

Achnatherum splendens investigation once again in northern China

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Achnatherum splendens (Trin), Nerski) is a perennial gramineous forage. The grass is high density, high yield grass, good dry dead branches, *Achnatherum* adaptability, salt, alkali, cold, drought, root system It is good palatability and high nutritional value, is a good livestock feed; *Achnatherum* is the agricultural and pastoral areas of daily necessities, high-quality raw materials; *Achnatherum* fibers suitable for manufacturing high-quality paper. However, the function of *Achnatherum splendens* in soil and water conservation has not been properly understood and applied.

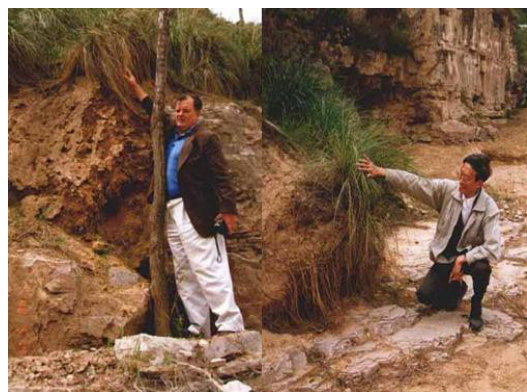


Photo 1 The World Bank investigated the loss of Achnatherum splendens (1998, Baode)

1 Chinese Vetiveria zizanioides and Its Application to Achnatherum splendens

As early as 1994, the World Bank supported the Loess Plateau Water and Soil Conservation Project, which involved many provinces in Shanxi, Shaanxi and Inner Mongolia, which lasted for many years. In 1998, the project was undergoing a mid-term evaluation. Former World Bank officials and later President of the International Vetiver Network, M. Graeme Shaw, took part in the study and Xu Liyu, the Chinese Vetiver Network Coordinator, was invited. They focused on the *Achnatherum splendens* and other plants in loess high

The role of the original soil and water conservation (photo 1). It is concluded that *Achnatherum splendens* is a good herbaceous soil and water conservation, and can play a very important role in controlling soil and water loss in the Loess Plateau.

Later in the international network of vetiver 2000, supported by the beginning of the graduate project, specializing in the splendid slope protection function. "The Impact of *Achnatherum splendens* on soil properties and its potential to control soil erosion in arid and cold regions". The project was sponsored by the Wallace Genetic Foundation.

Soil and water loss has always been the main problem affecting the agricultural production and environment in mountainous areas of northern China. To prevent and control soil erosion, people have taken a lot of engineering measures, such as construction Terraces, ponds, digging fish-scale pit, built Valley Square and so on. These measures are simple and effective in terms of prevention and control of soil erosion, but requires high manpower, material and financial resources. In contrast, biological measures to invest less, quick, it can not only effectively control water and soil, but also effectively protected and improved the ecological environment. So use of biological measures to keep soil and water much more people favor. However,

selecting a suitable soil and water conservation plant in a specific soil erosion area is not an easy task. It needs to consider a number of factors, but one of the most important is that the selected species should have good soil and water conservation function and Adapt to the environment in which the plant is planted. *Achnatherum splendens* (Tin), Nerski) thick, wide crown, root system developed. It not only has a strong function of soil and water conservation, and salt tolerance, drought resistance. The vast majority of the existing *Achnatherum splendens* natural growth, no management. In the artificial harvest (for bar broom) or fire grow better.

1 Chinese *Vetiveria zizanioides* and Its Application to *Achnatherum splendens*

(2001) studied the effects of *Achnatherum splendens* on soil physical properties, soil erosion resistance, soil erosion resistance, soil shear strength and soil properties, and the effects of *Achnatherum splendens* on soil physical and chemical properties, soil erosion resistance, soil erosion resistance and soil shear strength were also studied in Shaanxi, Shanxi, Inner Mongolia and Ningxia. The results showed that *Achnatherum splendens* could significantly improve the soil physical properties, improve soil erosion resistance, corrosion resistance and shear strength, and have a certain salt tolerance [1]. More systematic research

The characteristics of soil and water conservation of *Achnatherum splendens* provide a new idea for the soil and water loss control and soil and water conservation grassland resources in the Loess Plateau of Northwest China. *Achnatherum splendens* was divided into three ecological types according to its topography, topography and ecology. Semi-desert ecological types and ecological types of steep slopes in the valley, and the ecological types of the severely eroded gullies were emphasized, which laid a foundation for the further study and application of *Achnatherum splendens*.

