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EXPERIMENTAL STUDY ON THE PROPERTIES OF CONCRETE BY USING NEEM SAP AS NATURAL ADMIXTURE

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ABSTRACT

As the demand for sustainable and eco-friendly construction materials continues to rise, scientists are considering natural admixtures as an alternative to conventional chemical additions. The objective of this study is to determine the effects on concrete's properties by incorporating Neem Saap, an all-natural substance derived from neem leaves, into the material. The bioactive properties of neem (Azadirachta indica), which include antifungal and antibacterial properties, raise the possibility that concrete is more suited to tropical and humid climates.

The incorporation of Neem Saap into the concrete mixture influences several crucial properties, including workability, setting time, compressive strength, and resistance against microbial attack. There is some preliminary evidence that Neem Saap may have a little effect on water reduction and a slight delay in setting time, making it a potentially useful product to keep on hand when the weather becomes hot. The bioactive components of this material increase its resistance to mold, bacteria, and algae, making it perfect for buildings that are exposed to dampness.

Sustainable and environmentally friendly construction is possible according to Neem Saap's plan, which advocates for the use of organic, locally obtained resources while reducing the usage of synthetic additives.

This empirical investigation evaluates the material's performance in comparison to that of M30 Grade concrete blended with 0, 4, and 5 milliliters of neem sap, in that order.

The material of choice for construction in every nation is concrete. Since weather patterns and construction methods may vary greatly, a wide range of admixtures have been used to cater to the specific requirements of each structure.

INTRODUCTION

The compressive strength, not the tensile strength, of concrete, a composite material, is its strongest suit. Adding different compounds to concrete may make it perform better under compressive forces.

Concrete is used for a lot of construction jobs. Aggregates (such pebbles, sand, or crushed stone), water, cement, and sometimes chemical additives are the primary components of this composite. Due to its pliability when initially mixed, concrete lends itself well to molding. Hydration is the chemical reaction that makes things harden and becoming harder over time.

The many uses, high compressive strength, and extended lifetime of concrete have contributed to its immense fame. Many types of infrastructure, including buildings, bridges, dams, and highways, rely on it to work properly. A variety of architectural styles may make use of it because of its versatility.

A wide variety of concrete types are available to you, including reinforced, precast, lightweight, and high-performance selections. Different types have different characteristics that make them ideal for certain types of construction projects.

Ignoring the many advantages of concrete does nothing to address the problem of carbon emissions from cement production. Sustainable construction methods are now in the planning stages.

During the mixing process, concrete is supplemented with chemical additives. Because of these changes, the concrete is no longer as workable, strong, durable, or resistant to environmental stresses. whether you want to know whether you can overcome challenges and build project-specific tangible, you should ask them. The most noticeable benefit of chemically treating concrete is that it improves its performance. Concrete is substantially enhanced in its behavior by the addition of additives. In this experiment, admixtures in proportions of 0, 2, 3, and 4 milliliters will be used to analyze cube and cylinder specimens. After seven days, we can see clearly how compressive and tensile strengths relate to one another.

OBJECTIVES

In this approach, the characteristics of neem sap may be discovered.

In order to determine the potential uses of neem sap.

In order to determine the tensile and compressive strengths.

evaluate its appropriateness.

in order to determine the effectiveness of neem sap, as an organic component to concrete.

determine how it will affect the concrete's workability, strength, and longevity.

In order to compare the performance of conventional concrete with that of concrete that contains neem sap.

The usage of sustainable and environmentally friendly building materials has increased dramatically. Natural Neem Saap, made from Neem leaves or extract, is one novel way to incorporate it to concrete. The antimicrobial and medicinal qualities of neem (Azadirachta indica) have been studied and may find use in concrete.

Modifying the workability, setting time, durability, and resistance to microbiological development of concrete is one of the many possible outcomes of adding Neem Saap to the mixture. The bioactive components of neem are particularly useful in tropical and humid areas because they increase resistance to microbial, fungal, and algal assaults. As a consequence, traditional chemical admixtures may have less of an effect on the environment.

The use of locally sourced materials in conjunction with this natural admixture technology promotes green building practices by making construction both more economical and less harmful to the environment. In order to determine whether or not using Neem Saap in ecologically friendly building is feasible and efficient, this research will examine its impact on the mechanical and physical qualities of concrete.

Neem sap is a natural remedy that combines the many useful properties of neem with organic solvents and tricalcium silicate. The primary objective of this research is to determine if neem saap can be used as a sustainable component in the cement manufacturing process. The bioactive components of neem saap may change the characteristics of cement. The natural ingredients in neem sap provide it the potential to improve binding and healing properties. Use of neem sap, an eco-friendly material, helps green building practices.

