

# ANOVA

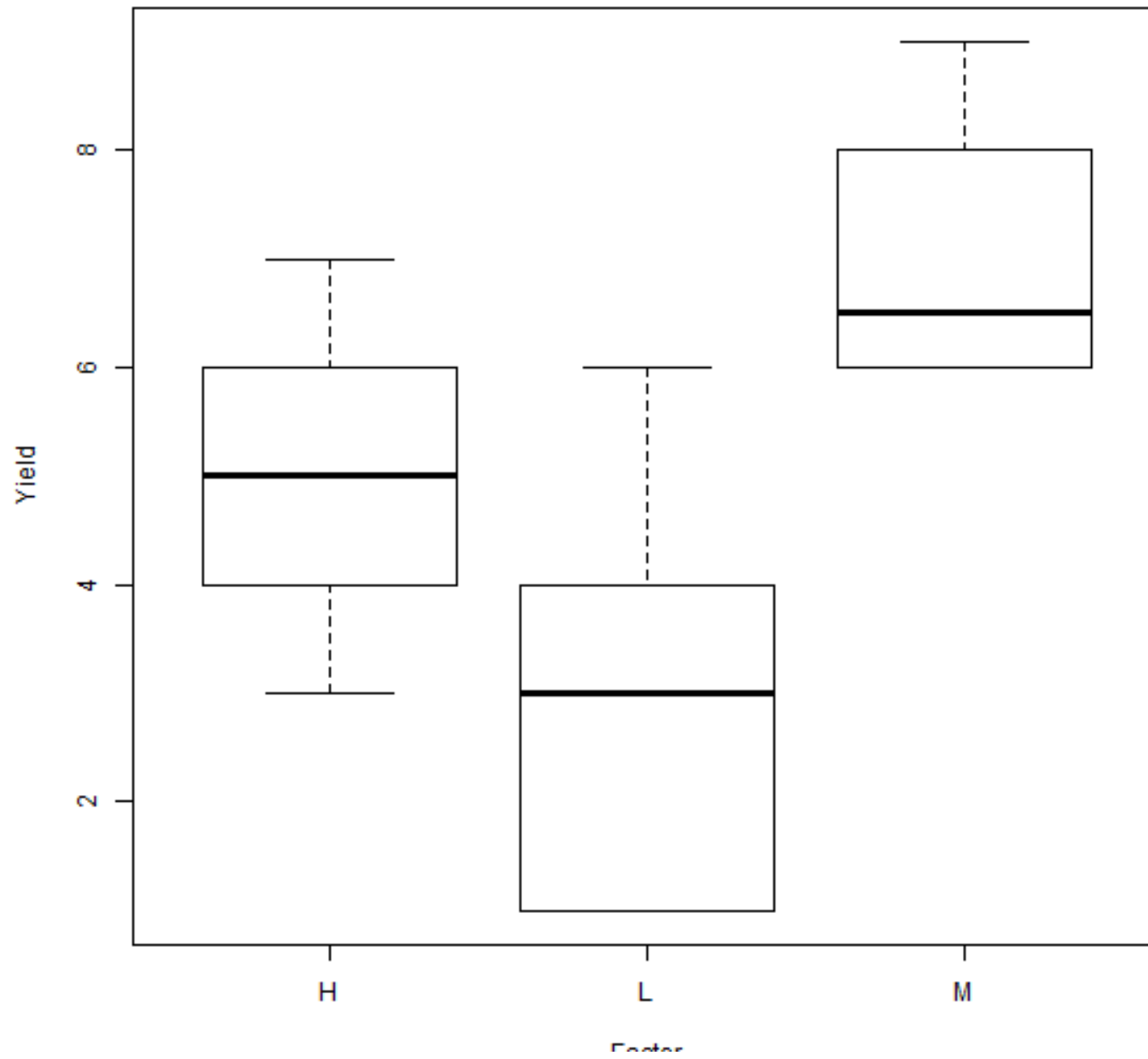
MP

2015-05-15

```
> setwd("D:/Dropbox/R/2015-NUS/Session-1/(b) R-Functions/ANOVA")
```

