Utilization of nyamplung industrial waste for compost and the response to nyamplung seedlings growth and nitrogen uptake

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Abstract. The solid waste (dregs seed) of nyamplung (Calophyllum inophyllum) industry from seed pressing processes could be more than 50% of the dry seed weight. Nyamplung oil industry in Bantul (Yogyakarta) has been produced nyamplung oil 4-5 ton/month that produced dregs seed around 50-60%/ton nyamplung dry seeds. The accumulated waste has been piled up and immediately important to utilize it. This study aimed to determine (i) the effect of bioactivators with ameliorant material application and the interactions among treatments on nyamplung dregs compost quality, and (ii) the growth response, seedling quality index and nitrogen uptake on nyamplung seedlings with nyamplung dregs compost application. The study was arranged in Completely Randomized Design (CRD) factorial. Two bioactivators Prouponic Gb#1 and cattle rumen bio starter were used in the study. The bioactivators were combined by ameliorants (no ameliorant, dolomite, and rice husk ash) with 3 replicates for each treatment. Analyses of soil chemical properties were carried out on nyamplung dregs before and after the treatments applied including: pH, DHL, N Total, C/N ratio, P Total, K Total. Those characters were compared to SNI No.19-7030-2004 on compost quality standards. DHL, C/N ratio, the total N, P, and K met the criteria on SNI. Seedling growth characters (height, diameter, number of leaves) and seedling quality index varied between nyamplung dregs compost treatments and control up to 16 weeks observation. Nyamplung dregs compost application showed the highest N uptake on nyamplung seedlings compared to the controls. Nyamplung seedling quality index was highly influenced by the uptake of N nutrients in the shoots and the roots than by height character and diameter.

1. Introduction

Nyamplung (Calophyllum inophyllum L.) is an ideal source for biodiesel since it’s non-edible seed containing high kernel oil (65%) and it is also potential for medicinal and cosmetic products [1,2]. During nyamplung oil production, the excess waste could be more than 50% [2]. PT Sinergi Panggung Lestari (SPL), one of nyamplung oil industry in Bantul (Yogyakarta) has been produced nyamplung oil 4-5 ton/month that produced dregs seed (waste) around 50-60%/ton nyamplung dry seeds (personal communication). It means that PT SPL produces 4-6 ton of waste every month. The waste will be serious problems for environment and human life when not be processed into useful products. The accumulated waste has been piled up and immediately important to utilize it. Nyamplung dregs seed contains high rough protein and organic material that potentially utilized as raw material for ruminant feed and organic fertilizer (compost) [3]. Organic fertilizers can improve the quality of soil physics,
biology, and chemistry and sustainably maintain soil health [4]. Organic fertilizers slowly released nutrients that in a long term will reserve the nutrients for plant. Nyamplung dregs utilization for compost were reusable for nyamplung seedling medium. This will form a cycle from the utilization of nyamplung oil industrial waste which will return to the plant.

Nyamplung dregs will decompose naturally by microbial activity. In nature, the decomposition of organic matters can take a very long time, it can be months to years. Composting may decompose organic matter more quickly by adding microorganisms to accelerate the decomposition rate [5]. Broadcasting starters or microbial inoculant including Prouponic Gb#1 and cattle rumen bio starter on compost materials will also accelerate composting processes [6]. The addition of dolomite and rice husk ash can increase pH that consequently will improve the quality of the compost. This study aimed to determine (i) the effect of bioactivators and ameliorant application on nyamplung dregs compost quality in accordance with SNI No.19-7030-2004 [7], and (ii) the growth response, seedling quality index and N uptake of nyamplung seedlings by nyamplung dregs compost application.

