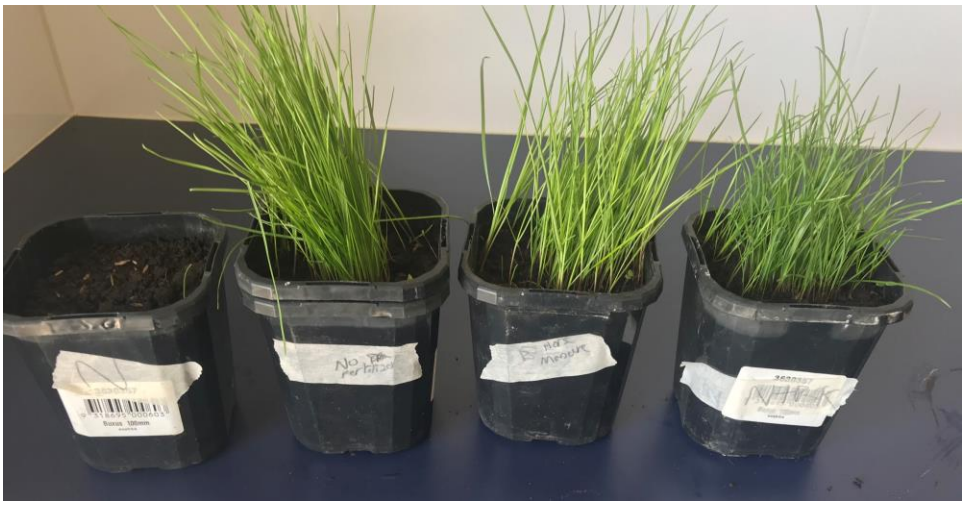
The grass is always greener

An investigation into how different fertilisers affect plant growth



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Content

1.0 Abstract

This experiment was based on the research question, “Does fertiliser affect plant growth?”. This research question was asked so it would be easier to identify what fertiliser helps with plant-growth, so farmers can then use that advice for when they need to grow grass on their property either for livestock or so they can grow crops.

To answer the research question four regular plant pots were filled with soil, then the fertiliser and grass seeds were added. For the next four weeks everyday (bar the weekends) the plants were watered with exactly 30 ml of water. After four weeks of grass growth from the grass seeds were harvested and their wet mass was weighed. Once the wet mass was weighed the were put in the microwave for thirty seconds intervals and were weighed until their wet mass stopped going down, so we could accurately measure their dry mass.

The grass grown with no fertiliser had the best yield, the NPK fertiliser has the second-best yield and the horse manure fertiliser had the third best yield. The urea grass did not grow at all; this is believed to have been caused by an accidental urea poisoning by adding too much urea to the plant pot area. The NPK fertiliser took longer to germinate but it had the second-best yield and although the grass was shorter it was a lot greener and thicker. It is believed that if given another week the grass planted in the NPK would have a greater dry mass.

Some recommendations for this experiment are, if you want grass to grow faster it is recommended to use no fertiliser, as its growth is stunted in the short term (4 weeks). If you want richer, thicker grass, especially for livestock, NPK would be the best option. If urea fertiliser is going to be used farmers need to make sure it is spread out over a large area and not too much is put into one area or it will cause a urea overdose, and will kill the grass.

2.0 Introduction

An experiment was carried out on grass growth. Different types of fertiliser were used on the grass seeds to see how they affect the germination rate, germination time and plant growth. This is an important topic for sheep, beef, dairy and cropping farmers because they all use fertiliser to grow grass and/or plants. Farmers typically use fertiliser to make the grass grow faster with more nutrients.

In Australia 57,300 agricultural businesses applied 5 million tonnes of fertilizer to 50 million hectares of land during 2016-17 (Reference 1) Urea is, and continues to be, the most applied fertiliser by tonnage used in 2016-17. A mass of 1.4 million tonnes were applied, with 21,800 agricultural businesses using it during 2016-17.

This experiment will help farmers make more calculated decisions about what sort of fertiliser works best. There are many different types of fertiliser that farmers use as well as fertilisers used by home and professional gardeners. In this experiment three variables of fertiliser and a control were used as growth media for grass seeds, to find out which is the most efficient and effective.

Horse manure with water mixture was used because this is a cheap and easy way to fertilise gardens. A lot of home gardeners with access to horse manure use this as an alternative to expensive fertiliser. A 16: 8: 13 blended mix of NPK was used. This was chosen because many farmers use this as it is easy to spread on large paddocks and it has important elements that benefits the soil and plants. Urea fertilizer was used because it is a common fertiliser farmers use with an important element, nitrogen, and that benefits the soils as well. Lastly, soil that was unfertilised was used as our control, because would be easy to compare with fertilised grass.

