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Hardy Leaf Concrete- Partial Replacement of Cement with Banana Leaf Ash

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ABSTRACT: This study was under taken to know the concrete properties using Banana Leaves ash. Concrete is one of the materials that is widely used in construction all around the world. This material is widely used because it has several benefits such as durable, energy-efficient, low maintenance, affordability, fire-resistance, excellent thermal mass and also versatility. World is as of now concentrating on alternate material sources that are environment agreeable and biodegradable in nature. The Banana Leaves Ash is an agriculture waste that has potential to replace one of construction material which is cement. Banana Leaves Ash contains a pozzolanic reaction that usually occurs in Portland cement. Instead of growing banana tree only for fruit consumption and discard the trunks, the use of banana leaves after the fruits are harvested should be explored. This project is conducted to determine the strength of concrete to produce good cementitious material by using Banana Leaves Ash. The source of BLA are found in banana plant and they are readily available, environmental friendly and cheap. In addition, BLA has an excellent potential to improve the performance of concrete. The banana trunks ash was produced from the process of burning the dried banana trunk and collecting the residue of it. The BLA will be used in cement to replace about 0%,5%,10%,15%,20% & 25% respectively. Mechanical properties such as compressive, split tensile and flexural strength were determined by casting cubes, cylinders and beam respectively.

KEYWORDS:Banana Leaf Ash, Compressive, Flexural strength & Split tensile strength

I. INTRODUCTION

The Concrete is most widely used as a construction material due to its good compressive strength & durability. It is material which is used more than any other man-made material on the earth for construction work. The main factor which determines the strength of concrete is the amount of cement used and water/cement ratio in the mix. Depending upon nature of work the cement, fine aggregate, coarse aggregate & water are mixed in specific proportions to produce concrete. Plain concrete needs suitable atmosphere by providing moisture for a minimum period of 28 days for good hydration & to attend desired strength. We know that for hydration process curing is must for the concrete. Any lack of curing will badly affect the strength & durability of concrete. The use of alternative material in the construction is increasing day by day. The project deals with the comparative study of properties of concrete by using Banana Leaves Ash as a cementitious material in the concrete mix. The ash produced from various types of agricultural waste can be used effectively as a partial replacement of cement. Some researchers evaluated the presence of pozzolanic activity in the deriving ash of Banana Leaves. The overall production of banana In India is approximately 16.91 Million Tonnes from 490.70 Thousand Hectares, with national average of 33.5 T/Ha. Maharashtra ranks first in production with 60 T/Ha. After cutting of banana tree the remaining part of tree i.e. stem and leaves are directly dumped or burned after drying it. That can be utilised as an alternative material for partial replacement of cement. Banana tree contains approximately 80% liquid matter and after drying its weight reduces up to 80% approximately. After burning dry leaves it gives 20% ash by its dry weight. Means if we dry 500 kg of fresh leaves and stems of banana tree, we will get 100 kg dry leaves and 20 kg of leaves ash. Banana Leaves are mainly obtained from various Banana Production farms (Maximum production is in Jalgoan District). These leaves are sun dried for a period of 30 days and open air burning is carried out. The residue remained after the burning is collected and known as Banana Leaves Ash. If required, this ash is made fine by using ball mill for 30 minutes. The final product obtain is finer enough to mix with the cement. The

grade of concrete to be used is M25 with super plasticizer. The BLA will be used in cement to replace about 0%, 15% & 25% respectively. The concrete obtained after this replacement will be analysed with the normal concrete by conducting various tests like Compressive Strength, Split Tensile strength & Flexural Strength after period of 7 days and 28 days curing. This might achieve economy, strength requirement and durability of concrete.

II. RELATED WORK

In this related work we are collecting the Banana leaf ash, it is an agricultural waste that has potential to replace one of the construction material, which is cement. because it contains a pozzolanic reaction that usually occurs in port land cement. this ash as a potential to improve the performance of the concrete the banana leaves with stem used for this study are obtained from the local banana farms. the leaves available in this process are dried for period of 30 days (minimum), after which the dried banana leaves are combusted in a control environment and residual ash of the leaves with stems collected. this ash is then sieved through 90 micron sieve for getting a fine powder of banana leaves ash. this ash is used in our study for replacing cement partially in calculated percentages. And the parameters of BLA is silicon dioxide (SiO₂) its having the 48.7% of composition banana leaf ash and similarly iron oxide, aluminium oxide, sodium oxide, loss of ignition are having composition of banana leaf ash percentage are 1.4, 2.6, 0.21, 5.06 respectively.

