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# Yield Performance And Quality Of Peashoot Microgreens From Seeds Soaked In Varied Concentrations Of $Cacl_2$ Utilizing Different Water Types.

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**Abstract**

Microgreens are small vegetables harvested at young age (7-14 days after planting) and are more nutritious than those harvested in mature stage. The aim of this study is to determine the impact of pre-soaked seed using different concentrations of $CaCl_2$ and watering using different types of water on the yield and quality of micro-green peashoots. This study used factorial randomised design of blocks with two factors. The first factor was the pre- soaked seeds with several concentrations of $CaCl_2$, three levels of 0, 0.5 and 1. The second factor is the difference in the type of water, which is made up of three types ( well water, mineral water and destilled water). The results showed that there was no significant interaction between the treatments on the yield and quality of the micro-greens. Separately, the treatment of pre-soaked seedusing some $CaCl_2$ concentration had a significant effect on the fresh weight per box and on the fresh weight of the shoots. Treatment with 0.5 percent $CaCl_2$ resulted in the best fresh weight per box (160.42 g) and the best weight per microgreen shoots (76.63 g). Microgreens soaked in mineral water had the highest weight of shoots (73.85 g) and the highest of ash content (3.59 mg). The results of the organoleptic test showed that the microgreen peashoot was relatively favored by consumers in terms of taste and color. Based on the results of this study, a pre-planting seed soaking treatment using a 0.5% $CaCl_2$ solution is recommended. Mineral water has good prospects for application in microgreen peashoot cultivation to produce good shoot weight and high fiber and mineral quality.

*Keyword : Peashoot Microgreens, Seeds Soaked, $CaCl_2$*

## Introduction

A microgreen is a small crop of vegetables that are harvested at a young age and are more nutritious than those that are harvested at a full maturity. (Rokhmah & Sapriliani, 2021). Unlike sprouts, microgreens have a longer growing period and are harvested in between 7 and 14 days old. The micro-green is harvested when the leaves, stems and roots of the plant are already present. Sprouts are usually grown in water, while microgreens are intentionally grown in a culture medium. Microgreens generally contain higher levels of nutrients such as ascorbic acid, phylloquinone, tocopherols, carotenoids, vitamins, minerals, and antioxidants than mature plants (Restiani, 2022). One of the most popular types of microgreen today are peashoot microgreen, which can be served fresh as an accompaniment to a salad, boiled or sauced, or as a filling for an omelet (Kong et al., 2018). This type of microgreen is also rich in phytochemical substances which may contribute to health by being rich in vitamins C, chlorophyll, carotenoids and phenols (Šamec et al., 2022).

One of the problems encountered in growing microgreen is the short shelf life and the risk of microbial attack during growth. Calcium chloride ($CaCl_2$) is an active substance which is widely used in pre- and post-harvest cultivation to increase the cell stiffness of plants in order to improve growth quality and durability. The use of CaCl2 is one of the ways of prolonging the life of plants (Stefani & Andayani, 2022) . Based on the research of (Singh et al., 2017), soaking seed for 12 hours with $CaCl_2$ solution could increase germination and vigor of the seed. Moreover, the use of $CaCl_2$ may also increase the activity of enzymes involved in the early plant formation process. In the meantime, the production of microgreen, which yield good yields and are maintained with high quality, also plays a very important role. Water plays a crucial role in micro-green growth, as it acts as a substrate for seed germination and early plant growth. The general health of the microgreen, the availability of nutrients and the absorption of minerals may all be affected by the type of water used. The mineral content, pH level and possible contaminants of different water sources - such as potable, mineral and distilled water - may affect the yield and quality of micro-greens.(Abbas et al., 2021).

The aim of this study is to determine the impact of soaking the pre-planted seeds with different concentrations of $CaCl_2$ and watering with different types of water on the yield and quality of the micro-green shoots.

