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Growth Response and Results of Red Onion (*Allium Cepa* L.) Towards Treatment of Plant and Organic Mulch Distribution

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Abstract: *Red Onion (Allium cepa L.) is an annual crop that is widely cultivated by farmers to function as a food seasoning and traditional medicine. In a planting area there is often competition between plants to obtain nutrients, water, sunlight and growing space. One effort that can be done to overcome this is by adjusting plant spacing and mulching. At the optimum spacing, an optimum leaf area index will be obtained, so that the formation of dry plant material will be maximum. Mulching is one way to improve soil air condition and availability. water for plants. This study aims to analyze the interaction between plant spacing and organic mulch as well as the single factor of spacing and organic mulch on the growth and yield of red onion. The study was held in May to August 2019. The research site in Senaken Village, Tanah Grogot District, Paser Regency The research design used was a Randomized Block Design (RBD arranged in two factorial factors. The first factor is the spacing (J) consists of three levels, namely j1 = 20 x 15 cm, j2 = 20 x 20 cm, and j3 = 20 x 25. The second factor is the provision of organic mulch (M) consisting of three levels, they are m1 = no mulch, m2 = rice straw mulch 3 kg / bed equivalent to 15 tons / ha, and m3 = palm leaf mulch 3 kg / bed equivalent to 15 tons / ha. The results showed that the interaction between spacing and organic mulch treatments did not significantly affect all observed parameters. The treatment of single factor plant spacing significantly affected the parameters of plant height 6 MST and tuber weight per plot, while the single factor of organic mulch did not significantly affect all parameters observed.*

Keywords: ***Red Onion, Planting Distance, Organic Mulch.***

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I. Introduction

Red Onion (Allium cepa L.) is one of the vegetable horticultural commodities that has long been cultivated intensively by farmers. Red onion cultivation in Paser Regency began around 1998, initially cultivated at Muara Komam. At present there is one village area in three sub-districts which is used as a center of onion cultivation in Paser Regency, they are Sekuan Makmur Village in Muara Komam, Padang Jaya Village in Kuaro and Desa Tempakan in Batu Engau (BPS Paser, 2017). In a planting area competition often occurs between plants and between plants and weeds to get nutrients, water, sunlight and growing space. One thing that can be done to overcome this is by adjusting the spacing and mulching. Wide spacing can stimulate weed growth, whereas spacing that is too tight can result in competition between plants, which can reduce yields (Moenandir, 1996 in the journals of Josua, Lisa, and Toga, 2015). Mulch is useful for protecting the soil surface from rain splashing, erosion, reducing evaporation and maintaining moisture, structure, soil fertility, and inhibiting weed growth (Harist, A. 2000). This study aims to analyze the interaction between spacing and organic mulch and the single factor of spacing and organic mulch on the growth and yield of red onion.

II. Material And Methods

Time and Place of Research

The study was held in May to August 2019 which was located in Senaken Village, Tanah Grogot District, Paser Regency with a height of 10 m above sea level. Red yellow podsolid soil type, sandy clay texture and crumb structure. Soil pH 6.5. Type A climate or tropical rain climate with temperatures of 29-34^{o}C and rainfall 232.3 mm / month.

Materials and Tools

The materials used in this study were Bima Brebes variety red onion, manure, NPK Mutiara fertilizer, Antracol fungicide, Dharmabas insecticide, rice straw, and palm leaf.

The tools used are hoes, ropes, machetes, knives, fansticks, pH meters, dipper, sprayers, scales, rulers, stationery, buckets, measuring cups, gauges, brushes, paints, nets, cameras, hammers, nails, saws, and wood.

Research design

The design used is a Randomized Block Design (RBD arranged in factorial two factors. The first factor is the spacing (J) consists of three levels, they are :

j1 = 20 x 15 cm
j2 = 20 x 20 cm
j3 = 20 x 25 cm

The second factor is the provision of organic mulch (M) consists of three levels, they are :

m1 = no mulch (control)
m2 = rice straw mulch 3 kg / bed equivalent to 15 tons / ha
m3 = palm leaf mulch 3 kg / bed equivalent to 15 tons / ha

Research procedure

1. Land Preparation
2. Seedling Preparation
3. Planting
4. Provision of Mulch
5. Maintenance
- Sprinkling
- Embroidery
- Weed weeding
- Fertilizing
- Pest and Disease Control
6. Harvest.

