

An Investigative Study Of Eco-friendly Bricks Using Straw, Recycled Plastics, Mycelium And Grass

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Abstract - This paper provides an overview of investigative

Study on eco friendly bricks using straw, recycled plastics, Grass, mycelium. Using eco friendly material is the best way To build ecofriendly building. Productio of building materials Lead to irreversible environmental impact. Environmentally Friendly materials are those use optimal amount of resources Produce minimum waste and are safe for environment and People. Land fill problem is a major threat to environment So using of recycled plastics in the molding of bricks will Reduce the land fill problems. Various test is carried out On these bricks and these result is compared with conventional brick for suitability.

Key Words: Brick, compressive strength, water absorption, mycelium, grass, recycled plastics, straw

1. INTRODUCTION

Bricks are one of the oldest and first building materials made of mud, moulded by hand and dried in sun for days until they are strong enough for use .in present day use of natural resources are increasing day to day. Reuse of waste material is the one way to reduce this. Utilization of recycled plastics, straw-bales, mycelium and grasscrete can be used in making of brick.

Production of bricks increased massively with the onset of the Industrial Revolution and the rise in factory building in England. For reasons of speed and economy, bricks were increasingly preferred as building material to stone, even in areas where the stone was readily available. The use of material such as brick and stone can increase the thermal mass of building giving increased comfort in the heat of summer and cold of winter and can be ideal for passive solar application.

Brick typically will not require painting and so can provide a structure with reduced life cycle costs, although sealing appropriately will reduce potential spalling due to frost damage. Concrete block of the non-decorative variety generally is painted.

Straw is an agricultural by product consisting of dry stalks of cereal plants after the grain and staff have been removed. It makes up about half of the yield. It has a number

of different uses including fuel bedding fodder construction etc. In many parts of the world, straw is used to bind clay and concrete.

Mycelium is the vegetative part of a fungus or fungus-like bacterial colony, consisting of a mass of branching, thread-like hyphae.

Recycling plastics is helping to save energy and landfill space. Recycled plastics are used in new building and construction activities every day. Plastic is one of the most energy efficient material over its entire life .Grass known as sustainable urban drainage helps to form a natural bio filter to remove pollutants

Cow dung increases the plasticity of clays and acts as reinforcing agent reducing concentrated cracks that can lead to breakage within the raw bricks. Upon firing the dung ignite, thus assisting in even firing of bricks and minimizing the development of high temperature gradients within the brick- a phenomenon which will lead to firing cracks. When the fires burn out they leave cavities within the brick which reduces unit weight and improve thermal characteristics.

MATERIALS USED

The material used:

- i. Straw
- ii. Recycled plastics
- iii. Mycelium
- iv. Cow Dung
- v. Grass

STRAW

Straw is an agricultural by product consisting of dry stalks of cereal plants after the grain and staff have been removed. It makes up about half of the yield. It has a number of different uses including fuel bedding fodder construction etc. In many parts of the world, straw is used to bind clay and concrete. A mixture of clay and straw, known as cob, can be used as a building material. Straw is an abundant agricultural waste product, and requires little energy to bale and transport for construction. For these reasons, straw bale construction is gaining popularity as part of passive solar

and other renewable energy projects. Composite lumber Wheat straw can be used as a polymer filler combined with polymers to produce composite lumbar.

RECYCLED PLASTICS

Recycling plastics is helping to save energy and landfill space. Recycled plastics are used in new building and construction activities every day. Plastic is one of the most energy efficient material over its entire life. Recycled plastic boast thermal and acoustic performance. Plastic products can also be fire resistant, cheaper, and more eco friendly.

One year study has shown that energy that comes from using plastic as a primary construction material is enough to meet the average energy need.