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LITERATURE REVIEW

1. Dhananjayan Venkataraghavan & H.C. Nagaveni (2005)

At the 36th Annual Meeting of the International Research Group on Wood Protection, the authors of the paper "Evaluation of Copperised Cashew Nut Shell Liquid and Neem Oil as Wood Preservatives" looked at how well neem oil mixed with copper naphthenate preserved rubber wood. Based on the study's findings, this combination greatly improved the wood's resistance to rot fungus and termites, suggesting it might be a sustainable option for wood preservation in building projects.

2.Ettagbor Hans Enukwa & Yilom Hyginus Ndang (2020)

A study published in the International Journal of Research -GRANTHAALAYAH titled "Effects of Neem Oil on the Preservation of Milicia excelsa: Evaluation of Termiticidal Effectiveness" delves into the use of neem oil as a wood preservative. The research found that neem oil-treated Milicia excelsa wood decreased termite damage and weight loss, suggesting it would be a more environmentally friendly alternative to traditional wood preservatives.

3. Ettagbor Hans Enukwa & Yilom Hyginus Ndang (2020)

"Effects of Neem Oil on the Preservation of Milicia excelsa: Evaluation of Termiticidal Effectiveness," a study by Enukwa and Ndang, suggests that neem oil might be utilized for wood preservation. Since neem oil decreased termite damage and weight loss in Milicia excelsa wood, their results imply that it may be a more environmentally friendly substitute for conventional wood preservatives in building.

4. Fadairo et al. (2021)

In the article "Study the Suitability of Neem Seed Oil for Formulation of Eco-Friendly Oil-Based Drilling Fluid" published by Fadairo and colleagues, the use of neem seed oil biodiesel in the creation of inverted emulsion drilling mud was examined. Neem oil drilling mud complies with API requirements and is fireproof, thus it might be utilized for green drilling initiatives.

EXPERIMENTAL WORK

BASIC TESTS ON MATERIAL

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1. FINENESS OF CEMENT

The rate of hydration and, thus, the increase in strength, are strongly influenced by the fineness of the cement. Cement with a finer texture may transmit heat more quickly. A higher hydration surface area allows cement to generate strength more quickly. Cement fineness increases owing to shrinkage, making structures more crack-prone.

Method Start by weighing 100 grams of the cement that is provided and continuously passing it through an I.S. sieve No. 9 (90) for a duration of 15 minutes. Instead of using scouring sifters, which is not suggested, you may use your fingers to separate air set knots. After the sieving procedure is finished, it is important to note the amount of material that has settled on the strainer in comparison to the original sample.

Observations

Trial no.	1	2	3
Weight of cement in grams	100	100	100
Weight of residue on sieve in grams	2.5	2.3	2.4
Amount retained(%)	2.5%	2.3%	2.4%

Table-3: Fineness of cement test observations

Calculations

Amount retained = 2.5+2.3+2.4/3 = 2.4%

Fineness of cement = 2.4%

2. SPECIFIC GRAVITY OF CEMENT

You can get a decent notion of the specific gravity of cement samples by weighing and measuring them, which will give you a general approximation of the volume or quantity of liquid that they displace. Prior to use, ensure that the liquid does not undergo any chemical reactions. Also, make sure the liquid doesn't soak into the cement or touch it in any way. The specific gravity of cement is the quantity of liquid it displaces, and its volume is equal to its weight, which may be determined by measuring and weighing cement samples. There shouldn't be any chemical reactions happening in the liquid that it will be utilized in. The

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liquid also shouldn't seep into the cement or touch it directly.

A specific gravity of 3.15 is typical for OPC. So long as the particular gravity is not called into dispute. Crushed sand, clay, and other minerals are examples of impurities that lower the specific gravity of cement.

Procedure

When filling the flask with kerosine, add 13.6 grams per cubic centimeter or until the measurement lands between the zero and one milliliter marks on the stem. Your initial reading will be shown the second your flask is immersed in water. While the liquid is still hot, add a little quantity of weighted cement, about 64g of Portland cement. If you're having trouble getting cement to flow into the flask or keeping it from becoming trapped, a vibrating gadget could be just what you need. After you've added all of the cement, place the cork in the flask.

Observations

weight of empty bottle (W1) = 30gm

Weight of bottle + cement (W2) = 60gm

Weight of bottle + cement + kerosene (W3) =90gm

Weight of bottle + kerosene (W4) =70gm

Weight of bottle + water (W5) =70gm

Calculations:

Specific gravity of kerosene = W4-W1/W5-W1

= 70-30/70-30 = 1

Specific gravity of cement = (w2-w1) / (w2-w1) – (w3-w4)* sp.gravity of kerosene

= (60-30) / (60-30) – (90 – 70) *1

= 3

Specific gravity of cement = 3.15

3. NORMAL CONSISTENCY OF CEMENT

Cement paste is considered to be of an appropriate consistency when the Vicat plunger is 5 to 7 mm deep from the base of the Vicat mold. This depth is dependent on the paste's water requirement. Cement paste is made less spreadable and harder and tougher by adding

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water.

