iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** III **Month of publication:** March 2025

DOI: https://doi.org/10.22214/ijraset.2025.67786

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue III Mar 2025- Available at www.ijraset.com

Evaluation of Certain Attributes Derived from Tobacco and Sugarcane Products for the M30 Categorization

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Abstract: Population development has been further developed, providing enormous requirements for increasing scaffolding. This demand results in increased cement production. The huge amount of luxury materials is provided by the production of companies such as silica exhaust, rice scale feeders, mineral slag and more. As a result, waste management has had a major problem with our environment. Economically important bagasse, molasses and channel press mud. Bagasse is a thread-shaped structure that remains as sugar cane is extracted. The sugar pipe bag consists of about 50% of cellulose, 25% of hemicellulose, and 25% of lignin. In the sugarcane industry package, the produced bagos is usually used as fuel, reducing its volume for transmission at the same time. One of the residues from the tobacco production line is tobacco stems, which are easy to collect when that generation is concentrated on the tobacco production line. This is driven by a true waste of resources and natural topics, as more than 95% of landfills and burned cigarettes have reached conclusions. Tobacco is created by burning these unwanted tobacco tribes. The exploration of the study here negotiates half the substitution of the combination by mass with SBA at the rate of 3%, 6%, 9%, 12%, and 15%, and at the combination of 3%, 6%, 9%, and 12%. After mixing, the characteristic quality of this new concrete is compared to the everyday concrete of the M30. Exploratory studies are carried out for print quality, sometimes flexible quality, and bending strength over 7, 14, and 28 days of cure time. The experiments suggest that the combination of a 21% exchange rate, including 12% SBA and 9% TWA, had higher values for print quality, bending strength and partial poison quality compared to other replacement processes.
Keywords: SBA (sugarcane bagasse fiery debris), TWA (Tobacco waste cinder), Compressive quality, Flexural quality and split pliable quality.

I. INTRODUCTION

Concrete may be a profoundly predominant substance on a worldwide scale. The basic to diminish vitality utilize is developing as a result of the wonder of worldwide warming. The impacts of worldwide warming have as of now saturated the lives of individuals around the world and are well recognized. The method of cement make requires a significant sum of vitality, coming about within the emanation of critical amounts of carbon dioxide (CO2) and the era of carbon monoxide. In any case, the fabricating prepares of Portland cement, which could be a essential fixing in concrete, emanates noteworthy amounts of carbon dioxide, a strong nursery gas. Particularly, the make of one ton of Portland cement clinker ordinarily yields around one ton of carbon dioxide and other nursery gasses. Nursery gasses (GHGs). The barometrical concentration of carbon dioxide has risen by over 30 percent amid the past two centuries. The cement and concrete industry's maintainable development is altogether impacted by natural concerns. To play down cement utilization and relieve natural contamination, it is essential to substitute certain parcels of cement with volcanic fiery remains components. Around 111 million tons of managed junk from household, commercial and mechanical rubbish are tossed in UK landfills each year, raising squander transfer costs and natural issues. Utilizing reused items will assist you spare landfill space and transfer costs. Utilizing reused materials employments less vitality than virgin assets.

Including supplemental cementitious materials (SCMs) to concrete is one way to reduce the natural impact of the cement generation handle. SCMs are substances that, when utilized within the making of concrete, can somewhat supplant normal cement. This will diminish the vitality utilized and nursery gas outflows related with the generation of cement. Squander materials from mechanical operations such as fly cinder, slag, lime slime, SWA, TWA, wollastonite, GGBS, glass powder and silica smolder are cases of common SCMs. These substances can increment workability, quality, and durability whereas bringing down the desired cement substance. Moreover, by diminishing shrinkage and breaking, upgrading resistance to chemical ambush and freeze-thaw cycles, and amplifying the life expectancy of structures, the utilize of SCMs will improve the long-term execution of concrete.

The utilize of SCMs within the fabricating of concrete has the potential to make strides the long-term execution and flexibility of concrete structures whereas decreasing the natural effect of building hones. Including SCMs to ordinary cement blends is known as ternary and quaternary folios, and they are elective strategies for improving concrete execution. A few examinations have been carried out to look at the microstructure, quality, and toughness of quaternary concrete composites, taking under consideration the effect of different components. Moreover, thinks about utilizing strategies like computerized picture relationship have been done on the break parameters and adequacy of concretes made utilizing quaternary blended cements.

