Writing the paper

1

The classic one

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THE
ELEMENTS OF STYLE

BY
WILLIAM STRUNK, JR.
PROFESSOR OF ENGLISH
IN
CORNELL UNIVERSITY

NEW YORK
HARCOURT, BRACE AND COMPANY

2

Writing Style

- Shorter sentences are better
- Write concisely
- Quality not quantity

•

Don't annoy editors and referees:

It better to fill your own wastepaper basket than the editors

3

Grammar and punctuation

- Modifiers
  - It should be clear what an adjective (i.e. modifier) is modifying

    On the basis of (not *based on*) their previous findings, the authors developed a new set of treatments

  - Modifiers should be placed as close to the words they modify – *different implied emphasis*

    Only the herbicides were effective against 10 species
    The herbicides were *only* effective against 10 species
    The herbicides were effective against *only* 10 species

4

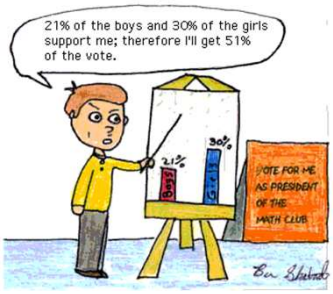
Open source dictionaries, Grammarly and Ludwig

- https://www.collinsdictionary.com/dictionary/english/
- https://www.merriam-webster.com/
- https://app.grammarly.com/
- https://ludwig.guru/

5

All models are wrong, but some are useful!

George Cox



Experiments require proper statistics

6

Examples of what not to do and what to do

2.6. Statistical analysis

All the results were subjected to ANOVA and the means were compared according to Student-Newman-Keuls (SNK) Multiple range test (*P*)0.05). When appropriate, linear regressions were analyzed for signifcance at *p*<0.05.

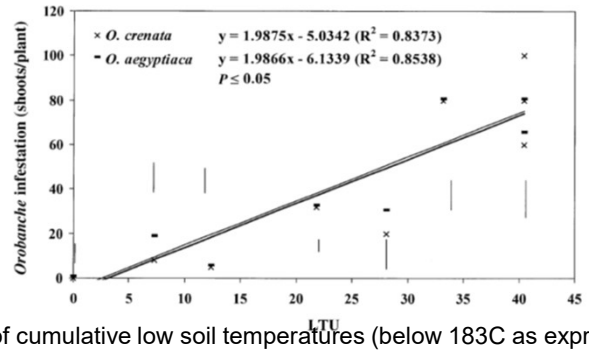


Fig. 2. E!ect of cumulative low soil temperatures (below 183C as expressed by LTU) on the level of *O. crenata* and *O. aegyptiaca* infestation in carrots grown in the field. Bars represent the LSD for each calculated LTU.

7

An ancova

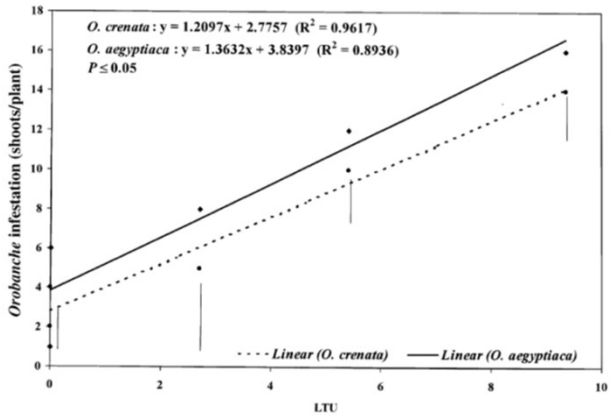


Fig. 5. Effect of cumulative low temperatures (below 18C as expressed by LTU) on the level of *O. crenata* and *O. aegyptiaca* infestation in carrots grown under controlled conditions. Bars represent the LSD for each calculated LTU.

