Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 4(J), pp. 26235-26239, April, 2018

ISSN: 0976-3031

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

COMPARISON OF CONCRETE PROPERTIES BY USING DIFFERENT TYPES OF FINE AGGREGATES AVAILABLE IN LUCKNOW

Asra Faizan., Anwar Ahmad., Syed Aqeel Ahmad and Mohd Sadat

Department of Civil Engineering, Integral University, Lucknow, India

DOI: http://dx.doi.org/10.24327/ijrsr.2018.0904.2018

ARTICLE INFO

Article History:

Received 5th January, 2018
Received in revised form 20th February, 2018
Accepted 8th March, 2018
Published online 28th April, 2018

Key Words:

Natural sand, stone dust (grey in color), stone dust (brown in color), compressive strength, split tensile strength, flexural strength, cubes, cylinder, beam, water, admixture.

ABSTRACT

In lieu of exponential infrastructure growth, the demand for raw materials has grown tremendously. Unchecked, exploitation of resources for concrete production has led to the environmental crisis. This study aims to analyze the use of alternative materials to replace fine aggregate in concrete production. Natural Sand, Stone Dust (Grey) and Stone Dust (Brown) are used to caste cube, cylinder and rectangular beams to test compressive, tensile and flexural strengths respectively. Among aforementioned fine aggregates natural sand, sourced from river beds, is extensively used in the Uttar Pradesh (India). The 7 and 28-day strength achieved by replacing natural sand with stone dust for M 25 is comparable and thus it can be used as fine aggregate. Thus Stone dust which isa waste product from quarries can be utilized in concrete production. This will result in not only reduced pressure on natural sand extraction from river beds but also solving the problem of waste disposal in stone quarries.

INTRODUCTION

Urbanization has led to increased construction activities in different regions of India which is becoming a threat. One such threatisoverexploitation of natural sand. In the last 15 years, availability of fine aggregate (natural sand) is decreasing due to a rapid growth of construction activity. Concrete has been preferred construction material for the past few years due to its mould ability, durability, ease of availability and rigidity. Manufacturing of concrete involves the use of construction materials like aggregate, cement, water and admixture. Aggregates form a major part of concrete gel which is formed after hydration. Overexploitation of natural sand causes lowering of water table, the sinking of bridge piers and erosion of river bed posing enormous challenges for governments. Environmental concern has also been arising against uncontrolled extraction of natural sand. Overconsumption of natural sand has increased and therefore degrading the quality of sand. The government has restricted quarrying of the sand which has led to the problem of scarcity and increased the cost of natural sand. In today's competitive world we cannot stop the construction activity but can curtail the use of natural sand by innovative ideas. The prime duty of civil engineers to conserve natural resources without affecting the construction activities. One of theways is to search alternatives material which can fully or partially replace naturally available material in construction. Stone dust can be a viable alternative to natural sand which can be effectively be used in construction material. Stone dust is a waste product and causes environmental pollution.It is obtained from the aggregate crushing plant, it may be used as raw material without any processing. In the earlier review paper works of scholars like Manjunath *et al*. (2017), Naresh Kumar *et al*. (2017 Karuna Devi *et al*. (2017) Ayushi R.Sharma(2016), Kavitha Karthikeyan *et al*. (2017) , Azhahendran *et al*. (2016) Chabbara *et al*. (2015) , Yusut *et al*. (2015) Sadat and Celikoglu (2017), Abuamer *et al*.(2017) and Sadat *et al*. (2017) were summarized.

This study involves a comparative analysis of concrete prepared by using Badarpur Sand (moorum), Stone Dust (grey) and Stone Dust (brown) as fine aggregates. These are available in the Lucknow region of the state of Uttar Pradesh, India. Performance parameters were a compressive strength,split tensile strength and flexural strength of cubes, cylinder,and beamrespectively after a curing period of 7 and 28 days.In this study, we used an M25 grade of concrete to test various aforementioned sands.

Corresponding author:* **Asra Faizan
Department of Civil Engineering, Integral University, Lucknow, India

MATERIALS AND THEIR PROPERTIES

Cement: Cement is a hydraulic binder and fine powder which when mixed water it gets set and hardens. It has a tendency to unit fragments of all masses of solid matter together to produce a mechanically strong material. In this research, we use Ordinary Portland Cement 43 grade confirming to IS 8112:1989.