2. Materials and Methods

2.1. Location

Research on composting processes, the application to seedling medium and seedling production were conducted at medium preparation area and at nursery of the Center for Research and Development of Forest Plant Breeding Biotechnology, Sleman in Yogyakarta. Analysis of chemical and physical properties of the medium were carried out at 4 laboratories i.e.: (1) General Soil Laboratory; (2) Soil Physics Laboratory; (3) Soil Chemistry Laboratory, and (4) Soil Fertility Laboratory at the Faculty of Agriculture, Gadjah Mada University Yogyakarta.

2.2. Materials and Equipment

Materials and equipment for the composting were as follows: dregs, Prouponic Gb#1, cattle rumen bio starter, dolomite, rice husk ash, molasses, shovels, buckets, wooden boards, plastic and tarpaulin. The composting processes were carried out on 5.5 m x 0.5 m beds covered with plastic and tarpaulin. The composting processes were carried out on 5.5 m x 0.5 m beds covered with plastic and tarpaulin. The composting processes were carried out on 5.5 m x 0.5 m beds covered with plastic and tarpaulin.

Composting was carried out by preparing 20 kg of nyamplung dregs for each treatment and mixing it with 300 kg ton⁻¹ manure. Two liters ton⁻¹ starter and 10 liters ton⁻¹ molasses were dissolved into ± 20 liters ton⁻¹ of water. The solution was splashed into mixing dregs and 1/20 dolomite or rice husk ash were added into the mixture until well mixed and ready to compost. The compost materials were stacked on 40 cm x 40 cm beds, ± 20 cm in height and covered with tarpaulin. During the decomposition processes, the compost was regularly turned to maintain the temperature and pH. Mature compost was sieved and used as a planting medium for nyamplung seedlings.

The medium was prepared by mixing topsoil of inceptisols and compost in a ratio of 1:1 in 18 cm x 6.5 cm polybag on seedbed with plastic cover under 55% of shade. The medium was watered in field capacity and was applied fungicide before transplantation. The seeds were sown on sand before transplanted to the medium. Regular maintenance and observation were carried out up to 16 weeks after sowing.

2.3. Methods

This research consisted of two experiments conducted simultaneously: 1) nyamplung waste composting and 2) the application of the compost as seedling medium. A factorial Completely Randomized Design (CRD) consisting of two factors (bioactivators and ameliorant) were used in the experiment. Prouponic Gb#1 (B1) and cattle rumen bio starter (B2) were used as bioactivator treatments. Without ameliorant (P1), Dolomite (P2) and rice husk ash (P3) were used as ameliorant treatments. The treatments of compost application were as follows B1P1, B1P2, B1P3, B2P1, B2P2, B2P3. Those treatments were compared with two types of control medium, namely soil (B0K1) and commercial compost (B0K2) on 15 seedlings in each treatment with three replicates.

The characters observed on compost quality were temperatures in every 2 days, pH in every 3 days and C/N, DHL, P, K ratios when the compost matured. Seedling growth (height, diameter, number of leaves) were measured up to 16 weeks after sowing. The height and the number of leaves were measured
in every 2 weeks from the base of the stem to the point of growth. The diameter of seedling stem was measured in every 4 weeks 3 cm from the base of the stem. Seedling quality index was measured by measuring wet and dry weigh on seedling stem and root at 16 weeks after sowing. Dry weight measurement was carried out under 60°C for 48 hours.

Laboratory analyses on waste raw materials, mature compost, topsoil, medium mixture and total N content in plant tissue were carried out referring to the method in Soil Chemical Analyses Manuals [8]. pH H2O were analyzed using a pH meter, DHL using an EC meter, soil organic C using the Walkley and Black method, total soil N content using the Kjeldahl method, available soil N content using the Cottenie method and CEC using neutral ammonium acetate. Other properties were carried out according to Soil Chemical Analyses Technical Guidelines [9] such as C-Organic using Muffle Furnace, total soil N content using the Kjeldahl Method, total P content using a Spectrophotometer, total K content using a Flame Photometer and total N content in shoot tissue and roots using the Kjehdahl Method.

