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Study of Compressive Strength of Concrete using Nutrient Broth

Hitendra Shivhare¹, Prof. Vijay Kumar Shrivastava², Prof. Satyendra Dubey³

¹M.Tech scholar, Civil Engg. Department, Gyan Ganga Institute of Technology and science, Jabalpur

²Asst. Prof. Civil Engineering Department, Gyan Ganga Institute of Technology and science, Jabalpur

³Asst. Prof. Civil Engineering Department, Gyan Ganga Institute of Technology and science, Jabalpur

Abstract: In this research work, water is replaced with the media and effect of this, on various properties of concrete is carried out. Nutrient broth is a special type of media which is used to growth of microbes. In concrete technology our ultimately goal is to increase the compressive strength of concrete and improve other properties of concrete

In this research, nutrient broth is used as replacement of water and for this quantity taken are 50% and 100% of water. For this, various tests have been performed, like compressive strength, slump cone test. Result shows that when nutrient broth taken as replacement of water, is negligible change in compressive strength of concrete.

Keyword: Nutrient broth, compressive strength.

I. INTRODUCTION

Concrete is an important and extensively use building material use for construction work. It is manly used in heavy construction because of its durability and compressive strength. In concrete technology, our aim is to increase the compressive strength of concrete, for this various admixtures like pound ash, fly ash etc are available.

In this work, nutrient broth is used as replacement of water and compressive strength of concrete is studies out under various % of water. Nutrient broth is a media, which can be prepared in the laboratory by mixing ingredients like pepton, beef extract, NaCl, distilled water and NaOH at their respective content.

II. MATERIAL AND METHOD

In concrete the cement, sand and coarse aggregate are my conman materials are mix with water but in this research nutrient broth (media) is used as a replacement of water. These are the material use in this research

- 1) **Cement:** For this work, cement has purchased from supplier heaving following properties
 - a) Manufactured by Reliance.
 - b) Initial setting time 90 min.
 - c) Final setting time 360 min.
- 2) **Sand /fine Aggregate:** The send is purchased by supplier which is brought from river Narmada having following properties.
 - a) Specific gravity= 2.60
 - b) The grade of fine aggregate is zone II as per IS 387-1970 specification
- 3) **Course Aggregate:** For this work, course aggregate of 20 mm size is used. Having specific gravity of aggregate is 2.70.
- 4) **Water:** The potable water is use for mixing of material and curing of cubes.
- 5) **Media:** Culture media contains nutrient and physical growth parameters necessary for microbial growth. All microorganisms can't grow in a single culture media and in fact many can't grow in any known culture media.

There are two major types of growth media

- a) Cell culture, which use specific cell types derived from plants or animals.
- b) Microbiological culture, which are used for growing microorganisms, such as bacteria or fungi.

A. Nutrient broth (solution)

Nutrient broth is a specific type of liquid media. A general-purpose liquid basal medium composed of nutrients (e.g. beef extract and peptone), which allows many types of microorganisms to grow.

B. Ingredients Of Nutrient Broth

- 1) *Pepton*: It is an enzymatic digest of animal protein. Peptone is the principal source of organic nitrogen for the growing bacteria.
- 2) *Beef extract/yeast extract*: It is the water-soluble substances which aid in bacterial growth, such as vitamins, carbohydrates, organic nitrogen compounds and salts.
- 3) *NaCl*: The presence of sodium chloride in nutrient agar maintains a salt concentration in the medium that is similar to the cytoplasm of the microorganisms.
- 4) *Distilled Water*: Water is essential for the growth of and reproduction of micro-organisms and also provides the medium through which various nutrients can be transported.
- 5) *NaOH*: NaOH is use for pH is adjusted to neutral (7.4) at 25 °C/room temperature.

C. Procedure For Preparing Nutrient Broth

- 1) In a flask, 0.5% NaCL, 1.00% peptone and 1.00% beef extract of distilled water taken shaking a flask is done by simply by hand to dissolve these component with distilled water.
- 2) NaOH mix for pH is adjusted room temperature. (ph=7.4)
- 3) Flask is kept air tight by using the cotton plug.
- 4) The flask has sterilized for 15 min at by autoclave @ 121°C.
- 5) After autoclaving, the solution is removed.
- 6) Now the solution (nutrient broth) is free from any contaminants and the solution is clear orange in color.

D. Procedure For Compression Test Of Concrete

The IS 10262-2009 code are fallow to prepare the specimen and to the test of compressive strength of concrete

The cubical moulds of size 150mm × 150mm× 150mm is taken and checked the joint movement. Coating of oil has been applied on the inner surface of moulds and prepared for concreting operation.

The ratio of cement, sand, and coarse aggregate at 1:1.8:3 has taken mixed with hand mixture and rotated till uniformly dry mixture is obtained.

The water cement ratio is taken as 0.5 and the quantity of water is mixed as per w/C ratio. After that the quantity of water are replaced by nutrient broth with different percentage and mixing has been continued to get a uniformly mix.

The wet concrete is now poured into the moulds for 2 to 3 layers and compacted manually. After concreting operations, the upper surface is leveled and finished with a mason’s trowel.

