Plagiarism Checker X Originality Report

Similarity Found: 13%

Date: Kamis, Juli 15, 2021
Statistics: 355 words Plagiarized / 2828 Total words
Remarks: Low Plagiarism Detected - Your Document needs Optional Improvement.

Vol. 3 (2020) No.1 ISSN:2655-3023 JERAMI Indonesian Journal of Crop Science Content from this work may be used under the terms of the Creative Commons Attribution 4.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI. Research Article Direct Organogenesis in Local Clones of Patchouli Plant (Pogostemon cablin Benth) In Vitro Reni Mayerni, Warnita, Armansyah, and Sari Rukmana Okta Sagita Chan Department of Agrotechnology, Faculty of Agriculture, Andalas University, Padang, West Sumatra, 25163, Indonesia Abstract Growth regulators that are often used in tissue culture to increase the production of secondary metabolites (organogenesis), such as shoot multiplication are cytokinin.

Cytokinin growth regulators include Benzyl Amino Purine (BAP) ad kinetin. The objective of this research is to obtain the best concentration of BAP interaction with Kinetin concentration, the best concentration of BAP, and the best concentration of Kinetin that can stimulate the formation for multiplication of patchouli plants. The concentration of BAP in the in vitro growing medium varies according to the type of plant and the type of explants used. The cytokinin concentrations used ranged from 0.1-10 mg/L media.

The research material used in this study was the accession of patchouli plants in West Sumatera, namely Situak and method of research is a completely randomized design. The treatment will be tested in this study consist of BAP concentrations with 5 levels (0.5, 1, 1,5,2,0 mg/L, and concentration of Kinetin with 2 levels (0.5, 1 mg/L). The basic media used were Murashige and Skoog (MS). Concentrations of 0.5 mg/L kinetin + 0.5 mg/L BAP, 0.5 mg/L kinetin + 1 mg/L BAP and 1 mg/L kinetin + 1 mg/L BAP can stimulate organogenesis (bud) in vitro. The results showed that the concentration of Kinetin and BAP influenced the growth and development of explants.

Keywords: BAP, growth regulators, kinetin, patchouli plant, tissue culture Received: 20 November 2019 Accepted: 25 August 2020 Published: 28 August 2020 Competing Interest: The authors have declared that no competing interest exists. Corresponding Author: Reni Mayerni, Department of Agrotechnology, Faculty of Agriculture, Andalas University, Padang, West Sumatra, 25163, Indonesia Email: prof.renimayerni@gmail.com Article Info 17 1. Introduction Patchouli plants(Pogostemon cablin Benth) is the perennial herbs (Wahyudi and Ermiati, 2012). It's the main raw in the pharmaceutical industry and the essential oils of the word (Huang, et al., 2016).

Living in the subtropics, growing well at altitudes of up to 1,200 m asl in warm and wet climates with rainfall between 1,500 mm to 3,000 mm annually evenly throughout the year, 70-90% humidity, 24-28°C temperatures. Good soil types are regosol, latosol, and alluvial. Sandy clay texture or clay dusty, have good absorption and is not inundated during the rainy season with soil pH 5.5-7.0. It grows wild in several parts of the world. It grows wild in Malaysia, Indonesia, and Singapore as well (Ramya, et al. 2013). In Indonesia, patchouli plants spread of Aceh and West Sumatera, especially in West Pasaman.

There are seven locations in West Pasaman Regency where the community has known for a long time and are still familiar with and still have a high interest in patchouli cultivation and refining business at the foot of Mount Pasaman (Hidayat, Mayerni and Syarif,2017). West Sumatra. According to Febriyetti, Mayerni, and Anwar (2017), from the observations of plant quality characteristics, it can be concluded that Rimbo Binuang accession and Situak can be used for the best clone since the highest oil yield is obtained in Rimbo Binuang accession and the highest alcohol content of patchouli is found in Situak accession. Since Pogostemon cablin Benth does not flower, the plants are reproduced by cutting.

Cutting with 15-20 cm length is inserted into well-prepared soil and shaded until established. The plants are easily rooted without using rooting hormones. However, the horticultural practice of cutting is a slow process and not suitable for large-scale propagation. Therefore, a more rapid method of propagation is required for large scale propagation. One such method of propagation that can be usefully employed to produce relatively uniform plantlets in a short time is via in vitro culture (Fitriana, 2011).