8

An ancova

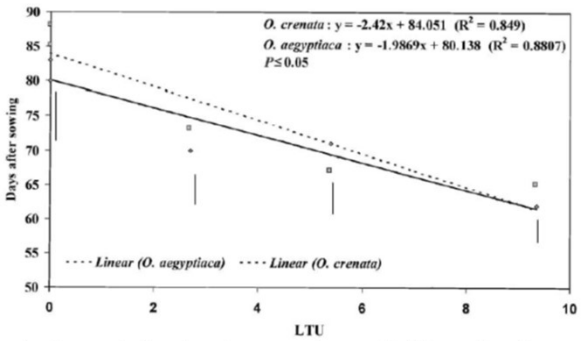
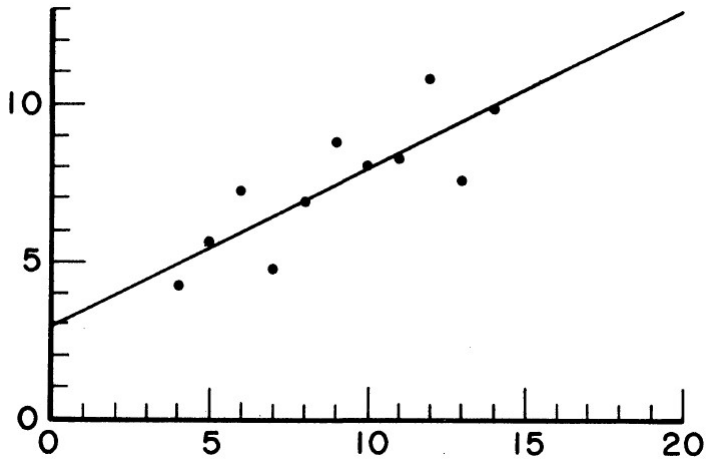


Fig. 6. Effect of cumulative low temperatures (LTU) on the time needed for *O. crenata* and *O. aegyptiaca* emergence in carrots grown under controlled conditions. Bars represent the LSD for each calculated LTU.

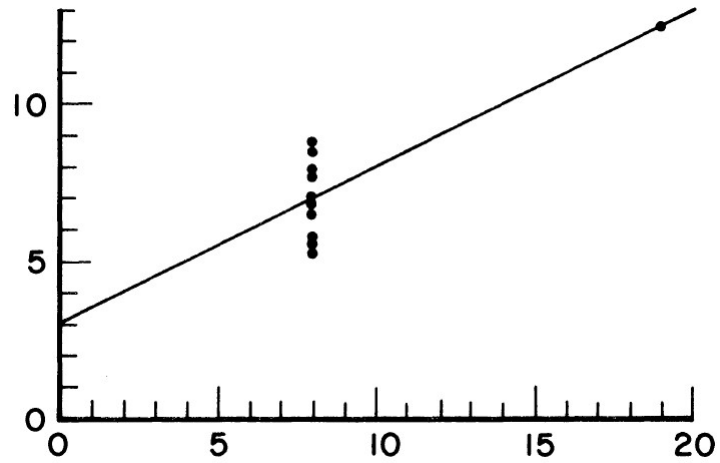
9

OK fit



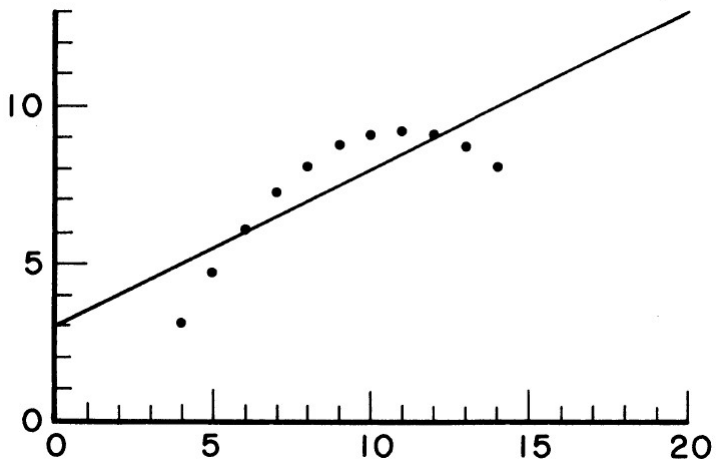
10

Unreliable fit



11

Wrong fit



12

Completely redundant

Source	d.f.	Barley yield		Mite density		Weed density	
		F	P	F	P	F	P
Replicates	3	5.48	0.037	7.49	0.019	2.81	0.130
Input level (I)	2	0.82	>0.300	1.04	>0.300	0.22	>0.300
Error A	6	–	–	–	–	–	–
Diversity level (D)	2	0.50	>0.300	0.91	>0.300	0.52	>0.300
I × D interaction	4	0.22	>0.300	0.90	>0.300	4.68	0.009
Error B	18	–	–	–	–	–	–
Cropping phase (P)	5	0.17	>0.300	2.08	0.071	0.21	>0.300
I × P interaction	10	0.52	>0.300	1.76	0.074	0.47	>0.300
D × P interaction	10	1.21	0.288	1.39	0.192	0.13	>0.300
I × D × P interaction	20	0.86	>0.300	1.09	>0.300	0.42	>0.300
Error C	135	–	–	–	–	–	–
Coefficient of variation		11.7		66.3		59.9	

Analysis of variance of 1994 barley yield, spring 1995 mite density and pre-treatment weed densities based on experimental design to be used in the subsequent alternative cropping study.

