AN EXPERIMENTAL INVESTIGATION ON PROSOPIS JULIFLORA ASH AS A PARTIAL REPLACEMENT OF CEMENT IN PAVER BLOCK

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ABSTRACT

The aim of this project is to replace cement with PROSOPIS JULIFLORA ash in paver block . PROSOPIS JULIFLORA ash is obtained from biomass waste power plants as a waste material. PROSOPIS JULIFLORA ash does not have cementitious property by itself which is responsible for strength generation. In this thesis I have design paver block by using cement concrete mixture of Mix Design M 20 Which is composed of 10mm coarse Aggregate, Cement and fine Aggregate. Dimension of paver block is 225 x112 x80mm. In this process I have partial replaced cement with PROSOPIS JULOFLORA ash partially replaced to cement in paver blocks at various levels of 0%, 5%, 10%, 15%, 20%, 25%, 30% ,35% and 40% by the method of replacement by weight. Super plasticizer is used as an admixture which Is ded% by weight of cement constantly in the production of concrete mixture. The function of this admixture is to reduce the water cement ratio and enhance workability. The paver block Curing process is done for 7 days and 28 days, After curing it is checked for its Compressive Strength.

Key words : PROSOPIS JULIFLORA ash, concrete materials.

1.INTRODUCTION

In the recent years, growing consciousness about global environment and increase energy security has led to increasing demand for renewable energy resources and to diversify current method of energy production. Among these resources, biomass (forestry and agriculture wastes) is a promising source of renewable energy. In the current trends of energy production, power plants which run from biomass have low operational cost and have continuous supply of renewable fuel. It is considered that these energy resources will be the CO2 neutral energy resource when the consumption rate of the fuel is lower than the growth rate. Also, the usage of wastes generated from the biomass industries (sawdust, woodchips, wood bark, saw mill scraps and hard chips) as fuel offer a way for their safe and efficient disposal. The characteristics of the ash depend upon biomass characteristics herbaceous material, wood or bark, Combustion technology fixed bed or fluidized bed and the location where ash is collected, As wood ash primarily consists of fine particulate matter which can easily get air borne by winds, it is a potential hazard as it may cause respiratory health problem to the dwellers near the dump site or can cause groundwater contamination by leaching toxic elements in the water. Wood ash is also a similar waste materials produced from wood burning industries which is mainly used as a fertilizer for soil. The possibility of adding wood ash with cement, and using it as a partial replacement to cement may be one of the best application in the current environment scenario. Wood ash is a residue that is left after combustion of wood in home or in industries. During the last decades it has been recognized with growing wood ash waste of large volume and that is increasing year in the household, mills and factories. . The utilization of these waste materials can be an economical and eco-friendly alternative in nearby areas for rural road construction. Using the waste in useful manner.

2. MATERIAL SPECIFICATION

2.1 Materials:

Cement:

Cement is a binder that sets and hardens and can bind other Materials together. Cement is general can be defined as a material which posses very good adhesive and cohesive properties which make it possible to bond with other material to form compact mass. The cement type 1 grade 33 is used for the casting of the paver block. the compressive strength of cement after 28 days test as per IS specification is 33 MPa.

Fine Aggregate:

Aggregate which passed through 4.75 mm IS sieve and retained on Aggregate is a granular material, such as sand , gravel , crushed stone, Crushed hydraulic cement concrete, or iron blast furnace slag, used with a Hydraulic cementing medium to produce either concrete or mortar. The Purpose of the fine aggregate is to fill

the voids in the coarse aggregate And to act as a workability agent. the particle size of fine aggregate used in this study was such a way that it passed through 4.75mm sieve conforming to zone 11

Coarse Aggregate:

Aggregate are a component of composite materials such as concrete and Asphalt concrete; the aggregate serves as reinforcement to add strength the Overall composite material. 10mm sized aggregate are used in the paver Blocks. The natural of work decides the maximum size of the coarse aggregate. Locally available coarse aggregate having the maximum size of 10mm was used in our work. The aggregate were washed to remove dust and dirt and were dried to surface dry condition.

Water:

The water used for mixing and curing should be clean and free from Injurious quantities of alkalis, acid, oils, salt, sugar, organic materials ,Vegetable growth and other substances. The Ph value of water should be Not less than 6. Water is generally considered satisfactory for mixing and curing concrete. In the present work potable tap water was used.

Super plasticizer:

Super plasticizer is used to improve the workability of the concrete. Super plasticizers, also known as high range water reducers, are chemical admixtures used where well – dispersed particle suspension is required. It is also used to improve the freeze / thaw to improve the durability of the Concrete. The super plasticizer used in SIKA A (Sikament 610 UTS).