The wet corresponding identification marks are labeled over the finished surface and they are tested for 7 and 28 day UTM for compression testing.

$$\text{COMPRESSIVE STRENGTH} = \frac{\text{TOTAL FAILURE LOAD}}{\text{AREA OF THE CUBE}}$$

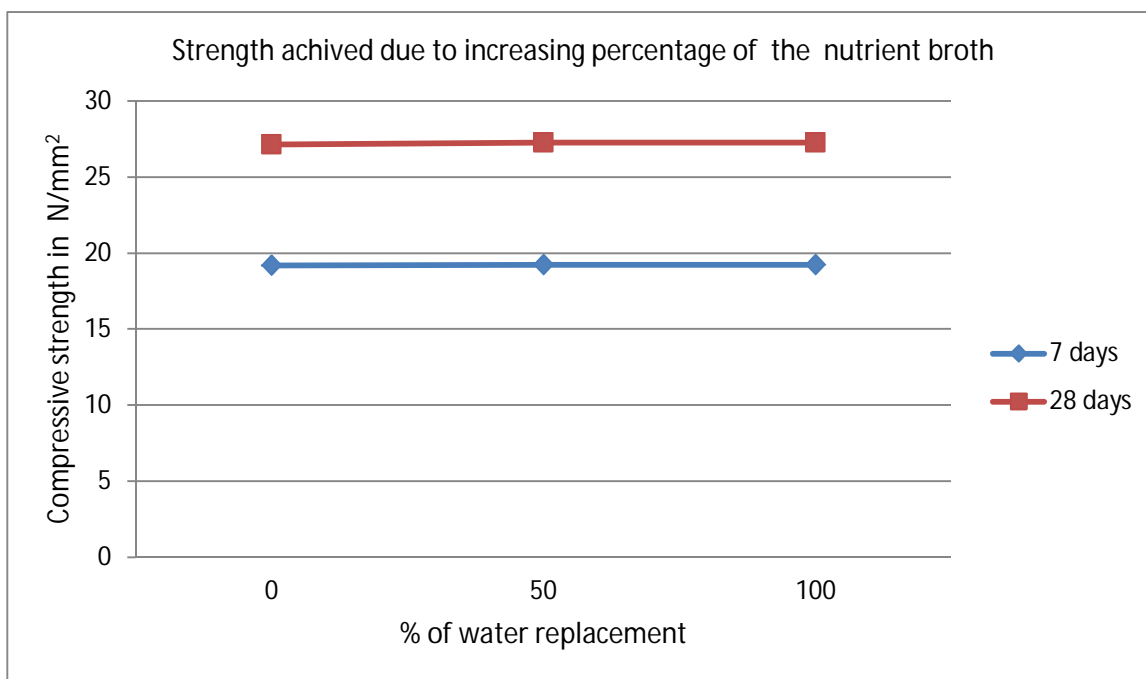
III. TEST AND RESULT

Table no. 01 for 7 days compressive strength of concrete

Group name	Water in liter	Nutrient Broth in liter	Water in %	Nutrient Broth in %	Total replacement of water in %	Average strength achieved in N/mm ²			Change of strength achieved in N/mm ²	Change of strength achieved in %	Average strength achieved in N/mm ²
						samples					
						1	2	3			
G-1	186	0	100	0	0	19.16	19.56	18.84	0	0	19.18
G-2	93	93	50	50	50	19.35	18.75	19.50	+0.03	+0.15	19.21
G-3	0	186	0	100	100	19.67	19.34	18.72	+0.06	+0.31	19.24

Table no. 02 for 28 days compressive strength of concrete

Group name	Water in liter	Nutrient Broth in liter	Water in %	Nutrient Broth in %	Total replacement of water in %	strength achieved in N/mm ²			Change of strength achieved in N/mm ²	Change of strength achieved in %	Average strength achieved in N/mm ²
						samples					
						1	2	3			
G-1	186	0	100	0	0	28.44	25.17	27.11	0	0	27.16
G-2	93	93	50	50	50	25.81	28.36	27.65	+0.11	+0.40	27.27
G-3	0	186	0	100	100	28.44	26.11	27.32	+0.13	+0.47	27.29



Graph no. 01

IV. DISCUSSION AND CONCLUSION

After 7 and 28 days curing period, the compressive strength of different sets of samples of M20 concrete containing different percentage of nutrient broth and nutrient presented in these table

- A. The compressive strength test after 7 days results are given in Table no.01 from this table it is clear that the compressive strength of conventional concrete is 19.18 N/mm² which is approximately equal to the concrete with nutrient broth.
- B. The compressive strength test after 28 days curing period results are given in table no. 02 from this table it is clear that the compressive strength of conventional concrete is 27.71 N/mm² which is approximately equal to the concrete with nutrient broth.

According to the experiment and their result we can say that the replacement of water with nutrient broth are not changes the compressive strength of concrete considerably. The concrete strength comes as equal as a conventional concrete. It means there is no effect of nutrient broth in a concrete. It works just like as the water.

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