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The Effectiveness of Vegetable Neem Leaf Pesticides Against Purple Spot Disease on Onion Plants in The Rain Season

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ABSTRACT

Purple spot disease is one of the main diseases in leaf onion cultivation. One form of control is carried out by utilizing neem plants, especially the neem leaves which have the potential as vegetable pesticides (fungicides). This study aims to determine the effectiveness of neem leaf vegetable pesticide and to obtain the right concentration of neem leaf vegetable pesticide in controlling purple spot disease on a leaf in rainfall season. This study used an experimental method designed in a single factor Completely Randomized Design (CRD) using neem leaf pesticide consisting of three treatments (control, 10%, and 20%). The results showed that neem leaves at a concentration of 20% were effective as a vegetable pesticide to control purple spot disease on leaf onion. Neem leaf vegetable pesticides at a concentration of 20% were able to inhibit the increase in the area of attack symptoms and also inhibit the intensity of purple spot disease attacks on leaf onion by 13.84%. This is caused by the increase in concentration causing an increase in the content of the active ingredient in the substance which functions as a pesticide that is able to inhibit the spread of large quantities.

Keywords: Purple spot disease, neem leaf, vegetable pesticide, leaf onion

Introduction

Food crops and horticulture are basic needs of every human being that cannot be replaced or postponed from time to time until the future. Shallots (*Allium fistulosum* L.) is one type of vegetable crop that has the potential to be developed intensively and commercially. The demand for leeks will increase along with the increasing rate of population growth. The increase in demand mainly comes from instant noodle companies that use green onions as a flavoring ingredient (Jumadi, 2014). BPS (Central Statistics Agency) stated that shallot production reached around 1,580,247 tons, an increase of 5.1% from 2018 which only reached 1,503,438 tons and has not been able to meet market demand (BPS, 2020).

The main obstacle to the cultivation of leeks in Indonesia is the problem of disease. There are several types of diseases found in leek plants. Leek disease problems commonly found in the field are purple spot disease (*Altenaria porri*), anthracnose (*Colletotricum gloeosporioides*), cescospora leaf spot (*Cercospora duddiae*), late blight (*Peronospora destructor*), wilt disease or tuber rot (*Fusarium oxysporum*).

Purple diseases is capable causing crop losses 3–57%, and cause yield loss both in seeds and bulbs 100% (Nurosid, 2018). The attack of A. porri generally occurs during the rainy season which is characterized by the presence of whitish spots, gradually purple in the oval shape, grayish and black powdery (Mohsin et al., 2016).

Efforts to control purple spot disease are currently still focused on the use of chemical fungicides, unfortunately, this method of control only works well if the application is carried out with high frequency (Santoso et al., 2007). Pesticides that are environmentally friendly are a safe alternative solution for the

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environment. Pesticides contain active ingredients from biological ingredients. One type of vegetable pesticide that is widely known to the world community is that which comes from the neem tree (*Azadirachta indica* A. Juss).

Global Climate Change (GCC)will cause high rainfall that impacts increasing pathogen virulence. GCC also increases the use of chemical and botanical pesticides causing washing and the absorption of these pesticides. Warming impact already presents insect pests and pathogens and could cause a changed use of pesticides in terms of higher amounts, doses, and susceptibility to pesticide absorption, so influencing human exposure to them during agricultural activities (Gatto et al., 2016).

Based on the problems above, the authors innovate to make neem leaf vegetable pesticides in controlling purple spot disease on leeks.

Material and Methods

This research was conducted from January 18 to February 18 2022 at the Plant Protection Laboratory of the Ketindan Agricultural Training Center, Lawang, East Java. The research method used an experimental method designed in a single factor Completely Randomized Design (CRD) using neem leaf pesticide consisting of three treatments (control, 10%, and 20%). The implementation of the research was the exploration of diseased leek plants, the manufacture of vegetable pesticides from neem leaves, the application of neem leaf vegetable pesticides against purple spot disease, and testing the effectiveness of neem leaf pesticides against purple spot disease of leeks.

