WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Effects of Soaking Sannabis Cuttings in Rhizotonic on the Growth and Yield of Super Glue Cannabis Strains on Hydroponic Cultivation

Rungrusemee Hasaen [a], Thanachai Punkasemsuk, Ph.D [a], Athitaya Kawe-AI, Ph.D [a], Rossakornpat Hirunyasiri [a].*

[a] Division of Cannabis and Medicinal Plants for Local Development, Graduate School, Payap University, Chiang Mai 50000, Thailand
Doi : https://doi.org/10.55248/gengpi.5.0924.2630

A B S T R A C T

This research aimed to study the effect of soaking cannabis cuttings in rhizotonic on the growth and yield of Superglue cannabis strains on deep water culture hydroponics by comparing the growth in various aspects between cannabis cutting that had been soaked in rhizotonic for 3 minutes and cannabis cutting that had not been soaked in the solution. The results of the research found that although the Randomized Complete Block Design - RCBD analysis showed that soaking the cuttings in rhizotonic had a statistically significant effect on the growth and yield of cannabis plants. On the other hand, the T-test analysis did not find any significant in all studied parameters. Nonetheless, cannabis plants that had been soaked in rhizotonic solution tended to have higher average values in all aspects, including root length, stem height, bush circumference, leaf size, inflorescence size, and fresh inflorescence weight. Further studies with larger sample sizes and longer experimental periods, as well as consideration of other factors that may affect cannabis growth and yield, should be conducted to find the most appropriate method to increase the yield of high-quality cannabis

Keywords: Cannabis Cutting, Rhizotonic, Superglue Strain cannbis, Hydroponic

1. Introduction

Cannabis is a plant with the scientific name *Cannabis* spp. in the Cannabaceae family. It has several common names such as cannabis, hemp, Indian hemp, ganja, marihuana, and marijuana. It is an annual herbaceous plant, typically dioecious (Thomas & ElSohly, 2016) (with male and female flowers on separate plants), although monoecious (with both male and female flowers on the same plant) can also be found. Originating in Asia, it has spread worldwide. The important chemical compounds in cannabis include cannabinoids such as Δ9-tetrahydrocannabinol (Δ9-THC), cannabidiol (CBD), cannabinol (CBN), cannabigerol (CBG), and terpenoids. Δ9-THC, which acts on the central nervous system, is found in high concentrations in female flowers. (Chandra et al., 2017) Today, cannabis is cultivated in tropical and temperate regions across all continents, with strains being developed for various uses, including fiber production and medicinal purposes (Woodbridge, 2019).

Cannabis seedlings can be propagated in two ways: seed germination and cutting. Cutting is an asexual reproduction method that produces seedlings genetically identical to the mother plant, ensuring genetic stability of selected strains. It is also a convenient and straightforward method. An important step in preparing cuttings for cannabis cultivation is the use of root stimulants to enhance root cell division and growth (Monder et al., 2020). In sustainable agriculture, reducing chemical use through environmentally friendly alternative products is a significant challenge. The use of biological root growth stimulants can be part of reducing risks associated with agricultural chemicals, as they are non-toxic, non-polluting, biodegradable, and safe (Loconsole et al., 2024). Rhizotonic is a commercial root growth stimulant made from seaweed extracts.

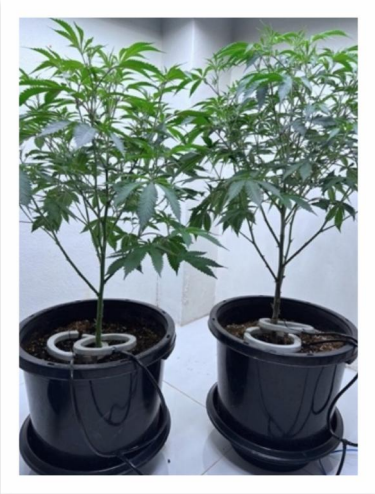
Currently, there are no studies on the use of this substance to improve the efficiency of cuttings from the Super Glue cannabis strain. Therefore, the researcher is conducting an independent study, hypothesizing that the use of the biological stimulant Rhizotonic in cannabis cuttings will improve root growth, increase root number and structure, and contribute to the growth and quality of cannabis plants. This research involves cultivating the Super Glue cannabis strain in a Deep Water Culture Hydroponic system.

