Analysis of kale (brasicca oleraceae) crop cultivation using verticulture method in the city of padang panjang

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Abstract. Urban Agriculture is an effort to use minimalist space in urban areas to produce the desired production. This production is related to fulfilling food needs, living comfort amid urban air pollution and presenting an aesthetic feel in the city house. Limited land, urban distance away from sources of food production is not an obstacle to actualizing the economic potential of urban land. Things that can be done planting in various ways such as verticulture using paralon media which are arranged vertically. This study aims to see the growth of vegetable kale by vertical verticulture method in the city of Padang Panjang. Kale (Brasicca oleracea) is a vegetable that is still one species with cabbage or cabbage. Kale is a seasonal and short-lived vegetable, around 40-50 days after the seeds are planted. Kale has good prospects to be developed in Indonesia because of its high nutritional content and high economic value. The material used is a 2-meter-high Parallon pipe that has been perforated, with soil and compost media. The design used in this study was a completely randomized design with treatment: (1) 100% soil, (2) 75% soil + 25% compost, (3) 50% soil + 50% compost, (4) 25% soil + 75 % compost, with four (4) replications. Activities carried out include vertical verticulture pots making, nurseries, giving fertilizers according to treatment, planting, maintaining plants, watering, weeding weeds and controlling pests and diseases, harvesting, data collection and analysis, and preparing reports. The data collected consists of; (1) plant height at 10, 20, and 30 days after planting.

1. Introduction

The height of a place from sea level will affect the types of plants that are able to live, develop and produce well. Altitude below 600 meters above sea level can be classified in the lowlands, while above 600 meters above sea level are classified as highlands. Lowland and highland plants are certainly different from the crater. Especially vegetable plants. City of Padang Panjang with an altitude ranging from 600 asl to 850 asl is certainly very potential to be a high-yielding vegetable producing area, but it is very unfortunate that this city only has a very limited land area only 23 km square. This condition is very interesting for the author to find a solution to the limited land problems with regional potential for upland vegetable crops.

Verticulture is one of the answers to this problem where Verticulur is a way of planting in a vertical arrangement upward towards free air space, with a composition of planting media that is also arranged vertically [1]. This method of planting is suitable to be applied to the yard with limited land, narrow land, even the slightest land [2].
Model, material, size, verticulture container is very much, just adjusted to the conditions and desires. In general, they are rectangular, triangular, or shaped like stairs, with several steps or a number of shelves. The material can be bamboo or paralon pipes, used cans, and even sacks of rice can, because one of the philosophical philosophies is to use used objects around us.

Vertical requirements are strong and easy to move. Plants that will be planted should be adapted to their needs and have high economic value, short-lived, and have short roots such as kale (Brasicca oleraceae). Kale is a vegetable that is still one species with cabbage or cabbage. Kale includes seasonal vegetables and short-lived around 40-50 days after the seeds are planted. Kale has good prospects to be developed in Indonesia because of its high nutritional content and high economic value. Kale contains lots of vitamin A, vitamin C, thiamin and lime. Aside from being a food ingredient, kale is also used for the treatment of various diseases because it contains carotenoids (anti-cancer compounds) [3].

For commercial purposes, this verticultural development needs to be considered economically so that production costs do not exceed the income from the sale of crops. As for hobbyists, verticulture can be used as a medium of creativity and obtain healthy and quality crops.

To see the potential production of Kale vegetables by Verticulture method in the yard of the community of Padang Panjang city, the research the problem as follows: (1). How is the growth of Kale planted by verticultural methods when compared to ordinary cropping patterns, (2). What media is most suitable for Kale plants if planting is done by verticultural methods. The objectives of this study are to see the growth of kale (Brasicca oleraceae) which is grown by the verticulture method, and to find out the most suitable media for kale planted vertically.

2. Research Methods

2.1. Time and Place
This research was carried out in the nursery garden of the dahlia farmer group RT 7 Perumahan Perbukitan Teduh Padang Reno, Padang Panjang city in August – September 2018.

2.2. Procedure

2.2.1. Equipment. The main ingredient used in this research is Parallon pipe as a container, the media used by the soil and manure, and vegetable kale as a plant.

2.2.2. Research Design. The design used in this study is a Complete Design with four (4) replications. Treatment consists of:
[1] 100% land
[2] 75% soil + 25% manure
[3] 50% soil + 50% manure
[4] 25% soil + 75% manure

The research activities that will be carried out are making pots with vertical vertical methods, nurseries, giving fertilizers according to treatment, planting, maintaining plants, watering, weeding, and controlling pests and diseases, harvesting, collecting and analyzing data, and preparing reports. Data collected consisted of: (1) plant height at the age of 10, 20, and 30 days after planting, (2) Number of leaves at 10, 20, 30 days after planting.

