Analysis of Incorporation of Water Hyacinth and Marble Powder in Concrete

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***Abstract*— Water hyacinths, in the rivers of Kerala, are the worst aquatic weed ever known, and the aqua life killers. These water plants are notorious for their fast growth. Hyacinths are considered as one of the most productive aquatic plant. It is a plant which can spread over the whole river in a small amount of time. Water hyacinths collected from a small area of river can weight up to tones. Water hyacinths are known to make allergies from their plant saps to humans. Also some diseases are seen in people living around the water bodies filled with hyacinth weeds.**

Marble has been commonly used as a building material since the ancient times. Consequently, Marble waste as a by-product is a very important material which requires adequate environmental disposal effort. In addition, recycling waste without proper management can result in environmental problems greater than the waste itself. Marble dust is a waste product formed during the production of marble. A large quantity of powder is generated during the cutting process.

The project is focused on the potential use of water hyacinth fibers (WHF) in the partial replacement of fine aggregate and feasibility of the substitution of marble waste for cement to attain economy and environmental saving.

Keywords: Water hyacinth, Marble powder

INTRODUCTION

Eichhornia crassipes, commonly known as common water hyacinth, is an aquatic plant native of the Amazon basin, and is often a highly problematic invasive species outside its native range. One of the fastest growing plants known, water hyacinth reproduces primarily by way of runners or stolon's, which eventually form daughter plants. Each plant additionally can produce thousands of seeds each year, and these seeds can remain viable for more than 28 years. Water hyacinth invasion has been highlighted to be a source of problem to riparian communities. They are known to reduce the velocity of water bodies, thereby serving as suitable breeding grounds for mosquitoes. Their obstruction to water transportation also means students who cross invaded water bodies to school will have their education negatively affected and also affects the barge movements through rivers which can't be allowed for long time.

Marble has been commonly used as a building material since the ancient times. Consequently, Marble waste as a by-product is a very important material which requires adequate environmental disposal effort. In addition, recycling of this waste without proper management can result in environmental problems greater than the waste itself. Marble dust is a waste product formed during the production of marble. A large quantity of powder is generated during the cutting process. The result is that about 25% of the original marble mass is lost in the form of dust. Leaving these waste materials to the environment directly can cause environmental problems such as increase in the soil alkalinity, affects the plants, affects the human body etc.

The project aims at the study on the strength variation in concrete by the addition of water hyacinth and marble powder(MP)with it. .

LITERATURE SURVEY

2017,Juby Mariam Boban,Parvathy v Nair

In this study the potential use of water hyacinth fibers in the partial replacement of fine aggregate is studied. Water hyacinth fiber was used as replacement for fine aggregate at 0.5, 1, 1.5 and 2 wt. %. Concrete cubes and cylinders were tested for compressive strength up to the age of 28 days. Optimum value is obtained for 0.5% water hyacinth incorporated concrete. Compressive and tensile strength for the same is greater than the normal concrete which shows the strength of water hyacinth incorporated concrete. Sorptivity value for both remains same so that normal concrete and water hyacinth incorporated concrete has same durability. Compressive test done after heat transfer in cubes also gave good results for water hyacinth incorporated cube which implies that they have good heat resistance capacity and also increases its overall strength. Water absorbing property of water hyacinth incorporated

cube is less than normal concrete so that it can be used in exposed surfaces.

2019, Kirty Vardhan , Rafat Siddique , Shweta Goyal

In this study the Strength, permeation and micro-structural characteristics of concrete incorporating waste marble were studied. Test results from this study indicate that waste marble can be incorporated into concrete to improve its strength and permeation properties, with the maximum improvement obtained at 40% replacement level Results of this study confirms that waste marble has the potential to be an alternate fine aggregate to improve overall performance of concrete and for sustainable development.

2018, Deepankar Kumar Ashish

In this study the feasibility of waste marble powder in concrete as partial substitution of cement and sand amalgam for sustainable growth was studied. Here concrete mixtures were made by partially replacing marble powder in place of sand, cement and amalgam were evaluated for the mechanical strength, ultrasonic velocity , carbonation and microstructure analysis. Optimal replacement was noticed with 10% sand and 10% cement amalgam by 20% marble powder.

2018, U Abirami ,K Pavithra , K Kayalvizhi, A Govandhan

Here, experimental study on behavior of concrete replaced with water hyacinth ash was carried out. The examinations have been done to assess and quality execution of water hyacinth powder mixed cement with substitution of bond in proportion's 0%, 5%,10% ,15%and 20% with M25 concrete included with admixture of smaller scale silica and contrasted and customary cement. Compression strength test then was done at 7, 14 and 28 days of curing. From the results, the performance ideal substitution of Water hyacinth to bond is 15% for M25 concrete.

2018, Sukarni Sukarni, Yahya Zakaria, Sumarli Sumarli, Retno Wulandari, Avita ,Ayu Permanasari, M. Suhermanto

In this study, physical and chemical properties of Water Hyacinth were studied. The results of this study indicated that chemical elements of water hyacinth are C, O, Na, Mg, Al, Zr, Cl, K, Ca, Si, Ti, and Fe revealing dominant elements, ie, oxygen and carbon for 49.50% and 14.46%, respectively. The proximate analysis revealed that its moisture, volatile matter, fixed carbon, and ash content were 4.9, 61.2, 13.8, 20.1 (wt.%).

I. OBJECTIVE OF WORK

Concrete is the most widely used construction materials in the world. In fact, concrete is used in virtually everything and there is still no substitutes available for many of its application. Without concrete, the community and society today could not exist. Therefore, lots of researchers and engineers are doing the research of the aggregate sources. All these research as alternative sources for the replacement of the natural aggregates in producing concrete in the various future construction works.

