

*Full Length Research Paper*

# Stem biomass of *Erodium ciconium* in Shanjan Rangelands, East Azerbaijan, Iran

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**Stem of plants can be used for animal grazing, wind erosion control, reduce water flow, increase evaporation and transpiration. In NW of Iran (East Azerbaijan Province), rangelands are utilized for animal grazing and later changed to agricultural land use; this vegetation is unsuitable for vegetation coverage. We studied *Erodium ciconium* to determine its stem biomass characteristics. Data were collected with accidental sampling method (1×1 m) in this area. A total of 12 plots were collected and 60 samples were studied in this research. Minimum, maximum and mean stem biomasses of this plant were 3.9, 6.7 and 5.00 g, respectively.**

**Key words:** *Erodium ciconium*, Iran, rangeland, stem biomass.

## INTRODUCTION

Rangeland ecosystem stabling, optimum and continuum utilization of range without studding and knowing effective factors on its segments and animal pasturage have special importance (Mozaffarian, 2007; Shadkami-Til and Bibalani, 2010; Shadkami-Til and Bibalani, 2011). There are different methods for evaluating range position, with each having special advantages and disadvantages as well as different factors, such as species composition percentage, production, coverage, density, soil position (soil surface coverage and erosion), cadaver, birthing, constitution, and succulence. Plants were used (Bidlock et al., 1999; Mogaaddam, 2001) but estimation of these parameters are time consuming and expensive.

Fresquez et al. (1990) reported an increase in vegetative production and forage quality of blue grama (*Bouteloua gracilis* (H.B.K.) Lag. ex Steud.) (Mata-González et al., 2002). Benton and Wester (1998) reported an increase in tobosagrass (*Hilaria mutica* (Buckley) Benth.) yield following applications of biosolids at levels of 7, 18, and 34 dry mg ha<sup>-1</sup> 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-González et al., 2002).

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 and Coronato, 1994; Callaway, 1995; Mazzarino et al., 1998; Schlesinger et al., 1996), the reduction of soil seed banks (Bertiller, 1996; Mayor et al., 2003), the decrease in the availability of safe microsites for plant reestablishment (Bisigato, 2000; Oesterheld and Sala, 1990), and the invasion of woody plants (Milchunas and Lauenroth, 1993; Schlesinger et al., 1990, Rodriguez et al., 2007).

Aboveground defoliation can modify the partitioning of assimilates between belowground and aboveground organs and consequently the root growth of defoliated plants (Belsky, 1986; Richards and Caldwell, 1985; Snyder and Williams, 2003, Rodriguez et al., 2007).

In this research we have studied the amount of over ground biomass and *Erodium ciconium* species (Gharaman, 2003) (Figure 1) at rangeland area of Shanjan village, Shabestar district, NW Iran. This parameter needs more attention, but it is one of the determining factors of rangeland ecosystem stabling in that place.

## MATERIALS AND METHODS

Research area is part of Shanjan rangeland from Shabestar district with distance of about 5 km from it (Figure 1). This is a hilly area

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**Figure 1.** A part of Shanjan rangeland from Shabestar district, East Azerbaijan Province, Iran.

and we studied the North region (Salimi, 2003). This region is component flora Iran and Turan with altitude between 1700 to 1850 m (Pabot and Beck, 1990). *Erodium* is a genus of the botanical family Geraniaceae. The genus includes about 60 species, for the most part originating in the Mediterranean or Western Asian regions. American species are known as Filarees or Heron's bill, Eurasian ones are usually called Storks bills (Wikipedia, 2010). *E. ciconium* is an annual plant of this genus (Table 1, Figure 2).

Stem biomass was sampled in May and Jun, 2010. For recognition of species for sampling, we used accidental sampling method (1×1 m plot) and select 12×5=60 samples totally (Ping et al., 2010) (Figure 3). Produced sampling from area studding plants after sending to laboratories, then scale fresh weight of over ground part with careful and sensitive scale and then dry weight of over ground part of plant is determined by Avon set after drying for 24 h at 80°C (Ping et al., 2010).

