

# Partial Replacement of Cement by Neem Leaves Ash and Fly Ash

T.Felixkala, R.Nandhini, R.Shanmugam, K.P.Surendhar, Syed maslihuddin ahmed, M.A.Sriarjuna

*Abstract Concrete is the most essential construction materials in all over the world. It is necessary to search the cheaply obtainable material as admixture which might be partially replaced cement in the production of concrete. This project is an experimental investigation of the neem leaves ash as partial replacement for cement also fly ash is used for partial replacement of cement. The neem leaves were dried, burnt and heated in the furnace to produce Neem leaves Ash, which was discovered to posses Pozzolanic properties.the ordinary Portland cement was replaced by neem ash by 5%,10%,15%,20% and 25% by weight also flash replaced by 15%,20%,25% and 30% the cubes were crushed to know the comparative strength of the concrete at different curing days. The last result showed that workability and strength properties of the concrete was depended on water cement ratio, total days of curing, the percentage of replacement of Neem leaves ash for OPC . I. This project it was noticed that the result of 5% NLA and 15% fly ash and 10% NLA and 20% of fly ash were gradually increasing the strength at 28 days. Neem leaves play a vital role and behaviour of Neem leaves ash and flash used concrete will be studied.*

**Keywords :** Cement, Fly ash, Neem leaves ash, Fine aggregate, Course aggregate, Ordinary water.

## I. INTRODUCTION

Cement is one of the most important binding material for making the concrete is the material which most widely used in construction field all over the world. Utilisation of concrete is produced over six billions ton each year. It is most generally utilised substance than the man made material in the earth. It is used inn most of the reconstruction, which includes bridges, buildings structures, dams, basement, tunnels, streets, pavements, airports and so on. Concrete consider a cement, sand coarse aggregate and water , since concrete is one of the important materials in structural construct, its blend content should be in a form of good quality for structural purposes. Since the manufacturing of cement at very high temperatures, it consumes a lot of energy with huge amount of energy consumption, it emits harmful gases, which pollute the atmosphere. Neem is a composite material which grows acumbality in our country.

**Revised Manuscript Received on April 16, 2020.**

**Dr Felix Kala T**, Professor in Department of Civil Engineering Dr MGR Educational and Research Institute, Chennai.Email - felixkala.civil@drmgrdu.ac.in

**Nandhini R** Student, B. Tech Civil Engineering, Dr MGR Educational and Research Institute, Chennai. Email - [nandhucivil154@gmail.com](mailto:nandhucivil154@gmail.com)

**Shanmugam R**, Student, B. Tech Civil Engineering, Dr MGR Educational and Research Institute, Chennai

**Surendhar K.P**, Student, B. Tech Civil Engineering, Dr MGR Educational and Research Institute, Chennai

**Syed.Maslihuddi Ahmed** , Student, B. Tech Civil Engineering, Dr MGR Educational and Research Institute, Chennai

**Sriarjuna M.A**, Student, B. Tech Civil Engineering, Dr MGR Educational and Research Institute, Chennai

Fly ash also getting easily , since the cost of cement is high, neem leaves ash and fly ash partially replaced with cement using the above proportion of neem leaves ash and fly ash getting good compressive strength in concrete.

## II. MATERIALS AND METHODS

### A.Cement

The bureau of Indian standard (BIS) has classified OPC in three different grades the grades are 1. 33 Grade, 2. 43 Grade, 3.53 Grade. The binding materials used in concrete are ordinary Portland cement. This cement is of 43 Grades conforming IS-456-2000 and is having desired properties. The compressive strength of cement is checked by citing cubes.

### B.Neem leaves ash

Neem is a medicinal plant get oxygen fresh.neem is easily available materials which has good chemical properties, it has high calcium content which is very important for binding property. Neem leaves are collected and dried for few days, after that they are burned to get ashes, these ashes were sieved and used for preparing concrete.

