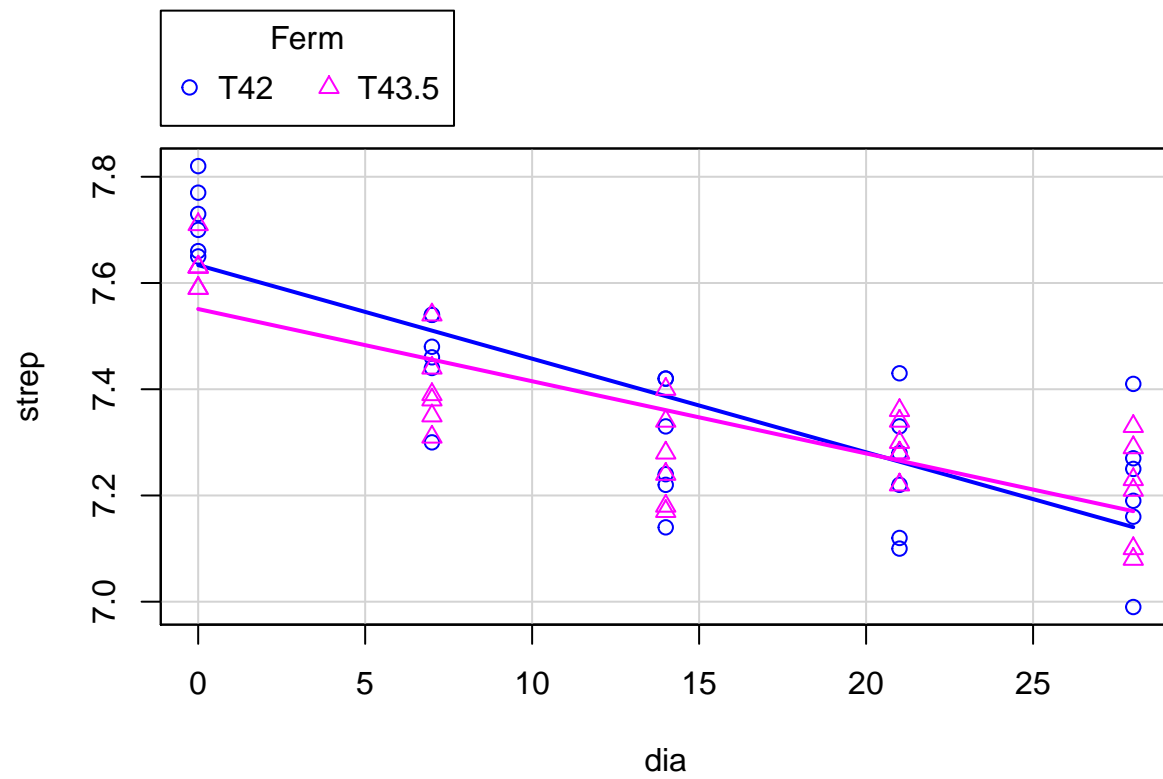
```
# (a) Descriptiva
```

```
# Gràfiques
```

