

EFFECT OF ONION AND GARLIC PEEL MIX FERTILIZER ON GROWTH AND YIELD OF LETTUCE (*Lactuca sativa*)

J.R.J. Roshini¹, M. Anusiya¹ and M.A.P. Mayakaduwa²

¹Department of Biosystems Technology, Faculty of Technology,
University of Jaffna, Sri Lanka

²Agriculture Research Station, Seetha Eliya,
Sri Lanka

jenniregi09@gmail.com

ABSTRACT: *The study was carried out at Agriculture research station, Seetha Eliya, from February to May 2022 to find the effect of red onion peel and garlic peel fertilizer mixture on the growth and yield performance of lettuce. The pot experiment was laid out in a completely randomized design with nine treatment and four replicates. Powder forms of onion and garlic peel fertilizer were used in the 1:1 weight ratio. Nine different powder mixture; T1 (control) – only ½ recommended compost, T2 – ½ recommended compost + 2g powder, T3- ½ recommended compost + 4g powder, T4 – ½ recommended compost + 6g powder, T5 – ½ recommended compost + 8g powder, T6 – only 2g powder, T7 – only 4g powder, T8 – only 6g powder, T9 – only 8g powder were used. Powder form was applied as basal and after 1st and 3rd weeks from transplanting. Plant growth parameters; leaf length, width, plant height, number of plant and yield were measured. Data were analyzed in ANOVA one way method using Minitab software. Among all nine treatments, T2 was showed significantly better fresh weight (324.79±14.03) and number of leaves (24.00±1.00) than others. T3, T4, T5 were showed good growth and yield performance. Therefore, onion garlic peel fertilizer improved lettuce yield. The use of organic onion garlic peel fertilizer mixture used as a plant growth booster is inexpensive, environmentally safe, and low-cost technology to improve the yields of small farmers.*

Keywords: Lettuce, Onion and Garlic Peel Fertilizer

1. INTRODUCTION

Lettuce (*Lactuca sativa*) is a one of the most widely grown salad crops in the world under the family of Asteraceae. Soil fertility will be reduced if inorganic fertilizer is used excessively. This may harm the long-term viability of food self-sufficiency. Change the farmers' behavior to use organic fertilizer to solve this problem. Producing organic fertilizer with local natural resources is the best way to reduce the quantity of inorganic fertilizer used. It is a long-term solution that reduces the negative impact. Onion peel has more rich nutrition than the onion itself. The by-product or waste of the onion production (onion peel) contains more nutrient factors and it also promotes plant growth. Garlic peels can also be used as fertilizer. Potassium, calcium, and phosphorus are all found in garlic skin. They also include magnesium. Directly dumping garlic peels into agricultural soil is another fertilizing strategy.

Using onion and garlic peels to make organic fertilizers boosts plant growth, productivity, and disease resistance. It's a completely natural fertilizer. It will also have no negative impact on humans, animals, or the environment. Another significant advantage is that it is a low-cost product that can be made quickly.

This research can satisfy farmers' needs for organic fertilizer while also utilizing garbage as a long-term raw material for fertilizer manufacturing. Because onion and garlic peels are high in nutrients, throwing them away is a waste of resources. The majority of food and feed products in the environment are nutrient-dense. Also, food waste has a large number of nutrients. In

this approach, plant nutrients such as nitrogen, phosphorus, potassium, calcium, iron, magnesium, and copper are abundant in onion and garlic peels. Vitamins a, c, and e, as well as numerous antioxidants, are abundant. The onion peel is high in flavonoids, particularly quercetin, an anti-inflammatory and antioxidant. Onion and garlic peels are rich in nutrients in both quality and quantity. However, most individuals throw away onions and garlic peels. Some people use it to make compost. The nutrients in onion and garlic skin aid plant development, productivity, and disease resistance. This study will show how to manufacture organic fertilizer from onions and garlic peels in a simple and cost effective manner and effect of onions and garlic peels on growth and yield performance of lettuce.

2. METHODOLOGY

This research was conducted at the Agricultural research station, Seetha Eliya, Sri Lanka. The experiment was done from February 2022 to May 2022. The location of the research station was covered by the agro-ecological regions of WU1, WU2, and WU3. The experiment was laid out in completely randomized design. Mixture of onion peel and garlic peel fertilizer were applied in powder forms. Nine treatments were applied with four replicates.