The cultivation of patchouli presents some problems that affect the production of biomass and the yield of essential oil. The low yield of essential oil is due to the plant's susceptibility to different types of viruses and bacterial. Thus, in vitro propagation is a

viable alternative for obtaining pathogen-free plants and also allows for large-scale propagation in a relatively short period, through the in vitro propagation (Arrigoni, et al., 2011). And then, In vitro micropropagation is an effective means for the rapid multiplication of plant species of clonal origin (Saha, et al. 2020).

This multiplication is determined by many factors including the type of explants and growth regulators (Swammy, 2016, Hua et al. 2014; Norrizah et al. 2012). Many in vitro studies have been reported on different patchouli species, using nodal segment explants. One such method of propagation that can be usefully employed to produce relatively uniform plantlets in a short time is via in vitro culture (Inampudi, et al. 2017).

And using growth regulators that are often used in tissue culture to increase the production of secondary metabolites (organogenesis), such as shoot multiplication are cytokinin. Cytokinin growth regulators include Benzyl Amino Purine (BAP) ad kinetin. BAP is a more economical and frequent cytokinin used to stimulate the multiplication of axillary shoots (Pradana, 2011), and an increase in the number of shoots (Tiliar and Sompotan, 2007). And functions of Kinetin to regulate cell division and morphogenesis (Sintha, 2017). 2. Materials and Methods A.

Plant Material and Time of Research The research was conducted in the Laboratory of Tissue Culture, Faculty of Agriculture, Andalas University from May until November 2019. Plant material is local Pogostemon cablin namely Situak. Media is Murashige and Skoog (MS) and Growth regulators Benzyl amino purine (BAP), and kinetin (KIN). Explants using nodal segment 1-2 cm explants taken from mother plants as that long was suitable for sterilization procedures. Mother plants of Patchouli (Pogostemon cablin Benth) age 6 months. B. Experimental Details The research method used a randomized factorial design. In each treatment consist of three replications.

The treatment will be tested in this study : 1) BAP, 5 levels concentrations (0.5 , 1 , 1,5,2,0 mg/L) and 2) Kinetin, 2 levels concentrations (0,5 and 1 mg/L). The basic media used were the Murashige and Skoog (MS) base media which were added with 30 g / L sucrose sugar and 8 g / L agar. Sterilization explants, the leaves were removed from the explants and washed under running tap water for 2-3 times to wash off the external dust/contaminants. After sterilization of explants, explants were inoculated in culture bottles aseptically.

Each bottle of culture was filled with 5 explants. The media is autoclaved at a pressure of 20 psi for 15 – 25 minutes. The culture bottles that have been planted are stored in the culture chamber with a constant room temperature of 26° C. Observe the growth of plant shoots. Observations are carried out every week. The parameters observed were

the percentage of life, shoot induction time, and high of bud. Analisis data is only done on treatment response using the F test at 5% level. If the results show a real effect then proceed with the DMRT test (Duncan Multiple Range Test) 5%. 3. Results and Discussion A. The Percentage of Live Explants (%) Live explants are characterized by fresh, brightly colored, and not browned explants.

The percentage (%) of live explants of patchouli plant accessions for Situak in many concentrations of Kinetin and BAP (Table 1.) 18 Table 1. Live percentage (%) of patchouli plant explants in many concentrations The concentration of Kinetin (mg/l) BAP concentration (mg /L) 0 0.5 1,0 1.5 2.0 (%) 0.5 0.0 16.6 16.6 0.0 0.0 1 0.0 0.0 16.6 0.0 0.0 Table 2. Table 2. Shoot induction time in many concentrations of BAP and Kinetin Kinetin concentration BAP concentration (mg / l) 0 0.5 1,0 1.5 2.0 (HST) 0.5 - 25 20 - - 1 - - 18 - - Note: - (Does not bud) Table 3.Shoot induction time in many concentrations of BAP and Kinetin Kinetin concentration BAP concentration (mg / l) 0 0.5 1,0 1.5 2.0 (cm) 0.5 - 0.8 1,0 - - 1 - - 1,0 - - Note: - (Does not bud) Figure 1.

Height of buds in many concentration of kinetin and BAP a) 1 mg/L Kinetin and 1 mg/L BAP b) 0.5 mg/L Kinetin and 0.5 mg/L BAP, and c) 0.5 mg/L Kinetin and 1 mg/L BAP Based on Table 1., it showed that addition of Kinetin and BAP concentrations that produce live explants with a percentage of 16.6% in the treatment of 0.5 mg/L kinetin + 0.5 mg/L BAP, 0.5 mg/L kinetin + 1 mg/L BAP and 1 mg/L kinetin + 1 mg/L BAP. In this research, BAP and Kinetin concentration can growth live explants but the percentage of growth is not optimal. Its growth is characterized by green explants.