Fine Aggregate: The aggregate whose size is 4.75mm and less is considered as a fine aggregate. In this research, we use stone dust and natural sand as a fine aggregate. The testing procedures of sieve analysis of fine aggregate are given in IS 383-1970.

Coarse Aggregate: The size of aggregate bigger than 4.75mm is considered as coarse aggregate. In this research, we use aggregate of size 10mm and 20mm.

Water: Water is an important constituent for producing concrete. It chemically reacts with cement to produce the desired properties of concrete. The water is used in this investigation is recommended from IS: 456-2000**,** the water to be used for curing and mixing is free from deleterious materials.

Admixture: In this research, we use complast sp430 as an admixture.

Figure 1 a) Natural sand (Badarpur) b) Stone Dust (grey) c) Stone Dust (brown)

Figure 1 shows Badarpursand as a natural sand and use of artificial sand (stone dust which is grey and Stone dust which brown in color) replacing of natural sand. These three grains of sand are available in Lucknow. Concreting is done using these three sand and then testing as well as comparative analysis is performed.

Table 1 physical properties of cement

Characteristics	Observed Value
Normal consistency	30%
Initial setting time	45 minutes
Final setting time	620 minutes
Specific gravity	3.15
Compressive strength at 28 days	43.2MPa

Table 2 physical properties of natural sand (Badarpur), stone dust (grey) and stone dust (brown)

S.No.	Aggregate	Grading zone	Fineness modulus	Specific gravity	Silt content
1	Natural Sand (Badarpur)	3	2.35	2.61	2.6%
2	Stone dust (grey)	3	2.67	2.69	1.9%
3	Stone dust (brown)	3	2.54	2.78	2.1%

Table 3 physical properties of coarse aggregate

Physical properties	Observed value 10mm aggregate	20mm aggregate
Fineness modulus	5.98	6.40
Aggregate crushing value (%)	17.2	23.99
Aggregate Impact value (%)	27.91	23.10
Specific gravity	2.66	2.65

METHODOLOGY

Following processes were adopted in order to cast the test specimens. Batching is the process of measuring of all materials for making concrete. Batching is followed by Mixing where dry constituent of concrete making material like cement, water, coarse aggregate, fine aggregate are mixed until a homogeneous mixture is obtained. Mixing of constituent is done by concrete mixer machine. Further casting is done which is a process of placing concrete into a specified mould in layers with appropriate blows by the standard tamping rod. Curing: All specimens were demoulded after 24 hours and stored in water until the age of testing. All tests are conducted after the specified cured period. Mix design M25 grade of concrete

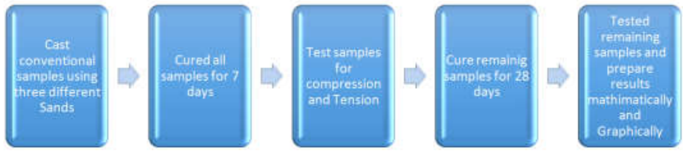

Figure 2 Methodology

Therefore we collected all the concrete making materials like cement, water,and coarse aggregate, fine aggregate. First cubes, cylinders and beams are casted using Badarpursand as a natural sand. Later natural sand is replaced with the artificial sand like stone dust grey and brown in colour. Specimens are cured for 7 and 28 days. Then the cube, cylinder and beam specimen are tested and data is recorded. Later results are analyzed mathematically and graphically. Three tests are conducted on the samples in this study namely compressive strength test, split tensile strength test, and flexural strength test.

Mix Design

Concrete for the M25 grade was prepared as per IS 10262:2009 for M25 grade concrete for the material of as follows

Materials	Quantity
Cement	350Kg/m3
Sand	635Kg/m3
Coarse aggregate	1310Kg/m3
Water	148.8Kg/m3
Admixture	4.2Kg/m3

The table below summarizes the results for Compressive Strength, Split Tensile Strength and Flexural Strength. Average values of samples have been presented to weed out error arising from poor workmanship and improper mixing.

RESULT

This section discusses the results in detail. The figures below show the variation of compressive strength for cubes three types of fine aggregates for 7 and 28-days. Similarly, figures also show the Split Tensile Strength and Flexural Strength.

Figure 3 shows a comparative study of average compressive strength values of 7 days cubes at y- axis and specimens (Badarpur sand, stone dust grey, stone dust brown) at x- axis.

