INFLUENCE OF RICE HUSK ASH AND SUGAR CANE BAGASSE ASH PERCENTAGE ON THE CHARACTERIZATIONS OF STRENGTH CURVE MORTAR UNDER COMPRESSIVE OF AXIAL LOADING

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ABSTRACT

An experiment was conducted to investigate the characterization of strength Curve as the influence of adding Rice Husk Ash and Sugar Cane Bagasse Ash under Compressive of axial Loading. Six series of test specimens which was consist of two series of normal mortal specimens, two series of rice husk ash mortal specimens with 10 % and 20 % of cement replacement. Two series of Sugar Cane Bagasse Ashmortal specimens which was consist of 10 % and 20 % of cement replacement. Test result indicated that themortar strength curveof Sugar Cane Bagasse has higher than strength curve of Rice Husk Ash Specimens and normal Strength concrete.

Key Words : Strength Curves, Rice Husk Ash, Sugar Cane Bagasse Ash, Normal Concrete

INTRODUCTION

The research application of using pozzolanic material to increase durability of concrete has been developed. The presenting of pozzolanic material in concrete not just increase durability, but also bring positive effect to the environment, since by substituting large quantities of cement in concrete production, reduce the problem associated with their disposal (Cordeiro GC, et al, 2008) and the decrease in the emission of greenhouse gases ($CH_4$and CO_2) the main cause of global warming.

According toSingh, et al (2000) the use of pozzolanic material in developing countries by studying waste material that are generated in abundance in the region has increase the strength of mortal concrete.Some of these materials are Rice Husk Ash and Sugar Cane Bagasse Ash.

Sri Haryano, et al(2008) in her report, to use Rice Husk Ash and Sugar Cane Bagasse Ash should burn of Rice Husk and Sugar Cane Husk at temperature 700 C^0 to get Ash of Rice Husk and Sugar Cane Husk. Ismail and Waliuddin (1996) to get amorphous particle size Rice Husk and Sugar Cane Husk should burn along two hours until got the white ash. Rice Husk Ash and Sugar Cane Ash used were ash from two third deep of burning materials.

Katsuki, et al (2005) the particle size after burning process which form amorphous, after burning produced pure silicon, carbide silicon,and nitrite powder silicon. To have the cristabolic form of amorphous particle, the Rice Husk Ash and Sugar Cane Husk Ash blended in Los Angelos Machine with 36 Kg for 2 hour. The powder sieve with 200 μm to get more cristabolic particle (R.Zerbino, 2012), thus the process of alkali – silica reaction in concrete mortar become better.

There have been few studies to evaluate the behavior of Rice HuskAsh and Bagasse Cane Ash in concrete. Saraswaty and Song (2007) observed the behavior of replacement 25 % until 30 % Portland cement with Rice Husk Ash and Bagasse Cane Ash without any effect on the desirable properties of hardened concrete. The specific benefits of such replacement were the development of high strength at early ages. The study of the influence of Sugar Cane Bagasse Ash on mortal needed to study more future. That's way this research aim to have studying of it behavior.

EXPERIMENTAL PROGRAM

An experiment was conducted in Polytechnic civil Engineering Laboratory to investigate the influence of Rice Husk Ash and Sugar Cane Rush Ash percentage on the Characterizations of Strength Curve Mortar under Compressive of Axial Loading.The parameter studied included concrete compressive strength and specimens mass.

