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Solid Waste Management in a Panchayat and Utilization of Waste in Construction

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ABSTRACT: The aim of my project is to analyze and separate the MSW collected in a panchayat. After the separation of waste into degradable and non degradable the degradable waste is used for vermi composting and the non degradable waste is used in construction. This article investigates the feasibility of using aggregates coated with melted plastics as a partial and fully replacement for conventional coarse aggregates in concrete and the uses of degradable materials as fertilizers. The testing program was organized to study the effect of adding plastic aggregates to the concrete in order to reduce the cost of construction, density and have acceptable and good strength. The results also show that degradable waste which is used in vermi composting also have good fertilizers properties. This paper presents a detailed review about the low cost concrete which leads to the reduced building cost, waste management options, and the effect of recycled plastic on the fresh and hardened concrete. The effect of recycled waste plastic on specific gravity, water absorption, workability, compressive strength, splitting tensile strength and flexural strength are discussed in this report and the degradable waste, which is used in vermi composting will be used as fertilizer for the growth of plants and crops.

I. INTRODUCTION

The industrial revolution followed by the urbanization in the temperature countries, concentrated people in very high density and added new sources of wastes. These wastes are normally solid and result in landscape pollution. Solid waste management is an obligatory function of urban local bodies in India. Due to the population explosion huge quantities of S W are being dumped in to the environment. It is estimated that every human being released 500 – 1000 g of SW per day. Lack of financial resource, institution weakness, and improper choice of tech & public and pathy towards solid waste manager have made this service far from satisfactory.

II. MANAGEMENT OF NON DEGRADABLE WASTE

2.1 MATERIALS USED

- aggregate(coarse and fine)
- cement
- water
- plastics wastes and Demolition wastes

2.2 PRELIMINARY TEST

The preliminary test is conducted for the materials to be used to produce the concrete specimen for testing. The test result table is shown in the table 2.1.

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Table 2.1 Preliminary test results

PROPERTIES	OBTAINED RESULT	REQUIREMENT AS PER IS 12269:1987
Fineness of cement	6.2 %	Not more than 10%
Standard consistency	31%	Between (26-33)%
Initial setting time	42 min	Not less than 30 min
Final setting time	480 min	Not greater than 600 min
Specific gravity of F.A	2.46	Range 2.4-2.6
Fineness modulus of F.A	2.48	Range 2.2 -2.6
Specific gravity of C.A	2.62	Range 2.6-2.8
Fineness modulus of C.A	2.57	Range 2.8- 3.2
Water absorption of F.A	6.7%	
Water absorption of C.A	2.99%	
Specific gravity of cement	3.15	
Water cement ratio	0.48	0.5
Aggregate impact value	22.94%	

2.3 TEST CONDUCTED FOR SPECIMEN

- Compressive strength test,
- Split tensile strength test,
- Flexural strength test.

2.4 TEST RESULT

2.4.1 COMPRESSIVE STRENGTH TEST

The compressive strength of the concrete cubes of M20 grade are determined from the compression testing machine. The results are shown in Table 2.2.

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Table 2.2 Compressive Strength of concrete

COMPRESSIVE STRENGTH (N/MM ²)		
% OF PLASTIC COATED AGGREGATE USED	NO OF DAYS	
	7	28
0	21.91	27.24
50	24.76	30.4
100	25.47	30.67
50 plastic coated demolition waste	20.76	25.93
100 plastic coated demolition waste	20.31	25.33
50+50 plastic coated demolition waste	23.24	27.85

2.4.2 SPLIT TENSILE STRENGTH TEST

The Split tensile strength of the concrete cylinder of M₂₀ was determined from the compression testing machine. The results are shown in Table 2.3.

