

Effects of cultivation of *Puccinellia tenuiflora* on the chemical and physical characteristics of alkalinized soil in western areas of Jilin

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Key words : alkalinized soil, alkali-grass, *Puccinellia tenuiflora* chemical and physical characteristics of soil

Introduction Alkalinized soils are expanding over the western area in Jilin province of China and have been partially used as grasslands. Alkali-grass (*Puccinellia tenuiflora*), a perennial plant in the *Poaceae* family, grows well in those areas, unlike most grasses which do not grow in soils with very high levels of pH. It has been observed that some grasses become established after several years of cultivation of the alkali grass in these soils. Thus, it is expected that the grass could be used to improve alkalinized soil. Changes in soil characteristics from alkali-grass cultivation, however, were not determined in detail in previous studies. The present study, therefore, was conducted to clarify the effects of alkali-grass cultivation on the chemical components and physical characteristics of alkali soil in Jilin.

Materials and methods Soil samples were collected from the alkalinized region around Da-an city of Jilin province. Samples were collected from different depths (0 to 2, 2 to 10, 10 to 20, 20 to 30, 30 to 40 and 40 to 50 cm) from five points in each three types of the alkali areas where alkali-grass had cultivated for three years (Third year) and ten years (Tenth year) or never cultivated (Control), respectively. Electrical conductance (EC mS/cm), pH, minerals (Na, Ca, Mg, K, P, Fe and Cl mg/kg), CO₃²⁻ (g/Kg) and HCO₃⁻ (g/Kg) of the samples were analyzed after soils were dried and passed through a screen mesh.

Results and discussion Mean values of EC, pH (Table 1) and Na contents of shallow layers of soil of Third and Tenth years were lower than those of Control respectively, although those values of middle layer of soil of Third year were higher than those of Tenth year. On the other hand, mean values of EC and Na contents of deep layer of soil of Third year were higher than those of Control. There is significant positive correlation ($r^2=0.772$) between CO₃²⁻ content and pH of alkalinized soils. These data suggest that anions in the soils would be neutralized by unknown factor(s) such as organic acids released from roots of alkali-grass and, as a result, sodium concentration of the soils could decrease via transportation of ions.

Table 1 Characteristics of pH of soils collected from different depth in the alkalinized lands which are cultivated alkali-grass.

Soil type	Depth of soil (cm)					
	0-2	2-10	10-20	20-30	30-40	40-50
Control	11.1	11.4	11.3	11.2	11.3	11.2
Third year	9.9	11.3	11.3	11.3	11.3	11.3
Tenth year	9.9	9.4	9.1	10.1	10.4	10.5

Conclusion Based on the results obtained in the present study, it is likely that alkali-grass could improve the alkalinized soil via process of neutralization by unknown factor(s) released from the roots.