Fig 1 Super plasticizer

Wood ash (PROSOPIS JULIFLORA ash):

PROSOPIS JULIFLORA ash is used as the additive material in the paver Blocks The percentage of PROSOPIS JULIFLORA ash used in 0, 5, 10, 15,20, 25, 30, 35, 40 by the weight of cement. The PROSOPIS JULIFLORA Ash added is to Enhance the strength of concrete paver blocks. Wood ash(PROSOPIS JULIFLORA ash) is optioned from the combustion of wood. Wood ash prepared from the uncontrolled burning of wood (PROSOPIS JULIFLORA).During the last decades it has been recognized with growing wood ash waste of large volume and that is increasing year in the household, mills and factories.

Fig 2 PROSOPIS JULIFLORA ash

Specific Gravity:

S.NO	MATERIALS	SPECIFIC GRAVITY
1	Cement	3.1
2	Coarse aggregate	2.74

3	Fine aggregate	2.60
4	Prosopisjuliflora ash	2.56

Consistency of cement

S.No	Weight of cement	Weight of water	Plunger Penetration	Consistency Of cement In %
1	300	78	32	26%
2	300	84	28	28%
3	300	90	21	30%
4	300	96	15	32%
Average value of normal consistency = 29%				

Grading of fine aggregate

IS Sieve	weight Of sieve	Retained Weight of soil	Cumulative % retained	% Finer
4.75mm	380	2	0.2	99.8
2.36mm	346	11	1.3	98.7
1.18mm	363	98	11.1	88.9
1mm	358	114	22.8	77.2
600 µ	304	116	34.4	65.6
300 µ	316	392	73.6	26.4
150 µ	370	232	96.8	3.2
75 µ	-	-	-	-
Pan	302	25	99.3	0.7
Fineness modulus = 0.46				

Test of an aggregate

S.NO	Properties Tested	Result
1	Aggregate impact value	**21.65%**
2	Aggregate crushing value	**29.01%**

Mix design:

The mix design of M20 grade concrete is calculated using IS 456-2000 and IS 10262-2009. The material required as per design are given.

Materials required as per method of design

Water cement ratio	**Quantity of materials (kg/m^3)**		
1.25	**Cement**	**Fine Aggregate**	**Coarse Aggregate**
	416	798	1016

Casting:

For the experimental program 27 specimens were cast for testing. Zig zag Paver blocks of average dimension 225 * 112 * 80 mm., the mixing operation consists of rotation or stirring on Order to blind all the ingredients of the concrete into a uniform mass. Hand mixing was preferred for casting. The uniformly mixed previous Concrete was placed in the paver mould after the application of grease Inside the mould in order to help in de - moulding of specimens.


Fig 3 Mixing and Casting of specimen

3. Experimental procedure:

Tests on specimens:

De-moulding was done after 24 hours. And the specimen are cured For a period of 7 days and 28 days and the test is carried in order to a Determine the properties of the specimen. Compression test–The Paver Block specimens are selected and the samples are tested for the Compressive strength in compression testing machine. The load shall be Applied without shock and increased continuously until no greater Load can be sustained by the specimen or delaminating occurs. Compressive strength of paver block is given by,

Compressive strength = Load at failure / Area of the specimen

Fig 4 Compression test

Compressive strength test:

The size of the paver block 225mm x 112mm x 80mm were used to determine the compressive strength of the paver block. three specimens were tested for 7 days and 28 days with varying proportional of PROSOPIS JULIFLORA ash as 0% to 40% by the weight of the cement. These were compared with the conventional concrete mix. The constituent were weighed and the materials were mixed by hand mixing. The specimens were weighted and the materials were mixed by hand mixing. The specimen were remolded after 24 hours, cured in water for 7 days and 28 days, and then tested for its compressive strength. There are three paver blocks casted and tested for compressive strength And the average compressive strength of three specimen was estimated. From the test results, it can be seen that the average compressive Strength of the paver block.

The compressive strength of the specimen is calculated using the following formula:

Compressive strength $F_c = P/A$ N/mm^2

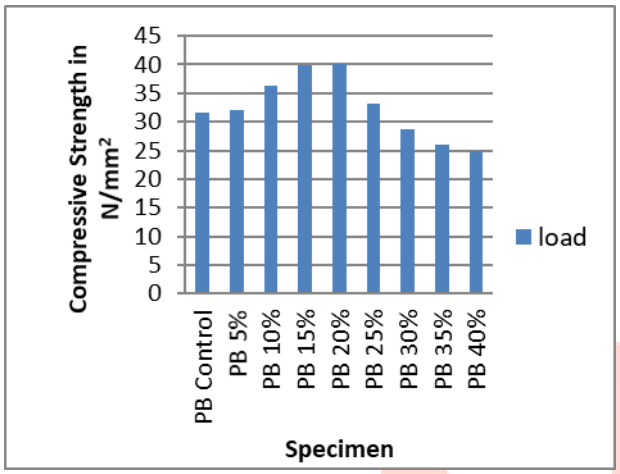
Where P = Load at failure in N

A = Area subjected to compression in mm^2

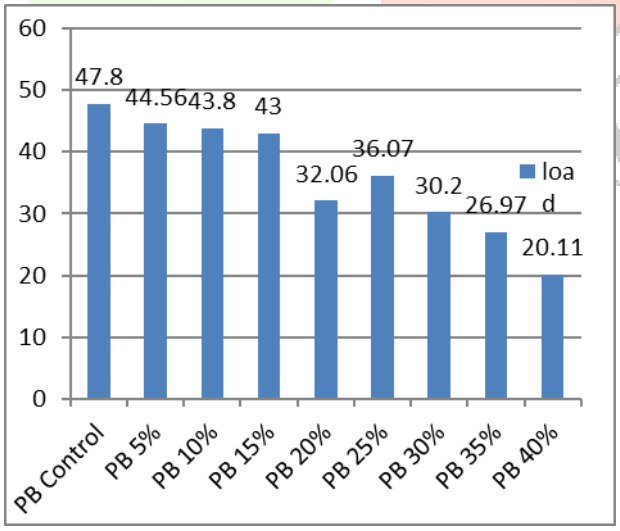
Compressive strength of paver blocks

% Of JULIFLORA ash	Compressive strength N/mm^2	
	7 days	28 days
0	31.67	47.8
5%	32.12	44.56
10%	36.21	43.8
15%	39.92	43
20%	40.01	32.06
25%	33.24	36.07
30%	28.79	30.2
35%	26.11	26.97
40%	24.93	20.11

Compressive strength of 7 days testing result

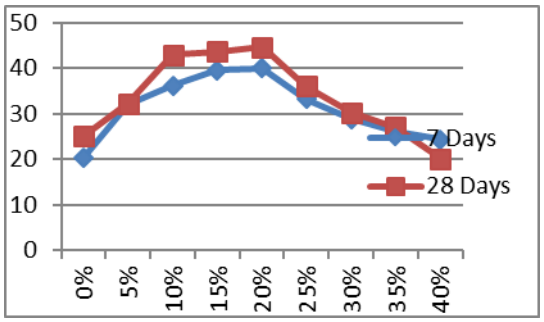


Compressive strength of 28 days testing result



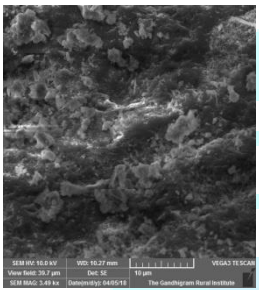
After 7 and 28 days curing, these paver blocks were tested on digital compression testing machine. In each category three blocks were tested and their average value is reported.

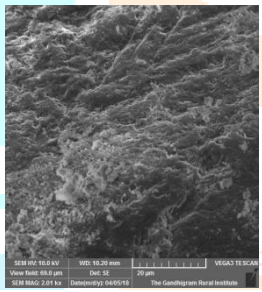
COMPRESSIVE STRENGTH OF VARIOUS PROPORTIONAL OF PRPSOPIS JULIFLORA ASH FOR 7 DAYS AND 28 DAYS GRAPH RESULT



4. Sem analysis

The Scanning electron microscope (SEM) is one of the most versatile instrument available for the examination and analysis of micro structural characteristics of solid objects. The primary reason for the SEM usefulness is the high resolution that can be obtained when bulk objects are examined. The microscope has been a powerful tool in the study of cement and concrete since the early development of these materials. Le Chattelier (1882) was among the first to apply the microscope to the study of cementitious materials. He used it to investigate the chemical and physical aspects of hydration and setting , rather than to study cracks. His effects undoubtedly influenced later workers in their use of the microscope. Tavasci (1941) Successfully used the microscope to study the composition and structure of concrete, but not of cracks per se. His work, however, set the stage for the studies of cracks on the interior surfaces of cut specimens which were conducted in the 1960s.





The material used in the paver block thoroughly binded. On increasing the fineness of the prosopisjuliflora ash the strength of the paver block gets retained. On adding of 5% of ash the strength obtained is 32.22 and adding 20% of ash the strength is obtained is 44.7.By not adding any ash contentthe strength is 25**.**

5. Conclusion:

An experimental investigation study on PROSOPIS JULIFLORA ash partial replacement of cement in paver block is replacement up to 40%. An ash may be found easily or we can prepare on our own. We can replace this up to 35% and the strength is about 23 in compressive strength. An ash may prepared on our own or we can buy. The cost of the paver block is reduced as comparative to the concrete paver block. Paver block made by using PROSOPIS JULIFLORA ash , cement , coarse aggregate and fine aggregate have shown a best result. Probably the PROSOPIS JULIFLORA ash is an waste materials so it is an effective method in partially replaced by cement in paver blocks It is an effective and useful method . SEM Analysis is done, The paver block is conducted to find out the strength of the paver block and find out the workability.

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