2.4. Analysis
The experiment was established with a two-way ANOVA statistical model to examine: i) the response of seedling growth on different bioactivator and ameliorant treatments; ii) the response of seedling growth on different interactions between bioactivator and ameliorant treatments. Such two-way ANOVA analysis is commonly used to compare the effects of different treatments between two populations [10]. ANOVA was performed using the plot’s mean data (Yijk) for seedling growth, with the following linear model:

\[ Y_{ijk} = \mu + B_i + A_j + (BA)_{ij} + \varepsilon_{ijk} \]  

where, Yijk is the ijk th observation, μ is the overall mean effect, Bi is the i th bioactivator effect, Aj is the j th ameliorant effect, (BA)ij is the interaction between bioactivators and ameliorant effect and \( \varepsilon_{ijk} \) is the experimental error for Yijk.

An SAS (Statistical Analysis System) ver. 9.1.3. program was used to analyze the experimental data. When the effect significantly different at the 5% level in the ANOVA test, the data were further analyzed by Duncan Multiple Range Test (DMRT).

3. Results and Discussion
3.1. Effect of bioactivator and ameliorant application to nyamplung dregs compost quality

3.1.1. Temperature. Temperature is an indicator to determine the level of compost maturity. Temperature greatly affected the activity of decomposing microorganisms in the composting processes [11-13]. The temperature during the composting processes of nyamplung dregs varied as shown in Figure 1. On the first week of composting, the average temperature after mixing was ranged 30-35°C. Temperature was increased on the 9th day of composting and reached the highest peak temperature (37-40°C). The temperature decreased into 29-31°C on the 11-15th days of composting. When compost temperature approaching the ambient air temperature, it was indicated that the decomposition processes were completed. The average temperature between treatments tends to be similar. Highest temperature (40°C) was reached by B1P3 (Prouponic Gb#1 bioactivators and rice husk ash) treatment on 9-13th days observation.
Figure 1. Temperature on composting processes of nyamplung dregs.

In this study, the compost temperature did not reach the ideal temperature of 55-65°C for compost pile. The lower temperature showed in this study could be due to the thin layer of the pile (± 20 cm), that the heat generated from the composting processes was easily evaporated. The highest temperature for composting was reached by the compost with 1 m pile height [14]. The increasing compost temperature was affected by pile porosity. The mass and heat transfer in the compost pile was significantly influenced by the geometry and size distribution of the pores and the composition of the compost material [15]. The increasing depth of compost pile will result the lower of pile porosity which causing the amount of heat generated during the decomposition processes to be trapped in the pile.

3.1.2. pH

Figure 2. pH on composting processes of nyamplung dregs.

pH is a relative acidity and an important parameter in the composting processes ranging from 4.1-4.62 at the beginning of composting processes. In the following days there was an increase in pH for all treatments reaching to neutral pH. At the end of composting the pH of all treatments was in the slightly alkaline category ranging from 8.0-8.3, higher compared to SNI 19-7030-2004 requirement (Table 1). The increasing pH of nyamplung dregs compost was influenced by microorganisms mineralizing the organic matter and releasing alkaline cations. pH tends to increase during the composting processes due to a reaction of base cations [16]. Microorganism activity highly dependent on pH. Acidity condition (ranged 5.5-8) will support the growth of decomposing fungi. The fungi will decompose lignin and cellulose content in nyamplung dregs. Fungi do not photosynthesize and are able to live in a humid
environment and low pH [17]. pH will also affect enzyme activation. Enzymes are proteins, factors affecting proteins structure such as level of acidity or alkalinity will affect the enzyme stability [18].

3.1.3. Chemical properties of nyamplung dregs compost. Table 1 showed that nyamplung dregs compost met 5 chemical properties required by SNI for compost including: DHL, N total, C/N ratio, P total and K total. There were no significant differences for all chemical properties among bioactivators and ameliorant application, except for C/N ratio.

