

## Use of Refused Tea as a Hydroponics Growing Medium for Lettuce (*Lactuca sativa*)

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### Introduction

Going through a process of withering, rolling, fermenting, drying and grading the finest black tea is collected whereas the left over brown tea is rejected as refused tea. The total annual tea production of the country is recorded as 326 million kilograms and 10 % of it is declared as 'Refuse Tea' (Sri Lanka Tea Board, 2012). But refused tea has more beneficial physical and chemical characteristics. Good aeration, good drainage and physical stability are some of those physical characteristics. Refused tea is also rich in important plant nutrients such as Nitrogen, Calcium and Potassium (Mohotti, 1999). Therefore, refused tea is used as a fertilizer, mulching material, dry litter material and a growing medium in mushroom production (Atapattu and Wickramasinghe, 2007; Rupasinghe and Nandasena, 2006; Dayananda and Wahundeniya, 2002). Refused tea is readily available in up country regions, where there is also a high potential for growing plants under hydroponics. Coir dust is the common growing medium used for hydroponics production in Sri Lanka and it is not abundantly available in up country areas. In this regard, refused tea would be an alternative hydroponics growing medium which can be used in up country area easily with low cost. Therefore, this research was conducted to assess the performances of refused tea as a hydroponics growing medium for lettuce (*Lactuca sativa*).

### Methodology

The study was conducted during May to July 2013 in a protected house at the university premises. Different combinations of two growing media (coir dust and refused tea) were tested under five treatment levels (Table 1) replicating each three times and arranging them according to the Complete Randomized Design.

Table 1. Treatment combinations

Treatment number	Treatment combinations
T1	Refused tea only
T2	Coir dust only
T3	Refused tea 1: coir dust1
T4	Refused tea 1: coir dust2
T5	Refused tea 2: coir dust1

Lettuce variety, Grand Rapids was used to assess the performances of the different combinations of two growing media. The nursery was laid in a nursery plate using commercially available, well washed, sterilized and wetted coir dust. The nursery was maintained for three weeks. Disposed cups were sterilized well and several holes were made at the bottom half of each cup and they were filled with different growing media according to the treatment combinations appeared in Table 1. Vigorously grown healthy plants obtained from the nursery were transplanted into those cups. Then plants were kept under non circulating, root dipping method of hydroponics using Styrofoam boxes. Interior of the Styrofoam boxes were covered using black polythene and five planting holes were made on each lid of those boxes. Then five transplanted cups were placed in those five holes. One box having five plants was considered as one replicate and altogether there were fifteen such boxes. Commercially available Albert's nutrient mix was used to nourish the plants. Nutrient solutions having required concentrations were applied to all plants depending on the growth stage of lettuce.

Finally, growth and yield parameters of lettuce grown under different treatment combinations were assessed. Total number of leaves, plant height, leaf area and fresh weight of fifth leaf, fresh weights of shoot and root of the plants at harvest were statistically assessed using ANOVA.

### Results and Discussion

According to the Table 2, there are significant differences ( $p < 0.05$ ) among the treatments for total number of leaves, area and fresh weight of fifth leaf. The highest total number of leaves has been produced T4 and lowest by T1 and T3. The highest fresh leaf weight has given by T4 and lowest by T5. The highest leaf area is with T4 and lowest is with T1. However, the leaf area and the total number of leaves at harvest affect the overall appearance of the plant.

Table 2. Yield parameters of the plants in different treatment combinations

Treatment	Total number of leaves	Area of 5 <sup>th</sup> leaf (cm <sup>2</sup> )	Weight of 5 <sup>th</sup> leaf (g)
T1	9.33 <sup>b</sup>	168.17 <sup>b</sup>	3.95 <sup>b</sup>
T2	10.33 <sup>ab</sup>	187.83 <sup>b</sup>	6.77 <sup>ab</sup>
T3	9.33 <sup>b</sup>	176.83 <sup>b</sup>	4.53 <sup>ab</sup>
T4	11.33 <sup>a</sup>	230.5 <sup>a</sup>	8.20 <sup>a</sup>
T5	10.00 <sup>ab</sup>	179.08 <sup>b</sup>	3.65 <sup>b</sup>
P value	0.026	0.001	0.010

Tables 3 reveals that, the plant height at maturity and fresh weights of shoot and root in five treatments, have become statistically non-significant ( $p > 0.05$ ), proving that all growing media (including refused tea only) have performed more or less equally at the development of both shoot and root systems.

Table 3. Shoot and root development in different treatment combinations.

Treatment	Plant height (cm)	Fresh shoot weight (g)	Fresh root weight (g)
T1	31.77 <sup>a</sup>	37.26 <sup>a</sup>	11.67 <sup>a</sup>
T2	29.20 <sup>a</sup>	45.28 <sup>a</sup>	19.70 <sup>a</sup>
T3	31.77 <sup>a</sup>	38.81 <sup>a</sup>	10.51 <sup>a</sup>
T4	31.27 <sup>a</sup>	46.50 <sup>a</sup>	12.33 <sup>a</sup>
T5	30.50 <sup>a</sup>	43.75 <sup>a</sup>	12.86 <sup>a</sup>
p value	0.858	0.5333	0.117

### Conclusion

The results of this study reveal that, refused tea can be used as an alternative hydroponics growing medium for lettuce. Further, mixing refused tea with commercially available coir dust (1:2 ratio) will produce better quality lettuce rather than coir dust only medium under hydroponics.

### References

Atapattu, N.S.B.M., Wickramasinghe, K.P., 2007. The use of refused tea as litter material for broiler chickens, *Poultry Science* 86, 968–972.

Dayananda, M.A.I., Wahundeniya, W.M.K.B., 2002. Effect of different hydroponic systems and media on growth of lettuce (*Lactuca sativa*) under protected agriculture, Proceedings of 2<sup>nd</sup> Agricultural Research Symposium, 4<sup>th</sup> June 2002, 151-158.

Mohotti, K.M., 1999. Bio management of tea nematodes, Proceedings of the 1999. Experiment and extension programme, Tea Research Institute of Sri Lanka. Thalawekelle, 16-30.

Rupasinghe, K.H., Nandasena, K.A., 2006. Potential exploitation of refuse tea as an alternative medium in mushroom cultivation, Eighteenth Annual Congress of the PGIA, 16-17, Nov 2006.

Sri Lanka Tea Board. 2012. Annual Report, Sri Lanka Tea Board.