The effect of shade and vermicompost application on yield and flavonoid levels of Tempuyung (Sonchus arvensis)

D P Putri, Y Widyastuti, W S Dewi and A Yunus

1Student of Agrotechnology Studi Program, Agriculture Faculty, Universitas Sebelas Maret, Surakarta, Indonesia
2Lecturer of Agrotechnology Studi Program, Agriculture Faculty, Universitas Sebelas Maret, Surakarta, Indonesia
3Research center for Medicinal Plant and Traditional Drug, Tawangmangu, Indonesia

E-mail: yunus.uns7@yahoo.com

Abstract. This study aims to determine the effect of shade and vermicompost on yield and level of flavonoids in Tempuyung (Sonchus arvensis). The study was conducted in May-August 2016, in Tegal Gede Village, Kab. Karanganyar. Secondary metabolite content analysis was performed in B2P2TOOT laboratory, Tawangmangu. This study used a Completely Randomized Design (CRD) arranged in a split plot. Treatment consists of shade as main plot and the dose of vermicompost as sub plot. Shade treatments are 0% (without shade), 50% and 75%. The dose of vermicompost are 0 g / polybag (control), 250 g / polybag, 500 g / polybag and 750 g / polybag. Each treatment was repeated 3 times and each in experimental unit consist of 2 sample plants. The results showed that the higher levels of shade tend to decrease vegetative growth of plants. Moreover, vermicompost give significant effect on leaf weight, number, wet and dry weight. The combination of 0% shade and 750 gram vermicompost gave the highest value (P<0.05) to leaf weight ± 186.68 g, wet weight ± 252.08 g and dry weight ± 30.76 g Tempuyung. The combination of 50% shade with 0 g vermicompost and 75% shade with 250 g vermicompost show to increasing the content of flavonoid compounds.

1. Introduction

Indonesia has many kinds of medicinal plants that have been developed well or still grows wild. Tempuyung is one of the potential medicinal plants in Indonesia and has long been utilized by the public as herbal treatment [1]. Tempuyung has benefits to treat gout, diuretics, kidney stones, bladder stones, gallstones, swelling drugs, tranquilizers, cough, asthma and bronchitis. Tempuyung grows in wild in the open exposed area to sunlight or less protected and the soil slightly damp, like the edge of the ditch, roadside, between the stones, cliffs and sloping walls [2]. Tempuyung is a pioneer plant that can live in marginal soil that has minimal nutrient or event heavy metal. Tempuyung included in the category of nonnitrophilous species that can grow on low soil N content [3].

Simplicia Tempuyung leaves are commonly uses drug, therefore needs a cultivation techniques to improve the quantity and quality of crude content of TTempuyung leaves. Vermicompost application has a significant effect on root length, leaf fresh weight and dry weight of Tempuyung [1] at dosages of 0.25 kg/ polybag, 0.5 kg / polybag and 0.75 kg / polybag. Effect of shade treatment is expected to
increase secondary metabolite in Tempuyung, that is flavonoid. The shade treatment of Tempuyung will affect the intensity of the light obtained.

Previous study [4] showed the highest increment of flavonoids (11.42%) is in the shade level of 50% [5]. Tempuyung which receive stress shade plants tend to have higher number of branches and stems than in the absence of shade. Therefore, to study the effect of shade on medicinal plants is very important for cultivation management of medicinal to achieve higher biomass and active ingredient.

2. Methods

2.1. Material and tools
The materials used in this study are seed Tempuyung, media Latosol soil, vermicompost, ethanol, methanol, hexan and ethyl acetate. The tools used in this study include hoe, meter, an oven, a knife or scissors, analytical balance, weighing a kilogram, ruler, camera, plastic tubs, stationery, grinder, plates silica gel 254, chamber, saucer porcelain beaker 50 ml, waterbath, sonicator, a pipette, tweezers and the filter paper.

2.2 Treatment Design
This study uses a completely randomized design (CRD) which are arranged in a split plot and arranged randomly. The treatments consisted of shade as the main plot and doses of vermicompost as a sub plot. Shade consists of 0% (no shade), 50% and 75%. Vermicompost dose consisting of 0 g / polybag (control), 250 g / polybag, 500 g / polybag and 750 g / polybag. Each treatment were repeated 3 times, and each experimental unit consisted of two plant samples.

