



Growth of Pepper Cuttings (*Piper nigrum* L.) at various type of Plant growth regulator

AUTHORS INFO

Kasriana
Universitas Sembilanbelas November Kolaka
Kasriana.tinondo@gmail.com

Marlina Mustafa
Universitas Sembilanbelas November Kolaka
linamarlinamus@gmail.com
+628111072907

Yolanda Fitria Syahri
Universitas Sembilanbelas November Kolaka
yolandafitriasyahri@gmail.com
+62811402721

ARTICLE INFO

e-ISSN: 2548-5148
p-ISSN: 2548-5121
Vol. 2, No. 1, June 2017
URL : <http://dx.doi.org/10.31327/atj.v2i1.939>

© 2017 ATJ All rights reserved

Abstract

Pepper is an important crop in Indonesia because it is one of the country's foreign exchange sources because it is one of the export commodities. The availability of good plant materials will support increased production. Provision of growth regulators in vegetative propagation is very influential on the propagation of pepper plants. The purpose of this study was to determine the most effective combination of growth regulators for pepper cutting. This study was conducted using a randomized block design consisting of eight treatments namely Control (P1), metallic 2 mL L-1 water (P2), mastafol 2 mL (p3), Atonik 2 mL (P4), metallic 1 mL + Mastafol 1 mL (P5), metallic 1 mL + atonic 1 mL (P6), mastafol 1 mL + atonic 1 mL (P7), metallic 0.66 mL + Mastafol 0.66 mL + Atonik 0.66 mL (P8). Setek is grown on soil media: fuel husk: manure (2: 1: 1). The results showed that the best Plant growth regulator combination treatment for the growth of pepper cuttings was P7 (mastafol 1 mL L-1 water + atonic 1 mL L-1 water), which can be seen in the parameters of the number of roots, root length, root volume and number of shoots. The treatment of Plant growth regulator given did not significantly affect the character of leaf growth.

Keywords: atonic, pepper, mastophole, metallic, cuttings, Plant growth regulator

A. Introduction

Pepper is an important crop in Indonesia because it is a source of foreign exchange. Pepper is an export commodity that ranks sixth after rubber, oil palm, coffee, cocoa and coconut. However, pepper productivity in Indonesia is still low because the total exports are only 53,291 tons compared to Vietnam with a total export of 56,506 tons. Pepper plants are now widely cultivated in Indonesia (Aceh, Bangka, Lampung and West Kalimantan). This pepper plant produces two types of pepper namely white pepper and black pepper, the difference between white pepper and many black pepper lies in the method of post-harvest handling only. White pepper is obtained from pepper fruit whose skin is removed, while black pepper is obtained from pepper fruit whose skin is not removed (Setyono, R.T, 2004).

Pepper plants are developed both generatively and vegetatively. Generative breeding using seeds takes a long time so it is rarely done. Conversely vegetative propagation using cuttings is more done because the time needed is shorter with material that is easily obtained. The problem faced in developing pepper is that productivity is still low. One of the ways to increase pepper production is to procure seedlings by means of vegetative propagation or cuttings whose activities include selecting branch cuttings, cutting branch cuttings, giving treatment, preparing cuttings media, planting cuttings and using appropriate planting media and supported by the use of Plant Growth Regulator (atonic, metallic, and mastafol). Nurseries are needed as a way to provide large amounts of plant material. As it is known that pepper plants can be planted directly vegetatively with the condition that the planting material is in the form of stems with a size of 7-9. This requirement is an obstacle in increasing crop production because plant material is limited, it is different if plants are propagated vegetatively with seedlings in the form of stems with only 2-3 segments. This becomes an opportunity for the availability of plant materials appropriately so as to support increased production (Setyono, R.T., 2004).

Plant Growth Regulator is a means of supporting agriculture which has begun to be known for its use. Plant Growth Regulator has several objectives, which are stimulating the growth of roots, stems, leaves, flowers and fruit, increasing production, preventing flower loss and preventing stalk decay and improving plant health (Setyati, S., 2009).

Atonik serves to increase the production and quality of agricultural crops. The effect on plant growth and development is to accelerate protoplasmic flow, root growth, stimulate flowering and prevent the fall of flowers and fruit (Lestari, L., 2011).

