

Comparative Study on Concrete Block Using Composite Fiber

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Abstract - Global warming and environment demolition have become manifest problems in recent years. The present day world is witnessing the construction of very challenging and difficult civil engineering structures. In this study test will be conducted for concrete of grade M20 [1:1.5:3] and ratio 70 – 29 – 1 [i.e.70% of concrete and 29% f Fly Ash 1% of admixtures]. The compressing strength test will be conducted of 7, 14, 28 days strength. Experimental studies will show the comparison of compressive strength of material [glass fiber, wheat husk fiber / rice husk fiber, coconut fiber & fly ash]. Graphical representation of compressive strength results are shown & compared to that of each other.

Keywords: Glass fiber, Wheat husk fiber, Coconut fiber, Fly ash concrete, Compressive strength machine, Concrete block.

I. INTRODUCTION

1.1 General Background for the Concrete

Concrete is a compound material made from sand, gravel and cement. The cement is a mixture of various minerals which when mixed with water, hydrate and rapidly become hard binding the sand and gravel into a solid mass.

The oldest known surviving concrete is to be found in the former Yugoslavia and was thought to have been laid in 5,600 BC using red lime as the cement. The first major concrete users were the Egyptians in around 2,500 BC and the Romans from 300 BC. The Romans found that by mixing a pink sand-like material which they obtained from Pozzuoli with their normal lime-based concretes they obtained a far stronger material.

The pink sand turned out to be fine volcanic ash and they had inadvertently produced the first 'pozzolanic' cement. Pozzolana is any siliceous or siliceous and aluminous material which possesses little or no cementitious value in itself but will, if finely divided and mixed with water, chemically react with calcium hydroxide to form compounds with cementitious properties.

The Romans made many developments in concrete technology including the use of lightweight aggregates as in the roof of the Pantheon, and embedded reinforcement in the form of bronze bars, although the difference in thermal expansion between the two materials produced problems of spalling.

1.2 General Background for the fiber Concrete

Fiber can be used with Admixtures for increasing strength of mortar with partial replacement of cement. Partial replacement of cement by Fiber reduces the density of mortar and thus adding it reduces the dead load on the structure.

Using of Wheat husk ash helps in reducing the environment pollution during the disposal of excess Fiber. Fiber contains considerably higher percentage of silica than other replacement material. Cement is costly and scarce so the partial replacement of these materials Fiber. Fiber be used as plasticizers, admixtures & super plasticizers. In our further work we are going to conduct graphical representation of data that consists of strength on concrete block.

Fly ash for construction of roads and embankments. Feasibility study of the large scale fly ash brick manufacturing units. Fly ash in aerated autoclave concrete.

II. AIMS & OBJECTIVES OF THE STUDY

2.1 Need of study

- To study by the compressive strength of concrete block using different concrete fibers.
- To study the comparative strength of concrete block and to represent them using graphical method.
- To study the feasibility of different fiber on concrete block.

2.2 Aims & Objectives

- To study the compressive strength of concrete blocks using different fiber materials [glass fiber, wheat husk fiber, coconut fiber, fly ash].
- To study the feasibility of different fiber used in construction.

- To compare and graphical representation of the compressive strength of concrete of different fiber.
- Mix design of concrete to be used is M20 grade.

2.3 Methodology

In this Experiment we will make 6 cubes of glass fiber, 6 cubes of fly ash, 6 cubes of coconut fiber, and 6 cubes of wheat husk fiber. We will conduct compressive strength test for 7, 14, 28 days & the final strength will be converted into percentage & will be shown in graphical representation.

