Research Journal of Biological Sciences 5 (9): 628-631, 2010
ISSN: 1815-8846

Under-Ground Biomass Characteristic of Perennial Species (*Onosma trachtricum*) in Northwest Iran (Till Area of Shabestar)

[1]Hamideh Shadkami-Til and [2]Ghassem Habibi Bibalani
[1]Islamic Azad University, Marand Branch, Marand, East Azerbaijan
[2]Islamic Azad University, Shabestar Branch, Shabestar, East Azerbaijani

Abstract: *Onosma trachtricum* (Boiss.) is an important perennial native grass widespread in the range areas of the arid and semi-arid Phytogeographical region in Northwest Iran. Previous studies have shown great variability in forage biomass production per plant among different varieties. Research area is of rangeland of Til village from Shabestar district with distance is 25 km from it. This area is semi arid area and this land covered with natural range land grasses. Root and shoot in these species were sampled in one stage from late March late to late August. Roots of plants stable soils on slope and provide resistance against the forces that improve slope instability. We studied, *Onosma trachtricum* to determine, its characteristics. Data were collected with random sampling in this area with 1 m^2 in 64 quadrate plots. Mean, max and min root biomass of this plant is 1.14, 13.05, 5.22 g m^{-2}, respectively.

Key words: Root biomass, *Onosma trachtricum*, rangeland and soil, grasses, Shabestar district, Til village

INTROUDUCTION

Understanding root biomass is particularly important in rangeland ecosystems. In most rangelands, a large proportion of biomass is below-ground (Coupland, 1992), making estimates of total biomass in rangelands particularly sensitive to estimates of below-ground production. Several studies in rangelands have shown shorter root life spans in fertilized soils, compared to control plots indicating that site fertility has some bearing on root turnover (Aber *et al*., 1985).

Alternatively, root turnover may not be influenced by environmental factors, making root turnover constant in grasslands. A third possibility is that root turnover is controlled by a suite of factors including root herbivores, water stress and growing season length that are correlated with mean annual temperature (Gill and Jackson, 2000).

There is little information on root architecture of plants growing on semi-arid rangeland where, soil nutrient heterogeneity and defoliation might impose particular restrictions on root growth. In this research, we determined root biomass and production of perennial plant species (*Onosma trachtricum* Boiss.) stands during one growing seasons.

The under study root biomass, encompass and production varied in relation to stand age although, the variation was not statistically significant. The depth distribution of biomass and encompass of fine, roots varied with stand age. Most of the *Onosma trachtricum* fine roots were located in the mineral soil in the mature and pole stage stands. But estimation of these parameters are time consuming and expensive. This parameter need more attention but it is one of the determined of stabling position of slope area in that place.

MATERIALS AND METHODS

Study area is about 25 km of Shabestar city between 15' 38°-38°17' 30" North width and 45°27' 30"-45°30' East length of prime meridian and the total space of the area is almost 310.31 km^2 for studying this research, we selected 10 ha space land covered with natural rangeland grasses (Salimi faed, 2003).

In surface sampling, we must have more attention in cases such as shape, plat size, design size and the way of writing data. So from sampling, the pointed case was determined by Surface plat method. Quadrate size (1×1 m) is selected as the best plot. Then, sampling is done by completely Accident method after determine the size of optimum plot. Data that were related two soil observation are collected that they generally include erosion information and soil protection. All of the plants in plots were measured separately in two parts after plant sampling. Biological spectrum studying of area showed that the more species of type are Hemicriptophyte and Trophite. *Onosma trachtricum* species that grows naturally in Azerbaijan province of Iran and commonly

Corresponding Author: Hamideh Shadkami-Til, Islamic Azad University, Marand Branch, Marand, East Azerbaijan

found in rangelands areas were selected this species for test shows (Table 1) the scientific and Farsi name of that species with blossoming time and local position (Fig. 1). For recognition of species for sampling, we used of Accidental sampling method. In simple Accidental sampling method each people has equal for selecting (Farahvash, 2004). In this sampling, determined accidental vegetal coverage and or un-coverage in each plot. We determined, geographical direction and elevation for each plot. Sampling is done from early May to late July and it ended late June when 60% of area coverage was in blossoming stage.

And most of the plats were used from above statistical method in this season. And all of the present plants in plats after plant sampling were measured in two parts separately.

