Game Fowl Chicken (*Gallus Gallus Domesticus*) Feather in Fortifying Cinder Blocks

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Abstract. - This research study aimed to determine the potential of game fowl chicken (Gallus gallus domesticus) feather in fortifying cinder blocks. This study was significant in making cinder blocks more durable for industrial and domestic use and encourages the recycling of discarded game fowl feathers. The research design used was the completely randomized design that involved three experimental treatments: (25g, 50g, 75g) of game fowl feather and standard made cinder blocks for control set ups. For compressive strength and water absorbency test, the most recommended was Treatment 1 with mixture of 25g of game fowl feathers, which is the best treatment with a mean of 20 PSI and with a mean of 7.66 water absorbed and it was compared with the standard block (control set-up). Hence, Treatment 1 was comparable to the standard block (control set-up) in terms of compressive strength and water absorbency based on the statistics results at p value of 1.000 for compressive strength and 0.751 for water absorbency respectively. As a result, this research study on the potential of game fowl feathers as a component in fortifying cinder blocks concluded that in terms of compressive strength and water absorption test, the enhanced experimental blocks are comparable to the standard made blocks.

Indexed Terms- Game fowl chicken feather, cinder blocks, fortifying, compressive strength test, water absorbency test

I. INTRODUCTION

Having a strong block can help the buildings or houses to prevent flooding and other calamities. Durability can exist for a long time without significant deterioration. The making of new buildings needs materials that can last [1]. Cinder blocks are one of the materials needed in building houses. It is considered one of the major problems in the Philippines wherein the materials used are not durable enough to sustain the stability for these blocks [2]. Game fowl chickens are not good in laying eggs but exclusively kept by competitive breeders. Game fowl feathers consist of fibers which came from the feathers [3]. These feathers cause a problem as it contributes to the amount of waste material in the environment. If these feathers will continue to increase there are cases of allergies, chronic respiratory disease, and other diseases [4]. To find a solution to this existing problem, the researchers conceptualized this study on the utilization of game fowl chicken feather as enhancer on the strength and durability of cinder blocks. Due to its high fiber content, game fowl chicken feather would be useful in fortifying cinder blocks to increase its durability. Likewise, to help reduce the waste materials in the surroundings and to promote the use of 3R's.

- STATEMENT OF THE PROBLEM

This study aimed to determine the potential of game fowl chicken *(Gallus gallus domesticus)* feather in fortifying cinder blocks. Specifically, it sought to answer the following questions:

1. Which among the different treatments [T1(25g), T2 (50g), T3 (75g)] of Game Fowl Chicken feather is effective in fortifying cinder blocks in terms of Compressive strength and Water absorbency test?
2. Is there a significant difference among the treatments of Game fowl chicken feather in fortifying cinder blocks in terms of compressive strength and water absorbency test?
3. Is there a significant difference in the effectiveness of the most recommended treatment comparable to

standard cinder blocks in terms of compressive strength and water absorbency test?

II. METHODS AND MATERIALS

- Research Locale

This research study was conducted at Department of Public Works and Highways, Tumaga, Zamboanga City. Compressive strength test was performed at the Zamboanga Testing Laboratory, Sta. Maria, Zamboanga City. Water absorbency test was performed at the Department of Public Works and Highways, Tumaga, Zamboanga City.

- Gathering of Materials

Game Fowl Chicken Feathers were collected at the San Roque, Zamboanga City. The fine sand and portland cement were bought at the hardware shop. Other materials such as spade, water, were gathered at the researcher's residence. 18 molders with the dimension of 2 in x 2 in x 2 were constructed based on the standard size of cinder blocks recommended by the DPWH personnel. The digital weighing scale and other apparatus were borrowed from Department of Public Works and Highways.

- Preparation of Feather

Game Fowl feathers were collected at San Roque, Zamboanga City with the aid of an expert personnel to gather the feathers in the cock fighting place. Proper sanitization protocol was observed to avoid contamination and was sun dried for three days. The barbs and feather were separated from the shaft. It was weighed and mixed with the other components to make cinder blocks.

- Preparations of Molders

Molders were provided by the DPWH. It was measured with the dimension of 2 inches length, 2 inches width, and 2 inches height. This was used to form a size of the cinder blocks.

- Experimental Procedure

All the materials needed were prepared; 25g of game fowl chicken feather, 850g fine sand, 900g portland cement were measured using digital weighing scale and 1000mL of water for Treatment 1. The portland cement and sand were mixed evenly afterwards using mixer for 1 minute. Then, the feather was mixed with the mixture of fine sand and portland cement. The same procedure was done for Treatment 2 with 50g of game fowl chicken feather and Treatment 3 with 75g of game fowl chicken feather. The mixture was placed in the molders. A total of 18 blocks was made.

- Curing

The curing begun immediately after making of the cinder blocks. There were eighteen (18) cinder blocks with game fowl chicken feathers undergone in curing process for 14 days to develop the durability of cinder blocks for Compressive strength test and Water absorbency test.

