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Stability of Alpine Meadow Ecosystem on the Qinghai-Tibetan Plateau

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Stability of alpine meadow ecosystem on the Qinghai-Tibetan Plateau

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Key words: alpine meadow, stability, coefficient of variance, ecosystem diversity, net primary production, precipitation, temperature

Introduction The stability of grassland ecosystem is one of the most important topics in modern ecology (Bai et al. 2004; Tilman & Downing 1994). However, little relevant information is available for the alpine meadow on the Qinghai-Tibetan Plateau (Zhao & Zhou, 1999). In this paper, we examined the ecosystem stability and its sensitivity to environmental variations in an alpine meadow using the quantitative methods.

Material and methods In this study, air temperature and precipitation were measured by regular meteorological methods. The above-ground net primary production was measured by the harvest method. The annual variations of precipitation and mean air temperature from 1957 to 2000, and the above-ground net primary production of the *K. humilis* meadow from 1980 to 2000 were collected.

In this paper,

$$E = \left| \left(\frac{\Delta y}{\Delta x} \right) / \left(\frac{\bar{y}}{\bar{x}} \right) \right| = \left| b / \left(\frac{\bar{y}}{\bar{x}} \right) \right|$$

which can measure the stability of grassland ecosystem. When E does not change with x or time (t) in a given period, the E is constant. The constant E means the measurement of system stability of abiotic factor. Furthermore, it is easy to compare each other because the parameters are dimensionless.

Results and discussion Comparison of alpine meadow ecosystem stability with other five natural grassland ecosystems in Israel and southern Africa indicates that the alpine meadow ecosystem on the Qinghai-Tibetan Plateau is the most stable ecosystem. The alpine meadow ecosystem with relatively simple structure has higher stability, which indicates that community stability is not only correlated with biodiversity and community complicity but also with environmental stability. The high stability of the alpine meadow ecosystem may be resulted also from the adaptation of the ecosystem to the alpine environment.

Conclusions In this study, we use the coefficients of variation (CV) and stability (E) obtained from the Haibei Alpine Meadow Ecosystem Research Station to characterize the ecosystem stability. The results suggest that the net primary production of the alpine meadow ecosystem was more stable (CV = 13.18%) than annual precipitation (CV = 16.55%) and annual mean air temperature (CV = 28.82%). The net primary production was insensitive either to the precipitation (E = 0.0782) or to air temperature (E = 0.1113). In summary, the alpine meadow ecosystem on the Qinghai-Tibetan Plateau is much stable.

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