Table 2.3 Split Tensile Strength of concrete

SPLIT TENSILE STRENGTH (N/MM ²)	
% OF PCA USED	NO OF DAYS
	28
0	2.54
50	3.86
100	4.05

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50 plastic coated demolition waste	2.4
100 plastic coated demolition waste	2.31
50+50 plastic coated demolition waste	2.68

2.4.3 FLEXURAL STRENGTH TEST

The flexural strength of the concrete beams of M₂₀ grade was determined from the universal testing machine and the results are shown in Table 2.4

Table 2.4 Flexural Strength of concrete

FLEXURAL STRENGTH (N/MM ²)	
% OF PCA USED	NO OF DAYS
	7
0	2.73
50	2.92
100	2.95
50 plastic coated demolition waste	2.62
100 plastic coated demolition waste	2.58
50+50 plastic coated demolition waste	2.75

Following results are drawn from the values obtained from the experimental verification of concrete specimen using plastic waste coated coarse aggregate as partial and full replacement of coarse aggregate in concrete. Usage of plastic waste in concrete as ingredient increases the strength of the concrete and can solve its disposal problems to significant extent. Improvement in the mechanical properties of concrete are observed such as compressive strength, split tensile strength and flexural strength by coating the plastic wastes into the conventional coarse aggregate and demolition waste. The use of plastic waste in concrete by coating it into the conventional coarse aggregate and demolition waste and using it as replacement of conventional coarse aggregate is quite a new research area hence presents a great research potential. The compressive strength, split tensile strength and flexural strength of concrete containing in the specimen S2 and S3 ie, concrete containing both conventional coarse aggregate and plastic coated coarse aggregate and concrete containing only plastic coated coarse aggregate are noticeably increased. Since all the three properties plays a vital role in concrete, the specimen S2 and S3 can be used as the replacement of conventional concrete which is more helpful in solid waste management without disturbing the basic mechanical properties of concrete.

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III. MANAGEMENT OF NON DEGRADABLE WASTE

3.1 MATERIAL COLLECTION

The materials needed to start a vermi-composting system are simple and inexpensive.

The materials needed are:

- a worm bin,
- bedding,
- water,
- worms, and
- Degradable waste.

3.2 SETUP FOR PREPARATION OF VERMI COMPOST

First the materials used for the vermi- composting is to be collected. Then plastic container and the concrete tank are thoroughly clean by using the water. The plastic container and the concrete tank has a hole at it bottom in which a bend or a pipe is used for extract water. Now the broken brick are laid at the bottom of the bin. Then the clay is laid above the broken brick layer and the coco- pith is laid ,which is mixed with the sand. Next, the cow dung is added to the bin which is in dry form , since the fresh cow dung is not suited for the worm bin as it generates heat which is harmful to the worms. Then the partially decomposed leaves or garden refuse is added which equalize the C/N ratio of the bin. Now the decomposed degradable wastes are added to the bin. The degradable waste are chopping into small pieces and left undisturbed for 1 week for decomposing. Fresh vegetables wastes are not eaten by the worms. The required amount of water is added to the bin to decompose the organic matters present in the bin. The bin is now left for 5 days. The worms are collected from the worm farm and are left into the bin. Water is sprinkled on the worm bin for required amount. High amount of water or deficiency of water leads to escape of the worms to escape from bin or death of worm. Leave the bin for 45 days. The vermi-compost is made by the worms. The vermin-compost is the waste coming out from the worms which is high in humic acid and this humic acid is useful for the plant growth. After the completion of 45 days water sprinkling is stopped (for 5 days). At that time the earthworms are moved to the bottom of bin. The vermi-compost present above the bin is collected and sieved for the elimination of the unwanted matter presented in the vermi-compost otherwise the vermi-compost is directly apply to the plant. At the period of vermi-composting the water extract from the worm- bin is also collected. This water extract is called vermi-compost leachate, which also have much amount of micro nutrients which is used for the plant growth. We used both vermi-compost and the leachate water for the growth of plant.

3.3 EXPERIMENTAL USAGE OF VERMICOMPOST

The obtained vermi-compost and vermicompost leachate are tested by applying it in the plant “Solanum lycopersicum” ie, commonly known as Tomato or “Better boy”. and also the growth of the same species plant without applying the vermicompost are discussed below. We plant the Solanum lycopersicum in the month of february and the various stages of the plant is shown below.