13

Effect of doses on sexes
anova
Interactions

```
Analysis of Variance Table Response:
AlkalinePhosphate Df Sum Sq Mean Sq F value Pr(>F)
Dose               1 6241    6241     15.4289 0.002006 **
Sex                1 2401    2401      5.9357 0.031367 *
Dose:Sex           1 2044    2045      0.5538 1.23e-05 ***
Residuals         12 4854     405
```

Means

Dose	Female	Male
8	133.5	180.5
25	165.5	69.5

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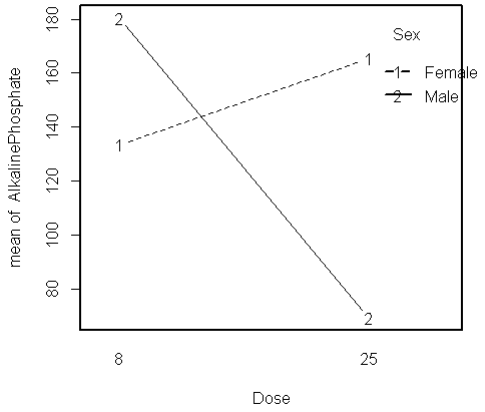
Interaction plot



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Interaction

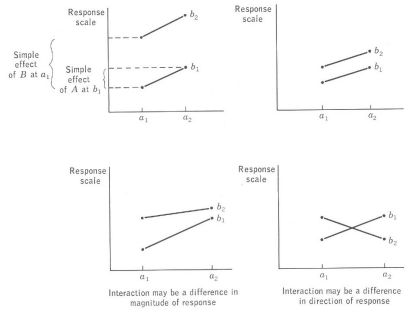

FIG. 11.1 Illustration of interaction

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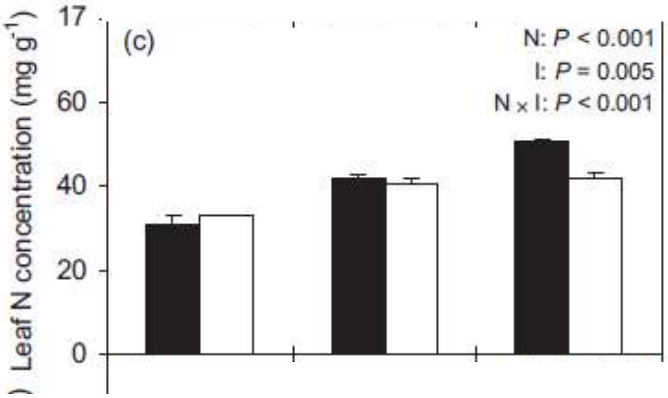
Undigested Statistics Why?



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Redundant statistics

Table 2 Effects of ginger aqueous extracts on activities of antioxidant enzymes in leaves of ginger seedlings

Ginger part	Concentration ($g\ L^{-1}$)	POD ($U\ mg^{-1}$ protein)	SOD ($U\ g^{-1}$ FW)	APX ($U\ mg^{-1}$ protein)	CAT ($\mu mol\ H_2O_2\ g^{-1}$ FW min^{-1})
Rhizome	0	1097 ± 39a	168 ± 11b	11.8 ± 2.1ab	5.46 ± 0.11ab
	10	1117 ± 76a	189 ± 25ab	12.1 ± 0.8a	6.50 ± 0.50a
	20	1185 ± 102a	230 ± 14a	9.6 ± 0.7abc	4.54 ± 0.25b
	40	861 ± 34b	171 ± 7b	8.0 ± 1.2bc	3.00 ± 0.52c
	80	732 ± 75b	139 ± 19b	7.4 ± 0.3c	1.54 ± 0.21d
Stem	0	1097 ± 39a	168 ± 11a	11.8 ± 2.1a	5.46 ± 0.11a
	10	997 ± 65a	147 ± 9a	6.2 ± 0.7b	3.29 ± 0.15ab
	20	669 ± 23b	106 ± 6b	5.3 ± 0.4bc	2.42 ± 0.22b
	40	549 ± 34bc	82 ± 9bc	4.9 ± 0.4bc	1.83 ± 0.40c
	80	434 ± 46c	60 ± 6c	2.4 ± 0.5c	1.38 ± 0.11d
Leaf	0	1097 ± 39a	168 ± 11a	11.8 ± 2.1a	5.46 ± 0.11a
	10	1020 ± 32a	166 ± 8a	9.6 ± 0.7ab	4.21 ± 0.15b
	20	761 ± 35b	123 ± 15b	7.8 ± 0.4bc	2.67 ± 0.22c
	40	582 ± 10c	84 ± 1c	5.2 ± 0.2cd	1.96 ± 0.15cd
	80	449 ± 58d	66 ± 10c	4.2 ± 0.1d	1.45 ± 0.11d

