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Yajing Bao

Dalian Nationalities University, China

Zhenghai Li

Dalian Nationalities University, China

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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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The caloric values of main plant species and functional groups in the steppe communities of Xilin River Basin

BAO Ya-Jing LI Zheng-Hai

College of Life Science, Dalian Nationalities University, 18 Liaohe West Road, Dalian Economic & Technical Development Zone, Liaoning 116600, People's Republic of China. E-mail: byj@dlnu.edu.cn

Key words: Xilin River Basin, the caloric value, plant functional groups, steppe community, plant species

Introductions The caloric value is a useful parameter which has been broadly employed to measure the energy budgets through an ecosystem (Ren et al., 1999), as well as to assess the photosynthetic efficiency of plants and to identify the allocation of energy storage within different organisms of plants. The objective of this study was to detect variations of caloric value of dominant species and functional groups in total 12 sites in the steppe communities of Xilin River Basin, Inner Mongolia.

Materials and methods Caloric values of main plant population were investigated in Xilin River Basin, Inner Mongolia. The study was based on field surveys of the standing vegetation in two typical steppes respectively dominated by *L. chinensis* or *S. grandis* and one meadow steppe dominated by *L. chinensis* including of four degraded intensities sites (undegraded, relatively light, moderate and heavy degraded) in each steppe types. Aboveground part was sampled in terms of different species from above 12 sites from 18 July to 10 August 2002, and then oven dried at 60°C to constant weight. The caloric determinations were made of each sample using a Parr 1281 oxygen bomb calorimeter. The caloric value was analyzed for species grouped according to their life form, family and water ecological types.

Results The mean caloric value of 60 species, taking into account three steppe types and four grazing degraded intensities studied, was $17.25 \pm 0.92 \text{ kJ g}^{-1}$ with a CV of 5.4%. Among them, an annual forb, *Salsola collina* ($13.12 \pm 1.09 \text{ kJ g}^{-1}$) had a significant lower caloric value than other species (Figure 1). Shrub had the highest value among groups classified by life forms. The mean of perennial grasses was significant higher than that of annuals and biennials ($p < 0.05$), the subshrubs and perennial forbs were in the midst. No statistically significant differences were found among the caloric values of the different plant groups based on water ecological types include of xerophytes, mesoxerophytes, xeromesophytes and mesophytes. Different families showed apparent difference in caloric value. The higher caloric values were found in Gramineae, Leguminosae and Compositae, while Chenopodiaceae has the lowest value (Figure 2).

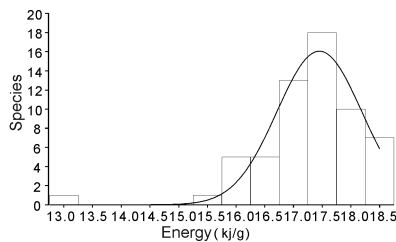


Figure 1 Frequency distributions of the number of species by caloric value classes of major plant species in the steppe of Xilin River Basin.

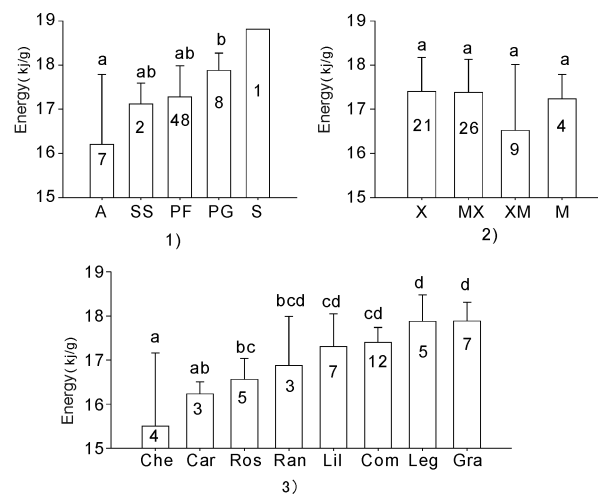


Figure 2 Mean caloric value (\pm SD) for different plant grouping in steppe of Xilin River Basin. Different letters represent significant differences among means ($P < 0.05$, ANOVA Duncan test). The number in the bar represent the number of species in corresponding grouping.

1) Based on life form. A: annual and biennials, SS: subshrubs, PF: perennial forbs, PG: perennial grasses, S: shrubs.

2) Based on water ecological types. X: xerophytes, MX: mesoxerophytes, XM: xeromesophytes, M: mesophytes.

3) Based on family. Che: Chenopodiaceae, Car: Caryophyllaceae, Ros: Rosaceae, Ran: Ranunculaceae, Lil: liliaceae, Com: Compositae, Leg: Leguminosae, Gra: Gramineae.