The result of Rozalina's research results (2013) related to the percentage of live explants of patchouli plants with NAA and BAP treatment showed that BAP concentration of 1.0 mg / l and BAP 1.5 mg / l were treatments with the highest percentage of live explants reaching 93, respectively. 75%. And the lowest in the treatment of 0.5 mg / l BAP is 81.25%. This explains that explants of life with the highest percentage of life were found in the treatment of BAP concentration of 1.0 mg / l and BAP 1.5 mg / l.

Growth of explants is influenced by many factors such as the environment and growth regulator, especially the balance between cytokinins and auxins both exogenous and endogenous explants in tissue culture. In this research, some explants did not grow until the end of the study. It is caused by contamination. Contamination of plant material culture occurs because of external or internal infection. According to Lina et al. (2013), effort prevention of external contamination is carried out by sterilizing the surface of the plant material. Internal infection cannot be eliminated with surface sterilization.

Explants that contain or are infected with bacteria, viruses, or fungi will cause

contamination at the growth stage. Even at times early after inoculation, there is no contamination, the next few days fungi growth seen. B. Shoot Induction Time The observations showed that from the 10 combinations of media used, it was obtained that the shoots appeared on the 18-25 days after culture. There are 3 media containing 0.5 mg/L kinetin and 0.5 mg/L BAP, 0.5 mg/L kinetin and 1 mg/L BAP and 1 mg/L kinetin and 1 mg/L BAP which are able to induce buds.

The shoot induction time is relatively slow compared to shoot induction in patchouli plants beginning with the emergence of callus in the second week after culture using media containing NAA 0.1 -0.9 mg/L(Isnaeni et al. 2018). The difference in response is due to the effectiveness of each plant growth regulator used. In agreement with the previous report that the use of picloram with a concentration of 2-8 mg/L can induce patchouli leaf callus at 12 DAP(Musdalifah, 2017). The induction time of patchouli explant buds at various concentrations of kinetin and BAP (Table 2). 19 The function of cytokinins for organ formation, and bud formation (George et al., 2008). According to Rainiyati et al.

(2007), the higher the concentration given cytokinins then the number of shoots are formed will be increasing, however, the formation of individual shoots can be hampered so that the correct concentration is determined very need to pay attention to produce maximum multiplication. Height of Buds Observation results showed that the growth of patchouli buds at the age of 8 MST was 0.8 cm -1 cm on the media 0.5 mg/L kinetin + 0.5 mg/L BAP, 0.5 mg/L kinetin + 1 mg/L BAP and 1 mg/L kinetin + 1 mg/L BAP . This is similar to the study of Sobardini et al. (2005) who reported shoot or bud height at treatments 0 and 0.5 mg/L BAP added 0.0.1 and 1 mg/L NAA which resulted in an average shoot height of 0.5 cm-2.18 cm (Table 3).

The difference in growth response of shoot height or shoot length is influenced by different endogenous cytokinin content and the response plus exogenous cytokinin are also different, the meristematic level of explant tissue used is also likely different. Rai et al. (2009) reported that medium containing 1 mg/L BAP was the most effective for shoot multiplication in guava (Psidiumguajava L.)Patchouli shoot height growth at several concentrations of kinetin and BAP (Figure 1.) 4. Conclusions The results showed that concentration of Kinetin and BAP influenced the growth and development of explants. Concentrations of 0.5 mg/L kinetin + 0.5 mg/L BAP, 0.5

mg/L kinetin + 1 mg/L BAP and 1 mg/L kinetin + 1 mg/L BAP can stimulate organogenesis (bud) in vitro. References [1] Arrigoni, A. Santos, and Arie F Blank. 2011. Direct Organogenesis and Acclimatization of Patchouli Plants. Hortic. Bras. 29 (2). [2] Azwin, Siregar Iskandar Z, Supriyanto. 2006. Pengaruh BAP dan TDZ untuk Perbanyakan

Tanaman Gaharu (Aquilaria Malaccensis Lamk). Fakultas Kehutanan Institut Pertanain Bogor. Bogor. [3] Febriyetty, L., Mayerni, R dan A. Anwar . 2018. Identifikasi Karakteristik Morfologis, Anatomis Dan Mutu Minyak Atsiri Tanaman Nilam (Pogostemon cablin Benth) di Kabupaten Pasaman Barat. Thesis. Fakultas Pertanian Universitas Andalas. [4] Fitriana, S. 2011.