Study on *Achnatherum splendens* in China recently

In order to further understand the ecological characteristics of *Achnatherum splendens*, as soon as the *Achnatherum splendens* applied to China's soil and water conservation work for our national economy, China Vetiver Network and Jiangsu Tianpeng Rand eco-technology Co., Ltd. of China's northern region *Achnatherum* growth The situation was investigated, from August 31, 2016 to September 12, which lasted 13 days. The purpose of this study was to study the ecological habit of *Achnatherum splendens*, and to understand the flowering of *Achnatherum splendens* in order to prepare for the propagation experiment of *Achnatherum splendens* (Photo 2).

Slope protection function of *Achnatherum splendens* in Loess Plateau of Shanxi Province Firstly, the function of *Achnatherum splendens* was studied. Similar to the previously seen, *Achnatherum splendens* in the Loess Plateau region of the slope protection function is very significant. Due to serious soil erosion in the Loess Plateau, *Achnatherum splendens* are mostly distributed in the higher part of the edge of the erosion ditch, can be a good fixed slope to prevent further collapse and erosion of the slope to protect the farmhouses or walls. *Achnatherum splendens* the ground part of up to 2m above the root can reach 2m or more (photo 3).



Photo 2 On-site study *Achnatherum splendens* seed photos 3 aboveground and underground parts respectively over 2m photos 4 to the local fellow *Achnatherum splendens*



Achnatherum splendens in the local main purpose is to tie broom (Photo 4), is said to be because of its good toughness, light and not easily broken. The broom in the Loess Plateau and Northwest China is very common. A broom in Ningxia can sell 18 yuan. But the farmers for *Achnatherum* water and soil conservation

function is not much understanding. *Achnatherum* in any place, mostly distributed in the plexus. And typical

Older dwellings with more stabilizing effects may be associated with human activities (such as sweeping the yard) and slow growth. And are fend for themselves, never heard of artificial cultivation. But in any case, *Achnatherum* slope protection function is at a glance and no doubt (Photo 5). As can be seen from the photo 5 *Achnatherum* slope protection and the role of housing on the slope.

2.2 The distribution and growth of *Achnatherum splendens* in Ningxia

In Ningxia Hui Nong, the study selected from south to north, from the Yellow River alluvial plain to the Helan Mountain foothills, from low to high a line. In the plain area, most of the *splendens* are distributed in the ditches and a few open spaces, but also distributed around the old house. In these places *Achnatherum splendens* the role of solid slope is very obvious *Achnatherum splendens* often flourish. The height of a cluster of *splendens* can reach 210cm diameter up to 1m In the old house around the strong growth of *Achnatherum splendens* may be due to the local soil moisture, nutrient conditions better. In addition, in the old house (Rather than the new house) around the good growth may be from the side shows *Achnatherum* growth period is longer, need enough time to grow into large grass.

Along with the elevation, *Achnatherum* in semi-desert areas of stone growth was weakened. This is related to elevation, slope terrain obvious soil moisture, nutrient poor. Here a long drought, deep in the northwest inland plateau, is a typical continental semi-humid semi-arid climate, annual rainfall in 200-300mm evaporation is more than 1000mm and multiple natural disasters.

In this site conditions, *Achnatherum* growth is poor, each plexus height of only 100cm plexus diameter 40-50cm Most sporadic growth in stone intermittent (Photo 6). But also shows *Achnatherum* is very resistant to barren. This also provides a basis for the use of *Achnatherum splendens* in the barren and arid areas. On the hillside, there is still a small amount of *Achnatherum splendens* in the thicker part of the slope, and the growth is better. Growth height can reach about 150cm

In addition, a large area of *Achnatherum splendens* was found at a distance of about 20 km from the foot of the mountain (Photo 7). And neatly distributed on both sides of the drain. The villagers have reflected *Achnatherum splendens* are often grown in the farming area and grazing area at the junction of the place, that is like growing in the pastoral site conditions better place. In the event of food shortages, people often cultivate *Achnatherum splendens* growth to farming.

