Experimental Study of Corn Cob Ash Concrete

Manank Patel[1], Jay Rathod[2], Para Bhatt[3], Drashti Chaudhari[4], Noreen Pathan[5], Mr.Sagar Naik[6]
[1,2,3,4,5] *Student, Bhagwan Mahavir College of Engineering & Technology, Surat*
[6]*Assitstant Professor, Bhagwan Mahavir College of Engineering & Technology, Surat*

***Abstract*- One of the major environmental challenges facing municipalities around the world is the disposal of dilapidated agricultural waste. In order to solve this global problem, several studies have been conducted to study the various applications of corn cob ash powder. It is this intention to propose the use of corn cob ash as a substitute for concrete in concrete for experimental research. In this experimental research work, corn cob ash powder was taken from Rahi agro- industries Ahmedabad, Gujarat, India used in M20 grade of concrete by replacing cement with variation by weight and compare with a normal M20 grade of concrete to check the performance of corn cob ash powder in concrete. This experimental work divided into the three-phase feasibility of corn cob ash powder with partial replace with cement to check the behaviour or of corn cob ash powder in concrete. In second phase corn cob ash powder replaced with cement at 0%, 10%, 20% and 30% by weight in concrete to check mechanical and also workability of concrete. In the third phase try to determine the durability of concrete. The present study is to investigate the effect of corn cob ash powder in concrete.**

***Index terms*- Corn cob ash powder, Cement, Fine aggregate, Coarse aggregate, Water**

I.INTRODUCTION

The history of cementing materials is as old as the history of engineering construction. Concrete is one of the most widely used building materials today. More than 90% of the buildings, bridges, roads, dams, retaining walls and other structures are constructed of concrete. The versatility and plasticity of the material, its high compressive strength and the discovery of enhanced and pressurized techniques have been widely used. This is a popular building material that requires strength, durability, impermeability, fire resistance, and abrasion resistance. Strength, durability, and workability can be considered the main performance of concrete. In addition, good concrete should be able to resist wear and corrosion, should be waterproof, economical. The concrete must be strong enough to withstand all applied stresses without the safety factor required for personal safety. When the concrete mix has been designed on the basis of maximum permissible water-cement ratio, keeping in view the requirements of durability, it will develop the required strength if properly placed in position and cured. After placing, do not let the concrete dry quickly because moisture is very important for the development of its high strength. To develop a given strength, longer time of moist curing is required at a lower temperature than is necessary while curing is done at a higher temperature. The modification of building materials has an important impact on the construction industry. A number of attempts have been made in the building materials industry to use waste products, such as supplemental cement material (SCM), for useful and cost-effective items. Some studies have focused on finding alternatives that can be used as alternatives to cement, such as industrial and agricultural disposable and less valuable wastes, and their potential benefits can be achieved through recycling, reuse and renewal programs. As a result, researchers have been investigating the effectiveness and availability of waste as a cement substitute for cement alternatives. The desired material should be a by-product from the original source rich in silicon (Si) and aluminium (Al). The framework for building applications with industrial waste has a successful history, including fly ash, slag, and silica fume. Thus, the landfill waste, which is normally handled and landfilled, is now considered to be valuable for improving the desired performance of the concrete. Corn is often considered agricultural waste; by using it as a building material, it can lead to economic and sustainable benefits.

II. EXPERIMENTAL MATERIAL

1 Corn cob ash powder -In this dissertation, corn cob ash was used which directly obtained from RAHI AGRO INDUSTRIES,66, Nr Asian Tube, ChattralKadi Road, Vill, Ta KadiDist, Mehsana, Gujarat. Before adding corn cob ash powder in the concrete it has to be powdered to the required size.

2 Cement -The most commonly used Pozzolona Portland cement of 53-Grade conforming IS 12269 – 1987 (2013

3 Fine Aggregate -Local no residue and almost bed sand are used as fine aggregate. The sand should also be packed to produce the smallest voids, and higher voids lead to the need for more mixed water. In this study, sand was determined according to the criteria for the second district in India. (IS: 10262, IS: 383). The specific gravity of sand is 2.78. The bulk density of fine aggregate is 1554.67 kg / m3.

4 Coarse aggregate -The crushed aggregate used is nominally the largest size of 20mm and 10mm and is tested according to the Indian standard, with the result being within the permissible limits (IS: 10262, IS 383). The specific gravity and bulk density of the 10 mm and 20 mm aggregates were 2.8 and 2.84 and 1308.00 kg / m3 and 1253.33 kg / m3, respectively.

5 Water -The water used is drinking, fresh, colorless, odorless, tasteless water of any type of organic matter. According to IS-456-2000 requirements, the university campus water can be used for concrete and cure water.

III. MIX DESIGN

Using the properties of materials the mix design has been adopted from BIS-IS 10262: 2009 to design for M-20 grade of concrete.