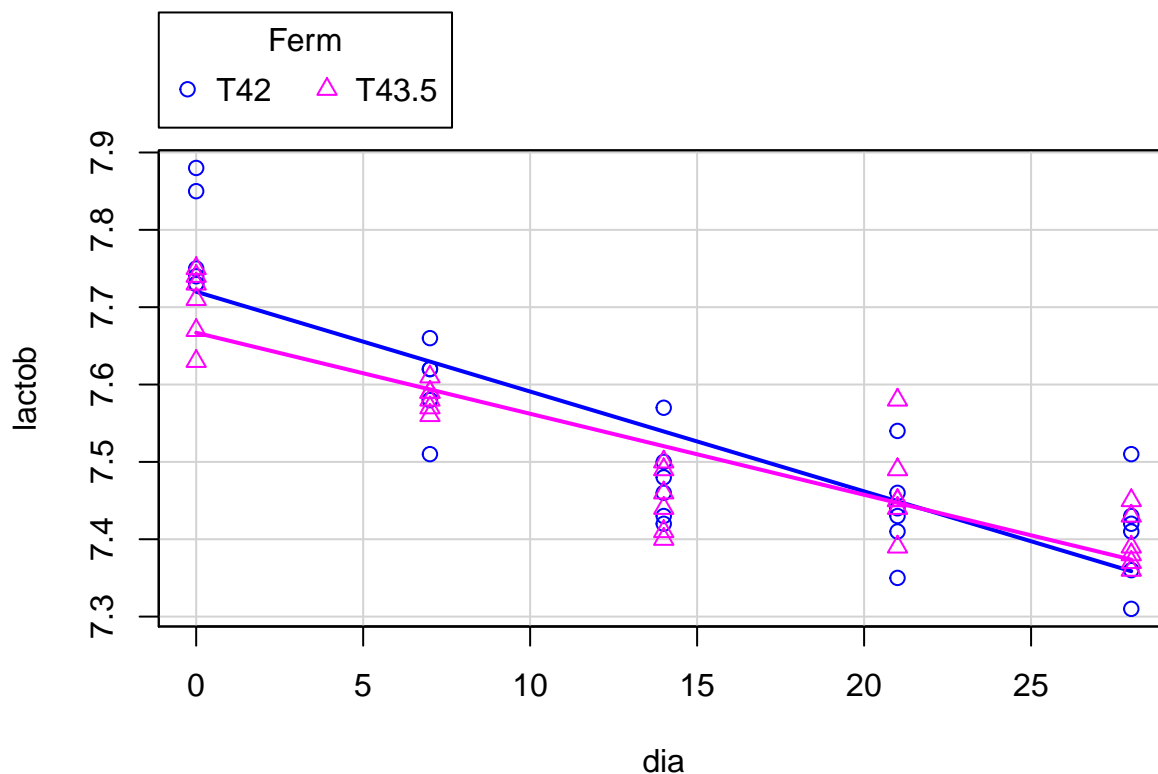
```
sp(pH~dia|Ferm,dd,smooth=F)
```



```
sp(strep~dia|Ferm,smooth=F,dd)
```



```
sp(lactob~dia|Ferm,smooth=F,dd)
```



Taules

```
dd$Fdia<-as.factor(dd$dia)
tabular((pH+strep+lactob)*Ferm*((n=1)+mean+sd)~Fdia,dd)
```

			Fdia				
	Ferm		0	7	14	21	28
pH	T42	n	6.00000	6.00000	6.00000	6.00000	6.00000
		mean	4.45000	4.23000	4.10167	4.05500	4.03333
		sd	0.02191	0.02683	0.04997	0.03886	0.04633
	T43.5	n	6.00000	6.00000	6.00000	6.00000	6.00000
		mean	4.35333	4.17167	4.10333	4.08667	4.02167
		sd	0.03141	0.02483	0.05785	0.03011	0.03312
strep	T42	n	6.00000	6.00000	6.00000	6.00000	6.00000
		mean	7.72167	7.46000	7.29500	7.24667	7.21167
		sd	0.06555	0.08854	0.11415	0.12644	0.13891
	T43.5	n	6.00000	6.00000	6.00000	6.00000	6.00000
		mean	7.63000	7.40167	7.26833	7.29667	7.20667
		sd	0.04382	0.08035	0.09042	0.04967	0.10013
lactob	T42	n	6.00000	6.00000	6.00000	6.00000	6.00000
		mean	7.78000	7.59500	7.47667	7.43833	7.40667
		sd	0.06693	0.05128	0.05465	0.06242	0.06772
	T43.5	n	6.00000	6.00000	6.00000	6.00000	6.00000
		mean	7.70500	7.58333	7.45000	7.46667	7.39667
		sd	0.04637	0.01751	0.04099	0.06408	0.03559

o b  per separat tabular(pH*Ferm*((n=1)+mean+sd)~Fdia,dd) ...

#=====

(b) Comparacions de 2

```

# pH dia 0
t.test(pH~Ferm,dd[dd$dia==0,])

##
## Welch Two Sample t-test
##
## data: pH by Ferm
## t = 6.1828, df = 8.9338, p-value = 0.0001673
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## 0.06125851 0.13207482
## sample estimates:
## mean in group T42 mean in group T43.5
## 4.450000 4.353333
t.test(pH~Ferm,var.equal=T,dd[dd$dia==0,])

##
## Two Sample t-test
##
## data: pH by Ferm
## t = 6.1828, df = 10, p-value = 0.0001038
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## 0.06183034 0.13150299
## sample estimates:
## mean in group T42 mean in group T43.5
## 4.450000 4.353333
var.test(pH~Ferm,dd[dd$dia==0,])

##
## F test to compare two variances
##
## data: pH by Ferm
## F = 0.48649, num df = 5, denom df = 5, p-value = 0.4479
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
## 0.06807452 3.47661819
## sample estimates:
## ratio of variances
## 0.4864865
# strep dia 21
t.test(strep~Ferm,dd[dd$dia==21,])

##
## Welch Two Sample t-test
##
## data: strep by Ferm
## t = -0.90159, df = 6.5071, p-value = 0.3994
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.18317752 0.08317752
## sample estimates:

```

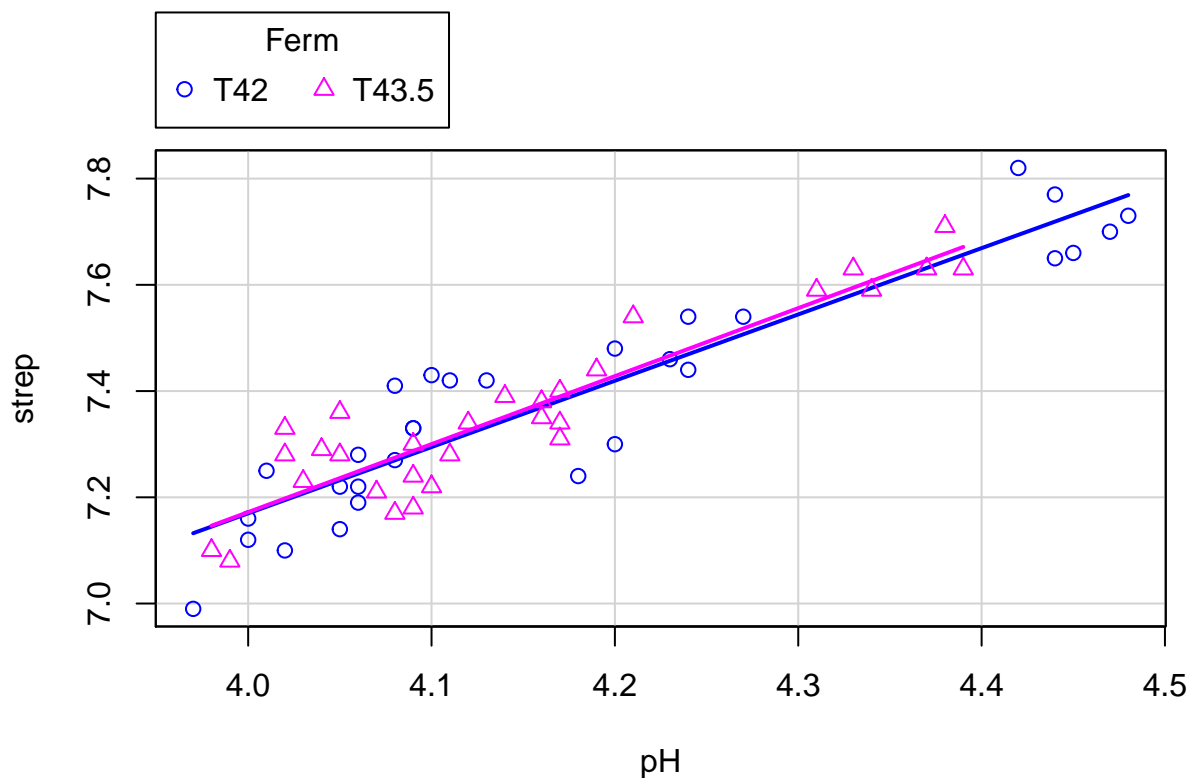
```
## mean in group T42 mean in group T43.5
## 7.246667 7.296667
t.test(strep~Ferm,var.equal=T,dd[dd$dia==21,])

##
## Two Sample t-test
##
## data: strep by Ferm
## t = -0.90159, df = 10, p-value = 0.3885
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.17356744 0.07356744
## sample estimates:
## mean in group T42 mean in group T43.5
## 7.246667 7.296667
var.test(strep~Ferm,dd[dd$dia==21,])

##
## F test to compare two variances
##
## data: strep by Ferm
## F = 6.4811, num df = 5, denom df = 5, p-value = 0.06108
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
## 0.9069038 46.3162801
## sample estimates:
## ratio of variances
## 6.481081

#=====
# (c) Predicció a partir del pH

#strep
sp(strep~pH|Ferm,dd,smooth=F,boxplot=F)
```



```
sp(strep~pH,dd,smooth=F,boxplot=F)
```

