IDENTIFICATION OF ORGANIC MULCH EFFECTS ON WEED DIVERSITY AND SHALLOT (*Allium ascalonicum* L.) PRODUCTIVITY

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Abstract.
Shallot cultivation in North Kalimantan has not been implemented properly. This is because the soil in North Kalimantan is acid so the yield of shallot is low. One effort to increase soil pH using organic mulch. Organic mulch has the function of maintaining soil moisture and inhibiting the growth of weeds so that shallot cultivation can grow well. This study aims to determine the effects of organic mulch on weed diversity and yield of shallot. The study was conducted using Randomized Block Design with the treatment without mulch (P0), *Imperata cylindrica* mulch (P1), *Cyperus rotundus* mulch (P2), *Eleusine indica* mulch (P3) and *Cynodon Dactylon* mulch (P4). The results showed that the parameters of shallot using *Cyperus rotundus* mulch and *Eleusine indica* mulch increased the number of tubers 11.57%. In this study, species of weeds had the highest a on each treatment were species *Eleusine indica* on without mulch (21.93%), *Cyperus rotundus* mulch (54.26%), and *Eleusine indica* mulch (28.79%). Then, species *Borreria latifolia* on *Imperata cylindrica* mulch (28.79%), and species *Cynodon dactylon* on *Cynodon dactylon* mulch (47.21%).

1. Introduction
Shallot is an annual plant from the Liliaceae family that forms clumps with height between 15-50 cm, can grow well in 0-800 meters above sea level. However, to obtain optimal output in planting shallot, good amount of sunlight, air and nutrient exposure is very crucial [1]. According to research soil pH in Tarakan City, North Kalimantan Province the soil pH is 3.95 (very acid) [2] which is not very suitable to grow shallots that require sandy or dusty loam with soil degree of acidity (pH) between 5.5 - 6.5. Thus, one effort to increase soil pH and soil fertility using mulch is necessary.

Mulch, soil enhancer that can increase soil fertility [3], is divided into three types, namely organic mulch, inorganic mulch, and synthetic chemical mulch [4]. Organic mulch is a soil cover material derived from plant remains and animal dung that has soil surface protection from erosion, soil safety, soil structure, soil fertility, and utilization of weed growth [5]. *Imperata cylindrica, Cyperus rotundus, Eleusine indica, Cynodon Dactylon* are a type of weed that can be used as organic mulch.

Mulch is a way improve soil air conditioning as well availability of air for plants. Besides offering mulch can accelerate plant growth newly planted. Advantage use of organic mulch in agriculture can improve and improve quality of results [6]. This is in line with research [7] on shallot plants showing that applying reed mulch combined with chicken manure increased the yield on tuber fresh weight parameters by 8.5%. Besides being able to increase the yield of shallot plants, the use of organic mulch can also suppress weed growth.
Provision of fresh organic mulch which still contains alleopathy so that it can inhibit weed growth [8] is strengthened [9] cultivated land covered by organic mulch can inhibit weed growth, because weeds need sunlight to break dormant seeds. The results of research [10] effect of organic mulch to tomato plants in Garut Regency can suppress weed growth and the identification results of weeds that given organic mulch contained 16 species of weeds, namely Alternanthera sessilis, Oxalis latifolia, Portulaca oleracea, Erechtites valerianifolia, Ageratum conyzoides, Drymaria villosa, Digitaria ciliaris, Eulisine indica, Amaranthus spinosus, Drymaria villosa, Digitaria ciliaris, Eulisine indica, Amaranthus spinosus, Cyperus rotundus, Galinsoga parviflora, Erigeron sumatrensis, Cynodon dactylon, Richardia brasiliensis, Oxalis corniculata, Leptochloa chinensis.

Based on the results of previous determination, the use of organic mulch can increase plant productivity and suppress weed growth. Therefore, it is necessary to conduct research on the effect of organic mulch on the diversity of weeds and shallot yields planted in acidic soil of North Kalimantan.

2. Material and Methods
The study was conducted in Experimental Farm of Faculty of Agriculture, Universitas Borneo Tarakan, Tarakan, North Kalimantan, Indonesia from January to March 2020. This research was done by using a Randomized Block Design with the treatment without mulch (P0), Imperata cylindrica mulch (P1), Cyperus rotundus mulch (P2), Eleusine indica mulch (P3) and Cynodon Dactylon mulch (P4) with giving organic mulch as much as 3 kg per soil block. The study was repeated 5 times to produce 25 experimental units, each experimental unit consisting of 16 plants, so that the entire plant was 400 plants.

The parameters consisted of two parts, namely shallot harvest parameters and weed vegetation parameters. The parameters of the shallot harvest were the number of tubers, diameter of tubers, Weight of tubers/plant, weight of tuber/hectare, and weight of plant. Weed vegetation parameters were Absolute Frequency (FM), Relative Frequency (FR), Absolute Density (KM), Relative Density (KR), Important Value Index (INP) and Summed Dominance Ratio (SDR).

