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Waste Management Technique Applied in the Preparation of Bio Concrete Material

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Abstract. ***Due to Modernization and urbanization constructing industries are fast growing also it leading to high demand of constructing materials because of expensive prices, and for the construction industry, usage of steel is currently limited heavily Many studies have been carried out to identify highly available, low cost innovative material to use in construction industry as a solution to meet the ever increasing demand for raw material. Bamboo was used as a construction material as a coarse aggregate, steel reinforcement. Bamboo has a higher compressive strength than wood, brick, or concrete and a tensile strength that rivals steel. water absorption in bamboo was the main problem used for construction .because The durability of the concrete is largely affected by absorption of water. Also poly ethylene bags are widely used in the country and its disposal after use causes more problems ,Mismanaged waste of polyethylene bags is the current threatening to the environment this waste is largely availbe its abundant high resistance to insects, fungi, animals, as well as molds, mildew, rot and many chemicals. In this study cubic bamboo was used as a coarse aggregate and it was coated with the waste LDPE bag melt ,as one of the coating material and other one is neem oil.and it was investigated to find the water absorption and turbidity, antifungal activity and compressive strength some other parameters in bamboo material with coatings it was observed that compared to untreated bamboo the polyethylenene coated bamboo material shows reduction in water absorption level and turbity.***

IndexTerm:Bioconcrete,bamboo,LowDensitypolyethylene(LDPE) bags, Neemoil, water absorption.

I. INTRODUCTION

Conventionally non-renewable materials are used for construction such as brick, sand, rocks for making concrete and steel is a main thing since production of steel processing industries utilizing more natural resources and also producing various types of pollution .so to safe guard our environment this is the right time to minimize the usage of these product and to find the various other substitute. Among many choice Bamboo is the potential plant and fast growing used as construction material. Comparatively its not equal strength to steel or concrete but it can be used in mixture to replace some portion of conventional material. So many researchers are working in finding alternatives have prepared bamboo as concrete beams[1,2].

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The research work of[3-5] tried with concrete column with the bamboo.so many work was done for finding reuse of waste material as a concrete aggregate substitute such as coconut shell[6].

In wood material water absorption is the main problem bamboo material shrink or swell due to water effect so some treatment should be done for bamboo to use for construction. Coatings are the better choice to reduce water absorption silicone modified coatings are used to increase durability[7] and also Neem botanical name as *Azadirachta indica* (A. Juss) is evidently known that all parts of plant used for disease curing exhibit the property of antibacterial, antifungal, antiviral8, anti-malarial[9]. Neem Leaf extract is a

good inhibitors of plant pathogens[10,11] and wood decay fungi[12]. Neem wood is against wood rotters[13]. Bamboo may also be attacked and destroyed by biodegradation factors[14]. Chemical treatments are used[15-18] to increase durability, and to reduce water absorption, chemical treatment is not eco-friendly[19-20] and high cost[21]. There are also some eco-friendly methods to improve the durability, which use thermal and natural products like vegetable oils (palm, sunflower, or soy bean)[6,22,23]. Water absorption in the bamboo-concrete decreases the bond strength, this is also leads to increasing risk of decay by fungi.

So in this work we used Neem oil for treating bamboo material to make it resistant to microbial degradation so that it can be used in a concrete for long life. Also today the major reason for environmental pollution is usage of thin plastic carry bags which cannot be recycled and use only once .it affect land and aquatic life if it is incinerated it emits more gases which create more air pollution. But it has favorable properties like high water resistant and flexible in nature so the idea of making these type of low density polyethylene LDPE in to another way of use was as a coating for bamboo to reduce water absorption.

II. MATERIALS AND METHODS

A. Sample preparation:

Bamboo logs are collected from my residence as the waste unused dried and tender bamboo logs. They were dried at room temperature and are reduced in size by cutting with blades. These smaller cubic bamboos were coated with neem oil. The bamboo was soaked into the neem oil for one day. And then take out the bamboos and bamboos were dried in sunlight for one day. The cubic bamboos were coated with plastic are eventually. The plastic was melted in the form of liquid and then coated in bamboos. After coating left for setting again in room temperature and was used as the sample. The sample was prepared and stored in room temperature for further use.

Fig:Dried bamboo

Fig:2 Tender bamboo

B. Water absorption test:

The initial dry weight of sample bamboo was taken ,and that same sample was immersed to required time of investigation and weighed after surface wiping with cloth from the readings noted the water absorption rate was calculated as follows,

Water absorption (%) = $(Wt_2-Wt_1)/Wt_2$

Wt_1 = initial weight of specimen gm

Wt_2= specimen weight after hours of water soaking, gm.

C. Antifungal test:

The dried and tender samples were taken and soak it in distilled water. Then after 24 hours the water was taken for culture. Use water sample for serial dilution. The water was cultured each sample in each petriplates. And then the culture is incubated it for 24 hours at 370 c. the sample procedure is repeated for 10 days.