Sampling from area studying plants after sending to laboratories each plant was photographed to record general above ground and below-ground morphology/architecture prior to being disected into its component parts to determine biomass. Above-ground biomass was measured by separating the foliage, branches and stem. Each component was oven dried at 80°C for 24 h then weighed. Below-ground biomass was determined by hosing roots clean of soil before they were oven dried at 80°C for 24 h then weighed. The dry weight of each plant component was recorded to the nearest 0.1 g and statistical analyzing is done by Excel.

Table 1: Collected and determined species with blossom time and geographic height (Ghahraman, 2002; Mozaffarian, 2007)

Dicotyledonous	Angiosperms gamopetalous
Family	Boraginaceae
Species binominal name	*Onosma trachtricum*
Species Persian name	Zangoleiye rishepir
Blossoming time	March to May
Geographic height	Collecting place: Hussein Abad Till, height 1460 m

Fig. 1: *Anchusa italica* species

RESULTS AND DISCUSSION

Results of this showed that in studying area, stem height *Onosma trachtricum* was unsteady from 24-28.5 mm that in average it is about 26.25 mm and the mean, max. and min. under-ground of biomass in studying area 1.14, 13.05, 5.22 g m^{-2}, respectively. The variation in fresh weight during the maturation and senescence phase was is significant (Table 2). Result shows that in studying area *Onosma trachtricum*, biomass over ground and under-ground 0.75, 1.14 g m^{-2}, respectively (Fig. 2). The results showed that *Onosma trachtricum* depth is 22 cm and stem height is 26.25 cm (Fig. 3).

Table 2: Calculation is done for vegetal species

	Average (cm)		Total weight (g)			
Onosma trachtricum	Height	Root depth	Fresh stem	Fresh root	Dry stem	Dry root
			Average			
In unit surface	26.25	22	1.65	1.88	0.75	1.14
Max.	28.50	18	16.33	21.57	7.28	13.05
Min.	24.00	26	10.07	8.57	4.86	5.22

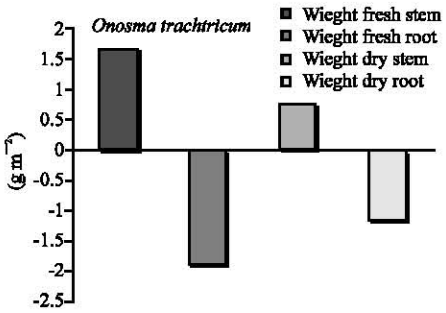

Fig. 2: *Onosma trachtricum* average biomass over-ground and under-ground

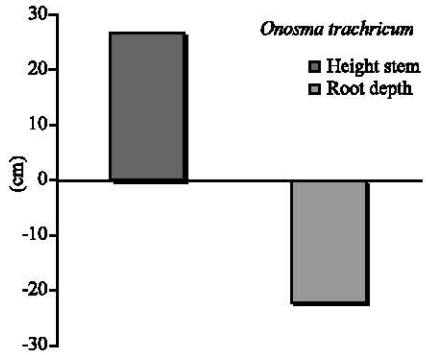

Fig. 3: *Onosma trachtricum* average root depth and stem height

CONCLUSION

The important factor in soil erosion in studying area is because of shrubs decreasing that have more root depth. By irregular and unsystematic utilization of rangeland shrubs, natural potential of erosion will be more. In that case if there is not environmental management on this process, the damage of flood and soil erosion will progressively increase in future. Because by decreasing range, species in ranges such as *Onosma trachtricum*, the amount of bulk soil will be lesser in front of created unstable. Soil depth as measured by the depth to bedrock or a restrictive soil horizon.

Influences water and nutrient availability and imposes mechanical resistance to root penetration thus, affecting plant growth (Glinski and Lipiec, 1990). As such it is a primary determinant of plant production and composition across landscapes (McAuliffe, 1994, 1999). Fissures and crevices represent belowground gaps that might be differentially exploited by plants with contrasting root architectures. Grasses, generally have relatively shallow, fibrous root systems well-suited for intensively exploiting upper volumes of the soil (Richards, 1986) but there are species and environment-specific variations (Fox *et al*., 1953; Bookman and Mack, 1982). Root site occupancy is related to plant density and lateral root growth rates. Root site occupancy occurs when root systems of adjacent plants overlap.

The concept projects the root system onto the ground as a circle in the same manner as for canopy occupancy. The faster a site is occupied by roots, the greater the reinforcement to the soil and the more effective the plant treatment is.

However, as many species have root systems that are confined to shallow depths, they have little influence on the critical failure surface. Lateral root site occupancy is therefore, not in itself a good indicator of effectives. Data have been gathered for a number of rangelands species in East Azerbaijan by Bibalani *et al*. (2006). Root tensile strength varies both with growing environment and species.

