PLANT GROWTH REGULATOR OF AUXIN CONTENT IN FERMENTED COCONUT WATER WASTE

Elik Murni Ningtias Ningsih 1, Sudiyono 1, Frida Dwi Anggraeni 1
1 Widyagama University (UWG), Malang - Indonesia, 65145
Email: elik_uwg@yahoo.co.id

Abstract: Natural Plant growth regulator (PGR) of auxin as a plant growth promoted was found in coconut water waste. The addition of glucose and tryptophan improved the quality of the substrate in the fermentation of coconut water waste. The addition of tryptophan glucose could reduce acidity / pH and produced acetic acid. Acetic acid was the source of plant growth regulator of auxin was in the form of IAA compounds (Indole acetic acid). The process of Auxin separation (IAA) was through extraction and isolation. This study was aimed to determine the content of plant growth regulator of auxin in fermented coconut water waste with the addition of glucose and tryptophan. This study used a completely randomized design with a single factor treatment. The treatments were consisted of P0 = coconut water waste, P1 = coconut water waste and 1.5 g glucose, P2 = coconut water waste and tryptophan 8 mg P4 = coconut water waste and tryptophan 10 mg. The results of glucose and tryptophan were affected in pH and acetic acid after fermentation. The addition of tryptophan was affected the amount of plant growth regulator of auxin in fermented coconut water waste. The best treatment that obtaining IAA was P3 and P4.

Keywords: Plant Growth Regulator, Auxin, Coconut Water Waste, Fermentation

1. Introduction

Plant growth regulator (PGR) of auxin as a compound for promoting plant growth. Coconut water waste contains auxin for growth compound promoters [1]. Auxin compounds in coconut water waste can be separated by isolation [6]. Isolation of plant growth regulator in coconut water is carried out at pH 2.5 and extracted using ethyl acetate [3].

Plant growth regulator (PGR) is an organic compound that produced by plants (8). Based on its role there are 3 groups of plant growth promoters namely auxin, gibberellins and cytokines. Plant growth regulator of auxin in the form of indole-3-acetic acid (IAA) compounds [2]. IAA compound (C10H9NO) is formed from indoleacetonitrile with the help of the enzyme nitrilase to form auxin [5]. IAA biosynthesis is formed from tryptophan with microorganism helping.

The effectiveness of fermentation is influenced by the environment and microorganism activity. [5]. Microorganism decomposition activity is influenced by the quality of substrate in providing food that is a source of energy for microorganism activity. The substrate quality is improved by adding food sources that act as energy sources for microorganism activity decomposition in the form of carbon and nitrogen sources [5]. Carbon source with the addition of glucose, sugar and nitrogen that enhancement with the addition of the amino acid tryptophan.

The separation of natural plant growth regulators are done with extraction and isolation. This separation was carried out on mushroom extracts by using methanol and chloroform solvents [7]. The plant growth regulator separation method is followed by isolation of the plant growth regulator which is carried out at a specific pH for each group of plant growth regulators. The release of plant
growth regulator of auxin and gibberellins group are carried out at acidic pH levels and cytokinin group is carried out at acidic and basic pH (3).

This study aims to determine the content of plant growth regulator of auxin in fermented coconut water waste with the addition of glucose and tryptophan.

2. Methodology

The study used a completely randomized design with a single factor treatment. The treatments were consisted of P0 = coconut water waste, P1 = coconut water waste and 1.5 g glucose, P2 = coconut water waste and 1.5 g glucose, P3 = coconut water waste and tryptophan 8 mg, and P4 = coconut water waste and tryptophan 10 mg. Each treatment was repeated 4 times.

