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The Use Of Sago Fiber Waste *metroxylon sagu rottb*. As Added Material to Concrete Bricks

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Abstract. During this time, sago pulp has been dumped into the river and it is feared that it can pollute the environment. Therefore, the waste of sago pulp is important to be researched by academics in order to improve people's welfare. Through a touch of engineering from the Department of Architecture, Faculty of Engineering, Halu Oleo University, sago pulp waste can be made as an added material for concrete brick. This research has a positivistic paradigm. This study uses a survey method with a qualitative approach. Data were analyzed and processed with mathematical formulas for brick strength and water absorption. Based on the results of the compressive strength and water absorption test, the concrete brick material with the composition of 1 cement: 50% sago fiber: 50% sand is feasible to be used as building wall material.

1. Introduction

Recently, many researchers have begun to be interested in examining local knowledge and utilizing biological resources. The fact proves that local knowledge has been tested and not a little contribution to technological progress. Revealing the knowledge system in every Indonesian tribe is needed from technical research, because there are still many biological resources that have not been utilized and known by various ethnic groups [1]. Sago is one of the interesting biological resources studied by academics. Sago *(metroxylon sagu rottb.)* is referred to as a native plant of Southeast Asia. Sago is spread from West Melanesia, East India, North Mindanao, Java Island, and Nusa Tenggara [2].

Sago plants are famous in the archipelago and grow in areas such as Papua, Maluku, and Sulawesi. In Sulawesi these plants are found in North Sulawesi, Central Sulawesi and Southeast Sulawesi. In the Southeast Sulawesi region sago plants are found in the mainland such as Konawe Regency, South Konawe, North Konawe, Kolaka, North Kolaka, East Kolaka, and Bombana. This district in the past included the base of the traditional kingdom of Konawe and Mekongga. Sago is an important plant in the life of the Tolaki community. Some indicators related to this statement were evidenced by the sago plant including the basic food source of the Tolaki ethnic community and the sago leaf was used as the roof of the traditional Tolaki community house (Melamba, 2014) [3]. The waste of sago pulp is obtained from the sago stem process into sago. So far, sago pulp has been dumped into the river and it is feared that it can pollute the environment. Therefore, the waste of sago pulp is important to be researched by academics in order to improve people's welfare. Through a touch of engineering, sago pulp waste can be used as an added material for concrete bricks. This research is aimed at testing compressive strength and water absorption in concrete brick material from sago fiber.

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2. Literature Review

2.1. Compressive Strength and Water Absorption on Concrete Bricks

Brick mixtures should be designed in proportion to produce a uniform compressive strength and required absorption [4]. Concrete block strength is identified as the quality of a structure. The size of the concrete brick water absorption is greatly influenced by the pores contained in the brick [5]. Compressive strength and absorbency are influenced by substitutes for natural materials, substitute materials for cement substitution, concrete additive materials, and waste materials [4]. The compressive strength of B2 quality solid concrete brick was obtained from the mixture and used Lapindo mud at 7.25%. The lowest water absorption of 24.56% is obtained through mortar [6]. Palm fibers can be used to reduce cracks in concrete blocks. Compressive strength of 25.47 kg / cm^2, 28.55 kg / cm^2, and 33.36 kg / cm^2 was obtained from the compressive strength of the fibers added by 0%, 2%, 4%, and 6%. The absorption test results were obtained with the same percentage and obtained at 15.22%; 8.25%; 8%; and 12.43% [5].

The value of compressive strength with a percentage of 25.47 kg / cm^2, 36.43 kg / cm^2, 37.81 kg / cm^2, 31.85 kg / cm^2, and 27.27 kg / cm^2 met the criteria for solid concrete IV requirements and obtained from the addition of 0%, 5%, 10%, 15%, and 20% of red cement to pottery waste. The value of water absorption is obtained with a percentage of 15.22%; 12.47%; 7.28%; 6.58%; and 10.87% and obtained from the addition of earthenware waste red cement by 0%, 5%, 10%, 15%, and 20%. The level of optimum red semen addition was obtained at 12.75% and the absorption of water produced was 7.43% [7]. Compressive strength of 52.37 Mpa and water absorption capacity of 6.92% resulted from variations of 30% carbide waste. Compressive strength of 19.64 MPa and water absorption of 12.01% resulted from variations in carbide waste [8].

The compressive strength test results were obtained by the average value of inorganic ash bricks on concrete blocks 1: 3: 1 = 4 Mpa and included in quality III. The testing of water absorption is still below 25% and is included in water quality I [9]. Sand material from the Pohara area (rather smooth) and sand material from the Nambo area (rather rough) are used by concrete brick makers in Kendari City. Both sands are mixed with a balanced composition [10]. The absorption capacity of the Nambo sand brick material obtained a value of 86.32% - 92.89% and the absorption capacity of concrete brick material from the sand of Pohara and Nambo obtained a value of 92.89% -96.48%. The absorption of the brick is not fulfilled in the physical conditions of the brick based on SNI 3-0349-1989 [11]. Thus, concrete bricks can be made with good quality, as follows: 1) balanced composition; 2) the right added material.