Method To produce concrete, combine the water and cement in a basin and stir for three to five minutes. Do not stir the mixture any more as it begins to solidify. Before filling the Vicat mold with paste, mix the dry cement with water. Place the mold on a non-absorbent plate once you've distributed the paste to fill it to the brim. After combining the water and cement for three to five minutes, the mixture will begin to solidify. As soon as the dry cement is dampened, the timer starts counting down and keeps going until the mold is entirely filled with concrete. Fill the Vicat mold with paste using a non-porous plate, then level the surface to the top.

Observations and calculations

Cement sample taken = 300 grams

Percentage of water	Initial reading	Final reading	Height not penetrated (mm)
26%	50	32	18
28%	50	20	30
30%	50	12	38
32%	50	7	43

Table-4: Normal consistency test of cement test observations

Normal consistency of cement = 32%

4. INITIAL SETTING TIME

You can tell whether paste has set by how long it takes for a Vicat needle to get stuck within 5 millimeters of the mold's base; this is the measurement taken from the bottom of the mold.

Procedure

Use 0.85 times the amount of water needed to produce a standard consistency while making cement paste. Start the stopwatch the second water is added. Put the finished mold on a plate that won't absorb any liquids. Fill the Vicat mold to the brim with paste once you've smoothed the surface. Place the test book and the needle on the rod. Snug fit should be the goal. To insert the needle into the test block, release it the second it reaches the surface of the block. Continue until the needle can no longer penetrate the test block after

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5+0.5 mm. The test block; proceed until the needle is unable to pass through it anymore. The initial setting time is the amount of time that has passed after water was added.

Observations and calculations

Cement weight sample taken = 300gms

Weight of water taken = 0.85 P*300gm = 0.85*(82/100)*300 = 81.6ml

Where,

P is the normal consistency.

Time(minutes)	10	20	30
Initial reading	50	50	50
Final reading	2.5	3.5	5
Height not penetrated	47.5	46.5	45

Table-5: Initial setting time of cement test observations

Initial setting time of cement = 30minutes

5. SPECIFIC GRAVITY OF COARSE AGGREGATE

Finding the aggregate specific gravity (SG) for use in mixture design is the principal use of SG in concrete technology. By converting the weight of the various components into their solid volume using their specific gravities, one may determine the potential yield per unit volume. When calculating the compacting factor using workability data, it is also important to know the aggregate's specific gravity. Always keep the aggregate's specific gravity in mind while dealing with concrete, regardless of its weight. Aggregate has a fairly wide specific gravity range, which may be anywhere from 2.5 to 2.8.

Technical Approach We need to know its weight (W1) before anything else. When the container is halfway full with coarse aggregate (W2), you may start to weigh it. When transferring aggregates to a container, make sure to add enough water to completely

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submerge the coarse particles. Locate the spot where it makes a W shape. Fill the container with water after adding the coarse aggregate and water mixture. Filling coarse aggregate and determining its weight (W4) gets difficult when water levels are too low. Mix half water and half aggregate in the container to create a new route.

Figure-9: Specific gravity test of coarse aggregate

Observation & calculation

Observations	**Trial-1**
Weight of empty specific gravity bottle (W1gms)	530
Weight of bottle + aggregate (W2gms)	1190
Weight of bottle + aggregate + water (W3gms)	1890
Weight of bottle + water (W4gms)	1490

Table-6: Specific gravity test of coarse aggregate observations

Specific gravity = W2 - W1 / (W2 - W1) - (W3 - W4)

= 1190 - 530 / (1190 - 530) - (1890 - 1490)

= 2.5

specific gravity coarse aggregate = 2.5

6. SPECIFIC GRAVITY OF FINE AGGREGATES

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A substance's specific gravity may be calculated by dividing its mass by its water content and then dividing that result by its volume. Calculations for the volume output and moisture content of cement concrete are based on the specific gravity of the aggregate. The specific gravity of the aggregate is one measure that may be used to determine its properties. A material's specific gravity is one indicator of its quality and strength. Due to their very low specific gravities, many stones are vulnerable to damage in different ways.

Figure-10: Specific gravity test of fine aggregate

Observations

Observations	**Trial-1**
Weight of empty specific gravity bottle (gm)	540
Weight of bottle + aggregate (gm)	1260
Weight of bottle + aggregate + water (gm)	1930
Weight of bottle + water (gm)	1490

Table-7: Specific gravity test of fine aggregate test observations

Specific gravity = W2 – W1 / (W2 – W1) – (W3 – W4)

= 1260- 540 / (1260 – 540) – (1930 – 1490)

= 2.5

Specific gravity of fine aggregate = 2.5

7. SIEVE ANALYSIS OF FINE AGGREGATE

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A material's fineness modulus may be calculated by multiplying the total amount of material that can be retained on standard-sized sieves by 100. One alternative view is that the material is kept on a weighted average sieve, with successively finer sieves arranged at the bottom (a 150-micron sieve is utilized in this case).