2. Materials and Methods

2.1 Mother Plant

The Super Glue cannabis strain mother plants used in this research were obtained from Bodhi Farm in Lamphun Province. These plants were grown from seeds produced by Seed Genetic Co. in the Netherlands (Figure 1). The plants were grown in a hydroponic system in an indoor cultivation at

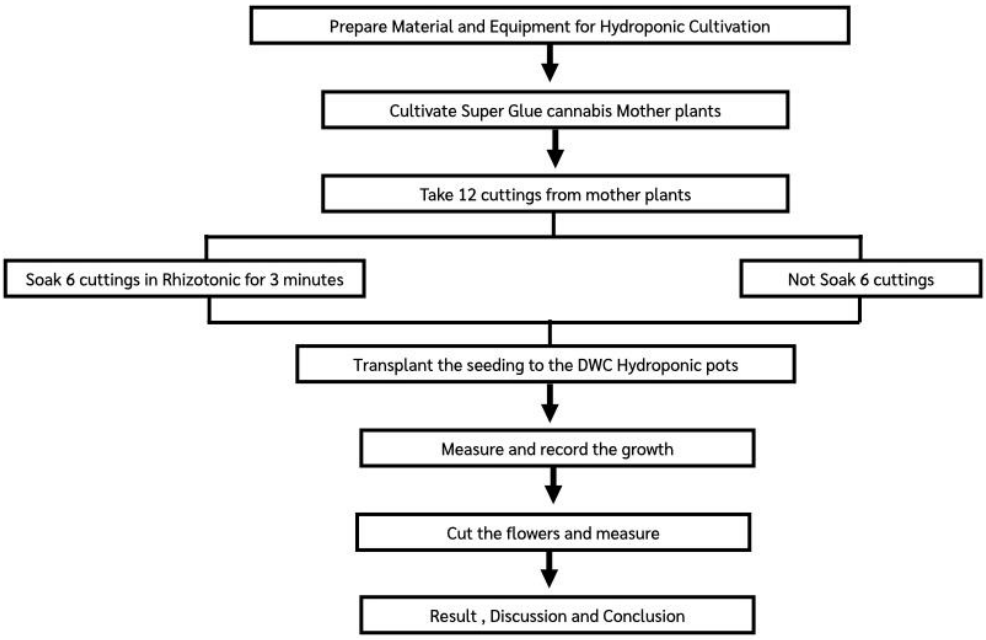
Bodhi Farm. They were exposed to 18 hours of light daily with an average light intensity of 600 µmol/m2/s at the leaf canopy using LED grow lights. Nutrient solution with an EC of 1.50 mS/cm was provided. On the day of cutting, the mother plant was 15 weeks old, and 12 cuttings were taken.



[**Figure 1**: Super Glue cannabis strain mother plant at Bodhi Farm]

2.2 Research Methodology

The research procedure is outlined in Figure 2. It began with cultivating the mother plant under optimal conditions as per Monder et al. (2020). Twelve cuttings were then taken and divided into two groups: six cuttings soaked in Rhizotonic solution and six control cuttings not soaked in Rhizotonic. The cuttings were cultivated, and their growth was measured weekly for 12 weeks, recording root development and stem height. They were then grown for an additional 4 weeks to measure fresh flower bud weight.



[**Figure 2**: Diagram of research methodology]

2.3 Optimizing Growth Factors for Cannabis Plants

Cannabis plants require different growth factors during various growth stages: seedling, vegetative, and flowering. Adjusting these factors to suit each growth stage is crucial (Thanee Srivongchai, 2022).

2.3.1 Nutrient Solution Concentration (EC Value)

This research used concentrated liquid nutrients mixed with Reverse Osmosis (RO) filtered water (pH 5.9, EC 0.02 mS/cm). The solution was mixed according to the manufacturer's recommendations and adjusted to achieve the desired EC values.

Table 1: Electrical Conductivity (EC) values of nutrient solutions for cannabis at different growth stages

Growth Stage	Nutrient EC (mS/CM)	Dominant Nutrients
Seeding	1.0	Nitrogen
Vegetative	1.2	Nitrogen
Flowering	1.4	Potassium, Phosphorus

2.3.2 Light Intensity and Duration

Light intensity was measured using the Photone app on an iPhone, recording Photosynthetic Photon Flux Density (PPFD).