S.No:	Specimen	Shape	Curing Period	Load	Strength
				Average Test Load (KN)	Average Compressive Strength (MPa)
		Cube	7 days	369.25	16.70
			28 days	790.25	35.12
				Average Test Load (KN)	Average Split Tensile Strength(MPa)
1	Badarpur Sand	Cylinder	7 days	117.55	1.66
			28 days	171.05	2.42
				Average Test Load (KN)	Average Flexural Strength(MPa)
		Beam	7 days	7.22	1.93
			28 days	21.77	5.8
				Average Test Load (KN)	Average Compressive Strength (MPa)
		Cube	7 days	403.5	17.93
			28 days	698.75	31.06
				Average Test Load (KN)	Average Split Tensile Strength(MPa)
2	Stone Dust (Grey)	Cylinder	7 days	146.92	2.08
			28 days	205.88	2.91
				Average Test Load (KN)	Average Flexural Strength(MPa)
		Beam	7 days	7.82	2.08
			28 days	22.57	6.02
				Average Test Load (KN)	Average Compressive Strength (MPa)
		Cube	7 days	371.5	16.51
			28 days	688	30.58
				Average Test Load (KN)	Average Split Tensile Strength(MPa)
3	Stone Dust (Brown)	Cylinder	7 days	146.82	2.07
			28 days	175.43	2.48
				Average Test Load (KN)	Average Flexural Strength(MPa)
		Beam	7 days	9.28	2.47
			28 days	22.81	6.08

The figure clearly shows that 7 days average compressive value for stone dust (grey) which is 17.93 MPa is higher than Badarpur sand and stone dust (brown) values which is 16.7 MPa and 16.51Mpa respectively.

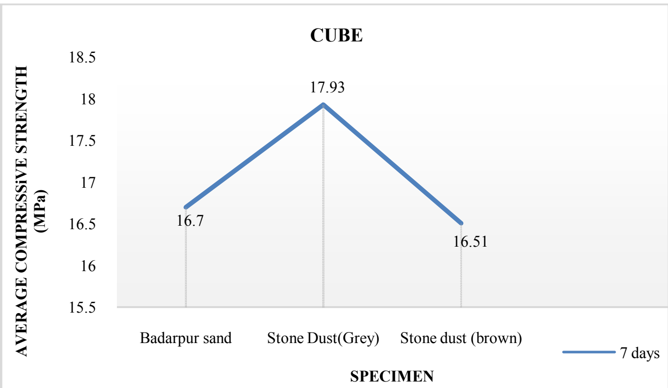

Figure 3 Average compressive strength of cubes at 7 days.

Figure 4 shows a comparative study of average compressive strength values for 28 days cubes at y-axis and specimens (Badarpur sand, stone dust grey, stone dust brown) at the x-axis. The figure clearly shows that 28 days average compressive value for Badarpur sand which is 35.12MPa is higher than stone dust (grey) and stone dust (brown) values which are 31.06 MPa and 30.58 MPa respectively.

Figure 5 shows a comparative study of average split tensile strength values for 7 days cylinder at y-axis and specimens (Badarpur sand, stone dust grey, stone dust brown) atthe x-axis. The figure clearly shows that 7 days average split tensile strength value for stone dust (grey) which is 2.08 MPa is higher than Badarpur sand and stone dust (brown) values which are 1.66MPa and 2.07MPa respectively.