**Materials and methods**

Research was conducted from January to March 2022 at a microgreen house of UNISMA Agriculture facultyin Malang, Indonesia. The following instruments were used in the study: analytical balance, furnace, mortar, mortar, spoon, platter, spiking rod, magnetic stirrer, erlenmeyer, bunsen, tripod, paper millimeter, measuring spoon and plastic cup The materials used in the study were: peashot seeds, CaCl2, mineral water, drinking water, distilled water, alcohol and aquades. The experimental design used in this study was a two-factor randomised block design. The first contributing factor was the soaking of peashoot seed prior to planting at different concentrations of 0, 0.5 and 1 percent $CaCl_2$. The second factor was various types of water used to irrigate and soak the seedlings, including well water, mineral water and destilate water.

Before sowing, the seeds were soaked for 12 hours in each type of water with a concentration of $CaCl_2$ according to the treatments. After soaking, the seeds were placed in a planting box which has been provided with a substrate of non-woven fabrics for planting. The seeds are placed in a neat row.

**Observations on crop yield and quality**

The observed variables encompass harvest yield and quality characteristics, including: fresh weight per box, dry weight per box, weight of fresh roots per box, dry weight of roots per box, fresh weight of shoots per box, dry weight of shoots per box, fresh weight of residual seeds per box, storage durability, and moisture content. The moisture content analysis (mg) was conducted by weighing 2 grammes of each sample and thereafter baking them for 48 hours at 80°C until a stable dry mass was achieved.

$$\text{Moisture content} : \frac{(W+W2)-W1}{W}\ x\ 100\ \%$$

Note: W = sample weight before drying (g)
W1 = weight (sample + cup) after drying
W2 = empty cup weight (g).

The quality assessing was done using the following methods ;

a. Total dissolved solids: weigh out 1 gram of the fresh ingredients, grind them to a smooth consistency and add 10 drops of distilled water. Then the liquid is taken by pipette and dropped onto a refractometer to obtain the total dissolved solids in degrees Celsius.

b. Chlorophyll Analysis

Chlorophyll analysis Chlorophyll analysis was performed with the aid of the SPAD (Soil Plant Analysis Development) tool. Observations were carried out by observing leaves and stems of plants with five samples attached to the SPAD sensor assembly. The results of the reading of the data by the SPAD are then converted into g/cm2 chlorophyll units. Observations were recorded during the harvest.

Chlorophyil is calculated by the formula :

$$Chl_i = \frac{117.1 \times SPAD_i}{148.84 - SPAD_i} (R^2 = 0.890)$$

- The ash content of the sample has been calculated by applying the formula:

$$\text{Content of 'ash (\%)} = \frac{Weight\ of\ cup\ and\ ashes - weight\ of\ cup}{Sample\ weight} \text{ x } 100\%$$

d. The concentration of acsorbic acid (vitamin C) is calculated by the formula :

$$\text{Formula} : \frac{(titer(ml)x\ 0{,}88\ mg\ x\ Dilution\ factor)}{Sample\ weight\ (g)}\ x\ 100$$

**Results and Discussion**

The variance analysis results revealed no significant interaction between pre-plant seed treatment with $CaCl_2$ soaking concentration and watering with different water types regarding crop yield variables (Figure 1). The application of $CaCl_2$ during seed soaking significantly affected both the total fresh weight per box and the fresh weight of the shoots, whereas water treatment also considerably influenced both parameters.

Nonetheless, it did not exert a substantial impact on the fresh weight of the roots or the weight of the leftover seeds.