III. SELECTED MATERIAL AND FIGURE



Figure 1: Glass fiber



Figure 2: Wheat husk fiber



Figure 3: Coconut fiber



Figure 4: Fly ash



Figure 5: Cement



Figure 6: Fine aggregates



Figure 7: Coarse aggregates

IV. OBSERVATION RESULTS AND CONCLUSION

Table 1: Tests on Coarse Aggregate

Tests on Coarse aggregates	Standards	Results Obtained	Standard Value
Crushing test on aggregate	[IS: 2386 part 4]	31.8 %	Max. 45 %
Impact test on aggregate	[IS: 2386 part 4]	7.07%	Max. 45 %
Abrasion test on aggregate	[IS: 2386 part 5]	15.2 %	Max. 50 %
Flakiness index and Elongation index on aggregate	[IS: 2386 part 1]	Flakiness index=10.04 % Elongation index= 10.96 %	Max. 15 %
Specific gravity and water absorption test on aggregate	[IS: 2386 part 3]	S.G. = 2.88 W.A. = 0.25 %	S.G. =2.5 – 3.0 % W.A. =0.1 – 2.0 %
Particle size distribution	[IS: 2386 part 3]	82%	---

Table 2: Tests on Fine Aggregate (Sand)

Tests on fine Aggregate (sand)	Standards	Results obtained	Standard value
Specific gravity test	[IS: 383 & 480]	2.594	Around 2.65 %
Water absorption	[IS: 383 & 480]	1.91%	0.3 – 2.5 %
Particle size distribution	[IS: 383 & 480]	76 %	-
Bulking	[IS: 383 & 480]	28.2 %	20 – 40 %

Table 3: Tests on Cement

Tests on cement	Standards	Results obtained	Standard Value
Fineness test	[IS: 269]	3.44 %	Max. = 10 %
Consistency test	[IS: 269]	32 %	5 to 7 mm
Setting time test	[IS: 269]	Initial setting time = 35 min Final setting time = 185 min	Max. Initial setting time = 60 min Final setting time =600 min
Strength test	[IS: 269]	3 Days = 27 N / mm sq 7 Days = 38 N / mm sq 14 Days = 53 N / mm sq	Max. 3 Days = 27 N / mm sq 7 Days = 37 N / mm sq 14 Days = 53 N / mm sq
Soundness test	[IS: 269]	1.92 mm	10 mm
Tensile Strength test	[IS: 269]	3 Days = 20 KG/cm sq 7 Days = 20 KG /cm sq	Around 20 KG/cm sq

V. FUTURE WORK

The tests will be conducted in the laboratory facility of Khyati School of Engineering (KSE) i.e.,

- 6 cubes of concrete made from glass fiber.
- 6 cubes of concrete made from fly ash.
- 6 cubes of concrete made from coconut fiber.
- 6 cubes of concrete made from wheat husk fiber.
- Casting, Curing, and Compressive testing will be done for each cube consisting fibers namely Glass fiber, Fly Ash, Coconut Fiber, Wheat Husk.
- Hence displaying results of the Compressive testing graphically with respect to economic feasibility.
- We will conduct compressive strength test for 7, 14, 28 days & the final strength will be converted into percentage & will be shown in graphical representation.

VI. CONCLUSION

The results of the various tests on Cement, Coarse Aggregate, and Fine Aggregate are shown in the above. The tests are conducted in the SIMCON TECHNOLOGY PVT LTD Laboratory. The results are within permissible limits following the criteria for the Indian Standard (IS-Codes).

It is also seen that the Coarse Aggregates which are to be used should be Angular instead of Rounded, Flaky, Elongated, Sub-Rounded etc. It is also seen that the Fine Aggregates which are to be used be Coarser to Fine Depending on the

Project requirement resulting in the interaction between the fibers and fine aggregate.

