Jurnal Ilmu Pertanian Indonesia (JIPI), Juli 2024
ISSN 0853-4217
EISSN 2443-3462
Vol. 29 (3): 372–388
http://journal.ipb.ac.id/index.php/JIPI
DOI: 10.18343/jipi.29.3.372

Application of Various Nutrition to the Growth and Production of Melon (*Cucumis melo* L.) Hydroponic DRFT (*Dynamic Root Floating Technique*)

Aplikasi Berbagai Nutrisi terhadap Pertumbuhan dan Produksi Tanaman Melon (*Cucumis melo* L.) secara Hidroponik DRFT (*Dynamic Root Floating Technique*)

Chairudin, Rika Fitria, Evi Julianita Harahap*, Muhammad Afrillah

(Received September 2023/ Accepted May 2024)

ABSTRACT

This study aims to determine the effect of providing nutrients on the growth and production of hydroponic melon plants DRFT (*Dynamic Root Floating Technique*). The experimental design used in this study was a randomized block design (RBD) with a non-factorial pattern with 3 treatments with 3 replications. The factors studied were nutrition which consisted of 3 levels namely N1 (AB Mix) = 5 mL/l, N2 (Goodplant) = 5 mL/l, and N3 (Hydro-J) = 5 mL/l. Parameters observed were plant height (cm), number of leaves (strands), stem diameter (mm), fruit weight (kg), and fruit diameter (mm). The results showed that the treatment of N3 (Hydro-J) had significantly different parameters of plant height and number of leaves at the age of 21 days after planting and 28 days after planting compared to N2 (Goodplant), but not significantly different from N1 (AB Mix).

Keywords: AB Mix nutrition, Goodplant, Hydro-J

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh pemberian nutrisi terhadap pertumbuhan dan produksi tanaman melon secara hidroponik DRFT (*Dynamic Root Floating Technique*). Rancangan percobaan yang digunakan dalam penelitian ini adalah rancangan acak kelompok (RAK) dengan pola non faktorial dengan 3 perlakuan dengan 3 ulangan. Faktor yang diteliti adalah nutrisi yang terdiri dari 3 taraf yaitu N1 (AB Mix) = 5 mL/l, N2 (Goodplant) = 5 mL/l, dan N3 (Hydro-J) = 5 mL/l. Parameter yang diamati adalah tinggi tanaman (cm), jumlah daun (helai), diameter batang (mm), bobot buah (kg), dan diameter buah (mm). Hasil penelitian menunjukkan bahwa perlakuan N3 (Hydro-J) berbeda nyata terhadap parameter tinggi tanaman dan jumlah daun pada umur 21 hari setelah tanam dan 28 hari setelah tanam dibandingkan dengan N2 (Goodplant), namun tidak berbeda nyata dengan N1 (AB mix).

Keywords: Nutrisi AB Mix, Goodplant, Hydro-J

INTRODUCTION

Melon plants (*Cucumis melo* L.) are among those with high economic value which are often cultivated because they taste quite good and have good nutritional content (Istiningdyah *et al*. 2013). Melon fruit can be cultivated both conventionally (in the field) and hydroponically. Generally, hydroponic cultivation produces better quality melons compared to melon cultivation on land (Sutiyoso 2018). The short harvest time of 55–65 days and high fruit prices are also reasons for farmers to cultivate this agribusiness commodity intensively and make melons a superior commodity (Lestari *et al*. 2019).

Program Study of Agrotechnology, Faculty of Agriculture, Teuku Umar University, Jl. Alue Peunyareng, Ujong Tanoh Darat, Meureubo, Aceh 23681
*Corresponding author: evijulianita@utu.ac.id

In 2021 melon production in Indonesia reached 129,147 tons. This number decreased by 6.54% compared to production in 2020 which amounted to 138,177 tons. The melon harvested area in 2020 are 8,211 Ha and the harvested area in 2021 are 7,397 Ha (BPS 2021). This decrease harvested area is allegedly due to the increase use of productive land for other functions such as housing construction, shopping areas, construction of tourist attractions, and could also be caused by natural disasters such as landslides, floods, volcanic eruptions, and others. Therefore, to increase melon production in limited land, one can utilize hydroponic techniques.