2.3 Observation of growth
The growth were observed at every week and after harvesting time. The observed factors were number of leaves, leaf weight, leaf length, crown diameter, root length, root weight, dry leaf weight, chlorophyll, wet weight, and dry weight

2.4. Flavonoid analysis
Flavonoid analysis was done by TLC (Thin Layer Chromatography). Thin layer chromatography (TLC) is a method of chemical component separation and development is strongly influenced by the type and polarity of separated chemicals. The common and widely used silicone phase is silica gel mixed with CaSO4 to increase the adhesion of silica gel particles to other widely used absorbent (alumina) auxiliaries are alumina, cellulose powder, starch and sephadex. Parameters in thin layer chromatographies are retention factor (Rf), a comparison of the distance traveled by the solute to the distance traveled by the mobile phase. The distance traveled by the phase of motion (cm): Distance traveled solute (cm) \( Rf = \frac{(1)}{\text{Rf price is generally smaller than 1, whereas if multiplied by 100 will be worth 1-100, so this parameter can be used for qualitative calculations in sample testing with thin layer chromato- gos [6].

2.5. Statistic analysis
Data were statistically treated by ANOVA, Duncan's multiple ranges test at probability level 0.05 was performed to compare mean.

3. Results and discussion

3.1. General Conditions Research
This research was conducted at B2P2TOOT Medicinal Plant Garden, Tanjungsari Village, Tegal Gede Village, Karanganyar. Geographical location of the research site at 7036,687 'S and 110057,766' E. The study site is altitude of 215 meters above sea level. The temperature at the study site ranged from
27°C-30°C. Type of soil in this area is a red latosol land, textured clay and with the content of nutrients that are.

3.2. Weight leaves

The leaves are a very important part of the plant, where the photosynthesis take place to obtain energy. There is no interaction (P <0.05) between the shade and vermicompost. The highest interaction generated by N0V3 (without shade and vermicompost 750 g) of ± 186.68 g. N2V0 combination treatment (75% shade and without vermicompost) provides the lowest leaf weight values of ± 12.25 grams.

| Table 1. Interaction Shade and Vermicompost on Leaf Weight (g) |
|---------------------------------------------------------------|
| Treatment | Without Vermicompost (V0) | Vermicompost 250 g (V1) | Vermicompost 500 g (V2) | Vermicompost 750 g (V3) |
|-----------|--------------------------|-------------------------|-------------------------|-------------------------|
| Without Shade (N0) | 76.78 ± 35.59 | 168.66 ± 72.42 b | 154.42 ± 84.05 b | 186.68 ± 89.14 b |
| 50% shade (N1) | 16.13 ± 3.88 | 26.34 ± 12.1 a | 34.80 ± 10.26 a | 33.09 ± 22.83 a |
| Shade 75% (N2) | 12.25 ± 3.8 | 16.33 ± 14.7 a | 12.81 ± 16.4 a | 16.63 ± 5.12 a |

Previous study [1] explains that vermicompost contain cytokines that can increase endogenous cytokines, either directly or indirectly to regulate the production of hormones to stimulate cell division and form new shoots, which can affect the leaf area and leaf dry weight. While the greater level of shade, the leaves lose weight, plants growing under shade will have leaves that are wider and thinner than the leaves of plants that live in the open [7]. Giving light shade that minimize the entry of plants to cause the slow process of photosynthesis and growth Tempuyung. Variable observation leaf weight was positively correlated with a variable number of leaves (r = 0.985 **).

| Table 2. Interaction Shade and Vermicompost on the Number of leaves (leaf) |
|---------------------------------------------------------------|
| Treatment | Without Vermicompost (V0) | Vermicompost 250 g (V1) | Vermicompost 500 g (V2) | Vermicompost 750 g (V3) |
|-----------|--------------------------|-------------------------|-------------------------|-------------------------|
| Without Shade (N0) | 25 ± 9.98 b | 46.33 ± 2.46 c | 42.16 ± 3.40 c | 45.5 ± 20.3 c |
| 50% shade (N1) | 8.83 ± 3.12 a | 10 ± 1.8 ab | 13 ± 6.4 ab | 10 ± 2.17 ab |
| Shade 75% (N2) | 7.33 ± 6.08 a | 8.5 ± 13.93 a | 6 ± 5.89 a | 10.5 ± 2.17 ab |