Each value is the mean of five replicates ± S.E. Values followed by the same letter in the same column are not significantly different at $P < 0.05$ according to Duncan's multiple range test.

18

What is the mean of zeros?

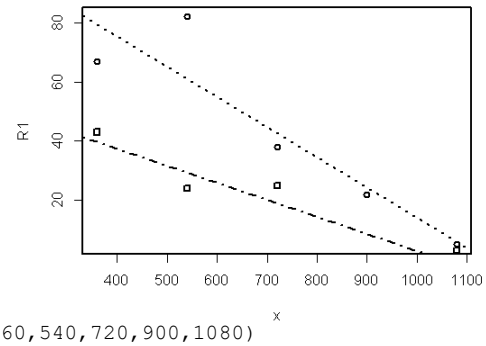
Table 1. Survival (% ± standard error) of the four *Papaver rhoeas* standard populations in greenhouse and field trials to 2,4-D (susceptible: S1 and S2; resistant: R1 and R2). Field trials were only performed on resistant standard populations. DAT= days after treatment.

	Greenhouse trial at g AI ha^{-1}					Field trials at 360 g AI ha^{-1}	
Population	360	540	720	900	1080	1997-98	2000-01
S1	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	-	-
S2	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	-	-
R1	67 ± 34	82 ± 14	38 ± 20	22 ± 8	5 ± 5	58 ± 17.3 (DAT=55)	-
R2	43	24 ± 13	25 ± 14	0 ± 0	3 ± 3	61 ± 8.8 (DAT=61)	84 ± 8.4 (DAT=24)

```
y<-rep(0,40)
> mean(y)
[1] 0
> sd(y)
[1] 0
```

19

Why not make a regression of R1 and R2




```
x<-c(360,540,720,900,1080)
R1<-c(67,82,38,22,5)
R2<-c(43,24,25,0,3)
plot(R1~x)
points(R2~x,pch=22,lty=2)
abline(lm(R1~x),lty=3)
abline(lm(R2~x),lty=4)
```

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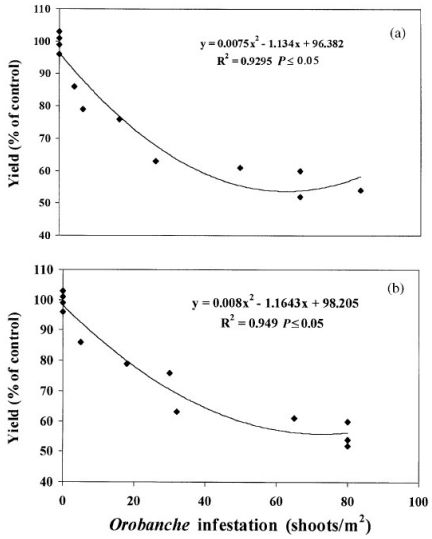

Fig. 4. Effect of the level of *O. crenata* (a) and *O. aegyptiaca* (b) infestation on carrots yield-field study.