Hydroponics is a farming system that utilizes nutrient-rich water and does not use soil. Hydroponic farming has several advantages over traditional farming methods. Farming profits using a hydroponic system are (1) the success of plants to grow and produce more secure, (2) more practical and maintenance pest infestations are better controlled, (3) use of fertilizer more economical (efficient), (4) more dead plants are easy to replace with new plants, (5) no requires a lot of labor because of the method of work is more economical and has standardization, (6) plants can grow more rapidly according to conditions which is not dirty or damaged, (7) more production results sustainable and higher compared to planting in the ground, (8) the selling price of hydroponics product is higher than non-hydroponic products, (9) several types of plants can be cultivated out of season, (10) there is no risk of flooding, erosion, drought, or dependence on natural conditions, (11) plants hydroponics can be done on land or space with some limitasion (Waluyo *et al*. 2021). Traditional agriculture often uses chemical fertilizers, pesticides, fungicides and herbicides. These applications can disrupt the ecological balance and worsen the environment. Hydroponic farming does not use chemical fertilizers and pesticides, and also reduces water use which helps water conservation (Dubey & Nain 2020). The hydroponic system used in this research is DRFT (*Dynamic Root Floating Technique*).

Hydroponics DRFT (*Dynamic Root Floating Technique*) is a hydroponic system that maintains plants on a continuous stream of nutrients that moisten the ends of the plant's root system. The roots of plants in this system are not immersed in water, but only flow at the tips of their roots. The root tips allow moisture to enter the plant, while the open root system gives plenty of access to oxygen. The features of the DRFT hydroponic system include (1) saving water and 2) modular design. The saving water system recirculates water, does not require large amounts of water or nutrients. The constant flow also makes it more difficult for salt to accumulate on plant roots. This system also does not require planting media, so it can save the cost of buying media. The modular design system is suitable for large-scale and commercial enterprises. Once you have one channel set up and working, it is very easy to expand. However the weaknesses of the DRFT hydroponic system include (1) pump failure and 2) density. If the pump fails and the channel no longer drains the nutrient layer, the plants will dry up. This system does require readiness and oversight. If the spacing is too close or the root growth is too much, the density of the canal will increase and the canal may become clogged. If the canal is blocked by roots, water will not be able to flow (Subandi *et al*. 2012). To support optimal growth and production, it is necessary to add proper nutrition. The nutrients used in this study were mixed AB, Goodplant, and Hydro-J solutions.

Nutrition is a determining factor to get good quality results in a hydroponic cropping system. Providing nutrients with the right concentration in hydroponic cultivation will spur better plant growth responses and can provide maximum yield and production (Moerhasrianto 2011).

Cultivating plants with the hydroponic method usually uses liquid fertilizer, namely a special hydroponic solution (AB Mix). AB Mix is a nutrient solution that contains absolute nutrients consisting of nutrient A solution which has macronutrients and nutrient B solution which has micronutrients. AB Mix hydroponic nutrition which contains N (10.98%), K (25%), P (5.15%), Ca (8.12%), Mg (6.68%), S (9.98%), Fe (0.15%), Mn (0.06%), Cu (0.05%), Zn (0.02%), Bo (0.02%), and Mo (0.02%) (Nugraha, 2014).

The benefits of using Goodplant fertilizer include being able to stimulate and accelerate plant growth, accelerate and stimulate the growth of new branches, can increase the number of tillers and can dilate flowers and fruit. Hydroponic nutrition with Goodplant packaging contains NH_4 (1.63%), Ca (6.21%), N (12.55%), K (35.64%), Mg (6.68%), S (9, 98%), P (4.91%), Bo (0.03%), Zn (0.02%), Mo (0.003%), Fe (0.12%), Mn (0.06%), and Cu (0.06%), while this packaging was originally named Hydrogroup and changed its name to goodplant fertilizer since 2009 (Dyah 2017).

Hydro-J nutrition is hydroponic fruit nutrition which contains nutrients needed by plants with ingredients that are easily absorbed and 100% soluble in water so that it is a special nutrient for hydroponic fruit plants. Hydro J contains macro and micro nutrients including N, P, K, Ca, Mg, S, Fe, Mn, Bo, Zn, Cu, and Mo (Hydroj 2016).

