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# Experimental Study on Compressive Strength of Concrete with Rubber Seed Shell and Silica Fume

**E.Nainar[1], S.Sahaya Pravin[2] , Khekiye Aye[3]**

[1] *Assistant Professor, Department of Civil Engineering, St.Joseph University, Nagaland.*
[2] *Assistant Professor, Department of Civil Engineering, St.Joseph University, Nagaland.*
[3] *Assistant Professor, Department of Civil Engineering, St.Joseph University, Nagaland.*

***Abstract: Concrete is an synthetic cloth similar in appearance and houses to some herbal lime stone rock. It is a man a made composite, the major constituent being herbal mixture along with gravel or beaten rock, sand and great particles of cement powder all blended with water. The concrete as time is going on thru a system of hydration of the cement paste, generating a required energy to withstand the weight. The use of rubber seed shell as coarse mixture in concrete has not ever been a ordinary repetition some of the average citizens, in particular in regions wherein light weight concrete is required for non-load bearing partitions, non-structural flooring, and strip footings. Rubber is grown in greater than ninety three international locations. South East Asia is regarded because the beginning of India. India has the major cultivation of rubber about 18 million tones production yearly with 3 million hectares region. The experiment was performed on concrete containing the Rubber seed shell and Silica fume because the partial alternative of Cement and coarse combination at 5%,10%,15%.***

***Keywords – Rubber seed shell, Silica Fume, Concrete, Crushed rock, Fine Aggregate, Coarse Aggregate.***

## I. INTRODUCTON

In the world there are many countries wherein rubber seed shell is cultivated at a big level. Here some information is furnished consistent with manufacturing of rubber seed shell a place under the rubber seed shell cultivation. The rubber seed shell enterprise in India debts for over a quarter of the arena's overall rubber seed shell oil output and is usual to develop similarly with the worldwide boom in petition. However, it's also the main supplier to the country's pollution hassle as a solid waste in the usage of shells, which entails an annual manufacturing of approximately three.18 million tones.

Rubber seed shell represents greater than 60% of the home waste volume. Rubber seed shell, which gives critical dumping problems for neighborhood environment, is an copiously to be had agricultural waste from local rubber seed shell industries. In growing international locations wherein abundant agricultural and business wastes are discharged, those wastes may be used as potential fabric or substitute fabric inside the production industry. This will have the double benefit of discount inside the price of construction fabric and also as a means of disposal of wastes. The concrete acquired the usage of Rubber seed shell aggregates fulfills the minimal necessities of concrete. Concrete the usage of Rubber seed shell aggregates led to desirable electricity required for structural concrete. Rubber seed shell might also offer itself as a coarse mixture as well as a capacity production fabric inside the subject of building industries and this would resolve the ecological trouble of reducing the generation of strong wastes concurrently. The Rubber seed shell-cement composite is well matched and no pre-treatment is required. Rubber seed shell concrete has better workability due to the clean floor on one facet of the shells. The effect confrontation of Rubber seed shell concrete is excessive while related with conventional concrete. Humidity retaining and water soaking up ability of Rubber seed shell are greater in comparison to standard aggregate. The amount of cement content can be more while Rubber seed shell are used as combination inside the production of concrete as compared to standard aggregate concrete so silica fume is added. It is found that wooden based totally substances, being difficult and of natural origin, will no longer pollute or leak to provide poisonous substances as soon as they're bound in concrete matrix. Rubber seed shell needs no pre remedy, except for water absorption.

Use of rubber seed shell aggregate in concrete as structural light-weight concrete is usually recommended. Rubber seed shell combination is a likely creation fabric and concurrently condenses the ecological problem of solid waste.

## II. INVESTIGATIONAL MATERIALS

Materials required for making traditional concrete ,rubber seed shell and silica fume are gathered from the nearby supply, the diverse substances required are cement, silica fume, quality combination, coarse combination and rubber seed shell. The various materials collected are organized and batched for casting.

