

Beans circumnutation preferences

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Outline

1. Statistics
 - a. corrected Statistics
 - b. Problems of doing further suggested statistics
2. Relevance for the ongoing debate in plant cognition:
3. Limitations
4. Suggestions for further research
5. Discussion

Statistics

Recap...

First Experiment

- circumnutation preferences of climbing plants (*Phaseolus Vulgaris* - common beans)
- three support materials (wooden, poisonous, metal)
- 12 individuals
- chi-square revealed to be not significant $\chi^2=4.5$, $df =2$, $p=.1054$, $\varphi_c=.433$)

Recap...

Second Experiment

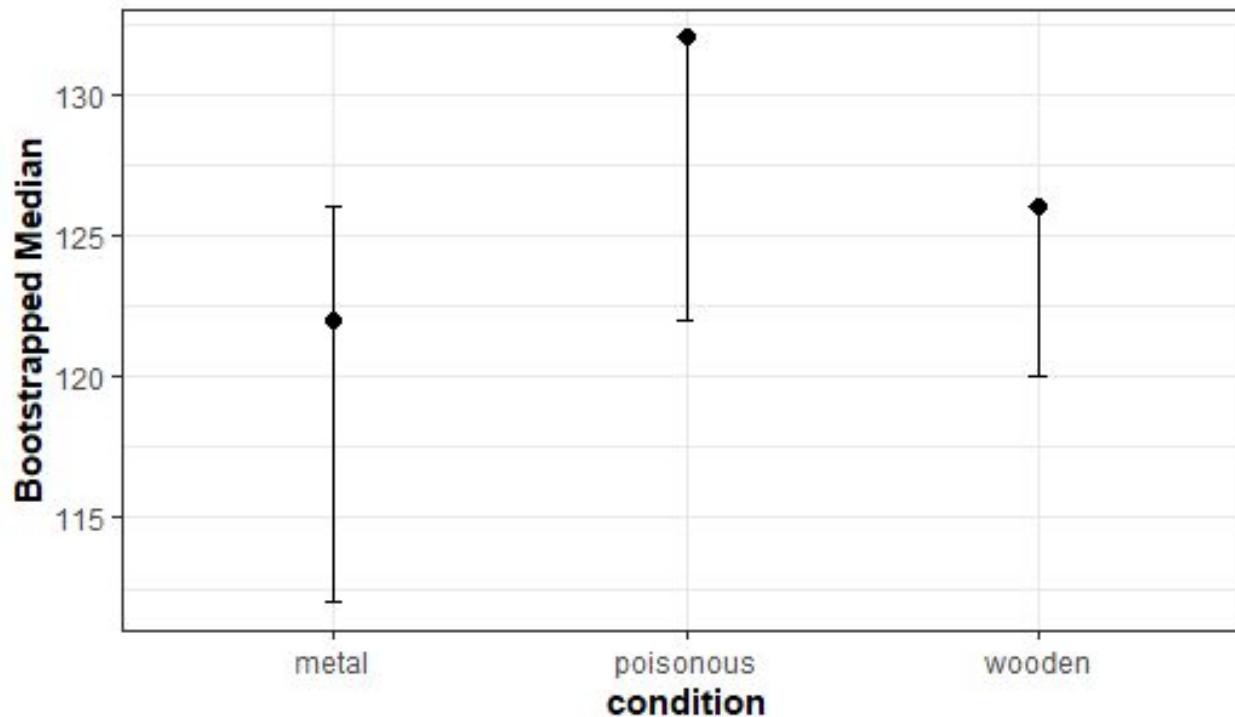
- differential behaviour in climbing plants for different materials (*Phaseolus Vulgaris* - common beans)
- three support materials (wooden, poisonous, metal)
- growing and number of leaves
- 12 individuals (3 discarded)

Type of sticks	Height (in cm)	Number of leaves	Dates
Poisonous	128	14	Sep 9
Poisonous	138	11	Sep 19
Poisonous	130	8	Sep 11
Metal	121	11	Sep 10
Wooden	12516	11	Sep 16
Metal	130	11	Sep 16
Wooden	124	8	Sep 11
Wooden	125	11	Sep 16
Wooden	130	12	Sep 23

Second Experiment

- Kruskal-Wallis tests did not show significant differences either for length ($\chi^2=2.85$, $df = 2$, $p = .24$, $\eta^2=.142$, ci[-.7 .62]) or number of leaves ($\chi^2=0.027$, $df = 2$, $p=.9$)