Diseased onion plant exploration

The leek plant that will be observed is the leek variety. The age of leek plants in the field was 75 DAP. Observation of the sample is done by observing the symptoms and signs of visible pathogen attack. The plant samples observed were the leaves. Symptoms of the attack are shown on the leaves with white or gray spots. Size varies depending on the level of attack and leaf tips dry, also brown or black. Samples of leek plants that were attacked by the disease were given a nameplate that read the treatment of giving neem leaf vegetable pesticides.

Making pesticide neem leaves

Neem leaf pesticide is made by using wind-dried neem leaves. Wind-dried neem leaf pesticide is made one day after taking the leaves from the plant or until the leaves wilt or dry up a little, in this case the neem leaves are dried in the sun for 1 day. The leaves used as vegetable pesticides are neem leaves that are old and young. The workings of making wind-dried neem leaf pesticide is to collect 1.5 kg of fresh neem leaves. Separate the stems and leaves, as only the neem leaves are used. Wash the collected neem leaves using water. Clean neem leaves are chopped or chopped for easy blending. The neem leaves are dried by placing the neem leaves on filter paper for 1 day. Furthermore, the dried neem leaves are blended using a blender machine by adding distilled water little by little. Distilled water required neem leaves 1.5 kg which is as much as 1.5 liters. Blended neem leaves are stored in a bucket. This step is a fermentation process carried out for 1 day. The goal is that the substances contained in neem leaves can dissolve and mix with water so that neem juice is expected to contain as much of the active ingredient of neem as possible. After the mixture is fermented, the result is squeezed using a filter cloth. The use of filter cloth aims to prevent clogging of hand spray during application.

Application of pesticide neem leaves against purple spot disease on leek plants

The application of pesticide neem leaf on leek plants was carried out using a hands sprayer by spraying the plants, especially the leaves that were attacked by purple spot disease. Spraying of neem leaf pesticide is carried out if it does not rain in one day where the spraying is not too wet or muddy so that it does not stimulate the growth of pathogens. The application of the pesticide neem leaf is carried out in the afternoon at 16.00 WIB which is based on environmental conditions because the application time is influenced by internal factors that can affect the quality of the paitan vegetable pesticide such as temperature, sunlight and rainfall.

Spraying is not carried out during the day when the sun is hot because it will experience evaporation and will be decomposed by ultra violet rays. This is in accordance with the opinion of Jayashree et al. (2006) which states that while spraying is carried out during the day when the sun is hot, the air temperature above the ground surface is lower, so there will be air movement from bottom to top (turbulence) which will fly away the air spray granules.

Test the effectiveness of neem leaf pesticides against purple spot disease of onion plants

The concentrations of neem leaf pesticide used were control, 10%, and 20%. The leek plants that will be used to test the effectiveness of the neem leaf vegetable pesticides are 3 leek plants. Plant 1 in the control treatment, plant 2 at the 10% concentration treatment, and plant 3 at the 20% concentration treatment. The concentration of 0% or control is derived from 100 ml of distilled water. The concentration of 10% is by mixing 10 ml of neem leaves versus 100 ml of distilled water. The concentration of 20% is by mixing 20 ml of neem leaf extract versus 100 ml of distilled water. The test was carried out for 2 weeks to determine whether or not there was a change after the application of botanical pesticides according to the control, 10%, and 20% treatments.

Parameters of observation of neem leaf pesticide against purple spot disease of leeks are the rate of infection and the incidence of disease. The infection rate test was determined by measuring the area of leaf attack symptoms every day and then evenly distributing the measurement results for each plant in the treatment carried out for 14 days. While the incidence of disease is determined by the formula. According to Rahardjo and Suhardi (2008) that the observation of disease incidence can be calculated by the formula:

$$DI = \frac{n}{N} \; x \; 100\%$$

Information :

DI = disease incidence (%)
n = number of sick leaves
N = number of sample leaves

Results and Discussion

The results of pesticide neem leaf is wind-dried neem leaves obtained are 1 liter and the resulting form is a dark green watery liquid (Figure 1). According to Wibawa (2019), wind-dried neem leaves have active substances that do not evaporate easily because they have been dried first. So that the residue contained in the wind-dried neem leaves is more than the fresh neem leaves.