The rubber seed shell is wiped clean and soaked in water for 3 hours for saturated floor dry circumstance of rubber seed shell that are immersed in water for an hour and dry it in atmospheric temperature to obtain the nation not to study water from the concrete.

Materials which are used for making concrete had been examined before casting the specimens. The residences obtained from the checks have been utilized in blend layout. The preliminary assessments have been carried out for the subsequent materials. Cement

- Silica fume
- Fine aggregate
- Coarse aggregate
- Rubber seed shell

**a. Cement**

Portland cement produced via Sankar Company has been used all through this investigation. Cement is the peak extensively used cementations Element in modern concrete. The feature of cement is major, to discover the exceptional aggregate together and 2nd to fill the voids in between nice combination to from a compact mass. Ordinary Portland Cement (OPC) 53 Grade conforming to Indian Standard IS 12269:1987 become used as a binder. The property of Cement are proven in Table1

**Table1 cement**

| SL NO | PROPERTY | VALUE |
|---|---|---|
| 1 | Normal Constancy | 30% |
| 2 | Specific Gravity | 3.14% |
| 3 | Fineness of Cement | 7.2% |
| 4 | Intial Setting Time | 90minutes |
| 5 | Final Setting Time | 540minutes |

**b. Fine Aggregate**

River sand (from Nagercoil) was used during the investigation as the fine aggregate imitating to grading zone III as per IS 383:1970. Natural sands and gravels are the product of enduring and the action of wind or water, while manufactured crushed fine aggregate and crushed stone coarse and fine aggregate are shaped by crushing natural stone. Crushing, selection and coating may be used to process aggregates form either sand and gravel deposits or stone quarries. The property of Fine aggregate are shown in Table 2.

**Table 2 Fine Aggregate**

| SL NO | PROPERTY | VALUE |
|---|---|---|
| 1 | Specific Gravity | 2.64 |
| 2 | Fineness Modulus | 3.75 |

**c. Coarse Aggregate**

The natural coarse aggregates obtained from the nearby available quarries with maximum size of 20mm and filling the grading requirements of BLS (IS: 383-1970) is used in both normal and recycled aggregate concrete. The specific gravity of coarse aggregate is 2.5 and the fineness modulus of 2.88. The crushing value of the coarse aggregate used as 31.25%, the ideal aggregates should be clean, cubical, angular, crushed with a minimum of large enlarged surface. The property of Coarse aggregate are shown in Table 3.

**Table 3 Coarse Aggregate**

| SL NO | PROPERTY | VALUE |
|---|---|---|
| 1 | Specific Gravity | 2.65 |
| 2 | Fineness Modulus | 3.75 |
| 3 | Impact Factor | 25% |

**d. Rubber Seed Shell**

The freshly discarded shell was together from the local rubber plant area and they were fine weathered. The seasoned RSS is crushed by physically. The crushed edges were uneven and sharp and the lengths are restricted to a extreme of 12.5mm. The surface consistency of the shell was properly even on concave and bumpy on convex faces. RSS aggregates used ware in soaked surface dry (SSD) condition. The property of Rubber seed shell are shown in Table4.

**Table4 Rubber Seed Shell**

| SL NO | PROPERTY | VALUE |
|---|---|---|
| 1 | Specific Gravity | 0.8125 |
| 2 | Fineness Modulus | 2.65 |
| 3 | Impact Factor | 16% |

**e. Silica Fume**

Silica fume is a consequence of producing silicon metal or Ferrosilicon alloy. One of the most valuable uses for silica fume is concrete. On behalf of of its compound and substantial properties, it is a very combative pozzolanic. Concrete containing silica fume can ensure great strength and hard-wearing. The Specific Gravity of Silica fume is 2.2.