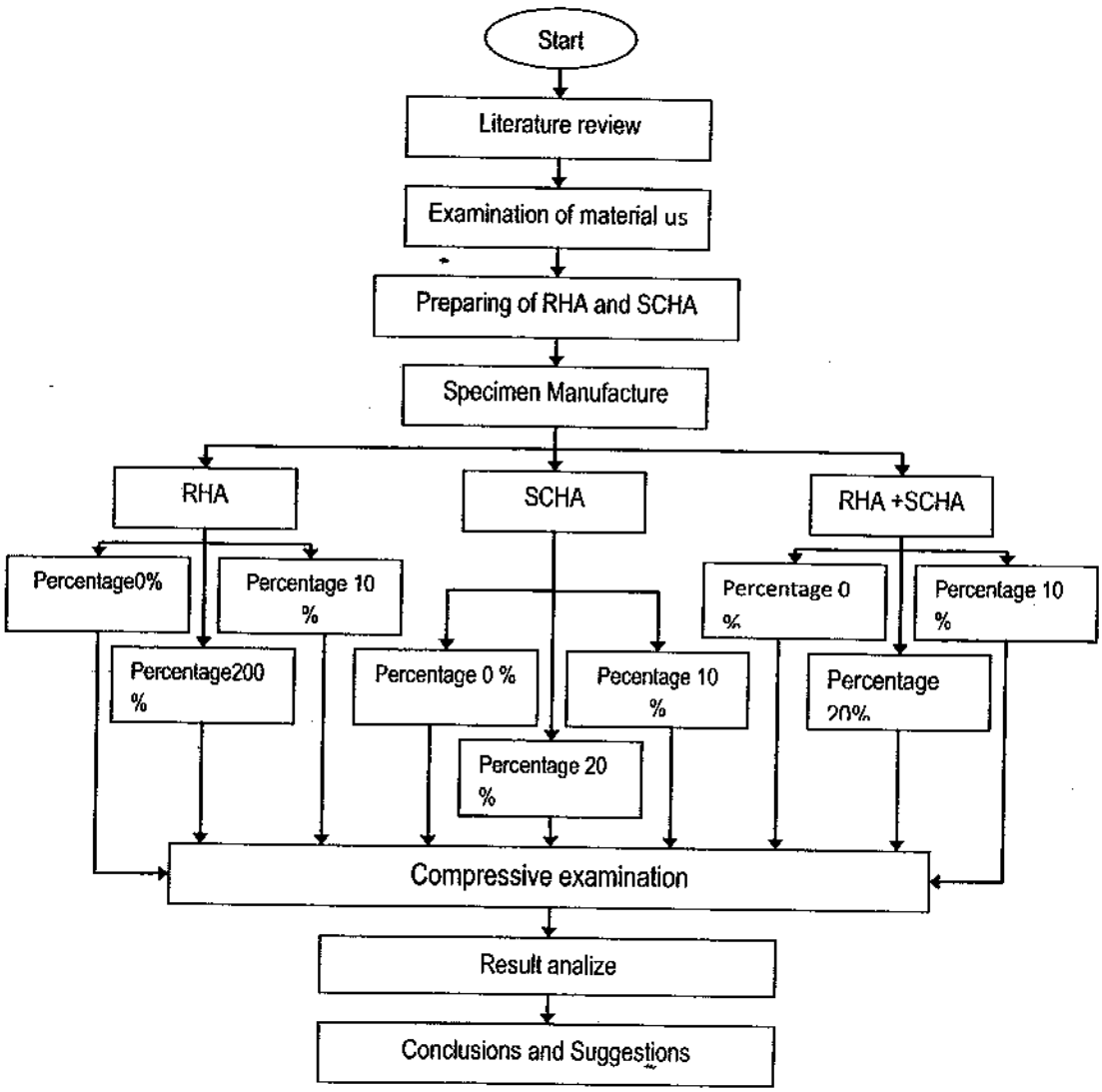

Figure 1. Research Flow Chart

The experiment starting with preparing material that consist of burning of material Rice Husk and Sugar Cane Husk in furnace at temperature 700 C⁰for two hours and letcooling down its self. After it was cool the Rice Husk Ash (RHA) and Sugar Cane Husk Ash (SCHA) blended in Los AngelosMachine with 36 Kg steel ball for two hours blended. RHA and SCHA blended sieve with 200 µm to get RHA powder and SCHA powder.

The other materials needed to be prepared were :Portland Cement, water (aqua) and fine sand aggregate. While preparing of RHA and SCHA outside of laboratory, the identification of physical properties of fine were investigated. The equipment used in this research were mixer, cubes molder measuring 50 mm x 50 mm x 50mm, container, electrical oven, compactor, sieve size 200 µm, sieve analysis set, digital weight measuring, and compressive strength equipment. Material passed sieve size 200 µm tested with SEM to examine zed Silica (Si) contain. Based on SEM tested result the Silica (Si) contain were 52,34 % for SCHA and 43,78 % for RHA.