### Table 1. Chemical properties of nyamplung dregs compost.

| No | Karakter          | Prouponic Gb#1 (B1) | Rumen (B2) | SNI  |
|----|------------------|---------------------|------------|------|
| 1. | pH               | 8.00               | 8.20       | 8.20 | 8.30 | 8.00 | 6.8-7.49 |
| 2. | Weight loss (%)  | 38.28              | 37.37      | 35.01 | 36.26 | 37.08 | 35.05 |
| 3. | DHL (dSm-1)      | 1.48               | 1.56       | 1.30 | 1.63 | 1.65 | 1.35 | 2< |
| 4. | C organic (%)    | 39.74              | 42.70      | 42.30 | 40.31 | 39.86 | 40.40 | 9.8-32 |
| 5. | N total (%)      | 3.23               | 2.90       | 2.95 | 3.28 | 2.35 | 3.64 | >0.4 |
| 6. | C/N ratio (%)    | 13.07              | 15.74      | 11.17 | 12.89 | 17.21 | 11.37 | 10-20 |
| 7. | P total (%)      | 0.51               | 0.55       | 0.42 | 0.44 | 0.39 | 0.56 | >0.10 |
| 8. | K total (%)      | 1.74               | 1.40       | 1.23 | 1.56 | 1.13 | 1.49 | >0.20 |

Remarks: P1= Without ameliorant; P2= dolomite; P3=rice husk ash; SNI 19-7030-2004 about compost quality standards

The decreased weight of the mature compost ranged from 35.01% (B1P3) to 38.28% (B1P1). The decline weight of biomass materials in the composting processes was due to the release of nutrients from organic compounds into inorganic compounds which are useful for plant growth. Most of the carbohydrate compounds are lost, evaporate into the air and the levels of soluble N compounds increase. The decomposition processes produced heat which evaporating the water vapor and CO₂ content in nyamplung dregs causing the weight of the compost to decline [13,19].

The DHL increased from 0.03 dSm⁻¹ before composting to 1.3d Sm⁻¹ (B1P3) + 1.65 dSm⁻¹ (B2P2) after composting processes. The increasing DHL was influenced by the release of salts resulted from decomposition of the dregs by microorganisms. The increasing DHL indicated increasing dissolved salt content. The lower DHL value of nyamplung dregs compost (less than 2 dSm⁻¹) indicated non-toxic content on the compost and feasible to be applied. The non-toxic character is the advantage of nyamplung dregs waste compared to *Jatropha curcas* which containing toxic forbol esters and kursin that required pre-processing steps to neutralize these toxins before feeding live stocks [20,21] or plants.

The organic C content of nyamplung dregs compost ranging from 39.74% (B1P1) to 42.7% (B1P2) was higher than compost of SNI requirements (9.8-32%). The high C-organic content in the compost were caused primarily by the raw material (nyamplung dregs) containing high organic carbon (52.2%). The structure of the mature compost become crumblier while compost material structure before composting was lumpy. Decreasing organic carbon content occurred during the composting processes for the carbon is used by microorganisms to produce energy. High carbon content was a result of incomplete decomposition processes due to the low pile that cannot isolate sufficient heat for living of thermophilic bacteria [22].

The total nitrogen (N) content of nyamplung dregs compost ranged from 2.35% (B2P2) to 3.64% (B2P3), higher than SNI requirement (0.40%). During composting there is an increase in N content due to the decomposition processes. In the decomposition processes, microorganisms will produce ammonia and nitrogen. The N content of compost varied depending on the raw materials. N content in nyamplung dregs compost was higher than compost from cow manure (0.4%) and chicken manure (0.55%) [23,24].