We wanted to do this experiment because we are interested in the different ways we can help improve the agricultural industry. It has always been a topic we have been interested in particularly since we both live on farms. While doing this experiment we have learnt a lot and have really enjoyed it.

3.0 Hypothesis & Variables

Aim: To determine the best fertiliser for pasture growth

Hypothesis:

If grass seeds are germinated and grown with a range of fertiliser and one unfertilized control, then the grass sends germinated in the fertiliser will germinate and grow the faster than the unfertilised control.

Variables

Independent variable: Type of fertiliser used

Dependent variable: Dry mass of grass produced

Controlled variables:

- Time the plants are in the soil for
- Volume of water used in irrigation
- Amount of grass seeds in pot
- Amount of fertiliser used
- Soil type used

4.0 Materials & Method

Materials

- Controlled soil variable
- Horse Manure fertiliser
- A 16.8.13.7 blended mix of N+P+K fertiliser
- Urea fertiliser
- Water for irrigation
- Grass seeds
- Planting pots
- 3 decimal scale
- Microwave
- Paper
- Beaker

Photos: Soil, Horse Manure, NPK, Urea

Method

1. Fill three quarters of the four pots with soil
2. Add one teaspoon of fertiliser variable (Horse Manure, Blended NPK, Urea fertilizer, no fertilizer)
3. Mix fertiliser through the soil medium
4. Plant one teaspoon of grass seeds in each growth medium
5. Add another one centimetre of soil above grass seeds
6. Water the grass with 40 ml of water
7. Each school day water grass seeds with 40 ml of water
8. Each week take a photo of the plants
9. After 4 weeks cut the grass at soil level
10. Weigh the wet mass of the grass
11. Put the grass on a piece of paper and microwave it for seconds
12. Weigh mass
13. Repeat top two steps until the mass stops going down
14. Record results

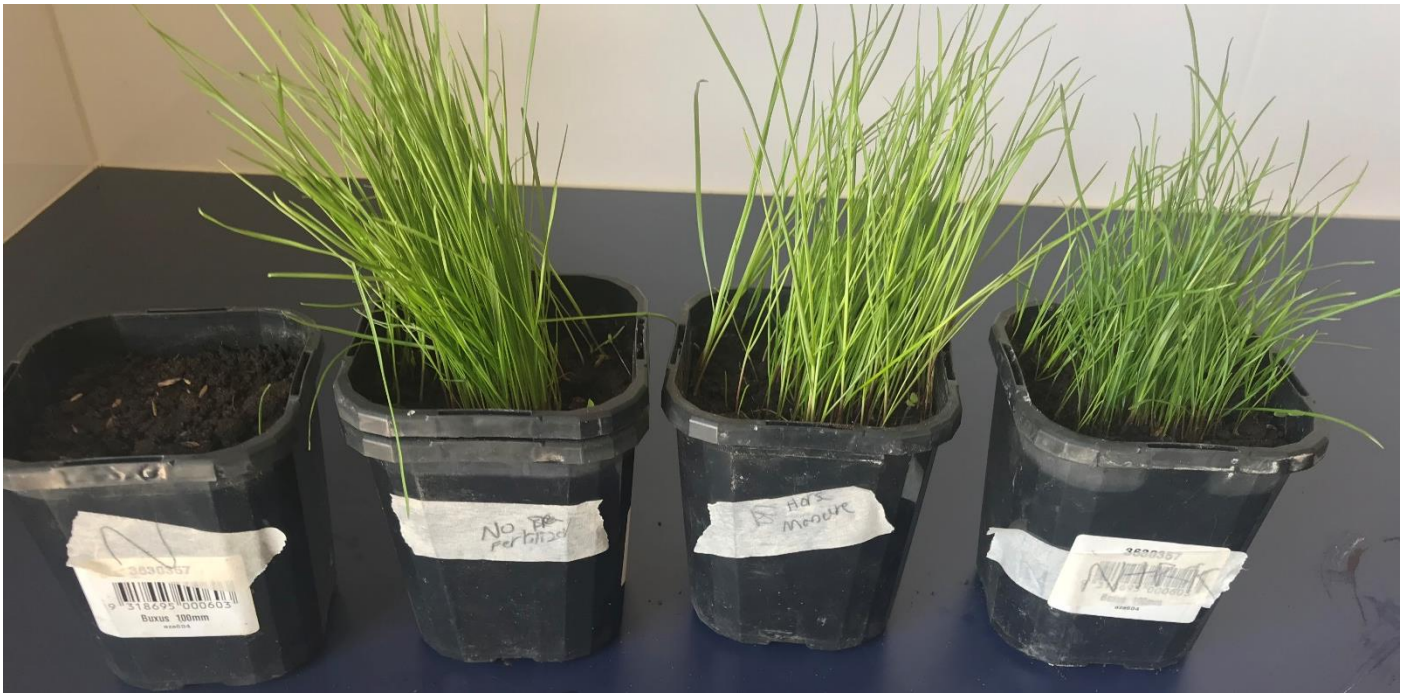
Recording the dry mass

5.0 Results

Week 1:

Week 2:

Week 3


No fertilizer
Horse Manure
Buxus 100mm

Week 4:

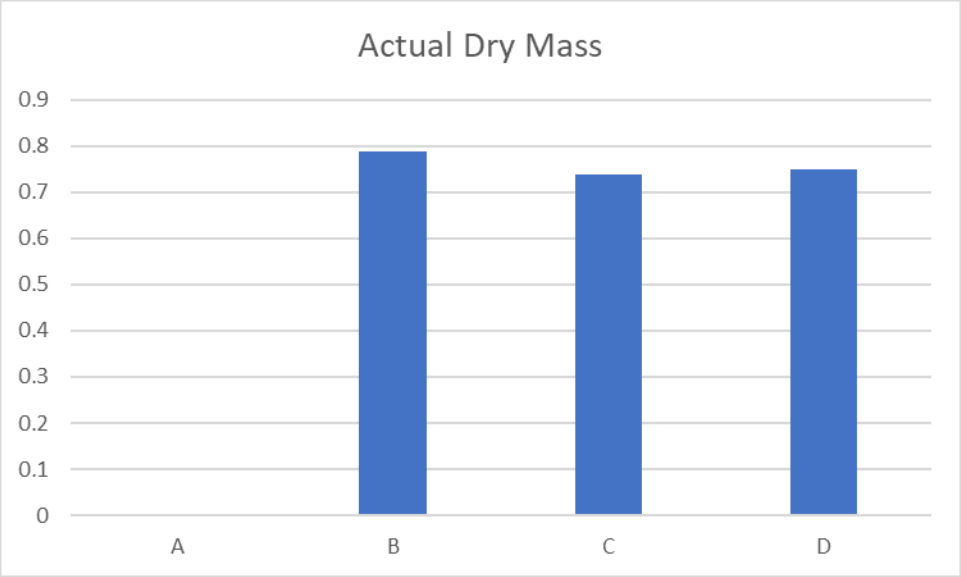

A
Urea
11/8
B
NONE
11/8
C
Horse
11/8
D
NPK
11/8

ANALYSIS:

Wet mass to dry mass (grams)

Variable	Fertiliser	Wet Mass	Dry Mass 1	Dry Mass 2	Dry Mass 3	Dry Mass 4	Dry mass	Dry Mass 6	Dry Mass 7	Dry Mass 8	Dry Mass 9	Dry Mass10	Dry Mass 11	Dry Mass 12
A	Urea	*												
B	None	5.901	4.785	3.829	2.741	1.733	1.298	1.026	0.894	0.804	0.792	0.791	0.787	0.788
C	Horse Mai	6.272	4.725	3.368	2.557	1.718	1.331	1.048	0.88	0.787	0.756	0.737	0.734	0.738
D	Npk	5.196	4.221	3.07	1.992	1.426	1.164	0.954	0.824	0.788	0.761	0.748	0.75	0.748

Variable	Fertiliser	Mass H_20 Removed
A	**Urea**	*
B	**None**	**5.901_g- 0.788_g = 5.113**
C	**Horse Manure**	**6.272_g – 0.738_g = 5.534**
D	**NPK**	**5.196_g – 0.748_g = 4.448**



<u>Conclusion</u>

Best Yield = No fertiliser

2nd Best= NPK

3rd Best = Horse manure

*The urea did not grow, this is believed to have been caused by an accidental urea overdose. There was too much urea in one small area which ended up poisoning the grass and killing it so it couldn't grow.

