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Theme 4. Biodiversity, conservation and genetic improvement of range and forage species
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Evaluation of tropical herbaceous legumes for drought resistance in Myanmar

Jue Jue[1], Nang Khan Hline[1]*, Khin San Mu[1], Moe Thida Htun[1], Lwin Naing Oo[1], Soe Min Thien[1], Dezin Soe Lwin[1], Jenny Hanks[2], Ganda Nakamanee[3] and Werner Stuer[4] Aung Aung[5]
[1]Dept. of Physiology and Biochemistry, University of Veterinary Science, Yezin, Nay Pyi Taw, Myanmar
[2]University of Melbourne, Melbourne, Australia
[3]Nakhornratchasima Animal Nutrition Research & Development Center, Pakchong, Nakornratchasima 30130 Thailand
[4] Australian Centre for International Agricultural Research. GPO Box 1571, Canberra, ACT 2601, Australia
[5]Dept. of Physiology and Biochemistry, University of Veterinary Science, Yezin, Nay Pyi Taw, Myanmar
*Corresponding author e-mail: nangkhanhline@gmail.com

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Introduction

Animal nutrition systems in the tropical and subtropical countries utilize a wide range of feedstuffs, mainly the crops and agricultural by- products, grasses, legumes, trees and shrubs. During the dry season, the crude protein concentration in the native grasses can drop below 3% crude protein (Atta- Krah and Reynolds, 1989). Fodder tree is not sufficient and is of low quality in Myanmar (Myo and Aye, 2007). Shrubs represent an enormous potential source of protein for ruminants in the tropics (Devendra, 1992). Browses are rich in nitrogen and minerals which are low in other conventional feeds of tropical regions. Herbaceous legume species play an important role in feeding ruminants worldwide. Herbaceous forage legume have been identified as potential protein supplements for ruminants since they contain high crude protein, minerals and vitamins needed for the growth of ruminal microbes (Norton and Poppi,1995).

Herbaceous legumes can be grown as a relay within cereal crops or as a rotation with cereals. Herbaceous legumes can access atmospheric N (‘fixation’) through bacterial activity in root nodules. The ‘fixed’ N becomes available to the legume and subsequent cereal crops. Herbaceous legumes are best planted from seed (Nulik *et al.*, 2013). The aim of using herbaceous legumes in cropping systems is to increase animal productivity, particularly live weight gain in animals being prepared for market. Herbaceous legumes may be fed directly to animals as fresh material in the late wet and early dry seasons, with browse or tree legumes retained for later dry season feeding, or stored as hay and fed in the late dry or early wet seasons when the availability and quality of local feed is lower (Nulik *et al.*, 2013).

Legume based pastures give high individual animal performance for growth, fattening, reproduction and wool growth. Cattle live weight gain has been related positively to the proportion of legume in the sward (Mureithi *et al.*, 1995). As pastures become mature, they are characterized by high content of fibre with a higher grade of lignifications and low protein content (Enoh *et al.*, 2005). In Myanmar there is only 0.35% cultivated pasture area to that of cultivated acreages. The improvement and development of pasture is a necessity for Myanmar (Myo and Aye, 2007). For that reason it is needed to evaluate the yield herbaceous legumes for the potential use for ruminants in Myanmar.

Materials and Methods

This experiment was conducted at the Department of Physiology and Biochemistry, University of Veterinary Science, Yezin, Nay Pyi Taw, Myanmar. The experiment was started in June 2014. In this experiment, 13 herbaceous legumes provided by Australian Centre for International Agriculture Research (ACIAR) planted to be evaluated. Those were Ooloo (*Centrosema brasilianum*), Verano (*Stylosanthes hamata*), Endurance (*Lablab purpureus*), Seca (*Stylosanthes scabra*), Progardes (*D. virgatus/bicornutum*), Cadarga (*Macroptilum bracteatum),*Ubon Stylo (*Stylosanthes guianensis)*, Stylo 184 (*Stylosanthes guianensis*), Milgarra (*Clitoria ternatea*),TQ90 (*Desmanthus leptophyllus*), Archer (*Macrotyloma axillare*), Cardillo (*Centrosema molle*), Mayara (*D. pernambucanus*) . The experiment was designed in Randomized Completely Block Design (RCBD) with 4 plots and each plot consisted of 13 species. Herbaceous legumes were planted at the start of rainy season (15-6-2014). A single row of the legumes was drilled by hand giving 13 rows of 4m long in each plot. The interval between the plots was 2m wide. All plots were hand-weeded and received no fertilizer and additional water during the experiment. Weeding of plots was done by 3-4 weeks after sowing. Every 4 weeks, weeding of plots were done. Herbaceous legumes were harvested every 6 weeks for DM yield determination for 3 times. The data were subjected to the analysis of variance (ANOVA) using randomized completely block design (RCBD).

