

Effects of Sesame Stalk Ash (SSA) as Partial Replacement of Cement in Concrete

I. Bello, T. A. Sulaiman, M.M. Musa, J.A. Adamu
Department of Civil Eng., Ahmadu Bello University, Zaria, Nigeria
belloi1040@gmail.com

Abstract

This work presents the results of the evaluation of Sesame Stalk Ash (SSA) used as partial replacement for Ordinary Portland Cement (OPC) in concrete. SSA was used to replace OPC by weight ranging from 0 to 20% at intervals of 5% replacement using the concrete mix ratio (1:2:4). Experimental tests such as setting times, consistency, soundness, XRF and slump were carried out to determine the properties of SSA-cement paste and fresh concrete respectively. Likewise, compressive strength test was carried out on 100mm cubes after 7, 14 and 28 days curing. However, from the result obtained it indicates that both the Initial and Final Setting Time increases with an increase in the percentage of Sesame Stalk Ash (SSA). The values of soundness obtained at each replacement levels falls within the acceptable limit specified by BS EN 196-3 (1995). Also, XRF conducted on SSA indicate that the content of Silica (SiO₂) is 11.636 %, Aluminium oxide (Al₂O₃) is 3.005 % and Ferrous oxide (Fe₂O₃) is 0.982 % sums up to (15.623 %) which is less than the minimum value for a good Pozzolanic material. Therefore, SSA is of low Pozzolanic reactivity (ASTM C618, 2008). It was also confirmed from the research that the compressive strength of concrete decreases with an increase in SSA content. On the other hand, it increases as the curing age increases. The 5, 10, 15 and 20 % replacement of cement with SSA respectively gives a compressive strength of 15.55N/mm², 9.08N/mm², 6.00N/mm², and 5.50N/mm² at 28 days of curing. However, the 5 % replacement gives the optimum compressive strength of 15.55N/mm².

Keywords

Sesame, Stalk, Portland, Concrete, Ash.