Sugarcane Bagasse Ash

Bagasse is a by-product of the sugar industry and is burned to produce the energy needed for various processes in the factory. When sugar cane pulp is burned, the resulting bagasse ash has antagonistic properties that can be used as a cement raw material. It is understood that the total value of sugar in the world is over 1.5 billion tons. Sugar recovery from bagasse is around 10% and about 8% of the waste in bagasse is bagasse ash, so the treatment of bagasse ash is very important. Bagasse ash has recently been tested worldwide as a material that can be used instead of cement. It has been found that bagasse ash can improve some properties of mortar, grout and concrete, such as compressive strength and water resistance, at certain conversion and refinement rates. These improvements are thought to be due primarily to the higher silica content in bagasse ash. Although silicate content can vary from ash to ash, depending on the composition and other properties of the raw material (e.g. the soil in which the product is grown), silicates have been reported to interact antagonistically with cement hydration products, resulting in the formation of white lime in concrete. reduce.

Figure 1 Sugarcane Bagasse Ash

Tobacco Waste Ash

Cigarette stalk is one of the remaining products of the cigarette factory and is easy to collect since its products are concentrated in the tobacco area. This causes great damage and environmental problems as more than 95% of tobacco stalks are thrown into landfills or slaughterhouses. Therefore, the residues must be disposed of in an environmentally friendly manner. Tobacco ash is produced by burning tobacco stalks. It shows high pozzolanic activity. Ashes are not pozzolanic material, they have pozzolanic activity, but this activity is lower than pozzolanic materials. Ash has a filling effect; this effect is mainly dependent on the quality of the material, namely the nucleation effect and the filling effect. When small particles are dispersed in the cement mixture, the nucleation effect occurs and a better hydration reaction occurs, and when the voids in the paste are filled with good products, the filling effect occurs.

The smoke cleaning ash used in the experiment was produced by purchasing and then burning tobacco sticks, and then passing the ash through a 425 µm screen to remove impurities. The ash is ground in a machine in Los Angeles to reduce the particle size to 90 microns. The silica content in flue gas ash depends on temperature and burning time. Therefore, we can obtain different products from different sources of cigarettes. In order for a material to be considered pozzolanic, the total content of silica, aluminum oxide and iron oxide must be less than 70 percent.

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Figure 2 Tobacco Waste ash

II. LITERATURE REVIEW

Prince Saini, Sourabh Lalotra 2023 [1] As demand for infrastructure, energy and resources continues to grow, so does the demand for concrete. One danger comes from the large amounts of carbon dioxide emissions during cement production. When the leaves dry and burn, they produce ash known as volcanic ash. The carbohydrate content in bamboo plays an important role in improving energy and health. Next-generation concrete buildings must replace half of the aggregates in order to adapt to the environment. Natural resources are increasing. We decided to change the equipment. In the current study, TWA and BLA are partially replaced by cement and sugar cane fiber is added. The best percentage is found to replace smoke waste and bamboo leaf ash with 12% and 12% cement and reinforced with 0.6% sugar fiber. When we increase the percentage of TWA and BLA, the workability of the mixture increases, then the workability of concrete decreases. A test was conducted to measure the compressive strength, splitting tensile strength and flexural strength of concrete. The results showed that the compressive strength, splitting tensile strength and flexural strength of sugar cane fiber blended cement increased with the addition of TWA and BLA.

Anil Kumar, Priyanka Dubey 2023 [2] These studies aim to meet the needs of sustainable construction by combining OPC (ordinary silicate cement) and cement mixtures using different minerals in concrete. In this study, M20 class concrete mixture with a water-cement ratio of 0.48 was used. Glass dust and bagasse ash are used partially instead of cement. Glass dust is a non-toxic and recyclable material that will not remain in landfills for a long time. Broken glass waste can be used effectively in the infrastructure sector. Bagasse ash is a by-product of sugar cane. In this study, the amount of cement was investigated with a change of 5% from 30% to 0% and the amount of glass dust and bagasse ash with a change of 0% to 30%. 5%. Seven different combinations were examined, especially at two different ages, 7 days and 28 days. The compressive strength of concrete blocks containing different percentages of replacement was examined and compared with concrete to determine the appropriate mixture. In addition, the flexural strength of the concrete of the visible mixture was analyzed and some durability was investigated.