Efficient Direct Regeneration of True-To- Type Pogostemon cablin Benth from Leaf Explant and Profile of Essential Oils. Thesis. Faculty of Chemical and Natural Resource Engineering Universiti Malaysia Pahang. [5] George, E.F., M.A. Hall, and G.D. Klerk. 2008. Plant Growth Regulators II: Cytokinins, their Anologues, and Antagonists. Plant Propagation by Tissue Culture 3rd Edition,. 205- 226. [6] Hadipoentyanti, E. 2010. Perbanyakan Benih Nilam Veritas Ung iian PdksiMnak 30kgh, eatd Murah Hasil Kultur Jaringan (30 % dari Biaya Standar). Balai Penelitian Tanaman Obat dan Aromatik. Bogor. [7] Hidayat, R.,R. Mayerni.,dan A. Syarif. 2017.

Eksplorasi dan Karakterisasi Fenotip Tanaman Nilam (Pogostemon cablin Benth) Lokal di Kabupaten Pasaman Barat.Skripsi. Fakultas Pertanian Universitas Andalas. [8] Hua J., Cheng D.Z., Hong H. 2014. Effect of Explant Types and Plant Growth Regulators on Direct Regeneration In Medicinal Plant 'Pogostemon cablin'. Plant Omics. 7(5): 322-327. [9] Huang, H. R., Wu, W., Zhang, J. X., Wang, L. J., Yuan, Y. M., & Ge, X. J. (2016). A Genetic Delineation of Patchouli (Pogostemon cablin) Revealed By Specific-Locus Amplified Fragment Sequencing. Journal of Systematics and Evolution, 54(5), 491 – 501. [10] Isnaeni. S, Chaidir. L, dan Novie D. 2018.

Pengaruh Pertumbuhan Tanaman Nilam Aceh (Pogostemon cablin Benth) dengan Penambahan Naftalen Asam Asetat (NAA). J. Hexagro. 2 : 11-15 [11] Lina, F.R., E. Ratnasari dan R. Wahyono. 2013. Pengaruh 6- benzylamino purine (BAP) dan 6-furfuryl amino purine (Kinetin) pada Media MS terhadap Pertumbuhan Eksplan Ujung Apikal Tanaman Jati secara In Vitro. LenteraBio 2 (1):57 – 61. [12] Muzdalifah. 2017. Induksi Kalus Daun Nilam Aceh (Pogostemon cablin Benth) Dengan Penambahan Zat pengatur Tumbuh Picloram Dan Kinetin Secara In Vitro. Skripsi Universitas Islam Negri Malang. [13] Norrizah, S.M., W.N. Hidayah, S. Aminah, S. Ruzaina, and P. Faezah. 2012.

Effect of Medium Strenght and Hormones Concentration on Regeneration of Pogostemon cablin Using Nodes Eksplan. Asian J. of Biotech. 4 (1) : 46 - 52. [14] Pradana, O.C.P. 2011. Pengaruh konsentrasi Benziladenin dan Kinetin pada Multiplikasi Tunas Pisang Ambon Kuning In Vitro. Skripsi. Universitas Lampung. Bandar Lampung. [15] Rai, M. K, V. S. Jaiswal, and U. Jaiswal. 2009. Shoot Multiplication and Plant Regeneration Og Guava (Psidium guajava L.) From Nodal Explants of In Vitro Raised Plantlets. The Banaras Hindu University of India. 17(1) :29-38 [16] Rainiyati., D. Martino.,

Gusniawati., dan Jaminarni. 2007.

Perkembangan Pisang Raja Nangka (Musa sp.) Secara Kultur Jarngan dari Eksplan Anakan dan Meristem Bunga. Jurnal Agronomi 11(1): 35-39 [17] Ramya H, Palanimuthu V and Rachna S. 2013 Agricultural Engineering International: CIGR Journal. An Introduction to Patchouli (Pogostemon cablin Benth.) – A Medicinal and Aroatclttmprtc t Mkid5 (:2 -50. [18] Saha, P.S., S. Sarkar. R. Jeyasri, P. Muthuralinggam, M. Ramesh, S. Jha 2020. In Vitro Propagation, Phytochemical and Neuropharmacological Profiles of Bacopa monnieri (L.) Wettst.: A Review. Plant (Basel).9(4). [19] Sintha, D. 2017. Pengaruh BAP dan Kinetin Terhadap Pertumbuhan Tunas Pisang Barangan (Musa Paradisiaca L.)

