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Utilization of Kereweng as A Coating For Slow Release Nitrogen Fertilizer.

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ABSTRACT

A research on the utilization kereweng as a coating on the urea was made into slow release. Kereweng is a fraction of roof tile that is less utilized by people. This research is related to the utilization of kereweng as a coating on ure fertilizer that is made release slowly. The purpose of this research is to know the characteristic of slow release nitrogen fertilizer with kereweng as coating. The determination of urea ratio with kereweng consists of composition 60:40, 70:30, 80:20, tested water content, compressive strength, nitrogen release rate, functional group and pore size as its characteristic. From the result of the research, the comparison of urea with kereweng which have good characteristic is SRNF 70:30 composition with water content of 0.573%, the change of hardness of 0.460 KPa/grain and the rate of freelance which has regression almost close to 1 is 0.9972 with the pore size is 3,050 nm and has a functional group of -NH, C = O, and C-N.

Keywords: kereweng, urea fertilizer, characteristic of SRNF, coating

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INTRODUCTION

Indonesia is a country whose majority population is farmers. In agriculture, fertilizer is used to increase agricultural productivity. Fertilizers circulating in Indonesia have various types of them are urea fertilizer. Urea is a white water-soluble crystalline solid and contains about 45% N elements [1]. Urea fertilizers have hygroscopic and this properties easily flooded during river washing so it has not been absorbed by plants. High concentrations of nitrate in water can stimulate the growth of microorganisms and other aquatic plants due to the nitric fertilization process [2]. Then another effort is made by modifying urea fertilizer into slow release fertilizer with natural ingredients in the form of granular. Modification of urea fertilizer into slow release fertilizer form can improve the efficiency of nitrogen fertilization [3]. Urea coating is often done using zeolite. The use of zeolite as a coating in that fertilizer because it has high Cation Exchange Capacity value and can serve as a binder, adsorbent, and cation exchanger [4].

Calcined zeolite can be found in the form of kereweng. Kereweng is a roof tile fragments that made of clay. In general, people is less utilize kereweng. Based on the results of pre-testing about kereweng, using XRD instrument, obtained the result that the composition of kereweng resembles zeolite. Kereweng or roof tile fragments can be utilized, processed into artificial stone used as a decorating material on the interior and exterior wall coating [5]. Another study which states that kereweng has the potential to absorb radioactive liquid waste [6], potentially as a geopolymer used as a substitute for cement [7], is potential as a concrete-making material which is expected to replace fly ash [8], and potentially as a fine aggregate in the construction industry [9].

In this study, the manufacture of slow release nitrogen fertilizer (SRNF) using kereweng as a coating material, which is urea fertilizer as a source of nitrogen in nitrogen fertilizer. The naming of nitrogen fertilizer using urea prill fertilizer based on SNI 2801: 2010 says that the minimum limit of N content is 46%, so in this research use the term of nitrogen fertilizer because of its level which is less than 46%. Utilization of waste kereweng as SRNF coating material is expected to increase the economic value of kereweng itself.

MATERIALS AND METHODS

Making slow release nitrogen fertilizer using granulator tool. Then test the water content using Karl Fisher instrument, analyze the compressive strength using hardness tester, to analyze the rate of release using kjeldahl method. The best composition will be tested for functional groups using FTIR instrument, and pore size using SAA instrument.

RESULTS AND DISCUSSION

The slow-release nitrogen fertilizer (SRNF) is varied with three kinds of composition urea compound with kereweng is 60:40 (P1), 70:30 (P2), and 80:20 (P3). The three variations were tested for water content, compressive strength, and nitrogen release rate. From the three test results will be determined the best composition which is then used to determine the functional group and pore size of SRNF. In the test the water content obtained data in table 1.

Table 1. Water content of each variation

Composition	Value of water content (%H_2O)
P1	0,749
P2	0,573
P3	0,359

Based on the SNI 2801: 2010 standard, maximum water content is 0.5%, while the yield on the composition of P1 is more standard and at P2 approaches the standard. For the composition of P3 otherwise meet the standards. The difference of moisture content in the composition variation is caused by the amount of water added to the process of making SRNF and the more the amount of kereweng used in the manufacture of water required more and in other hand.