2.3 Inner Mongolia *Achnatherum* growth

Investigation of the Linhe District is located in the western Inner Mongolia Autonomous Region of the Hetao Plain abdomen. It is located between latitude $40^{\circ} 34' \sim 41^{\circ} 17'$ north and longitude $107^{\circ} 6' \sim 107^{\circ} 44'$ east. Li Bayannaoer city, for the city seat. Linhe deep inland, belonging to the temperate semi-arid continental climate, which is characterized by: precipitation, wind, dry climate. The mean annual precipitation is 138.8mm in the south, 156.2mm in the north, and the evaporation is 2236.7mm The evaporation is 16.1 times of the precipitation. According to Ivan Roeff formula to calculate the wetting coefficient of Q12, is a very arid climate. The most humid August is the semi-arid climate type.



Photo 6 *Achnatherum splendens* growing in crevices in semi-desert areas (Ningxia Hui Nong)

Photo 7 A large splendid *Achnatherum splendens* the crop

However, on the other hand, Linhe District is located in the Yellow River alluvial plain, elevation 1 029 ~ 1 045m terrain from southwest to northeast tilt.

Alluvial plain near the Yellow River shore area is the river slow, different width, generally in the 150 ~ 5000m higher than the Yellow River surface 0.5 ~ 1m the ground flat open. Some of the surface is fine sand, irrigation channels and the Yellow River is also more sedimentation of the old course of sand, in the long wind erosion, the formation of many disc-shaped depression (commonly known as ge Bu) and sand dunes. The height of the moving sand dune is between 2m and 20m Semi-fixed dunes generally high 1 ~ 1.5m and wind erosion depressions and phase distribution, fixed dune slow undulating, multi-growth sand Peng, *Tribulus terrestris* and other drought-resistant plants. General depression area of 0.5 ~ 2km², deep 0.5 ~ 1m between the greater and deeper. Wind erosion depression, the old course of the Yellow River left over from the natural levee and Furukawa lowlands, waste irrigation channels, product

Photo 8 Growing in the water of the *Achnatherum splendens* in Linhe, Inner Mongolia, lakes (commonly known as Haizi) form the landscape of many lakes in the plain. Because of this, although the area is very little rainfall, but the soil site conditions, especially water conditions may not necessarily poor. Groundwater depth: The vast majority of the city below 150cm accounting for the city's total soil area of 81.02% of which > 200cm accounted for 46.7% < 150cm accounted for 18.98% of the total soil area of the city. The maximum temperature difference between day and night was 5 months (16.9 °C). In the growing season of 4-9 months, the daily difference was 13-16 °C, which was beneficial to the accumulation of photosynthate. Therefore, the study found in the region, "A Splendor King" (Photo 8). A cluster of splendens up to 3m plexus diameter of 3-4m Splendens are generally distributed in the higher dunes and houses not far from the place,

mostly sporadic or small area into pieces distribution. According to the local villagers introduced, and some *Achnatherum* may have grown more than 50 years, is still healthy growth. He saw the grass in his teens, Now more than 60 years old, is still here. Photo 7 A large splendid *Achnatherum splendens* the crop

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3 *Achnatherum splendens* reproduction



Photo 9 Achnatherum spikes with seeds

The main purpose of this study is to understand the characteristics of *Achnatherum splendens* seed to be artificially propagated. For the application of *Achnatherum splendens* in the solid slope to create the conditions. Inner Mongolia fellow said *Achnatherum* seed in the Dew after the mature (ie, September 7 this year), the study is before and after. At that time some of the seeds have matured, dark brown. Some are still in the grouting period. On the whole, *Achnatherum* seed is very light, small, spindle-shaped, about 3mm width 0.8mm (Photo 9). As a result, the 1000-grain weight was only 0.77 g [2]. So it is difficult to collect them And some spikes which seem to have no mature seeds. In addition, the growth of *Achnatherum splendens*, the surface also found some round seed accumulation, diameter of about 3cm the center of an animal cavity, may be caused by ants feeding.

For the shell found on the seeds sprout shell provides evidence. This is the proliferation of *Achnatherum* adds uncertainty. And *Achnatherum* germination by the temperature limit, the best temperature in 25/15 °C [3]. Also pay attention to sowing depth should be ≤ 1.5 cm and to keep the soil moist more than 10 days [2].

In order to further find out the method of reproduction of *Achnatherum splendens*, I selected partners in Shanxi, Ningxia and Inner Mongolia, hoping to harvest seeds in the local, planting experiments, gain experience in order to promote. After the success of seed propagation and then seedlings transplanted, because the old seed metabolism is poor, not suitable for transplantation. 3 *Achnatherum splendens* reproduction

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