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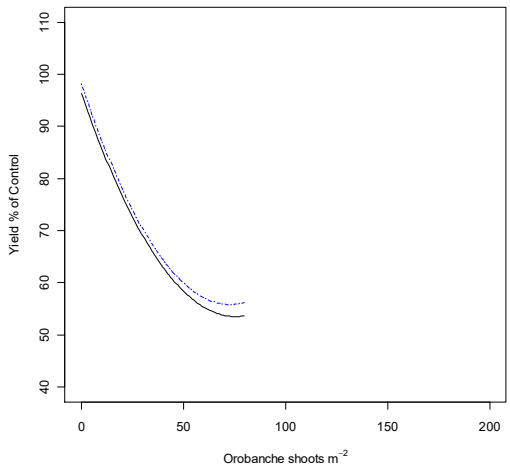
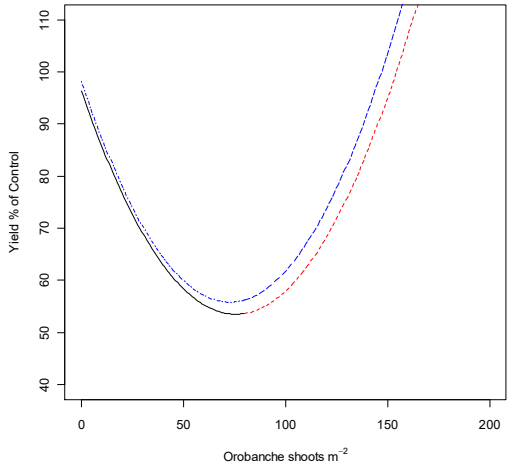
Combining O. crenata (a) and *O. aegyptiaca*



22

Predictive power of a Polynomium



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The standard errors are not from an ANOVA

Table 1
Effect of different dried leaf tissue concentrations of *A. artemisiifolia* on total germination (GT), shoot and root length of the weeds: *A. artemisiifolia* (AMBAR), *D. sanguinalis* (DIGSA), *E. crus-galli* (ECHCG), *P. oleracea* (POROL) and *S. nigrum* (SOLNI).

	Indicator species	Control[a]	Dried leaf tissue amounts (g Parker dish $^{-1}$)[a]		
			1.0	2.0	3.0
GT	AMBAR	50.0± 7.07a	40.0± 6.41a	42.5± 6.29a	32.5± 2.50a
(%)	DIGSA	48.8± 0.00a	42.5± 0.15a	30.0± 0.37ab	5.0± 1.34b
	ECHCG	42.5± 0.00a	62.5± 0.13a	45.0± 0.30a	50.0± 0.42a
	POROL	55.0± 0.00a	60.0± 0.13a	77.5± 0.23a	60.0± 0.39a
	SOLNI	12.5± 0.00a	10.0± 0.32a	30.0± 0.37b	45.0± 0.45b

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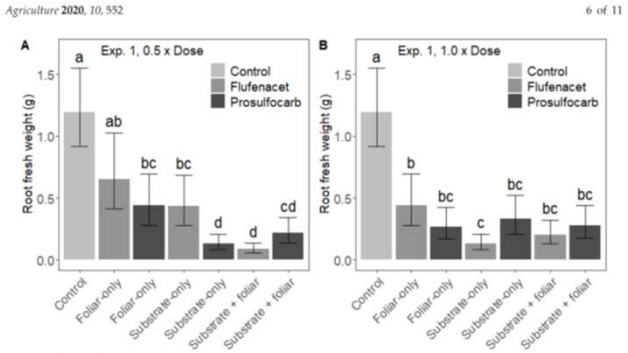
Here do you get relevant information?



Agriculture **2020**, *10*, 552

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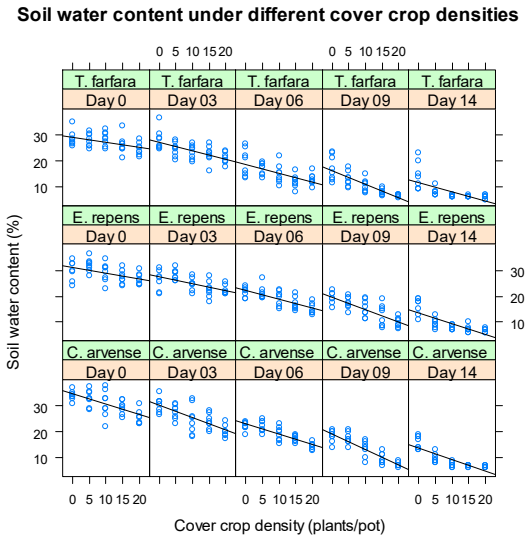
Soil water content (SWC) at different densities of cover crop and time of measurements during the drought stress in pots with *Cirsium arvense*, *Tussilago farfara* or *Elytrigia repens*
But are SD from Anovas?