Secara In Vitro. Skripsi. Pertanian Universitas Bengkulu. [20] Sobardini. D, Suminar. E, dan Murgayanti. 2006. Perbanyakan Cepat Tanaman Nilam (Pogostemon cablin Benth). Skripsi. Fakultas Pertanian. Universitas Padjajaran. [21] Swamy M K, Sinniah U R. 2016 Industrial Crops and Products. Patchouli (Pogostemon cablin Benth.): Botany, Agrotechnology and Biotechnological Aspects. (87). 161-76. [22] Tilaar. W dan S. Sompotan. 2007. Perbanyakan In Vitro Pisang Barangan (Musa Paradisiaca Var. Sapientum L.) Pada Media Murashige dan Skoog dengan Penambahan Benzyl Amino Purin. Eugenia 13(2):127-131. [23] Wahyudi A., Ermiati. 2012. Prospek Pengembangan Industri Minyak Nilam di Indonesia. Bunga Rampai Inovasi Tanaman Atsiri Indonesia.

Balai Penelitian Tanaman Rempah dan Obat. Bogor.

INTERNET SOURCES:

1% - http://jerami.faperta.unand.ac.id/index.php/Jerami-JIJCS/article/download/59/40
1% - http://apem-journal.org/PublishingProcedure.html
<1% - https://es.scribd.com/document/231824021/Agroforestry-in-Sustainable-Agricultural-Systems
<1% - https://globaljournals.org/GJSFR_Volume14/3-Effect-of-Coconut-Milk-and-Benzyl-Amino.pdf
1% - http://repository.unib.ac.id/12660/1/DEWI%20SINTHA%20%28SKRIPSI%29.pdf
<1% - https://www.sciencedirect.com/science/article/pii/S0254629916305610
1% - https://www.researchgate.net/journal/JERAMI-Indonesian-Journal-of-Crop-Science-2654-9395
<1% - https://link.springer.com/article/10.1007/s11240-020-01931-1
<1% -

https://www.thefreelibrary.com/Effect+of+BAP%2c+NAA+and+%5bGA.sub.3%5d%2c+either+alone+or+in+combination%2c+on...-a0452158415
1% - https://issuu.com/biodiversitasunsjournals/docs/d160200aaall
<1% - https://link.springer.com/article/10.1007/s11627-021-10167-3
<1% - https://www.sciencedirect.com/science/article/pii/S0734975010000285
<1% - https://www.slideshare.net/prakashsiju/chapter-3-plant-tissue-culture
<1% - https://core.ac.uk/download/pdf/81170291.pdf
<1% - https://www.journalcra.com/archive/201605
<1% - https://journals.ashs.org/hortsci/view/journals/hortsci/55/3/article-p294.xml
<1% - http://jairjp.com/FEBRUARY%202014/05%20DHANALAKSHMI.pdf
<1% - https://www.academia.edu/21781061/Lab_in_Industrial_Plant_and_Animal_Biotechnology_Students_Manual
<1% - https://iopscience.iop.org/issue/1755-1315/308/1
<1% - https://text-id.123dok.com/document/6zkpvv4q-in-vitro-shoot-induction-of-kaempferia-parviflora-wall-ex-baker.html
<1% - https://id.scribd.com/doc/86183006/buah-tropika
<1% - https://file.scirp.org/Html/39577.html
<1% - https://www.sciencedirect.com/science/article/pii/B9780128182994000087
<1% - https://www.sciencedirect.com/science/article/pii/S0304423813002446
<1% - https://www.longdom.org/articles/development-of-protocol-for-efficient-callusing-in---heliotropium----indicum-l-an-important-medicinal-herb.pdf
<1% - https://www.sciencedirect.com/topics/nursing-and-health-professions/murashige-and-skoog-medium
<1% - https://iopscience.iop.org/issue/1755-1315/575/1
<1% - https://www.tandfonline.com/doi/full/10.1080/13102818.2020.1871545
<1% - https://es.scribd.com/document/223879884/Hydroponics-A-Standard-Methodology-for-Plant-Biological-Researches
<1% - https://www.tandfonline.com/doi/full/10.1080/15538362.2019.1621236
<1% - http://article.sapub.org/10.5923.j.ijaf.20190902.02.html
<1% - https://tryl2012.blogspot.com/2016/05/patchouli-pogostemon-cablin-benth.html
1% - https://journal.uinsgd.ac.id/index.php/ja/article/view/1069
1% - https://www.govserv.org/ID/Bogor/187044225215004/Balai-Penelitian-Tanaman-Rempah-dan-Obat---Balittro