- Testing the Cinder Blocks

Compressive Strength test

The nine (9) experimental cinder blocks undergone compressive strength test using Universal Testing Machine (UTM) with the assistance of the Laboratory Testing personnel. This Compressive strength test was conducted to determine if game fowl chicken feather can be a component in fortifying cinder blocks.

- Water Absorbency test

For the Water absorbency test, the remaining nine (9) experimental cinder blocks and were pre-weighed using digital weighing scale. After weighing, the blocks were soaked in water for 24 hours. The weight of the blocks was determined by subtracting the final weight to the pre-weight.

- Proper Waste Disposal

After the experimentation, the remaining fine sand and portland cement were brought home for other purposes and the other materials were disposed properly.

- Data Analysis / Statistical Tool

Mean was used to determine which treatment is the most effective in terms of compressive strength and water absorbency. One-way Analysis Variance was used to determine the significant difference between the experimental treatments [T_1 (25g GFF), T_2 (50g GFF), T_3 (75g GFF)]. Independent T-test was used to determine the significant difference between the most recommended treatment and control set up (standard blocks) in terms of water absorbency test and compressive strength test.

III. RESULTS

Table 1. Mean on the Compressive strength test among the three treatments.

Treatments	Pound per square inch (PSI)			Mean
	R1	R2	R3	
T1(25g game fowl chicken feather)	20	21	19	20
T2(50g game fowl chicken feather)	17	16	15	16
T3(75g game fowl chicken feather)	10	8	12	10
Control set up	20	20	20	20

Table 1 showed the result of the compressive strength test among the different treatments (T1, T2, and T3). Treatment 1 has the highest PSI value for compressive strength with 20 PSI, preceded by the Treatment 2 (16 PSI), and Treatment 3 (10 PSI) respectively. Since treatment 1 obtained the highest PSI value for compressive strength test, therefore lesser the amount of game fowl feather, the greater the PSI[5] .

Table 2. One-way Analysis of Variance (ANOVA) of experimentation Treatments 1, 2 and 3 in terms of compressive strength.

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups Within Groups Total	152.000 12.000 164.000	2 6 8	76.000 2.000	38.000	.004	Reject null hypothesis

Table 2 showed the result of the ANOVA to determine if a difference existed between the statistical means of Treatment 1, 2, and 3. Since the computed *p= value of 0.004* is less than *p= value 0.05*, the decision is to reject the null hypothesis. Therefore, there is a significant difference between the three treatments.

Table 3. Post Hoc Test (Tukey) for the experimental treatment 1, 2, and 3 in terms of compressive strength.

(I) Experimental Set ups	(J) Experimental Set ups	Mean Difference (I-J)	Std. Error	Sig.	Decision
Treatment 1	Treatment 2	4.00000	1.15470	.531	Not significant
	Treatment 3	10.00000	1.15470	.000	Significant
Treatment 2	Treatment 1	-4.00000	1.15470	.531	Not significant
	Treatment 3	6.00000	1.15470	.105	Not significant
Treatment 3	Treatment 1	-10.00000	1.15470	.000	Significant
	Treatment 2	-6.00000	1.15470	.105	Not Significant

Table 3 showed the Post Hoc Test (Tukey) for the experimental Treatments 1, 2, and 3 in terms of compressive strength test. Treatment 1 and 2 showed no significant difference at *p=.531*. Treatment 1 and 3 showed a significant difference with *p=.000*, while Treatment 2 and 3 showed no statistical difference at *p=.105*. This means experimental Treatment 1 is statistically significant. This result implies that Treatment 1 is the most significant variant.

Table 4. Independent T-test between experimental set-up A and standard made blocks (control set-up) in terms of compressive strength.

		F	Sig.	T	Df	Sig. (2-tailed)	Decision
PSI	Equal variances assumed	4.000	.116	.000	4	1.000	Accept null hypothesis
	Equal variances not assumed			.000	2.000	1.000	

Table 4 showed the result of the Independent T-test to determine if a difference existed between the statistical mean of experimental Treatment 1 and standard made cinder blocks (control set up) in terms of compressive strength. Since the computed *p=1.000* is greater than *p=0.05*, the decision is to accept the null hypothesis. The result indicated that Treatment 1 and the standard made blocks have no significant difference in terms of compressive strength test. The result revealed that Treatment 1 is comparable to control set up (standard blocks) in terms of compressive strength test.

Table 5. Water Absorption Test: Raw Data for Pre- and Post-soaking weights.