## RESULTS

Results of this study have shown that the maximum, minimum and medium stem biomass of *E. ciconium* in studding area were 3.9, 6.7 and 5.00 g, respectively (Figure 4). Stem height *E. ciconium* was unsteady from 850 to 1330 mm, that is, an average of about 1050 mm.

## Conclusion

A total of 12 plots were collected and 60 samples were studied in this research. In the total 60 samples, about 55.35% of stem weight were lost when samples dried. Vegetal species can have effect on soil chemical and physical properties (Ardekani, 2003). Increasing *E. ciconium* specie in studying area can cause specific biological qualification, and as this specie increase density of over ground Biomass will increase, and also the amount of soil stabling and protection will increase, especially protection against wind erosion and soil losing with runoff (Shadkami-Til and Bibalani, 2010, 2011). This study has revealed and quantified the stem biomass of the *E. ciconium* in the Shanjan rangelands, the plant has good biomass in this research area and probably also in other areas where the *E. ciconium* is growing. It is a pioneer study, and the results have given estimations of the stem biomass of the *E. ciconium* for the first time in Shanjan rangeland. It is need for studding for shrubs and plant in this area and other places, for recognizing the Best plant for rangeland ecosystem stabling and stabilizing surface soil erosion, especially wind erosion.

**Table 1.** Scientific name for *E. ciconium* classification report (USDA, 2010).

Kingdom	<i>Plantae</i> – Plants
Subkingdom	<i>Tracheobionta</i> – Vascular plants
Superdivision	<i>Spermatophyta</i> – Seed plants
Division	<i>Magnoliophyta</i> – Flowering plants
Class	<i>Magnoliopsida</i> – Dicotyledons
Subclass	<i>Rosidae</i>
Order	<i>Geraniales</i>
Family	<i>Geraniaceae</i> – Geranium family
Genus	<i>Erodium</i> L'Hér. ex Aiton – stork's bill
Species	<i>Erodium ciconium</i> (L.) L'Hér. ex Aiton – common stork's bill

**Figure 2.** *E. ciconium* species.**ACKNOWLEDGEMENT**

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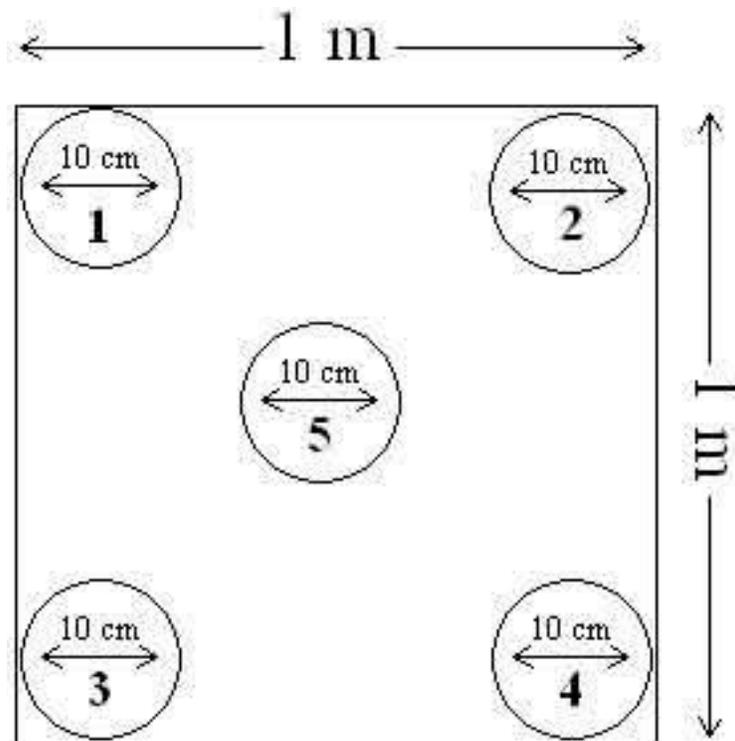


Figure 3. Sampling design in 1×1 m plot (Ping et al., 2010).