MYCELIUM

Mycelium is the vegetative part of a fungus or fungus-like bacterial colony, consisting of a mass of branching, thread-like hyphae. The mass of hyphae is sometimes called shiro especially within the fairy ring fungi. Fungal colonies composed of mycelium are found in and on soil and many other substrates. A typical single spore germinates into a homo karyotic mycelium, which cannot reproduce sexually; when two compatible homo karyotic mycelia join and form a di karyotic mycelium, that mycelium may form fruiting bodies such as mushrooms. A mycelium may be minute, forming a colony that is too small to see, or it may be extensive

COW DUNG

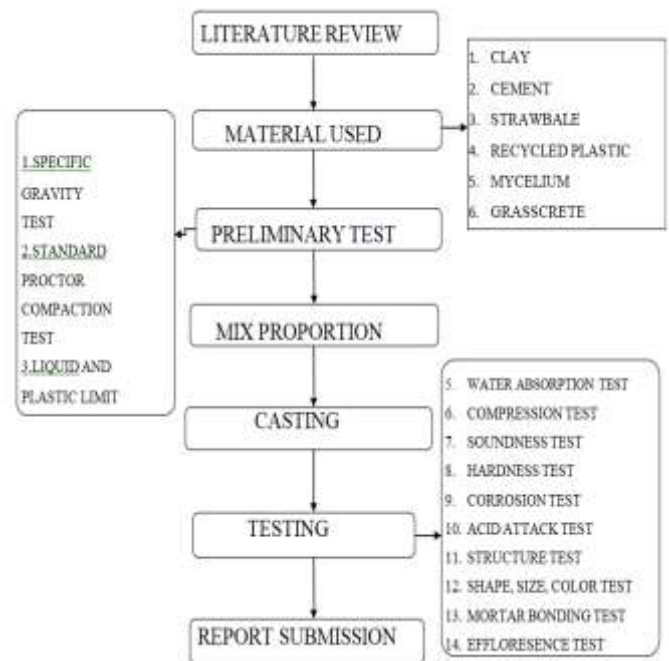
Cow dung increases the plasticity of clays and acts as reinforcing agent reducing concentrated cracks that can lead to breakage within the raw bricks. Upon firing the dung ignite, thus assisting in even firing of bricks and minimizing the development of high temperature gradients within the brick- a phenomenon which will lead to firing cracks. When the fires burn out they leave cavities within the brick which reduces unit weight and improve thermal characteristics

GRASS

Grass known as sustainable urban drainage helps to form a natural bio filter to remove pollutants.

2. METHODOLOGY

Methodology explain how the project had been carried out in a step by step manner.



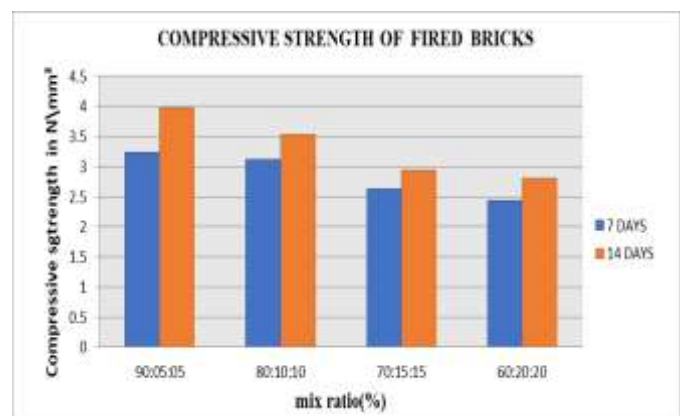
3. TESTING OF SPECIMENS

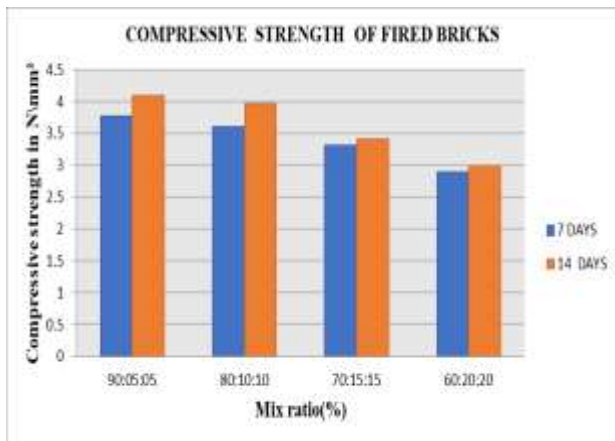
Compressive strength test

1. Bricks are mostly subjected to compression and tension.
2. The usual crushing strength of common hand moulded well burnt bricks is about 5 to 10N/mm² (50to100/kg/cm²) varying according to the nature of preparation of the clay.
3. Pressed and machine moulded bricks made of thoroughly pugged clay are stronger than common hand moulded bricks from carelessly prepared clay.