D. Turbidity test:

Turbidity test was done to find whether any dissolution occurs in bamboo material after immersion with water and also any fungal growth is to occurs. The dried and tender bamboo sample 1, sample 2 and sample 3 was taken to check the turbidity. And then take the distilled water and measure the turbidity to know the initial turbidity value of the distilled water. Then the sample was immersed in to Dis.H2O. After a day take the water and checked the turbidity. The water is taken daily to check the turbidity till 10 days and the turbidity was checked in turbid meter.

E. Concrete mix design:

The materials used for these investigations are: cement, fine and coarse aggregates, water, cement. The test sample concrete block was made with the different combinations as follows

1.Cement+Fine aggregates+Coarse aggregate

2. Cement+Fine aggregates+Coarse aggregate+ Uncoated bamboo

3. Cement+Fine aggregates+Coarse aggregate+Neemoil coated bamboo

4. Cement+Fine aggregates+Coarse aggregate+LDPE coated bamboo

F. Compressive strength:

Compressive strength is an important parameter to be considered for any structures so the four set of mix design were prepared as a concrete block in a mould after one day of drying it was subjected for curing after that all the four samples were subjected for compression test.

III. RESULTS AND DISCUSSION

Water absorption test:
Dried bamboo

Table.1Moisture content untreated and treated bamboo.

Sample weight	Initial weight(gms)	Day 1	Day 6	Day 7	Day 8	Day 12
Untreated Bamboo	3.438	5.54	6.78	6.9	7.07	7.3
Neem oil coated	3.16	4.44	5.7	5.86	5.93	6.09
Poly ethylene coated	3.33	4.55	5.81	5.92	6.01	6.12

From the table 1we can observe the day by day water absorption increases the rate of water absorption was calculated in percentage for ease of understanding and prepresented in table 2.

Table.2 Water up take rate of untreated and treated bamboo

Day	Untreated Sample (%)	Neem Oil (%)	Plastic (%)
1	61	40	36
6	22	28	27
7	1.8	2.8	1.8
8	2	1.2	1.8
12	3.2	2.6	1.8

the water absorption for untreated bamboo was more 60% whereas for neem oil it was reduced to 40% and more than that only 36% of wter absorption showed for plastic coated after the day one.

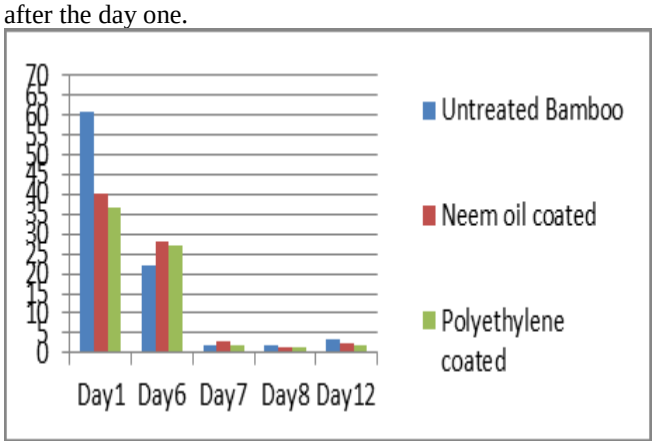

Fig.3: Water absorption Rate

The Fig 3 shows the graphical representation of water absorption rate over 12 days showing that untreated bamboo shows higher rate of water absorption .

Table.3 Moisture content of untreated and treated bamboo.

S.No	Untreated Sample (%)	Neem Oil (%)	Plastic (%)
1	59	40	36
2	72	50	45
3	79	68	52
4	84	75	64
5	90	76	70
6	94	80	74
7	98	85	77
8	103	87	80
9	106	90	81
10	110	92	83

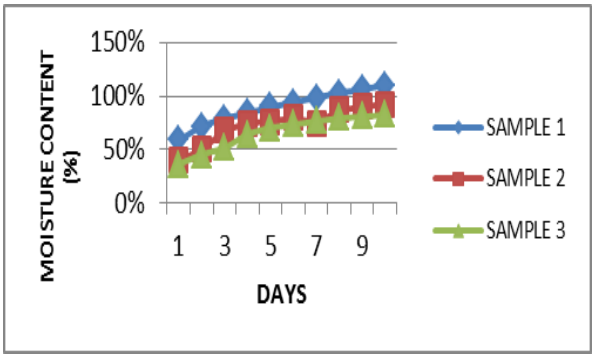

Fig. 4 Moisture content of untreated and treated bamboo

From the above graph it's been confirmed that the plastic treated bamboo shows less water absorbance than the other two samples i.e. the untreated bamboo and the neem oil treated bamboo.

Antifungal Activity:

Table.4 Antifungal activity

Day	Antifungal
1	-
2	-
3	-
4	-
5	-
6	-
7	-
8	-
9	-
10	-

Day 1

Untreated Neem oil Plastic bamboo

Fig:5 Antifungal activity results of various sample

The antifungal activity was done with the day interval of one, five &ten days. From the Fig:5 The results were concluded that all the three days there was no growth of any fungal stains. This shows that both untreated and treated bamboo as antifungal characteristics by nature itself.

