Mungbean Growth

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Mungbean Sprout Growth

Mungbeans were sprouted in 3 petri dishes at varying temperatures. The germination%, length, and weight were measured at 24 hour intervals for 5 days. With this data, we can determine if the temperature had an effect on the growth. We would also like to determine the ideal temperature of those tested. The source of the data was Islam et al. (2017).

Temperature & Light Conditions

The 3 temperatures that are being compared are 25°C, 30°C, and Ambient (ranging from 21°C - 31°C). Seeds were grown at constant temperature by placing them in a controlled incubator. Seeds were grown in darkness for this set of data.

Growing Medium

The seeds were grown in petri dishes, placed on a wet tissue used to keep them moist. There were 10 seeds per sample. Seeds were soaking in water for 12 hours prior to placing them in the dishes which was determined to be to optimal time.

Figure 1: Germenated Mungbean Seeds in Petri Dishes

Table 1: measured length & weight

| temp	duration	weight	germination	length	sproutwt	sproutdrywt
Ambient	24	0.63	98.0	3.310	1.28	0.46
Ambient	48	0.60	95.0	6.225	1.98	0.42
Ambient	72	0.64	97.5	15.710	3.98	0.42
Ambient	96	0.64	90.0	23.060	4.72	0.38
Ambient	120	0.61	99.0	26.150	4.98	0.41
25	24	0.58	95.0	2.793	1.13	0.44
25	48	0.59	97.5	5.993	1.93	0.41
25	72	0.56	92.5	12.680	3.96	0.39
25	96	0.54	100.0	20.700	4.85	0.41
25	120	0.53	100.0	25.020	5.26	0.42
30	24	0.56	97.5	1.740	2.45	0.53
30	48	0.58	95.0	7.075	2.48	0.47
30	72	0.59	90.0	11.090	2.93	0.45
30	96	0.58	90.0	23.540	3.98	0.40
30	120	0.58	97.5	22.550	4.14	0.41

```
## [1] "Summary of Data"

##       temp      duration      weight      germination      length
##   25     :5   Min.   : 24   Min.   :0.5300   Min.   : 90.00   Min.   : 1.740
##   30     :5   1st Qu.: 48   1st Qu.:0.5700   1st Qu.: 93.75   1st Qu.: 6.109
##   Ambient:5   Median : 72   Median :0.5800   Median : 97.50   Median :12.680
##               Mean   : 72   Mean   :0.5873   Mean   : 95.63   Mean   :13.842
##               3rd Qu.: 96   3rd Qu.:0.6050   3rd Qu.: 97.75   3rd Qu.:22.805
##               Max.   :120   Max.   :0.6400   Max.   :100.00   Max.   :26.150
##      sproutwt      sproutdrywt
##   Min.   :1.130   Min.   :0.380
##   1st Qu.:2.215   1st Qu.:0.410
##   Median :3.960   Median :0.420
##   Mean   :3.337   Mean   :0.428
##   3rd Qu.:4.430   3rd Qu.:0.445
##   Max.   :5.260   Max.   :0.530
```

Growth Plot

This graph seems to show that the Ambient temperature produced the longest sprouts. However, the study concluded that the change in length from 24 hours to 120 hours was greatest at 30°C. Since all were started from seeds, if maximum length was the desired outcome and 0 was your starting length, ambient growing conditions seem fine.

I would like to prove that the study was correct by showing the difference in length from 24 hours -> 120 hours and calculating the %percentage increase at each temp.

