INITIAL ASSESSMENT ON GROWTH AND YIELD OF SOME GRASS VARIETIES GROWN IN THE NORTHWESTERN MOUNTAINOUS REGION

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SUMMARY

The study was carried out to test the viability, growth and yield of 05 grass varieties including Guatemala, Ghine TD58, Mulato 2, VA06 and Stylo in both highland and lower land of the Northwestern mountainous area. These forages were grown in experimental plots with 3 replicates for each variety. The investigation results in the first year of plantation showed that all 5 varieties adapted perfectly with the natural conditions of the studied area; Showed to have good growth and development; and yielded range from 10-70 tons/ha/harvest. Especially, VA06 and Guatemala grass varieties had the highest capability of growth and yield. They can be planted widely in massive production in the study areas.

Key words: *Guatemala grass; Mulato 2; VA06 grass; Ghine grass, Stylo grass; Growth, yield.*

INTRODUCTION

According to the General Statistics Office, the number of cattle in the northern mountainous provinces has been decreasing continuously (buffalo fell by 7.44 %, cow lessened by 12.87 % from 2008 to 2011) this declination was due to a number of causative factors such as adverse weather conditions and natural forage source reduction due to unsuitable plantation and forest management method. Whereas, the amount of planted grass and forage trees in addition to agricultural by-products only met 53.47 % of the total forage requirements of cattle. Thus, lack of forage sources, especially for raising ruminants is an urgent problem and is one of the reasons why livestock husbandry has not developed in accordance with its potentials.

The northwestern mountainous area has relatively favorable natural conditions for the development of livestock husbandry. However, development of forage source for livestock has not got much attention. Many grass and forage tree varieties with high yield and quality such as B. Decumbens, B. Brizantha, B. Mutica, B. Ruziziensis, P. Purpureum, P.M. TD 58, Stylosanthes, L. Leucosephala... (Nguyen Ngoc Ha et al, 1995; Phan Thi Phan et al, 1999; Truong Tan Khanh, 1999; Vu Thi Kim Thoa et al, 2001; Nguyen Thi Mui et al, 2008) which have been developed and made an important contribution to livestock productivity development in other regions has not been widely planted in the studied area. One of the causes of this slow development is due to the climate difference between highland and lower land of Northwest and wet season and dry season, resulting in almost no grasses grow in dry season.

For more diverse and abundant forage sources to meet the growing demand of cattle, especially in winter in some high and low specific areas of Northwest, some grass varieties were experimentally grown and initially assessed.

RESEARCH CONTENT AND METHODS

Objects, location and duration

- Research objects: some exotic grass varieties including Guatemala, Ghine TD58, Mulato 2, VA06 and Stylo

- Duration: From 3/2012 to 8/2013.

- Location: Long He commune - Thuan Chau district - Son La province; Quai Cang and Toa

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Tinh communes - Tuan Giao district - Dien Bien province.

Research Contents

- Assessment on nutritional indicators of grass planting land in the studied area.

- Weather conditions in the studied area.

- Assessment on viability and productivity of the exotic species for the studied area.

Layout of experiments and monitoring methods and data collection

- 05 grass varieties including Guatemala, Ghine TD58, Mulato 2, VA06 and Stylo were arranged into five 100-150-m^2 experimental plots in households at (with 3 replicates) in two regions with different ecological conditions (the highland with an altitude of 800-1000m and the lower land with an elevation of 30 - < 100 m) to examine the adaptability of the varieties to the area.

- Conditions of soil and hydrologic climate were analyzed and assessed so that fertilizer treatments could be provided in accordance with requirements of the varieties.

- The plantation of grass was carried out in March when soil moisture is suitable for plantation of grass.

- The first harvesting of grass was depended on each grass variety, ranging from 60 to 120 days.

- During the raining season, the average cutting interval was 45 – 50 days depends on each variety and during dry season, this interval was 60 days.

Monitoring parameters

- Soil nutrients in the study area: pH, OM total, N total, P_2O_5 total, K_2O total.

