

The Cultivation Techniques of Plantago lanceolata L. in Guizhou Area, China

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Abstract: Chinese herbal medicine has attracted people's attention as an ideal substitute for antibiotic additives in livestock production, and the characteristics of medicinal forage grass with both medicinal and forage value is the future development direction of grassland agriculture. Plantain was introduced to Guizhou Province in 2011, and has gradually been applied and extended in grassland agriculture. In order to standardize the planting of plantain, this article gives suggestions on the technical aspects of building, management and utilization of plantain pasture in Guizhou area, which provides technical support for the green development of grassland agriculture in Guizhou Province.

1. Introduction

With the continuous development of the animal husbandry, the issue of feed safety has gradually received widespread attention from the society, especially the additives applied to prevent diseases in the animal production (Ding, 2013). Antibiotic are commonly used in animal husbandry as additives to prevent diseases. However, livestock can generate drug-resistant after using antibiotic in long-term, which not only affects the immune function of animals, but also remains in animal products and enters into the human food chain, then that will be threatening human health (Xu, 2009). Adopt measures to restrict the use of antibiotics in animal production in many countries, some experts in animal nutrition and veterinary have turned their attention to the development of safer and greener alternatives to antibiotic additives (Li, 2015). Chinese herbal medicine is favored by scientific researchers and farmers, because of the characteristics of pure naturalness, low toxic and side effects, no drug resistance, no pollution and so on. That can enhance animal immune function, improve animal anti-stress ability, promote animal growth, and improve the quality of livestock and poultry (Ding, 2013).

The species of plantaginaceae has been used as a traditional medicinal plant for a long time in

China, and many studies have shown that it has the advantages of antibacterial, enhanced immunity and high feeding value (Kong, 2010; Chen, 2012; Chen, 2015; Dong, 2018), can replace antibiotics in the process of animal husbandry to a certain extent. As a medicinal forage grass, plantain widely used in mixed-pasture building in developed grassland agriculture countries due to its high yield and resistance, and has achieved good results (Sanderson, 2003; Labreveux, 2006). Our province introduced plantain domesticated by New Zealand in 2011, and it has been gradually extended to grassland establishment for animal husbandry production. In order to standardize the planting of plantain, and popularized and applied in the grassland agriculture in Guizhou, the cultivation technical regulations of plantain in Guizhou are formulated to provide technical support for the green development of grassland agriculture in Guizhou Province.

2. Preparation before sowing

2.1 Field preparation

Moist, loose and fertile soil was selected for plowing with a depth of 23 - 26 cm, raking fine and leveling.

2.2 Basic fertilizer

It is advisable to apply sufficient base fertilizer in combination with soil preparation. The decomposed manure is applied with 20000 - 35000 kg/ha, which can be used in conjunction with inorganic fertilizer according to the soil fertility.

2.3 Weeding

The non-selective herbicides can be sprayed in the plots if there was too weedy. Field can be plowed in 9 - 10 days and sowing 18 - 23 days after spray.

3. Seed selection and treatment

The seeds are required that are plump, purity $\geq 95\%$, clarity $\geq 95\%$, and germination rate $\geq 80\%$. The germination rate can be increased by gently rubbing the seed with fine sand before sowing, and dressing the seeds with 35% carbendazim powder.

4. Sowing

4.1 Sowing time

The plantain can be sowing in March to April and October to November.

4.2 Seeding rate

For unicast, refer to 8 - 10 kg/ha. 1- 4 kg/ha in mixed pasture establishing.

4.3 Seeding ways

For unicast, sowing in drill would be recommended. The ditch at a row spacing of 25 to 35 cm with a depth of less than 10 mm. Sow 2 to 3 seeds into the ditch at the row spacing, and rolling in time after covered with soil.

White clover, perennial ryegrass and other species can be mixed in mixed pasture establishing, the sowing amount of each species seed is 60 - 70% of that in unicast.

5. Pasture management

5.1 Weeding and loosing soil

Generally, loosing soil and weeding will be performed 3 to 5 times in first year when plantain is unicast. Weeding by light grazing will be recommended after 2 months of sowing in mixed pasture.

5.2 Oversowing

The rate of emergence should be estimated when the height of the seedlings is 3 - 5 cm, and it should oversowing in grassland gap.

5.3 Fertilization

About 35 kg N/ha should be applied in 2 to 4 times after grazing in spring and summer.

5.4 Disease and pest control

Regular grazing can effectively prevent pests and diseases.

6. Seed harvest

To harvest mature panicles in every 3 to 5 days, and try to avoid hot weather. The seeds should be stored in the seed granary after cleaning.

7. Utilization

7.1 Grazing

The first formal grazing should take place after the six leaves stage of plantain, generally in 8 - 9 weeks after sowing. The regrow period is 3 - 6 weeks in Guizhou area. It can be grazed again when the leaf length is above 25 cm and the coverage is above 85%.

7.2 Mowing

It can be mowed when the plant height is above 25 cm, and stubble height is above 5 cm, and used for fresh feeding of livestock, silage or making hay.

8. Conclusion

Plantain has both medicinal and feed value, and it will be a great potential in the development of grassland agriculture. In this article, the suggestions were given about the technical aspects of sowing, pasture management and utilization of plantain, that based on the performance of plantain in Guizhou. That will provide technical reference for the promotion and application of plantain in the production of grassland agriculture in Guizhou.

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