The testing on cement is Then to calculate specific gravity of cement is Le-chatlier's Flask method. In this cement is tested by using Kerosene. The tested cement specific gravity is of 3.094. 3.1.2 Normal consistency test is conducted as per IS 4031 (part 4) – 1988. The main purpose of conducting Normal consistency is to find the amount of water to be added for producing cement paste of standard consistency. Vicat apparatus is generally used for this test and is confirming to IS 5513 – 1976. The other apparatus are balance, Gauging trowel. and Initial and Final setting time test is confirming to IS 4031 Part 5. In this test we use Vicat apparatus, gauging trowel and Balance.

The test on fine aggregate then Tests on aggregates are confirming to IS 383 specifications are followed. In that firstly sieve analysis of fine aggregate. Sieve analysis helpful in determining the particle size distribution of the aggregates gradation of fine aggregate. It is confirming to IS 2386 – 1963 part 1 are followed to tested the aggregate. and Grading limits of fine aggregate in sieve analysis (As per IS 383 – 1970) are also determined at then we can know the zone of the aggregate percentage and specific gravity and bulk density of aggregate is also calculated. Then the test on coarse aggregate is sieve analysis. The Sieve analysis helpful in determining the particle size distribution of the aggregates gradation of fine aggregate and Grading limits of Coarse aggregate, the Specific gravity is the major property of the coarse aggregate. Specific gravity is calculated by the Cylindrical (Pycnometer Bottle) method bulk density of coarse aggregate (IS 2386 Part-3) Bulk density is defined as the ratio of weight of aggregates to its volume. Bulk density is the very important property in preparing the Mix design. Bulk density is directly proportional to the weight of the building. And the bulk density and fineness modulus of C.A, F.A.

III. METHODOLOGY

In this methodology By partially replacing cement with BANAN LEAF ASH, the experimental examination is carried out to get the compressive strength, split tensile strength, flexural strength, and modulus of elasticity of M25 grade concrete. Concrete specimens were made with different amounts of BANAN LEAF ASH (0 percent, 15 percent, and 25 percent). The creation of a concrete mix necessitates a thorough understanding of the component components' characteristics. The fine aggregate and coarse aggregate are added after the materials like as cement and BANANA LEAF ASH have been fully combined. Water was precisely metered. The wet mix is then added to the dry mix and thoroughly mixed until a consistent colour and consistency is reached, and the mixture is ready to cast. Workability is assessed before to the casting of specimens using slump and compaction factor tests in line with IS 1199-1959. The batching of material is done by weight batching. The method used for mixing is manual. The cement replaced by BLA in percentages of 0, 15 & 25 respectively. The super plasticizer is used with different quantities in this study for achieving workability. the completion of workability tests, the concrete was poured in three layers into typical metallic moulds and compressed with a tamping rod each time. For simple removal of test specimens, the concrete inner walls of the mould are treated with machine oil prior to placement. The Table vibrator was used to vibrate the concrete in the moulds for 30 seconds, and the surface of the examples was smoothed off. Preparation of moulds are The moulds for concreting are need prepare carefully before casting. All the moulds should be fitted properly. Oiling is done on the surface of the moulds for an easy removal of specimens. Calculation of materials is The required materials are calculated for casting. The materials should be dry and well graded. Mixing of materials are The prepared materials are poured in rotating miller and careful supervision is required here. Measuring the fresh properties are Before pouring concrete into



the moulds we need to observe the fresh properties of concrete by slump cone method. Concreting the moulds is Place the concrete into the moulds with a trowel. The concreting should be done in layers of 5cm each. For each layer proper compaction is required by tamping bar. After compacting top layer, the moulds are vibrated on the vibrating table for better mixing and bonding. Naming of the trials are The casted moulds are named and set for undisturbed for 24 hrs. for setting. Demoulding is The specimens should be removed after proper setting concrete. The specimens are removed and processed for curing.

In the methodology the following steps are followed those are [1] Collection Of Materials in that The materials collection is based on the availability areas. If the materials are collected from the near by site area. The collection is centered on sustainable innovative materials used in construction architecture and design. Collection of materials can be done with cheap rate of cost, [2] Testing of Aggregates And Cement [3] Mixing [4] Castings And Curing Of Cylinders & Cube Specimens. [5] Tests On Hardened Specimen [6] Compressive Strength, Split Tensile Strength And Flexural Strength On Specimen. [7] Result & Discussion. these are methodology adopted for in our project .