	Densities of cover crop	T1 Mean (±SD)	T2 Mean (±SD)	T3 Mean (±SD)	T4 Mean (±SD)	T5 Mean (±SD)
C. arvense	0	34.0 (±1.73)	30.3 (±2.85)	22.1 (±1.57)	18.2 (±2.31)	15.7 (±2.49)
	5	33.0 (±3.09)	27.6 (±2.78)	22.0 (±2.12)	17.3 (±2.26)	9.6 (±1.68)
	10	30.8 (±5.29)	24.6 (±5.66)	19.0 (±2.62)	13.3 (±3.02)	7.2 (±1.03)
	15	29.3 (±2.51)	23.9 (±2.83)	17.3 (±1.24)	9.5 (±2.00)	6.7 (±0.46)
	20	25.6 (±3.10)	20.2 (±2.79)	14.3 (±1.30)	7.2 (±0.91)	6.4 (±0.53)
T. farfara	0	28.5 (±2.88)	28.1 (±3.98)	19.1 (±5.22)	17.1 (±4.76)	13.7 (±5.35)
	5	28.0 (±2.48)	24.4 (±2.66)	16.9 (±2.30)	12.9 (±2.78)	8.0 (±1.30)
	10	28.6 (±2.73)	23.3 (±2.69)	14.8 (±3.65)	10.3 (±2.50)	6.3 (±0.51)
	15	26.1 (±3.57)	22.5 (±3.29)	12.0 (±2.46)	7.8 (±1.16)	6.1 (±0.35)
	20	24.6 (±2.34)	20.8 (±2.19)	12.8 (±2.21)	6.6 (±0.58)	6.0 (±0.75)
E. repens	0	29.7 (±3.84)	26.2 (±3.86)	21.5 (±2.00)	19.3 (±2.37)	16.1 (±3.18)
	5	32.0 (±2.52)	28.2 (±2.10)	21.3 (±2.52)	17.5 (±2.28)	9.5 (±1.85)
	10	29.2 (±3.49)	24.7 (±2.42)	19.1 (±2.81)	15.2 (±3.20)	7.8 (0±.99)
	15	27.4 (±2.69)	22.6 (±3.11)	17.0 (±2.48)	12.5 (±4.15)	7.2 (±1.28)
	20	26.6 (±2.15)	22.3 (±1.71)	15.0 (±2.05)	9.8 (±1.92)	6.6 (±0.74)

26

Drought and perennials better way to illustrate the relationships



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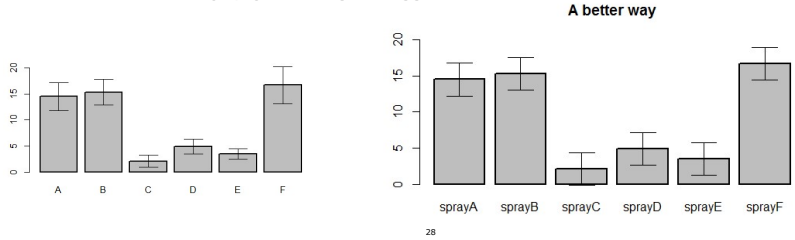
```
m<-lm(count~spray-1,data=InsectSprays)
summary(m)
```

```
            Estimate Std. Error t value            Pr(>|t|)
sprayA 14.500    1.132         12.807          < 2e-16 ***
sprayB 15.333    1.132         13.543          < 2e-16 ***
sprayC 2.083     1.132         1.840           0.07024 .
sprayD 4.917     1.132         4.343           4.95e-05 ***
sprayE 3.500     1.132         3.091           0.00292 **
sprayF 16.667    1.132         14.721          < 2e-16 ***
```

```
barplot2(coef(m),plot.ci=TRUE,
ci.l=confint(m)[,1],
ci.u=confint(m)[,2],
main="A better way", ylim=c(0:20))
```



28

28

InsectSprays All combinations differences

```
B - A == 0   0.8333     1.6011   0.520    0.995
C - A == 0 -12.4167     1.6011  -7.755   <0.001 ***
D - A == 0  -9.5833     1.6011  -5.985   <0.001 ***
E - A == 0 -11.0000     1.6011  -6.870   <0.001 ***
F - A == 0   2.1667     1.6011   1.353    0.754
C - B == 0 -13.2500     1.6011  -8.276   <0.001 ***
D - B == 0 -10.4167     1.6011  -6.506   <0.001 ***
E - B == 0 -11.8333     1.6011  -7.391   <0.001 ***
F - B == 0   1.3333     1.6011   0.833    0.960
D - C == 0   2.8333     1.6011   1.770    0.492
E - C == 0   1.4167     1.6011   0.885    0.949
F - C == 0  14.5833     1.6011   9.108   <0.001 ***
E - D == 0  -1.4167     1.6011  -0.885    0.949
F - D == 0  11.7500     1.6011   7.339   <0.001 ***
F - E == 0  13.1667     1.6011   8.223   <0.001 ***
```