Specimens made in five categories, they were control specimens (contain of 100 % Portland Cement), Specimens made used 10 % of RHA, specimens made used 20 % of RHA, specimens made of 10 % of SCHA and specimens made used 20 % of SCHA. Each category consist of 5 specimens. The flow chart and table of specimens mentioned on Figure 1 and Table 1 to Table 3. The experimental used in this research was factorial experimental which variable used RHA (there were two variable 10 % and 20 %) , SCHA (there were two variable 10 % and 20 %), combination of RHA and SCHA (there were two variable 10 % and 20 %). The procedure of specimens manufacture followed regulation of ASTM C 140 with curing.

Table 1.Average of mass and Compressive Test Specimens for water cement ratio 0,45

Specimens Percentage variation	Mass of Specimens (gr)	Compressive Strength (MPa)
Portland Cement Ordinary (PCO)	276,52	168,81
RHA 10 %	242,65	85,61
RHA 20 %	264,29	54,22
SCHA 10 %	261,67	108,06
SCHA 20 %	269,0	87,90
(RHA + SCHA) 10 %	262,42	120,07
(RHA + SCHA) 20 %	258,74	86,22

Table 2.Average of mass and Compressive Test Specimens for water cement ratio 0,50

Specimens Percentage variation	Mass of Specimens (gr)		Compressive Strength (MPa)
Portland Cement Ordinary (PCO)	274,73		174,87
RHA 10 %	276,27		133,83
RHA 20 %	254,88	69,10	
SCHA 10 %	266,01	109,50	
SCHA 20 %	254,88	79,10	
(RHA + SCHA) 10 %	253,76	71,31	
(RHA + SCHA) 20 %	253,76	55,24	

Table 3.Average of mass and Compressive Test Specimens for water cement ratio 0,55

Specimens Percentage variation	Mass of Specimens (gr)		Compressive Strength (MPa)
Portland Cement Ordinary (PCO)	267,93		159,35
RHA 10 %	251,58		93,17
RHA 20 %	251,38	94,99	
SCHA 10 %	264,63	133,46	
SCHA 20 %	271,98	140,57	
(RHA + SCHA) 10 %	268,90	104,84	
(RHA + SCHA) 20 %	273,43		119,15

Manufacturing of specimens done with mixed fine sand aggregate, cement, RHA (as appropriate designed) or SCHA (as appropriate designed) and water blended in mixer until all material mix well. The blended material put in cubes molder and compacted with compactor to let the specimens dense. After 24 hours, the specimens got from cubes molder and cured in water container for 28 days curing process. After 28 days curing, let the specimens blow dried and weight with digital weight. After weighting test with compressive strength, data got analyze with Complete Random Design Experiment.

TEST RESULT AND DISCUSSION

Test of compressive strength were performed at 28 day according to ASTM C 39 – 99. Result of the test shown in Figure 2.

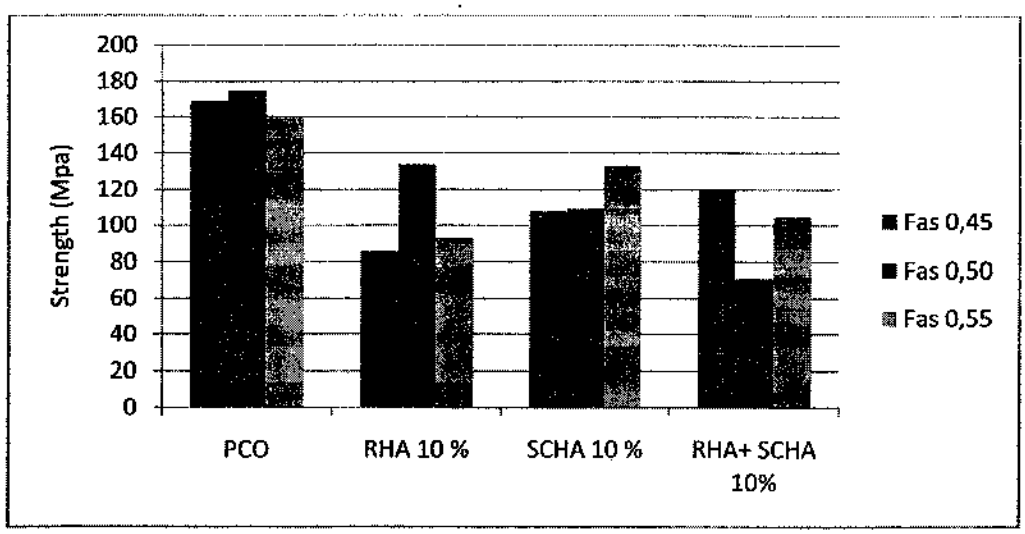

Figure 2.Compressive Strength bar ofpercentage 10 % (RHA, SCHA, RHA &SCHA Combination).