The results of Azmi (2021) stated that the concentration of a 100% AB mix solution was the best concentration in the fruit weight parameter of planting cherry tomatoes (*Solanum lycopersicum* var Cerasiforme). The results of Juliyanti (2021) stated that the provision of Goodplant nutrition increased stem diameter, number of leaves and root volume in cucumber plants (*Cucumis sativus* L.). Research results of Trisnawati *et al*. (2018) stated that the provision of Hydro-J Melon nutrition had a significant effect on plant height aged 2, 3, and 4 weeks after transplanting, stem diameter, number of leaves respectively at ages 1, 2, 3 and 4 weeks after transplanting, age flowering, harvest age, fruit weight, and plant height 1 week after transplanting.

MATERIALS AND METHODS

This research was conducted in Peunaga Rayeuk Village, Meureubo District. West Aceh District. The time of the research was carried out on December 28th, 2020 to March 15th, 2021.

The materials used in this study were melon seeds of the Amanta F1 variety, AB Mix nutrition, Goodplant, Hydro-J, Styrofoam, black plastic, water, rope, arnet, and rockwool. The tools used in this study included hand sprayers, nursery trays, measuring cups, buckets, TDS meters, pH meters, pipes, hydroponic machines, hydroponic frames, rulers, netpods, stakes, tape measure, calipers, analytical scales, scissors, tools write and camera.

The experimental design used was a non-factorial randomized block design (RBD) with 3 treatments with 3 replications. The factors studied were nutrition which consisted of 3 levels: N1 (AB Mix) = 5 mL/L, N2 (Goodplant) = 5 mL/L, and N3 (Hydro-J) = 5 mL/L. Observational data were analyzed statistically using analysis of variance (ANOVA). If the F count obtained is greater than the F table, then it is continued by carrying out the Least Significant Difference (LSD) further test at the 5% level.

Making a DRFT system using a table-shaped wooden frame 60 cm high (40 cm to support legs and 20 cm for gutters), gutters made of Styrofoam and plastic measuring 0.5 m x 5 m with a depth of 20 cm. Water depth in the gutter were 3–5 cm and 18–15 cm of extra space for air. The pipe connected between the pump reservoir and the gutter pipe for the reservoir. Plant spacing between holes on Styrofoam is 15 cm.

The preparation of AB Mix, Goodplant, and Hydro J nutrient solutions was carried out by adding 5 ml each of stock A and stock B into 1 liter of water, then stirring thoroughly.

Parameters observed were plant height (cm), stem diameter (mm), number of leaves per plant (strands), fruit weight (kg), and fruit diameter (mm).

RESULTS AND DISCUSSION

Effect of Type of Nutrition on the Vegetative Phase

Table 1 shows that the N3 (Hydro-J) treatment on plant height parameters aged 21 DAP and 28 DAP were significantly different from N2 (Goodplant), but not significantly different from N1 (AB Mix). It is suspected that the macro and micro nutrients from Hydro-J nutrients have been fulfilled for the growth of melon plants. It is known that nutrition contains macro nutrients N (15%), P (15%), and K (15%) which are balanced compared to Goodplant and AB Mix nutrients. Jumin (2012) stated that the presence of nutrients available or stored in a plant can increase the rate of photosynthesis and will be able to increase growth in a plant so that it can accelerate plant growth including plant height.

Table 1 shows that the treatment of N3 (Hydro-J) on the parameter number of ages 21 DAP and 28 DAP was significantly different from N2 (Goodplant), but not significantly different from N1 (AB Mix). It is suspected that the nitrogen content in Hydro-J nutrients helps in the formation of chlorophyll and accelerates the process of photosynthesis so that the formation of leaf organs becomes faster. Djafar *et al.* (2013) stated that the nitrogen (N) element is an element needed in large quantities and the adequacy of the nitrogen will be followed by an increase in plant growth and yield. Likewise with the parameter of the number of leaves, increasing the number of leaves is one of the activities of cell division. The increase in the number of leaves is thought to be caused by the nitrogen. Fitri *et al*. (2021) stated that in the process of forming leaf vegetative organs, plants need nitrogen in large quantities.

Table 1 shows that there was no significant difference in the stem diameter parameter, but the highest stem diameter was found in N3 treatment (Hydro-J) and the lowest in N2 treatment (Goodplant). It is suspected that Hydro-J contains the macro nutrients N, P, and K which help in increasing the diameter of melon plants. Soomro *et al*. (2014) stated the high availability of nutrients N, P, and K in plant tissue causes more stems to grow faster.

