

Experimental Study on Effects of Banana Leaves Ash on Consistency and Settings behaviour of Ordinary Portland Cement

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Abstract—This paper present the use of banana leaves ash as the pozzolanic material with ordinary Portland cement to investigate the effects of addition of banana leaves ash on consistency, initial setting time and final setting time of ordinary Portland cement. In this direction we replaced ordinary Portland cement in 5% , 10% and 15% amount by BLA. In case of replacement of OPC by BLA in varying percentages consistency was found to be 35% and also same in the case of without replacement. We observed with replacement of cement with amount 0% to 15% by BLA, the settings time get increase but replacing OPC more than 10% by BLA, the settings time almost same.

Keywords: Cement, Banana leaves, Pozzolanic material, settings time.

1. INTRODUCTION

Cement is the most important and commonly material used for construction. Cement helps in binding the other ingredients of concrete mixture and allows them to bind together and harden. This binding property of cement can be enhanced by adding non conventional materials having binding properties. Agribusiness waste like Rice husk, Sugar cane Bagasse and BLA can be used as replacement material for cement up to allowable percentage. These agribusiness wastes may not only prove to be economic but also can enhance the different

Properties of cement like consistency and setting behaviour. Settings time of cement are one of the most important factors in concrete construction as cement allows the concrete ingredients to bind together and form a hard matrix. Initial setting time of cement can be explained as the time at which cement starts harden and final setting time of cement can be explained as the time at which cement completely losses its plasticity and became hard. Setting behaviour of cement can be controlled by adding such non conventional materials with cement. These non conventional materials may act as accelerator and retarder. These additions will help in many aspects like placement of concrete, transportation and compaction and in finishing of concrete. In this direction we are using BLA passing through 850 micron IS sieve in

different percentages as additive/replacement material to check the effect on consistency and setting time of cement

2. MATERIALS

OPC Grade 43 and BLA passing through 850 micron IS sieve was used in different proportions to check the effects on physical properties of cement.

Table 1: Varying Percentage of Cement And BLA

Sample	Proportion
S1	100% OPC Grade 43 and 0% BLA
S2	95% OPC Grade 43 and 5% BLA
S3	90% OPC Grade 43 and 10% BLA
S4	85% OPC Grade 43 and 15% BLA

3. EXPERIMENTAL STUDIES

Vicat apparatus was used to determine the consistency, initial setting time and final setting time of OPC Grade 43 with BLA. IS 4031 part 4 and 5 were followed for the preparation of samples, placing of samples in moulds and for testing of samples. The standard consistency of the paste is determined by adding water in different percentages for the formation of paste (starting from 27% as per IS code provision) till the paste has a given resistance to penetration (5-7 mm. above the base of mould).

Initial setting time and final setting time was determined to analyse the setting behaviour of cement. Initial setting time test was performed as per IS 4031 (part-5) recommendations.

For preparation of cement paste for checking setting behaviour of cement “0.85p” amount of water was added. A needle of 1 sq.mm was allowed to penetrate the sample at interval of every 10 minutes till paste offered the resistance of 5-7 mm above the base of mould. The time was recorded as initial setting time.

For final setting time, we changed the needle of Vicat apparatus and check after every 30 minutes if needle is leaving

any mark on the surface of harden cement. When the needle leaves a mark on the surface of harden cement the time is recorded as final setting time of cement.

4. RESULTS AND DISCUSSION

The consistency of OPC Grade 43 for the sample having 5% of BLA was recorded as 35% ,for sample having 10% of BLA consistency was recorded as 35%, and 35% consistency was recorded for OPC with 0% replacement.

Table 2: Consistency Results of Cement with Varying Replacement by BLA

Samples	Consistency
S1	35%
S2	35%
S3	35%
S4	35%

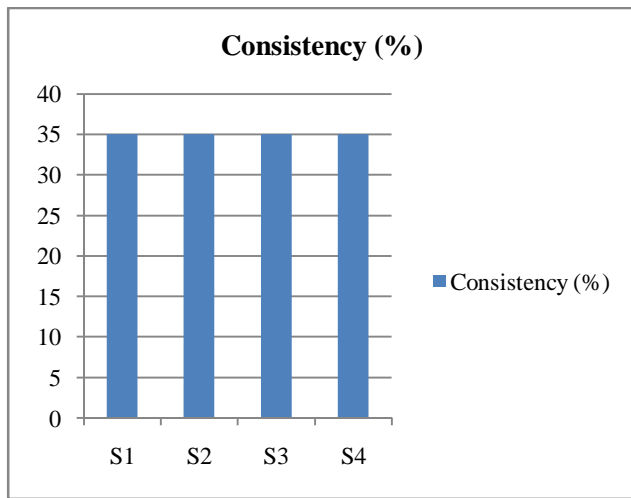


Fig. 1: Consistency of Cement

From the results, it can be concluded that there was no effect by replacement of cement with BLA on the consistency of OPC Grade 43.