We use three type of soil container for experimental verification, they are as follows,

- Container containing Ordinary soil,
- Container containing Garden compost soil ,
- Container containing Vermicompost soil.

By observing the growth of the plant, the plant is growing well with vermi-compost applied soil when compared to normal soil and garden compost soil. The leaves are very big compared to other plants and they are very greenish and healthier. The plant in vermicompost soil is bright looking. The plant growth is considerably increase in the vermicompost applied soil. The plant in ordinary soil has a growth of 13 cm but the plant in vermi-compost applied soil has a growth of 15.5 cm and garden compost soil plant has 14 cm growth in 5 days. After 10 days the vermicompost soil plant reaches 21.5 cm. It is considerably high compared to ordinary soil. After 15 days it reaches 25.5 cm and also it starts to flowering and after 2 days , a ladies finger has grown out which is 2 cm in length.

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IV. CONCLUSION

In the case of non degradable waste disposal, the idea to use plastic waste as concrete ingredient will result in its large volume disposal, which is environmentally safe and does not pose any health hazard. At present these trials are mostly limited to laboratory or research level. However, these investigations pose a big challenge to provide a bridge to fill the gap between the laboratory works and real applications. The process of making plastic waste suitable for concrete is energy intensive but if an energy efficient method is developed then this work will be of high energy performance, low cost and eco-friendly. No clear-cut methodology is available for mix design using plastic waste; a significant experimentation is required for its formulation. Durability aspects of concrete using different types of plastic waste require thorough investigation though the strength is good. An in-depth experimental analysis of mechanical behavior of concrete containing plastic waste needs an urgent attention which will be of great advantage to the world.

Organic fertilizer plays an important role in world wide agricultural lands. Nowadays many people like to use organic vegetables as food. In world around, every human being producing organic waste amount is 500-1000g/day. So, there is need of managing the organic waste. In this project, the organic waste is used to make vermi-compost with the help of earthworms. The earth worms is used to convert the organic waste into effective organic fertilizer. The vermi-compost contains more amount of micro and macro nutrient compared to other composts. This vermi-compost is in the plant for the plant growth. Good results are observed in vermi-compost applied plant than other plants. The main aim is to reduce the amount of degradable waste . In this project the utilization of organic waste is done by the worms and also the organic fertilizer problem can be solved.

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REFERENCES

- 1.P.Asokan "Assessing the recycling potential of glass fiber reinforced plastic waste in concrete and cement composites" journal of cleaner publications; vol: 17, no 9(2009).
- 2.A.Harini& Ramana "use recycled plastic waste as partial replacement for fine aggregate in concrete" international journal of innovative research in science, engineering and technology, vol4.
- 3.Pramod. S. patil "innovative techniques of waste plastic used in concrete mixture" international journal of engineering and technology.
- 4.Tomas.U.Ganiron. "effect of thermoplastic as fine aggregate to concrete mixture" international journal of science and technology, vol 62.
- 5.J.N.S.Suryanarayana.Raju"mechanical study on concrete with waste plastic" International journal of research in civil engineering,vol11.
- 6.L. A. Guerrero, G. Maas, and W. Hogland, "Solid waste management challenges for cities in developing countries," Waste Management, vol. 33, pp. 220-232, January 2013.
- 7.B. Antizar-Ladislao and J. L. Turrion-Gomez, "Decentralized Energy from Waste Systems," Energies, vol. 3, p. 194, 2010.
- 8.P. Brunner and H. Rechberger, "Waste to energy – key element for sustainable waste management," Waste Management, vol. 1, pp. 1- 10, March 2014.
- 9.U. Di Matteo, B. Nastasi, A. Albo, and D. Astiaso Garcia, "Energy Contribution of OFMSW (Organic Fraction of Municipal Solid Waste) to Energy-Environmental Sustainability in Urban Areas at Small Scale," Energies, vol. 10, p. 229, 2017.
- 10.M. S. Korai, R. B. Mahar, and M. A. Uqaili, "The feasibility of municipal solid waste for energy generation and its existing management practices in Pakistan," Renewable and Sustainable Energy Reviews, vol. 72, pp. 338-353, 5// 2017.