- Weather elements in the study area: temperature, rainfall and average monthly humidity in the regions.

- Monitoring parameters for planted grass varieties: Survival rate, regeneration speed, regeneration intensity, regeneration height; yield.

Data processing methods

The data were processed by analysis of variance (ANOVA) and Biostatistics on Minitab software version 14.0.

RESULTS AND DISCUSSION

Evaluation results on soil conditions and hydrologic climate

To have a basis for determining appropriate levels of fertilizer requirements of each variety of grass, we conducted soil sampling at localities in the study area to analyze soil composition. The obtained results are presented in table 1.

Analysis results of the soil composition at the two studied regions showed that the soil here was characterized by soil acidity (pH from 4.29 to 4.82); the ratio of the total organic matter of soil samples at the high land was 2% higher than that at the lower land. Other parameters including total nitrogen, P_2O_5, K_2O of soil samples collected in the two regions were similar. Due to the similar soil conditions of both regions, amount of fertilizer which was used for grass was equal as recommended by grass varieties.

Layout of experiments

No	Grass varieties	Highland (m^2)	Lower land (m^2)
1	Guatemala	150	150
2	Mulato 2	120	100
3	Ghine TD58	150	150
4	VA 06	120	100
5	Stylo	120	120

Table 1. *Soil composition*

Composition	Unit	Lower land	Highland
pH		4.82	4.29
OM_{total}	%	2.78	4.78
N_{Total}	%	0.23	0.22
$P_2O_{5\ total}$	%	0.12	0.11
K_2O_{total}	%	0.62	0.65

Table 2. *Climate conditions at two studied regions*

Month	Monthly temperature (^{0}C)		Monthly rainfall (mm)		Monthly humidity (%)	
	Lower land	Highland	Lower land	Highland	Lower land	Highland
1	11	8.5	20.5	30.6	90	93
2	16.3	12.4	25.3	30.9	92	91
3	15.9	13.1	94.1	98.3	91	91
4	21.4	19.3	99.3	109.7	90	92
5	24.3	21.5	229.8	244.9	95	95
6	26.2	24.7	230.5	275.3	96	95
7	27.8	24.6	290.7	300.6	97	98
8	26.7	23.4	220.1	280.3	95	96
9	24.8	22.1	80.7	92.4	90	91
10	22.1	19.8	70.9	79.2	90	92
11	22.7	18.5	30.6	58.6	89	90
12	15.4	13.8	25.9	30.8	88	90

(Source: Hydrometeorological Centre in Son La and Dien Bien - 2012)

Table 3. *Survival rate of grass varieties after plantation and after winter*

No	Grass varieties	Survival rate after plantation (%)		Survival rate after winter (%)	
		Highland	Lower land	Highland	Lower land
1	Guatemala	100	100	100	100
2	Mulato 2	95	95	100	100
3	Stylo	-	-	100	100
4	Ghine	95	95	98	98
5	VAO6	95	95	100	100

Collected secondary data of climate comdiotions showed a relatively distinct difference in average monthly temperature and average monthly rainfall between two studied regions. It is obvious to see that weather conditions in the two studied regions were divided into two distinct seasons including rainy season and dry season; rainy season in the highland lasted from April to August while it actually started from May to August. In terms of rainfall, the highland had a total annual rainfall of about 1600mm while the responding value in the lower land was about 1400mm. In terms of temperature, due to high altitude (800 - 1000m above sea level), the average monthly temperature of the highland was 2^0C lower than that of the other region. The average temperature got the lowest values in January, February, March and December.

Results of grass survival

The experimental grass varieties were grown from cuttings (except Stylo grass was sown from seed), cared and managed according to standards of each variety farming techniques. Monitoring results of survival rate after 7 days of plantation and after winter revealed that all five varieties had high survival rate after plantation (95-100 %) and survival through the winter reached 98-100 %. It can be inferred from table 3 that all 5 varieties were resistant to cold and drought conditions in the provinces of Son La and Dien Bien. Our results is consistent with some previous researches on taking the same grass varieties into Vietnam such as Doan An & Vo Van Tri (1976), Nguyen Ngoc Ha et al (1985), Hoang Chung et al (2006).

