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Predictive models for biomass and carbon stocks estimation in *Grewia optiva* on degraded lands in western Himalaya

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Abstract *Grewia optiva* Drummond is one of important agroforestry tree species grown by the farmers in the lower and mid-hills of western Himalaya. Different models viz., monomolicular, logistic, gompetz, allometric, rechards, chapman and linear were fitted to the relationship between total biomass and diameter at breast height (DBH) as independent variable. The adjusted R^2 values were more than 0.924 for all the seven models implying that all models are apparently equally efficient. Out of the six non-linear models, allometric model ($Y = a \times DBH^b$) fulfils the validation criterion to the best possible extent and is thus considered as best performing. Biomass in different tree components was fitted to allometric models using DBH as explanatory variable, the adjusted R^2 for fitted functions varied from 0.872 to 0.965 for different biomass components. The t values for all the components were found non-significant ($p > 0.05$), thereby indicating that model is valid. Using the developed model, the estimated total biomass varied from 6.62 Mg ha^{-1} in 4 year to 46.64 Mg ha^{-1} in 23 year old plantation. MAI in biomass varied from 1.66–2.05 Mg ha^{-1} yr^{-1}. The total biomass carbon stocks varied from 1.99 Mg ha^{-1} in 4 year to 15.27 Mg ha^{-1} in 23 year old plantation. Rate of carbon sequestration varied from 0.63–0.81 Mg ha^{-1} yr^{-1}. Carbon storage in the soil up to 30 cm soil depth varied from 25.4 to 33.6 Mg ha^{-1}.

Keywords Allometric · Biomass · Carbon · *Grewia optiva* · Predictive models

Introduction

Quantification of biomass and carbon storage has recently become important all over the world and is presently an important component in the implementation of the emerging carbon credit market mechanism (Brown 2002; Chave et al. 2004; Mugasha et al. 2013).