# THE DEVELOPMENT OF EQUATIONS FOR ESTIMATING HIGH HEATING VALUES FROM PROXIMATE AND ULTIMATE ANALYSIS FOR SOME SELECTED INDIGENOUS FUEL WOODS

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## ABSTRACT

In this study, the development of equations for estimating higher heating values (HHV) using proximate and ultimate analysis for some selected indigenous fuel woods such as *Daniella (Copaiba) oliveri, Vitellaria paradoxa, Prosopis Africana* and *Hymenocardia,* was carried out. The HHV otherwise known as calorific value of the five fuel wood species which is the heat liberated when a unit quantity of the fuel wood is completely burnt was determined according to ASTM D 2015-85 using bomb calorimeter model Parr 6400. The proximate and ultimate analyses of the five wood samples were determined by reducing the samples to powder form using hammer mill and sieved to obtain up to 250 µm grain size according to ASTM D2013-86 standard. The equation for calculating HHV from proximate analysis used for the correlation was assumed to be a function of fixed carbon (FC), volatile matter (VM), moisture content (MC) and ash content (AC). While that equation for calculating HHV from ultimate analysis used for the correlation was assumed to be a function hydrogen, oxygen, carbon, sulphur, and nitrogen. The constant and coefficients of multiple regression equations were evaluated using **reglin** function in SCILAB environment. The models formulated for the estimation of HHV were validated using percentage (%) bias error. The obtained results indicated that the calculated values of HHV from the developed equations from proximate and ultimate analyses were in good agreement with the experimental HHVs. This was confirmed by lower positive bias errors of 0.030365, 0.171, 0.209, 0.499, and 1.137 % used for validation; thus confirming the validity and applicability of the equation for estimating HHVs for biomass.

**Keywords:** Ultimate analysis, proximate analysis, high heating value, fuelwood.