Choudhary Asif Ali, Sourabh Lalotra 2022 [3] Nowadays, people are showing more interest in the production of environmentally friendly products. The waste flue gas has the characteristics of fineness, amorphous quality and high silica content, so the ability to use or replace strong pozzolanic active refractory bricks in the metallurgical industry should be investigated to show that it is cyclical to nature. The refractory bricks that are released after use are called used refractory bricks. Waste refractory bricks should be disposed of as waste and should not create environmental problems near the disposal site. Garbage is often thrown into landfills. Similarly, waste refractory bricks are also used as flooring materials. TWA refractory bricks and other services. Partial replacement of aggregates is the need for the next environmentally friendly concrete. Natural resources are increasing. We decided to change the equipment. In this study, TWA was partially replaced by cement and fine aggregate was partially replaced by waste refractory bricks. The best value in terms of compression, splitting tensile and flexural strength is obtained by replacing TWA12% SFB24% with cement and replacing the good mixture with refractory bricks. When we increase the percentage of TWA and waste refractory bricks, the properties of the mixture increase, then the properties of the concrete decrease. Concrete compressive strength, splitting tensile strength and flexural strength tests were conducted. The results showed that compressive strength, splitting tensile strength and flexural strength were obtained by adding refractory bricks and TWA.

K. Ashwin Thammaiah, P. Manu Prasadet al., 2022 [4] This study was conducted to understand the properties of cigarette waste and to examine the new and hardened state of self-compacting concrete produced using cigarette waste ash as part of cement. Tobacco ash is a by-product of the industry and is considered waste, but it can be used as part of cement, thus reducing the need for cement and promoting the development of stables. To understand the content of cigarette waste ash as well as cement and fly ash. The self-compacting mixture follows Su Nan's mix design method. The best replacement percentage corresponding to the maximum compressive strength is determined by half-replacing the cement with 10%, 12%, 14%, 16%, 20%, 25% and 30% of waste smoke. The results showed that while changing the quality of cement, the new state properties such as cohesion and separation are also improved and have effects on hard objects such as compression, bending tension and splitting. . tension Tensile strength also has a positive effect percentage.

III. MATERIALS

A mixture of cement or binder is added to materials or components to fill the gaps left by assembly and joints to make concrete. This experiment aims to ascertain how the Sugarcane bagasse ash -Tobacco waste ash (SBA-TWA) combination affects the mechanical characteristics and longevity of M30 standard concrete. We looked at the strength of concrete that had 3%, 6%, 9%, 12%and 15% Sugarcane bagasse ash added. Increased cement can be substituted with mineral materials such as Tobacco waste ash (3%, 6%, 9%&12%), provided that the Sugarcane bagasse ash replacement percentage stays constant.

The primary components utilized in this investigation are water, fine and coarse aggregate, Sugarcane bagasse ash -Tobacco waste ash and cement. High-quality materials that meet IS: 383-2016 standards, Conforms to IS: 383-2016 Water [Portable], Coarse Aggregate, Sugarcane bagasse ash -Tobacco waste ash.

Class 53 Common Portland Cement, adhering to IS: 269-2015
Fine Aggregate, adhering to IS: 383-2016
Coarse Aggregate, according to IS: 383-2016
Water [Portable]
Sugarcane bagasse ash &Tobacco waste ash
Super plastisizer Conplast wl xtra

IV. EXPERIMENTAL INVESTIGATION

Normal Consistency of Cement	34%
Setting Time of Standard Cement	Initial -48 min & Final - 460 min
Specific Gravity Of Cement	3.10
Fineness Test of Cement by Sieve Analysis	97%
Soundness of Cement	3 mm
Fineness Modulus of Fine Aggregate	4.07
Fineness Modulus of Coarse Aggregate	3.9
Specific Gravity of Fine aggregate	2.56
Water Absorption Test on Fine Aggregate	1.59%
Bulking of Fine Aggregate	9.09%
Specific Gravity & Water Absorption of Coarse aggregate	2.68 1.68%

V. MIX DESIGN

Grade	M30
Proportion	1:1.99:3.47
W/C ratio	0.42
Cement	359.8 Kg/m^3
Fine Aggregate	717.61 Kg/m^3
Coarse Aggregate	1250.14 Kg/m^3
Water	151.12 Kg/m^3
Chemical admixture	2.68g/m^3

