OPEN ACCESS International Journal of Applied Biology

ISSN : 2580-2410
eISSN : 2580-2119

EFFECT OF NATURAL GROWTH REGULATORY SUBSTANCE (PGR) AND DIFFERENCES OF PLANTING MEDIA ON CHLOROPHIL CONTENT NUMBER OF VEGETABLESTOMATES AND AREA OF VEGETABLESTOMATES *MICROGREENS* BROCCOLI (*Brassica oleracea L.*)

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Abstract

Microgreens are plants from the group of vegetables or herbal plants that are harvested at the age of 7-21 days. As a horticultural crop, broccoli (Brassica oleracea L.) is a type of vegetable that belongs to the cabbage family (Brassicaceae). This study aims to determine the effect of natural ZPT and differences in growing media on chlorophyll content, number of stomata and stomata openings of broccoli *Microgreens*. This study consists of 2 treatment factors. The first factor of the planting medium consists of husk charcoal (M1). Cocopeat (M2) and rockwool (M3). The second factor of natural ZPT consists of no ZPT (Z0), coconut water (Z1) and bean sprout extract (Z2). The combination treatment of rockwool growing media and natural zpt of bean sprout extract (M3Z2) gave the best results on parameters of chlorophyll a, b and total content, each of which was 14 days old. While the combination of treatment with cocopeat growing media and natural zpt of bean sprout extract (M1Z2) gave the best results on parameters of chlorophyll a, b and total content, each of which was 21 days after planting. The best parameters for the number of stomata and the area of stomata openings were found in the combination treatment of cocopeta growing media and natural zpt of coconut water (M1Z1), 15.00 and 115.13 m^2, respectively.

Article History
Received 05 October 2021
Accepted 30 December 2021

Keyword
Broccoli, *Microgreens*, Chlorophyll.

Introduction

Indonesia is a tropical country with a wide area, with high agro- climatic variations, which is a potential area for horticulture development for both lowland and highland crops. This agro-climatic variation is also beneficial for Indonesia, because the fruit, vegetable and flower season can last throughout the year. Public awareness of health is increasing along with the development of a healthy lifestyle in the millennial era, especially since society is faced with the COVID-19 pandemic that has shocked the world. Consuming healthy food is increasingly becoming a trend and is the choice of many people as a contemporary healthy

lifestyle. The demand for food sources of vitamins and minerals that are important for increasing immunity, such as vegetables and fruits, continues to increase. (Rena, 2016).

Vegetables and fruit are one of the food menus that support health because they have the nutrients and nutritional values that the body needs. *Microgreens* is a plant from a group of vegetables or herbal plants that are harvested at the age of 7- 21 days. This plant can be harvested by cutting the stems using sharp scissors just above the surface of the growth medium. So that what is consumed from *Microgreens* is the stem, cotyledons and the first leaves that have fully opened except for the roots. This group of plants has been very popular in developed countries since the 1980s due to awareness about healthy living including consuming healthy foods, namely *Microgreens*. Types of plants such as broccoli, basil, coriander, arugula and wheat are used as *Microgreens* which are harvested after reaching 4-8 cm in height (Lobiucet al., 2017).

As a horticultural crop, broccoli (Brassica oleracea L.) is a type of vegetable plant belonging to the cabbage family (Brassicaceae). Broccoli is often referred to as "Super Vegetable" because it has a high nutritional or nutritional content, namely it contains folate, vitamin C, vitamin C, and vitamins. K, iron and high in potassium (potassium), and contains antioxidant compounds such as sulforaphane. Sulforaphane is formed from methionine and glucorafanine which are precursors or precursors to sulforaphane (Rajiman, 2018).

According to (Maspary, 2011) rice husk charcoal is porous, light, not dirty, but has a low ability to absorb water and has large pores so that evaporation in the media is also higher which causes a lot of nutrients to be lost before being absorbed by plants. . The advantage of cocopeat as a planting medium is because of its high water absorption capacity between 6-8 times its dry weight so it saves water and nutrients, supports root growth quickly so it is good for nurseries.