2.2. Utilization of Sago Trees metroxylon sagu rottb.

Sago bark and side fibers from agro-industrial sago flour can be transformed into goods of economic value. Test results on heat produced variations in the ratio of mass of binders and waste materials 3: 4 able to produce maximum heat (maximum gross heat) of 3929.5 kal / gr. The duration of burning briquettes is proportional density [12]. Sago pulp and cow dung can also be used as compost. Sago pulp is used as organic waste in composting and combined with cow dung [13].

Tolaki's traditional community of sago can be assessed from non-physical and physical factors. Sago is assessed from non-physical categories, as follows: (a) social factors. Sago is used as a measure of wealth, inheritance (hapo-hapo tiari) and kinship. (b) economic factors. Sago is used as a basic food source and welfare. (c) political and government factors. Sago is defined as the value of unity and unity. (d) religious factors. (e) ecological factors. Sago trees planted can fertilize the soil. Sago is assessed from physical factors, as follows: (a) sago plants are a staple food source. (b) the outer skin of the sago tree is used as a wall and girder in the traditional Tolaki house. (c) sago leaves are used as house roofs and woven goods storage containers. (d) sago trees in a certain area are indicated by freshwater sources [3].

Natural materials are highly recommended for use as sustainable building materials. Sustainable architectural principles are found on the roof of sago leaves, such as work equipment and manufacturing materials derived from vegetation material grown except for machetes, how to make

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the sago leaf roof using human power, and sunlight in the drying process [14]. Sago fiber is a by-product of processing that has the potential to mix paving blocks. The results of the 28 day storage compressive strength test were obtained at 8.52-24.83 Mpa and 56 days storage was obtained at 8.85-25.65 Mpa [15].

Waste of sago fiber can be used as concrete brick. The concrete brick base material is made with cement, sand, and sago stem fibers. Sago fiber is added in a certain amount of 0% (without the addition of sago fiber), 5%, 10% and 15%. The value of optimal compressive strength on the addition of sago stem fibers with a composition of 10% obtained the compressive strength of 2.03 N/mm2. The maximum value of flexural strength obtained is 3.02 N / mm2. This compressive strength value fulfills SNI-3-0349-1989 with quality brick class IV [16]. Thus, sago fiber has never been studied as concrete brick and the composition of 1 cement: 50% sago fiber: 50% sand.

3. Methods

This research has a positive paradigm. This study uses a survey method with a qualitative approach. This research was carried out at the Civil Engineering Laboratory of Halu Oleo University, Kendari in September-October and 2018. The working tools in this test were calipers, digital scales, ovens, saucers, cloths, and stationery. The analysis used the experimental method. The test object is made with a size of 15cm x 15cm x 15cm x 15 cm. Each test object is made as much as 5. The test object is made with a composition of 1 cement: 50% sago fiber: 50% unaha sand. Press power testing is used by CTM (Compression Testing Machine) on 28 days concrete brick age. Testing the absorption of water using an oven. Data were analyzed and processed with a mathematical formula for compressive strength and concrete brick water absorption.Research Steps are, as follows: star - preparation of work tools - preparation of work materials (phase I); fiber sago waste (fiber is separated from sago meat and the fiber is dried) – cement – water – sand (phase II); stirring – making test material (phase III); making concrete bricks – care of specimens (phase IV); test specimens (phase V); data analysis (phase VI); conclusions and recommendation (phase VII); finished.

4. Result and Discussion

Table 1. The results of the average compressive strength of concrete brick material from sago fiber with a composition of 1 cement: 50% sago fiber : 50% unaha sand.

Sample	Average			
	Weight (gr)	Pmax (kN)	Broad Field (cm^2)	Compressive strength (kg/cm^2)
S 1-5	39.607,4	60.000	225	58,66
		SNI		40

4.1. The Result Of Compressive Strength Test

The results of the average compressive strength of concrete brick material from sago fiber with a composition of 1 cement: 50% sago fiber: 50% unaha sand obtained a value of 58.66 kg/cm². According to SNI 3-0349-1989 that is classified into III quality with a minimum gross compressive strength of 40 kg / cm² (table 1).

4.2. The Result Of Water Absorption Test

The water absorption test results of the average concrete brick material from sago fiber with a composition of 1 cement: 50% sago fiber: 50% unaha sand obtained value of 6.3518%. According to SNI 3-0349-1989 that is classified into quality I with a maximum water absorption of 25% (table 2).

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Table 2. The average water absorption test results of concrete brick material from sago fiber.

Sample	Oven dry weight (gr)	The weight of the test object after soaking (gr)	Water absorption (%)
	A	B	$\frac{(B-A)}{A} x\ 100\ \%$
S 6-10	37768,8	40167,9	6, 3518
	Water absorption average (%)		
	SNI		25

5. Conclusion

Based on the results of the compressive strength and water absorption test, the concrete brick material with the composition of 1 cement: 50% sago fiber: 50% sand is feasible to be used as building wall material.

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