IV. EXPERIMENTAL RESULTS

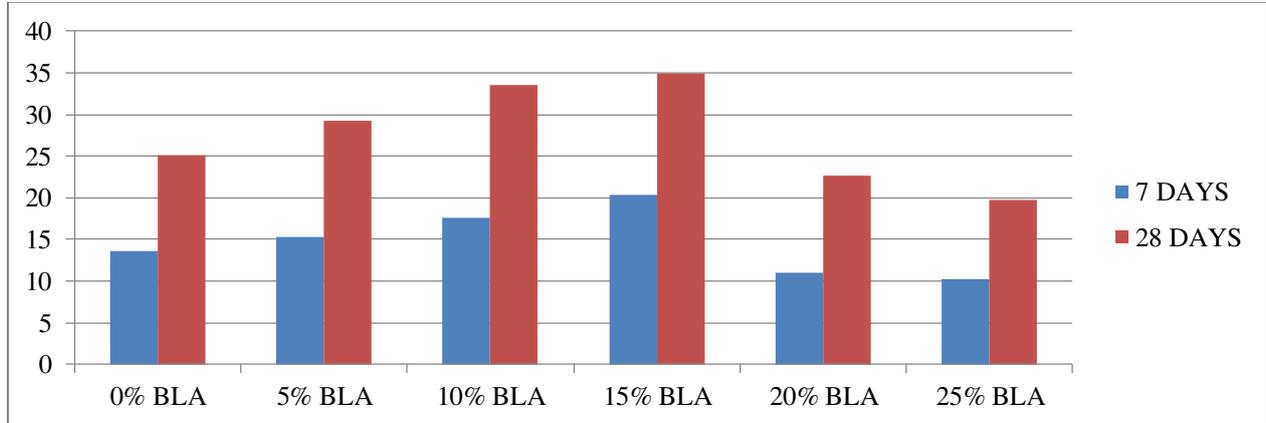
The Compressive strength, flexural strength, split tensile strength, and modulus of elasticity were measured on hardened concrete specimens. For testing, standard protocols were used. The findings of the experiments are reported and discussed in this paper . This experiment was is to compare the properties of compressive strength of cubes and cylinders, flexural strength, splitting tensile strength, and modulus of elasticity of M40 grade concrete with different levels of replacement of ordinary Portland cement with BANANA LEAF ASH .

The compressive strength results of this experiment is shown in below table:

BLA Replacement (%)	Age of curing (days)	Compressive strength (N/mm ²)
0	7	13.64
	28	25.13
5	7	15.24
	28	29.26
10	7	17.56
	28	33.58
15	7	20.41
	28	34.91
20	7	11.05
	28	22.69
25	7	10.29
	28	19.72

Table 1

The compressive test results is to represented in the below graph following .



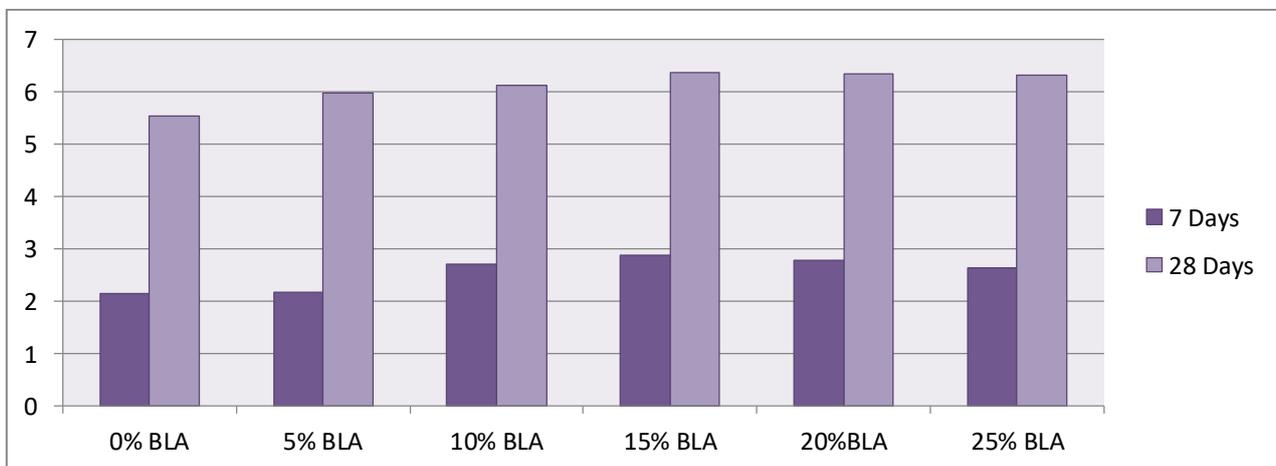
Graph :1 Compressive strength results

The Flexural strength results are shown below.