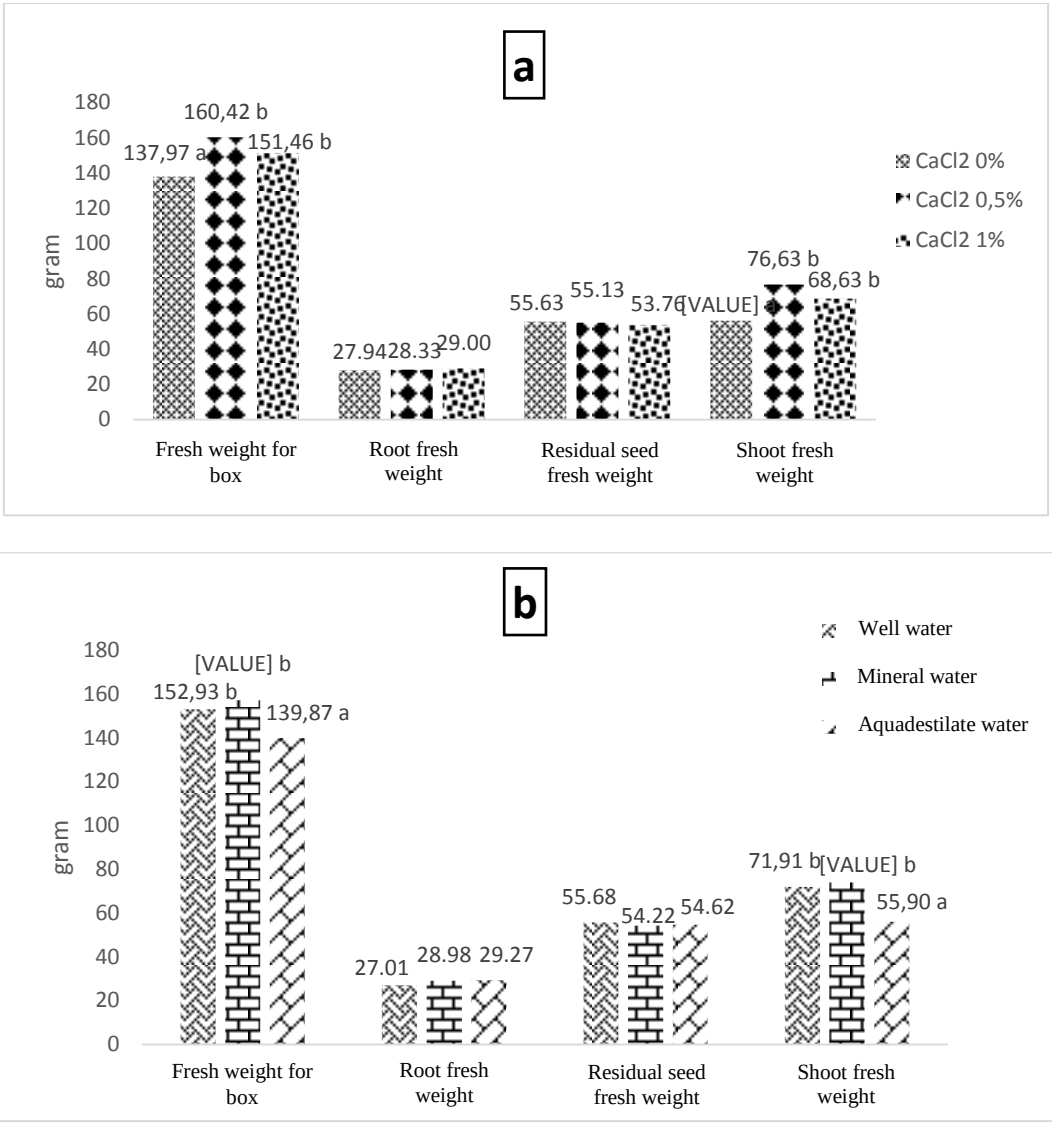


Figure 1. Average values of fresh weight per box, root fresh weight, residual seed weight and fresh weight of shoots in peashoot microgreen due to the treatment of the seed with CaCl2 (a) and water type (b)

Figure 1 shows that microgreen from seeds soaked with 0.5 and 1.0 percent $CaCl_2$ resulted the best fresh weight per box (160.42 g and 151.46 g) and the best fresh weight of shoot (76.63 g and 68.3 g), which differed significantly from the seeds soaked with 0% $CaCl_2$. The optimal total fresh weight values (157.05 and 152.93 g) and the better fresh weight values for shoots (73.85 and 71.91 g) showed significant differences compared to the microgreen fresh weight values related to the type of water sourced from the groundwater and wells treated with distilled water (139.87 g).

The data showed that soaking the seed with $CaCl_2$ may increase plant weight. Calcium chloride ($CaCl_2$) is an ionic compound made up of the elements calcium and chlorine. According to (Miao et al., 2020), calcium is also known as the respiratory control ion, because it may decrease the permeability of membranes to water. Calcium is considered to be a major mineral element that controls the quality of fruit and in particular the hardness of fruit (Wang et al., 2022). Meanwhile well water is better for potting up plants. Well water is ground water that contains phosphorous and lime. Well water is good to irrigate plants. Well water also has a high iron content. (De Bang et al., 2021).