4. RESULTS AND DISCUSSION

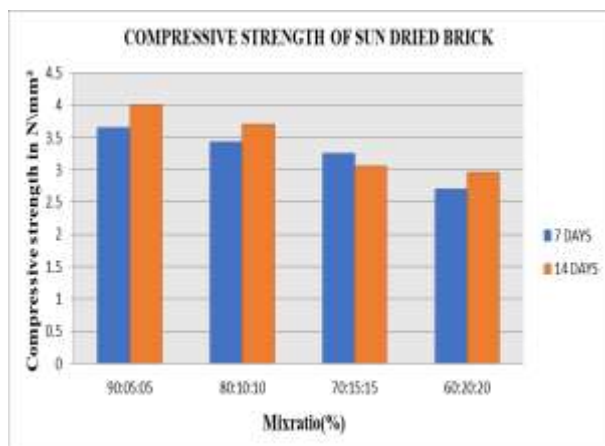
Compressive strength test





SL NO	MIX PROPORTION CLAY: STRAW :COW DUNG (%)	COMPRESSIVE STRENGTH OBTAINED (N/mm ²)		COMPRESSIVE STRENGTH OBTAINED (N/mm ²)	
		FIRED		SUN DRY	
		7 DAYS	14 DAYS	7 DAYS	14 DAYS
1.	90:5:5	3.78	4.10	3.65	4.01
2.	80:10:10	3.61	3.97	3.43	3.71
3.	60:20:20	3.32	3.41	3.25	3.05
4.	70:15:15	2.9	3.00	2.7	2.96

Table Compressive strength test



SL NO	MIX PROPORTION CLAY: LIME: FINE AGGREGATE (%)	WATER ABSORPTION (%)		WATER ABSORPTION (%)	
		FIRED		SUN DRY	
		7 DAYS	14 DAYS	7 DAYS	14 DAYS
1.	90:5:5	6.2	7.0	6.4	7.5
2.	80:10:10	7.0	7.6	7.7	8.0
3.	60:20:20	8.4	8.6	8.4	8.8
4.	70:15:15	8.9	9.4	9.6	10.0

Table 4.4.2(A): Water absorption test

SL NO	MIX PROPORTION CLAY: STRAW :COW DUNG (%)	WATER ABSORPTION PERCENTAGE (%)		WATER ABSORPTION PERCENTAGE (%)	
		FIRED		SUN DRY	
		7 DAYS	14 DAYS	7 DAYS	14 DAYS
1.	90:5:5	7.0	7.4	7.7	8.2
2.	80:10:10	7.3	7.6	8.1	8.8
3.	60:20:20	8.01	8.15	8.4	8.99
4.	70:15:15	8.2	8.3	8.7	9.06

Table 4.4.2(B): Water absorption test

SL NO	MIX PROPORTION CLAY: STRAW :COW DUNG (%)	COMPRESSIVE STRENGTH OBTAINED (N/mm ²)		COMPRESSIVE STRENGTH OBTAINED (N/mm ²)	
		FIRED		SUN DRY	
		7 DAYS	14 DAYS	7 DAYS	14 DAYS
1.	90:5:5	3.78	4.10	3.65	4.01
2.	80:10:10	3.61	3.97	3.43	3.71
3.	60:20:20	3.32	3.41	3.25	3.05
4.	70:15:15	2.9	3.00	2.7	2.96

