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Full Length Research Paper

Average stem biomass of *Althaea ficifolia* in Shanjan Rangelands, East Azerbaijan, Iran

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Plants can be used for animal grazing, in wind erosion control, to reduce water flow rates, and increase evaporation and transpiration. In the NW of Iran (East Azerbaijan Province), rangelands previously used for animal grazing were changed to agricultural land use, in that this vegetation had unsuitable vegetation coverage. *Althaea ficifolia* was studied to determine its stem biomass characteristics. Data were collected using an accidental sampling methodology (1*1 m). In total, 6 plots were identified and 30 samples were collected for this research. The minimum, maximum and mean stem biomass for this plant, were found to be 23.1, 57.3 and 34.2 g, respectively.

Key words: *Althaea ficifolia*, Iran, rangeland, stem biomass.

INTRODUCTION

Rangeland ecosystem stabilizing, optimum and continual utilization of the range without studding and knowing the influencing factors on its segments and animal pasturage are of special importance (McNaughton et al., 1998; Mozaffarian, 2007; Shadkami-Tiland and Bibalani, 2010, 2011). There are different methods of evaluating rangelands and all of them have advantages and disadvantages. Factors, such as vegetation species composition, annual production, area coverage, plant density, soil surface coverage, constitution and presence of succulent plants were used (Bidlock et al., 1999; Mogaaddam, 2001), but estimation of these parameters were time consuming and expensive.

Fresquez et al. (1990) reported an increase in vegetative production and forage quality of Blue Grama (Mata-Gonza´lez et al., 2001), while Benton and Wester (1998) reported an increase in Tobosagrass (Hilaria mutica) yield following applications of biosolids at levels of 7, 18 and 34 dry Mg ha^{-1} in the Chihuahuan Desert. Although, dormant season applications of biosolids seem to be more beneficial for plant growth than growing season applications during the year of biosolids application (Benton and Wester, 1998), explanations for this phenomenon have not been documented (Mata-Gonza´lez et al., 2001). However, most evidence is related to its negative effect on aboveground vegetative and reproductive plant biomass (Hutchings and John, 2003; Milchunas and Lauenroth, 1993), changes in the spatial patterning of plant canopies and soil resources (Adler et al., 2001; Bertiller, 1996; Callaway, 1995; Mata-Gonza´lez et al., 2001; Schlesinger et al., 1996), the reduction of soil seed banks (Bertiller, 1998; Mayor et al., 2003), the decrease in the availability of safe micro sites for plant re-establishment (Bisigato, 2000; Oesterheld and Sala, 1990) and the invasion of woody plants (Milchunas and Lauenroth, 1993; Rodriguez et al., 2006; Schlesinger et al., 1990).

Above-ground defoliation can modify the partitioning of assimilates between below-ground and above-ground organs and consequently the root growth of defoliated plants (Belsky, 1986; Richards and Caldwell, 1985; Snyder and Williams, 2003; Rodriguez et al., 2006).

In this research, the amount of above-ground biomass and occurrence of *Althaea ficifolia* was studied (Gharaman, 2003) (Figure 1) at the rangeland area of Shanjan village, Shabestar district, NW Iran. This parameter needs more attention, because it is one of the determining factors of rangeland ecosystem.

MATERIALS AND METHODS

The research area is part of Shanjan rangeland in Shabestar district with a distance of about 5 km from Shabestar City. The terrain in this area is hilly and the study was carried out on a site with a northerly aspect (Salimi, 2003) (Figure 1). This region is a component of Iran-Turan Flora with elevation between 1700 and 1850 m (Pabot and Beck, 1990).

A. ficifolia is an ornamental plant in Malvaceae family (Table 1 and Figure 2). Also, it is a hardy perennial and ornamental plant, and once it is established, it flowers for many years (Wikipedia, 2010).

Figure 1. A part of Shanjan rangeland in Shabestar district, East Azerbaijan province, Iran.

Figure 2. *Althaea ficifolia* species.

In this research, stem biomass was sampled in May and June, 2010. For sampling, an accidental sampling methodology (1*1 m plot) was used and 30 (6 plots with 5 sub samples for each of them) samples were selected in total (Xiaoyan et al., 2010) (Figure 3). After sampling from the studding area, the part of plant having fresh weight of above ground was scaled with sensitive scale. Afterwards, it was dried by Avon set in 80°C for 24 h (Xiaoyan et al., 2010) and the dried weight was scaled separately.

RESULTS

The results of this study showed that the maximum, minimum and medium stem biomass of *A. ficifolia* in the study area were 23.1, 57.3 and 34.2 g, respectively (Figure 4). However, the stem height of *A. ficifolia* was unsteady from 550 to 980 mm, in that its average was about 820 mm.