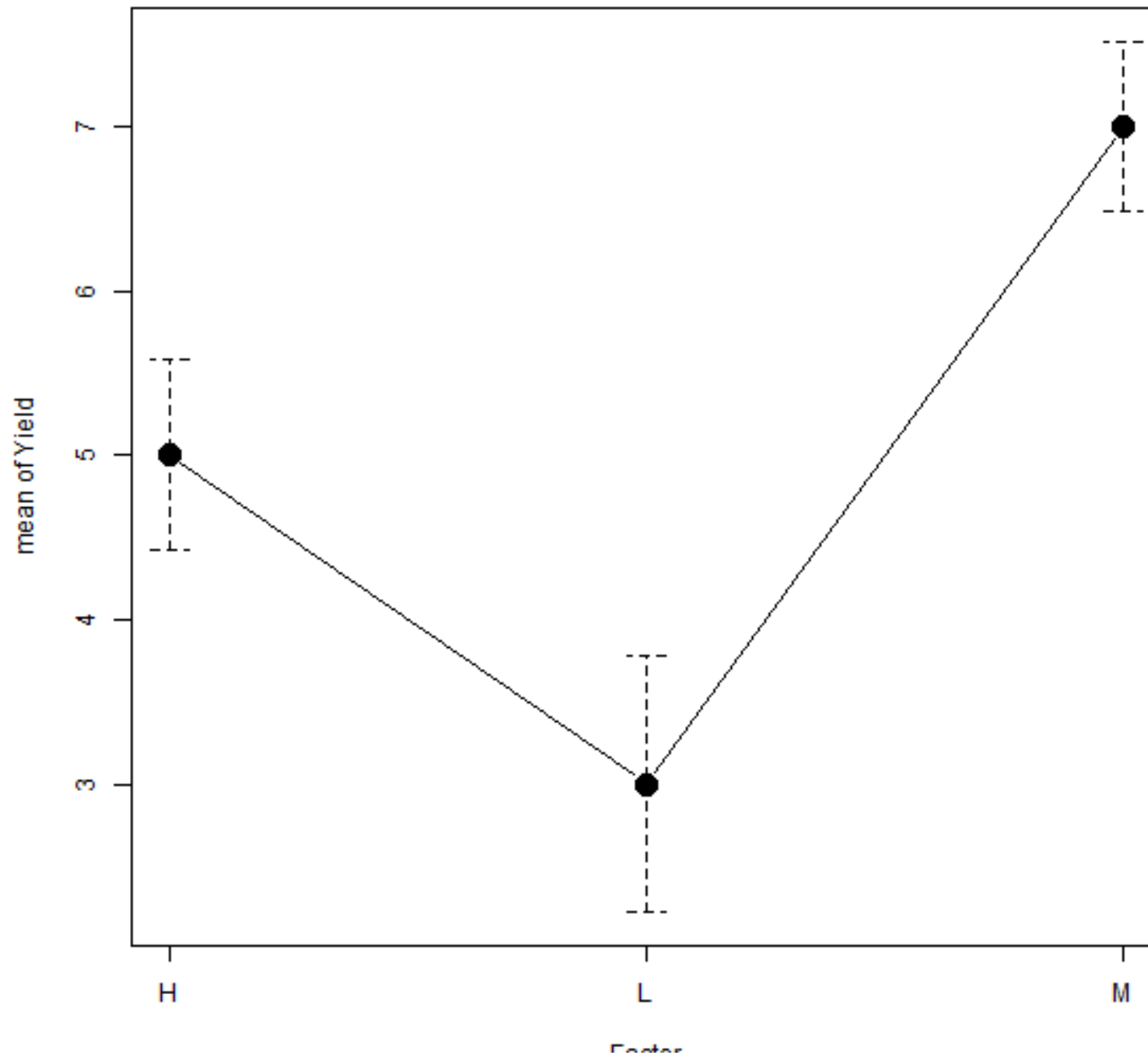
```
> Dataset <-  
+   read.table("D:/Dropbox/R/2015-NUS/Session-1/(b) R-Functions/ANOVA/Fertilizer.csv",  
+   header=TRUE, sep=",", na.strings="NA", dec=".", strip.white=TRUE)
```

```
> Boxplot(Yield~Factor, data=Dataset, id.method="y")
```