The variance analysis of yield by dry weight per box, root dry weight, residual seed dry weight, and dry weight of shoots across treatments indicated no significant interaction between seed soaking treatment with CaCl2 at any concentration and watering with various water types. The separate application of water types significantly influenced the dry weight of the shoots (Figure 2).

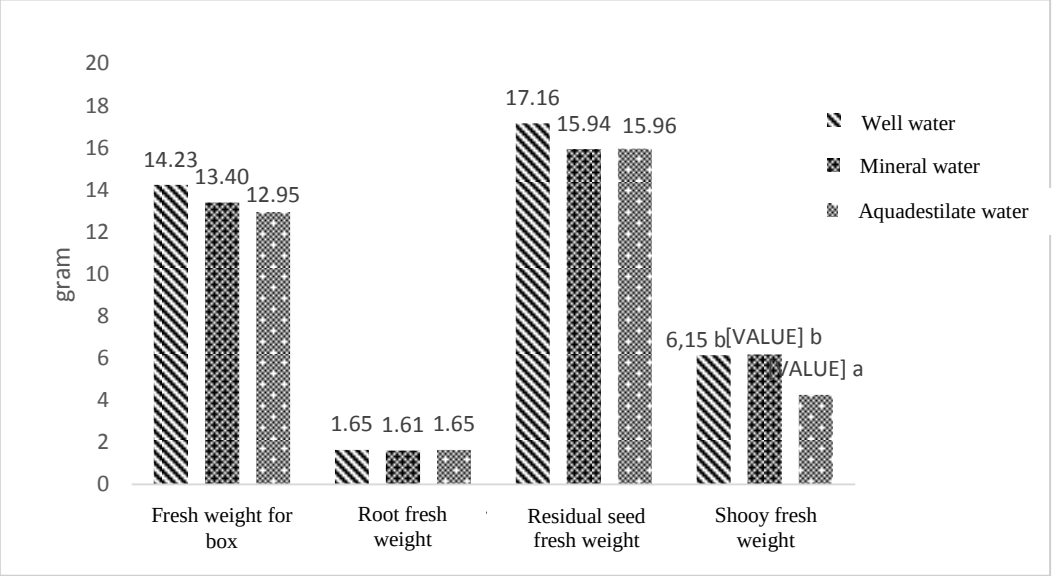


Figure 2. Average values of dry weight per box, root dry weight, residual seed dry weight and shoot dry weight in peashoot microgreen due to treatment with water type

In water treatment, the utilisation of mineral water and well water produced higher dry weights (6.17 g and 6.15 g), which were substantially different from the lowest value (4.26 g) obtained from distilled water. The enhanced growth of micro-green shoots is associated with a rise in fresh weight. Plant growth and development can be affected by factors such as nutrition, water, carbon dioxide, and climate. Plants require nutrients to promote growth and development. Nutrition can affect the primary, secondary, and

tertiary activation of enzymes. The availability of critical nutrients, comprising macronutrients and micronutrients, may affect plant growth.(Rika, 2022).

The moisture content variation and shelf life have no significant interaction between the treatment of pre-planted seeds with $CaCl_2$ concentration and the application of different water types, whether used in combination or separately (Figure 2 and 4)

