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Dataset of Individual Traits of *Poa alpigena* in Yushu Alpine Prairie (2014)

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Abstract: In order to study the responding model of grazing to the grassland ecosystem. the author, in early August 2014, "Yushu alpine prairie resources and ecological environment key field observation station" (33°24′30″N, 97°18′00″E, elevation 4,250 m), the Ministry of Agriculture, and the surrounding Jiatang grassland, selected the annual grazing plot (YG), summer grazing plot (SG), winter grazing plot (WG), fencing for 3 years plot (UG3), fencing for 5 years plot (UG5), and fencing for 5 years plot (UG12), in which 6 sample quadrat were selected for each plot, and 9 adult *Poa alpigena* plants were randomly selected from each quadrat. The phenotypic traits of plant height, leaf number, leaf length, leaf width, stem diameter, stem length, root length, root diameter and spike length were gauged by electronic vernier caliper and other instruments. The leaf area of all leaves of the sample was measured with digital scanner and image processing software and the average single leaf area was calculated. At last, the stem, leaf, spike and root of plant were separated into different envelopes, and dried at 65 °C for 48 h to constant weight in the oven. The stem of each plant was weighed by electronic balance, Leaves, ears and roots, and retrieved the data of individual traits of Alpine meadow *Poa alpigena* which affected by grazing and fencing. The dataset includes: (1) geographical location data of 6 plots; (2) individual trait data of *Poa alpigena* which are stored in .kmz, .shp and .xlsx formats, with a compressed data size of 44.6 KB.

Keywords: Qinghai-Tibet Plateau; Yushu Alpine Prairie; Grassland ecosystem; *Poa alpigena*

1 Introduction

Grazing, as the most important disturbance of mankind to the grassland ecosystem, has an important impact on the ecosystem process[1]. Livestock can directly affect the dynamics of some plant species through their selective feeding behavior and indirectly change the functional traits of plants[2]. Exploring the grazing response mechanism of grassland plants from the change of functional traits is a popular idea by ecologist[3]. Moderate grazing can in-

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crease the species diversity of the community, thus affecting the productivity and stability of the grassland. Overgrazing will lead to corresponding changes in individual species, composition, and community of plants, among which plant individuals respond in many ways to the effects of grazing. During the growth and development of plants, plants adapt to environmental change and subsist by optimizing the allocation of resources for growth, maintenance and reproduction[4–5].

The previous work found that the individual morphological characteristics of alpine forage grass in the alpine Kobresia meadow of Sanjiang sources changed under long-term grazing conditions, and the individual size and individual biomass of excellent forage obviously decreased[6]. So far, there are still few reports on the changes of characteristics of main traits of individuals by long-term grazing and plant traits plasticity in alpine meadow[7]. In particular, the sensitivity of different traits is still not clear, which is the important bottleneck in the process of plant biology under prairie. This study, therefore, explores Alpine meadow with both enclosure and grazing trials, and aims to reveal: (i) Differential response characteristics of stem and leaf of *Poa alpigena* to grazing and enclosure; (ii) Sensitivity of plasticity response of different traits to grazing.

2 Metadata of Dataset

Table 1 shows the names, authors, geographical regions, data years, temporal resolution, spatial resolution, dataset composition, data publishing and sharing service platform, data sharing policies and other data of dataset of individual traits in *Poa alpigena* in Yushu Alpine Prairie[8].

Table 1 Metadata Summary of the Individual Traits in *Poa alpigena* dataset

Items	Description
Dataset full name	Measured dataset of individual traits in *Poa alpigena* in Yushu Alpine Prairie (2014)
Dataset short name	InSituDataPoaCrymophilaYuShu2014
Author	Shi, H. X. V-2905-2017, Institute of Grassland Research, Chinese Academy of Agriculture Sciences, axiao8003@sina.com
Geographical region	Zhenqin Town, Chindu County, Yushu Prefecture, Qinghai ProvinceYushu alpine prairie resources and ecological environment key field observation station, the Ministry of Agriculture, 33°24′30″N，97°18′00″E
Year	2014
Data format	.shp, kmz, .xlsx
Data size	44.6 KB in compress
Dat a files	The dataset includes: (1) geographical location data of 6 plots (2) individual trait data of *Poa alpigena*
Foundation(s)	Ministry of Science and Technology of P. R. China (2014CB138802, 1610332016003, 2016KF-06); Qinghai Province (2016-ZJ-Y01, 2017-ZJ-Y12); National Natural Science Foundation of China (31560668)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China

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Items	Description
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (data products), and publications (in this case, in the *Journal of Global Change* ***Data*** *& Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten per cent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[9]

3 Methods

3.1 Data Collection

Figure 1 shows the flow chart of dataset response to individual traits of grazing and enclosure in alpine meadow plateau. Experimental data acquisition in early August 2014, six communities with small differences in micro topography, uniform plant growth and contiguous patches were selected in six sites including the annual grazing plot (YG), summer grazing plot (SG), winter grazing plot (WG), fencing for 3 years plot (UG3), fencing for 5 years plot (UG5), and fencing for 5 years plot (UG12). For each treatment, the typical quadrats of 1.0 m × 1.0 m (Figure 2) were selected for the sample with typical characteristics and repeated 6 times. Nine plants were randomly selected for each quadrat. The phenotypic traits of plant height, leaf number, leaf length, leaf width, stem diameter, stem length, root length, root diameter and spike length were gauged by electronic vernier caliper and other instruments (Figure 3). Among them, the leaf length and leaf width of all the leaves in the plateau were measured, and the average leaf length and the average leaf width were calculated. Using the digital scanner and image analysis software Adobe Photoshop, the leaf area of all leaves of the sample were gauged and the average single leaf area was calculated. After setting-out the phenotypic traits, the plants were separated from the stem, leaves, spikes and roots in different envelopes and dried in an oven at 65 °C for 48 h to a constant weight. The mass of stem, leaf, spikes and root of each plant were obtained by electronic balance.