Based on the interaction table shows the combined treatment of N0V3 (without shade and vermicompost 750 grams) shows the average value of the highest number of leaves 45.5 ± strands. Combination treatment N2V2 give an average value that is the lowest number leaves ± 6 strands. [8], shelter reducing solar light energy needed by plants to grow and thrive. This will lead to reduced photosynthetic production resulting in a reduction in the formation of the leaves. According to [9] the fertilization of vermicompost causes the plants to flourish, the stems are higher, the leaves are dark green and the leaf texture is good compared to the plants without the vermicompost. According to the previous study improvement of growth and yield as a result of vermicompost application is due to the improvement of soil quality and the availability of micro and macro nutrients [10], as well as increased soil microbial activity. Occurs a positive correlation between the number of leaves and leaf length (r = 0.825 **).

| Table 3. Effect of the Long Leaf Shade (cm) |
|------------|-----------------|
| Shade (%) | Long Leaf (cm) |
|------------|-----------------|
| 0 | 31.067 ± 3.9 c |
| 50 | 25.125 ± 6.11 b |
| 75 | 18.500 ± 6.22 a |
The application of shade showed the value of a long decline leaves on each level of shade. The application vermicompost did not show the effect of significantly different (P > 0.05) to the length of the leaf. This is reinforced by the research [11] that light passing or emanating from adjacent foliage makes plants grow to support the specific genetic and physiological processes of the leaves. Changes in gene expression underlie the adaptation, or the avoidance of light compromised by the environment or it can be said that the growth response in the environment on the light manipulated in direct sun avoidance responses, can physiologically inhibit the growth of leaves. The leaves are positively correlated with crown diameter ($r = 0.928 \ast\ast$), if the value of the leaf length increases, the diameter of the leaf canopy is also increasing. The longer the canopy showing very good plant growth, because growth header that lengthening the more leaves to photosynthesize.

Table 4. Effect of the Diameter header Shade Leaf Total (cm)

| Shade (%) | The longest canopy (cm) |
|-----------|-------------------------|
| 0         | 39.7448 ± 9.33 c        |
| 50        | 29.2057 ± 4.06 b        |
| 75        | 23.2813 ± 9.30 a        |

Shade treatment results were significantly different (P < 0.05), treatment without shade has an average value of the highest crown diameter ± 39.7448 cm. Fifty percent of shade treatment had an average value ± 29.2057 cm, while 75% shade treatment had the lowest average value that is equal to ± 23.2813 cm. Vermicompost treatment to variable diameter canopy provides results that are not significantly different ($p > 0.05$).

### 3.3. Chlorophyll levels

Chlorophyll is the green substance found in all green plants. Shade treatment showed shade intensity significantly ($p < 0.05$), whereas vermicompost treatment did not significantly affect chlorophyll content ($p > 0.05$). There is no interaction between shade intensity and vermicompost dose to chlorophyll content of Tempuyung.

Table 5. Effect of Shade to Chlorophyll levels

| Shade (%) | Chlorophyll levels (%) |
|-----------|------------------------|
| 0         | 38.10 ± 1.35 b         |
| 50        | 34.50 ± 2.19 a         |
| 75        | 32.98 ± 2.19 a         |

Based on Table 5, the highest chlorophyll content indicated by the plant with no shade that is equal to ± 38.10%, whereas treatment with shade intensity of 50% and 75% that is equal to 33.74%. This because the higher the intensity of irradiation will further increase the chlorophyll content of leaves that make the process of photosynthesis increases. This study is in line with [12], which examined the effect of light as a single factor on Myrtus communis, which resulted in the treatment without shade giving higher levels of chlorophyll compared to the 70% shade treatment. Vermicompost treatment did not significantly affect the levels of chlorophyll. Results of correlation analysis showed that the leaf chlorophyll positively related ($r = 0.754 \ast\ast$) with a weight Tempuyung leaves. Increased chlorophyll will increase the rate of photosynthesis which accelerate the formation of the leaves that are part of the plant fresh weight [13].

### 3.4. Roots of Tempuyung

Root as the entry point of mineral (translocate nutrients) from the soil to get to all parts of the plant. Shade treatment against root length variable result significantly different (P < 0.05). Table 6 shows the treatment without shade give the highest root length of 44.52 cm, while the length of the lowest root
level of 75% was obtained auspices of 15.12 cm. Effect of vermicompost did not give significantly
different results against Tempuyung root length (P > 0.05).

| Table 6. Effect of Shade to Root Length (cm) |
|---------------------------------------------|
| Shade (%) | Root Length (cm) |
|----------|-----------------|
| 0        | 44.52 ± 10.75 c |
| 50       | 22.38 ± 8.67 b  |
| 75       | 15.12 ± 6.31 a  |