Table 1- Design of Experiment

| Treatment | Quantity of peel powder |
|---------------------------------------|-------------------------|
| T1 control (1/2 recommended compost). | 0g / plant |
| T2 (with ½ recommended compost) | 2 g / plant |
| T3 (with ½ recommended compost) | 4 g / plant |
| T4 (with ½ recommended compost) | 6 g / plant |
| T5 (with ½ recommended compost) | 8 g / plant |
| T6 (without compost) | 2g / plant |
| T7 (without compost) | 4g / plant |
| T8 (without compost) | 6g / plant |
| T9 (without compost) | 8g / plant |

The raw materials (onion peel and garlic peel) were collected from the local markets. Then dried at 40oC for 3 hours. The raw materials were oven dried separately. After that, the onion peel and garlic peel were ground separately using a grinder. Then the powder was mixed with a 1:1 ratio in weight (onion peel powder: garlic peel powder). Finally, the powder was stored in an airtight container and then used as fertilizer. It was applied in basal form and after transplant, applied in the root zone.

After 4 weeks from the seed establishment, the seedlings were ready to be transplanted. The seedlings were removed from the nursery tray. And then it was planted in the soil bags. The powdered form of fertilizer was applied.

As a basal during potting media preparation. Then it was applied after one week and a third week of the transplanting. After transplanting, the fertilizer was applied to the root zone. After transplanting, the plants were irrigated at a uniform interval. Only foliar application treatments were irrigated one day after the foliar application. Lettuce plants reached the mature stage after 5 weeks from the transplanting. Plants were harvested in the morning to reduce the losses.

To study the effect, growth parameters: leaf length, width, plant height, number of plant and yield were measured were recorded. Then, the data were analyzed to find the effect of red onion peel and garlic peel fertilizer mixture on the growth and yield performance of lettuce.

3. DISCUSSION AND RESULTS

- Weekly growth rate of lettuce.

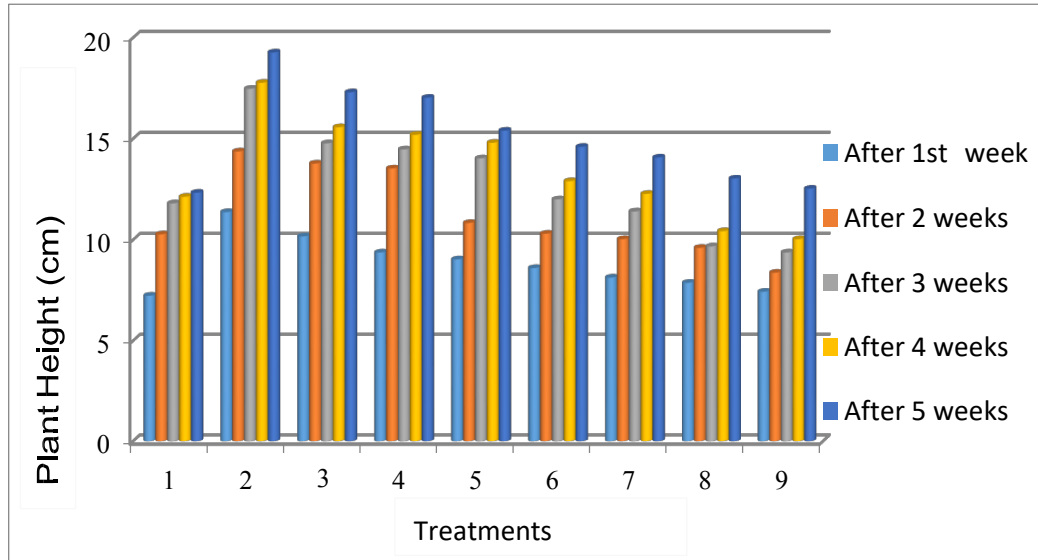


Figure 1: Weekly Growth Rate of Lettuce.

- Number of mature lettuce leaves after harvest.

Table 2: Number of Leaves

| Treatments | Number of Leaves |
|------------|------------------|
| T1 | 7.000 ± 1.000 |
| T2 | 24.000 ± 1.000 |
| T3 | 19.67 ± 2.08 |
| T4 | 18.667 ± 1.155 |
| T5 | 17.667 ± 0.577 |
| T6 | 17.333 ± 0.577 |
| T7 | 10.333 ± 0.577 |
| T8 | 10.000 ± 1.000 |
| T9 | 8.667 ± 1.155 |

- Mature leaf length on harvest.

Table 3: Leaf Length

| Treatments | Leaf length |
|------------|------------------|
| T1 | 12.3333 ± 0.0577 |
| T2 | 19.4667 ± 0.1528 |
| T3 | 17.5333 ± 0.1155 |

| | |
|----|------------------|
| T4 | 17.267± 0.252 |
| T5 | 15.5333 ± 0.0577 |
| T6 | 14.6667 ± 0.1528 |
| T7 | 14.2000 ± 0.1000 |
| T8 | 13.2667 ± 0.1528 |
| T9 | 12.6667 ± 0.1155 |

- Mature leaf length on harvest.

