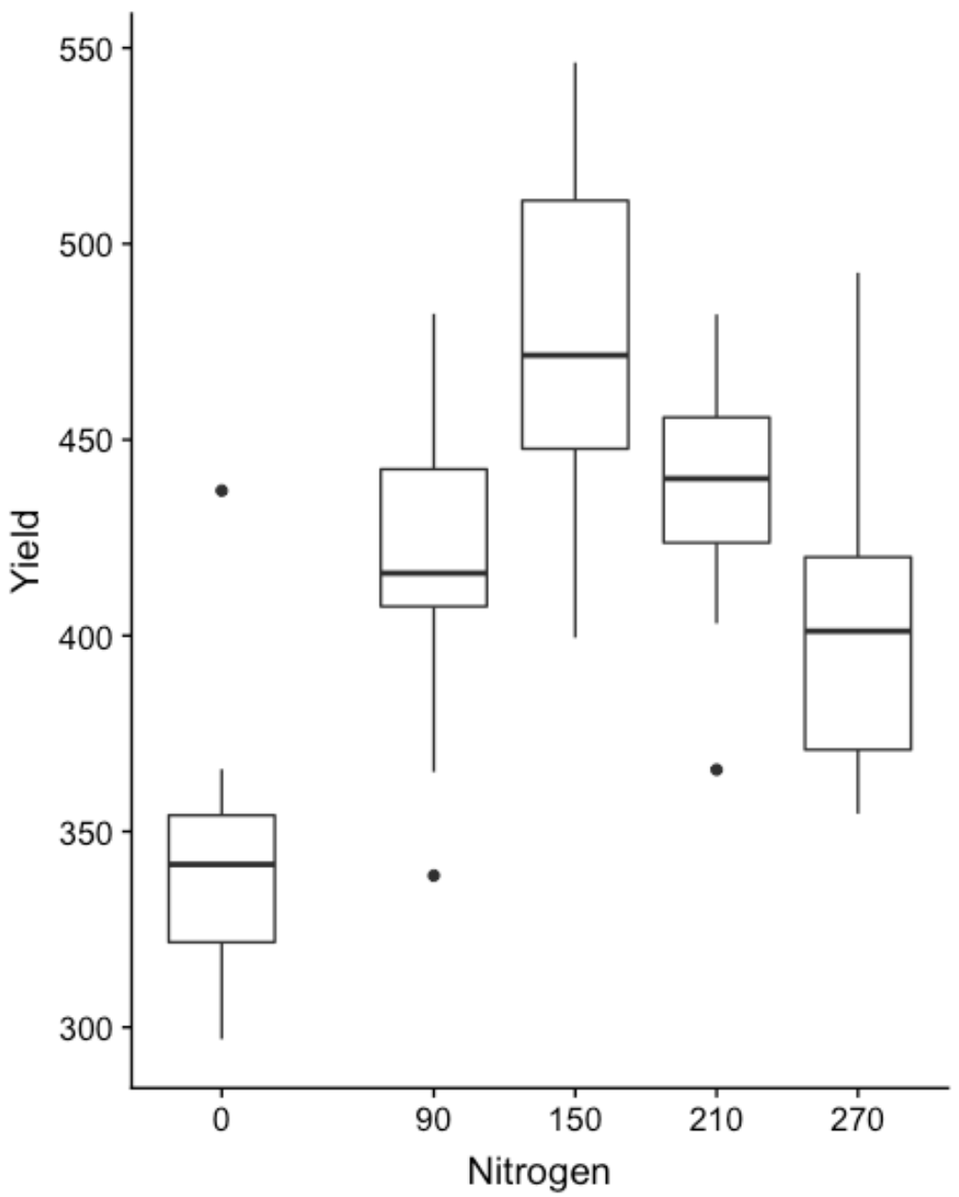
An experiment was run to evaluate effects
of increased nitrogen fertilization
on tuber yield of frying potatoes

5 nitrogen regimes (applied to plots):
0, 90, 150, 210, 270 lbs / acre at emergence

10 reps / treatment combination

Response: total yield per plot



40 pots are planted with pepper plants and distributed among 2 hot and 2 cold growth chambers (10 pots per chamber).

After two weeks, 2 leaves are harvested per plant.

RNA is extracted from each leaf and the expression of the gene *sp1* is measured 3 times per RNA sample.

How many experimental units were included for the effect of temperature on leaf gene expression?

Experimental Unit

The **smallest** unit of experimental material to which a **single treatment** (or treatment combination) is assigned by the experimenter and which is dealt with **independently** of other such systems **under that treatment** at **all stages in the experiment** at which important variation may enter.