Figure 1. Neem leaf pesticide results

The results of observations for 14 days, the application of neem leaf pesticide against purple leek spot disease in the control treatment showed an average leaf area (cm) of 1.28 cm affected by the disease which every day experienced an increase in disease symptoms. At a concentration of 10% the average leaf area affected by the disease was 1.47 cm which almost every day experienced additional symptoms of the disease. Meanwhile, at a concentration of 20%, the leaf area showing symptoms of the disease averaged 3.31 cm, which only took a few days to experience additional disease symptoms (Table 1).

Natural pesticides derived from neem leaves with a concentration of 20% gave effective results, this is because on the 2nd day to the 6th day and on the 7th day to the 14th day there was no additional attack symptoms or can be said to be fixed. Meanwhile, the control treatment and 10% concentration were less effective because on the 1st day to the 14th day of observation there were additional symptoms of disease attack (Figure 2.). It is suspected that the higher the concentration of neem leaves given, the longer the symptoms of the disease attack and also the concentration of neem leaves at that concentration can be absorbed by shallot plants so that it can inhibit the development of A. porri. This is reinforced by the statement of Marlina and Harlia (2012) that the higher the concentration of the material, the higher the antifungal activity it has. And also this is in accordance with what was stated by Ali et al. (2008) that at higher concentrations of neem leaf extract, there will be more active compounds that function as fungal control so that they can control fungi. This is in accordance with the opinion of Nurhayati (2011) that the mechanism of action of vegetable fungicides inhibits enzymes, so that they can damage the metabolic processes in fungi and some damage the fungal cell wall by dissolving chitin and cellulose in the cell wall which causes the cell wall to become damaged and disruptive. permeability system. As a result of the damage process - cell metabolism processes in fungi are not selective, tissue damage and cause death in fungi because fungi do not produce energy for growth and development.

Table 1. Purple spot infection test results on leek plants

Day	**Treatment**		
	Control	**10%**	**20%**
1	0.93	1	2.85
2	1.13	1.08	3.1
3	1.17	1.12	3.1
4	1.21	1.31	3.1
5	1.26	1.31	3.1
6	1.27	1.31	3.1
7	1.3	1.43	3.5
8	1.34	1.56	3.5
9	1.34	1.56	3.5
10	1.58	1.56	3.5
11	1.6	1.65	3.5
12	1.62	1.8	3.5
13	1.7	2	3.5
14	1.82	2	3.5
Mean	**1.28**	**1.47**	**3.31**

The results of observing the incidence of disease by neem leaves on the development of purple leaf spot disease indicate that the difference can be seen in (Table 2).

