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Study of Ecofriendly Admixture in Concrete

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Abstract: *To enhance workability and strength, water-reducing chemicals are commonly used, but their production emits CO2 and poses environmental and cost concerns. The research explores the potential of plant extract, specifically cypress extract, as an eco-friendly and cost-effective alternative admixture for concrete. Previous studies have shown positive effects of organic admixtures, including polysaccharides and bio-admixtures from water hyacinth, on concrete rheology and strength.*
This research aims to determine the viability of cypress extract as a sustainable admixture, offering an environmentally friendly solution to reduce reliance on imported, patented chemicals and mitigate the environmental impact of the cement industry.

Keywords: Concrete admixtures, Cypress, extract, Organic admixture, Eco-friendly alternatives

I. INTRODUCTION

The research addresses environmental and economic concerns associated with the use of proprietary chemical admixtures in concrete production. It explores the potential of cypress extract, derived from the bark of the cypress tree, as an eco-friendly and cost-effective alternative. Extracts were prepared through boiling or soaking the bark, and varying dosages (5%, 10%, 15%) were used as admixtures in concrete cubes at a constant slump.
Results showed that cypress plant extract acted as a concrete retarder in hot climates by delaying the cement setting time. Additionally, at a constant liquid: cement ratio, the extract increased workability or reduced the liquid requirement of the concrete mix at a constant slump. The compressive test results revealed that elevated dosages of the plant extract led to improvements in concrete compressive strength. Consequently, it can be concluded that the utilization of cypress plant extract enhances strength at a consistent slump and improves workability at a constant liquid-to-cement ratio
This research proposes a sustainable alternative to conventional chemical admixtures, addressing both environmental concerns and the high costs associated with imported patented products in the concrete industry. The significance of concrete as a widely used construction material is emphasized, highlighting the potential positive impact of adopting eco-friendly practices in its production.

II. LITERATURE REVIEW

The studies mentioned in the provided papers highlight the potential benefits of incorporating innovative materials and techniques into concrete construction. These approaches aim to improve sustainability,reduce environmental impact, and enhance the performance of concrete in various ways, such as through rainwater harvesting, extended setting times, increased workability, and enhanced strength. The research findings suggest that these methods may contribute to more eco-efficient and durable concrete structures, emphasizing the importance of environmentally friendly practices in the construction.

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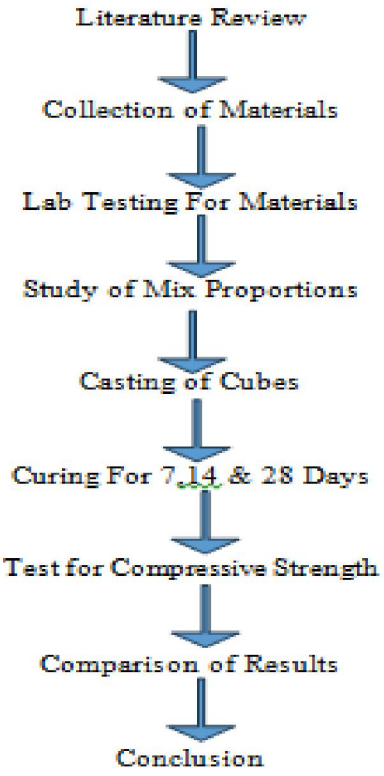
III. METHODOLOGY

3.1 Flow chart



3.2 Material used:

3.2.1 Cypress Tree Extract

The cypress tree extract used as an admixture was prepared by boiling cypress bark in water .Bark of cypress was cut in to very small pieces and then1kg of the bark was boiled with four litter of water for two hours. From boiling an average of 800ml/kg was obtained. Water was shaken vigorously for 5 minutes.

