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*Abstract*— The consistent demands for natural aggregate by the construction industry is on the increase and consequently cost of construction is affected. The increase in demand for natural resources for construction and the continuous depletion of such resources could create environmental and sustainability issues. In the quest for provision of affordable housing around the world, the adoption of waste concrete material for construction and in particular as a replacement of aggregates in concrete is becoming an option. Past researches showed that the strengths of concrete produced with waste concrete are lower than that produced with natural aggregates. This paper examines the potential of improving strength of concrete produced from recycled waste concrete as aggregate materials with different proportions of fiber added to the mix. Concrete cubes of dimension 150 mm x 150 mm x 150 mm and cylinders were cast at the Structures Laboratory of the Department of Civil Engineering, Covenant University, Ota, Nigeria. The cubes were prepared by replacing the coarse aggregate of normal concrete mix with 0, 20, 50, 70, and 100% of waste concrete aggregate. Momordica Angustisepala fiber (local sponge) was added in proportion of 0.25%, 0.5%, 0.75%, and 1% by mass of aggregates. Tests conducted on both fresh and hardened concrete include: slump test on fresh concrete, compressive strength of the concrete cubes and split tensile strength of concrete cylinders. Statistical methods were used to analyze the test results. The test results indicated an appreciable increase in strength of fiber reinforced waste aggregate concrete. Test results show that RCA of up to 50% can be used to obtain a good concrete mix while Momordica Angustisepala fiber content of up to 0.5% can be used to improve compressive and tensile strength of concrete.

*Index Terms*— Recycled Concrete, Aggregates, Momordica Angustisepala Fibers, Compressive Strength, Split Tensile Strength.