Table 2: Light parameters for cannabis at different growth stages

Growth Stage	Light Intensity PPFD (µmol/m2/s)	Light Duration (hours)
Seeding	650	18
Vegetative	650	18
Flowering	1,200	12

2.3.3 Temperature and Relative Humidity Control

Temperature was controlled using three 18,000 BTU Saijo Denki air conditioners operating alternately. A 138-liter dehumidifier was used to control relative humidity.

Table 3: Temperature and relative humidity parameters for cannabis at different growth stages

Growth Stage	Temperature (°C)	Relative Humidity (%)
Seeding	Day: 24-26, Night: 18-20	< 60
Vegetative	Day: 24-26, Night: 18-20	< 60
Flowering	Day: 24-26, Night: 18-20	< 55

2.3.4 Carbon Dioxide (CO2) Control

The normal CO2 level in the grow room was about 400-450 ppm (Malík et al., 2021). To increase CO2 levels, a 60 kg compressed CO2 tank with a Modela automatic release system was used.

Table 4: CO2 levels for cannabis at different growth stages

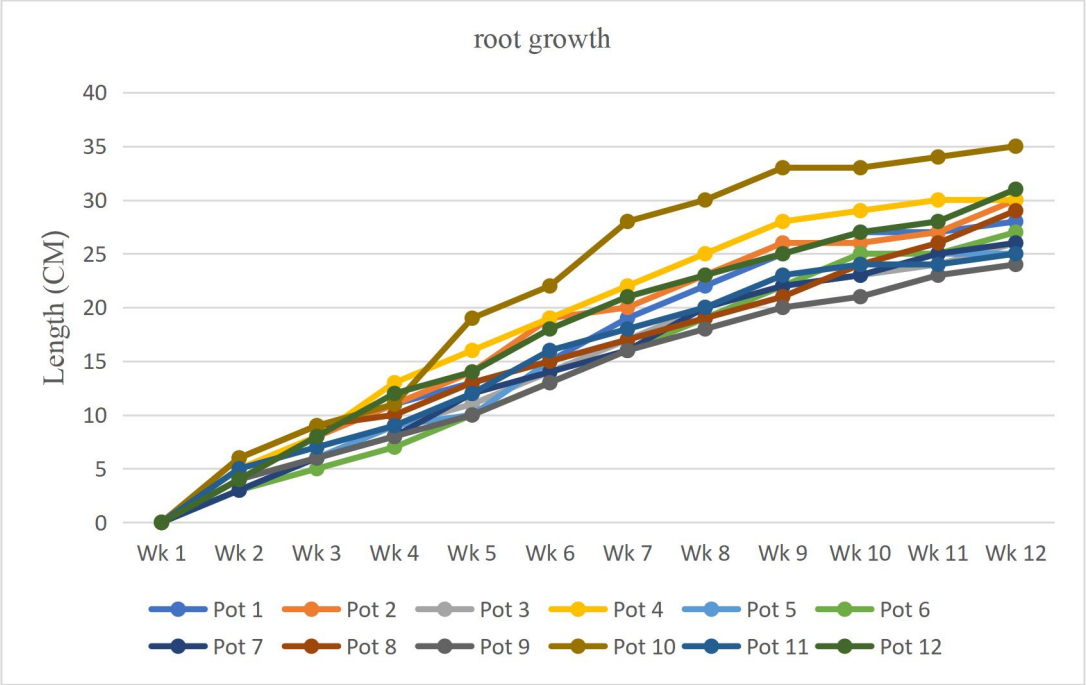
Growth Stage	CO2 Level During Light Period (ppm)	CO2 Level During Dark Period (ppm)
Seeding	800	500
Vegetative	800	500
Flowering	1000	500

2.4 Statistical Analysis

Data analysis was performed using statistical software. Independent-Samples T-tests and Randomized Complete Block Design (RCBD) analysis were used. Two treatments were compared: cuttings soaked in Rhizotonic for 3 minutes before planting and control cuttings.