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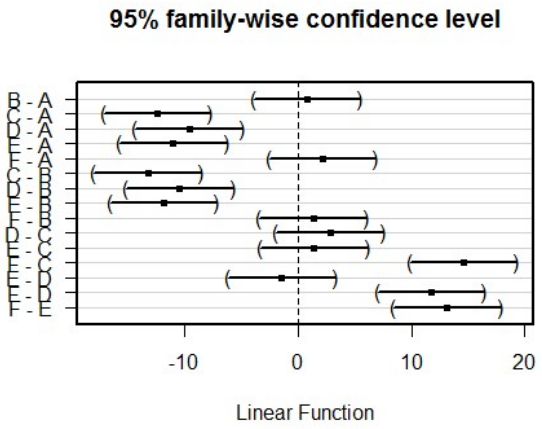
A better way to illustrate



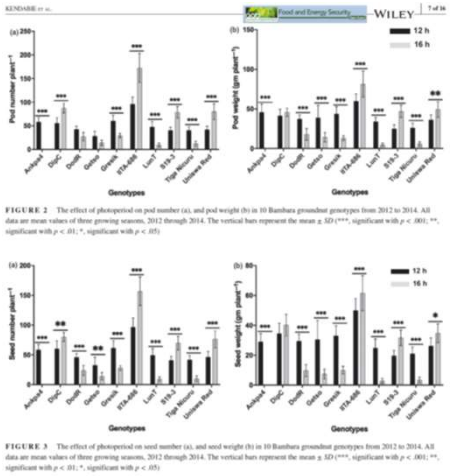
30

How to present?
With stars no numbers?

A	A	B	C	D	E	F
B						
C	***	***				
D	***	***				
E	***	***				
F			***	***	***	

31

Means were
compared for significant differences using LSD at a significant level of 5%.



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Graphs (can) say more than 1000 words

33

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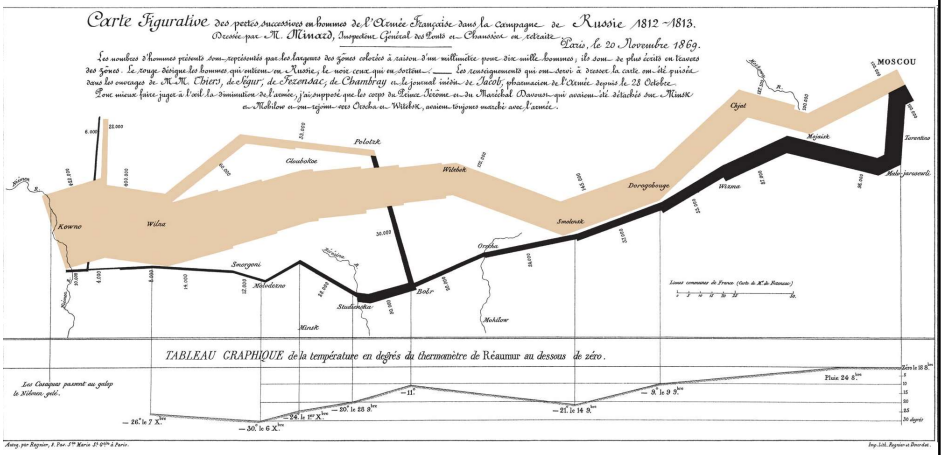
The beauty of graphics



Charles Minard's map of Napoleon's disastrous Russian campaign of 1812. The graphic is notable for its representation in two dimensions of six types of data: the number of Napoleon's troops; distance; temperature; the latitude and longitude; direction of travel; and location relative to specific dates.

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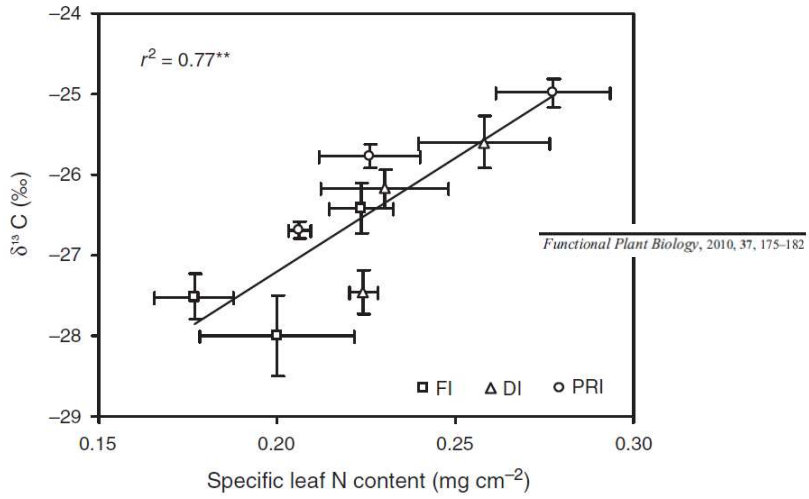