This is presumably due to the small light that can penetrate paranet so stunted plant growth. In the
previous study [14] states the auspices cause absorption of light for photosynthesis is very low and
cause growth to slow down. The analysis results show a root length correlated positively (r = 0.969 **) with root weight. This can be understood the longer the root, it will increase the weight of plant
roots Tempuyung. The shade treatment was significantly different (P < 0.05) against the weight of root
Tempuyung.

| Table 7. Effect of Shade on Root Weight (g) |
|-------------------------------------------|
| Shade (%) | Root weight (g) |
|-----------|-----------------|
| 0         | 39.64 ± 12.8 b  |
| 50        | 7.05 ± 4.41 a   |
| 75        | 3.91 ± 3.35 a   |

Treatment without shade giving an average of the highest root weight of ± 39. 64 g. While the
shade 50% and 75% was significantly different to the weight of the roots with an average of ± 5.48 g.
According to recent study [15] when plants lack light then the process of photosynthesis becomes low,
consequently the photosynthesis results can be distorted by the process of respiration, food reserves
are reduced so that plant growth is inhibited.

| Table 8. Effect of Vermicompost on Root Weight (g) |
|--------------------------------------------------|
| Vermicompost (g) | Root weight (g) |
|-------------------|-----------------|
| 0                 | 11.28 ± 12.12 a |
| 250               | 19.89 ± 24.40 b |
| 500               | 17.45 ± 16.21 b |
| 750               | 18.84 ± 19.66 b |

Treatment without vermicompost gives the average of the lowest root weight of ± 11.28 g. While
the provision of vermicompost significantly different to the weight of the roots with an average of ± 18.72 g. [16] stated that vermicompost contains plant-growing hormones. The hormone not only
stimulates rooting in the graft, but also spurs the growth of plant roots in the soil, spurring new branch
twigs on the stems and branches of trees, and spurring leaf growth.

3.5. Wet weight

Wet weight is the size of the resulting pile of photosynthesis in plants in the form of heavy plant that
still contains moisture is not constant. [17] explains that wet weight and dry weight of plants play an
important role in plant growth, because the plant can grow strongly if the wet weight and dry weight
of the plant is high. Vermicompost shade treatment and significantly different (P < 0.05) on the wet
weight. There is no interaction between the two treatments.
Table 9. Interaction Shade and Vermicompost on wet weight (g) at Tempuyung

| Treatment            | Without Vermicompost (V0) | Vermicompost 250g (V1) | Vermicompost 500g (V2) | Vermicompost 750g (V3) |
|----------------------|---------------------------|------------------------|------------------------|------------------------|
| Without Shade (N0)   | 111.52 ± 48.1             | 235.19 ± 72.4 b        | 235.27 ± 121.7 b       | 252.08 ± 100.22 b      |
| 50% shade (N1)       | 22.8 ± 6.87               | 35.86 ± 17.1 a         | 50.60 ± 14.52 a        | 44.23 ± 31.27 a        |
| Shade 75% (N2)       | 17.83 ± 6.32              | 18.63 ± 20.3 a         | 22.22 ± 25 a           | 22.26 ± 7.88 a         |

The results of the wet weight of the land without a shade higher than in land shaded. This condition is due to the growth of wet weight, Tempuyung plants need the help of good photosynthesis process, shade treatment can accumulate photosynthate products at light level required in the process of photosynthesis in plants [18]. Wet weight gain in this study caused also by vermicompost which has the ability to increase the stability of aggregates and increase total porosity of the soil.

The input of organic matter contributes nutrients to the soil [19], the higher the nutrient content in the soil can increase crop yields. Nutrients will be used to accelerate the process of photosynthesis. Based on the results of the correlation, so that the weight of high light intensity is needed. With the wet plant Tempuyung positively correlated ($P < 0.05$) with all variables except observation at variable levels of correlation and the extract did not occur at lower levels of flavonoids are negatively correlated.

3.6. Dry weight

Dry weight measurement is part of plant biomass measurements. There is interaction and vermicompost treatment giving shade to dry weight Tempuyung. The value obtained N0V3 treatment that is equal to 31.36 grams, while the value of the lowest dry weight obtained N2V1 treatment with an average value of 2.98 g. According to the table 10 can be seen that the higher the intensity the lower the auspices of the dry weight of the resulting, contrary to the provision of higher vermicompost will raise Tempuyung plant dry weight.