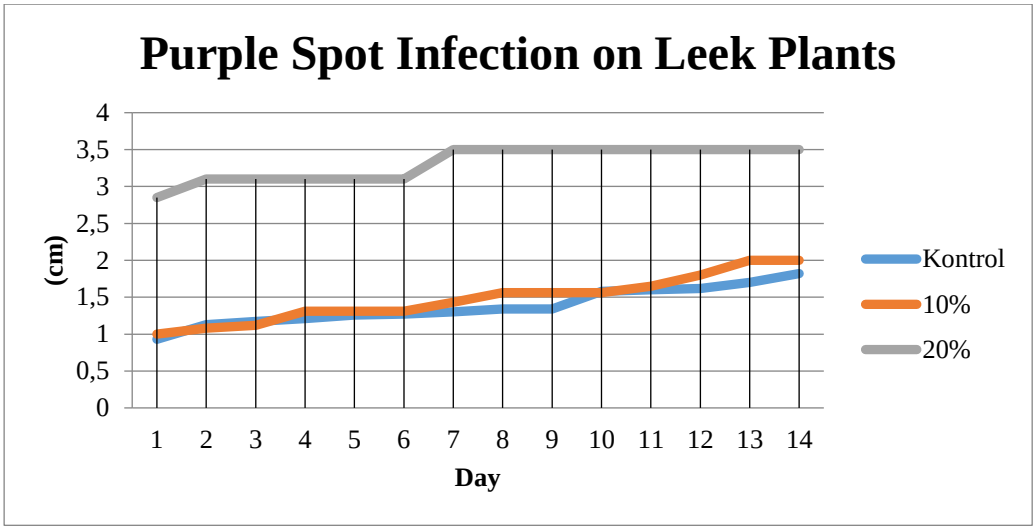

Figure 2. purple spot infection test results on leek plants

Based on Table 2, the results of the incidence of disease for 14 days, the application of neem leaf vegetable pesticides in the control treatment obtained results of 45.45%, 10% treatment of 28.12%, and 20% treatment of 13.84%. In the control treatment, there was an increase in the incidence of disease on days 3, 7, 9, and 13. In the 10% treatment, there was an increase in the disease on days 4, 8, and 12. While in the 20% treatment, there was an increase only on the 2nd day and experienced disease reduction on the 7th day. It can be said that the neem leaf vegetable pesticide was effective at a concentration of 20% because the lowest *A. porri* attack was found in the 20% neem leaf treatment. It can be seen in (Figure 3.) shows that the lower the concentration of neem leaves given, the higher the incidence of disease.

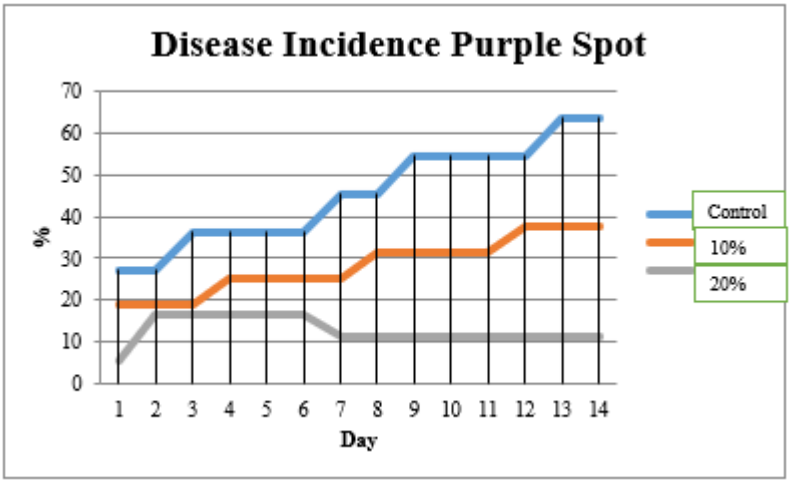

Figure 3. Shows that the lower the concentration of neem leaves given, the higher the incidence of disease

The addition of purple spot disease symptoms is thought to be due to environmental factors, namely humidity. Humidity can be expressed as rainfall, relative humidity and length of wet leaf. In general, spore germination and the first development of parasites are closely related to humidity (Semangun, 2016). A. porri generally occurs during the rainy season which is characterized by the presence of whitish spots, gradually purple in the oval shape, grayish and black powdery (Mohsin et al., 2016). At the time of observation lasted for 2 weeks and experienced rain. It is suspected that continuous rainfall

causes neem which is applied to plants to be easily washed, so this biological pesticide becomes less effective. High rainfall impacts increasing pathogen virulence. and increases the use of pesticide such as chemical and botanical pesticides by washing and the absorption of these pesticides. The warming impact of pathogens could cause a changed use of pesticides in terms of higher amounts, doses, and susceptibility to pesticide absorption (Gatto et al., 2016).

