# Whey protein powder effects on soil quality | experiment

# Abstract

Whey protein has been shown to increase soil quality and water capacity. (Sharratt et al., 1959) This experiment was designed to determine whether pea plant samples would exhibit similar effects when treated with whey. The test reagent was diluted into two different treatments (lx and O. lx), and a control group was treated with distilled water. The plants were watered five days a week for the first week with 15 mL of distilled water. The next two weeks, the two treatments were nourished with 15 mL of the whey dilutions and the control with 15 mL of distilled water. At the end of the grow period, a Bradford Assay was performed to determine the overall protein concentration of the pea plants as it pertained to the fresh weight of the plant. The pea plant leaf samples (control, lx, and O. lx) had average fresh weights of 8. 00 mg, 21. 33 mg, and 92. 67 mg, respectively. Their average absorbance values in the spectrometer were as follows: 0. 159, 0. 111, and 0. 157, respectively. A one-way analysis of variance (ANOVA)was performed to determine the difference of the numbers in the three data sets. A p-value of around 0. 009 was achieved, leading to the acceptance of the null hypothesis. This means that whey protein had a no effect on plant height growth, fresh weight, or protein concentration.


## Introduction

Whey protein is used commercially as a supplement for athletes and active human beings who want to build protein. It is widely used by weight lifters and workout fiends in shakes and other types of drinks designed to increase performance in sports and workouts. It is a source of branched

amino acids that fuel muscles and stimulate the synthesis of proteins (Krissansen, 2007). In past experiments, it has been shown that whey protein is particularly successful in increasing overall protein content in plants. Sharratt, Peterson, and Calbert showed in their 1959 experiment that whey increased the quality of soil aggregation in the treatments. Good soil aggregation allows for a greater amount of water to enter at the surface of the soil as well as a bigger capacity for water in general, and also provides better aeration. (Sharratt et at, 1959) Their study showed that whey protein was particularly successful in treatment of bluegrass. This study reasoned that the increase in bluegrass yields and height were due in part to the fact that whey increased the level of nitrates in the soil, which are essential to plant growth. Nitrogen is an important component in plant growth as plants use it to make proteins. Plants get about 90% of their nitrogen in the nitrate form. (Crawford, 1995)

The question for this experiment was whether or not whey protein (as it appears in supplemental form for humans) would affect pea plant growth with respect to plant height, fresh weight, and protein concentration. In this study, there were two treatments of plant growth, and one control. Each treatment and the control consisted of four different pea plants, grown separately from one another. The treatments were as follows: 1X and O. lX. The 1X treatment contained the recommended dosage of whey protein powder for human consumption mixed with distilled water. The O. lX treatment was a dilution of the first treatment by a factor of ten. It was predicted that the first treatment (1X) would have too much protein powder and would inhibit plant growth, fresh weight, and protein concentration

(Sharratt et al., 1959). It was also predicted that the second treatment would show increased growth as compared to the control and the first treatment. The null hypothesis was that whey protein would have no effect on plant height growth, fresh weight, or protein concentration.

Methods

Stock solutions of the whey protein test reagent were first made in lx and O. lx concentrates. The lx concentrate was the normal amount of powder recommended for human consumption and the O. lx concentrate was a dilution of the original by a factor often. The pH of the lx solution was found to be 5. 97, and for the O. lx the pH was 5. 99. Each treatment and the control had a total of 4 pea plants, grown independently of one another. For the first week, all the subjects were watered daily with 15 mL of distilled water. For the second week, the lx and O. lx treatments were nourished daily with 15mL of their specific reagent. At the end of the grow period, the plant leaves were weighed for their fresh weight values. A Bradford Assay for total protein was performed next. A standard curve (Figure 1) was produced using known concentrations of bovine serum albumin (BSA)and Bradford reagent. The absorbances of these known concentrations were used to make the standard curve. When the absorbance of an unknown sample is calculated using a spectrometer, that value is plugged into the equation of the standard curve to give the protein concentration. A one-way analysis of variance (AN OVA) was performed with the protein concentrations of the treatments and the control.

Results/Conclusion

It was found through experimentation that the both the Ix and O. lx solutions were ineffective in aiding pea plant growth, fresh weight, and protein concentration. The cause of this is due to the fact that whey protein drink mix has many globular proteins that inhibit the pea plants ability to get the adequate nitrates it needs from the soil in order to successfully grow. The size of the whey mix proved to be too large for the pea plant seeds or roots to absorb it. The one-way ANOVA performed produced a p-value of 0. 0089; because this value is less than 0. 05, the null hypothesis can be accepted. Whey protein powder has no effect on plant growth with respect to height, fresh weight, and total protein.