In line with the research of Prihmantoro (2013), generally cocopeat has micro pores that are able to inhibit the movement of larger water causing higher water availability, cocopeat also has macro pores that are not too dense so that air circulation is very good for plant roots. Nugraha et al. (2018), in his research on the effect of the composition of cocopeat and husk charcoal on the growth and yield of kailan (Brassica oleracea Var. acephala) plants, concluded that the composition of the growing medium cocopeat 75% + 25% husk charcoal gave the best effect on plant height, fresh weight of stover , dry weight of stover and root loss ratio of kailan plants.

Coconut water as a natural growth regulator is cheaper and easier to obtain. According to Lawalata (2011) that coconut water contains auxin and cytokinin hormones. Both hormones are used to support the cell division of coconut embryos. Coconut water has a high enough potassium content up to 17%. Arif's research (2016) reported that the concentration of sprout extract had a significant effect on the growth of the moon orchid. Sprout extract concentration of 150 mg/liter gave the best growth results in lunar orchids. The results of Arif's research (2016), showed that the use of 150 g/l touge extract gave the highest yield on moon orchids.

Products from the broccoli plant that we know and are often sold in the market are only the final product in the form of broccoli. People's interest in vegetables increases with the times and lifestyles of people who begin to implement a healthy lifestyle, it encourages people to consume fresh and quality vegetables. The length of time to harvest broccoli encourages farmers to make various innovations, one of which is by planting broccoli *Microgreens*. Broccoli plants that can be consumed do not have to be the final product, but can also be consumed in the form of *Microgreens*.

Research Methods

This research was conducted at the Experimental Garden of the Faculty of Agriculture, Hasanuddin University, the Laboratory of Biochemistry and Plant Physiology of the Department of Agronomy, and the Biochemistry Laboratory of the Faculty of Animal Husbandry, Hasanuddin University. Research will last 8 months

Tool

The tools that will be used are tools *content chlorophyll meter* (CCM 200+), microscope, slide glass, sprayer, harvesting shears. paranet cameras, analytical balances, and writing instruments.

Ingredients

The materials that will be used in this research include broccoli *Microgreens* vegetable seeds, husk charcoal growing media, cocopeat, rockwoll, natural growth regulators made from coconut water and bean sprout extract, ab mix nutrients and others.

Methods

Seed selection and germination

The selection of good seeds is done by soaking in water then selecting the seeds that sink, after that they are soaked for 24 hours and ripened for 24 hours for germination.

Preparation of planting media

The growing media used consisted of husk charcoal (M1), cocopeat growing media (M2) and rockwool growing media, each of which was put into 3 planting containers which were repeated 3 times so 9 total planting media.

Natural zpt immersion

Seeds that have been selected and have gone through the germination process will be divided into 3 parts and then soaked with natural ZPT consisting of no ZPT/plain water (Z0) as a dick, coconut water (Z1) and bean sprout extract (Z2), each soaked for 20 minutes.

Planting

Planting is done by spreading the seeds on the planting medium according to each treatment. For husk charcoal and rokcwool media, after spreading the seeds, add a little planting medium to the top of the seeds until the seeds are not visible and the root growth is strong downwards. For rokwool media before spreading the seeds, rokwool media made small holes in the media using a pointed tool.

Maintenance

Maintenance in the form of watering is done every day until harvest in the morning and evening. In addition, at the age of 3 days after planting, ab mix nutrition specifically for vegetables was given with a concentration of 700-800 ppm.

Observation

The parameters observed were the content of chlorophyll a, b and total as well as the opening area and the number of stomata.