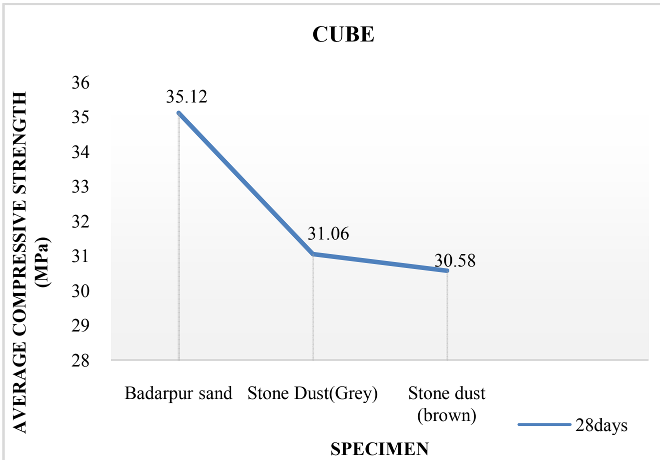

Figure 4 Average compressive strength of cubes at 28 days

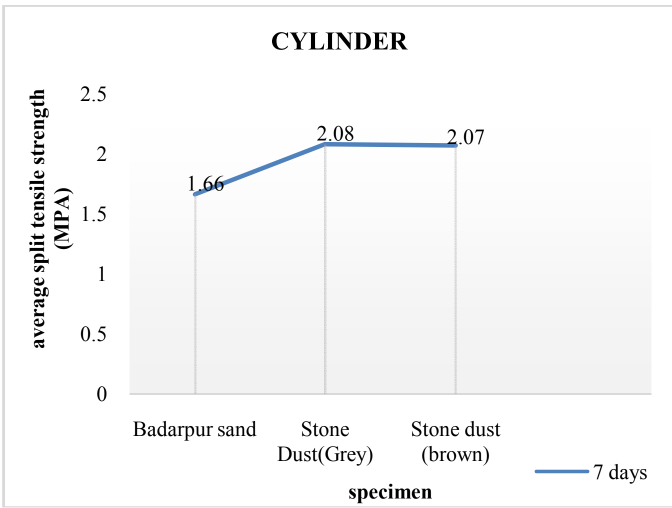

Figure 5 Average split tensile strength of cylinders at 7 days

Figure 6 shows a comparative study of average split tensile strength values for 28 days cylinder at x-axis and specimens (Badarpur sand, stone dust grey, stone dust brown) aty-axis. The figure clearly shows that 28 days average split tensile strength value for stone dust (grey) which is 2.91 MPa is higher than Badarpur sand and stone dust (brown) values which are 2.42MPa and 2.48MPa respectively.

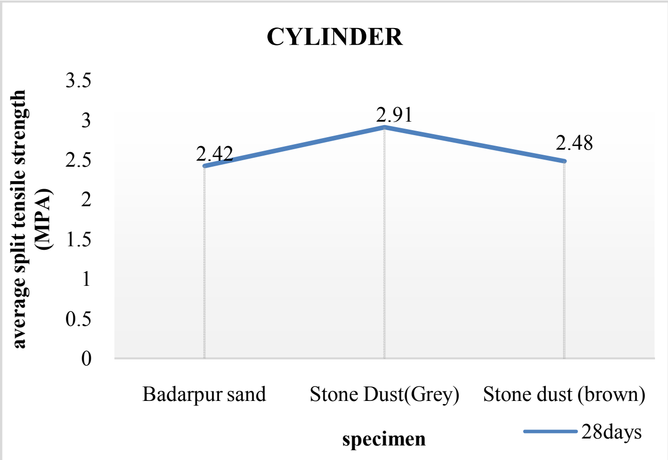

Figure 6 Average split tensile strength of cylinders at 28 days

Figure 7 shows a comparative study of average flexural strength values for 7 days beam at y-axis and specimens (Badarpur sand, stone dust grey, stone dust brown) atthe x-axis. The figure clearly shows that 7 days average flexural strength value for stone dust (brown) which is 2.47MPa is higher than Badarpur sand and stone dust (grey) values which are 1.93 MPa and 2.08 MPa respectively.

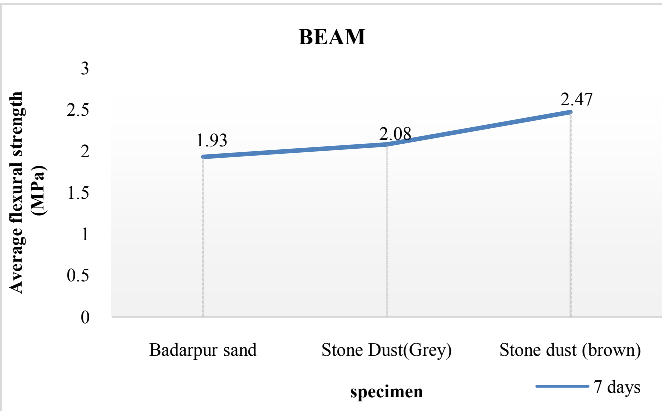

Figure 7 Average flexural strength of beams at 7 days

Figure8 shows a comparative study of average flexural strength values for 28 days beam at y-axis and specimens (Badarpur sand, stone dust grey, stone dust brown) at the x-axis. The figure clearly shows that 28 days average flexural strength value for stone dust (brown) which is 6.08MPa is higher than Badarpur sand and stone dust (grey) values which is 5.8MPa and 6.02 MPa respectively.