Plot of Length by Time
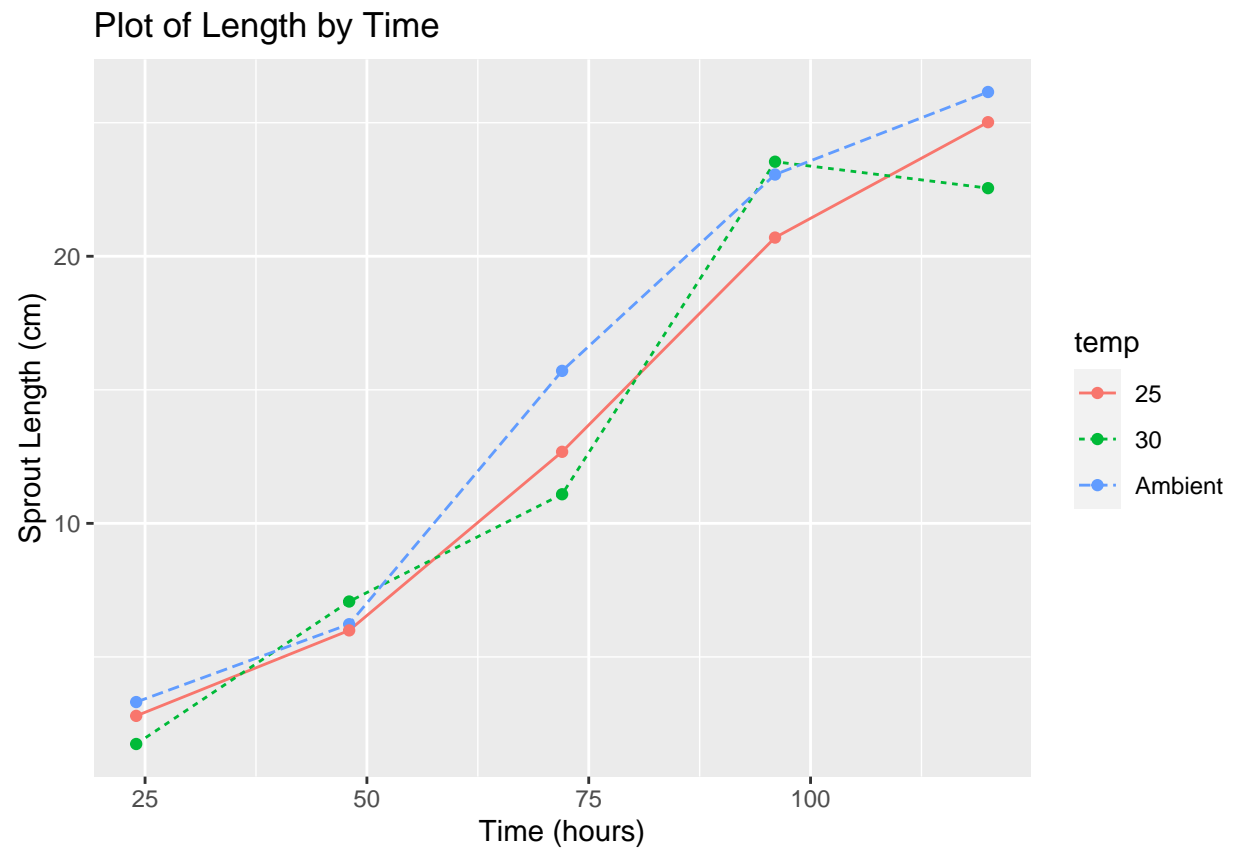
Weight Plot

This plot shows that the 25°C is the optimal temperature to achieve maximum weight. The starting weight was not equal. It may be necessary to scale these weights so see the a more accurate % increase at the 3 temps. The final weight for the samples grown at 25°C was the greatest but the initial starting weight was the lowest for that sample. This means the actual weight increase was more than shown on this plot, given equal weight samples.
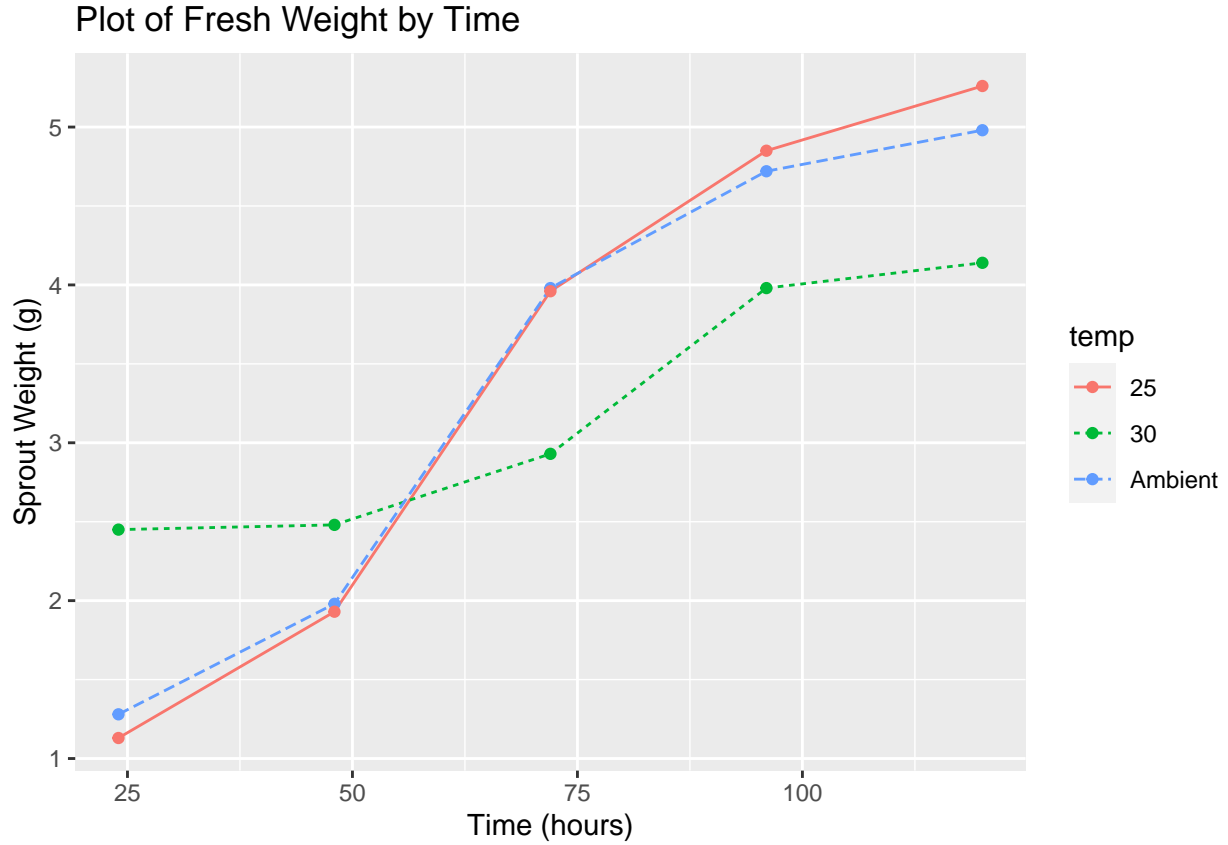
Plot of Fresh Weight by Time

Table 2: Lengths Compared at 3 Temps

duration	Ambient	25	30
24	3.310	2.793	1.740
48	6.225	5.993	7.075
72	15.710	12.680	11.090
96	23.060	20.700	23.540
120	26.150	25.020	22.550

At this point, I would like to perform a linear regression test to confirm that 25°C is the best temperature for growing these sprouts. I think the first step would be to normalize. I might be able to skip this step if it is not needed to perform the test.

Table 3: Normalized Data

duration	Ambient	25	30
24	-1.1532271	-1.1279693	-1.1952723
48	-0.8629536	-0.7888643	-0.6387859
72	0.0815554	-0.0802407	-0.2199868
96	0.8134627	0.7696413	1.0786553
120	1.1211626	1.2274331	0.9753898

References

Islam, Md, MK Hassan, SR Sarker, Anas Rahman, and Md. Solaiman Ali Fakir. 2017. "Light and Temperature Effects on Sprout Yield and Its Proximate Composition and Vitamin c Content in Lignosus and Mung Beans." *Journal of the Bangladesh Agricultural University* 15 (December): 248. https://doi.org/10.3329/jbau.v15i2.35070.