The study used Analysis of Variance (F-test) dan Weed Vegetation Analysis. Each treatment was compared with Duncan Multiple Range Test (DMRT) 95% confidence level. Then, the vegetation analyses was examined by Summed Dominance Ratio (SDR) of weeds in a field. The data analysed are labelled as Absolute Frequency (FM), Relative Frequency (FR), Absolute Density (KM), Relative Density (KR), Important Value Index (INP) and Summed Dominance Ratio (SDR).

The data was analysed by dividing the number of individuals in the type by the area of
the observation plot. Then, the percentage of relative density was calculated by dividing the absolute density of a type by the absolute density of all types. While the absolute frequency was calculated the number of plots that contain all types of weed with the total number of plot observations. Meanwhile, the absolute frequency of a type divided by the absolute frequency of all types. Finally, we calculated the important value by added up the relative frequency and relative density where the important value is the same as the Summed Dominance Ratio (SDR).

4. Results and Discussion
Based on the analysis of variance, the treatment of organic mulch has significantly affected the number of tubers. However, there were no significant influenced on diameter of tubers, weight of tubers/plant, weight of tubers/hectare and the weight of plant (Table 1).

Table 1. Recapitulation Of The Results Effects Of Organic Mulch On Yield Of Shallot

| No | Parameters             | F test result |
|----|------------------------|---------------|
| 1  | Number of tubers       | *             |
| 2  | Diameter of tubers     | ns            |
| 3  | Weight of tubers/plant | ns            |
| 4  | Weight of tubers/hectare | ns         |
| 5  | Weight of plant        | ns            |

Note: ns = not significantly different; * = significantly different

Based on the result of the variance, it is known that the *Cyperus rotundus* mulch and *Eleusine indica* mulch has a significant effect on the number of tubers (Figure 1) Figure 1 showed the *Cyperus rotundus* mulch and *Eleusine indica* mulch showed the highest yield compared to other treatments of 6.05, but not significantly different with the treatment of *Imperata cylindrica* mulch and *Cynodon Dactylon* mulch.

In this study, parameter of the diameter of tubers, weight of tubers/plant, the weight of tubers/hectare and weight of plant were not significant different among treatment (Table 2). The highest treatment on diameter of tubers was P1 treatment of 1.27 cm, the highest treatment on weight of tubers/plant was treatment P2 of 18.32 g, the highest treatment on weight of tubers/hectare was treatment P2 of 2.93 tons, and the highest treatment on weight of plant was treatment P2 of 13.77 g.

![Figure 2. Effect of Organic Mulch on the Number of Tubers Shallot](image_url)
Parameter number of tubers on weed diversity, the number of tubers/plant, weight of tubers/ton, weight of plant (ns, not significantly different; without mulch (P0), Imperata cylindrica mulch (P1), Cyperus rotundus mulch (P2), Eleusine indica mulch (P3) and Cynodon Dactylon mulch (P4). Table 2. DMRT test for parameter the diameter of tubers, weight of tubers/plant, weight tubers/hectare and weight of plant (ns, not significantly different; without mulch (P0), Imperata cylindrica mulch (P1), Cyperus rotundus mulch (P2), Eleusine indica mulch (P3) and Cynodon Dactylon mulch (P4).

| No | Treatment | Diameter of Tubers (cm) | Weight of Tubers/plant (g) | Weight of tubers/hectare (ton) | Weight of plant (g) |
|----|-----------|-------------------------|-----------------------------|-------------------------------|---------------------|
| 1  | P0        | 1.08 ns                 | 12.55 ns                    | 2.01 ns                       | 9.73 ns             |
| 2  | P1        | 1.27 ns                 | 14.69 ns                    | 2.35 ns                       | 9.92 ns             |
| 3  | P2        | 1.21 ns                 | 18.32 ns                    | 2.93 ns                       | 13.77 ns            |
| 4  | P3        | 1.21 ns                 | 14.72 ns                    | 2.36 ns                       | 10.51 ns            |
| 5  | P4        | 1.25 ns                 | 17.38 ns                    | 2.78 ns                       | 11.31 ns            |

Eleven weeds were collected, which consist of Eleusine Indica, Ageratum conyzoides, Cleome rutidosperma, Borreria latifolia, Ludwiga hyssopifolia, Crassocephalum crepido, Cyperus rotundus, Aeschymene aspera, Phylantus ninuri, Cynodon dactylon, dan Hedyotis difusa (Table 3).