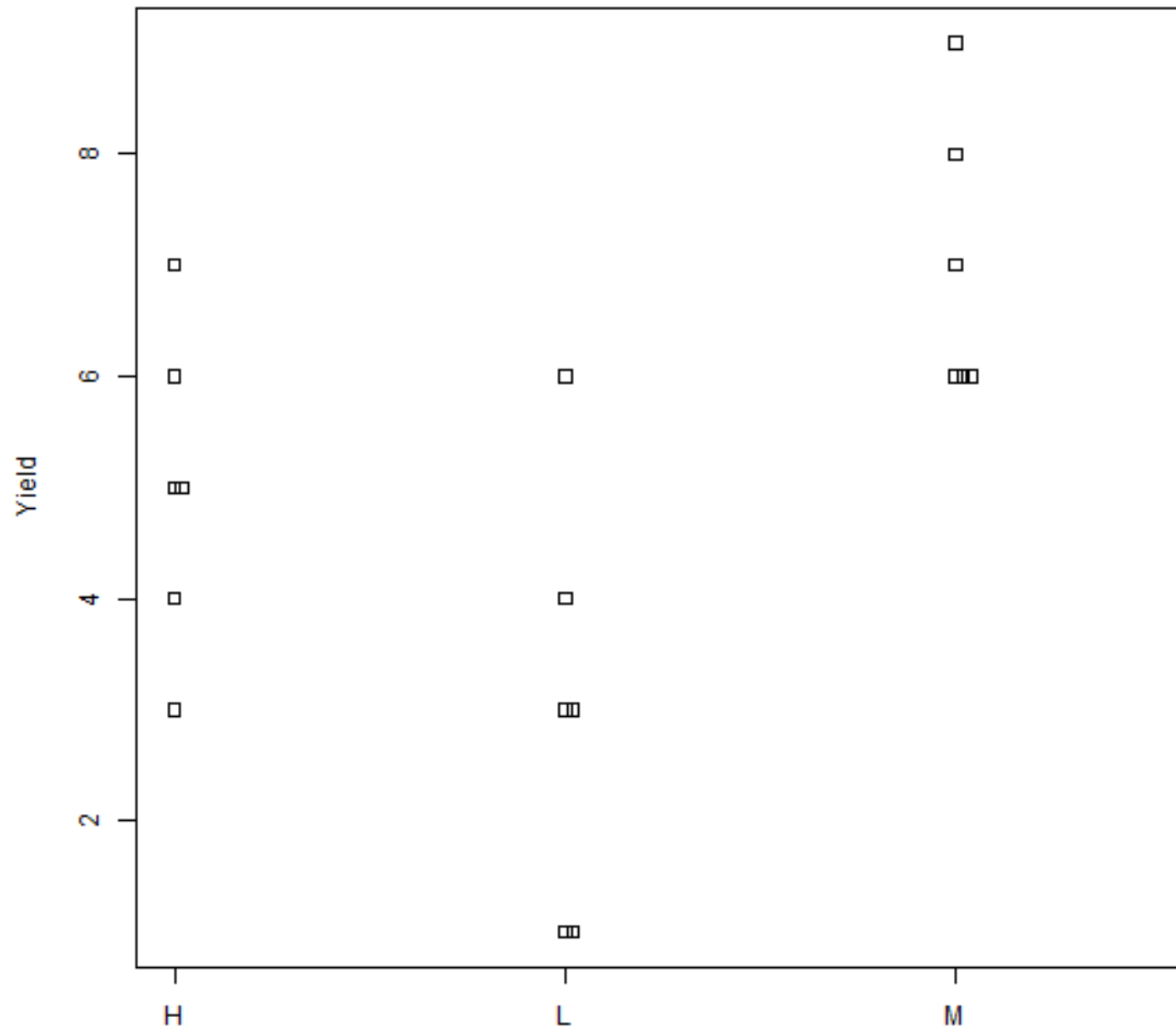


```
> with(Dataset, plotMeans(Yield, Factor, error.bars="se"))
```

Plot of Means



```
> stripchart(Yield ~ Factor, vertical=TRUE, method="stack", ylab="Yield",  
+ data=Dataset)
```



```
> library(mvtnorm, pos=15)
```

```
> library(survival, pos=15)
```

```
> library(TH.data, pos=15)
```

```
> library(multcomp, pos=15)
```

```
> library(abind, pos=19)
```

```
> AnovaModel.1 <- aov(Yield ~ Factor, data=Dataset)
> summary(AnovaModel.1)
```

```
          Df Sum Sq Mean Sq F value    Pr(>F)
Factor      2     48    24.0      10 0.00174 **
Residuals  15     36     2.4
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> with(Dataset, numSummary(Yield, groups=Factor, statistics=c("mean", "sd")))
```

```
  mean      sd data:n
H    5 1.414214     6
L    3 1.897367     6
M    7 1.264911     6
```

```
> AnovaModel.2 <- aov(Yield ~ Factor, data=Dataset)
> summary(AnovaModel.2)
```

```

      Df Sum Sq Mean Sq F value Pr(>F)
Factor    2     48    24.0     10 0.00174 **
Residuals 15     36     2.4

```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> with(Dataset, numSummary(Yield, groups=Factor, statistics=c("mean", "sd")))
```

```

  mean      sd data:n
H    5 1.414214      6
L    3 1.897367      6
M    7 1.264911      6

```

```

> local({
+   .Pairs <- glht(AnovaModel.2, linfct = mcp(Factor = "Tukey"))
+   print(summary(.Pairs)) # pairwise tests
+   print(confint(.Pairs)) # confidence intervals
+   print(cld(.Pairs)) # compact letter display
+   old.oma <- par(oma=c(0,5,0,0))
+   plot(confint(.Pairs))
+   par(old.oma)
+ })

```



### Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Tukey Contrasts

Fit: aov(formula = Yield ~ Factor, data = Dataset)

Linear Hypotheses:

	Estimate	Std. Error	t value	Pr(> t )	
L - H == 0	-2.0000	0.8944	-2.236	0.09728	.
M - H == 0	2.0000	0.8944	2.236	0.09713	.
M - L == 0	4.0000	0.8944	4.472	0.00119	**

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

(Adjusted p values reported -- single-step method)

### Simultaneous Confidence Intervals

Multiple Comparisons of Means: Tukey Contrasts

Fit: aov(formula = Yield ~ Factor, data = Dataset)

Quantile = 2.599

95% family-wise confidence level

Linear Hypotheses:

	Estimate	lwr	upr
L - H == 0	-2.0000	-4.3246	0.3246
M - H == 0	2.0000	-0.3246	4.3246
M - L == 0	4.0000	1.6754	6.3246

H	L	M
"ab"	"a"	"b"

**95% family-wise confidence level**