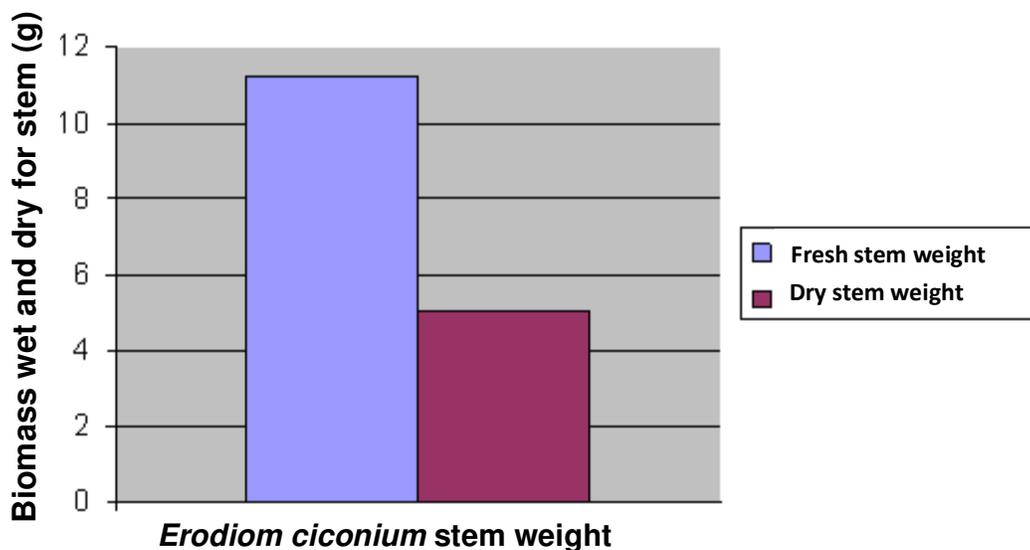


Figure 4. *E. ciconium* stem weight (fresh and dried weight).

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REFERENCES

Adler PB, Raff DA, Lauenroth WK (2001). The effect of grazing on the spatial heterogeneity of vegetation. *Oecologia* 128: 465–479.  
 Ardekani M, 2003. *Ecol. Univ. Tehran*, pp. 68–70.

Belsky AJ (1986). Does herbivory benefit plants? A review of the evidence. *Am. Nat.*, 127(6): 870–892.  
 Benton MW, Wester DB (1998). Biosolids effects on tobosagrass and alkali sacaton in a Chihuahuan desert grassland. *J. Environ. Qual.*, 27: 199–208.  
 Bertiller MB (1996). Grazing effects on sustainable semiarid rangelands in Patagonia: the state and dynamics of the soil seed bank. *Environ. Manage.*, 20: 123–132.  
 Bertiller MB (1998). Spatial patterns of the germinable soil seed bank in