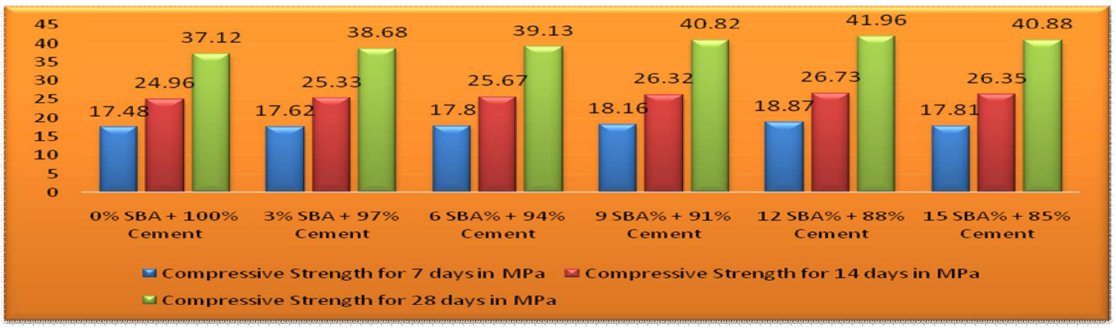
VI. PERFORMANCE TESTING AND RESULTS

An experimental study was conducted by mixing M30 quality concrete. Preparation of concrete mix for M30 grade concrete as per IS: 10262-2019. Five mixtures were prepared in which 3%, 6%, 9%, 12%& 15%Sugarcane Bagasse ash was added to the cement, respectively. It was determined that maximum strength was achieved by replacing the concrete by 15%. For this reason, the replacement of cement with 15% Sugarcane bagasse ash was kept constant and the samples were tested by replacing the cement with additional minerals (such as 3%, 6%, 9% &12% of Tobacco waste ash). A water/cement ratio of 0.40 was used for all mixtures throughout the study.

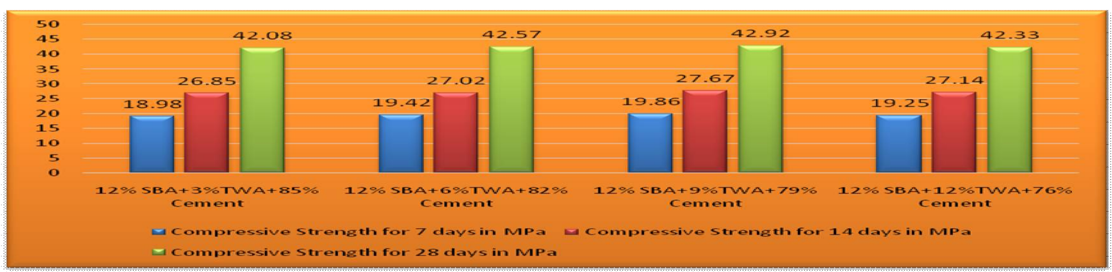
The Compressive Strength, Split Tensile Strength& Flexural strength results of M30 grade concrete after 7^{th}, 14^{th} and 28^{th} days curing are tested in the laboratory. The results are tabulated and graphs are represented below.

Table 1 Test results of Compressive Strength for 7, 14 & 28 days for M30

Mix % Replacement	Compressive Strength for 7 days in MPa	Compressive Strength for 14 days in MPa	Compressive Strength for 28 days in MPa
0% SBA + 100% Cement	17.48	24.96	37.12
3% SBA + 97% Cement	17.62	25.33	38.68
6 SBA% + 94% Cement	17.80	25.67	39.13
9 SBA% + 91% Cement	18.16	26.32	40.82
12 SBA% + 88% Cement	18.87	26.73	41.96
15 SBA% + 85% Cement	17.81	26.35	40.88
12% SBA+3%TWA+85% Cement	18.98	26.85	42.08
12% SBA+6%TWA+82% Cement	19.42	27.02	42.57
12% SBA+9%TWA+79% Cement	19.86	27.67	42.92
12% SBA+12%TWA+76% Cement	19.25	27.14	42.33



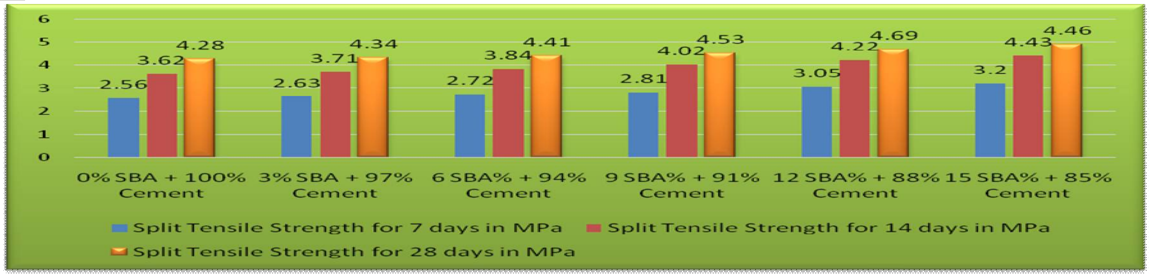
Graph 1 Development of Compressive strength after curing 7, 14& 28 days for M30