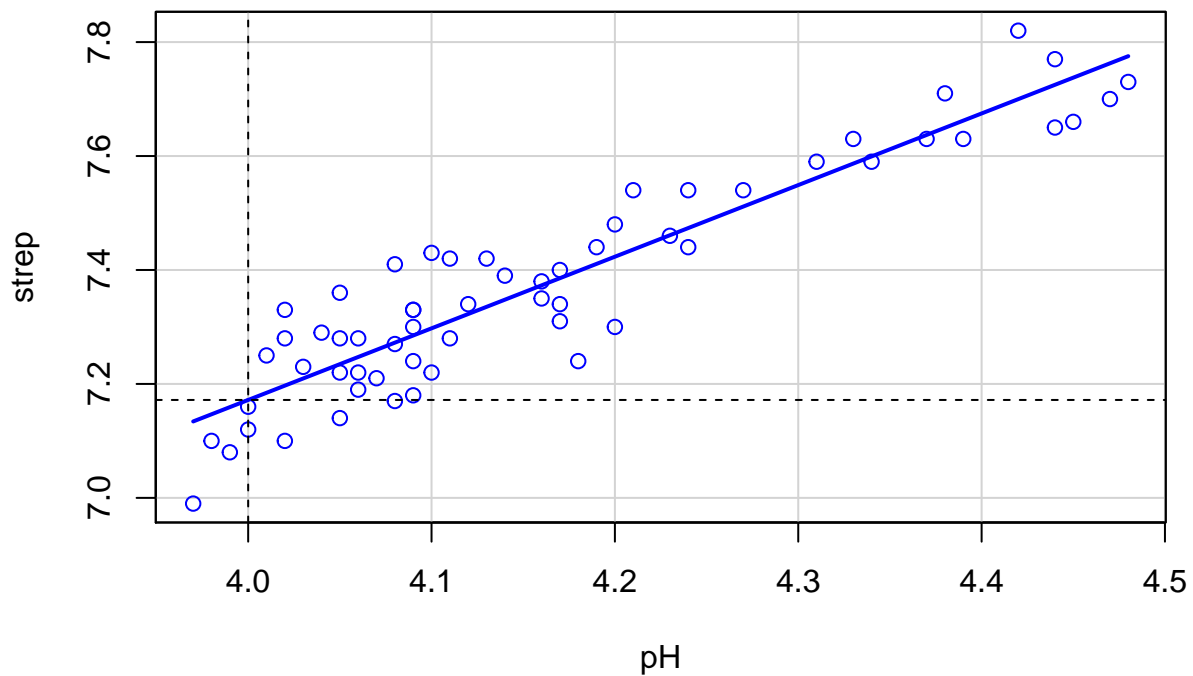
```
summary(mstrep<-lm(strep~pH,dd))
```

```
##
## Call:
## lm(formula = strep ~ pH, data = dd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.15814 -0.05035 -0.00171  0.04508  0.13758
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.14327    0.28205   7.599 2.89e-10 ***
## pH           1.25715    0.06775  18.556 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07359 on 58 degrees of freedom
## Multiple R-squared:  0.8558, Adjusted R-squared:  0.8533
## F-statistic: 344.3 on 1 and 58 DF,  p-value: < 2.2e-16
```