3. Results and Discussion

3.1 Root Growth



[**Figure 3:** Graph showing root growth of Super Glue cannabis strain grown using deep water culture hydroponics]

Figure 3 shows the root growth of Super Glue cannabis strain grown using deep water culture hydroponics. Plants 1, 3, 5, 7, 9, and 11 are cuttings not soaked in Rhizotonic solution, while plants 2, 4, 6, 8, 10, and 12 are cuttings soaked in Rhizotonic for 3 minutes.

The Randomized Complete Block Design (RCBD) statistical analysis revealed that both the position and the Rhizotonic soaking of cannabis cuttings had a statistically significant effect on the root length of Super Glue cannabis strain. Details are shown in Table 5.

Table 5: RCBD statistical analysis of root growth

Dependent Variable: Root

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	80.333[a]	6	13.389	2.257	.195
Intercept	9408.000	1	9408.000	1585.618	.000
Treatment	65.333	1	65.333	11.011	.021
Block	15.000	5	3.000	.506	.764
Error	29.667	5	5.933		
Total	9518.000	12			
Corrected Total	110.000	11			

a. R Squared = .730 (Adjusted R Squared = .407)

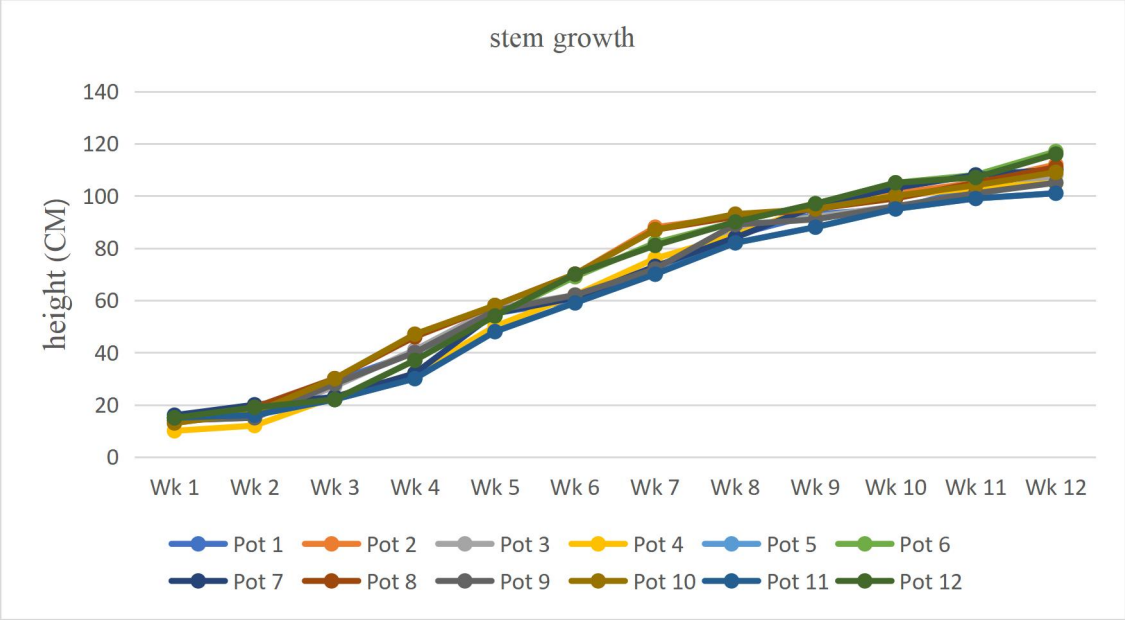
The T-test statistical analysis comparing root lengths of cuttings soaked in Rhizotonic versus those not soaked, measured after 12 weeks of cultivation, showed no statistically significant difference. Cannabis plants soaked in Rhizotonic solution had an average root length of 26.50±3.06 cm, while those not soaked had an average root length of 28.00±3.16 cm. Details are shown in Table 6.

Table 6: Comparison of root growth between Rhizotonic-soaked and non-soaked cuttings

Cannabis Plants	**Root Length (cm) [ns]**
Not soaked in Rhizotonic	26.50±3.06
Soaked in Rhizotonic	28.00±3.16

Note: The superscript 'ns' indicates no statistically significant (p<0.05) compared using Independent-Samples T-tests.