## III. EXPERIMETAL METHODOLOGY

**a) Mix Design**

The Mix design are through as per IS:10262-1982. The Following Design mix are shown in Table6

**Table 6 Mix Design**

| Mix | Cement ($kg/m^3$) | Fine aggregate ($kg/m^3$) | Coarse aggregate ($kg/m^3$) | Water (litre) | Silica Fume ($kg/m^3$) | Rubber seed shell ($kg/m^3$) |
|---|---|---|---|---|---|---|
| 0 | 425.78 | 545.246 | 1163.036 | 191.6 | - | - |
| 5% | 404.5 | 545.246 | 1104.88 | 191.6 | 21.29 | 58.15 |
| 10% | 383.20 | 545.246 | 1046.73 | 191.6 | 42.57 | 116.30 |
| 15% | 361.913 | 545.246 | 988.58 | 191.6 | 63.86 | 174.45 |

**b) MIX PROPORTION**

The Mix Proportion of $M_{25}$ Concrete mix design is 1:1.28:2.73.

## IV. TESTING RESULT

**a) Compressive Strength Test**

Concrete cubes are casted at the size of 150mm x 150mm x 150mm and tested by Compression Testing machine at the 7,14 and 28days respectively. The Following Table 7,8 shows the Compressive strength for 7,14,28 days. The figure1,2 shows the Comparison chart for Compressive and Tensile strength.

**Table 7 Compressive strength for 7,14 and 28days**

| Mix Ratio | 7 Day | 14 Day | 28 Day |
|---|---|---|---|
| 0% | 17.05 | 22 | 24.6 |
| 5% | 16.45 | 21.22 | 23.5 |
| 10% | 6.6 | 8.8 | 11.7 |
| 15% | 5.5 | 11.11 | 13.7 |

**b) Split Tensile strength Test**

The Following outcomes for the Split tensile are shown in the Following Table8.

**Table 8 Split Tensile strength for 28days**

| Mix Ratio | 7 Day | 14 Day | 28 Day |
|---|---|---|---|
| 0% | 5.4 | 7.61 | 8.56 |
| 5% | 3.4 | 7.07 | 8.05 |
| 10% | 4.07 | 8.20 | 7.58 |
| 15% | 3.67 | 3.69 | 5.66 |