Table Compressive strength test

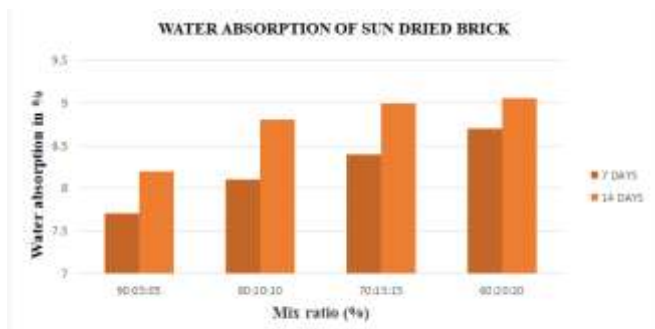
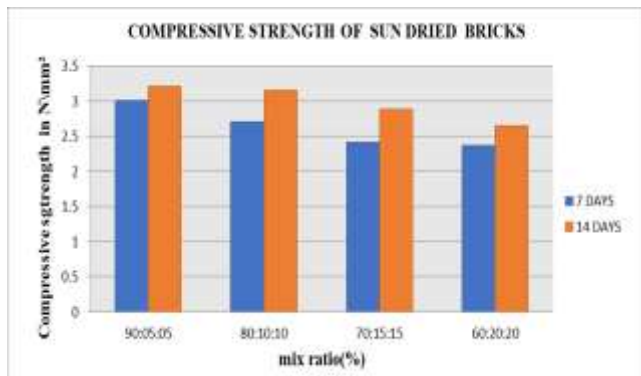


Figure 4.4.2(B2): Water absorption of sundried brick

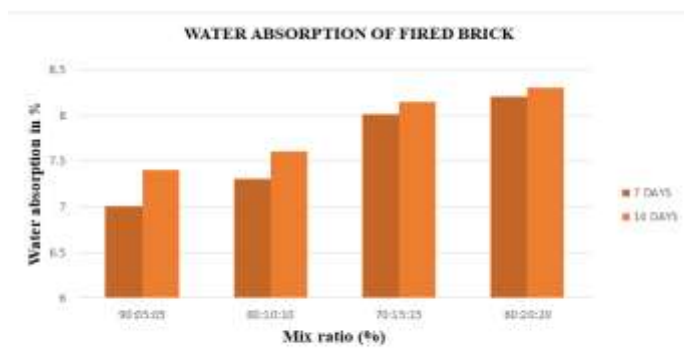
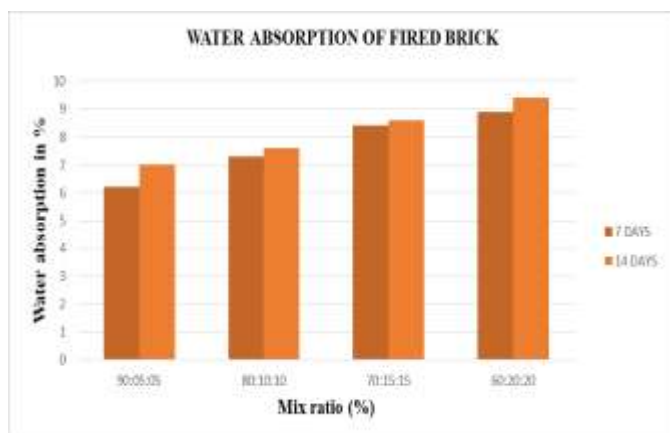


Figure 4.4.2(B1): Water absorption of fired brick

5. CONCLUSIONS

The waste materials are utilized for making bricks which on the other hand reduce the impact of environment. Due to strong bonding between the material they develop compressive strength ranging from 3 to 6 N/mm² shows more strength than conventional brick. As per standard the water absorption for good quality brick is 20%. The water absorption value for each mix gives value less than 20%. Thus satisfy the demand of quality bricks. Bricks can be attacked by salt from ground water or sea water. Brick made with plastics of 15% and above replacement shows salt attack after salt resistance test. For acid test conducted no major colour change has been seen. Bricks made with plastics shows white precipitate after acid resistance test. For abrasion resistance test when tested with metal brush there is no major loss in mass for all the brick. For mortar bonding test bricks shows greater strength after bonding compared to normal compressive test with conventional bricks. As bricks shows greater compressive strength after mortar bonding ranging from 6 N/mm² to 12 N/mm² it can be used for load bearing structures and even in foundation work. As plastic bricks give less strength it can be used in partition wall construction. It utilizes waste materials such as plastics and straw whose management lead to expenditure of millions of fund by Indian government and also coudung of less cost. Hence it is economically feasible.

1. This brick can be made just like clay bricks that is, no additional technology is required. Hence technically feasible
2. Cost analysis of the project clearly shows that cost of brick is less compared to conventional brick and can be preferred for low cost construction.
3. Hence it can be concluded that compared to hollow bricks made with fly ash this produces less heat and more strength. Hence in future construction work this brick can be suggested.

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