The treatment of ameliorant application had a significant effect on the C/N ratio of nyamplung dregs compost. Dolomite ameliorant application showed higher C/N ratio than rice husk ashes ameliorant indicated faster mineralization occurred in rice husk ash treatment than dolomite. The rate of mineralization in composting rice husk ash was highly influenced by nutrients content in rice husk ash such as potassium, calcium and magnesium [25]. The nutrients were consumed by microorganisms to
increase their decomposting activity. C/N ratio of compost which close to soil C/N ratio of 12 was considered to be good [26] related to nutrient efficiency for fertilizer application. The C/N ratio in organic matter determine the mechanism of decomposition during composting. The pre-composting nyamplung dregs material had 20.26% C/N ratio which decreasing during the composting processes. The decreasing ratio indicated that the organic carbon was utilized by microorganisms as an energy source and was released as CO₂. The ratio also indicated an increase in N content because microorganisms produce organic N during composting. Low C/N ratio will affect the decomposition of organic matters due to the limited availability of carbon compounds [27].

The total P content in mature compost materials of nyamplung dregs ranged from 0.39% (B2P2) to 0.56% (B2P3) increasing from the raw materials of nyamplung dregs compost of 64-75%. The P2O5 content in mature compost was assumed to be related to the N content in the compost. The high N content will increase the multiplication of microorganisms to decompose phosphorus which consequently increasing P content [28].

The total K content in mature nyamplung dregs compost ranged from 1.13% (B2P2) to 1.74% (B1P1) and met the minimum requirements in SNI (0.20%). The increasing K content indicating available K binders resulting from organic matter decomposition [29]. The raw compost materials contained K in organic complex form which not available to plants. Complex organic form will be degraded by decomposition processes into simple organic K that can be absorbed by plants. At the maturation stage, the microorganisms will die and the K content in the microorganisms will mix with organic fertilizers and increase the organic fertilizer content.

3.2. Nyamplung dregs compost application as seedling medium

3.2.1. Soil chemical properties. Table 2 showed that actual and potential soil pH increased and tended to be alkaline after the application of nyamplung dregs compost, excluding controls which tended to be neutral. The high increase in soil pH after the application of nyamplung dregs compost was assumed to be due to the high organic material content in nyamplung dregs compost. Application of organic matter into acidic soil will increase pH. Hydrogen will be attached to the active group resulted the active group to become positively charged (-COOH²⁺ and -OH³⁻) [30]. The increase in compost pH was also influenced by the mineralization process during composting that releasing minerals in the form of alkaline cations [31].

| No | Character                        | Before Treatment | After Treatment | Soil Control (B0K1) | Compost Control (B0K2) |
|----|----------------------------------|------------------|----------------|--------------------|-----------------------|
| 1  | Actual pH                        | 6.5              | 8.15           | 8.14               | 6.5                  | 6.5                  |
| 2  | Potential pH                     | 5.2              | 8.15           | 8.07               | 5.16                 | 6.55                 |
| 3  | CEC (cmol(+)/kg⁻¹)               | 16.15            | 25.91          | 25.91              | 16.08                | 16.72                |
| 4  | Soil organic matter (%)          | 6.62             | 21.84          | 14.95              | 6.62                 | 9.67                 |
| 5  | N total (%)                       | 0.20             | 1.48           | 1.54               | 0.21                 | 0.22                 |
| 6  | Ammonium (ppm)                   | 11.24            | 74.80          | 81.32              | 9.34                 | 9.35                 |
| 7  | Nitrate (ppm)                    | 4.67             | 6.51           | 6.51               | 3.73                 | 10.27                |

Table 2. Soil chemical properties before and after 16 weeks application of nyamplung dregs compost.

Cation Exchange Capacity (CEC) is the ability of the soil to absorb and release exchangeable cations. The CEC tended to increase after the application of nyamplung dregs compost, ranged from 18.36 to 25.91 (cmol(+)kg⁻¹) caused by the high content of organic matter in nyamplung dregs compost. Soils with higher clay/colloid content and/or high organic matter content will have a higher CEC compared to soils with low clay content and low organic matter [32]. Application of compost affects the formation of alkaline cations due to the mineralization process during composting [31].
The initial soil organic matter content was high (6.62%) and increasing after the application of nyamplung dregs compost ranged from 14.95-21.84% (very high). Organic matter will affect nutrient availability, soil chemical properties, physical and biological. Organic matter is a source of energy for soil microorganisms to decompose organic matter in the soil into simple compounds and finally available to plants [33].