Conclusion

In total, 6 plots were identified and 30 samples were studied in this research work. From 30 samples, about 49.33% of the stem weight was lost when samples were dried. Vegetation species can have an effect on soil chemical and physical properties (Ardekani, 2003). Increasing *A. ficifolia* species in the study area could cause specific biological qualification, and as this species increased the density of above ground, the biomass increased as well. Also, the amount of soil protection and stabilization increased especially by a protection with wind erosion and soil lost with runoff (Shadkami-Tiland and Bibalani, 2011; Snyder and Williams, 2003). A study on the over ground biomass of this plant is so much important, especially for medicinal plant. As such, Joudi and Bibalani (2010) studied and recognized some medicinal plants of Ilkhji region, Eastern Azerbaijan Province (Northwestern Iran).

This study has revealed and quantified the stem biomass of *A. ficifolia* in Shanjan rangelands, in that the plant has good biomass in this research area and probably in other areas where its growth need to be studied separately. It is a pioneer study, and the results have given estimations of the stem biomass of *A. ficifolia* for the first time in Shanjan rangeland. The study of this species and other shrub species is needed in this area and could be used in identifying plants best suited for rangeland ecosystem stability and specifically for stabilizing surface soil layers, especially from water and wind erosion.

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Table 1. Scientific name for *Althaea ficifolia* classification report (USDA, 2010).

Kingdom	*Plantae* – Plants
Sub-kingdom	*Tracheobionta* – Vascular plants
Super-division	*Spermatophyta* – Seed plants
Division	*Magnoliophyta* – Flowering plants
Class	*Magnoliopsida* – Dicotyledons
Subclass	*Dilleniidae*
Order	*Malvales*
Family	*Malvaceae* – Mallow family
Genus	*Althaea* L. – hollyhock
Species	*Althaea ficifolia* L. – hollyhock

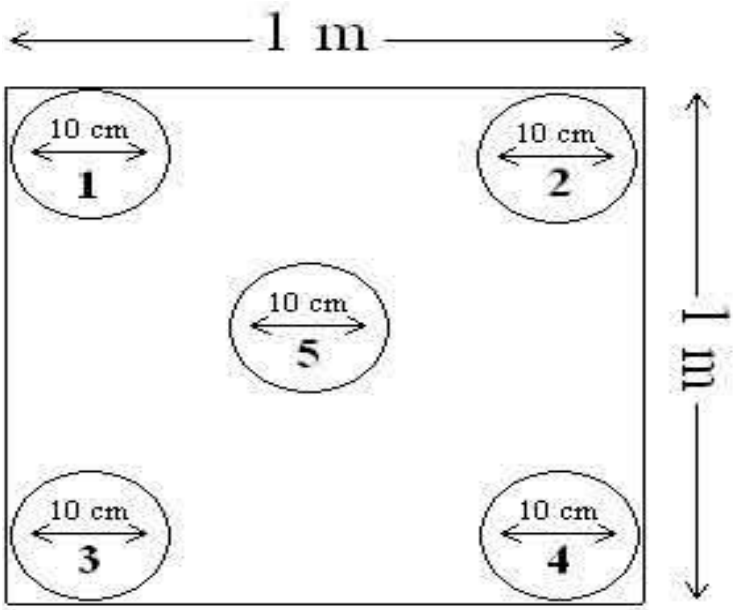

Figure 3. Sampling design in 1*1 m plot (Xiaoyan et al., 2010). 1, 2, 3, 4 and 5 are sub samples in each main sample.

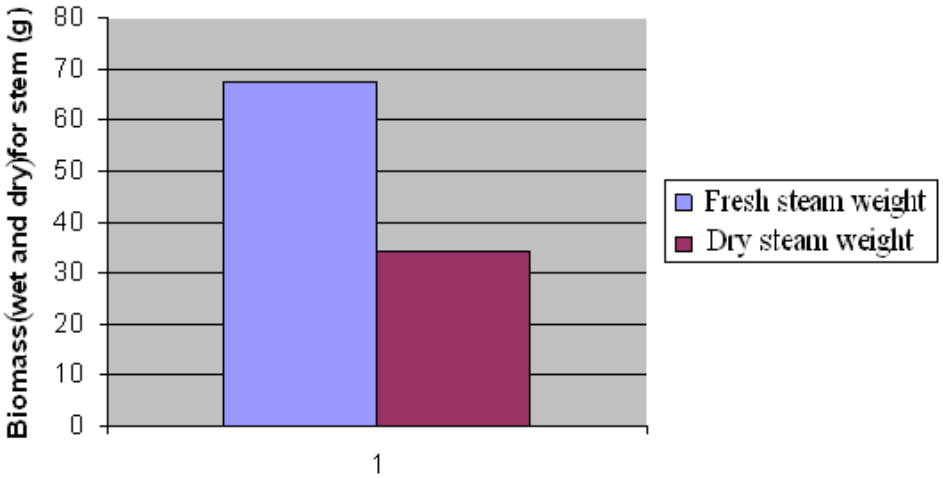

Figure 4. *Althaea ficifolia* stem weight (fresh and dried weight).

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