3.2 Stem Growth



[**Figure 4:** Graph showing stem growth of Super Glue cannabis strain grown using deep water culture hydroponics]

Figure 4 illustrates the stem growth of Super Glue cannabis strain grown using deep water culture hydroponics. Plants 1, 3, 5, 7, 9, and 11 are cuttings not soaked in Rhizotonic solution, while plants 2, 4, 6, 8, 10, and 12 are cuttings soaked in Rhizotonic for 3 minutes.

The RCBD statistical analysis showed that both the position and the Rhizotonic soaking of cannabis cuttings had a statistically significant effect on the stem growth of Super Glue cannabis strain. Details are shown in Table 7.

Table 7: RCBD statistical analysis of stem growth

Dependent Variable: Height

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	134.833[a]	6	22.472	.732	.646
Intercept	141918.750	1	141918.750	4625.272	.000
Treatment	102.083	1	102.083	3.327	.128
Block	32.750	5	6.550	.213	.942
Error	153.417	5	30.683		
Total	142207.000	12			
Corrected Total	288.250	11			

a. R Squared = .468 (Adjusted R Squared = -.171)

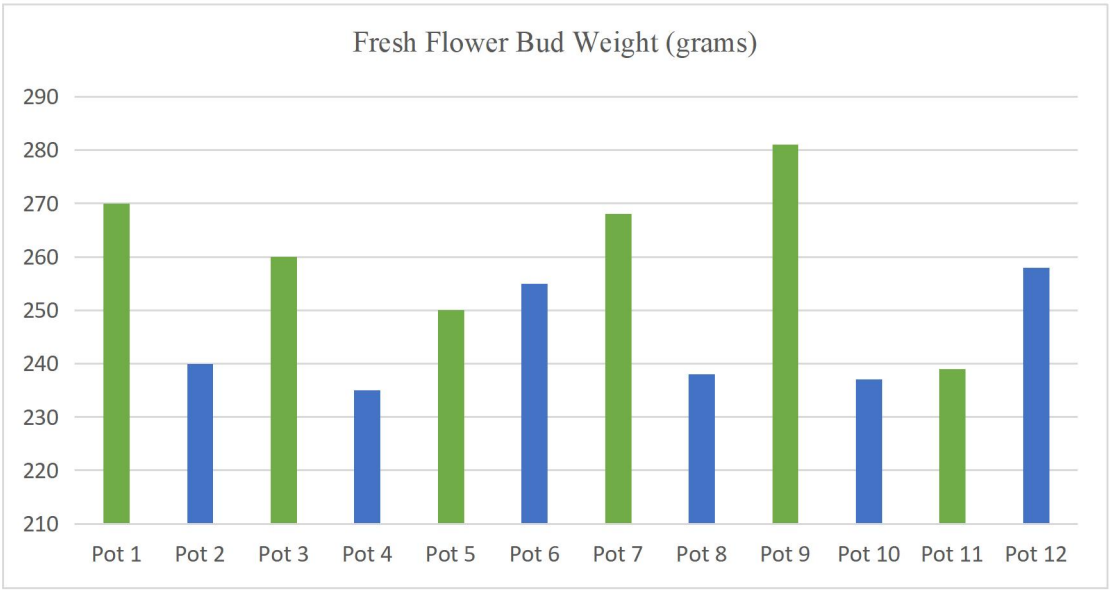
However, the T-test analysis found no statistically significant difference. Cannabis plants soaked in Rhizotonic solution had an average stem height of 111.67±4.46 cm, while those not soaked had an average stem height of 105.83±4.17 cm. Details are shown in Table 8.

Table 8: Comparison of stem growth between Rhizotonic-soaked and non-soaked cutting

Cannabis Plants	**Stem Height (cm) ^{ns}**
Not soaked in Rhizotonic	105.83±4.17
Soaked in Rhizotonic	111.67±4.46

Note: The superscript 'ns' indicates no statistically significant difference (p<0.05) compared using Independent-Samples T-tests.

3.3 Fresh Flower Bud Weight



[**Figure 5**: Graph showing fresh flower bud weight of Super Glue cannabis strain grown using deep water culture hydroponics]

Figure 5 shows the fresh flower bud weight of Super Glue cannabis strain grown using deep water culture hydroponics. Plants 1, 3, 5, 7, 9, and 11 are cuttings not soaked in Rhizotonic solution, while plants 2, 4, 6, 8, 10, and 12 are cuttings soaked in Rhizotonic for 3 minutes.