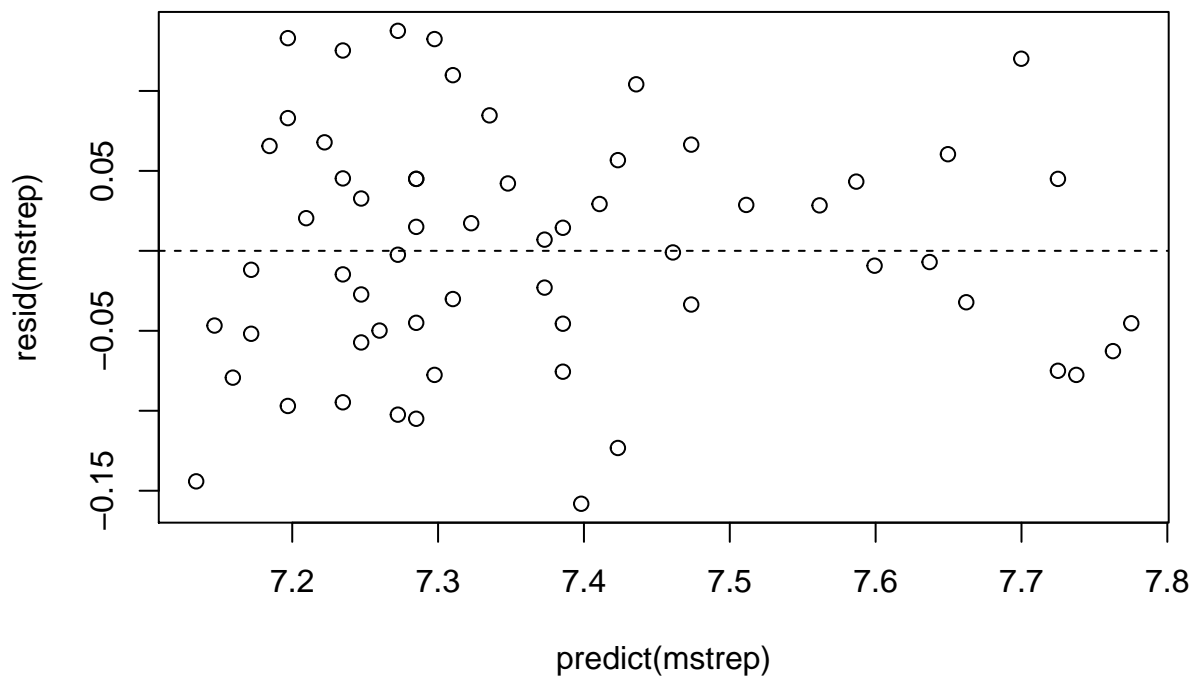
```
(lstrep<-mstrep$coef[1]+mstrep$coef[2]*4)
```

```
## (Intercept)
##      7.171852
```

```
sp(strep~pH,dd,smooth=F,boxplot=F)
abline(v=4,h=lstrep,lt=2)
```

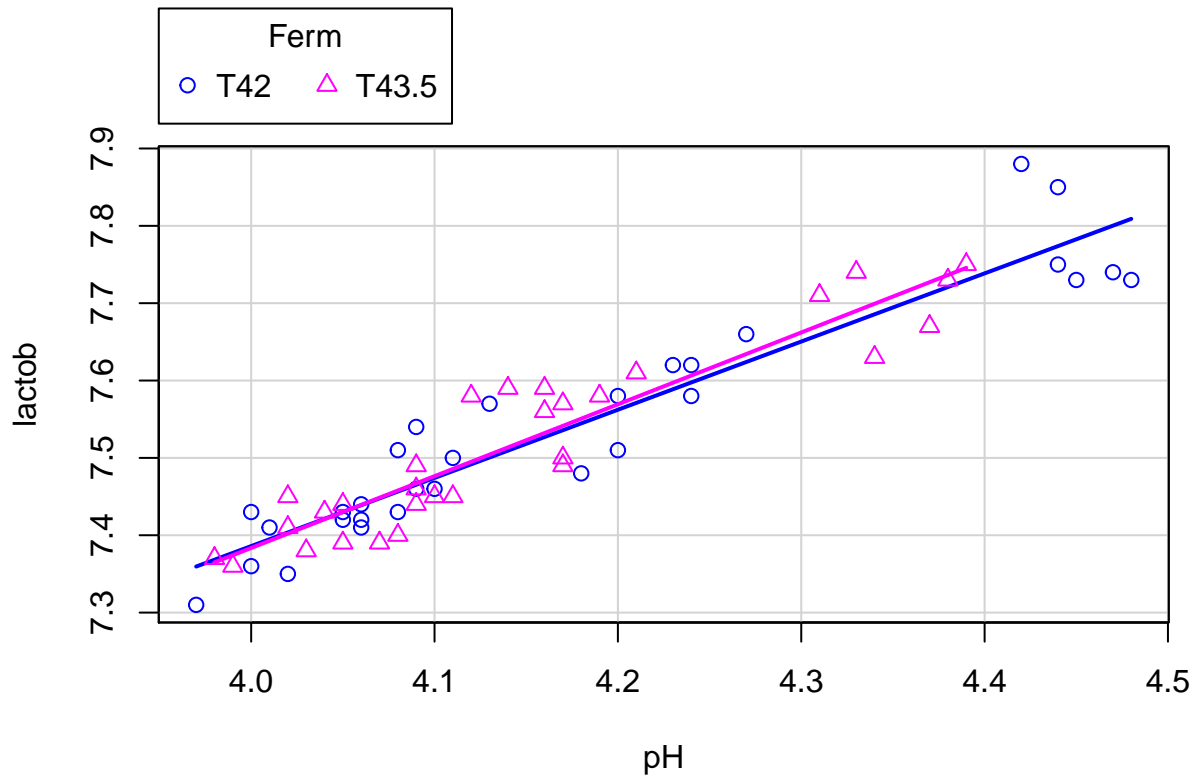


```
plot(predict(mstrep), resid(mstrep))
abline(h=0, lt=2)
```



```
#oldpar <- par(mfrow=c(2,2))
#plot(mstrep, ask=F)
#par(oldpar)

#lactob
sp(lactob~pH|Ferm, dd, smooth=F, boxplot=F)
```



```
sp(lactob~pH,dd,smooth=F,boxplot=F)
```

```
summary(mlactob<-lm(lactob~pH,dd))
```

```
##
## Call:
## lm(formula = lactob ~ pH, data = dd)
##
## Residuals:
```