3.2 Data Processing

In this study, the functional characteristics of Poa alpigena includes leaf traits, stem traits, root traits, panicle traits, and whole plant traits：

(1) Leaf traits：leaf number (LN), leaf length (LW), leaf area (LA), total leaf mass (TLW) and single leaf mass (LWE);
(2) Stem traits：stem length (SL), stem diameter (SD) and stem weight (SW);
(3) Root traits: root length (RL), root diameter (RD), root weight (RW);
(4) Panicle traits: panicle length (FL), panicle weight (FW);
(5) Plant traits: plant height (PH), number of branches (NB) and whole plant weight (WW).

The single factor analysis of variance was used to analyze the significant difference of the stem and leaf traits of Kentucky bluegrass (YG, SG, WG, UG3, UG5, UG10, etc.) and the

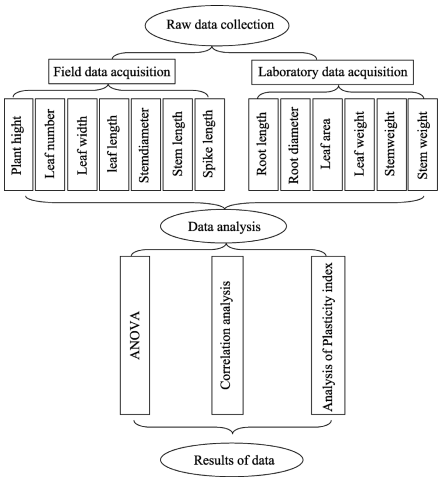

Figure 1 Flow plot of dataset response to individual traits of grazing and enclosure in alpine meadow plateau

Figure 2 Data collection quadratogram

Duncun multiple comparisons. The data were expressed as mean ± standard error. Pearson correlation analysis was used to analyze the correlation between stem and leaf traits. Regression analysis was used to fit the relationship between aboveground biomass and phenotypic traits of Kentucky bluegrass, and the significance was tested at 0.05 and 0.01.

The plasticity index indicated the response of the stem and leaf traits to grazing. The plasticity index (PI) of one trait of SG, WG, UG3, UG5 and UG12 was calculated by the method of Li Xiliang et al. (2014). Sample value minus SG, WG, UG3, UG5, UG12 and other plots of land value, divided by the YG plot value.

Statistical analysis software SPSS 17.0 was used for analysis of variance, correlation analysis, and 0.05 and 0.01 level significance test, data were plotted by SigmaPlot 12.0.

Figure 3 Measuring stems, leaves and spikes

4 Results and Validation

4.1 Data Products

The dataset is consisted of: (1) geographic location data of 6 plots; (2) 54 quadrats, 16 trait index data, 3 indexes of stem traits data, 2 indexes of panicle traits data, three traits of root traits data and whole plant traits data.

4.2 Validation

According to the plasticity index of 17 traits of Poa alpigena, the traits of leaf, stem, root and ear were significantly affected by grazing as a whole, the plasticity index of each trait was UG5>UG3>UG12>SG>WG. In the plots, the order of plasticity index of each trait was basically the same, and the plasticity of panicle weight, stem weight, whole plant weight, number of branches, stem length and plant height were larger (−0.13 <PI <14.5) (PI <1.3), which was the most insensitive trait and was an inert trait in response to grazing.

Plasticity indices of 17 traits of Poa alpigena were ranked by plasticity index. Overall, the plasticity index of all plots was ranked as UG5>UG3>UG12>SG>WG. Functional traits

were significantly affected by grazing. The plasticity of panicle weight, stem weight, whole plant weight, number of branches, stem length and plant height was larger (–0.13 <PI <14.5), which was a sensitive trait to grazing. However, the plasticity of leaf number, leaf width, stem diameter and root diameter changed less (PI <1.3).

5 Discussion

In future studies, analyzing the mechanism of plant-type transformation under grazing disturbance should not only consider macroscale processes, but also focus more on molecular ecological mechanisms. The study of plant molecular ecology in grassland has just started [10]. High-throughput analytical techniques such as genomics, transcriptomics, proteomics, metabolomics and phenomics should be used to detect the environmental response genes through the process of signal induction from grazing to plant metabolism for years to come. Thus, the signal regulation pathway and metabolic network of the phenotypic plastic deformation of the prairie plants are constructed.

Author Contributions

Shi, H. X. designed the algorithms of dataset. Shi, H. X., Li, P., *et al*. contributed to the data processing and analysis. Shi, H. X. wrote the data paper.

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