Table 10. Interaction Shade and Vermicompost on Dry Weight (g) on Tempuyung (Sonchus arvensis)

| Treatment            | Without Vermicompost (V0) | Vermicompost 250 g (V1) | Vermicompost 500 g (V2) | Vermicompost 750 g (V3) |
|----------------------|---------------------------|------------------------|------------------------|------------------------|
| Without Shade (N0)   | 10.81 ± 4.67              | 31.36 ± 10.65 c        | 20.93 ± 2.06 b         | 30.76 ± 7.91 c         |
| 50% shade (N1)       | 3.46 ± 0.7                | 4.72 ± 1.86 a          | 6.21 ± 1.59 a          | 4.85 ± 3.48 a          |
| Shade 75% (N2)       | 3.16 ± 0.94               | 2.98 ± 1.92 a          | 3.94 ± 5.17 a          | 3.46 ± 1 a             |

This is in line with the statement [20] which states that the granting of enhanced shade intensity by 75% causing the dry weight of various types of plants is lower. This is due in addition to the total leaf area is reduced, as well as the depletion of the leaves, which can cause leaves to shade each other and result in a decrease in the rate of photosynthesis. Also plant dry weight is closely associated with the availability of nutrients in growing media. In addition, vermicompost can also improve soil physical properties such as soil structure associated with the development of plant roots. Based on the results of the correlation, Tempuyung plant dry weight were positively correlated ($P < 0.05$) with all variables except observations on the extract did not happen correlation levels and negatively correlated with the levels of flavonoids.

3.7. Analysis of Flavonoids
The content of the extract is a quantitative calculation by comparing the extract obtained with the weight of the starting material. The picture shows the extract content of Tempuyung, which is the highest result obtained by treatment of N2V2 (75% shade and 0.5 kg of vermicompost fertilizer) by 22%, while the NOV1 treatment obtained the lowest percentage rendement of 14%.

Figure 1. Graph Extract yield levels on Tempuyung

Levels of this extract show the content of active compounds or secondary metabolites present in the plant. The greater the level of extract, the content of active compounds in the plant more and more, while the fewer levels of extract the active compound content in the plant the less. It can be understood that in this extraction method, using ethanol which serves to dissolve the resin, fat, oil, fatty acid compounds which then this solution is vaporized in the water bath and leaving the residue [21]. Based on the results of the correlation between extract levels with flavonoids in Tempuyung, it is known that there is no correlation between the two variables. It can be understood that the value of the extract is not necessarily directly proportional to the level of flavonoids Tempuyung, because in an extract contains a variety of other secondary metabolites.

Based on a qualitative analysis was conducted using TLC (Thin Layer Chromatography) dispersed in the form of pigment compounds, it appears that each treatment shows the results of size and thickness of different colors. Identification of flavonoid compounds in this study using Thin Layer Chromatography [6]. TLC used in the identification of flavonoids is made of silica gel with a size of 9 cm x 13 cm. Plate TLC silica gel is activated by means of the oven at 100°C for 1 hour. The aim is to remove the water contained in the TLC plate. Condensed extract extraction results then diluted with hexane as much as ± 5 ml. Hexane is used to dissolve fat and fatty acids. Then spotted along the plate by using a micro pipette at a distance of 1 cm from the bottom line and each treatment was given within 1 cm. Furthermore, in the elution using eluent gives the best results on the TLC separation, namely n-hexane - ethyl acetate - methanol ratio (5: 5: 1) [6].

In Figure 2, the chromatogram detection at 366 nm UV light showed a few patches of color that indicates the presence of a compound. The resulting number of spot colors signify the amount of active compound contained in a plant. The thicker the spot colors produced by the thicker the active compound content in plants. The test results are read on a flavonoid UV lamps generate Rf 0.5 (white column picture 3) with a red stain that is suspected of flavonoids and previous study[22] states that if the form of orange, red, purple or yellow, positive means flavonoids.

\[a\] N0= shade 0%; N1= shade 50%; N2= shade 75%; V0= 0 g; V1= 250 g; V2= 500 g; V3= 750 g
Plants evolved in various ways to survive from stress, one of them by producing secondary toxic metabolites. Poisonous metabolites generally accumulate in vacuoles, extracellular trichomes, or extracellular cells. Glycosylation is an important modification that occurs in various secondary metabolite compounds. Based on the origin of the biosynthesis, the plant’s natural metabolite products can be divided into three main groups, namely terpenoids, alkaloids, and phenylpropanoids as well as groups of antioxidant phenolic compounds [23]. There are two groups of sources of antioxidants, namely synthetic antioxidants (antioxidants obtained from the synthesis of chemical reactions) and natural antioxidants (antioxidants extracted natural ingredients or contained in natural ingredients). Natural antioxidants come from phenolic compounds such as flavonoids. Flavonoids are secondary metabolites produced by plants [24]. These compounds can be toxic to other organisms, which work by disrupting the function of cell proteins. Some metabolites interact with molecules that have basic cellular functions, such as DNA and proteins involved in cell division [25]. [26] mentions that the formation of secondary metabolites governed by nutrition, decreased growth rate, feedback control, enzyme inactivation, and enzyme induction.