Observation Parameters

1. Plant Height (cm)
2. Number of Leaves (strands)
3. Number of tuber Per Clump (tuber)
4. Wet Tuber Weight Per Clump / Sample (gr)
5. Wet Tuber Per Plot (kg)

Data analysis

The additive linear model used in analyzing each observed variable is:

$$\mathbf{Yijk = \mu + \alpha i + \beta j + \sigma k + (\beta\sigma)\, jk + \varepsilon ijk}$$

They are :

i = 1,2,3 (groups)
j = 1,2,3 (plant spacing treatment)
k = 1,2,3 organic mulch treatments)
Yijk = observation response in the i-th experimental unit which obtained a combination of j- level treatment from factor I and k-level from factor II
μ = general midpoint
αi = the influence of the i-th group
βj = the influence of the j-level from the plant spacing treatment
σk = the k-level effect of organic mulch treatment
(βσ) jk = the influence of the j-level factor I speculation of the plant spacing and factor II of the o rganic mulch treatment
εijk = random effect of the experimental unit receiving the j-I and k-II factors in the i group

To determine the effect of spacing and organic mulch on the growth and yield of red onion, the data were analyzed with variance. If the variance has no significant effect (F calculated treatment <F table 0.05), no further tests are continued. but if the variance is significant (F count> F table 0.005) then it is continued with the smallest significantly different follow-up test (BNT) at the 5% level.

III. Result

Average Plant Height (Cm)

The results of analysis of variance showed that the treatment of Spacing (J) significantly affected, whereas the treatment of Organic Mulch (M) and its Interaction (JxM) had no significant effect on the average height of plants aged 6 mst. BNT test results of 0.05 can be seen in table 1.

Table 1. Average Plant Height (Cm) Age of 6 MST in the Treatment of Spacing and Organic Mulch Giving

Plant Spacing	Organic Mulch Spacing (M)			Average
(J)	m1	m2	m3	
j1	27,30	29,86	30,45	29,20[a]
j2	25,71	28,13	25,56	26,46[b]
j3	23,96	27,20	26,45	25,87[b]
Average	25,66	28,40	27,49	

* Average numbers followed by unequal letters indicate significant differences based on the BNT 0.05 test (BNT J = 2.21).

Based on the BNT 0.05 test showed that the Jatropha (j1) treatment had a higher average plant height of 29.20 cm and was significantly different from j2 and j3 treatments, but j2 treatment was not significantly different from j3 treatment.

Average Number of Leaves (Strands)

Results of analysis of variance showed that the treatment of Spacing (J), Organic Mulch (M) and Interaction (JxM) had no significant effect on the average age of 6 mst.), But there was a tendency for j3m2 treatment, giving the highest number of leaves, 25, 92 strands.

Average Number of Tuber per Sample Plant (Tuber)

The results of analysis of variance showed that the treatment of Spacing (J), Organic Mulch (M) and Interaction (JxM) had no significant effect on the average number of tubers per sample plant at the end of the study. However, there was a tendency of j2m2 treatment, giving the number of tubers the most is 6.92.

Average Tuber Weight per Plant Sample (Gram)

The results of analysis of variance showed that the treatment of Spacing (J), Organic Mulch (M) and Interaction (JxM) had no significant effect on the average tuber weight per sample plant at the end of the study. however there is a tendency for j2m1 treatment, giving the highest number of tubers which is 26.50 gr.

Average Tuber Weight per plot (kg)

The results of analysis of variance showed that the treatment of Spacing (J) significantly affected, while the treatment of Organic Mulch (M) and its Interaction (JxM) had no significant effect on the average tuber weight per plot. BNT test results of 0.05 can be seen in table 2.

Table 2. Average Weight of Tuber Per Plot (kg) in the Treatment of Spacing and Organic Mulch Giving.

Plant Spacing	Organic Mulch Spacing (M)			Average
(J)	m1	m2	m3	
j1	1,16	1,19	0,94	1,10[a]
j2	1,03	0,84	0,96	0,94[b]
j3	0,95	0,81	0,98	0,91[b]
Average	1,05	0,95	0,96	

* Average numbers followed by unequal letters indicate significant differences based on the BNT 0.05 test (BNT = 0.13).