REFERENCES

- [1] Oluwatoyin OO, Afam IO, Jideani, Daniso B (2015) “Composition and functionality of wheat bran and its application in some cereal food products”. *Int J Food Sci Tech* 50(12): 2509-2518.
- [2] Shuang-Qi T, Yong-Heng L, Zhi-Cheng C, Yong-Feng Q (2017) “Effects of layering milling technology on distribution of green wheat main physicochemical parameters”. *J Food Qual* Article ID 8097893: 1-7.
- [3] Leo S, Frankie P, Kathryn O’S, Jenny W (2012) “Wheat bran: its composition and benefits to health, a European perspective”. *Int J Food Sci Nutr* 63(8): 1001-1013.
- [4] Pomeranz Y (1988) “Chemical composition of kernel structures. In: Pomeranz Y (Ed.), *Wheat: chemistry and technology*”. (3rd edn), Springer, pp. 99.
- [5] Apprich S, Tirpanalan O, Hell J, Reisinger M, Böhmendorfer S, et al. (2013) “Wheat bran-based biorefinery 2: valorization of products”. *LWT-Food Science and Technology* 56(2): 222-231.
- [6] Curti E, Carini E, Bonacini G, Tribuzio G, Vittadini E (2013) “Effect of the addition of bran fractions on bread properties”. *Journal of Cereal Science* 57(3): 325-332.

[7] Preuckler M, Siebenhandl-Ehn S, Apprich S, Höltinger S, Haas S, et al. (2014) “Wheat-bran based biorefinery: composition of wheat bran and strategies of functionalization”. *LWT- Food Sci Techn* 56(2): 211-221.

[8] Reisinger M, Tirpanalan, Preuckler M, Huber F, Kneifel W, Novalin S (2013) “Wheat bran biorefinery - A detailed investigation on hydrothermal and enzymatic treatment”. *Bio Reso Techn* 144: 179-185.

[9] Serna-Saldivar SO (2010) “Dry milling operations. In: Cereal Grains Properties, Processing, and Nutritional Attributes”, PP 177-222. *Taylor and Francis, Boca Raton, FL*.

[10] De Brier N, Hemdane S, Dornez E, Gomand SV, Delcour JA, et al. (2015) “Structure, chemical composition and enzymatic activities of pearlings and bran obtained from pearled wheat (*Triticum aestivum* L.) by roller milling”. *J Cereal Sci* 62: 66-72.

[11] Andersson AAM, Dimberg L, Aman P, Landberg D (2014) “Recent findings on certain bioactive components in whole grain wheat and rye”. *J Cereal Sci* 59(3): 294-311.

[12] Brouns F, Hemery Y, Price R, Anson NM (2012) “Wheat aleurone: separation, composition, health aspects and potential food use”. *Crit Rev Food Sci Nutr* 52(6): 553-568.

[13] Almeida EL, Chang YK, Steel CJ (2013) “Dietary fibre sources in bread: influence on technological quality”. *LWT-Food Sci Techn* 50(2): 545-553.

[14] Reddy BS, Hirose Y, Cohen LA, Simi B, Cooma I, et al. (2000) “Preventive potential of wheat bran fractions against experimental colon carcinogenesis: implications for human colon cancer prevention”. *Cancer Res* 60(17): 4792-4797.

[15] Javed MM, Zahoor S, Shafaat S, Mehmooda I, Gul A, et al. (2011) “Wheat bran as a brown gold: Nutritious value and its biotechnological applications”. *Afr J Microbiol Res* 6(4): 724-733.

[16] Bechtel D, Abecassis J, Shewry P, Evers A (2009) “Development, structure, and mechanical properties of the wheat grain. In: Khan K, Shewry P (Eds.),

Wheat chemistry and technology”. (4th edn), *St. Paul, Minnesota, USA*.

[17] Kozubek A, Tyman JHP (1999) “Resorcinolic lipids, the natural non-isoprenoid phenolic amphiphiles and their biological activity”. *Chemical Rev* 99(1): 1-26.

[18] Esposito F, Arlotti G, Bonifati AM, Napolitano A, Vitale D, et al. (2005) “Antioxidant activity and dietary fibre in durum wheat bran by-products”. *Food Res Int* 38(10): 1167-1173.

[19] Maki KC, Gibson GR, Dickmann RS, Kendall CW, Chen CY, et al. (2012). “Digestive and physiologic effects of a wheat bran extract, arabinoxylanoligosaccharide in breakfast cereal”. *Nutrition* 28(11-12): 1115-1121.

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