The main objective of this study is to examine the strength of concrete after the incorporation of water hyacinth and marble powder to it.

Broad objectives includes the following:

- To study the strength variation in replacement of cement with varying % of waste marble dust and replacement of fine aggregate with varying % of water hyacinth.
- To partially resolve various nuisance caused by water hyacinth and marble powder.

MATERIALS

WATER HYACINTH - Water hyacinth is one of the most noxious weeds in tropical and subtropical regions, and many attempts have been made to eliminate or control it .For the project water hyacinth is collected from Kodoor River (from Illickal and thiruvarppu regions) , Kottayam. Collected water hyacinth is then sun burnt and later cut it into small pieces of approximately 5mm length.

MARBLE POWDER

India is the largest producer of waste marble dust. India is estimated to have 3,172 thousand tons of marble dust was produced in year 2009-10. A marble dust is generated during the cutting process. Leaving these waste materials to the environment directly can cause environmental problem . The waste is dumped on land the dust is airborne by the wind and makes air pollution in environment Marble has been commonly used as a building material since the ancient times. Consequently, Marble waste as a by-product is a very important material which requires adequate environmental disposal effort. Marble powder required for the project is collected from online services

CEMENT, COARSE AGGREGATE AND FINE AGGREGATE

Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is typically the bonding agent of the concrete which keeps all the different elements of concrete together The cement used for the project is having standard consistency of 37 %Initial setting time and final setting time of the used cement is 32 minutes and 10 hours.

Aggregate in concrete is a structural filler, but its role is more important than what that simple statement implies. Aggregate occupies most of the volume of the concrete. It is the stuff that the cement paste coats and binds together. The composition, shape, and size of the aggregate all have significant impact on the workability, durability, strength, weight, and shrinkage of the concrete. Coarse aggregate used is metal which is having fineness modulus of 7.1 %

METHODOLOGY

- Collection of the basic materials needed i.e, water hyacinth, marble powder, cement , fine aggregate and coarse aggregate

- Carrying out preliminary or basics test
- Compressive strength test of plain concert.
- Compressive strength test of concrete with addition of marble powder to it in varying percentages and finding out the optimum percentage

RESULT AND DISCUSSION

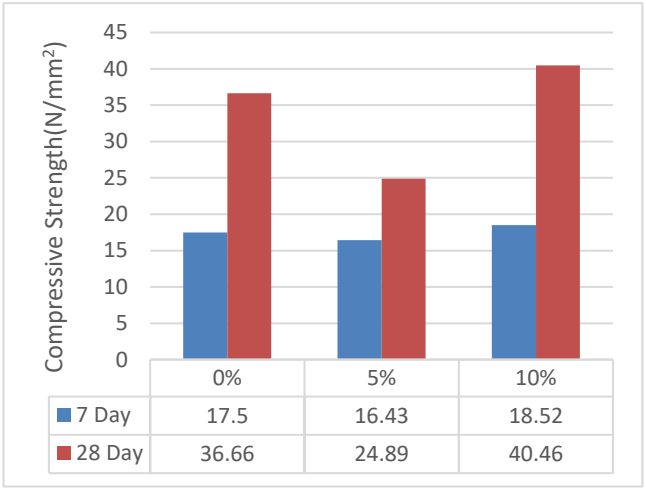

Fig Compressive strength pf concrete with various percentage of marble powder.

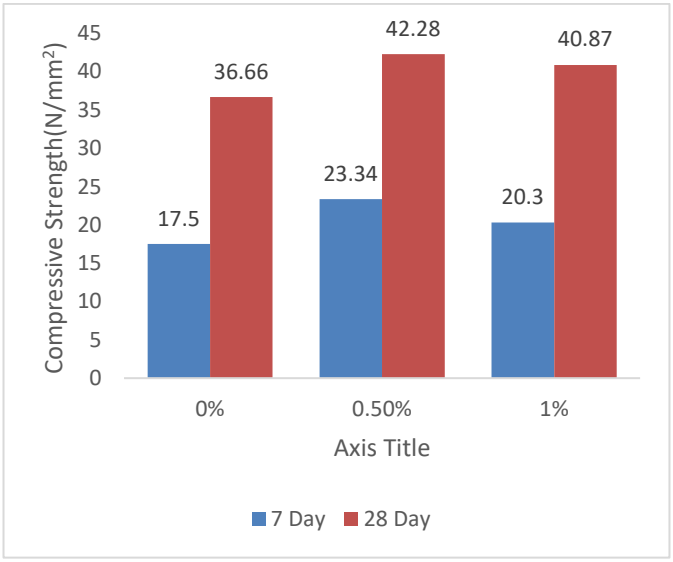

Fig : Compressive strength of concrete with 10% marble powder and different % water hyacinth

The test results obtained from Compressive strength testing of concrete after the incorporation of water hyacinth and marble powder reveals its possible effectiveness . The 28 day compressive strength of concrete cubes before addition and after addition of water hyacinth and marble powder at a certain percentage implies a positive result. The compressive strength of concrete cube with 10 % marble powder in place of cement and 0.5 % of water hyacinth in place of M sand is found to be very much greater than that of the plain cement.

CONCLUSION

The project focuses on studying the strength of concrete after the incorporation of water hyacinth and marble powder thereby utilizing the aquatic weed and hazardous marble waste effectively. It can be deduced from the results that marble powder and water hyacinth is effective in partially replacing fine aggregate and cement in concrete. The compressive strength of concrete cube after the incorporation of marble powder and water hyacinth is very much greater than that of the plain cement concrete . Also we can conclude that the collection of water hyacinth from Kodoor river significantly reduces the delay in transportation through the river and the collection of marble powder reduces its worst effect on the environment. Also, marble powder and water hyacinth incorporated concrete can be introduced as a cost effective and green option in concrete technology and civil construction works

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