The patron of compressive strength of specimens using 10 % of RHA, 10 % SCHA and 10 % of Combination of RHA and SCHA. The comparison in the same water cement ratio showed that

the strength increase for water cement ratio 0,45. It was a different situation in water cement ratio of 0,50 the curve slow down (see Figure 2 and Figure 3).

The result of the test as show in Figure 2 and Figure 3 has meaning that there were no effect of using RHA even though SCHA or both combination RHA and SCHA. The contribution of RHA, SCHA and combination of RHA SCHA attended in concrete with water cement ratio of 0,55 has a big contribution with additional of SCHA. The curve of compressive strength of SCHA has a real contribution. The first assumption of this condition related with cristabolic size of particle SCHA. So the cristabolic particle take placed. It was one the reason of higher strength caused of mass specimens as shown in Figure 4.

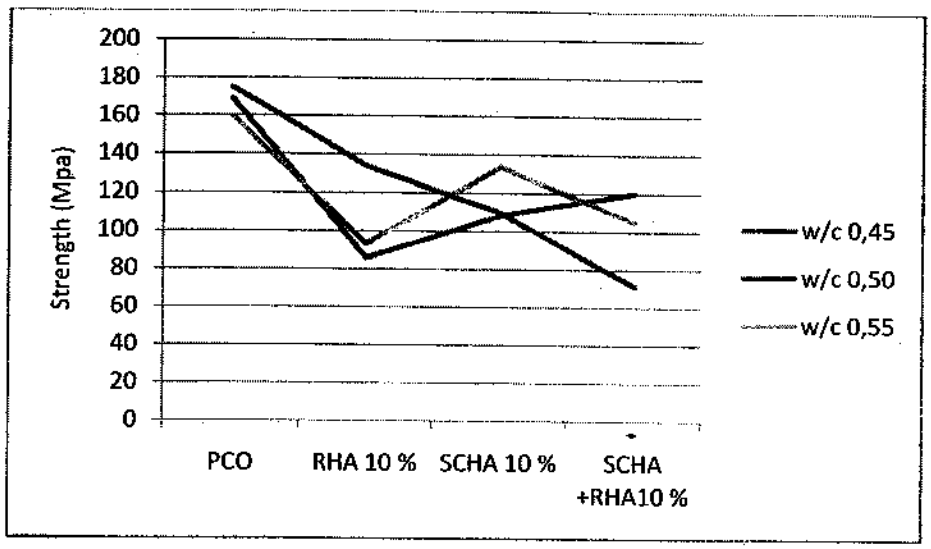

Figure 3.Compressive Strength Curve of percentage 10 % (RHA, SCHA,RHA&SCHA Combination)