Leaf chlorophyll content was observed using *Content chlorophyll meter* (CCM 200+) on young leaves. Observations were made on: the content of chlorophyll a (µmol. m-2), chlorophyll b (µmol. m-2) and total leaf chlorophyll ((µmol. m^{-2}), by using the formula: leaf chlorophyll content = a + b (CCl)c, where a, b and c are constants and CCl is leaf chlorophyll index data read on CCM 200+. Stomata sampling was performed using clear nail polish and clear tape. Sampling was carried out at 14 DAP. Leaf stomata components include;

Measurement of stomatal density was carried out using a magnification of 40 times with a field of view diameter of 0.52 mm $._2$.

Stomata opening area (µm2), calculated using the formula:

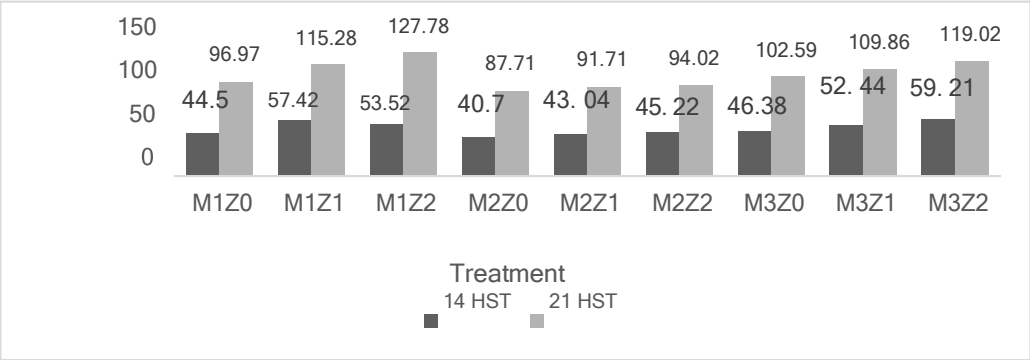
Stomata opening area = π x length of stomata x width of stomata

Measurement of the stomatal opening area was carried out using a magnification of 100 times with a field of view diameter of 0.52 mm $._2$. Sampling was carried out on vegetables *microgreens* broccoli 14 days after each treatment.

RESULTS AND DISCUSSION

The results of the research data on the effect of giving natural ZPT and the difference in media on chlorophyll content, stomata opening area and number of stomata.

Chlorophyll a



Gambar 1. Average chlorophyll a (µmol. m_{-2}) on p $_{behavior}$ n zpt al ami dan difference media aged 14 hst and 21 hst

Figure 1 shows that the highest average chlorophyll a of plant age 14 days after planting was found in the treatment of rockwool growing media with natural zpt of bean sprout extract (M3Z2) which was 59.21 µmol. m^{-2} while the lowest mean of chlorophyll a at the age of 14 days after planting was found in the treatment of cocopeat growing media with natural zpt (M2Z0), which was 40.7 µmol. m^{-2} For the highest average chlorophyll a plant age of 21 days after planting, it was found in the treatment of husk charcoal growing media with natural zpt of bean sprout extract (M1Z2), which was 127.78 µmol. m^{-2}while the lowest average chlorophyll a at the age of 21 days after planting was found in the treatment of cocopeat growing media with natural zpt (M2Z0), which was 87.71 µmol. m^{-2}