One way to visually portray the findings of a sieve analysis is using a grading curve. This kind of graph is drawn on semi-log paper and shows the passing percentage and matching sieve opening for each sieve. Alternatively to the semi-log plot, you might use a graph where each consecutive sieve is half the size of the preceding big one. The provenance of the bigger materials used to mine or crush the sand for concrete determines its quality. Classification of sand into zones I through IV is determined by the proportion of sand that passes through a 600-micron screen, according to IS:2386.

Figure-11: Sieve analysis of fine aggregate

Observations and calculations

Weight of fine aggregate = 1000gm.

Sl. No.	Sieve sizes (mm)	Weight retained	cumulative weight retained	Cumulative Retained %	%age weight passing
1	4.75	0	0	0	100
2	2.36	7.07	7.07	0.70	99.3
3	1.18	361.7	43.24	4.29	95.71
4	600mic	252.19	295.43	29.32	70.68
5	300mic	370	665.43	66.05	33.95
6	150mic	307.94	973.37	96.61	3.39
7	90mic	29.5	1002.87	99.54	0.46
8	pan	4.59	1007.46	100	0

Table-8: Sieve analysis of fine aggregate observations

Fineness modulus = Cumulative % of wt. retained/100 = 396.51/100 = 3.96

The fineness modulus of fine aggregate = 3.09

8. SPECIFIC GRAVITY OF NEEM SAP AS A NATURAL ADMIXTURE

Procedure:

Weight of empty specific gravity bottle (w1)	0.028
Weight of specific gravity bottle + Distilled water (w2)	0.082
Weight of specific gravity bottle + Sample liquid (W3)	0.094

Table-9: Specific gravity test of neem sap observations

Specific gravity of neem saap = w3 - w1 / w2 - w1

= 0.094 - 0.028 / 0.082 - 0.028

= 1.22

RESULTS AND CONCLUSION

SLUMP CONE TEST

Sl. No.	Neem saap admixture	Slump in mm
1	0 ml	80
2	3 ml	80
3	4ml	85
4	5ml	90

Table-12: Slump cone test observations

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Compressive strength test:

Neem saap admixture (ml)	1st Cube (N/mm²)	2nd Cube (N/mm²)	3rd Cube (N/mm²)	Average of 3 cubes (N/mm²)
0	18.22	19.77	20.08	19.33
3	22.47	23.19	23.95	23.20
4	23.72	24.48	25.28	24.49
5	24.97	25.77	26.62	25.78

Table-13: Compression strength of concrete test results after 7 days of curing

COMPRESSIVE STRENGTH AT 28 DAYS

Neem saap admixture (ml)	1st Cube (N/mm²)	2nd Cube (N/mm²)	3rd Cube (N/mm²)	Average of 3 cubes (N/mm²)
0	39.88	40.12	38.55	39.51
3	45.31	44.89	44.12	44.77
4	46.21	46.05	46.82	46.36
5	54.12	53.33	52.88	53.44

Table: Compressive strength of concrete at 28 days

Split tensile strength test:

Admixture in ml of concrete	1st Cylinder (N/mm²)	2nd Cylinder (N/mm²)	3rd Cylinder (N/mm²)	Average of 3 cylinders (N/mm²)
0	2.44	2.32	1.93	2.23
5ml	4.55	4.23	4.42	4.40

Table-14: Split tensile strength test of cylinder observations

CONCLUSION

All of the materials we use to make castings—cement, fine aggregates, and coarse aggregates—are up to code, so we can utilize them. After the concrete had cured for seven days, its compressive and split tensile strengths were measured.

These conclusions were reached based on the results of the tests:

The concrete's compressive and split tensile strengths were measured after 7 and 28 days of cure.

The concrete sample was mixed with neem sap, a natural additive, in three different volumes: 0, 4, and 5 milliliters.

M30 grade concrete cubes' compressive strength increased to 0 ml, whereas the weight-based target mean strength remained same for 3, 4, and 5 ml of addition.

Five milliliters of the mixture with the additive had a maximum compressive strength of 53.44 N/mm2 after 28 days, whereas zero milliliters of the mixture without the additive had an ideal value of 39.51 N/mm2.

After 7 days of curing, the maximum spilt tensile strength improved to 4.40 N/mm2, from 2.23 N/mm2 without an admixture.

The results show that the compression strength is enhanced with the addition of 5 ml of the admixture.

CHAPTER- VI
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