	Min	1Q	Median	3Q	Max
	-0.086181	-0.033098	-0.000082	0.031023	0.117622

```
##
## Coefficients:
```

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	3.79895	0.17497	21.71	<2e-16 ***
pH	0.89670	0.04203	21.34	<2e-16 ***

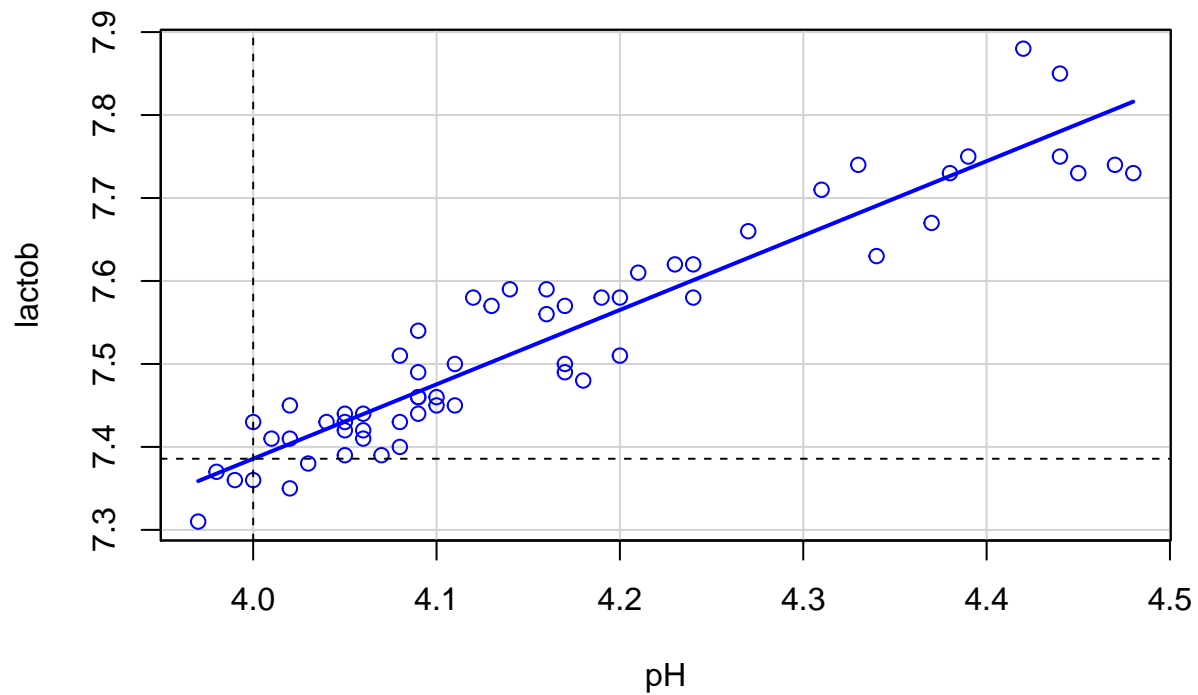
```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04565 on 58 degrees of freedom
## Multiple R-squared:  0.887, Adjusted R-squared:  0.885
## F-statistic: 455.2 on 1 and 58 DF, p-value: < 2.2e-16
```

```
(llactob<-mlactob$coef[1]+mlactob$coef[2]*4)
```