Implementation of the preparation of hybrid coconut water waste according to treatment. The waste of coconut water was fermented at 37°C for 96 hours. The extraction and Isolation of PGR were carried out on 10 ml of fermented coconut water waste plus 60 ml of a mixture of methanol: chloroform: 2N ammonium hydroxide (12: 5: 3 v / v / v) and 25 ml of distillate water. The chloroform phase was separated, while the methanol and water phases were evaporated at room temperature. The extract phase was conditioned at pH 3.0 by adjusting the pH using 1N HCl or 1N NaOH. The extract was added with pure ethyl acetate and incubated at 30°C for an hour. Ethyl acetate was evaporated at 45°C to obtain IAA.

Observation parameters were included the pH and acetic acid of fermented coconut water waste and the amount of auxin IAA. Observation data were analyzed by analysis of variance (analyzed of variance) at α = 5% level. To test the effect of differences between treatments used the Honestly Significant Difference Test (BNJ) which was determined at the P≤ 0.05 level.

3. Results and discussion

The treatment of glucose and tryptophan in fermented coconut water waste was affected in pH, acetic acid and IAA. The observations are presented in Table 1.

| Treatments | pH (ppm) | Acetic Acid (%) | IAA (ppm) |
|------------|----------|----------------|-----------|
| P0         | 5.40 a   | 0.14 a         | 0.51 a    |
| P1         | 4.87 b   | 0.24 b         | 0.52 a    |
| P2         | 4.40 c   | 0.36 c         | 0.52 a    |
| P3         | 4.90 b   | 0.28 b         | 0.62 b    |
| P4         | 4.30 c   | 0.38 c         | 0.62 b    |

Note: Treatment notation is based on the BNJ test (α <0.05) with the Program SPSS. Numbers followed by the same letter in one column showed the effect of treatment was not significantly different. HST: days after planting.

P4 treatment with the addition of tryptophan 10 mg in one liter of coconut water waste showed that the lowest acidity / liquid pH of coconut water waste. The addition of ingredients to the coconut water waste / fermentation media could increase carbon and nitrogen sources as an energy source to decompose microorganism during fermentation. The intensive fermentation processed had been shown by increasing the alcohol content and decreasing the acidity of coconut water waste [7].
The increase of the addition of tryptophan in coconut water waste showed an increase of acetic acid produced. The increase of acetic acid in fermented coconut water waste showed a higher level of fermentation. The addition of tryptophan could increase the energy source in the microorganism decomposition so that the fermentation process was more intensive. The fermentation process was influenced by the substrate quality, microorganism decomposition and environmental conditions [6]. In the fermentation process with the role of microorganism decomposition had occured the decomposition of complex compounds such as carbohydrates into carbon dioxide compounds and water. Carbohydrate was the compounds that were included in the easily decompose group, so that in the fermentation process carbohydrate compounds will be hydrolized first and then the decomposition was occured in the other compounds such as protein.

The IAA plant growth regulator content in fermented coconut water was influenced by the addition of tryptophan. The addition of tryptophan 8 mg in coconut water waste (P3) and the addition of tryptophan 10 mg in the coconut water waste (P4) were able to provide plant growth regulator of auxin source in the form of IAA. P3 and P4 treatments obtained IAA that did not significantly different in the amount of 0.62 ppm. The addition of tryptophan at P3 and P4 with the different which was not big to obtain indole pyruvic acid and then to be indol acetaldehyde compound as compiler of auxin indole acetic acid (IAA) was similar. IAA was formed from tryptophan when fermentation was turned into indole pyruvic acid, then it became indol acetaldehyde which was an ingredient of indole acetic acid (IAA). Indole acetic acid (IAA) compounds were formed from tryptophan compounds which formed into indole pyruvic acid and then became indol acetaldehyde compounds as a constituent of auxin indole acetic acid (IAA) [6]. The addition of tryptophan as an amino acid would increase the amount of plant growth regulator of auxin IAA [6].

CONCLUSION

The conclusion of this study was the treatment of glucose and tryptophan affected pH and acetic acid after fermentation. The addition of glucose and tryptophan influenced the amount of plant growth regulator of auxin in fermented coconut water waste. The best treatment that obtaining IAA was P3 and P4.

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