Chlorophyll b

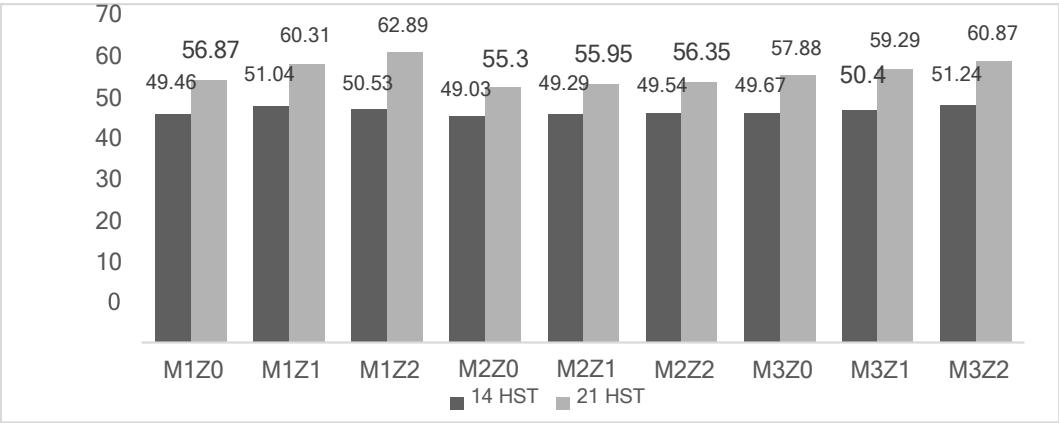


Figure 2. Average chlorophyll b (µmol. m_{-2}) on treatment natural zpt and difference media aged 14 hst and 21 hst

Figure 2 shows that the highest average chlorophyll a at the age of 14 days after planting was found in rockwool growing media with natural zpt of bean sprout extract (M3Z2), which was 51.24 µmol. m^{-2} while the lowest mean of chlorophyll a at the age of 14 days after planting was found in the treatment of cocopeat growing media with natural ZPT (M2Z0), which was 49.03 µmol. m^{-2} For the highest average chlorophyll a plant age of 21 days after planting, it was found in the treatment of husk charcoal growing media with natural zpt of bean sprout extract (M1Z2), which was 62.89 µmol. m^{-2}while the lowest average chlorophyll a plant age of 21 days after planting was found in the treatment of cocopeat growing media with zpt tanap natural (M2Z0) 55.3 µmol. m^{-2}

Total chlorophyll

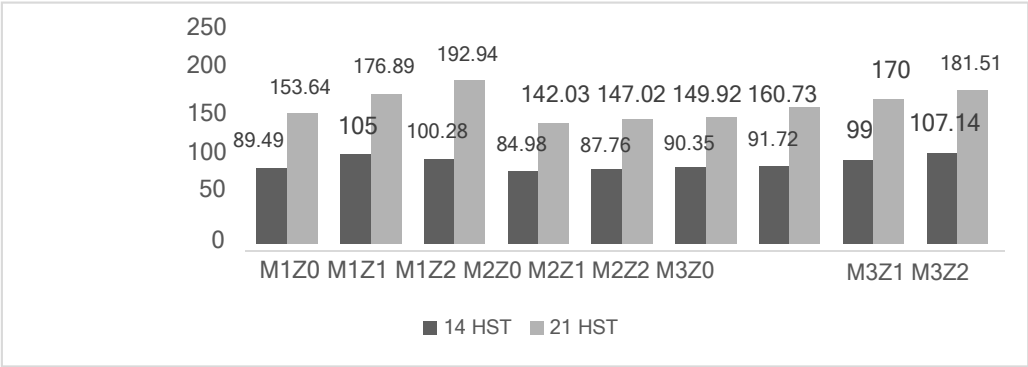


Figure 3. Average total chlorophyll (µmol. m_{-2}) on treatment natural zpt and the difference between the ages of the media 14 hst and 21 hst

Figure 3 shows that the highest average chlorophyll a at the age of 14 days after planting was found in rockwool growing media with natural zpt of bean sprout extract (M3Z2), which was 107.14 µmol. m^{-2}while the lowest average of chlorophyll a at the age of 14 days after planting was found in the treatment of cocopeat growing media with natural ZPT

(M2Z0), which was 84.98 µmol. m^{-2}. For the highest average chlorophyll a at the age of 21 days after planting, it was found in the treatment of husk charcoal growing media with natural zpt of bean sprout extract (M1Z2), which was 192.94 µmol. m^{-2}. while the lowest average chlorophyll a at 21 days after planting was found in the treatment of cocopeat growing media with natural zpt (M2Z0), which was 142.03 µmol. m^{-2}.