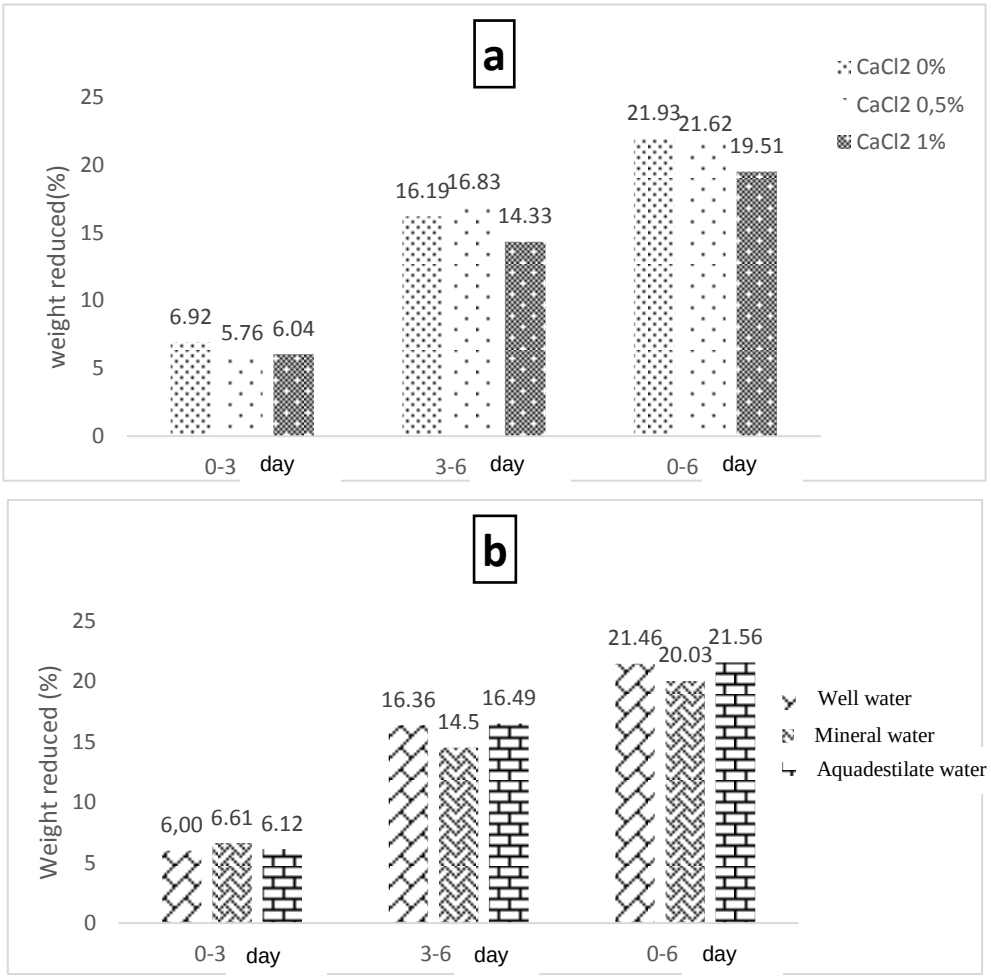


Figure 3. Average storage stability of micro-green peashoots as a result of pre-plantation seed soaking with CaCl2 concentration and water type

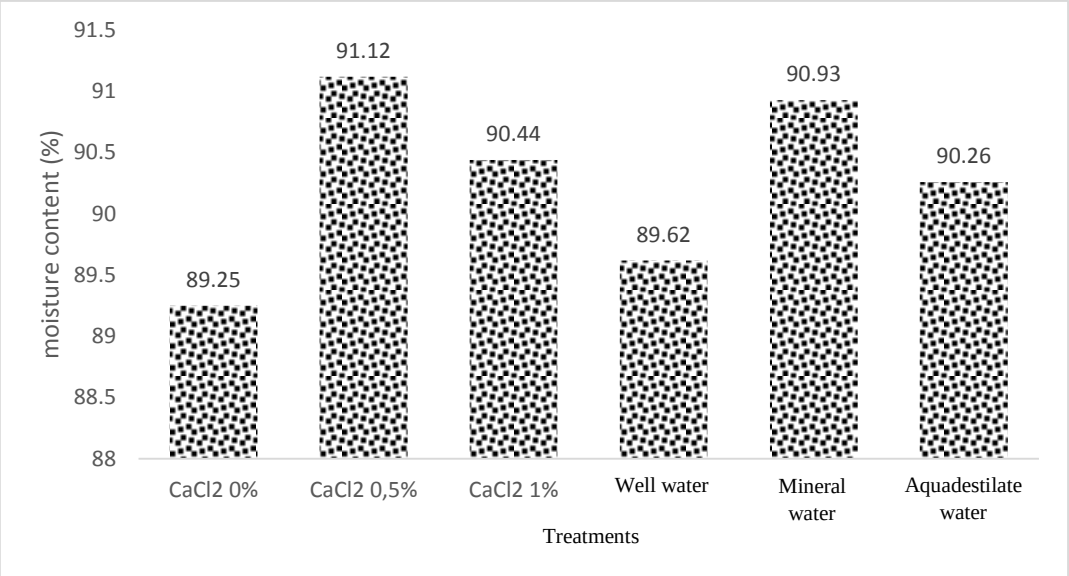


Figure 4. Average moisture content of micro-green peat resulting from pre-treatment with seed soak with CaCl2 concentration and water type