Second Experiment





Difference in growing behaviour

- Leaves as a measurement of the health of the plant: (John Hewitson)

unfortunately not possible to construct the data afterwards:

- different growing cycle
 - some plants attached to other sticks
 - some straighten up after reaching the end of the stick
 - self twining
- too many differences in growing behaviour after reaching the end

relevance for ongoing debate

Related research :

- plants reject support of too huge diameter (Darwin 1875)
- *experiment offering different habitats (Mac Donalds and Leiffers 1993)*
- When given the choice, roots choose not to grow into acidic or aluminium rich soils, or those containing saline (Salzman 1985).
- *If a glass rod is offered as a support, there is initial winding, but then after assessment it unwinds and grows elsewhere; the glass rod is rejected. (Darwin 1891)*
- *poisons obstruct to plants nutation - Darwin 1882*

New revealings from our experiments:

- checking for different surfaces
- different species of plant
- more evidence what a ‘suitable’ support looks like
- use poison as a new stimuli

Limitations

Limitations

- Height of the sticks
- Sample size !!!
- Biological /climate constraints
- Lack of facilities/ equipment
- Time duration (summer)

→ lack of experimental control



Further Suggestions

Recommendations for follow up research

- Reconsider materials → glass or coco poles /different poison
- More controlled conditions → well-equipped facilities/ seek the assistance of biologist
- Tendril plants (pumpkin) instead of twining plants
- Our experiment 3



Interesting findings.... What do you think?



Discussion:

Who is wrong? Roughness constraint...

our Observation:

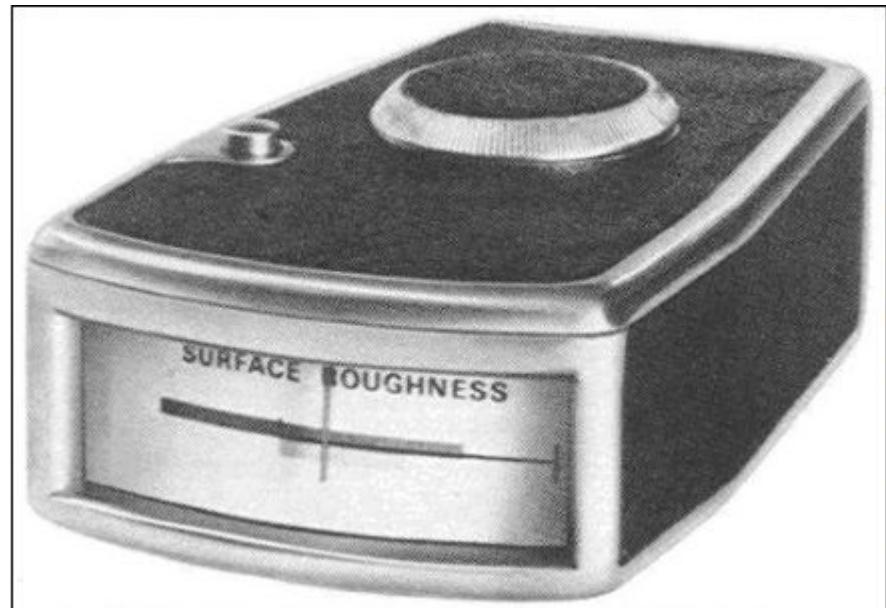
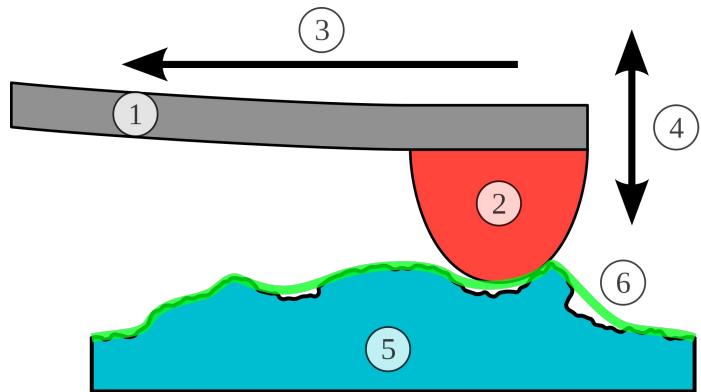


Darwin:

Darwin observed in kidney beans that the stem's axial twisting increased with support roughness (1875)

Measurement

Surface Condition measurement



Thank you very much for your time and attention !