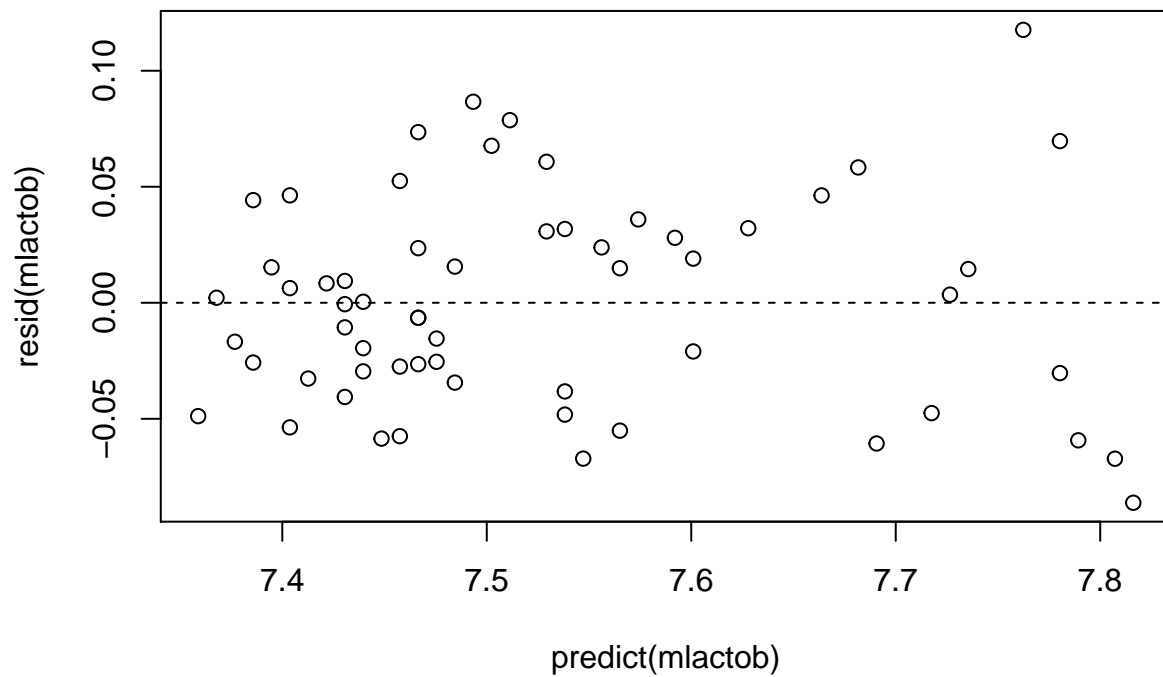
```
## (Intercept)
##      7.385763
```

```
sp(lactob~pH,dd,smooth=F,boxplot=F)
```

```
abline(v=4,h=llactob,lt=2)
```

```
plot(predict(mlactob),resid(mlactob))
abline(h=0,lt=2)
```



```
#oldpar <- par(mfrow=c(2,2))
#plot(mlactob,ask=F)
#par(oldpar)
```

```
# R2 i lv
summary(mstrep)
```

```
##
```

```
## Call:
## lm(formula = strep ~ pH, data = dd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.15814 -0.05035 -0.00171  0.04508  0.13758
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.14327    0.28205   7.599 2.89e-10 ***
## pH           1.25715    0.06775  18.556 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07359 on 58 degrees of freedom
## Multiple R-squared:  0.8558, Adjusted R-squared:  0.8533
## F-statistic: 344.3 on 1 and 58 DF,  p-value: < 2.2e-16
```

```
summary(mlactob)
```

```
##
## Call:
## lm(formula = lactob ~ pH, data = dd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.086181 -0.033098 -0.000082  0.031023  0.117622
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.79895    0.17497  21.71 <2e-16 ***
## pH           0.89670    0.04203  21.34 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04565 on 58 degrees of freedom
## Multiple R-squared:  0.887, Adjusted R-squared:  0.885
## F-statistic: 455.2 on 1 and 58 DF,  p-value: < 2.2e-16
```

```
c(strep=summary(mstrep)$r.squared,lactob=summary(mlactob)$r.squared)
```

```
##      strep      lactob
## 0.8558319 0.8869845
```

```
c(strep=logLik(mstrep),lactob=logLik(mlactob))
```

```
##      strep      lactob
## 72.43656 101.08524
```