The application of $CaCl_2$ has been ineffective in microgreen shoots thus far. This is likely attributable to the insufficient concentration of the $CaCl_2$ solution to make significant effects on the micro-green shoots. The outcomes of this investigation align with the findings of Muslikah et al., (2022) study. The application of $CaCl_2$ at the time of pre-harvest had no significant impact on the tomato plant quality, which was due to the high rainfall.

The analysis of the variance for vitamin C and chlorophyll variables showed that the treatment of presoaked seeds with $CaCl_2$ concentrations and various types of water did not have any significant effects. Moreover, there was no substantial interaction between the two treatments.

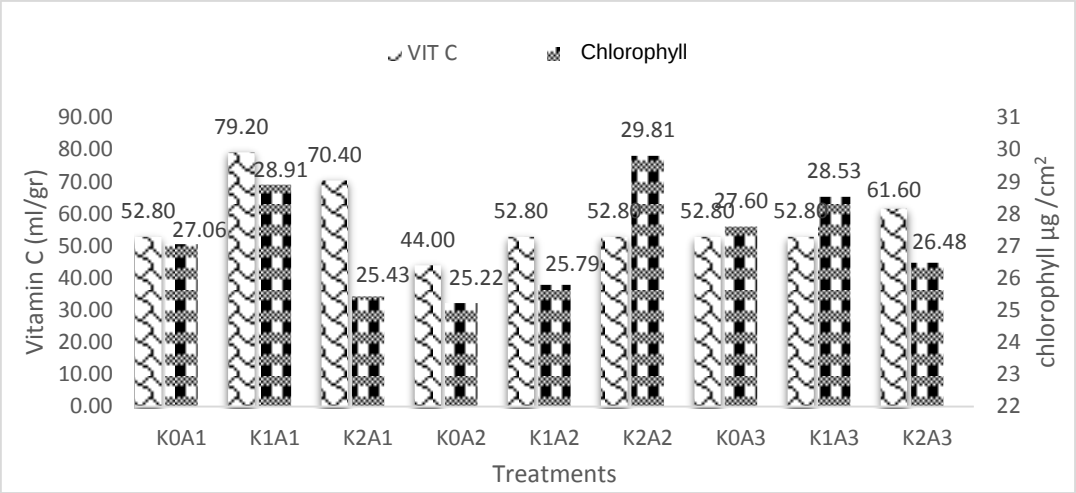


Figure 5. Average values of vitamin C and chlorophyll in the micro-green shoots due to pre-plantation seed soaking with CaCl2 concentration and water type

Results of an analysis of total soluble solid and ash content showed that there was no significant interaction between the treatment of the pre-plantation seed with $CaCl_2$ concentration and water of different types (Figure 6). In addition, water treatment of different types of water has had a significant impact on the ash content (Figure 7).