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In the compressive strength test composition P1 has the largest compressive strength, as shown in table 2. This is due to the increasing of kereweng composition, the value of the compressive strength is increased because of the mixture of kereweng and binder that makes the SRNF can harden on the heating process of SRNF. This is supported also by the statement that the more the addition of zeolite the greater the force [10]. Further testing of nitrogen release rate obtained data processed into curves in figure 1.

Table 2. Strong Value press each Variation

Composition	Compressive strength (Kg/grain)
P1	0,785
P2	0,460
P3	0,295

Based on Figure 1 the composition of P2 has the best rate of release, because its regression value is close to 1 where it indicates a stable rate of release. Testing the rate of freelancing N also proves that kereweng has the ability to absorb nitrogen in the form of ammonium. Zeolites also have high selectivity properties against the ammonium ion so that the ion can be absorbed even though temporarily [11]. The result of testing of nitrogen release rate, the best composition of P2, on test of water content of this composition has value near SNI standard, beside that hardness composition test of P2 is quite hard, therefore composition of P2 used in functional group test and pore size test.

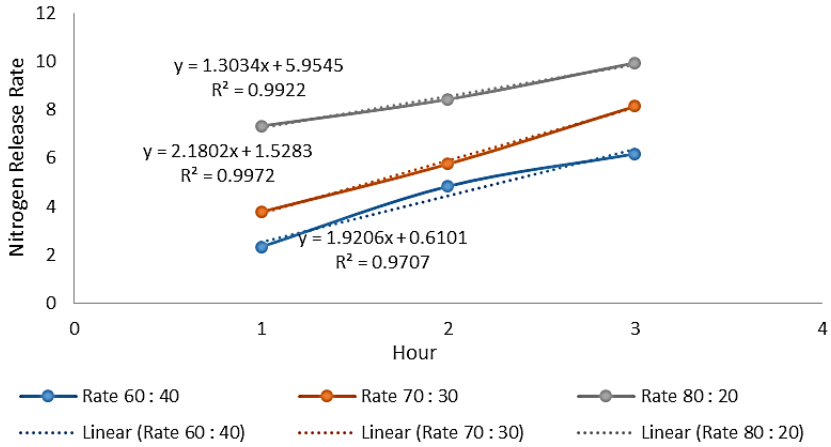

Figure 1. Nitrogen release rate every hour

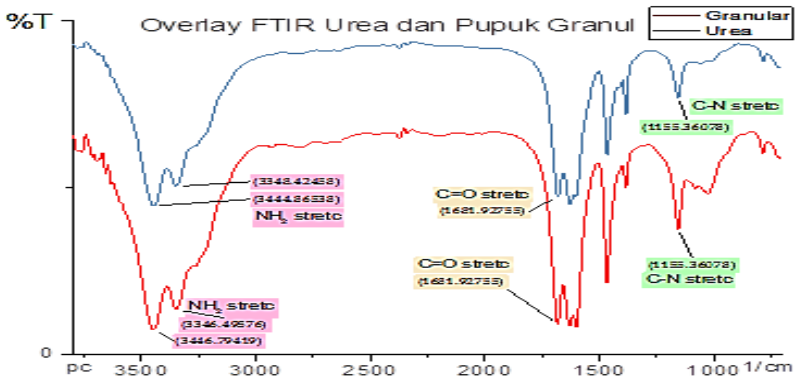

Figure 2. FTIR spectra of SRNF

Figure 2 shows that in the manufacture of PNLL is not involved in chemical reactions, this is covered by no change or wavelength shift and similar appearing clusters which read is urea with chemical formula

$(NH_2)_2CO$. Based on SAA instrument test of pore size on PNLL of 3.050 nm, this size includes mesopori. With a pore size of 3.050 nm, the kereweng of PNLL can absorb nitrogen molecules from prill urea. Nitrogen adsorption of SRNF performed in the ammonium form are temporary and can be absorbed by plants when the plants need. The nutrients in the soil, especially nitrogen (N) may be bound or retained by the zeolite that is only temporarily and will be released back into the soil when the plants need, it is supported because of the nature of the ammonium ion selectivity in zeolite adsorption is quite high [4].

CONCLUSIONS

Kereweng can be used as a coating on slow release nitrogen fertilizer with composition ratio of urea with kereweng is 70:30, which its characteristic include water content that is 0,573%, value of compressive strength 0,460 Kg/grain, regression rate of rate off 0.9972 and its 3.050nm pore size.

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