Fig. 7. Relationship between specific leaf N content and carbon isotope composition (δ^{13}C) of three leaf layers of tomato plants after 4 weeks full irrigation (FI), deficit irrigation (DI) and partial root-zone irrigation (PRI) treatments. **, significance of regression line at $P < 0.01$.

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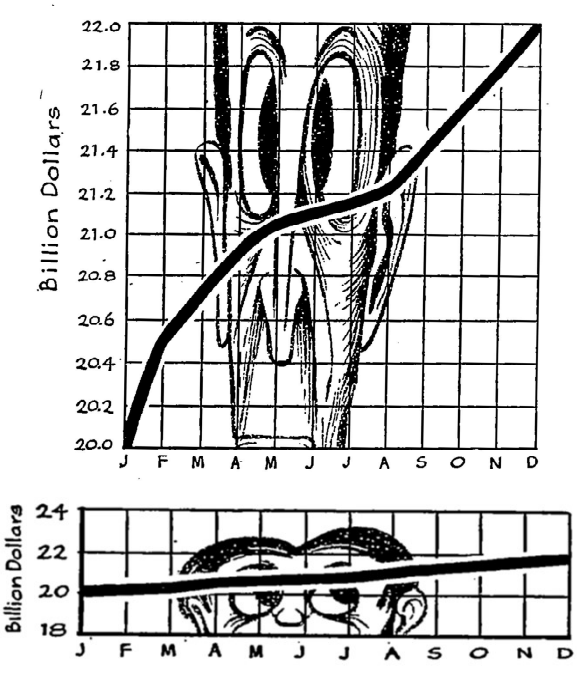

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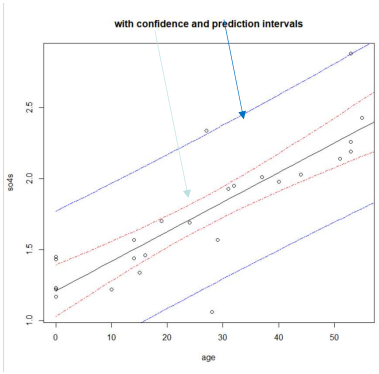
Sulphate content in plantation trees



37

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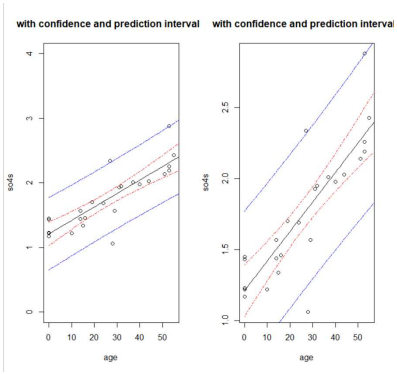
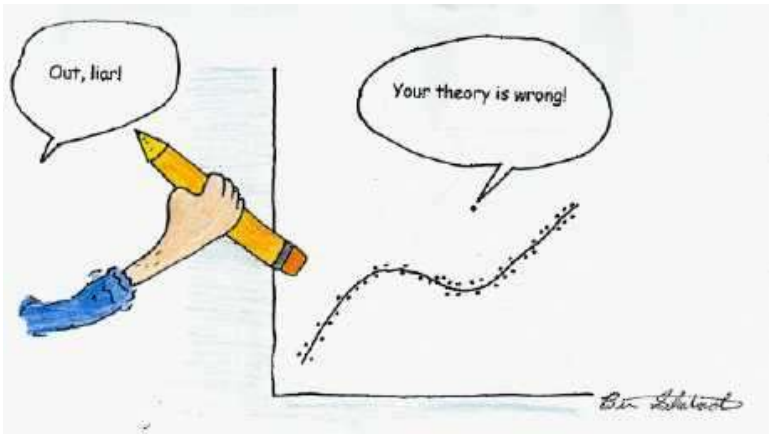
So much does the scaling of axes affects our view!




```
coef(sulphate.fit1)
(Intercept)          age
 1.21073350  0.02080878***
```

38

38



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Misperception and miscommunication

Source: E.R. Tufte (1983)

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