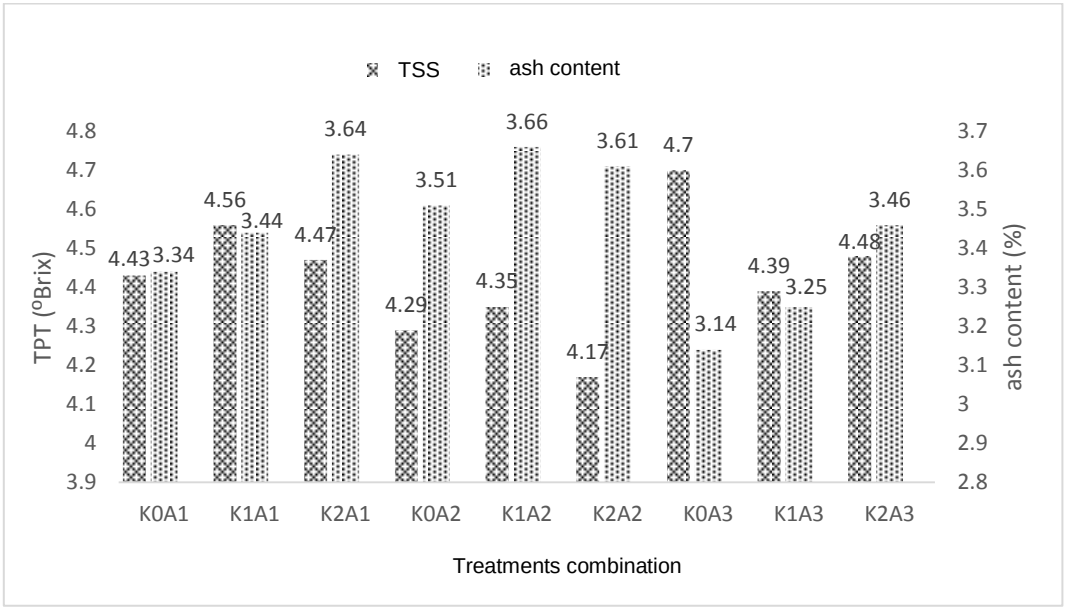


Figure 6. Average total soluble solid and ash content of peashoot microgreen as a result of pre-treatment of seedlings with $CaCl_2$ solution and water type

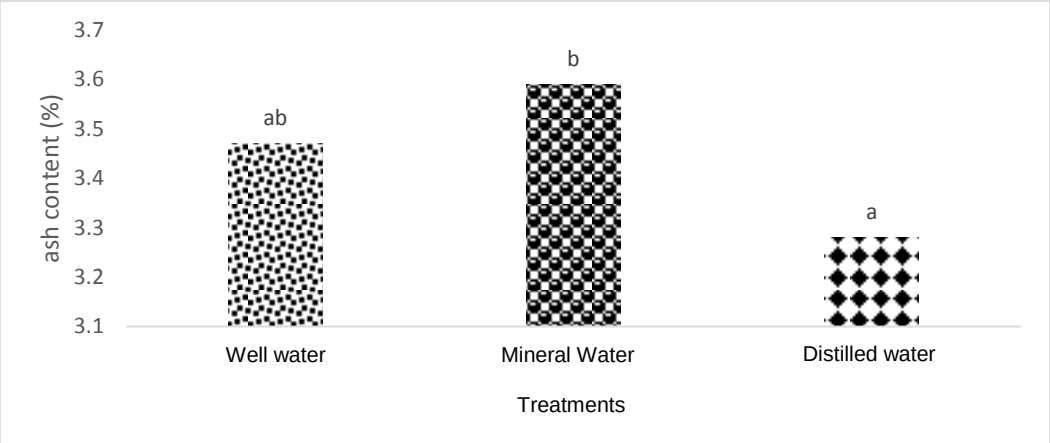


Figure 7. Average ash content of peashoot microgreen in water treatment of different water types.

The results of the 5 percent Duncan test (Figure 7) demonstrated that the treatment of different water types showed a significant disparity in ash level. The average ash percentage of microgreens watered with mineral water was higher at 3.59%, though not statistically distinct from the well water treatment, which exhibited an average ash level of 3.47%. The lowest result was observed utilising distilled water at 3.28%. This phenomena indicates that mineral water and well water are beneficial for cultivating microgreen. Mineral water is sourced from natural springs located underground and contains iron, salt, and sulphur. The ash content of the substance signifies the aggregate mineral content.

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## Conclusions

The pre-sown seed soaking treatment with a 0.5 percent CaCl2 concentration significantly influenced the yield of fresh weight per box, measuring 160.42 g, as well as the shoot fresh weight, which was 76.63 g. The method of water treatment significantly influenced the weight of the shoots. The microgreen irrigation with mineral water yielded the highest measurement of 6.17 g of dry matter per shoot. Concerning water quality, mineral water possesses the greatest ash concentration at 3.59 percent. This study's findings suggest that micro green shoots should be cultivated with a 0.5% CaCl2 dosage, utilising either mineral water or well water.

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