BLA Replacement (%)	Age of curing (days)	Flexural strength (N/mm ²)
0	7	2.139
	28	5.537
5	7	2.159
	28	5.976
10	7	2.689
	28	6.125
15	7	2.880
	28	6.360
20	7	2.779
	28	6.334
25	7	2.619
	28	6.311

Table 2

The Flexural strength results of this experiment is shown in below graph



Graph :2 flexural strength results

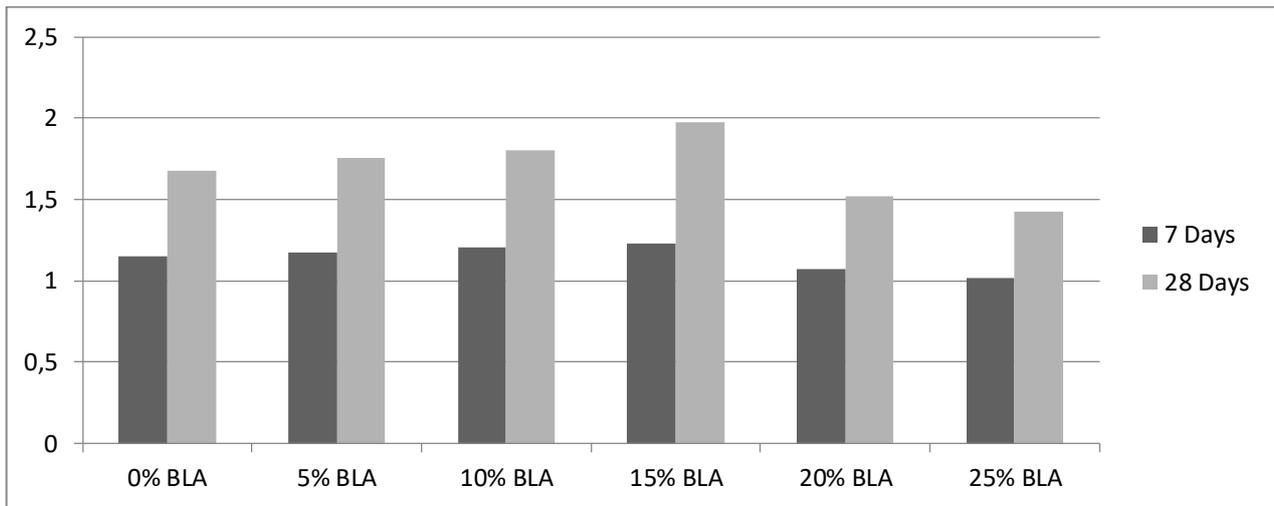


The split tensile strength test is to conducted then the below table values are getting those are following below.

Table 3

BLA Replacement (%)	Age of curing (days)	Split tensile strength (N/mm ²)
0	7	1.150
	28	1.677
5	7	1.175
	28	1.754
10	7	1.207
	28	1.805
15	7	1.227
	28	1.976
20	7	1.076
	28	1.522
25	7	1.015
	28	1.428

The split tensile strength results of this experiment is shown in below graph



Graph : 3 split tensile results

V. CONCLUSION

The Partial replacement of cement with BLA changes the Compressive, Flexural & Split tensile strength of concrete. As the percentage of BLA increases in the concrete the compressive strength decreased as compare to normal cement. The Split Tensile strength increases for 10% and 15% replacement & slightly decrease for 20 % and 25% replacement. The Flexural strength good for 15% replacement & slightly decrease for 20 % replacement. By using above combination of partial replacement we can reduce cost of concrete and increase the strength of concrete. So, the combination of the two materials can be used to get good strength properties in low cost. From the above results we can conclude that the Flexural & Split tensile strength increases at 15% replacement of cement with BLA. The optimum percentage of cement for partial replacement with BLA is 15%.