6.0 Discussion

The results from the experiment showed that the best grass yield was the grass with no fertiliser. The second best was the NPK fertiliser and the third best was the horse manure. This did not support the hypothesis. The grass with no fertilizer had a dry mass of 0.788g, although the grass did not have as much of a rich green colour as the grass with the fertiliser, indicating that the grass was not as rich with nutrients. The grass without fertilisers growth slowed down once it reached 3 weeks were as the grasses with the fertiliser continued to grow. The grass with the NPK fertiliser had the second-best yield, at a dry mass of 0.748. It had a rich green colour indicating that it was full of nutrients and energy and it continued to grow throughout the experiment. The horse manure had the 3rd largest yield. The horse manure had a dry matter of 0.738, it also had a rich green colour. The grass seeds with urea mixed into the soil did not germinate. It is believed to be caused from an accidental urea overdose. The urea was in too high concentration which poisoned the grass and killed it so the seeds could not germinate and grow.

The background knowledge does not support the results of the experiment. Our knowledge suggests that fertilised soil should result in the grass growing faster than the unfertilized soil. This has not happened in the experiment. It is believed that it is because of the amount of fertiliser used might have slowed down and in one case stopped because of fertilizer poisoning.

Background knowledge supports that the grass that has been fertilized is richer and a darker green. This was found in the results.

To improve the experiment research should be done into how much fertilizer is needed per an amount of soil. This would reduce the risk of fertilizer poisoning and ensure that the grass growth is boosted from the fertilizer. Another way to improve the experiment would be to have multiple pots of each fertilizer to average because it would make the results more dependable.

7.0 Conclusion

The hypothesis of if grass seeds are germinated and grown with a range of fertilizer and one unfertilised control, then the grass sends germinated in the fertilizer will germinate and grow the faster than the unfertilised control. Was incorrect the unfertilised control grew faster and had more dry mass than the grass seeds germinated in the fertiliser. In this experiment too much urea fertiliser was added to the grass seed pot, this poisoned the grass seeds so they were not able to grow which didn't give the most accurate results. If the urea didn't poison the grass seeds and it grew normally it would have most likely changed the results. Some recommendations for farmers is that if you want long grass quicky you don't need to use fertiliser but NPK grows slightly slower but is a lot richer and given another week would have most likely been heavier than the non-fertilised control, which can benefit the animals who would be eating it. There would be a need for further studies because of the urea poisoning and if the experiment were to be repeated, it would made sure there wouldn't be an urea poisoning which would help the results be more accurate.

8.0 References

Australian Bureau of statistics, 25 July 2020. Land Management and Farming in Australia, 2016-17. [Online] Available at: https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4627.0main%20features82016-17#:~:text=An%20estimated%2057%2C300%20agricultural%20businesses,used%20fertiliser%20in%202016%2D17. [Accessed 14 September 2020].

Fertilizer Australia, 2020. Fertilizer Industry - use trends. [Online] Available at: https://www.fertilizer.org.au/Fertilizer-Industry/Use-Trends [Accessed 14 September 2020].

9.0 Acknowledgements

We would like to thank the following people for the help and support they have given us throughout this project. Without them it wouldn't have been possible:

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- Mr. Glynn Williams, Glynn Williams Legal, Burnie, for acquiring us with resources needed for this experiment.
- Mr. Dave Field, Field Agriculture, Smithton, for giving us many of the resources needed for this experiment.

10.0 Risk Assessment

11.0 RISK ASSESSMENT for PRACTICAL INVESTIGATIONS BHP 2020

12.0

Practical Activity: a brief description of what is planned
Experiments:

13.0

What are the possible Risks?	
NPK, poisoning if digested, eye irritation if it gets in the eyes.	Medium risk
HORSE MANURE, poisoning if digested.	Low risk
UREA, skin irritation if stays on skin for too long, eye irritation if gets in eyes, poisoning if digested.	Medium Risk
Control Measures? Give details of how these risks will be managed.	
To prevent poisoning, we will keep fertilisers away from the mouth **To prevent skin irritation, PPE and gloves will be worn at all times** **To prevent eye irritation, glasses will be won at all times**	
Are there any activities that will require adult/ teacher supervision? **It was all done in STEM club so a teacher was present**	
Facilities and Services that will be needed to do this activity safely.	

Services	PPE	Safety Equipment
	Lab coat Eyewear	Gloves

14.0

Disposal of Wastes and Cleaning Up
Are any wastes or hazardous products produced in this activity? If so, how will they be disposed of? No hazardous waste were produced in this activity however there was leftover cow manure which was given to the year seven garden.

15.0

Risk Assessment indicates that this activity can be safely carried out. This Risk Assessment has been carried out and checked by the following:		
Student's Name (please print):: Nichola Williams	Signature: [redacted]	Date 22.9.2020
Teacher/ Supervisor Name (please print) **Ms Ann Burke**	Signature Ann B Burke	Date 22.9.2020
This Risk Assessment is due for review on (date): References for MSDS Information:		

16.0

17.0 April 09