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Innovation In Water Proofing In Concrete Using Bilva Leaf

Bhavana
Assistant Professor, School of Civil Engineering, REVA University,
Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka, India,
bhavana.b@reva.edu.in

Shanthi Sri.K
Assistant Professor, School of Civil Engineering, REVA University,
Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka, India

.PrajwalBalaji.K
Student, School of Civil Engineering, REVA University,
Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka, India

Deekshith R.N.
Student, School of Civil Engineering, REVA University,
Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka, India

Abstract

In the countries like India Bilva trees is considered as devotional and medicinal source. As we have used the Bilva leaf and fruit as an additive. In various formulations also Bilva is an ingredient. In this paper our main aim is to replace bitumen and other chemicals which are used as a water proofing agent with much of a natural material that is Bilva leaves and fruit (AegeleMarmelos). They are dried in the room temperature, where it is crushed and mixed with the jaggery. The preliminary test was conducted on the concrete mix to maintain standards, according to design standards and casted. This prevents the use of harmful chemicals which causes harm to environment. It helps in the judicious use of water for water proofing, its ecofriendly and economical. In this paper the waterproofing characteristics of concrete by mixing Bilva leaf and fruit paste are studied by applying in various percentages such as 0%, 1.5%, 2% and 2.5% of weight of concrete cube. Concrete of M20 grade is used for this study.

Keywords*: Bilva Leaf, Bilva Fruits, Jaggery, Moisture Content,Waterproofing*

Introduction

This paper deals with the designing, moulding and analyzing the cement block prepared with guidelines from concrete design with appropriate ratios of water, cement and fine aggregates. Bilva leaves and fruit also known as AEGELE MARMELOS is known to have water resisting properties naturally. Waterproofing is the formation of an impervious barrier over surfaces of foundations, roofs, walls, and other structural members. The function of the impermeable barrier is to prevent water penetrations. The building surfaces are the utilization of liquid waterproofing membrane; cementitious

materials, polyurethane liquid membrane, and bituminous
material are common in the waterproofing of buildings. The moulds were prepared and observed at

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regular intervals and the data was recorded. The results of water absorption for the moulds are noted for 14 days and 28 days respectively.

Bilva fruit has been known in India since ancient times. The plant belongs to the family Rutaceae. This fruit grows throughout the Nepal, Bangladesh, Thailand, Sri Lanka, Burma, Pakistan, Indian Peninsula as well as in most Southeast Asian countries[1].
The gum or resin of Aegle Marmelos (Bael fruit) was used as household glue and was employed as an adhesive by jewelers.
It was also mixed with lime plaster for water proofing wells and was added to cement when building walls.
Artists added it to their water color, and it may be applied as protective coating on painting [2].
The binding, thickening and gelling agent in Aeglemarmelos (Bael fruit) were widely used as tablet binders, emulgents and thickeners in cosmetics and suspensions as film-forming agents and transitional colloids [3].
Black cotton soil can be stabilized by many ways but the authors made an attempt to utilize a natural material for stabilization of black cotton soil using Aegle Marmelos (Bael fruit) powder [4].
Few researches on black cotton soil stabilization have been done using bael fruits, but there are no literatures available on the use of Bilva leaves and fruits in concrete.
From the literature it is understood that these materials have good water proofing capacity and hence the possibility of using natural adhesive material Aeglemarmelos (Bael fruit) and leaves powder in the form of paste, in waterproofing in concrete is explored in this study.

Advantages:

1. By this method we can reduce the amount of water used for water proofing.
2. The time for water proofing can also be reduced.
3. This prevents the use of harmful chemicals.
4. This method is an eco-friendly waterproofing material.

Materials used

Table 1: Materials used

Sl.No	Material	Specification
1	Cement	Specific gravity=2.71 Fineness modulus=6.5% Initial setting time=30 min Final setting time=600min Normal consistency=29%
2	Fine aggregate	Specific gravity=2.71
3	Coarse aggregate	Specific gravity=2.82
4	Concrete	M20(1:1.5:3)Mix proportion
5	Slump of concrete	True slump
5	Jaggery	----
6	Dried bilva fruit and leaves	----
7	Water	----

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Methodology

1. Coarse aggregates passing 12.5 mm and retained on 10mm was used in the preparation of concrete cube.
2. Fine aggregates were also sieved and used as per IS recommendations.
3. The concrete mix was prepared with adherence to the concrete mix design.
4. The cubes were casted kept in the oven for 24 hours and the dry weight is taken.
5. The cubes were later kept for curing, 4 cubes were kept for 14 days and 4 cubes were kept for 28 days.
6. A paste is prepared by mixing Bilva leaves and fruit powder with water and jaggery to form a paste in the proportion (1kg:2kg:25litres)
7. After 14 days of curing the weights is recorded as in tabular column.
8. The paste was applied on the block on all the sides uniformly.
9. After 14 days and 28days of curing the blocks were weighed with proportion (0,1.5,2) percentages.
10. Regularly the weight of blocks were noted down.

The cube casted are of 150 mm x 150 mm x 150 mm size as shown in Figure 1.