Conclusion

Based on the description above neem leaf pesticide at a concentration of 20% was effective in controlling purple spot disease of leek plants which was able to inhibit the increase in the area of attack symptoms and also inhibit purple spot disease on leek plants by 13.84%. While the control treatment and 10% concentration were less effective because it increased the area of attack symptoms and also increased the purple spot disease attack on leek plants by 28.12%.

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References

Ali, M., Venita, Y., & Rahman, B. (2008). Uji beberapa konsentrasi ekstrak daun mimba (*Azadirachta indica A. Juss*.) untuk pengendalian penyakit antraknosa yang disebabkan jamur colletotrichum capsici pada buah cabai merah pasca-panen. Agricultural Science and Technology Journal, 11(1), 1-14. http://dx.doi.org/10.31258/sagu.v11i1.1421

Gatto, M. P., Cabella, R., & Gherardi, M. (2016). Climate change: the potential impact on occupational exposure to pesticides. Annali dell'Istituto superiore di sanita, 52(3), 374-385.

Jumadi. (2014). Pengembangan budidaya bawang daun (*Allium fistulosom* L.) di lahan gambut menggunakan pupuk organik cair. *Skripsi.* Pekanbaru: Fakultas Pertanian dan Peternakan Universitas Islam Negeri Sultan Syarif Kasim Riau.

Marlina, E. T., & Harlia, E. (2012). Kualitas pupuk cair hasil pengolahan feses sapi potong menggunakan *Saccharomyces cereviceae* (Liquid fertilizer quality produced by beef cattle feces fermentation using *Saccharomyces cereviceae*). *Jurnal Ilmu Ternak Universitas Padjadjaran*, *11*(2), 1-5.

Mohsin, S. M., Islam, M. R., Ahmmed, A. N. F., Nisha, H. A. C., & Hasanuzzaman, M. 2016. Cultural, morphological and pathogenic characterization of alternaria porri causing purple blotch of onion. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, *44*(1), 222–227. https://doi.org/10.15835/nbha44110110

Nurhayati. (2011). Efetivitas ekstrak daun sirih terhadap infeksi *Colletotrichum capsici* pada buah cabai. *Dharmapala, 3*(2), 1-5.

Nurosid, I. S. (2018). Pengaruh Berbagai Konsentrasi Larutan Agen Hayati Terhadap Serangan Penyakit Bercak Ungu (Alternaria porri), Pertumbuhan dan Hasil Bawang Merah (Allium ascalonicum L.) Varietas Tukuk. JAGROS: Jurnal Agroteknologi Dan Sains (Journal of Agrotechnology Science), 3(1), 39–50.

Rahardjo, I. B., & Suhardi. (2008). Insidensi dan serangan penyakit karat putih pada beberapa klon krissan. *Hort.*, *18*(3), 312-318.

Santoso S. E., Soesanto, L., & Haryanto, T. (2007). Penekanan hayati penyakit moler pada bawang merah dengan *Trichoderma harzianum*, *Trichoderma koningii*, dan *Pseudomonas fluorescens* P60. Jurnal Hama dan Penyakit Tumbuhan Tropika, *7*(1), 115-120.

Semangun, H. (2016). *Penyakit-penyakit tanaman hotikultura di Indonesia*. Yogyakarta: Gadjah Mada Univesity Press.

Statistik, B. P. 2020. *Produksi Bawang Merah Menurut Provinsi, 2015-2019.*

Wahyuno, D., Manohara, D., & Mulya, K. (2003). Peranan bahan organik pada pertumbuhan dan daya antagonisme *Trichoderma harzianum* dan pengaruhnya terhadap *Phytophtera capsici*. *Jurnal Fitopatologi, 7*(2), 76- 82.

Wibawa, I. P. A. H. (2019). Uji efektivitas ekstrak mimba (*Azadirachta indica* A. Juss.) untuk mengendalikan hama penggerek daun pada tanaman *Podocarpus neriifolius. Jurnal Agroekoteknologi Tropika (Journal of Tropical Agroecotechnology)*,*8*(1), 20-31.