Turbidity Test:

Dried Bamboo

Table.5 Turbidity of dried untreated and treated bamboo

S.No	Untreated Bamboo(OD)	Neem Oil (OD)	Plastic (OD)
1	0.06	0.03	0.01
2	0.11	0.08	0.06
3	0.15	0.11	0.10
4	0.18	0.17	0.14
5	0.21	0.20	0.17
6	0.21	0.21	0.18
7	0.24	0.23	0.18
8	0.26	0.25	0.19
9	0.29	0.27	0.21
10	0.33	0.30	0.22

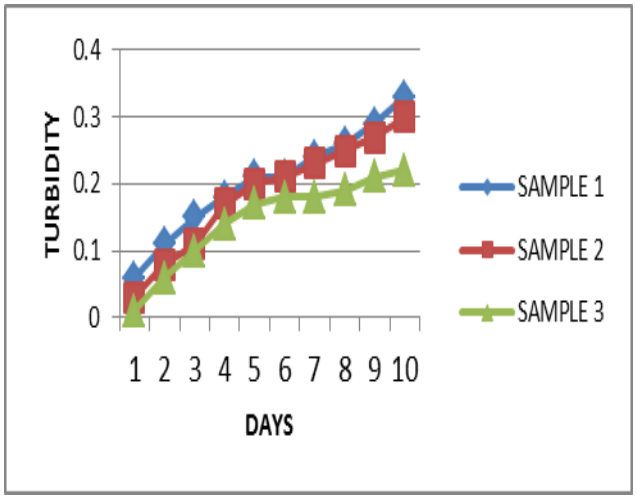

Fig. 6 Turbidity of dried untreated and treated bamboo

From the above graph it is clearly shown that the untreated bamboo shows much more turbidity than the plastic and neem oil treated bamboo sample.

Tender Bamboo

Table.6 Turbidity of tender untreated and treated bamboo

S.No	Untreated Bamboo(OD)	Neem Oil (OD)	Plastic (OD)
1	0.02	0.02	0.01
2	0.05	0.03	0.02
3	0.07	0.05	0.05
4	0.10	0.08	0.06
5	0.12	0.10	0.07
6	0.14	0.13	0.07
7	0.16	0.15	0.07
8	0.17	0.16	0.08
9	0.18	0.17	0.08
10	0.23	0.20	0.10

Tender bamboo blocks also were tested for turbidity measure ment during immersion in a water .Table.6 shows the results which proved that pretreatment of bamboo blocks with plastic coatings is the best way of avoiding water absorption.

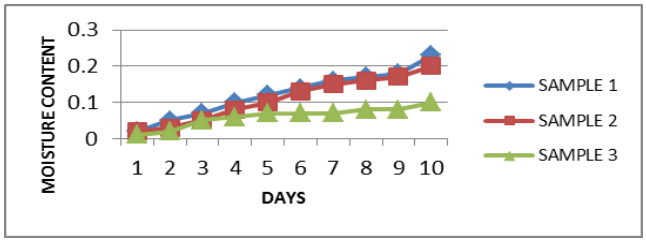

Fig. 7 Turbidity of tender untreated and treated bamboo

The Fig.6 shows the result graphically to evalate the performance easily.

Compressive Strength

Compressive strength of prepared sample was prepared shown in fig 8.Test was conducted as shown in fig.9 calculated as follows,

Fig:8 Sample block strength test

Fig:9 Samples under the compressive

Compressivestrength=Force(Load)/Area
Length= 150mm
Breadth=150mm

Compressive strength= 44000x9.81/ 22500

= 19.184 N/mm^2

TABLE.7

S.No	Block	Compressive strength(N/mm^2)
S1	Cement Block	25.288
S2	Non Coated Bamboo Block	19.184
S3	Neem oil Coated BambooBlock	25.288
S4	Polyethylene Coated Bamboo block	22.672

Table 7 shows that bamboo substituted cement block also giving relatively equal compressive strength.

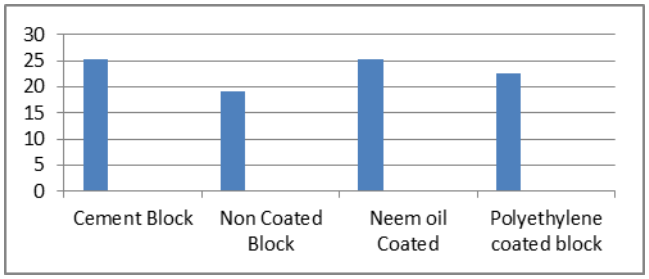

Fig: 10 compressive strength of samples

From Fig. 10 we can observe that compared to Non coated bamboo ,coated bamboo substituted cement block giving good compressive strength .

IV. CONCLUSION

This work was done to find the usability of bamboo as a substitute for coarse aggregate and also it is showing good compressive strength after prepared as concrete block in the meantime the method of coating bamboo with neem oil and LDPE melt proven that there is a way for managing polythene carry bag waste that could not be recycled in practice. Further this work can be extended for some more test which is applicable and as well as the time period of investigation also to be extended .

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