Number of stomata and stomata opening area

The results of the analysis of non-stomatal area variance showed that the interaction between the treatment of planting media and natural zpt had a significant effect on the stomatal opening area.

Table 1. Average number of stomata and stomatal opening area (μm_2) to natural zpt treatment and the difference in media at the age of 14 days after planting.

Perlakuan	Parameter	
	Jumlah Stomata	Luas Bukaan Stomata (μm^2)
M1Z0	7,67	$46,05^{a}_{r}$
M1Z1	13,33	$73,27^{a}_{q}$
M1Z2	15,00	$115,13^{a}_{p}$
M2Z0	5,33	$52,33^{a}_{p}$
M2Z1	6,67	$65,94^{a}_{p}$
M2Z2	8,33	$81,64^{a}_{p}$
M3Z0	9,33	$60,71^{a}_{p}$
M3Z1	17,00	$94,20^{a}_{p}$
M3Z2	13,00	$83,73^{a}_{p}$

Description: Numbers followed by the same letter in the same column not significantly different based on Duncan's test at the BNJ test confidence level 0.05.

Table 1 shows that the highest average number of stomata is found in the treatment of husk charcoal growing media with natural zpt of bean sprout extract (M1Z2), which is 15.00, while the lowest average number of stomata is found in the treatment of cocopeat growing media with no zpt (M2Z0) which is 5 ,33. For the highest average stomata opening area, it was found in the treatment of husk charcoal planting media with natural zpt of bean sprout extract (M1Z2), which was 115, 13 μm^2while the lowest average stomata opening area was found in the treatment of cocopeat growing media with no ZPT (M2Z0), which was 52.33 μm^2.

CONCLUSION

The combination treatment of rockwool growing media and natural zpt of

bean sprout extract (M3Z2) gave the best results on parameters of chlorophyll a, b and total content, each of which was 14 days old. While the combination of treatment with cocopeat growing media and natural zpt of bean sprout extract (M1Z2) gave good results the best on the parameters of chlorophyll a, b and total content, each of which was 21 days after planting. The best parameters for the number of stomata and the area of stomata openings

were found in the combination of treatment with cocopeta growing media and natural zpt of coconut water (M1Z1), 15.00 and 115.13 m, respectively.$_2$.

References

Arif, M, Murniati, and Ardian. 2016. Test Some Natural Growth Regulators Against the Growth of Rubber Seeds (Hevea Brasiliensis Muell Arg) Sleeping Eye Stum. Let's Faperta 3 (1).

Lawalata, Imelda Jeanette. 2011. Provision of Several ZPT Combinations to Regeneration of Gloxinia Plants from In Vitro Stem and Leaf Explants. J Exp. Life Science. 1(2) :83-87.

Lobiuc, A., Vasilache, V., Pintilie, O., Stoleru, T., Burducea, M., Oroian, M., & Zamfirache, M.-M. 2017. Blue and Red LED Illumination Improves Growth and Bioactive Compounds Contents in Acyanic and Cyanic Ocimum basilicum L. *Microgreens*. Molecules, 22(12), 2111. *Microgreens* Production with Low Potassium Content for Patients with Impaired Kidney Function. Nutriens, 10(6), E675.

Prihmantoro and Indriani, 2003. Effect of media type and intensity of fertilization on the growth of seedlings of love wave anthurium (Anthurium plowmanii). Faculty of Agriculture Eleven March. Surakarta

Rajiman. 2018. Effect of Natural Growth Regulatory Substances (PGR) on Yield and Onion Quality. STPP Magelang Agricultural Extension Department, Yogyakarta.

Renna, M., Castellino, M., Leoni, B., Paradiso, VM, & Santamaria, P. (2016). Wuryaningsih. S. 2008. Ornamental Plants Planting Media.