The total N content of soil with the application of nyamplung dregs compost was higher than the soil control and compost control, with a range of 0.89-2.31% (very high). The increase in the total N content of the soil was influenced by the organic matter content. The more organic matter content in soil will result in higher total N content for organic material is a source of N. Organic materials will be decomposed by microorganisms releasing nutrient elements such as N.

Ammonium (NH$_4^+$) and Nitrate (NO$_3^-$) are the form of N in the soil in an available state (can be absorbed and utilized by plants). Similar to the total N content, the ammonium and nitrate content after application of nyamplung dregs compost was higher than soil control and compost control. This was influenced by the organic matter content and the total N in nyamplung dregs compost. Nitrates are easily leached through drainage water and easily evaporate into atmosphere in gasses form [34].

### 3.2.2. Effect of nyamplung dregs compost on the growth and N uptake of nyamplung seedlings

Table 3 and Figure 3 showed that seedling height, diameter and number of leaves with application of nyamplung dregs compost varied between treatments up to 16 weeks after sowing. At the end of the observation, the height of the seedlings ranged from 12.98 cm (B1P1) to 19.79 cm (B0K1); the diameter ranged from 0.34 cm (B1P1) to 0.43cm (B0K1); and the number of leaves from 6.74 (B1P1) to 13.31 (B0K1). There was a significant difference in seedling growth among the bioactivator treatment of Prouponic Gb#1 without ameliorant (B1P1) and soil control (B0K1). The application of nyamplung dregs compost both bioactivator and ameliorant application showed no significant difference on growth, seedling quality index, and N content which was in line with the chemical properties in nyamplung dregs compost that had no significant difference between bioactivator and ameliorant application (Table 2).

#### Table 3. Growth, Seedling Quality Index and N uptake of nyamplung seedlings on 16 weeks.

| No | Treatment | Height (cm) | Diameter (cm) | Number of leaves | Seedling Quality Index | N total (%) | N uptake (mg/plant) |
|----|-----------|-------------|---------------|------------------|------------------------|-------------|---------------------|
|    |           |             |               |                  |                        |             | Crown Root          |
| 1  | B1P1      | 12.98 b     | 0.34 c        | 6.74 c           | 0.31 a                 | 1.76 a      | 1.72 a 2.60 a 0.95 a |
| 2  | B1P2      | 17.21 ab    | 0.39 bc       | 8.78 c           | 0.47 a                 | 1.75 a      | 1.23 bc 4.13 a 1.13 a |
| 3  | B1P3      | 14.14 ab    | 0.36 bc       | 7.92 c           | 0.55 a                 | 1.11 cd     | 1.37 b 3.13 a 1.34 a |
| 4  | B2P1      | 17.11 ab    | 0.40 bc       | 9.70 c           | 0.60 a                 | 1.45 a      | 0.98 cd 4.83 a 1.07 a |
| 5  | B2P2      | 17.13 ab    | 0.40 bc       | 9.29 c           | 0.60 a                 | 1.24bcd     | 0.99 cd 3.56 a 1.21 a |
| 6  | B2P3      | 15.25 ab    | 0.39 bc       | 8.26 c           | 0.68 a                 | 1.33 bc     | 1.14 bc 4.06 a 1.41 a |
| 7  | B0K1      | 19.79 a     | 0.43 a        | 13.31 a          | 0.60 a                 | 0.97 d      | 0.70 d 2.58 a 0.84 a |
| 8  | B0K2      | 17.50 ab    | 0.40 b        | 10.20 b          | 0.59 a                 | 1.27 bc     | 0.79 d 3.45 a 1.04 a |
Figure 3. Growth and seedling quality index of nyamplung after 16 weeks nyamplung dregs compost application.

