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Lab group X

The name of the author is clearly indicated in the header.

Lab Report: The effect of phosphorus nutrition on the growth of corn, *Zea mays.*

A lab report has required sections. The introduction includes background information as well as a statement of the aim or a prediction.

Introduction

Phosphorus (P) is an important nutrient for all plants. It is one of the nine essential plant macronutrients and has important functions in energy carrying compounds ATP and ADP, nucleic acids and phospholipids (Raven et al, 2013).

This is the format to use for an in-text citation. You need to cite the sources of information you use.

Plants that do not get enough phosphorus turn dark green or purple, have stunted growth, and lose their oldest leaves (Raven et al, 2013, Table 29-2). In crop plants, insufficient P leads to a low yield (Russell 1989). Phosphorus is taken up from the soil by a plant's roots, so the level of P in the soil has a large influence on plant growth. Many Australian soils are very low in P, and so phosphorus is applied as superphosphate fertilizer (CSBP, 2001). In sandy soils, such as those near Perth, this is nearly always necessary.

The scientific name should be in *italics.*

This experiment examined the effect of adding P on the growth of corn (Zea mays). This is a common market garden crop grown in the Metro area. Our prediction was that adding P to the soil will increase the rate of growth and the harvest of corn grown in a local soil.

This makes a clear prediction for the experiment. Using it makes it easier to write a conclusion later

Methods

Soil was obtained from a market garden in Wanneroo. It was steam- sterilised and placed in 200mm pots, in which corn seeds were sown as described in Koenders (2009). P was applied, and the corn was grown and harvested, as described in Koenders (2009), with the exception that rates of fertiliser application in this

If you use methods that someone else devised, then cite their paper. Don't re-write the whole lot.

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This is a correct use of SI units...but there is a fullstop missing from the sentence!

experiment have been converted to the standard format of kilograms per hectare

$(kg.ha^{-1})$

The results are summarised in text, not just presented as a set of numbers.

Note how the table is referred to. It is not necessary to say "Table one shows that..."

Results

Addition of a higher level of P had a large effect on plant growth (Table 1).

Plants with no P were very short, produced few or no cobs (Table1) and in general

had a low yield. Plants with applied P had the same mean number of cobs per plant,

but differed greatly in the yield of grain. The differences in yield levels between 0

and 26 $kg.ha^{-1}$ was highly significant at (t=122.41, df = 18, p=0.05), as were those

between 0 and 39 $kg.ha^{-1}$ (t=146.8) and 26 and 29 $kg.ha^{-1}$ (t= 64.0).

The results of the statistical test are included - but not the calculations!

The table has a title that explains its contents.

Table 1. Effect of P application on plant size and yield of corn.

Level of Phosphorus applied $(kg.ha^{-1})$	Mean plant height (cm)	No of cobs/plant	Grain yield $(kg.ha^{-1})$
0	55	0.375	1345
26	157	1.5	2921
39	176	1.5	3259

Each column has a heading and gives the units in which the number are measured

The results section does not include raw data, only summary statistics (mean, standard deviation etc)

Puts the results in context of the experiment's aims and design, and other knowledge. See the list of specific items in the module's description of this section.

Discussion

It is very clear that addition of P to the soil increases plant growth and yield.

This result is consistent with the results of previous experiments that have shown

similar effects in many different species (Raven et al, 2013) and with the predictions

in this experiment.

The discussion does not repeat the results, but considers what they mean.

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Phosphorus has a number of important roles in the plant (Raven et al, 2013). Plants that are deficient in P cannot grow properly, as they are unable to transport energy in the form of ATP and ADP and so cellular metabolism is limited. they are also less able to produce new cell membranes, as these also contain a large amount of P in the form of phospholipids. In fact, it is quite possible that the mebranes degrade over time and the cells die (Campbell et al, 2012).

> The student should have cited a reference for this information!

P limited plants also lose their lower leaves, which is due to the translocation of P from these leaves into the tissues where P is required. One of the major places where P is needed is in the production of fruits and seeds, for new cell membrane and DNA production as well as the production and transfer of energy. In the current experiment the yield of corn seeds was much lower in plants with low P than where P was provided, due to this effect. However it is not possible to comment on the levels of P within the actual tissues as this was not measured.

> A shortcoming is identified and acknowledged, but not over-emphasised.

It appears that there was not much difference between the production of corn cobs between the two higher rates of P application. Corn plants only ever produce two cobs at a maximum, so the biggest difference was in the production of none in plants with no P added. It is also possible to say based on these results that the effect of P was on the number of kernels and their weight within each cob in the 26 kg.ha^{-1} and 39 kg.ha^{-1} plants.

> Only includes books and papers that you have referred to. Is not a bibliography!

References

Campbell et al (2012). Biology: An Australian Focus 7ed. French's Forest: Pearson
Education Australia

> This is not the correct format.
> All authors must be listed and in the order they are given on the paper/book cover.
> The title should be italicised.

Koenders, A. (2009) SCB1234 Biology Unit Handbook. Joondalup: Edith Cowan

University.

Raven, P.H., Evert, R.F., & Eichhorn, S.E. (2013). *Biology of Plants.* 8th ed. New

York, NY: W. H. Freeman & Assoc.

This reference is correct.

There is a reference missing here. Can you find the other missing one?

Appendix one: Calculation of t .

Example calculation of t values

This is where to put raw data and calculations when required.

Dataset 1: Yield and P rates of corn plants

P.rate	Yield
0	1349.314
0	1375.269
0	1348.651
0	1361.168
0	1292.773
0	1278.519
0	1307.385
0	1290.501
0	1308.491
0	1392.21
26	2917.99
26	2927.51
26	2922.52
26	2933.661
26	2940.431
26	2911.618
26	2925.5
26	2904.873
26	2924.086
26	2936.097

Notice how this is not a table- it's just the listing of the raw data.
The table created for the calculation of t are tables - they introduce new ideas to the raw data.

The student has shown how she worked out the mean.

Mean yield of group 1 (0 kg.ha) = 13304.281/10 = 1330

Variance group 1

$$s^2 = \frac{\sum(x_i - \overline{X})^2}{n-1}$$

$= ((1349 - 1330)^2 + (1375 - 1330)^2 + (1348 - 1330)^2 + ...) / 9 = 1575.584$

Mean group 2 (26 kg.ha) $= 2917 + 2927 + .../ 10 = 2924$

Variance group 2

$$s^2 = \frac{\sum(x_i - \overline{X})^2}{n-1}$$

$= ((2917.99 - 2924)^2 + (2927.51 - 2924)^2 + (2922.52 - 2924)^2 + ...) / 10-1$

$=119.984$

Calculate value of t

$$t = \frac{|\overline{x}_1 - \overline{x}_2|}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

The student has included the formula

$= (|1330-2924|) / \sqrt{(1575.58/10 + 119.984/10)}$

$= 1594/ \sqrt{169.58} = 1594/13.02$

$= 122.42$

While the student has calculated t she has missed something very important - she has not listed the critical value that she looked up on the statistical tables!