According to the table 11, it is known that the treatment has the greatest scoring flavonoids contained in N2V1 treatment (shade level of 75% and vermicompost 250 g) and mistreatment N2V3 (shade level of 75% and 750 g of vermicompost). Other research supports this finding was carried out by [27], namely that examines the effects of vermicompost fertilizer and other organic fertilizers on the tuber timber. The content of phenolics and flavonoids were significantly higher (p <0.01) in vermicompost than mineral fertilizers and compost. Metabolite secondary is produced more when the plant is in a state gripped, but if the plant is too stressed or otherwise the plant will produce fewer secondary metabolites [28].

Based on the correlation results showed that levels of flavonoids correlated negatively on all variables observation and did not correlate with the levels of the extract. Although fertilizer able to improve secondary metabolites, but according to the previous finding [29] the expression of secondary metabolites depends not only on the increase in plant biomass but also depends on the activity of the enzyme. Because secondary metabolites is the result of the synthesis and degradation of enzymes that occur during the process of plant metabolism. Differences content of plant secondary metabolites depending on how plants adapt to the environment, such as light factor and how plants absorb nutrients [26]. The light shade conditions contain UV-A rays, blue, green and red light slightly, but rich in infrared light [30]. This affects on the production of active ingredients contained in the plant.

Figure 2. Cross-section on Chromatography Silica Gel Thin Layer Chromatography
Table 11. Result and Scoring Calculation Spot Size Color Flavonoids in Tempuyung (%)

| Code | Treatment | Spot Size (%) | Scoring Color (%) | Scoring Flavonoids | Harkat |
|------|-----------|---------------|-------------------|--------------------|--------|
| P1   | Standards | 4             | 3                 | 7                  | moderate |
| 1    | NOV0      | 2             | 3                 | 5                  | Low    |
| 2    | NOV1      | 2             | 2                 | 4                  | Low    |
| 3    | NOV2      | 3             | 3                 | 6                  | moderate |
| 4    | NOV3      | 2             | 2                 | 4                  | Low    |
| 5    | N1V0      | 4             | 4                 | 8                  | Many   |
| 6    | N1V1      | 4             | 3                 | 7                  | moderate |
| 7    | N1V2      | 4             | 3                 | 7                  | moderate |
| 8    | N1V3      | 4             | 3                 | 7                  | moderate |
| 9    | N2V0      | 4             | 3                 | 7                  | moderate |
| 10   | N2V1      | 4             | 4                 | 8                  | Many   |
| 11   | N2V2      | 4             | 3                 | 7                  | moderate |
| 12   | N2V3      | 4             | 3                 | 7                  | moderate |

Information:
Scoring diameter spot
Scoring color:
Scoring flavonoids:
1: diameter 0-24% 1: very pale 1: very low
2: diameter of 25-54% 2: pale 4-5: Low
3: diameter of 55-74% 3: light 6-7: medium
4: diameter 75-100% 4: very light 8: lots

4. Conclusion
The higher the level of shade giving up to 75% tends to lower the growth of plants, including ± 14.51 g of leaf weight, leaf number ± 8 strands, leaf length ± 18.5 cm ± 23.28 cm crown diameter, root length ± 15 12 cm, wet weight ± 20.34 g, and ± 3.39 g dry weight and chlorophyll content ± 32.98%. Giving vermicompost at a dose of 750 g/plant gives the highest yield to the weight of leaf ± 78.80 grams, number of leaves ± 22 strands, Gross weight ±106.33 g. Combination treatment without shade and vermicompost 750 g provides the highest scores (P < 0.05) to the weight of leaf ± 186.68 g, ± 252.08 g wet weight and dry weight of 30.76 ± Tempuyung. The combination treatment of 50% shade with 0 g vermicompost, and 75% shade with 250 g vermicompost, increasing the content of flavonoid compounds.

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