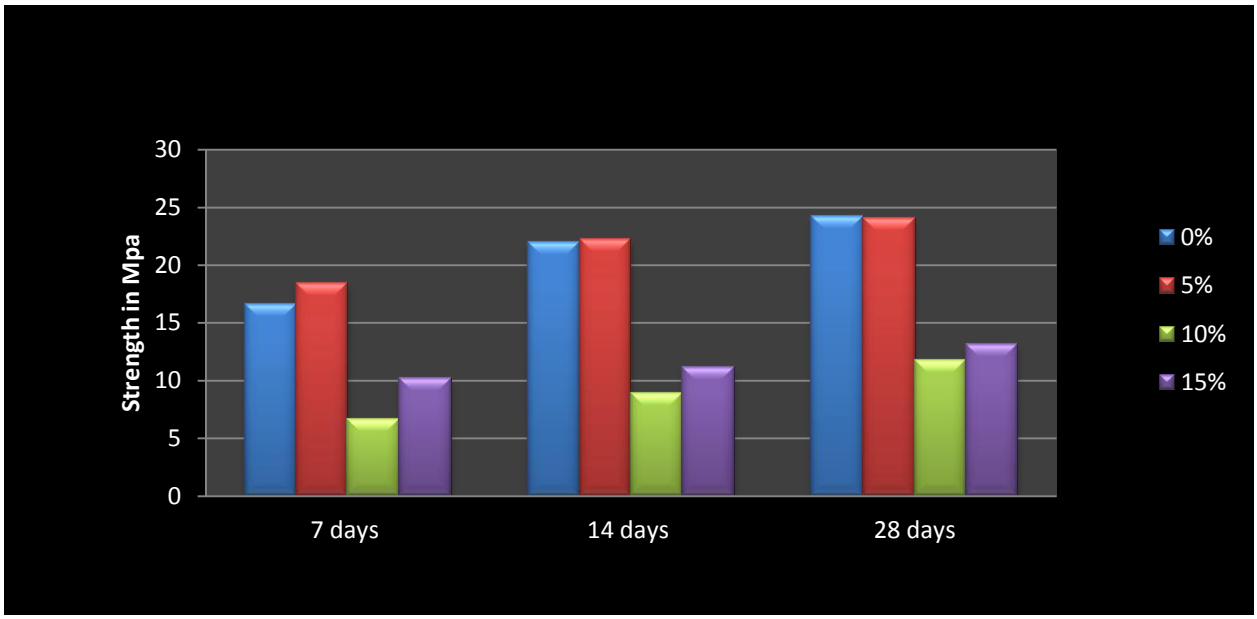


Fig1.Compression Test chart for 7,14,28days

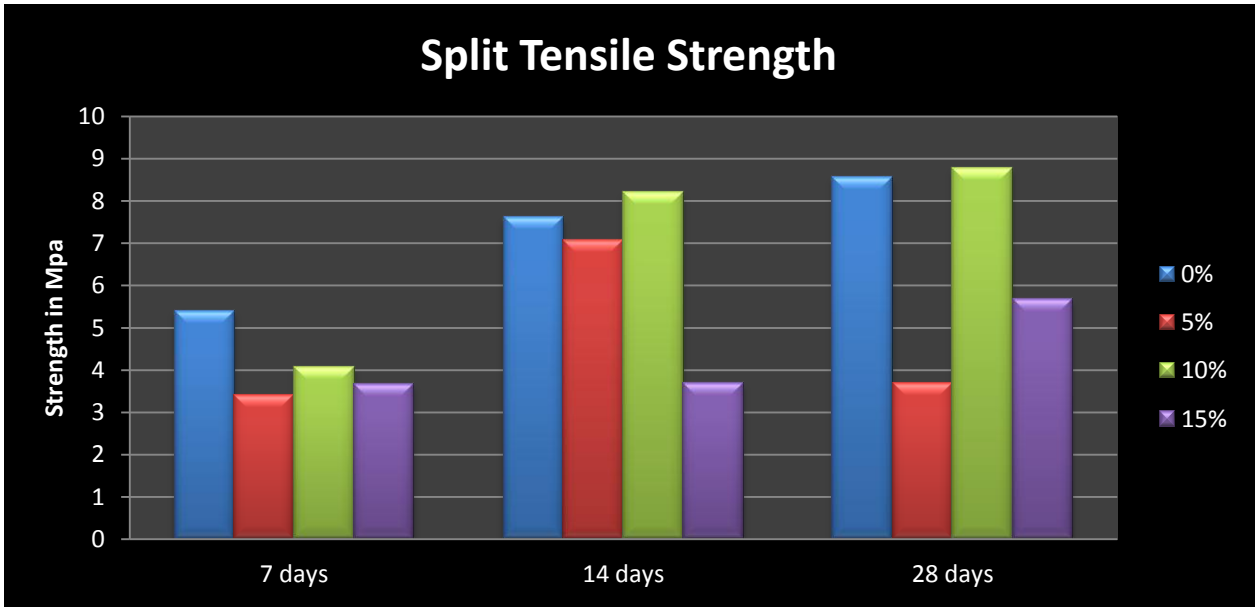


Fig2..Compression Test chart for 7,14,28days

## V. CONCLUSION

It is analyzed that inside the substitute of coarse mixture with rubber seed shell , it boom within the percentage of substitute it decreased the compressive energy of the concrete, through accumulation silica fume as a replacement of cement it's going to increase the compressive power. Density reduced on the increment of percentage substitute. It can be used as a mild weight concrete. The facts offered in this take a look at shows that there's a hopeful possible for using crushed rubber seed shell and silica fume in concrete cloth construction. Replacement of beaten rubber seed shell and silica fume that is round 5 to ten% might be capable of produce blend with compressive power appropriate for utility in concrete take a look at.

So rubber seed shell be used as slice alternative of coarse mixture and silica fume as fractional substitute of cement as there may be marginal distinction in energy between rubber seed shell and convention combination. Because of its far a waste fabric and abundantly to be had inside the vicinity of its manufacturing and near the industry used rubber, you possibly can moderate the powerful fee of the concrete and it's also useful for the ecological factor of view.

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