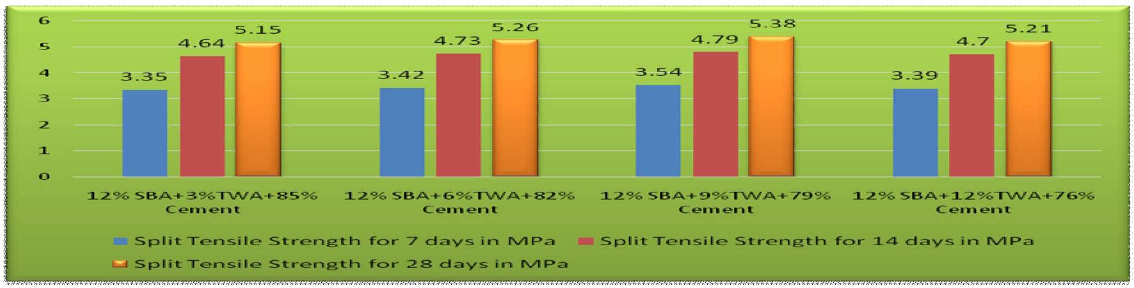
Graph 2 Relation between optimum SBA (12%) +%TWA replacement and Compressive strength

Table no 2 Test results of Split Tensile Strength for 7, 14 & 28 days for M30

Mix % Replacement	Split Tensile Strength for 7 days in MPa	Split Tensile Strength for 14 days in MPa	Split Tensile Strength for 28 days in MPa
0% SBA + 100% Cement	2.56	3.62	4.28
3% SBA + 97% Cement	2.63	3.71	4.34
6 SBA% + 94% Cement	2.72	3.84	4.41
9 SBA% + 91% Cement	2.81	4.02	4.53
12 SBA% + 88% Cement	3.05	4.22	4.69
15 SBA% + 85% Cement	3.20	4.43	4.46
12% SBA+3%TWA+85% Cement	3.35	4.64	5.15
12% SBA+6%TWA+82% Cement	3.42	4.73	5.26
12% SBA+9%TWA+79% Cement	3.54	4.79	5.38
12% SBA+12%TWA+76% Cement	3.39	4.70	5.21



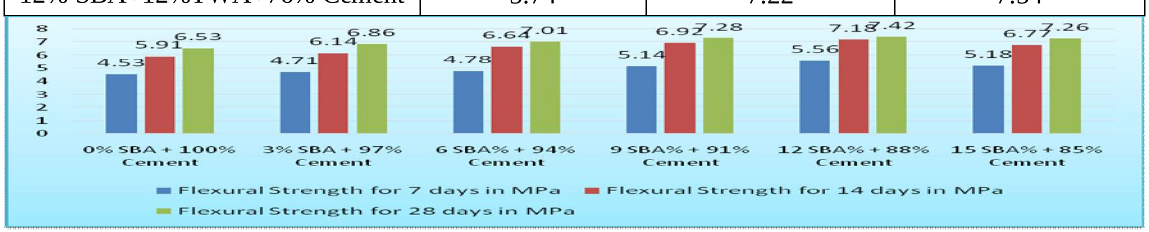
Graph 3 Development of Split Tensile strength after curing 7, 14 & 28 days for M30



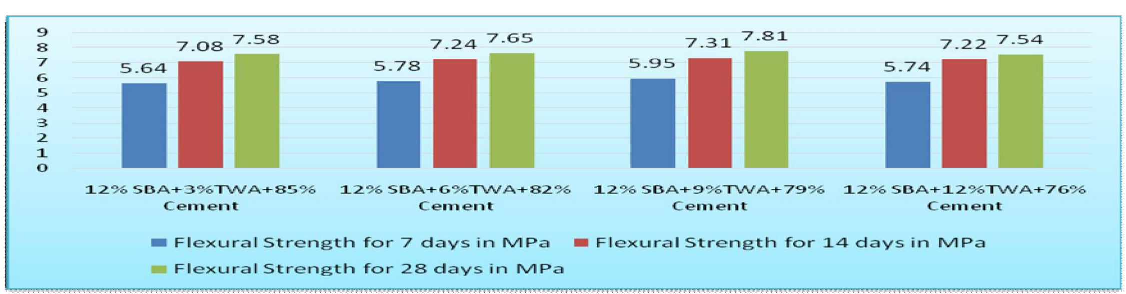
Graph 4 Relation between optimum SBA (12%) +%TWA replacement and Split Tensile strength