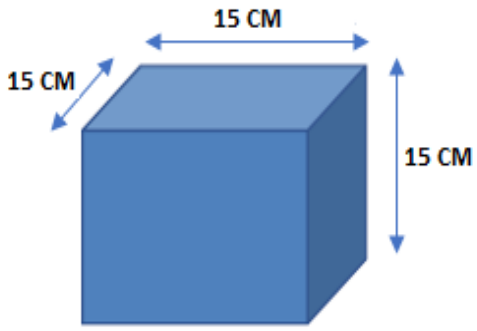

Figure 1:Cube Dimensions

Results

Figure 2: Cube after pasting the paste

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After 14 days of curing:

Table 2: Total percentage of reduction in moisture content in cube samples after 14 days curing

% of paste applied by weight	Weight of cube after taking out from water in g	Weight of cube After 15 days After removing out from water in g	Weight of cube After 30 days After removing out from water in g	Weight of cube After 45 days After removing out from water in g	Weight of cube After 60 days After removing out from water in g	Percentage of moisture reduction
0	8140	8128	8120	8005	8002	1.69 %
1.5	8420	8350	8310	8300	8296	1.5%
2	8240	8190	8140	8100	8095	1.8%
2.5	8050	8025	8005	7950	7920	1.6%

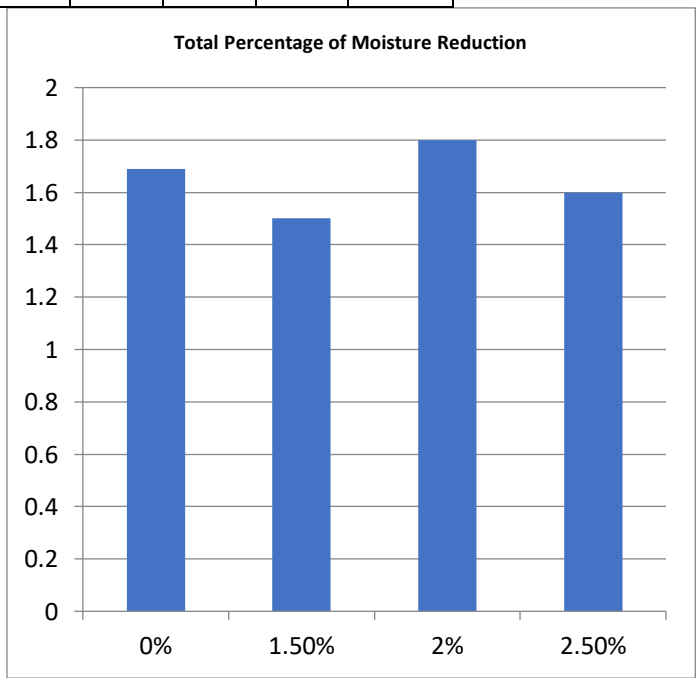

Figure 2: Graph showing total percentage of reduction in moisture content in cube samples after 14 days curing

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After 28 days of curing:

Table 3: Total percentage of reduction in moisture content in cube samples after 28 days curing

% of paste applied by weight	Weight of cube after taking out from water in g	Weight of cube After 15 days After removing out from water in g	Weight of cube After 30 days After removing out from water in g	Weight of cube After 45 days After removing out from water in g	Weight of cube After 60 days After removing out from water in g	Percentage of moisture reduction
0	8460	8380	8310	8250	8200	3%
1.5	7850	7760	7703	7670	7653	2.5%
2	7940	7830	7720	7690	7670	3.4%
2.5	8260	8160	8080	8010	7950	2.8%

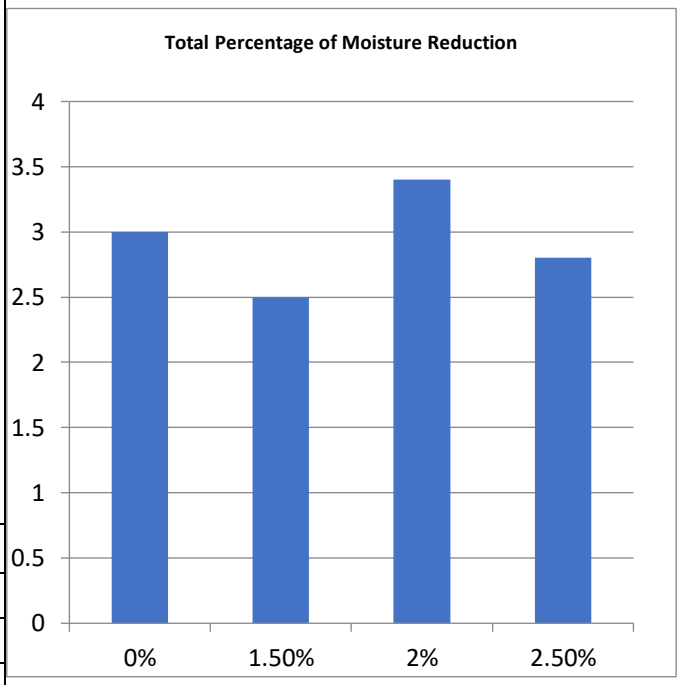

Figure 3: Graph showing total percentage of reduction in moisture content in cube samples after 28 days curing

Conclusion

1. Significant reduction in the water absorption of the blocks with the prepared paste being applied at 2% by weight of concrete is observed.
2. This can also be observed in the data obtained in the tabular columns,when compared to all other percentages effective moisture reduction is observed at 2% application of paste on cubes.
3. It is observed that without application of any paste on concrete cubes the moisture reduction was only 1.69% whereas application of paste has given moisture content reduction of 1.8% by application of 2% of paste by weight of concreteafter curing for 14days andafter 60days of resting.
4. It is observed that without application of any paste on concrete cubes the moisture reduction was only 3% whereas application of paste has given moisture content reduction of 3.4% by application of 2% of paste by weight of concreteafter curing for 28 days and after 60days of

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resting.

5. From the results obtained, came to the conclusion that the material used,Bilva leaves and fruit in the form of paste is very effective and can replace other chemical water proofing agents.
6. However, the results presented in this paper arelimited. If further research is carried out on this topic,we are sure to achieve good results and succeed in the main objective that is, to replace chemical waterproofing agents with much of a natural material.
7. With the research we can patent this and make this available to manufactures so that it is available in any retail store at an affordable price.

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