Survey results of growth rate

As shown in table 5, except that Stylo grasses planted in the highland were higher than those in the lower land after 90 days of plantation with statistically significant difference ($P < 0.05$), the other grass varieties had similar height and growth speed/day in both regions ($P > 0:05$). The results also showed that VA06 grasses were relatively high, reaching

2.80m after 120 days of plantation in the highland and 2.76m in the lower land. It is inferred that this variety is capable of growing and developing well in the study area. To get abundant feed source in scarcity seasons, VA06 grass is possibly a good choice for farmers because it is easy to grow, care and use. This result is comparable to other studies in Vietnam (Phan Thi Phan et al, 1999; Nguyen Khanh Quac et al, 2003).

Survey results of grass yield

To evaluate the adaption of the experimental grass varieties to the local conditions in the studies area, in addition to survival rate, fresh yield and dry matter (DM) yield per harvest were assessed. Results of the average yield per harvest were calculated based on the total harvest times in a year after plantation and were presented in table 4.

The study results showed that different grass varieties allowed different yields. Because of different growth period, the number of harvests was unsimilar among different varieties. All grass varieties planted in both studied regions provided high fresh yield and DM yield but VA06 grass variety ranked at the top with fresh yield of 63-66 tons/ha/harvest while Stylo grass had the lowest fresh yield with 9-10 tons/ha/harvest. However, fresh yield of the grass varieties had large fluctuations among months in which the harvests during the rainy season (from May to October) provided 2-3 times higher yield than the harvests in the dry season (from November to April). The results are similar to the findings of Nguyen Ngoc Ha et al (1995), Nguyen Van Quang and al (2002), Tu Trung Kien (2010) who studied the same grass varieties in Vietnam as feed for ruminants.

Table 4. *Height and growth rate of the grass varieties from plantation to the first harvest (60-120 days depending on varieties)*

Grass varieties	Highland				Lower land				
	Height (m)	SE	Growth speed (cm/day)	SE	Height (m)	SE	Growth speed (cm/day)	SE	P
VA06 (120 days)	2.80	0.03	2.34	0.05	2.76	0.02	2.30	0.01	0.128
Mulato 2 (90 days)	0.84	0.02	0.93	0.01	0.82	0.01	0.91	0.02	0.099
Stylo (90 days)	0.58	0.01	0.64	0.01	0.54	0.01	0.60	0.01	0.018
Ghine (60 days)	0.88	0.01	1.47	0.02	0.87	0.01	1.45	0.01	0.094
Guatemala (90 days)	2.07	0.05	2.30	0.08	1.97	0.03	2.18	0.05	0.127

Table 5. *Fresh yield and dry matter yield of the experimental grass varieties (tons/ha/harvest)*

Grass varieties	Harvest times/ year	High land				Lower land				
		Fresh yield	SE	DM yield	SE	Fresh yield	SE	DM yield	SE	P
VA06	5	66.6	6.52	13.33	0.50	63.7	6.02	12.73	0.67	0.128
Mulato 2	8	25.5	3.73	4.51	0.38	23.9	3.48	4.24	0.20	0.195
Stylo	5	10.1	2.49	2.03	0.28	10.5	2.92	2.10	0.55	0.727
Ghine	8	30.2	5.05	6.83	0.84	28.7	6.52	6.49	0.33	0.311
Guatemala	5	15.1	4.00	2.33	0.50	14.5	2.73	2.23	0.48	0.636

In comparison between two studied regions, the average yield of 5 grass varieties grown in the highland was higher than that in the lower land. For example, VA06 grass got 66.6 tons/ha/harvest in the highlland and 63.7 tons/ha/harvest in the lower land; Mulato 2 provided 25.5 tons/ha/harvest in the highland and 23.9 tons/ha/harvest in the lower land). However, the differences are not statistically significant (P > 0.05). Therefore, it is initially inferred that all 5 grass varieties are capable of good growth, development and adaption to the natural conditions of the study area.