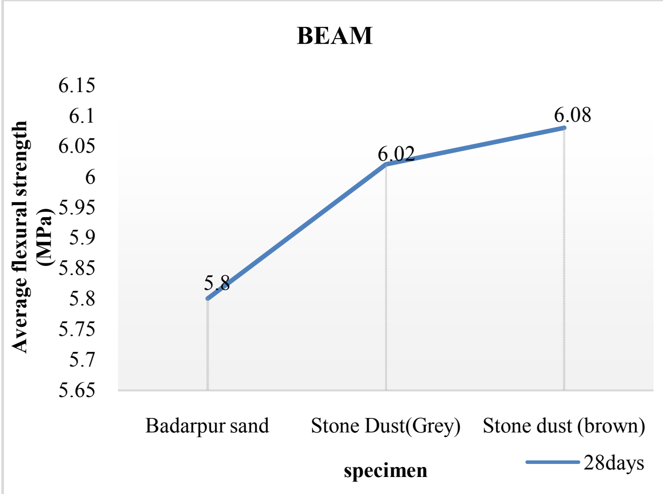

Figure 8 Average flexural strength of beams at 28 days

Figure 9 a)shows the testing of the cylindrical specimen**b)** shows the failure of the beam specimen**c)** shows the testing of the cubicalspecimen

CONCLUSION

An experimental study was done on concrete using different types of sand and coarse aggregate and also with an admixture of cement and concluded that.

1. Workability of the concrete is decreased when using stone dust brown.
2. The maximum compressive strength was obtained when 35% stone dust was used with coarse aggregate and cement content was increased by 10 %.
3. The maximum split tensile strength are obtained for stone dust brown 5% of replace with coarse aggregate.
4. It is also observed that the compressive strength is found to be optimum when fine aggregate was replaced by 5% with stone dust (grey) at the end of 7 days.
5. Stone dust can be used as partial or full replacement of natural fine aggregate in concrete.
6. The use of stone dust in concrete is beneficial in environmental aspects. Also, it can bea good quality of fine aggregate from strength criteria.
7. The workability of concrete decreased at increment level of stone dust in concrete which can maintained by extra doses of admixture.
8. Stone dust can be used as fine aggregate where setting time is not much important.

Reference

1. B.T. Manjunath, A., Manjunath.M.S., Karthick.T.R., Lakshmi.k.,(2017). Partial replacement of sea and desert sand in place of river sand for mortar in

construction. *Global Research and development Journal for engineering,* 2(7), 81-85
2. Naresh Kumar.D.V., Ganaraju.P.M., Avinash. P.& Rambabu.G. (2017). A study on compressive strength of concrete by partial replacement of coarse aggregate with coconut shell and with addition of fibres. *International Journal of Civil Engineering Research,* 8(1), 57-68.
3. Kavitha Karthikeyan, S., Priya.P., Azhahaendran, D. & Nagarajan., P. (2017). Exploratory study on partial replacement of coarse aggregate by Talipot Palm seed. *International Journal of Civil Engineering and Technology*, 8(7), 208-213.
4. Sadat, M., & Celikoglu, H. B. (2017). Simulation-based Variable Speed Limit Systems Modelling: An Overview and A Case Study on Istanbul Freeways. Transportation research procedia, 22, 607-614.
5. Sadat, M., Abuamer, I. M., Silgu, M. A., & Celikoglu, H. B. (2017, February). A CoMParative Performance Analysis of Variable Speed Limit Systems Control Methods Using Microsimulation: A Case Study on D100 Freeway, Istanbul. In International Conference on Computer Aided Systems Theory(pp. 462-469). Springer, Cham.

How to cite this article:

Asra Faizan *et al*.2018, Comparison of Concrete Properties by Using Different Types of Fine Aggregates Available in Lucknow. *Int J Recent Sci Res.* 9(4), pp. 20235-20239. DOI: http://dx.doi.org/10.24327/ijrsr.2018.0904.2018

****