Treatments	Weight before soaking (g)			Weight after soaking (g)			Difference (g)			Mean (g)
	R1	R2	R3	R1	R2	R3	R1	R2	R 3	
T1 (25g game fowl chicken feather)	299	289	297	306	297	305	7	8	8	7.66
T2 (50g game fowl chicken feather)	287	286	283	298	297	299	11	11	16	12.66
T3 (75g game fowl chicken feather)	257	265	253	289	287	267	32	22	14	22.66
Control set up	301	306	299	310	312	306	9	6	7	7.33

Table 5 showed the result of the watter absorption test among the different treatments (T1, T2, T3). Treatment 1 has the least amount of water absorbed with only 7.66g mean, followed by the Treatment 2 with 12.66g and Treatment 3 with 22.66g respectively. This further indicated that the lesser the amount of game fowl feather, the lesser the amount of water absorbed by the blocks. This result can be supported that the lesser dryer lints present in a concrete block, the lesser the water absorbed, since game fowl feather and dryer lints have fiber.[1]

Table 6. One-way Analysis of Variance (ANOVA) of Treatments 1, 2, and 3 in terms of Water absorbency test.

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	350.000	2	175.000	5.833	.039	Reject null hypothesis
Within Groups	180.000	6	30.000			
Total	530.000	8				

Table 6 showed the result of ANOVA to determine if a difference existed between the statistical means of among the different treatments 1, 2, and 3 in terms of water absorbency test. Since the computed *p= .039* is less than *p= 0.05*, the decision is to reject the null hypothesis. The result implied that Treatments 1, 2 and 3 has a varying effect in terms of water absorbency test. The higher amount of feathers the higher the amount of water will be absorbed by the blocks [5].

Table 7. Post Hoc Test (Tukey) for the experimental Treatments 1, 2, and 3 in terms of water absorbency test.

(I) Experimental Set ups	(J) Experimental Set ups	Mean Difference (I-J)	Std. Error	Sig.	Decision
Treatment 1	Treatment 2	-5.00000	4.47214	.539	Not significant
	Treatment 3	-15.00000*	4.47214	.035	Significant
Treatment 2	Treatment 1	5.00000	4.47214	.539	Not significant
	Treatment 3	-10.00000	4.47214	.143	Not significant
Treatment 3	Treatment 1	-15.00000*	4.47214	.035	Significant
	Treatment 2	10.00000	4.47214	.143	Not Significant

Table 7 shows the Post Hoc Test (Tukey) for the experimental Treatments 1, 2, and 3 in terms of water absorbency test. Based on the given table, Treatment 1 and 2 showed no significant difference at *p=.539*. Treatment 1 and 3 showed a significant difference with *p=.035*, while Treatment 2 and 3 showed no statistical difference at *p=.143*. This means experimental Treatment 3 is statistically significant. This further indicates that Treatment 3 absorbed more water among the other treatment.

Table 8. Independent T-test between experimental Treatment 1 and standard made blocks (control set-up) in terms of Water absorbency.

		F	Sig.	T	Df	Sig. (2-tailed)	Decision
Weight	Equal variances assumed	2.571	.184	.354	4	.751	Accept null hypothesis
	Equal variances not assumed			.354	2.560	.751	

Table 8 showed the result of the independent T-test to determine if a difference existed between the statistical mean of `water gained by experimental Treatment 1 and standard made blocks (control set up). Since the computed *p=.751* equal variance assumed is greater than *p=0.05*, the decision is to accept the null hypothesis. The result implied that Treatment 1 and standard made blocks has no significant difference in terms of Water absorbency test. This further indicated that Treatment 1 is comparable to control set up (standard blocks) in terms of water absorbency test. The lesser the amount of feather, the lesser it absorbed water [1]. This result can be supported that the lesser the amount of rice husk ash the more durable the concrete block [6]. In addition, too much fiber in a

concrete block the lesser the durability [5]. It can be then concluded that Game Fowl *(Gallus gallus domesticus)* Chicken Feather can be an alternative enhancer in fortifying cinder blocks.

CONCLUSION

In constructing building and houses, it is essential to have blocks that can last long during natural calamities. Game fowl chickens are being kept by the breeders for entertainment purposes and the waste chicken feathers has fibers where in can be used to strengthen the blocks. This study was conducted to determine the potential of Game Fowl Chicken (*Gallus gallus domesticus feather)* in fortifying cinder blocks in terms of compressive strength and water absorbency test.

For compressive strength and water absorbency test, the most recommended was Treatment 1 with a mixture of 25g of game fowl feathers, which is the best treatment with a mean of *20* PSI and with a mean of *7.66* water absorbed and it was compared with the standard block (control set up). Hence, Treatment 1 is comparable to the standard made blocks (control set up) in terms of compressive strength and water absorbency based on the statistics results.

This study concluded that Game fowl chicken feather can be a fortifier in cinder blocks. This potential of game fowl chicken feather is due to its high fiber content that can be found on its barbs and afterfeather. However, this study revealed that too much amount of game chicken fowl feather fiber can lessen the durability of the blocks because cement served as a binder of the aggregates and with the cement content increasing, the strength is also increasing and the fibers should be equally distributed [7]. This study helped lessen the solid waste by reducing the amount of waste game fowl feathers that can be seen in the environment. Game fowl chicken feather can also be used as a fortifier to prevent cracks during natural calamities and can save more money by producing much affordable component in fortifying cinder blocks. Thus, Game fowl chicken feather is a potential component in fortifying cinder blocks and can produce more durable blocks.

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