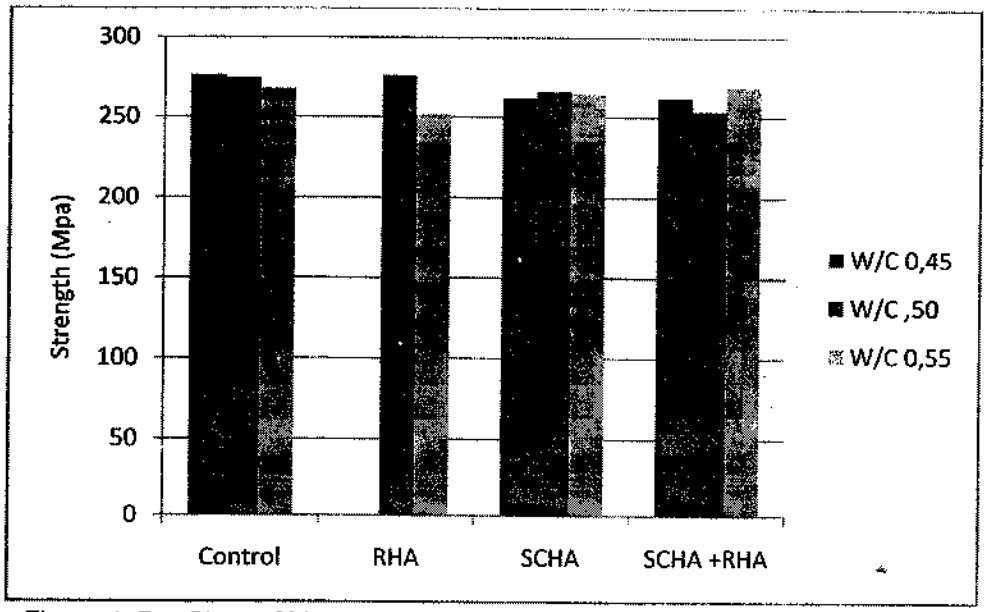

Figure 4. Bar Chart of Mass weight of Specimens of water cement ratio 0,45,0,50 and 0,55

The compressive bar chart of 20 % RHA, SCHA and both combination of RHA and SCHA showed that the best contribution of compressive strength gave by contribution of SCHA at 20 % and water cement ratio 0,55 (see Figure 4 and Figure 5). The consideration of strengthening got from SCHA there were related with cristabolic size of particle SCHA and got enough water to have appropriate binding between semen, Silica contain and water. The configuration of cristabolic particle distributed in concrete specimens need to be study in the future.

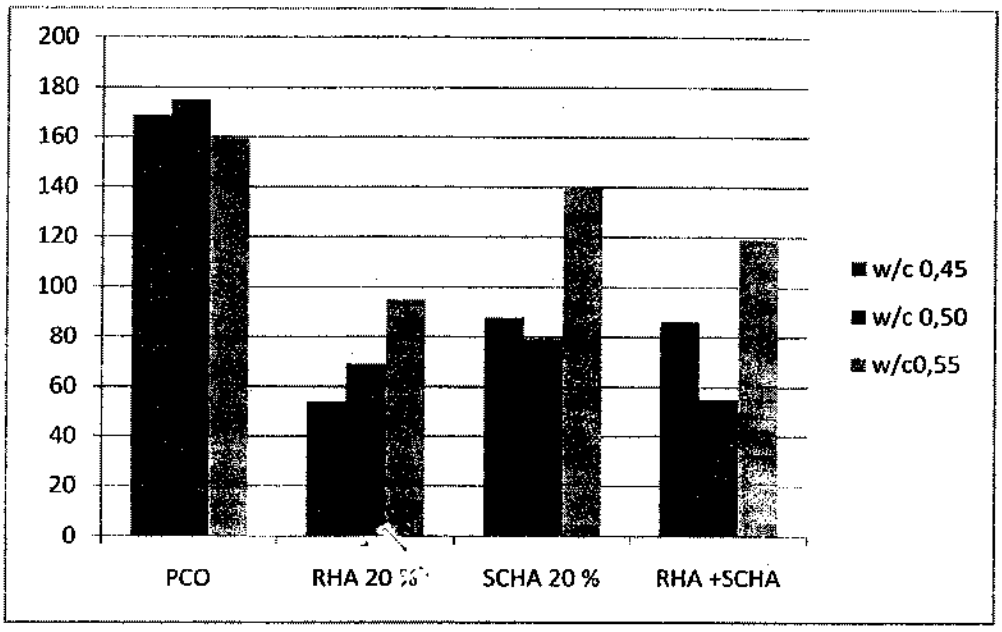

Figure 5. Compressive Bar Chart of 20 % additional RHA , SCHA and Combination RHA and SCHA.

CONCLUSIONS

The compressive strength measurement indicate that the pozzolanic reactivity between RHA and SCHA , it was more reactive SCHA compare than RHA based on the bar chart showed in figure 2 and figure 5. The best contribution by attendant of pozzzolanic material showed by attended of SCHA with percentage 20 % and appropriate water cement was 0,55. While the effect of mass of every water cement ratio no different. The average highest of compressive strength got from specimens with SCHA 20 % as140,52 MPa.

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