Survey results of regeneration intensity

Research results of the intensity of the experiment grass regeneration were calculated based on two first harvests of the growing season (rainy season) and were presented in the following table.

Survey results showed that there was different regeneration intensity among grass varieties. However, regeneration intensity of the same variety in two regions was similar (P > 0.05). Specifically, VA06 grass had the highest regeneration intensity (1.41 - 1.48 tons/ha/day); followed by Ghine grass with 0.82 - 0.86 tons/ha/day and Stylo grass had the lowest regeneration intensity of 0.23 tons/ha/day.

Based on the experiment results of some grass varieties in two provinces of Son La and Dien Bien, it can be seen that all of these exotic grasses are capable of good growth, development and adaption to the ecological conditions at the studied area. However, due to the characteristics and methods of local cultivation and livestock, we recommend that two varieties of VA06 and Guatemala should be widely planted because they were found to have very high fresh yield, especially during the rainy season. If planted in large numbers, they can be processed and stored for cattle feed in winter when other food sources have been depleted.

CONCLUSION

The experimental grass varieties including VA06, Mulato 2, Stylo, Ghine and Guatemala expressed good growth, development and adaption to natural conditions of the northern mountainous provinces such as Son La and Dien Bien. They can acchive a yield range of 10 - 70 tons/ha/harvest depending on varieties. However, due to the characteristics and methods of local cultivation and livestock, two grass varieties including Guatemala and VA06 are suggested being widely planted in the studied area because they had very high fresh yield, especially during the rainy season. Therefore, they can not only provide feed supplements for cattle but also be processed and stored for alternative feed for cattle in winter when other feed sources have been depleted.

Table 6. *Intensity of the grass regrowth rate (tons/ha/day)*

Grass varieties	Highland		Lower land		P
	Regeneration intensity (tons/ha/days)	SE	Regeneration intensity (tons/ha/days)	SE	
VA06	1.48	0.01	1.41	0.01	0.128
Mulato 2	0.73	0.01	0.68	0.02	0.195
Stylo	0.23	0.01	0.23	0.02	0.727
Ghine	0.86	0.02	0.82	0.02	0.311
Guatemala	0.34	0.02	0.32	0.01	0.636

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TÓM TẮT

BƯỚC ĐẦU ĐÁNH GIÁ KHẢ NĂNG SINH TRƯỞNG VÀ NĂNG SUẤT CỦA MỘT SỐ GIỐNG CỎ TRỒNG TẠI KHU VỰC MIỀN NÚI TÂY BẮC

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Nghiên cứu được tiến hành để thử nghiệm khả năng sống, sinh trưởng và cho năng suất của 05 giống cỏ trồng (cỏ Guatemala, cỏ Ghine TD58, cỏ Mulato 2, cỏ VA06, cỏ Stylo) tại 2 vùng cao và thấp của khu vực miền núi Tây Bắc. Các giống cỏ được trồng trong các ô thí nghiệm với nhắc lại 3 lần cho mỗi giống. Kết quả khảo sát trong năm đầu tiên sau trồng cho thấy: cả 5 giống cỏ trên sinh trưởng và phát triển tốt, phù hợp với vùng các tỉnh miền núi Tây Bắc. Năng suất của các giống cỏ thử nghiệm đạt từ 10 - 70 tấn/ha/lứa cắt tùy theo giống cỏ. Giống cỏ VA06 và giống Guatemala có khả năng sinh trưởng và cho năng suất cao. Chúng có thể đem trồng rộng rãi và đại trà trong vùng nghiên cứu.

Từ khóa: *Cỏ Guatemala; Cỏ Mulato 2; Cỏ VA06; Cỏ Ghine; Cỏ Stylo; Sinh trưởng; Năng suất*

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