The RCBD statistical analysis revealed that soaking cannabis cuttings in Rhizotonic solution had a statistically significant effect on the fresh flower bud weight of Super Glue cannabis strain. Details are shown in Table 9.

Table 9: RCBD statistical analysis of fresh flower bud weight

Dependent Variable: Flower Net Weight

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	1098.167[a]	6	183.028	.629	.707
Intercept	765580.083	1	765580.083	2631.312	.000
Treatment	918.750	1	918.750	3.158	.136
Block	179.417	5	35.883	.123	.981
Error	1454.750	5	290.950		
Total	768133.000	12			
Corrected Total	2552.917	11			

a. R Squared = .430 (Adjusted R Squared = -.254)

The T-test analysis found no statistically significant difference. Cannabis plants soaked in Rhizotonic solution had an average fresh flower bud weight of 261.33±15.07 grams, while those not soaked had an average fresh flower bud weight of 243.83±9.99 grams. Details are shown in Table 10.

Table 10: Comparison of fresh flower bud weight between Rhizotonic-soaked and non-soaked cuttings

Cannabis Plants	**Fresh Flower Bud Weight (grams) [ns]**
Not soaked in Rhizotonic	243.83±9.99
Soaked in Rhizotonic	261.33±15.07

Note: The superscript 'ns' indicates no statistically significant difference ($p<0.05$) compared using Independent-Samples T-tests.

4. Conclusion

The research findings show that while the Randomized Complete Block Design (RCBD) analysis indicated that soaking cuttings in rhizotonic solution had a statistically significant effect on the growth and yield of cannabis plants, the T-test analysis revealed no significant differences across all studied parameters. However, cannabis plants treated with rhizotonic solution tended to show higher average values in root length, stem height, and fresh flower weight.

Cannabis plants treated with rhizotonic solution had average root lengths and stem heights of 28.00±3.16 and 111.67±4.46 centimeters, respectively. While untreated plants had average root lengths and stem heights of 26.50±3.06 and 105.83±4.17 centimeters, respectively. No statistically significant difference was found in these measurements. Regarding fresh flower weight, the treated group had an average of 261.33±15.07 grams, while the untreated group averaged 243.83±9.99 grams.

Further studies with larger sample sizes and longer experimental periods are recommended. Additionally, other factors that may influence cannabis growth and yield should be considered to determine the most suitable methods for increasing high-quality cannabis production in the future.

REFERENCE

Chandra, S., Lata, H., & ElSohly, M. A. (2017). Cannabis sativa L. - botany and biotechnology. In *Cannabis sativa L. - Botany and Biotechnology*. Springer International Publishing. https://doi.org/10.1007/978-3-319-54564-6

Loconsole, D., Scaltrito, E., Sdao, A. E., Cristiano, G., & De Lucia, B. (2024). Application of commercial seaweed extract-based biostimulants to enhance adventitious root formation in ornamental cutting propagation protocols: a review. *Frontiers in Horticulture*, *3*. https://doi.org/10.3389/fhort.2024.1371090

Malík, M., Velechovský, J., & Tlustoš, P. (2021). The overview of existing knowledge on medical cannabis plants growing. *Plant, Soil and Environment*, *67*(8), 425–442. https://doi.org/10.17221/96/2021-PSE

Monder, M. J., Niedzielski, M., & Wolinski, K. (2020). Effect of phenological stage and rooting enhancers on physiological parameters in stem cuttings in the process of rhizogenesis of rosa × alba 'maiden's blush.' *Agriculture (Switzerland)*, *10*(11), 1–18. https://doi.org/10.3390/agriculture10110572

Thanee Srivongchai (2022) *The Handbook of Cannabis Indoor Cultivation*. Department of Thailand Agriculture.

Thomas, B. F., & ElSohly, M. A. (2016). *The Analytical Chemistry of Cannabis: Quality Assessment, Assurance, and Regulation of Medicinal Marijuana and Cannabinoid Preparations*.

Woodbridge, M. (2019). The rational use of cannabis - based medicines. *Bedrocan International*, 53.