Kozlov and Hurlbert 2006

Experimental Unit

EUs should be **randomly selected** from a **reference population**

Each EU is **equally likely** to be assigned each treatment

EUs shouldn’t **interfere** with each other

Treatments are applied **independently** to each EU

EUs are interspersed **temporally and spatially**

Source of confusion	Features of an experimental design that reduce or eliminate confusion
1. Temporal change	Control treatments
2. Procedure effects	Control treatments
3. Experimenter bias	Randomized assignment of experimental units to treatments Randomization in conduct of other procedures "Blind" procedures*
4. Experimenter-generated variability (random error)	Replication of treatments
5. Initial or inherent variability among experimental units	Replication of treatments Interspersion of treatments Concomitant observations
6. Nondemonic intrusion†	Replication of treatments Interspersion of treatments
7. Demonic intrusion	Eternal vigilance, exorcism, human sacrifices, etc.

Hurlbert 1984

To study the effect of mutating the MC1R gene on fish fin colors, a researcher spends 2 years generating a knock-out mutant.

He then grows 6 Wild-Type fish in one tank and 6 fish from the mutant line in a different tank.

When they get to 5cm length, he measures the fin color of each fish.

How many <u>experimental units</u> were included for the <u>effect of MC1R</u> on fin coloration?

To study the effect of mutating the MC1R gene on fish fin colors, a researcher spends 2 years generating a knock-out mutant.

He then **TAGS 6 FISH** of each strain and grows them **ALL IN THE SAME TANK**.

When they get to 5cm length, he measures the fin color of each fish.

How many <u>experimental units</u> were included for the <u>effect of MC1R</u> on fin coloration?

To study the timing of sugar signaling in *Arabidopsis* roots were exposed to 100mM sucrose solution, and then the concentration of starch was measured at 10 minute intervals.

Assays were done in petri dishes with 5 seedlings.

10 petri dishes were started, and at times 0 (before sucrose), 10, 20, 30 and 40 minutes, one randomly selected seedling was harvested from each plate and subjected to starch analysis.

What is the experimental unit for the effect of sucrose at 10min? 20min?