Results and Discussion

The rainfall at the plantation and first harvest ranged from 116 to 362 mm. *Centrosema brasilianum* had the highest emergence score while Mayar and TQ90 had no germination. The considerable variation was demonstrated in evaluation of legumes. For the first harvest, Archer and Ooloo had significantly higher dry matter yields than other species. At second harvest, Ooloo, Ubon stylo, Stylo 184, Archer produced more DM yield than others in the rainfall ranging from 61to183mm. For the third harvest, there was no rainfall in study area and Ooloo, Stylo 184, Ubon stylo and Verano had higher DM yield than other species and Ooloo showed the most satisfactory DM yield in the dry period. It was found that Ubon stylo, Archer, Ooloo, Stylo 184 and Milgarra had the best in total dry matter yield of 3 harvests. As at Ooloo (*Centrosema brasilianum*) had DM yield in the dry period (3rd harvest) it means that Ooloo has more drought resistance than others and it agreed with the report of Peters *et al.* (1994).

Table 1: Emergence score of legumes

Legume species	**Variety**	**Emergence score**
Centrosema brasilianum	Ooloo	3.00^{a}
Stylosanthes guianensis	Ubon Stylo	3.00^{a}
Clitoria ternatea	Milgarra	2.75^{a}
Lablab purpureus	Endurance	2.25^{ab}
Macroptilum bracteatum	Cadarga	2.25^{ab}
Macrotyloma axillare	Archer	2.25^{ab}
Stylosanthes guianensis	Stylo 184	1.75^{bc}
Centrosema molle	Cardillo	1.75^{bc}
Stylosanthes hamate	Verano	1.25^{cd}
D. virgatus/bicornutus	Progardes	1.25^{cd}
Stylosanthes scabra	Seca	1.00^{cd}
D. pernambucanus	Mayara	1.00^{cd}
Desmanthus leptophyllus	TQ 90	0.50^{d}

Table 2: Dry matter yield of herbaceous legumes in study area.

Species	**Variety**	**1st harvest (August, 2014)**	**2nd harvest (October, 2014)**	**3rd harvest (December, 2014)**	**Total Yield**
Stylosanthes guianensis	Ubon stylo	786^{bc}	3561^{a}	226^{ab}	4568^{a}
Macrotyloma axillare	Archer	1526^{a}	2631^{abc}	98^{cdef}	4255^{ab}
Centrosema brasilianum	Ooloo	1149^{ab}	2531^{abc}	320^{a}	4000^{ab}
Stylosanthes guianensis	Stylo 184	530^{bcd}	2707^{ab}	294^{a}	3531^{ab}
Clitoria ternatea	Milgarra	509^{bcd}	2344^{abcd}	83d^{ef}	2936^{ab}
Macroptilum bracteatum	Cadarga	739^{bc}	1474^{bcde}	121^{cde}	2334^{ab}
Stylosanthes hamata	Verano	376^{cd}	1060^{bcde}	192^{bc}	1628^{ab}
Stylosanthes scabra	Seca	157^{cd}	1069^{bcde}	152^{bcd}	1378^{ab}
Centrosema molle	Cardillo	217^{cd}	709^{cde}	141^{bcd}	1423^{ab}
Lablab purpureus	Endurance	387^{cd}	512de	21^{ef}	1067^{ab}
D. virgatus/bicornutum	Progardes	103^{cd}	0.0^{e}	18^{f}	121^{ab}
Desmanthus leptophyllus	TQ90	0.0^{d}	0.0^{e}	0.0^{f}	0^{b}
D. pernambucanus	Mayara	0.0^{d}	0.0^{e}	0.0^{f}	0^{b}

Means of dry matter yield values with different letter are significantly different ($P<0.05$).

Conclusion

It can be concluded that Ooloo has the most drought resistance in Myanmar. However, the further tests should be done for more information on the drought resistance of tropical legumes in Myanmar.

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