Table no 3 Test results of Flexural Strength for 7, 14 & 28 days for M30

Mix % Replacement	Flexural Strength for 7 days in MPa	Flexural Strength for 14 days in MPa	Flexural Strength for 28 days in MPa
0% SBA + 100% Cement	4.53	5.91	6.53
3% SBA + 97% Cement	4.71	6.14	6.86
6 SBA% + 94% Cement	4.78	6.64	7.01
9 SBA% + 91% Cement	5.14	6.92	7.28
12 SBA% + 88% Cement	5.56	7.18	7.42
15 SBA% + 85% Cement	5.18	6.77	7.26
12% SBA+3%TWA+85% Cement	5.64	7.08	7.58
12% SBA+6%TWA+82% Cement	5.78	7.24	7.65
12% SBA+9%TWA+79% Cement	5.95	7.31	7.81
12% SBA+12%TWA+76% Cement	5.74	7.22	7.54



Graph 5 Development of Flexural strength after curing 7, 14 & 28 days for M30



Graph 6 Relation between optimum SBA (12%) +%TWA replacement and Flexural strength

Table 4 Test results of Compressive, Tensile & Flexural Strength for 28 days for M30

Mix % Replacement	Compressive Strength in MPa	Tensile Strength in MPa	Flexural Strength in MPa
0% SBA + 100% Cement	37.12	4.28	6.53
3% SBA + 97% Cement	38.68	4.34	6.86
6 SBA% + 94% Cement	39.13	4.41	7.01
9 SBA% + 91% Cement	40.82	4.53	7.28
12 SBA% + 88% Cement	41.96	4.69	7.42
15 SBA% + 85% Cement	40.88	4.92	7.26
12% SBA+3%TWA+85% Cement	42.08	5.15	7.58
12% SBA+6%TWA+82% Cement	42.57	5.26	7.65
12% SBA+9%TWA+79% Cement	42.92	5.38	7.81
12% SBA+12%TWA+76% Cement	42.33	5.21	7.54

It was found that when cement was replaced with 12% SBA, the strength properties increased and then decreased. The maximum Compressive strength of the 12%SBA mixture is 41.96 N/mm^2, which is 13.03% higher than the reference mixture whereas Tensile strength is 4.69 N/mm^2 which is 9.57% higher than reference mixture and Flexural strength is 7.42N/mm^2 which is 13.62% higher than reference mixture.

Among all TWA substitutes, the highest strength is achieved when mixed with grade M30, which contains 12% SBA and 9% TWA. As the TWA content of concrete increases, its strength properties first increase up to 9% and then decreases. The maximum strength is achieved when the SBA content is 12%, and 9% TWA reaches a compressive strength of 42.92N/mm^2 which is 15.62% higher than the composite material whereas tensile strength of 5.38N/mm^2 which is 25.70% is higher than the composite material and flexural strength of 7.81N/mm^2, which is 19.60% higher than the composite materials.

VII. CONCLUSIONS

Based on the above research, the following analysis was carried out on artificial concrete in which cement was partially replaced with SBA and the mineral additive TWA.

1) As the SBA & TWA ratio in the Concrete changes, its workability decreases.
2) It was found that the maximum strength in the total percentage of cement modified with Sugarcane Bagasse ash occurred at 12%SBA.
3) Compared to other mixtures, the highest concrete properties were obtained with concrete mixtures containing 12%Sugarcane Bagasse ashand9%TWA.
4) According to the test results, it was determined that the strength of the concrete combined with Sugarcane Bagasse ash and Tobacco Waste ash increased better than the SBA concrete mixture.
5) It is seen that the use of 12%Sugarcane Bagasse ashincreases the compressive strength by 13.03%, splitting tensile strength by 9.57% and bending strength by 13.62% compared to conventional concrete.
6) Compared to normal concrete, it is seen that the use of 12%Sugarcane Bagasse ash and 9%Tobacco Waste ash increases the compressive strength by 15.62%, splitting tensile strength by 25.70% and bending strength by 19.60%.

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