Seedling quality index is the ratio of total dry weight to robustness of seedlings and shoot root ratio. Seedling Quality Index is a parameter to describe morphological properties and the physiology of seedlings [35]. Table 3 and Figure 3 showed that all treatments and controls showed no significant difference for seedling quality index up to 16 weeks observation, ranged from 0.31 (B1P1) - 0.68 (B2P3) indicated that the seedlings were not ready for planting out in field at the age of 16 weeks after sowing and required more times in nursery. Nyamplung seedlings with 31 cm height, 5.1 mm diameter and a minimum of 4.6 seedling quality index were considered to be the best value for planting [36].

Figure 4. N total and N uptake of nyamplung seedlings.

Nitrogen (N) is one of the essential macro elements which must be included in the medium. N is an important ingredient to form acids amino, amides, nucleotides, and nucleoproteins which are essential for cell division and development for growth [37]. Table 3 and Figure 4 showed that the treatments B1P1, B1P2 and B2P1 on the total N in shoot were significantly different from B1P3, B2P2, B2P3, B0K1 and B0K2. B1P1 showed the highest total N content of 1.76% in shoot and B0K1 showed the
lowest total N content of 0.97%. Total N in the roots showed a significant difference among B1P1 and other treatments of nyamplung dregs compost. B1P1 showed the highest total N content of 1.72% in roots and B0K1 showed the lowest total N content of 0.7%. B1P1 performed the highest total N content, but performed less growth in compared to the control treatments. Excess N in plants will result in accumulated N nutrient in certain plant tissues. N become less distributed in plant tissues that consequently affected the growth. Nyamplung dregs compost treatment comparing to the controls showed a significant difference in the total N concentration both in shoots and roots. Lower N levels found in control treatment, consequently less nutrients were absorbed by the seedlings.

N uptake showed by the amount of N weight in the plant tissues. Table 3 and Figure 4 showed that N uptake on nyamplung seedlings varied among treatments. N uptake in the shoots showed higher than in the root, however, no significant differences found between the treatments. B2P1 showed the highest N uptake (4.83 mg/plant) and B0K1 showed the lowest N uptake in the shoots (2.58 mg/plant). B1P3 showed the highest N uptake in the roots (1.34 mg/plant) and the lowest root N uptake showed by the soil control treatments (0.84 mg/plant) indicated an increasing in N content after the treatment (B2P1 and B1P3) compared to medium before the treatments (B0K1) that plants can absorb more N.

There was a strong correlation on N uptake between the shoot and the root with seedling quality index of 0.73 (the roots)-0.74 (the shoots). The values were higher than the correlation of seedling quality index between height (0.35) and diameter (0.52). This indicated that the quality of nyamplung seedlings in this study was highly influenced by the uptake of N nutrients in the shoots and the roots. The higher dry weight indicating high N uptake. N is required for photosynthesis and for producing higher assimilates.

4. Conclusion
The treatment of bioactivators and ameliorant application showed no significant effect on quality of nyamplung dregs compost in temperature, pH, organic C, total N content, C/N ratio, total P content and total K content. Nyamplung dregs compost chemical properties including C/N ratio, total N content, total P content and total K content met SNI minimum requirement for compost. Seedling growth parameters such as plant height, stem diameter and number of leaves in the control treatments showed higher values than nyamplung dregs compost treatment. The highest seedlings N content was performed by the application of bioactivator (Proponic Gb#1) without ameliorant application (B1P1). The treatments of cattle rumen bioactivator without ameliorant application (B2P1) showed the highest N uptake in the shoots and Proponic Gb#1 added by rice husk ash (B1P3) showed the highest nutrient uptake for the roots. Nyamplung seedling quality index was more influenced by the uptake of N nutrients in the shoots and the roots than by height character and diameter.

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