

Abstract

Two Acacia species (*Acacia reficiens* and *A. Senegal*) on two topographic sites (mountain slopes and lowlands) were studied for both standing biomass supported and annual aboveground production. The study was laid out as a stratified incomplete block design with the topographic sites as the blocks. This was carried out on the slopes of the Ndoto mountains, South-Western Marsabit, northern Kenya between October 1992 and August 1993. The area is a deciduous shrub land. The rainfall is bimodal with annual median of between 250 mm and 300 mm with an annual variability of 80%. Double sampling technique was used to determine the standing biomass and production with the aid of the Reference Unit (RU) method for estimating. The lowlands supported 10.52 tons/ha with *A. reficiens* and *A. senegal* contributing 9.31 tons/ha and 1.22 tons/ha respectively. The mountain slopes supported 6.34 tons/ha from *A. senegal* plants. *A. reficiens* on the lowlands produced 0.38 tons/ha and 0.11 tons/ha of leaf and pod biomass on annual basis, while *A. senegal* produced 0.04 tons/ha and 0.02 tons/ha of leaf and pod biomass respectively. The leaf and pod biomass production from *A. senegal* on the mountain slopes was 0.15 tons/ha and 0.06 tons/ha respectively. The stepwise multiple regression procedure was used to select the most highly correlated independent variable(s). The relationships were evaluated for coefficients of determination (r^2), standard errors of estimation (s_{yx}) and significance of linear regression coefficients ($\alpha=0.05$). The standing biomass of the two Acacia species on the two topographic sites was estimated from external plant parameters with r^2 of between 0.70 and 0.95. The r^2 values for the regressions for predicting biomass production were low even after log transformations. Pod production had the lowest r^2 values. The crown dimensions were the best parameters for estimating the standing biomass (r^2) while the crown dimensions, stem circumference and the plant height were the best parameters for predicting the aboveground biomass production for *A. reficiens*. For *A. senegal* on the lowlands, the stem circumference, crown dimensions and the number of stems were the best parameter for estimating the standing biomass while the plant height and the crown diameter were the best parameters for predicting aboveground biomass production. On the mountain slopes, the stem circumference was the best parameter for estimating the standing biomass while the stem circumference and the number of stems were the best parameters in predicting the biomass production. The different growth forms of *A. senegal* on the lowlands and the mountain slopes resulted in different parameters being selected as the best estimators for the standing biomass and predicting biomass production on the two topographic sites. This implies that the morphological appearance of plants on different locations should be considered before using regression equations developed from other locations for standing biomass estimation and annual biomass production prediction. The periods when various components (leaves, flowers, and pods) are produced was documented. This indicates when various plants components are produced and when they become available on the ground. The wood density of *A. reficiens* on the lowlands was 117.51 kg/m³ while for *A. senegal* was 116.23 kg/m³ and 1135.16 kg/m³ on the lowlands and mountain slopes respectively.