Metallic is useful to prevent a decrease in crop production due to lack of micro elements. The metallic function is to nourish plants that have complete nutrient elements (Agustina, 2013). Mastafol can stimulate plant metabolism, increase and accelerate root development, and activate microorganisms in the soil. These factors can improve the retrieval of minerals in the soil, so that plants grow rapidly (Harjadi, S.S., 2009). Plant Growth Regulator can stimulate root growth. Research results from Ardaka, I.M., Tirta, I.G., & Darma, D.P. (2011), showed that the treatment of atonic Plant Growth Regulator, IAA, rootone f, had a significant effect on the growth of pepper cuttings. Based on the description above, this study was conducted to determine the effect of atonic, metallic, and mastafol administration on the growth of pepper cuttings.

B. Methodology

This research was carried out using Randomized Block Design (RBD). This study consisted of 8 treatments 3 replications and each replication had 4 units so that overall it consisted of 96 units. The concentration of Plant Growth Regulator used refers to the results of Rineksane's research, I.A. (2005) with the best concentration of Plant Growth Regulator (atonic) is 2 mL L-2.

The treatment in this study consisted of:

P1: Control (without plant growth regulator),

P2: Metallic 2 mL L-1 water,

P3: Mastafol 2 mL L-1 water,

P4: Atonik 2 mL L-1 water,

P5: Metallic 1mL L-1 water + Mastafol 1 mL L-1 water,

P6: Metallic 1 mL L-1 water + Atonik 1 mL L-1 water,

P7: Mastafol 1mL L-1 water + Atonik 1mL L-1 water,

P8: Metallic 0.66 mL L-1 water + Mastafol 0.66 mL L-1 water + Atonik 0.66 mL L-1 water.

The land used is cleaned of weeds or plant debris, and prepares locations for research by measuring the land area as needed for three replications so that it can accommodate 96

polybags. Prepare a medium for growing soil mixed with fuel husk and manure with a ratio of 2: 1: 1. The media is mixed until smooth and filled in polybags 14 x 20 cm in size. Polybags are arranged and marked in each treatment.

The cuttings used are taken from plants that are healthy and grow well, have sticky roots in the book, dark green leaves and are more than 10 months old but are not in a flowering or fruiting condition. Taking stem cuttings is taken from the primary stem or climbing tendrils (Orthotrop branches) instead of fruit branches. Cutting material is taken from pepper plants in the afternoon and is done by cutting cuttings using a sharp cutter to prevent damage. The segment taken is the segment to 4-9 from the tip of the climbing tendrils. Climbing tendrils that have been taken are cut into 3 cuttings because the cuttings to be made into seedlings are cut into 3 sections. Dissolve the growth regulator in the water according to the treatment. Stir the mixture first before splashing it into the polybag which has been filled with soil media and the rest is stored as a stock solution. After filling the planting media into polybags, cuttings of pepper plants are planted in polybags that have been filled with rice husks, manure and soil. Before planting for planting holes first by Portugal then cuttings of pepper plants are planted into polybags.

C. Result and Discussion

Vegetative propagation with cuttings, Plant Growth Regulator is intended to stimulate and stimulate the formation of roots in cuttings, so that the roots will be better and more numerous. One of the Plant Growth Regulators that can stimulate root growth is through administration of auxin. Among the various types of auxin, atonic Plant Growth Regulator is one type of auxin that is widely circulating in the market so that it is better known by the public. Atonic Plant Growth Regulator generally functions to encourage, inhibit or regulate physiological processes in plants (Kusumo, S., 2004). The use of appropriate Plant Growth Regulator will have a good effect on plant growth, but if too much will actually harm the plant because it will poison the plant. Conversely, if in small amounts it will have less influence on the growth of these plants (Ardana, R.C., 2009).

The results showed that the treatment of various growth regulating substances affected the character of the number of roots, root length, root volume, number of shoots and length of shoots and did not differ in the character of the number of leaves. The average increase in number of roots and the best root length was shown by P7 (mastafol + atonic), which were 29.00 (Table 1) and 3.98, respectively (Table 2).

Table 1. Average number of pepper plant roots in various types of Plant Growth Regulator

Plant Growth Regulator types	Average	Duncan
P1 (control)	7.00 ^d	5.72
P2 (metalik)	10.33 ^{cd}	6.00
P3 (mastafol)	13.58 ^{bc}	6.17
P4 (atonik)	18.08 ^b	6.28
P5 (metalik+mastafol)	16.83 ^b	6.36
P6 (metalik+atonik)	8.75 ^{cd}	6.39
P7 (mastafol+atonik)	29.00 ^a	
P8 (metalik+mastafol+atonik)	9.75 ^{cd}	

The numbers in the same column, followed by the same letters (a, b, c, d) are not significantly different from α 5% Duncan test.