Root strength alone is not a good predictor of the effectiveness of a particular species for erosion control because the soil may fail around, the root long before the root actually breaks. This supports the notion that on shallow soil sites underlain by fractured bedrock when grasses do not use these deeper resources, there may be an abundant reservoir for species with deep, tap root architectures (Walter, 1979; Stark and Redente, 1985; Gibbens and Lenz, 2001).

Experiments quantifying patterns of fissure exploitation by grasses, forbs and shrubs with highly contrasting root architectures would be interesting and instructive (Sydes and Grime, 1984).

ACKNOWLEDGEMENT

The researchers greatly acknowledge the scientific support from Islamic Azad University, Marand Branch to the first researcher for this study. The first researcher is studying as M.Sc. student of Plant Systematic in Islamic Azad University, Marand Branch and this study is a part of her M.Sc. Thesis with title of Study on Density and Biomass of Rangeland Plants at Till area that have been researched in 2009.

REFERENCES

Aber, J.D., J.M. Melillo, K.J. Nadelhoffer, C.A. McClaugherty and J. Pastor, 1985. Fine root turnover in forest ecosystems in relation to quantity and form of nitrogen availability: A comparison of two methods. Oecologia, 66: 317-321.

Bibalani, G.H., A.A. Golshani, S.S. Zahedi, and Z. Bazrang, 2006. Thetration effect of lateral roots of Gavan (*Astragalus raddei*) on soil reinforcement in Northwest Iran (rangelands of the Shajan area of Shabestar). Can. J. Soil Sci., 86: 493-499.

Bookman, P.A. and R.N. Mack, 1982. Root interaction between bromus tectorum and poa pratensis: A three-dimensional analysis. Ecology, 63: 640-646.

Coupland, R.T., 1992. Mixed Prairie. In: Grasslands of the World, Coupland, R.T. (Ed.). Cambridge University Press, Cambridge, pp: 151-182.

Farahvash, F., 2004. Ecology. Islamic Azad University Tabriz, Tabriz, pp: 104-116.

Fox, R.L., J.E. Weaver and R.C. Lipps, 1953. Influence of certain soil-profile characteristic upon the distribution of roots of grasses. Agron. J., 45: 583-589.

Ghahraman, A., 2002. Folor colored Iran. Tomes, pp: 1-24.

Gibbens, R.P. and J.M. Lenz, 2001. Root systems of some Chihuahuan Desert plants. J. Arid Environ., 49: 221-263.

Gill, R.A. and R.B. Jackson, 2000. Global patterns of root turnover for terrestrial ecosystems. New Phytol., 147: 13-31.

Glinski, J. and J. Lipiec, 1990. Soil Physical Conditions and Plant Roots. CRC Press, Boca Raton, Florida, ISBN-13: 9780849364983, pp: 250.

McAuliffe, J.R., 1994. Landscape evolution, soil formation and ecological patterns and processes in Sonoran desert bajadas. Ecol. Monographs, 64: 111-148.

McAuliffe, J.R., 1999. The Sonoran Desert: Landscape Complexity and Ecological Diversity. In: Ecology of Sonoran Desert Plants and Plant Communities, Robichaux, R.H. (Ed.). The University of Arizona Press, Tucson, pp: 68-114.

Mozaffarian, V., 2007. A Dicionary of Iranian, Latin, English, Persian. Farhang Moaser, Tehran.

Richards, J.H., 1986. Root form and Depth Distribution in Several Biomes. In: Mineral Exploration: Biological Systems and Organic Matter, Carlisle, D., W.L. Berry, I.R. Kaplan and Watterson, J.R. (Eds.). Prentice-Hall, Englewood Cliffs, New Jersey, pp: 83-97.

Salimi faed, A., 2003. Looki to History and Geographical Shabestar. Tehran Sibe Sorkh, Tasuj, Sufiyan, pp: 234-244.

Stark, J.M. and E.F. Redente, 1985. Soil-plant diversity relationships on a disturbed site in Northwestern Colorado. Soil. Sci. Soc. Am. J., 49: 1028-1034.

Sydes, C.L. and J.P. Grime, 1984. A comparative study of root development using a simulated rock crevice. J. Ecol., 72: 937-946.

Walter, H., 1979. Vegetation of the Earth and Ecological Systems of the Geobiosphere. 2nd Edn., Springer-Verlag, New York.