### C. Fly Ash

Fly ash, also known as flue-ash, is one of the residues generated in combustion, and comprises the fine particles that rise with the flue gases. Ash which does not rise is termed bottom ash. In an industrial context, fly ash usually refers to ash produced during combustion of coal. Fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys of coal-fired power plants and together with bottom ash removed from the bottom of the furnace is in this case jointly known as coal ash. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide ( $\text{SiO}_2$ ) (both amorphous and crystalline) and calcium oxide ( $\text{CaO}$ ), both being endemic ingredients in many coal-bearing rock strata.

### D. Fine Aggregate

Ordinary natural river sand is used as fine aggregate which is passed through 4.75 sieve and retained On 75 micron (0.075 mm) is termed as fine aggregate, fine aggregate it added to concrete to get workability and to bring uniformity in mixture.

### E. Course Aggregate

The course aggregate for the work should be crushed stone of 20 mm size, it should be hard, strong, dense, durable, clean and free from clay or vegetable matter.

The pieces of aggregates should be cubical or rounded shaped and should have granular or smooth surfaces. The grading of Course aggregates should be as per specification of

IS 383 - 1930

### III. PHYSICAL AND CHEMICAL PROPERTIES OF MATERIALS

#### A. Composition of NLA

Table I

Composition	Value(wt)
Ca	0.70
K	0.25
Mg	0.29
Al	0.05
S	0.06
Na	0.06
Si	0.12
Cl	0.07

#### B. Composition of Fly Ash

Table II

Composition	Value(wt)
Ca	14.7
Mg	1.98
Al	11.1
S	0.35
Na	0.48
Si	63.5

#### C. Chemical Composition of Cement

Table III

Composition	Value(wt)
Fe <sub>2</sub> O <sub>3</sub>	3
SiO <sub>2</sub>	20.6
Al <sub>2</sub> O <sub>3</sub>	5.2
CaO	60.5
MgO	1.3
SO <sub>3</sub>	1.6
Insoluble residue	1.9
Loss on ignition	2.8
Lime stranded factor	0.65

#### D. Physical Properties of Cement

Table IV

S.No	Properties	Values
1	Fineness	4%
2	Specific Gravity	3.15
3	Initial setting time	106 min
4	Final setting time	375 min
5	Standard consistency	30%

#### IV. PREPARATION OF SPECIMEN

Specimens were prepared using Cubic moulds of size ( 150mm x 150mm x 150mm ). Neem leaves ashes and fly ash were weighted and added with cement. Fine aggregate and cement were mixed. Then coarse aggregates added. They are mixed well and required amount of water was added and mixed well.

The moulds were kicked using screws and after applying oil, the concrete mixture was poured inside the mould in layers. Each layers of concrete was compacted using a table vibrator. Next, it was kept for drying in the open place for 24 hours, after 24 hours, they were remoulded and kept inside the water curing.

#### V. TESTING SPECIMEN

Laboratory test includes limp test, compressive strength test carried out of the concrete mixes at the specified days( 7,14,28 days).

#### VI. RESULT AND DISCUSSION

##### A. Fresh Concrete Proportion

The result of various fresh properties tested by slump test and compressive strength test, for various mix composition are given in the table I to Table IV respectively . The slump test result show that the concrete have the highest slump value followed.

Table V : Result of Slump Test

Control Mixes	Slump (mm)
Control	68
Concrete with 5% Neem ash & 15% fly ash	72
Concrete with 10% Neem ash & 20% fly ash	75
Concrete with 15% Neem ash & 25% fly ash	78

##### B. Cube Compressive Strength Test

Foe determining the compressive strength of concrete at 7 days, 14 days and 2 days of curing got the result.

Table VI : Compressive strength test on cubes

Curing days	Normal Cube	Concrete with 5% Neem ash & 15% fly ash	Concrete with 10% Neem ash & 20% fly ash	Concrete with 15% Neem ash & 25% fly ash

7 days	17.0	17.58	17.65	16.40
14 days	24.25	24.40	24.55	24.1
21 days	26.40	27.14	27.51	27.25

## VII. CONCLUSION

The conclusion from the experimental study proved that the partial replacement of neem leaves ashes and fly ashes with minimum amount ( 10 % NLA & 20 % FA ) getting more strength and it decreases while adding more amount of neem leaves ashes and fly ash has more calcium content is increase binding properties decrease. So it can be replaced instead of cement. Based on the test result the following conclusion can be drawn.