Matafol contains enough food reserves in the form of carbohydrates and nitrogen so that it can increase the amount of root growth, then the given plant growth regulator can stimulate the emergence of roots, so that root growth is getting better. The type of plant growth regulator containing auxin like atonic has a large influence on the growth of root cuttings of pepper plants and gives the best influence on root growth compared to without the use of plant growth regulator. According to rineksane (2005) plant growth regulator acts to promote root growth, because plant growth regulator is a hormone that plays a role in stimulating root growth. The results of the study by ardaka et al. (2011) showed that the treatment of plant growth regulator types (atonic, mastafol, iaa and rootone f) significantly affected the number of roots and root length of pepper plants.

Tabel 2. The average length of the root of the pepper plant for various types of Plant Growth Regulator

Plant Growth Regulator types	Average	Duncan
P1 (control)	2.23 ^d	0.54
P2 (metalik)	2.51 ^{cd}	0.57
P3 (mastafol)	3.68 ^a	0.58
P4 (atonik)	2.30 ^d	0.60
P5 (metalik+mastafol)	2.71 ^{bcd}	0.60
P6 (metalik+atonik)	2.99 ^{bc}	0.61
P7 (mastafol+atonik)	3.98 ^a	
P8 (metalik+mastafol+atonik)	3.13 ^b	

The numbers in the same column, followed by the same letters (a, b, c, d) are not significantly different from α 5% Duncan test.

The best volume average was treatment P7 (mastafol + atonic) and the lowest was treatment P1 (control) (Table 3). Mastafol Plant Growth Regulator can improve mineral extraction in the soil so that plants grow rapidly and atonics can also accelerate root growth when pressing so as to accelerate root growth. According to Heddy, S., Nugroho, W.H., & Kurniati, M., (2006) Plant Growth Regulator plays a role to encourage root growth.

Table 3. Average volume of roots of pepper plants in various types of Plant Growth Regulator

Plant Growth Regulator types	Average	Duncan
P1 (control)	0.69 ^c	0.54
P2 (metalik)	0.83 ^c	0.56
P3 (mastafol)	1.20 ^{ac}	0.58
P4 (atonik)	1.47 ^{ab}	0.59
P5 (metalik+mastafol)	0.92 ^c	0.60
P6 (metalik+atonik)	0.83 ^c	0.60
P7 (mastafol+atonik)	1.57 ^a	
P8 (metalik+mastafol+atonik)	0.98 ^{ac}	

The numbers in the same column, followed by the same letters (a, b, c, d) are not significantly different from α 5% Duncan test.

Table 4. Average number of shoots of pepper plants in various types of Plant Growth Regulator

Plant Growth Regulator types	Average	Duncan
P1 (control)	1.08 ^c	0.36
P2 (metalik)	1.50 ^{ab}	0.38
P3 (mastafol)	1.42 ^{abc}	0.39
P4 (atonik)	1.67 ^a	0.39
P5 (metalik+mastafol)	1.50 ^{ab}	0.40
P6 (metalik+atonik)	1.25 ^{bc}	0.40
P7 (mastafol+atonik)	1.75 ^a	
P8 (metalik+mastafol+atonik)	1.50 ^{ab}	

The numbers in the same column, followed by the same letters (a, b, c, d) are not significantly different from α 5% Duncan test.

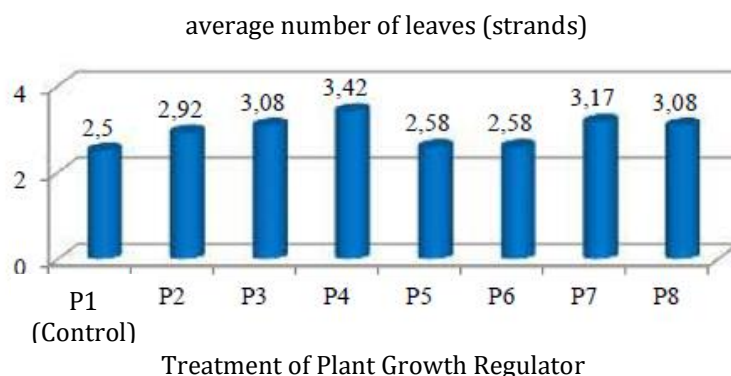
The average number of shoots was highest in treatment p7 (mastafol + atonic) with an average value of 1.75 fruits and the lowest number of shoots indicated by p1 (control) with an average of 1.08 fruits (table 4). The average length of shoots for the longest shoots is indicated by metallic + atonic p6) with an average value of 9.44 cm (table 5). The hormones contained in atonic plant growth regulators are able to meet the needs of pepper cuttings and are also able to support physiological processes in the plant's body for the growth of pepper shoots. Mastafol can form a thin membrane on the surface of the leaf so that it can prevent excessive evaporation (ardaka et.al., 2011). Plant growth regulator application has a significant effect on increasing shoot length, number of shoots and number of leaves, the three observational parameters above are closely related and have the same origin.