2.2.3. Making Verticulture Containers. Containers are made using 10-inch paralon pvc pipes. Then the paralon is drilled in a spiral with a diameter of 10 cm using an electric drill.
2.2.4. *Planting Media Procurement.* Planting media is where plants grow to support roots. It is from this growing media that plants absorb food in the form of nutrients through their roots. The planting medium used is

- [1] 100% land
- [2] 75% soil + 25% manure
- [3] 50% soil + 50% manure
- [4] 25% soil + 75% manure

After all the ingredients have been collected, mixing is evenly distributed. Soils with colloidal properties have the ability to bind nutrients, and through nutrients can be absorbed by plant roots with the principle of cation exchange. The planting media mixture is then put into the parallon until full. To ensure there is no empty space, small bamboo or wood can be used to push the soil to the bottom of the container. Planting media in Parallon is made so that it is not too dense so that water easily flows, also so that plant roots have no difficulty breathing and not too tenuous so that there is flexibility in maintaining water and maintaining moisture.

2.2.5. *Seed Preparation and Planting.* Before making a vertical container, a number of plant seeds are prepared until the plants reach their age, ready to be moved. There are three stages in this process, namely, nursery, transfer and planting. Like planting, sowing seeds also requires containers and planting media. The container can be anything as long as it can be filled with planting media as needed and has a hole at the bottom to remove excess water, such as a medium-sized pot or a used cake box. For the planting media, the media from finished products are organic.

The number of seeds that can be sown is measured because each hole is filled with one seed. 5-8 days after the nursery, the seeds have germinated and removed 3 - 4 leaves. Ideally, the seeds that have grown from leaves are 4-5 strands worthy of being transplanted.

Plant seeds that are transferred to verticulture containers are more than one month old, the leaves have also been added. Before the seeds are planted in a container, first pour water into it until it is saturated, which is indicated by the dripping of water out of the planting holes. After enough, just start planting seeds one by one. All parts of the roots of each seed must enter the soil.

2.2.6. *Plants Maintenance.* Plants also need treatment, just like other living things. Plants need attention and affection. In addition to watering carried out every day also need fertilization, and pest control. We recommend that the fertilizer used is organic fertilizer. Kitchen waste or dried leaves can be used for making bokashi fertilizer.

3. *Results and Discussions*

The results of the calculation of variance in kale growth with the verticulture method in Padang Panjang City on the average height of kale plants at the age of 10, 20, and 30 days after planting showed significant results as in Table 1.

| Treatment                          | Average plant height (cm) | Average |
|------------------------------------|---------------------------|---------|
|                                    | 10 DAP | 20 DAP | 30 DAP |       |
| K1 (100% land)                     | 11.5   | 12.3   | 12.6   | 12.1  |
| K2 (75% land + 25% mature)         | 11.6   | 12.4   | 12.8   | 12.3  |
| K3 (50% land + 50% mature)         | 11.7   | 12.6   | 12.9   | 12.4  |
| K4 (25% land + 75% mature)         | 11.6   | 12.4   | 12.7   | 12.2  |
| **Total**                          | 46.0   | 49.5   | 50.8   |       |
| **Average**                        | 11.5   | 12.4   | 12.7   |       |
In the observation of 10 dap, 20 dap and 30 dap the highest average was found in K3 treatment with a composition of 50% soil and 50% manure with a value of 11.7; 12.6; and 12.9 cm. While the lowest average is found in treatment K1 with a composition of 100% of the soil with successive values of 11.5; 12.3; and 12.6 cm.

Manure is processed by animal manure, usually livestock given to planting media to improve soil fertility and structure. Nutrients contained in manure depend on the source of the waste material. livestock manure is rich in nitrogen, and metal minerals, such as magnesium, potassium and calcium. However, the main benefit of manure is to maintain the physical structure of the soil so that the roots can grow well. According to Isdarmanto [3], with increasing metabolic productivity, plants will need more nutrients and increase water absorption, this is related to the needs of plants during growth and development. Plant growth rates tend to increase, if the nutrients needed by plants are sufficiently available and plants can be utilized immediately, such as nitrogen. This is in line with the opinion of Harlina [4] which states that if N elements are available in large quantities then more proteins are formed so that plant growth.

Vertical cultivation can provide aesthetic aspects because plants that appear in rows vertically can display the nuances of beauty. Therefore, generally verticultural techniques are mostly carried out by housewives, retirees or adolescents for hobbies. Vertical buildings in the yard of the house with various types of plants that line up indeed really captivate the eye and cause feelings of satisfaction and pride in the owner. Besides being able to display beauty, it does not mean that planting with verticultural techniques cannot be applied for commercial purposes. With the premise that verticulture can multiply the number of plants and production, this technique can be economically accountable for commercial purposes. The investment needed for the application of this verticulture technique is much higher than the conventional method. However, with higher production because there are many more plant populations, the investment can be covered [5-7].

4. Conclusion

From the results of the study it can be concluded that, there are differences in the results of growth of kale plants with different media and the most appropriate media is: 50% soil and 50% mature.

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