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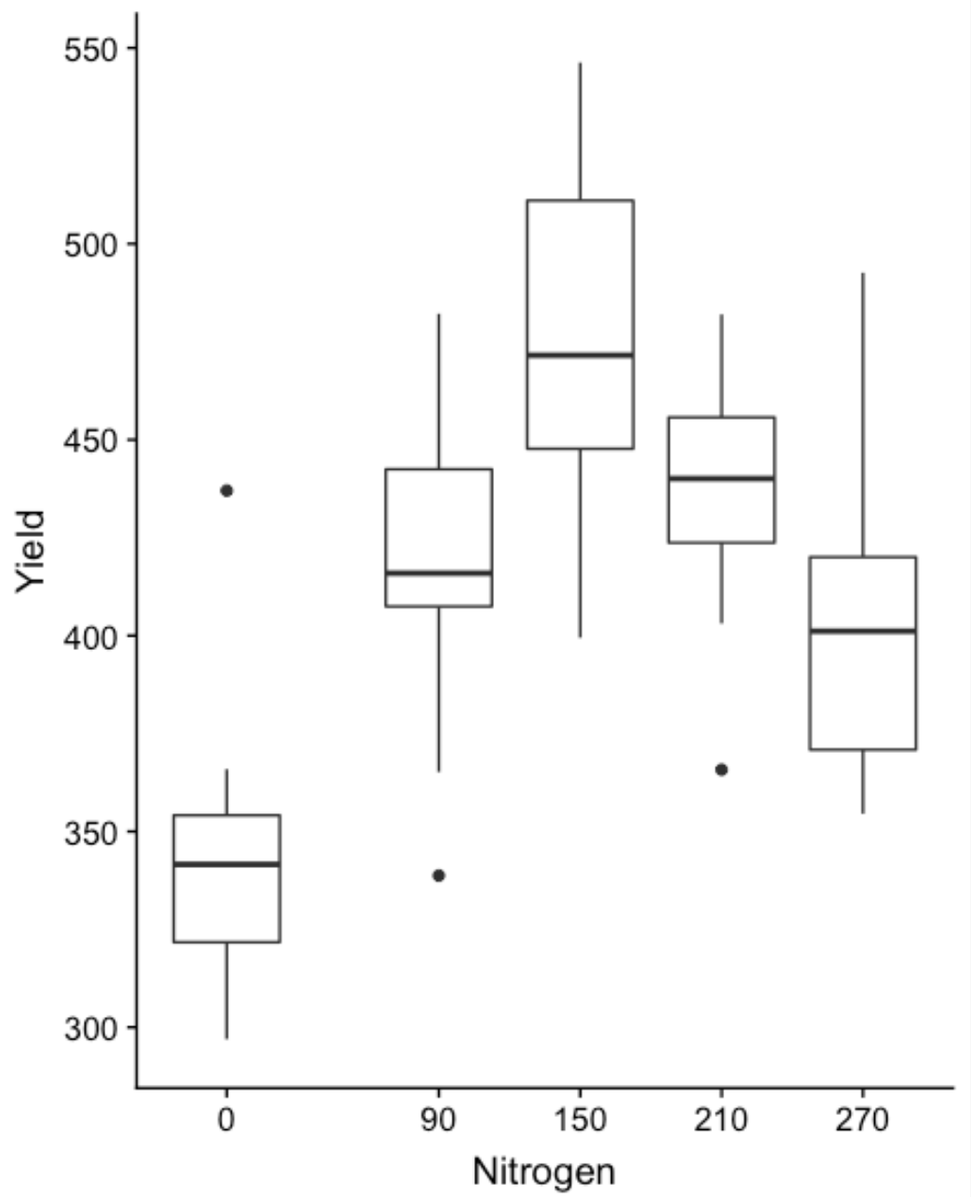
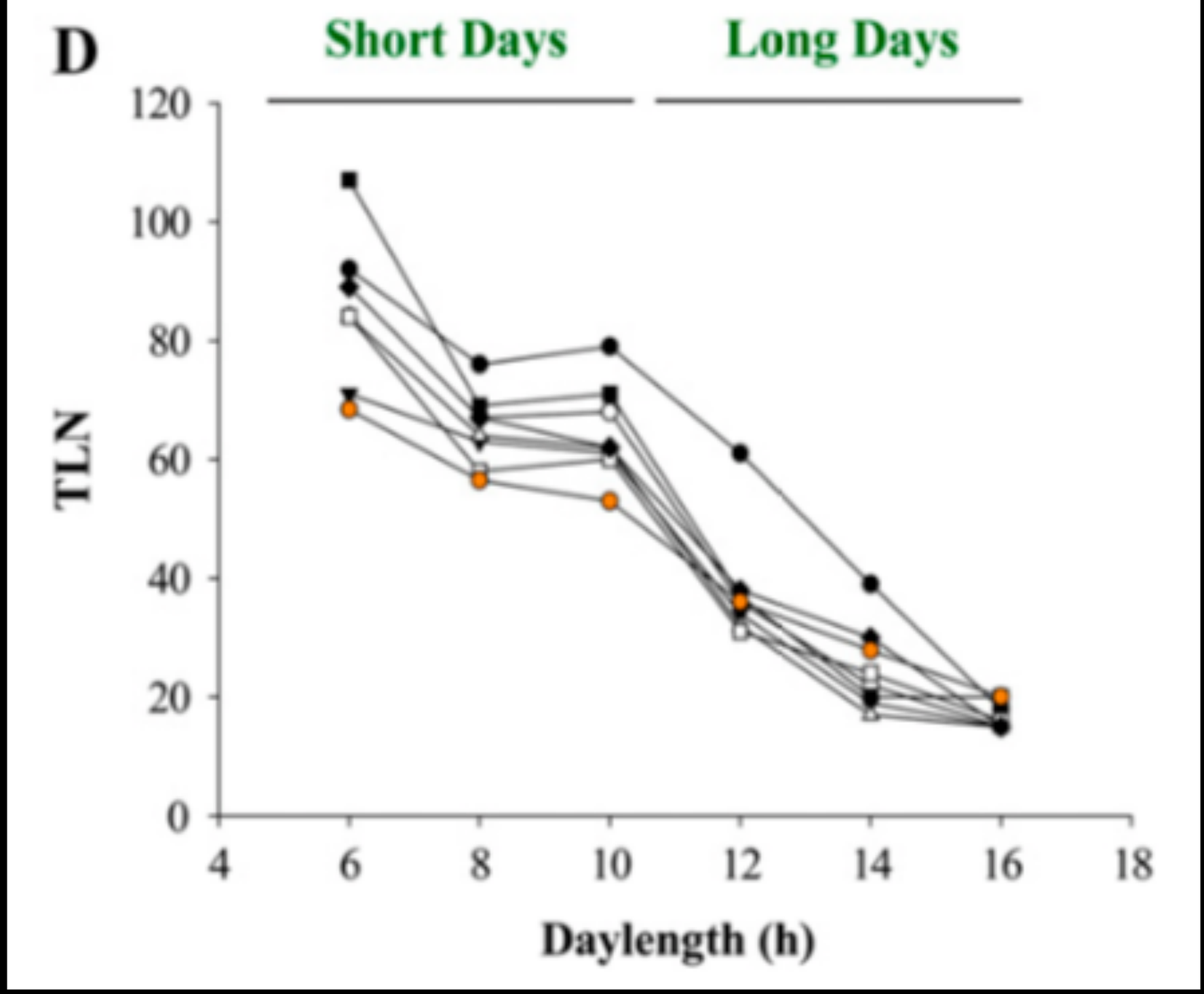
How were the +N treatments applied?




D
Short Days
Long Days
120
100
80
60
40
20
0
TLN
4
6
8
10
12
14
16
18
Daylength (h)