Table 5. Average length of shoots of pepper plants in various types of Plant Growth Regulator

Plant Growth Regulator types	Average	Duncan
P1 (control)	5.96 c	2.68
P2 (metalik)	8.12 abc	2.81
P3 (mastafol)	7.58 abc	2.89
P4 (atonik)	10.30 a	2.94
P5 (metalik+mastafol)	6.65 bc	2.98
P6 (metalik+atonik)	9.44 ab	2.99
P7 (mastafol+atonik)	7.28 bc	
P8 (metalik+mastafol+atonik)	6.68 bc	

The numbers in the same column, followed by the same letters (a, b, c, d) are not significantly different from α 5% Duncan test.

The results of observations of the number of leaves showed that the treatment of plant growth regulator type had no significant effect ($p < 0.05$). The average number of leaves that tends to be higher is a combination of treatments with atonic additions. Leaf growth will be more maximal if the planting media is available with sufficient plant growth regulator and nutrients. Salisbury, f.b. & ross, c.w. (2005) stated that the effect of absorption of auxin was not only seen from the concentration of auxin but from the sensitivity of the receiving tissue (plant protein). Ardana, r.c. (2009), also stated that the use of plant growth regulator would have a good effect on growth if with proper use.

**Figure 1. Average number of leaves of pepper plants on various types of Plant Growth Regulator**

D. Conclusion

Based on the results of the study it can be concluded that the best Plant Growth Regulator combination treatment for the growth of pepper cuttings is P7 (mastafol 1 ml L-1 water + atonic 1 ml L-1 water), which can be seen in the parameters of root number, root length, root volume and number bud. The treatment of Plant Growth Regulator given did not significantly affect the character of leaf growth.

E. References

- Agustina, (2013). *Zat Pengatur Tumbuh dan Hormon pada Tumbuhan*. <http://agustina.wordpress.com/Hormon-pada-tumbuhan/>. [Accessed on 12 April 2017]
- Ardaka, I.M., Tirta, I.G. & Darma, D.P. (2011). *Pengaruh Jumlah Ruas dan Zat Pengatur Tumbuh terhadap Pertumbuhan Stek Pranajiwa (Eucresta horsfieldi (Lesch) Benth)*. Balai Konservasi Tumbuhan Kebun Raya Bali.
- Ardana, R.C. (2009). *Pengaruh Macam Zat Perangsang Tumbuh dan Frekuensi Penyemprotan terhadap Pertumbuhan Awal Bibit Gelombang Cinta Plowmanii*. Skripsi, SI FP UNS Surakarta.
- Harjadi, S.S. (2009). *Zat Pengatur Tumbuhan*. Jakarta : Penebar Swadaya.
- Heddy, S.W., Nugroho, H., & Kurniati, M. (2006). *Pengantar Produksi Tanaman dan Penanganan Pasca Panen*. PT. Raja Grafindo Persada. Jakarta.

- Kusumo, S. (2004). *Zat Pengatur Tumbuh*. CV Yasaguna. Jakarta.
- Lestari, L., (2011). Kajian Zat Pengatur Tumbuh Atonik. Fakultas Pertanian Universitas Mochamad Sroedji Jember.
- Rineksane, I.A. (2005). Pengaruh Lama Rendaman Biji dalam Auksin Terhadap Perkecambahan dan Pertumbuhan Akar Manggis. *Jurnal Ilmu-ilmu Pertanian Agr UMY*, 13 (2) :83-91.
- Salisbury, F.B. & Ross, C.W. (2005). *Fisiologi Tumbuhan* Jilid 1. ITB. Bandung.
- Setyati, S. (2009). *Zat Pengatur Tumbuh*. Penebar Swadaya. Jakarta.
- Setyono, R.T. (2004). Lada Hibrida Harapan Tahan Terhadap Penyakit BPB. Prosiding Simposium IV Hasil Penelitian Tanaman Perkebunan Bogor.