- northern Patagonia. *Seed Sci. Res.*, 8: 39–45.
- Bertiller MB, Coronato F (1994). Seed bank patterns of *Festuca pallescens* in semiarid Patagonia (Argentina): a possible limit to bunch reestablishment. *Biol. Conserv.*, 3: 57–67.
- Bidlock EJ, Voughan JE, Devald CL (1999). Forage Quality of 10 Eastern Gama Grass. *J. Range Manage.*, 52: 661–665.
- Bisigato AJ (2000). Dinamica de la vegetacion en a reas pastoreadas del extremo austral de la provincial fitogeografica del Monte. Ph.D. Dissertation, Universidad de Buenos Aires Press, Buenos Aires, p. 163.
- Callaway RM (1995). Positive interactions among plants. *Bot. Rev.*, 61: 306–349.
- Fresquez PR, Francis RE, Dennis GL (1990). Soil and vegetation responses to sewage sludge on a degraded semiarid broom snakeweed/blue grama plant community. *J. Range Manage.*, 43: 325–331.
- Gharaman A (2003). Folor Colored Iran, pp. 1-24.
- Hutchings MJ, John EA (2003). Distribution of roots in soil, and root foraging activity. In: de Kroon, H., Visser, E.J.W. (Eds.), *Ecological Studies*. Ecological Studies, Berlin, pp. 33–60.
- Mata-González R, Ronald E, Sosebee, Changgui Wan (2002). Shoot and root biomass of desert grasses as affected by biosolids application. *J. Arid Environ.*, 50: 477–488, doi:10.1006/jare.2001.0897.
- Mayor MD, Boo RM, Pelaez DV, Elja OR (2003). Seasonal variation of the soil seed bank of grasses in central Argentina as related to grazing and shrub cover. *J. Arid Environ.*, 53: 467–477.
- McNaughton SJ, Banyikwa FF, McNaughton MM (1998). Root biomass and productivity in a grazing ecosystem. *Serengeti Ecol.*, 79(2): 587–592.
- Milchunas DG, Lauenroth WK (1993). Quantitative effects of grazing on vegetation and soils over a global range of environments. *Ecol. Monogr.*, 63(4): 327–366.
- Mogaaddam MR (2001). Ecology descriptive and Astistic Vegetal Coverage, University Tehran, p. 285.
- Mozaffarian V (2007). A dictionary of Iranian, Latin, English, Persian. Tehran, Farhang Moaser.
- Oosterheld M, Sala OE (1990). Effects of grazing on seedling establishment: the role of seed and safe-site availability. *J. Veg. Sci.*, 1: 353–358.
- Pabot RD, Beck RF (1990). Range Condition From an Ecological Perspective: Modification to Recognize Multiple Use Objectives, *J. Manage.*, 1: 27
- Ping X, Guangsheng Z, Qianlai Z, Yunlong W, Wanqing Z, Guangxu S, Xianglei L, Yuhui W (2010). Effects of sample size and position from monolith and core methods on the estimation of total root biomass in a temperate grassland ecosystem in Inner Mongolia. *Geoderma*, 155: 262–268.
- Richards JH, Caldwell MM (1985). Soluble carbohydrates, concurrent photosynthesis and efficiency in regrowth following defoliation: a field study with *Agropyron* species. *J. Appl. Ecol.*, 22: 907–920.
- Rodriguez MV, Bertiller MB, Sain CL (2007). Spatial patterns and chemical characteristics of root biomass in ecosystems of the Patagonian Monte disturbed by grazing. *J. Arid Environ.*, 70: 137–151, doi:10.1016/j.jaridenv.2006.12.010.
- Salimi FA (2003). Looki To History and Geographical Shabestar, Tasuj, Sufiyan, Tehran Sibe Sorkh. pp. 234-244.
- Schlesinger WH, Reynolds JF, Cunningham GL, Huenneke LF, Jarrel WM, Virginia RA, Withford WG (1990). Biological feedback in global desertification. *Science*, 247: 1043–1048.
- Schlesinger WH, Raykes JA, Hartley AE, Cross AF (1996). On the spatial pattern of soil nutrients in desert ecosystems. *Ecology* 77(2): 364–374.
- Shadkami-Til H, Bibalani Gh (2010). Under-over ground Biomass characterics of perennial Species (*Teucruim polium*) in northwest Iran (Till area of Shabestar). *Inter. J. Acad. Res.*, 2-6 (In press).
- Shadkami-Til H, Bibalani Gh (2011). Over ground Biomass characteristics of Genera single Species Iran (*Cnicus benedictus*) In northwest Iran (Till area of shabestar). *Int. J. Acad. Res.*, 3pp (In press).
- Snyder KA, Williams DG (2003). Defoliation alters water uptake by deep and shallow roots of *Prosopis velutina* (Velvet mesquite). *Funct. Ecol.*, 17: 363–374.
- USDA 2010, *Erodium ciconium*, <http://plants.usda.gov/java/profile?symbol=ERC19>, Retrieved 26, Nov. 2010.
- Wikipedia (2010), *Erodium*, <http://en.wikipedia.org/wiki/Erodium>, Retrieved 26: 2010.