Table 1 Average plant height, number of leaves, and diameter of melon stems at 7, 14, 21, and 28 days after planting (DAP) on several types of nutrients using hydroponic DRFT (*Dynamic Root Floating Technique*)

Parameter	Age	Treatment			$LSD_{0,05}$
		AB Mix (N1)	Goodplant (N2)	Hydro-J (N3)	
Plant height (cm)	7 DAP	10,28	9,44	11,33	-
	14 DAP	25,44	27,78	36,11	-
	21 DAP	70,33 ab	62,78 a	87,22 b	19,58
	28 DAP	149,22 ab	132,67 a	167,78 b	28,91
Number of leaves (sheet)	7 DAP	7,56	6,78	8,67	-
	14 DAP	9,56	8,78	12,44	-
	21 DAP	13,78 ab	12,33 a	19,89 b	4,20
	28 DAP	19,67 ab	16,56 a	24,22 b	4,53
Stem Diameter (mm)	7 DAP	4,70	4,27	5,37	-
	14 DAP	4,89	4,79	5,62	-
	21 DAP	5,30	5,10	6,02	-
	28 DAP	5,80	5,19	6,22	-

Description: Numbers followed by the same letter in the same row show no significant difference at the BNT test level of 0.05. N1 (AB-Mix), N2 (Goodplant), and N3 (Hydro-J).

Table 2 Average fruit weight and diameter of melon fruit on several types of hydroponic DRFT (Dynamic Root Floating Technique) nutrition

Parameter	Treatment		
	AB Mix (N1)	Goodplant (N2)	Hydro-J (N3)
Fruit weight (kg)	0,82	0,73	1,08
Fruit Diameter (mm)	38,67	37,56	42,44

Effect of Type of Nutrition on the Generative Phase

Table 2 shows that there was no significant difference in the fruit weight parameter, but the highest fruit weight (1.08 kg) was found in N3 treatment (Hydro-J) and the lowest (0.73 kg) was found in N2 treatment (Goodplant). It is suspected that the Hydro-J treatment was able to produce higher photosynthate than the other nutrients, resulting in higher fruit weight compared to the other nutrients, for example the P nutrient which helps in fruit formation and the K nutrient which helps in increasing fruit size. Imran (2017) stated that fruit size and fruit quality are influenced by the availability of K element, meanwhile P elements play a roles in fruit and flower formations. Kalium element functions to help formations of proteins and carbohydrates.

Table 2 shows that there was no significant difference in the fruit diameter parameter, but the highest fruit diameter (42.44 mm) was found in N3 treatment (Hydro-J) and the lowest diameter (37.56 mm) was found in N2 treatment (Goodplant). This condition is thought to be related to the diameter of the melon is closely related to the weight of the fruit per plant because usually a high fruit weight will produce a large diameter, and vice versa a low fruit weight will produce a small fruit diameter. Fruit diameter is also influenced by the availability of nutrients needed by plants, for example the K nutrient. Prayoda *et al.* (2015) stated that fruit diameter tends to be positively proportional to fruit weight and pruning melon plants will have a real influence on fruit diameter. Bariyyah *et al.* (2015) stated that the increase in fruit weight is influenced by sufficient K nutrients because the K element plays a role in carbohydrate translocation and starch formation.

CONCLUSION

The treatment of N3 (Hydro-J) on the parameters of plant height and number of leaves at the age of 21 DAP and 28 DAP were significantly different from N2 (Goodplant), but not significantly different from N1 (AB Mix).

REFERENCES

Aziz AH. 2006. *Ingredients in Several Types of Hydroponic Nutrition*. Jakarta (ID): Penebar Swadaya.

Azmi N. 2021. Effect of several concentrations of AB mix solution and inorganic growing media on growth and yield of cherry tomatoes (*Solanum lycopersicum* var Cerasiforme) with NFT system. [Skripsi]. Pekan Baru (ID): Universitas Islam Negeri Sultan Syarif Kasim Riau.

[BPS] Badan Pusat Statistik. 2021. Produksi dan luas panen melon di Indonesia. [internet] [diunduh 30 Juli 2023]. Tersedia pada: http://www.bps.go.id/site/pilihdata.

Bariyyah K, Suparjono S, Usmadi. 2015. Pengaruh kombinasi komposisi media organic dan konsentrasi nutrisi terhadap daya hasil tanaman melon (*Cucumis melo* L.). *Planta Tropika Journal of Agro Science*. 3(2): 67−72. https://doi.org/10.18196/pt.2015.041.67-72

Djafar TA, Barus A, Syukri. 2013. Respon pertumbuhan dan produksi sawi (*Brassica juncea* L.) terhadap pemberian urine kelinci dan pupuk guano. *Jurnal Online Agroekoteknologi*. 1(3): 646−654.