Concrete mix design

- Type of cement = PPC 53 grade
- Grade of concrete = M20
- Exposure condition = moderate
- Maximum size of aggregate = 20mm
- Minimum cement contain = 300kg/m3
- Maximum water/cement ratio = 0.55
- Workability = 50mm(slump)
- Type of aggregate = sub-angular
- Maximum cement content = 450kg/m3 ++
- Grading of fine aggregate confirming to grading zone II
- Method of concrete placing = by hand
- Chemical admixture type = no admixture

IV. RESULTS

Compression testing on concrete cubes

The cube compression test was carried out on a compression tester with a capacity of 3000 KN.

According to BIS 9013-1978, the compressive strength of CCA concrete was measured after wet curing at 7 and 28days.

Table 7.3Compressive strength of cubes after 7 days

Sr. No.	Type of Mix	Size of specimen in mm	Compressive strength in Mpa
1	CM(M20)0 %(CCA)	150x 150x150	16.22
2	CM(M20)0 4%(CCA	150x 150x150	14.67
3	CM(M20)8 %(CCA	150x 150x150	15.32
4	CM(M20)1 2%(CCA	150x 150x150	13.21

Table 7.4Compressive strength of cubes after 15 days

Sr. No.	Type of Mix	Size of specimen in mm	Compressive strength in Mpa
1	CM(M20)0 %(CCA)	150x 150x150	19.76
2	CM(M20)0 4%(CCA	150x 150x150	17.58
3	CM(M20)8 %(CCA	150x 150x150	18.29
4	CM(M20)1 2%(CCA	150x 150x150	16.02

Table 7.5Compressive strength of cubes after 28 days

Sr. No	Type of Mix	Size of specimen in mm	Compressive strength in Mpa
1	CM(M20)0 %(CCA)	150x 150x150	24.04
2	CM(M20)0 4%(CCA	150x 150x150	22.68
3	CM(M20)8 %(CCA	150x 150x150	24.90
4	CM(M20)1 2%(CCA	150x 150x150	21.85

V. CONCLUTION

A. Following are conclusions drawn on the basis of the results obtained from the experimental works:

- Corn Cob Ash (CCA) is a suitable pozzolana material because it meets the material requirements by making the combination of SiO2 and Al2O3 more than 70%.
- The results show that concrete becomes less workable (stiff) due to the increase in CCA percentage, which means that more water is needed to make the mixture more workable
- As CCA percentage increase in cement mortar, the initial and final set times increase.
- The compressive strength of CCA-blended cement concrete is lower than that of plain concrete (the control) at early curing ages but improves significantly at later ages and in fact has higher percentage gain in strength than the later.

B. Accorded with in IS code so it is concluded that concrete is homogenous and of good quality.

- Use of corn cob ash in concrete can prove to be economical as it is very much cheaper than cement
- CCA can be used as a pozzolana in blended cement concrete to improve the compressive strength at later ages. Due to the long-term strength development of CCA blended cement concrete and the low heat of hydration recorded, it is most applicable in mass concrete works.
- The above result shows a beneficial application of this waste product.

REFERENCES

[1] Adesanya DA, (2000) The characteristics of laterite bricks and blocks stabilized with corn-cob fillers, The Prof Build (2000) (June/July):47–55.

[2] Adesanya A, Raheem A,(2009) A study of the workability and compressive strength characteristics of corn cob ash blended cement-concrete, Construction and Building Materials 23 (2009) 311–317

[3] Adesanya A, Raheem A(2009) Development of corn cob ash blended cement, Construction and Building Materials 23 (2009) 347–352

[4] Adesanya A, Raheem A,(2010) A study of the permeability and acid attack of corn cob ash blended, cements-Construction and Building Materials 24(2010) 403–409

[5] Adesanya A, Raheem A,(2011) A Study of Thermal Conductivity of Corn Cob Ash Blended Cement Mortar, The Pacific Journal of Science and Technology

[6] Antonio P, Yeargin R, Fini E and Abu-Lebdeh (2014)- investigating effects of introduction of corn cob ash into Portland cement concrete: mechanical and thermal properties, American Journal of Engineering and Applied Sciences 7 (1): 137-148, 2014

[7] Apriant Ei, Shafigh P, Bahri S, Farahani J (2015) Supplementary cementitious materials origin from agricultural wastes – A review, Construction and Building Materials 74 (2015) 176–187.

[8] Deumenkayem E, Mbey A,(2014)- Preliminary study on the use of corn cob as pore forming agent in lightweight clay bricks: Physical and mechanical features, Journal ofBuildingEngineering5(2016)254–259

[9] Jorge P, Cruz D, Anabela P, Pereira P, Tavares P d, Lisete F(2012) Characterization of corn cob as a possible raw building material, traction and Building Materials 34 (2012) 28–33

[10] Jorge P, Barbosa V, Carlos J, Paulo V, Anabela P, Sandra P, Vitor M (2012) Corn cob lightweight concrete for non-structural applications, Construction and Building Materials 34 (2012) 346–351

Website:

[1] www.indiaenvironmentportal.org
[2] www.sciencedirect.com
[3] www.asce.com
[4] www.eai.in