Student 1: Low Excellence

NZQA Intended for teacher use only

PRO GIBB FIELD TRIAL

AIM: The aim of my investigation is to find the optimum concentration of Pro Gibb required to maximise plant growth.

HYPOTHISIS: I think the higher the concentration of Pro Gibb the faster the plant growth.
The recommended rate of application for Pro Gibb is 20g/ha.

METHOD:
1) Preparing Stock Solutions – we made up 5L solutions of Pro Gibb for each concentration in a conical flask
Equipment required – 5L conical flask, 200mL beaker, pipette, funnel, measuring cylinder, 5L plastic container for storage, electronic scales
- First we measured the weights of solid Pro Gibb needed: 0.5g, 1g, 1.5g and 2g
- We then added that to distilled water in a 200mL beaker to make a solution we then added that to the 5L conical flask and filled it up to the line with distilled water to get an accurate concentration.
- Once 5L was accurately measured we added 5mL of country mile organ silicon.
- We poured this all into 5 litre containers for holding.
2) Preparing Plots
- We mowed a strip 2m wide by 14m long in a paddock of established grass and separated it into $1m^2$ blocks.
- We used 4 of these blocks for each concentration
- Using electric fence wire and standards we created a grid pattern
3) Application of Pro Gibb
- We took 40mL of each stock and diluted it with 1L of water for ease of application
- We applied the Pro Gibb using a rose sprayer
- The first four squares were left as a control with only water being added, while a 1m gap was left between each concentration to limit spray drift
4) Harvesting
- We cut the grass using an electric hedge trimmer, keeping the same length of grass for each sample
- We gathered up the grass using a leaf rake and put each sample in a labelled plastic bag.

Harvesting grass

5) Weighing and Drying
- We first weighed all samples to get their wet weight using electronic scales
- We then dried 5 samples using a microwave and calculated the % dry matter
- Next we calculated the average and used that to estimate the dry matter for the rest of the samples. (We did this because of the time required to dry all of the samples) also we eliminated outliers when calculating average.

RESULTS

| wet weight | sample 1 | sample 2 | sample 3 | sample 4 | average |
|---|---|---|---|---|---|
| no Pro Gibb | 488 | 319 | 555 | 536 | 474.5 |
| 0.001g | 630 | 490 | 476 | 481 | 519.25 |
| 0.002g | 484 | 546 | 578 | 644 | 563 |
| 0.003g | 349 | 559 | 383 | 400 | 422.75 |
| 0.004g | 686 | 527 | 635 | 548 | 599 |

| dry weight | sample 1 | sample 2 | sample 3 | sample 4 | average |
|---|---|---|---|---|---|
| no Pro Gibb | 106 | 64 | ~~208~~ | 104 | 91.33 |
| 0.001g | 134 | 105 | 102 | 103 | 111.00 |
| 0.002g | 103 | 116 | 123 | 137 | 119.75 |
| 0.003g | 83 | 119 | 82 | 85 | 92.25 |
| 0.004g | 146 | 112 | 135 | 117 | 127.50 |

(Eliminated no Pro Gibb sample 3 because it is an outlier)

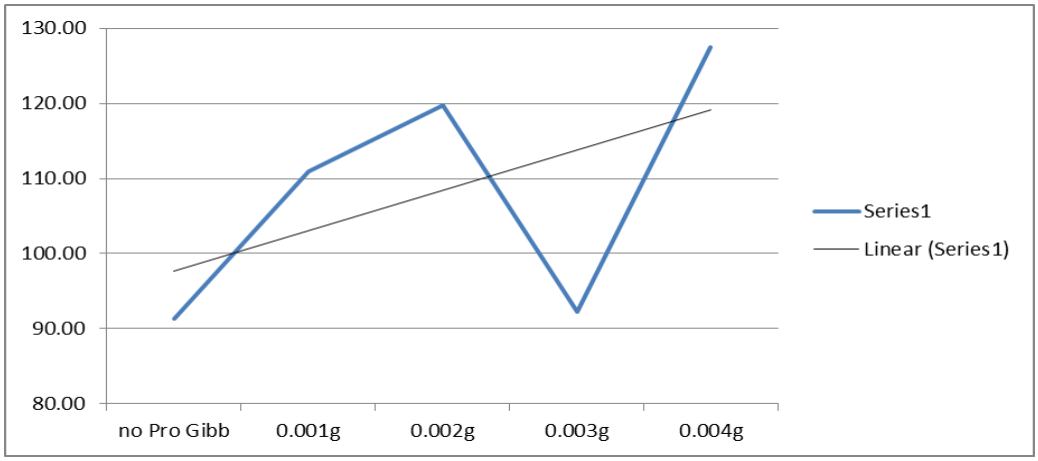
| % Dry matter | sample 1 | sample 2 | sample 3 | sample 4 |
|---|---|---|---|---|
| no Pro Gibb | 21.7 | 20.1 | 37.5 | 19.4 |
| 0.003g | 23.8 | | | |

Average % Dry matter $= \frac{21.7+20.1+37.5+19.4+23.8}{4}$

→ eliminate out liars

$= \frac{21.7+20.1+\cancel{37.5}+19.4+23.8}{4}$

= 21.25%




My graph shows that the average weight of dry matter is increasing as the rate of Pro Gibb applied rises with the exception of 0.003g which we see a large drop back to just above the control.

**Report**

I controlled variables and eliminated errors in the preparation of the stock solutions by using accurate chemistry equipment to measure volumes and by using distilled water instead of tap water I prevented any extra contaminants being sprayed on the trial area. By leaving a 1m gap between the samples of different concentrations in my grid I was able to limit spray drift witch would hinder my results, also applying the Pro Gibb on a calm day helped to prevent this. Using a hedge trimmer to cut the grass eliminates human era because if I was to use hedge clippers for example it would most likely result in an uneven cut giving me invalid data. By eliminating outliers in my data it made my calculations more accurate and helped to prevent eras. (1)

From my investigation it is clear that Pro Gibb (40% gibberellic acid) makes a significant difference in the dry matter production of grass. My data basically matched my hypothesis with the exception of the 0.003g/$m^2$ with the overall trend being as I had anticipated. The best rate of application I found to be 0.004g per metre squared of Pro Gibb. The recommended rate of 0.002g/$m^2$ is 6.1% less than this while the control is 28.4% less. However it is more economically viable to apply the recommended rate because the extra cost involved in doubling the rate (from 0.002g/$m^2$ to 0.004g/$m^2$) only results in a 6.4% increase in total dry matter per $m^2$ which is ultimately not worth it. I calculated that the average cost per kg of dry matter (extra from the control) for the recommended rate of 0.002g/$m^2$ to be 4.2c kg. While the rate double the recommended 0.004g/$m^2$ worked out to be 6.6c kg dry matter. (2)

Therefore the best rate to apply Pro Gibb at to get the best balance between price and quantity is 0.002g/$m^2$ so farmers wanting to maximise profit should use this rate. Because of this I agree with the recommended rate of 20g per hectare and if farmers want to get the best gains for a reasonable price they should apply Pro Gibb at this rate. (4)

Research that I did on Pro Gibb told me that when Dairy NZ ran a similar trial they found that the average amount of dry matter Pro Gibb produced was around 310kg/ha more than untreated grass, this backs up my trial as I found that the recommended rate of application grew 284kg/ha more than the control. The slight variation from Dairy NZ's results could be due to grass variety and growing conditions. Judging from this I think my data is reliable due to the likeness to the dairy NZ trial results. (3)