REFERENCES

- [1] DivyaVishnoi, Ali Asghar, Ankit Sharma, Chandan Kumar Ray and Amit Yadav- (2018) “Experimental Study on Effects of Banana Leaves Ash on Consistency and Settings behavior of Ordinary Portland Cement”, Department of civil engineering, Poornima Group of Institutions, Volume 5.
- [2] Rajendra Kumar Goyal| Abhishek Tiwari- (2016) “Use of Banana Leaves Ash in Concrete” Indian Technocrats Limited Corporate Institute of Technology.
- [3] Jugal R. Pawar, Aman S. Khaire- (2018) “Experimental Investigation on Properties of Concrete by Partial Replacement of Cement with Banana Leaves Ash”, Department of Civil Engineering, Guru Gobind Singh College of Engineering and Research Centre, Nashik, India.
- [4] Vijaya Prathima, Rajeswari Isnakula, Shaik Nadhim- (2017) “Comparative Study of Conventional Concrete With Banana Fiber Modified Concrete” Department of Civil Engineering, Geethanjali Institute of Science And Technology , Volume 3.
- [5] M.Dilipan, S.Ramkumar, S.Karthick- (2017) “Experimental Investigation based on Natural Fibers Banana and Jute in Concrete” Department of Civil Engineering, Valliammai Engineering College, Chennai, India, Vol. 5.
- [6] Samrat Mukhopadhyay, Raul Fangueiro, Yusuf Arpac, UlkuSenturk-(2017) “Banana Fibers – Variability and Fracture Behaviour” University of Minho, PORTUGAL Ege University, Turkey.
- [7] Marwan Mostafa, Nasim Uddin- (2015) “Effect of Banana Fibers on the Compressive and Flexural Strength of Compressed Earth Blocks”, Department of Civil, Construction and Environmental Engineering, University of Alabama at Birmingham, Birmingham, USA.
- [8] Rodrigo Cezar Kanning, Kleber Franke Portella, Marianne R. M. da Costa, Rogerio F. K. Puppi- (2011) “Evaluation of Pozzolanic Activity of Banana Leaf Ash”, International conference on durability of concrete materials and components
- [9] Porto-Portugal.
- [10] Olutaiwo A. O., Lawal Adeniyi Olushola- (2017) “Effect of Banana Leaf Ash on Cement - Modified Lateritic Soil”, International Journal of Engineering and Technical Research, Volume-7.
- [11] Suhas Pawar, Yogesh Jagtap, Shekhar Salunke, Vishwambar Jagtap, Kiran Shinde, RiteshDhoka- (2018)
- [12] “Enhancing the properties of concrete by using Banana Fiber ”, Dept. of Civil Engg., H.S.B.P.V.T. G.O.I. Collage of Engineering, Kashti, Maharashtra, India, International Journal of Advance Engineering and Research Development, Volume 5.
- [13] Muhammad Rizqi, HernuSuyoso, GatiAnnisaHayu- (2018) “The effect of addition of banana tree bark for compressive strength and crack tensile strength of rice husk ash concrete”, University of Jember, Department of Civil Engineering, 68121 Jember – East Java, Indonesia.
- [14] RobertS.P.Cout- (1990) “Banana fibers as reinforcement for building products”, Division of Forestry and Forest Products, CSIRO, Private Bag 10, Clayton, Victoria 3168, Australia ,Journal of materials science letters.
- [15] A. Gopi Raju, N. Bhagya Sree, “Study on Sugar Cane Bagasse Ash as Partial Replacement of Cement for High Strength Concrete”, IJSRD - International Journal for Scientific Research & Development, vol. 6(11), 2019, pp. 183-187.
- [16] S. Sakthivel, R. Parameswari , M. Gomathmi , S. Sangeetha, “Experimental investigation on concrete with banana fiber and partial replacement of cement by banana leaf ash”, International Research Journal of Engineering and Technology, vol-06(03) ,2019, pp. 3914-3919.
- [17] Sk .Musthafa , Sk. MahaboobBasha ,S. Bhavani ,P. Anudeep ,P.Chakravarthy ,Sk.NagoorVali , “Experimental Study On.
- [18] Partial Replacement Of Cement By Banana Leaves Ash And Glass Fiber”, International Journal of Research in Advent Technology, Special Issue, 2019, pp. 650-655.
- [19] Priyanka Selvi, “Comparative Study of GBFS & Banana Fibre Reinforced Concrete with Normal Concrete”, International Research Journal of Engineering and Technology (IRJET) , vol. 6(11), 2019, pp. 2351-2354.
- [20] Ramya M, Mercy Shanthi R, Suji D, “Strength Evaluation of Sustainable Concrete with Partial Replacement of Cement by Combination of Banana Leaf Powder and Cattle Bone Powder”, International Journal of Innovative Technology and Exploring Engineering, vol. 8(6S4), 2019, pp. 884-886.
- [21] Mir Firasath Ali, Syed Haseeb Ali , Mohammed Tanveer Ahmed , Shaik Khaja Patel, “Study on Strength Parameters of Concrete by adding Banana Fibers”, International Research Journal of Engineering and Technology (IRJET) , vol. 7(3), 2020, pp. 4401-4404.
- [22] Ayyappa R A, Sandeep Reddy B, G. Swamy Yadav, Dara SwethaSudarshan, “Partial Replacement of Cement and Coarse Aggregate by Egg Shell Powder and Coconut Shells”, International Journal of Innovative Technology and Exploring Engineering (IJITEE), vol.9(4),2020, pp. 1242-1246



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