Table 4: Leaf Width

| Treatments | Leaf width |
|------------|------------------|
| T1 | 8.033 ± 0.1528 |
| T2 | 18.500 ± 0.200 |
| T3 | 16.5667 ±0.1155 |
| T4 | 15.7333 ± 0.1155 |
| T5 | 15.0667 ± 0.1528 |
| T6 | 14.100 ± 0.200 |
| T7 | 12.6333 ± 0.1528 |
| T8 | 11.7333 ± 0.0577 |
| T9 | 11.5667 ± 0.1155 |

- Total fresh weight of lettuce after harvest.

Table 5: Total Fresh Weight.

| Treatments | Total Fresh weight |
|------------|--------------------|
| T1 | 13.973 ± 1.672 |
| T2 | 324.79 ± 14.03 |
| T3 | 272.5 ± 18.9 |
| T4 | 249.56 ± 15.16 |
| T5 | 227.2 ± 24.6 |
| T6 | 50.627 ± 1.412 |
| T7 | 37.21 ± 4.64 |
| T8 | 36.570 ± 0.531 |
| T9 | 24.830 ± 1.508 |

The height of plant was taken on 1st, 2nd, 3rd, 4th, and 5th week after transplanting. The highest height was observed in T2. Plant height is controlled by genetic and environmental factors. T2 significantly differed from other treatments at $p < 0.05$. Among the treatment, higher number of leaves were recorded in T2 than in other treatments. The least number of leaves were recorded in T1. T2 had highest leaf length and highest leaf width. In the yield parameter analysis, T2, T3, T4, T5 were showed better performance. T2 significantly differed from other treatments at $p < 0.05$. The yield of plant was significantly affected by application onion and garlic mix fertilizer.



Figure 2. Overall Performance of Lettuce in Different Treatments.

T2, T3, T4 and T5 shown the better growth and yield performance. Among those, T2 shows the better results.

4. CONCLUSION

The present study revealed that T2, T3, T4, and T5 treatments were shown to have better results than other treatments. Among these treatments, T2 (1/2 recommended compost with 2g of onion and garlic peel mix fertilizer) was the best. The T3 (1/2 recommended compost with 4g of onion and garlic peel mix fertilizer) and T4 (1/2 recommended compost with 6g of onion and garlic peel mix fertilizer) were shown to have comparatively the same growth. According to these results, the powder forms of Fertilization of sweet corn, celery, romaine, escarole, endive, and radish on organic soils in Florida onion and garlic peel fertilizer were good for lettuce cultivation. And also, it was a very cost-effective way for the farmer. Onion peel and garlic peel are sustainable raw materials to produce fertilizer. And also, it was fully organic, so it had no harmful effect on the environment.

Hence, in the future, research should find more effective organic raw materials for making fertilizer. It will help to reduce the use of chemical fertilizer and also preserve the environment.

REFERENCES

Foteinis, S., & Chatzisyneon, E. (2016). Life cycle assessment of organic versus conventional agriculture. A case study of lettuce cultivation in Greece. *Journal of cleaner production*, 112, 2462-2471.

- Hochmuth, G. Hanlon, George Snyder, Russell Nagata, and Tom Schueneman. 1996. Fertilization of sweet corn, celery, romaine, escarole, endive, and radish on organic soils in Florida. Florida Extension Serv. Bull, 313.
- Mou, B. (2009). Nutrient content of lettuce and its improvement. *Current Nutrition & Food Science*, 5(4), 242-248.
- Peiris, P. U. S., & Weerakkody, W. A. P. (2015, April). Effect of organic based liquid fertilizers on growth performance of leaf lettuce (*Lactuca Sativa L.*). In international conference on agricultural, ecological and medical sciences (AEMS-2015) April (pp. 7-8).
- Pellejero, Graciela & Miglierina, A. & Aschkar, Gabriela & Turcato, M. & Ballesta, Jimenez. (2017). Effects of the onion residue compost as an organic fertilizer in a vegetable culture in the Lower Valley of the Rio Negro. *International Journal of Recycling of Organic Waste in Agriculture*. 6. 10.1007/s40093-017-0164-8.
- Righetti, Tamara & Alcoforado, Raquel & Silva, Vinicius & Coimbra, Pedro & Mendes, Nathânia & Cavalcanti, Elisa & Jurelevicius, Diogo & Gonçalves, Édira. (2020). The Impact of Organic Fertilizer Produced with Vegetable Residues in Lettuce (*Lactuca sativa L.*) Cultivation and Antioxidant Activity. *Sustainability*. 13. 128. 10.3390/su13010128.