1. Neem leaves ash replacement and fly ash replacement increase the slump at 5% NLA and 15% FA replacement and 10% NLA & 20% FA replacement. But it increase 15% NLA & 25% FA replacement. It shown that the combination of 15% NLA & 25% FA increase the carbon content. So slump also increase.
2. Neem leaves ash replacement and fly ash replacement in concrete increased the compressive strength with Curing Time and decrease it with increase in percentage replacement by neem leaves ash and fly ash combination. After 28 days curing compressive strength gradually increase while adding 5% NLA & 15% FA replacement and 10% NLA & 20% FA but its starts decreasing 15% NLA & 25% FA. The study proves that we can use Neem leaves ash and fly ash combination (10% & 20%) used for construction purpose.
3. Neem leaves ash and fly ash are Economical compared with cement. It also easily available material demand and cost of cement will increase more, there is a good replacement materials for cement.

## REFERENCES

1. K.Kiran, I.Siva Kishore, " An experimental study on partial replacement of cement by bagasse ash in concrete mix", IAEME Publications.
2. Siva Kishore, Ch.Mallika Chowdary, " A study on waste utilisation of marble dust in high strength concrete mix, International journal of civil Engineering and Technology,6(12), 2015.pp.61-67.
3. Nuruddeen M.Musa, Stephen P.Ejeh, Synergic effect of Neem seed.
4. Arivumangai,A. and Felixkala,T., "Granite Powder Concrete with High Strength and Better Performance", International Journal of Earth Sciences and Engineering, Vol. 7, pp. 2018-2024, 2014.
5. Gomathi Nagajothi. and Felixkala,T., " Experimental Study on Properties of Self-Compacting Concrete with Partial Replacement of Marble Waste as a Fine Aggregate", International Journal of Research and Analytical Reviews (IJRAR).
6. MuraliKrishnan, S. and Kala, T. Felix , "Experimental Investigation of High Performance concrete using Manufactured sand as Fine aggregate", International Journal of Applied Engineering Research, Vol.10, No. 6, pp. 15643 – 15649, 2015.
7. Menassah J, " A review of partial replacement of cement with some agro waste" Nigerian journal of Technology, Vol.29, No2, June 2016;pp 12-20
8. Siddique R, "waste materials and by powder in Concrete" springer verlag bellin headlberg 2008.
9. Nuruddeen M.Musa."influence of Neem seed husk ash on the tensile streets of Concrete" A mechanical journal of Engineering Research, Vol 2, Issue12.

## AUTHORS PROFILE



**Dr Felix Kala T** is currently working as Dean (Student affairs) and Professor in Department of Civil Engineering in Dr MGR Educational and Research Institute, Chennai. She has over 25 years of experience. She has published over 60 papers in reputed journals and presented technical papers in over 75 conferences. She is a life member of ICI, ISTE,IEI and IAENG. Her research areas include concrete technology and structural Engineering. Email - [felixkala.civil@drmgrdu.ac.in](mailto:felixkala.civil@drmgrdu.ac.in)



**Nandhini R**  
Final Year Student Pursuing B. Tech Civil Engineering in Dr MGR Educational and Research Institute, Chennai.  
Email - [nandhucivil154@gmail.com](mailto:nandhucivil154@gmail.com)



**Shanmugam R**  
Final Year Student Pursuing B. Tech Civil Engineering in Dr MGR Educational and Research Institute, Chennai.



**Surendhar K.P**  
Final Year Student Pursuing B. Tech Civil Engineering in Dr MGR Educational and Research Institute, Chennai.



**Syed.Maslihuddi Ahmed**  
Final Year Student Pursuing B. Tech Civil Engineering in Dr MGR Educational and Research Institute, Chennai.



**Sriarjuna M.A**  
Final Year Student Pursuing B. Tech Civil Engineering in Dr MGR Educational and Research Institute, Chennai.