Based on BNT 0.05 test showed that the distance of planting distance (j1), had the highest weight of tuber weight per plot (1.10 kg) and was significantly different from j2 and j3 treatments, but j2 treatment was not significantly different from j3 treatment

IV. Discussion

Based on the results of analysis of variance showed that plant spacing treatment significantly affected the average parameters of the plant height 6 mst and the average tuber weight per plot. From the results of the 5% BNT test showed that 20 x 15 cm (j1) spacing was significantly different from 20 x 20 cm (j2) and 20 x 25 cm (j3) spacing. It is suspected that at the beginning of plant growth can still receive maximum sunlight, but along with its growth, competition occurs that encourages individual plants to get light. This is supported by the statement of Gardner, et al (1991) that, plant growth is largely determined by intensity, quality, and duration of

exposure. Suyati (2005) states that dense spacing increases plant height, this is because with spacing more dense, plants close together and appear to cover each other for absorption of sunlight, so plants will move towards the arrival of the sun by simply increasing height. Nurlaili (2010) added that the use of plant spacing that is too tight will cause the leaves of fellow plants to cover each other and affect the growth of plants with high elongated plant shapes because they compete in getting light. This is in line with the explanation from Budiastuti (2000) which states that some studies of spacing showed that the denser the spacing, the higher the plant.

Results of analysis of variance showed that plant spacing treatment had a very significant effect on the tuber weight per plot. Based on the 5% BNT test showed that the treatment of a narrower spacing produces more tuber weight compared to the treatment of a wider spacing. This relates to the number of plant populations in each plot. At a wide plant spacing, there are fewer plant populations compared to a narrow spacing. Narrow planting distance makes the plant population become more, but the tuber size becomes smaller. Narrow planting distance increases planting density, so the yield per unit area increases. This is in accordance with the opinion of Suavianti et al. (2014) that a high density results in a high total fresh weight, but the tuber size is small. Further Rajiman (2011) added that more plant populations are usually obtained at denser planting distances, so that the weight per unit area will be greater.

Based on the results of analysis of variance showed that the treatment of organic mulch did not significantly affect all growth parameters and yields of red onion that were observed. This is due to the influence of weather during high rainfall studies that causes low soil temperatures, so that it affects soil moisture increases, as a result the treatment of mulching does not give a real effect or there is almost no difference between without mulch and treatment using mulch. However, there is a tendency for mulch straw treatment to provide better growth and yield. According to Noorhadi and Sudadi (2003), soils treated with rice straw mulch show the lowest soil temperature, compared with no mulch or with black silver plastic mulch, this is because the heat received by straw mulch does not go directly into the soil and can immediately occur immediately exchange with free air so the bias lowers the temperature of the soil. This is consistent with the results of Herlina, Nihayati and Arifin's (2004) research that the use of straw mulch reduces soil temperature by 0,2^{o}C. This is in line with the opinion of Ansar (2012) stating that rice straw mulch reduces soil temperature by an average of 1.3% compared to without mulch. Dewantari (2015) also states that straw mulch is able to suppress evapotranspiration, lowering soil temperature thereby reducing water loss from the surface of the soil and reducing the presence of drought stress due to the amount of water entering soil plants in the soil more .. Another opinion stated by Mahmood et al (2002) which states that rice straw mulch or mulch derived from the remnants of other plants have low heat conductivity so that the heat reaching the ground surface will be less than without mulch or mulch with high heat conductivity such as plastic mulch. Low soil temperatures also cause soil moisture to be suboptimal for microbial activity, so that decomposition of organic matter by microbes is inhibited and cannot be directly utilized by plants. Organic matter is a factor that affects the amount of tubers of onion plants, especially the nitrogen element contained in the organic material. This is in accordance with the statement of Wijaya (2008) which states that plants with sufficient nitrogen supply will form broad leaf strands with high chlorophyll content, so that plants can produce assimilates in sufficient quantities to support their generative growth.

Based on the results of analysis of variance showed that the interaction between spacing and organic mulch treatments did not significantly affect all observed parameters. This shows that the difference in growth and yield of red onion due to different spacing does not depend on the provision of organic mulch or vice versa. The existence of this insignificant difference is suspected because the two factors are only able to encourage the growth of each factor in the plant so that the interaction between the two treatments has no significant effect. This is in accordance with the opinion of Stel and Torrie if the interaction between one treatment and the other is not significantly different, it can be concluded that these factors act independently of each other. Irfan Fauzi (2016) also stated that if the treatment did not show any interaction then the treatment only gave each response as a single factor and acted freely.

V. Conclusion

Based on the results of research and discussion can be concluded, namely as follows:

1. The interaction between spacing and organic mulch treatments does not significantly affect all observed parameters.
2. Plant spacing treatment significantly affected the plant height parameters at the age of 6 MST and weight of tuber weight per plot
3. Provision of organic mulch does not significantly affect all parameters observed.

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