The setting time for cement with different percentages of BLA was recorder and provided as:

Table 3: Results of Initial Settings Time of Varying Percentage by Replacement of Cement with BLA

Samples	Initial Setting Time
S1	165 minutes
S2	175 minutes
S3	190 minutes
S4	191 minutes

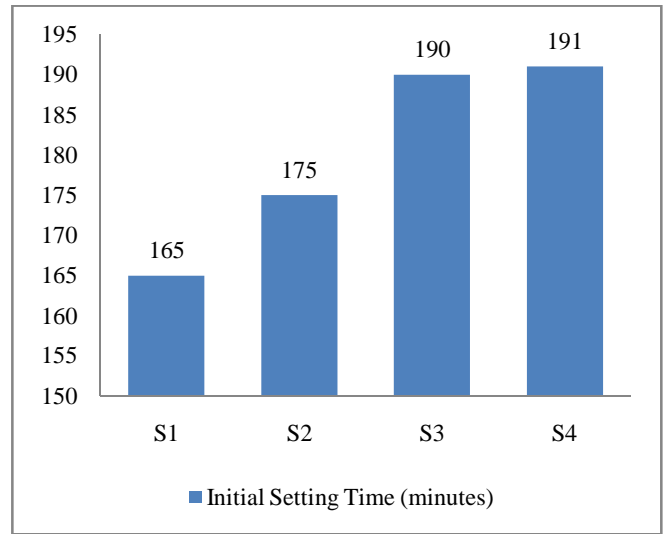


Fig. 2 Initial setting time of Cement

From the results, it can be concluded that the initial settings time increased by replacement of cement with 10% BLA but by increasing amount of BLA, initial settings time remain constant.

Table 4: Results of Final Settings Time of Varying Percentage by Replacement of Cement with BLA

Samples	Final Setting Time
S1	230 minutes
S2	255 minutes
S3	260 minutes
S4	261 minutes

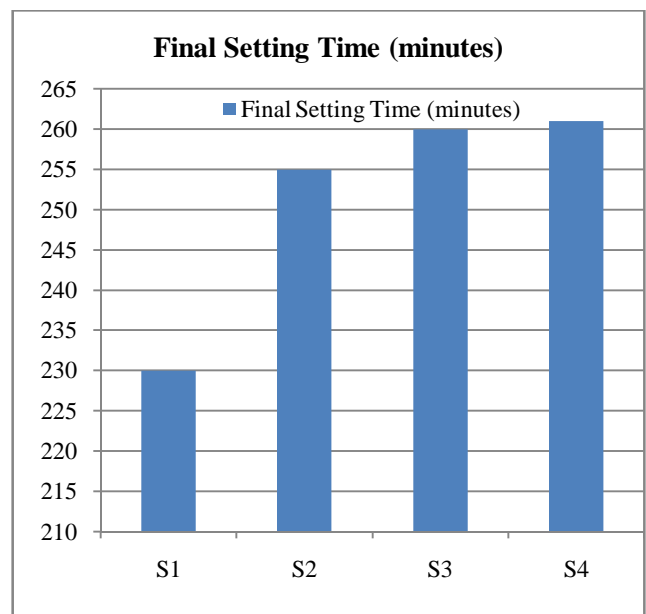


Fig. 3 Consistency of Cement

From the results, it can be concluded that the final settings time increased by replacement of cement with 10% BLA but by increasing amount of BLA, final settings time remain constant.

5. CONCLUSION

From the above results observed in laboratory, it was observed that BLA have no effect on the consistency of OPC Grade 43 as the consistency was the same in the cases of replacement and without replacement. BLA was acting as a retarder as it delays the initial and final setting time of OPC Grade 43 up to 10 % replacement of cement. Above this there are no major effects in settings time of cement.

REFERENCES

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