Fig.3.2.1 Cypress Tree

3.2.2 Cement

The cement used was Ordinary Portland cement (OPC) of grade 43. the cement has initial and final setting time 30 minutes and 10 hours respectively

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3.2.2 Fine Aggregate

Locally available river sand was used. The fine aggregate has the properties such as fineness modules of 3.26 , specific gravity of 2.6, Bulk density of 1471kg/m3and moisture content of 8%.

3.2.2 Coarse Aggregate

The coarse aggregate used for this research was crushed stone aggregates having nominal size 20 mm. The aggregates having properties such as fineness modulus 3.2,specific gravity 2.8.

3.2.3 Water

The water used for concrete mix and curing the specimen was tap water. The water was clean and free from impurities**.**

3.3 Methodology

3.3.1 Concrete Mix

For this research the mix ratio of M25 grade was used. The mix ratios was Mix (1: 1: 2) for cement: sand: coarse aggregate, and for the mix ratio slump of 50mm was used.

3.3.2 Workability

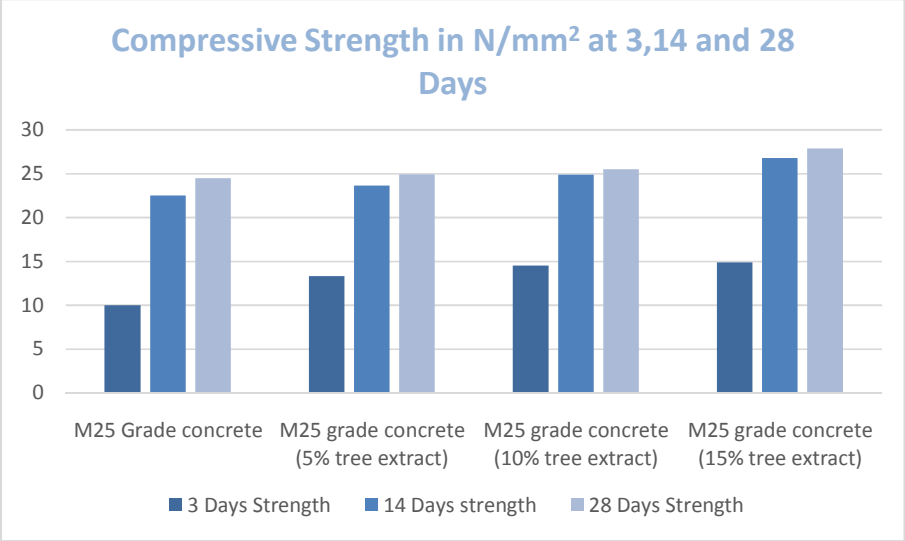
The workability of concrete was measured with the help of slump cone apparatus.the concrete mix shown the workability value as 50mm.

3.3.3 Compressive Strength

Cubes of 150x150x150mm were used for testing the compressive strength of concrete. A total of 18 cubes were tested out of total 18 cubes 9 cubes made with normal M25 grade concrete and remaining 9 cubes made with M25 grade concrete containing water with cypress tree extract at dosages of 5, 10 and 15%.The cubes were tested for 3 Days,14 days and 28 days strength under CTM

IV. TEST RESULTS

	M25 Grade concrete	M25 grade concrete (5% tree extract)	M25 grade concrete (10% tree extract)	M25 grade concrete (15% tree extract)
3 Days Strength	10	13.33	14.52	14.87
14 Days strength	22.5	23.64	24.88	26.77
28 Days Strength	24.5	24.9	25.49	27.87



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V. CONCLUSION

After conducting experiments and analysing the impact of plant extracts on the characteristics of both fresh and hardened concrete, the following conclusions can be drawn:

a) In regions with high temperatures, this material can function as a retarder

b) The incorporation of cypress plant extract improved the workability of the concrete while maintaining a constant liquid-to-cement ratio, thereby enhancing the fresh properties of the concrete.

c) The utilization of cypress plant extract at a constant slump led to an enhancement in the concrete strength, thereby improving the hardened properties of the concrete

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