The study results also showed observations of 42 DAP weeds in the without mulch (P0) treatment of Eleusine indica weed with the highest SDR value of 21.93%. Imperata cylindrica mulch (P1) treatment of Borremia latifolia weed with the highest SDR value was 28.79%. Cyperus rotundus mulch (P2) treatment of Eleusine indica weed with the highest SDR value was 54.26%. Eleusine indica mulch (P3) treatment of Eleusine indica weed with the highest SDR value was 54.26%. Cynodon Dactylon mulch (P4) treatment of Cynodon dactylon weed with the highest SDR value is 47.21%.

The results of the regression analysis carried out in Table 4. State that five of the ten regression analyzies are negative. The regression analysis that was negative was the number of tubers on diameter of tubers, the number of tubers on weed diversity, diameter of tubers on weed diversity, weight of tubers/plant on weed diversity and weight of plant on weed diversity.

Table 3. Value of Summed Dominance Ratio (SDR) 42 DAP on Shallot (without mulch (P0), Imperata cylindrica mulch (P1), Cyperus rotundus mulch (P2), Eleusine indica mulch (P3) and Cynodon Dactylon mulch (P4).
Table 4. Regression Analysis of Yield Shallot and Weed Diversity

| No | X                                      | Y                              | Result                  |
|----|----------------------------------------|--------------------------------|-------------------------|
| 1  | Number of Tubers                       | Diameter of Tubers             | 1.37-0.03x              |
| 2  | Number of Tubers                       | Weight of Tubers/plant         | 11.18+0.79x             |
| 3  | Number of Tubers                       | Weight of Plant                | 2.82+1.51x              |
| 4  | Number of Tubers                       | Weed Diversity                 | 11.25-0.52x             |
| 5  | Diameter of Tubers                     | Weight of Tubers/plant         | 7.05+18.75x             |
| 6  | Diameter of Tubers                     | Weight of Plant                | 4.78+5.21x              |
| 7  | Diameter of Tubers                     | Weed Diversity                 | 11.59-2.65x             |
| 8  | Weight of Tubers/plant                 | Weight of Plant                | 1.35+0.62x              |
| 9  | Weight of Tubers/plant                 | Weed Diversity                 | 11.17-0.17x             |
| 10 | Weight of Plant                        | Weed Diversity                 | 10.91-0.23x             |

Cultivation of shallots in Indonesia is usually harvested at the age of 70 DAP, but in this study, shallots were harvested at the age of 42 DAP. This is due to the use of organic mulch. The use of organic mulch is able to maintain optimal soil temperature so that it can optimize the rate of development of the root system which can help plants absorb nutrients and water to boost the rate of photosynthesis so that it can optimize tuber formation [11]. This is in accordance with Figure 2, namely P2 and P3 treatments increased the number of tubers by 11.57% from treatment P0.

Table 2. Shows that the treatment of tuber diameter, tuber weight, tuber weight of one hectare and plant weight were not significantly different. P2 treatment resulted in tuber diameter 10.74%, tuber weight 31.49%, one hectare tuber weight 31.49% and plant weight 29.34% higher than treatment P0. This shows that organic mulch can provide optimal environmental conditions, especially air temperature and soil temperature which play an important role in various physiological processes and plant growth. The results of research [12] that an increase in temperature to a certain extent can increase photosynthesis results, so that the weight of shallot plants.

*Elusine indica* had the highest value of SDR on the treatment of P0, P1, P2 and P3. The characteristic of *Elusine indica* growth was very fast, and allelochemical would be affected to another weeds. In P4 treatments, *Species of Cynodon dactylon* had the highest value of SDR. It was indicated that grining grasses were more adaptable than other weeds.

In general, there was potency for cultivating shallot on soil acid. The mulch was possible as a factor to control soil acid in this research which the utility has effect on maintaining soil conditions. For the case in North Kalimantan, the mulch organic was recommended as a component for cultivation onion in the field.

Table 4. States that not all regression analysis results are positive. The cause of the regression results between the number of tubers and the negative diameter of tubers is that the number of tubers produced by shallots is not in line with the diameter of tubers. in addition to the number of tubers on weed diversity, diameter of tubers on weed diversity, weight of tubers/plant on weed diversity and weight of plant on weed diversity. This is influenced by the presence of organic mulch and weeds on the shallots. During the cultivation process of shallot weeds are not removed and several types of weeds that grow in shallot fields produce allelopathy, so that the growth of shallots is inhibited.

5. Conclusions
The results showed that the parameters of shallot using *Cyperus rotundus* mulch and *Eleusine indica* mulch increased the number of tubers is 11.57%. In this study, species of weeds had the highest SDR on each treatment were species *Elusine indica* on without mulch (21.93%), *Cyperus rotundus* mulch (54.26%), and *Eleusine indica* mulch (28.79%). Then, species *Borreria latifolia* on *Imperata cylindrica* mulch (28.79%), and species *Cynodon dactylon* on *Cynodon dactylon* mulch (47.21%)
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