Dubey N, Nain V. 2020. Hydroponic-The Future of Farming. *International Journal of Environment, Agriculture and Biotechnology*. 5(4): 857−864. https://doi.org/10.22161/ijeab.54.2

Dyah AR. 2017. Growth responses of three varieties of lettuce (*Lactuca sativa* L.) against various types of nutrients in NFT hydroponic systems. [Skripsi]. Malang (ID): Universitas Brawijaya

Fitri SR, Sukawati N, Afra HA, Pervia R. 2021. Respons pertumbuhan tanaman pakcoy (*Brassica rapa* L.) dengan pemberian beberapa konsentrasi AB MIX pada sistem hidroponik. *Prosiding Seminar BIO*. 1051−1058.

Hydroj. 2016. Hydro J mini max melon. [internet] [diunduh 30 Juli 2022]. Tersedia pada: http://hydroj.com/produk/hydro-j-mini-max-melon-121.

Imran AN. 2017. Pengaruh media tanam dan pemberian konsentrasi pupuk organik cair (POC) bio-slury terhadap produksi tanaman melon (*Cucumis melo* L.). *Jurnal Agrotan*. 3(1): 18−31.

Istiningdyah A, Tambing Y, Bustami MU. 2013. Pengaruh BAP dan kasein hidrolisat terhadap pertumbuhan tunas melon (*Cucumis melo* L.) secara *in vitro*. *e-J. Agrotekbis*. 1(4): 314−322.

Julianti R. 2021. Growth and yield of cucumber *(Cucumis sativus* L.) in Inorganic Media at Different Concentrations of AB Mix solutions in hydroponic systems. [Skripsi]. Pekan Baru (ID): Universitas Islam Negeri Sultan Syarif Kasim Riau.

Jumin HB. 2012. *Fundamentals of Agronomy*. Jakarta (ID): PT. Raja Grapindo Persada.

Lestari GA, Sumarsono, Fuskhah E. 2019. Pengaruh komposisi media tanam dan dosis poc urin kelinci terhadap pertumbuhan dan produksi tanaman melon (*Cucumis melo* L.). *Jurnal Pertanian Tropik*. 6(3): 411–423. https://doi.org/10.32734/jpt.v6i3.3188

Moerhasrianto P. 2011. Growth response of three types of vegetables at various nutrient concentrations in hydroponic solutions. [Skripsi]. Jember (ID): Universitas Jember.

Nugraha RU. 2014. Nutrient sources as a substitute for AB Mix in hydroponic cultivation of leaf vegetables. [Skripsi]. Bogor (ID): Institut Pertanian Bogor.

Prayoda R, Juhariah, Hasyim Z, Suhadiyah S. 2015. Pertumbuhan dan produksi tanaman melon (*Cucumis melo* L. var. action) dengan aplikasi vermikompos padat. [Internet]. [diunduh 2023 Juli 30]: 1-8. Tersedia pada: https://core.ac.uk/download/pdf/77624273.pdf

Soomro AF, Tunio S, Keerio MI, Rajper I, Chachar Q, Arain MY. 2014. Effect of inorganic NPK fertilizers under different proportions on growth, yield and juice quality of sugarcane (*Saccharum officinarum* L). *Pure Appl. Bio.* 3(1): 10–18. https://doi.org/10.19045/bspab.2014.31002

Subandi, M., Salam N.P., Frasetya, B. 2012. DRFT System Hydroponics (Dynamic Root Floating Technique). [Skripsi]. Bandung (ID): UIN Sunan Gunung Djati.

Sutiyoso Y. 2018. *100 Hydroponic Success Tips*. Jakarta (ID): PT. Trubus Swadaya.

Trisnawati R, Kesumawati E, Hayati M. 2018. Growth and yield of melon (*Cucumis melo* L.) on various types of growing media and nutrient concentration of Hydro-J melon with hydroponic substrate. *Jurnal Agrista*. 22(1): 1–9.

Waluyo MR, Nurfajriah, Mariati FRI, Rohman QAHH. 2021. Pemanfaatan hidroponik sebagai sarana pemanfaatan lahan terbatas bagi karang taruna Desa Limo. *IKRAITH-ABDIMAS*. 4(1): 61–64.