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Growth characteristics of selected indigenous legumes for livestock feeds in Namibia

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Abstract

The study was conducted to evaluate the growth characteristics of seven (7) indigenous forage legumes in Namibia in comparison to lucerne as potential livestock fodder. A split-plot design was used with fertiliser level as the main factor and legume species as the secondary factor. Single super phosphate was applied at four (4) levels (0, 20, 40 and 60 kg/ha) to each of eight (8) legumes, each with three (3) replications. The growth of the legumes was monitored over a period of 2 months (April-May 2014), with heights recorded fortnightly. Results showed that *Lablab purpureus* grew faster (P < .001) than all the other legumes. The least square means (cm/day) were: *Canavalia ensiformis* 0.241 ± 0.093; *Clotalaria heidmannii* 0.214 ± 0.109; *Cullen tomentosum* 0.151 ± 0.116; *Lablab purpureus* 0.874 ± 0.102; *Otoptera burchellii* 0.079 ± 0.093; *Vigna lobatifolia* 0.012 ± 0.124; and *Vigna unguiculata* 0.219 ± 0.102. From these preliminary results, there is a clear indication that forage legumes that were transplanted had much slower initial vegetative growth compared to those directly established from seed.

Key words: Forages, forage legumes, fodder, indigenous, vegetative growth

Résumé

L'étude a été menée pour évaluer les caractéristiques de croissance de sept (7) légumineuses fourragères indigènes en Namibie par rapport à la luzerne comme aliment potentiel de bétail. Un carré subdivisé des légumes a été utilisé avec le niveau d'engrais comme le principal facteur et les espèces de légumes comme facteur secondaire. Un seul super phosphate a été appliquée à quatre (4) niveaux (0, 20, 40 et 60 kg / ha) pour chacun des huit (8) légumes, chacun avec trois (3) reproductions. La croissance des légumineuses a été suivie sur une période de deux mois (Avril-mai 2014), avec des hauteurs enregistrées par quinzaine. Les résultats ont montré que *Lablab purpureus* a poussé plus rapidement (P <0,001) que tous les autres légumineuses. Les moindres ressources au carré (cm / jour) étaient: *Canavalia ensiformis* 0,241 ± 0,093; *Clotalaria heidmannii* 0,214 ± 0,109; *Cullen tomentosum* 0,151 ± 0,116; *Lablab purpureus* 0,874 ± 0,102; *Otoptera burchellii* 0,079 ± 0,093; *Vigna lobatifolia* 0,012 ± 0,124; et *Vigna unguiculata* 0,219 ± 0,102.A partir de ces résultats préliminaires, il ressort une indication claire que les légumineuses fourragères qui ont été transplantées avaient une croissance végétative initiale beaucoup plus lent par rapport à celles établies directement à partir de semences.

Mots clés: Nourriture, les fourrages, les légumineuses fourragères, indigènes, la croissance végétative

Background

Farmers especially in communal areas of Namibia experience feed shortages in terms of quality and quantity. Crude protein is the main limiting factor despite being a crucial nutrient during the dry season. Energy and protein supplies are the most important components in animal nutrition and in many tropical countries they are often the critical limiting factors to animal production (Aminah and Chem, 1991). Introduction of native forage legume species in the range has a positive bearing on animal production (Richardson and Smith, 2006). There is paucity of information on indigenous forage legumes in Namibia. As part of the characterization efforts, the vegetative growth of eight (8) forage legumes (*Otoptera burchellii*, *Cullen tomentosum*, *Vigna lobatifolia*, *Crotalaria heidmannii*, *Lablab purpereus*, *Canavalia ensiformis*, *Vigna unguiculata* and *Medicago sativa*) were compared.

Literature summary

A successful establishment of legumes is determined by adaptation, biomass productivity, amount of N-fixed, weed suppression and persistence in a given environment (Kamanga and Shamudzarira, 2001). The understanding of the emergence and growth habits of indigenous legumes would improve the knowledge base, for easy management and adoption in a resource-constrained farming system. Pule-Meuelenberg and Dakora (2007) state that in Botswana, the major constraints to exploiting potential legume species include inadequate water, soil degradation, low soil nutrient concentrations and high soil temperatures. In contrast, Megan (2003) argues that legumes are well adapted to many of the harsh environmental conditions that currently limit the growth of exotic perennial legumes. In particular they can cope with low and irregular rainfall and as such, are likely to have deep roots and the ability to use water from deep soil layers all year-round. Nonetheless, the growth and biomass yield is largely influenced by nutrient content of the soil.

Study description

The study was done at Neudamm campus farm of the University of Namibia to compare growth rates of legumes under different fertiliser regimes. A split-plot design was used with fertiliser level as the main factor and legume species as the secondary factor. Single super phosphate was applied by broadcasting at four (4) levels (0, 20, 40 and 60 kg/ha) to each of eight (8) legumes, each with three (3) replications, giving a total of 96 plots. Each of the plots measured 4 m x 3 m and had 6 plants. The growth of the legumes was monitored over a period of 2 months (April – May 2014), with heights being recorded fortnightly (see Figs. 1-4). The germination and seedling establishment percentages in the field for the different legumes were as follows: *Canavalia ensiformis* (87.4 ± 7.5), *Clotalaria heidmannii* (54.6 ± 10.6), *Cullen tomentosum* (83.3 ± 8.7), *Lablab purpureus* (80.5 ± 6.7), *Otoptera burchellii* (90 ± 7.5), *Vigna unguiculata* (72.1 ± 9.7) and *Medicago sativa* (91.7 ± 5.3). *C. heidmannii* has tiny seeds and may have been in dormancy explaining the low germination rates. Data analysis by GLM procedure (SAS, 2006) showed that *L. purpureus* grew faster ($P < .001$) than all the other legumes. The least square means (cm/day) were: *C. ensiformis* 0.241 ±

Figure 1. *Lablab purpureus* six (6) weeks after planting.

Figure 2. *Canavalia ensiformis* six (6) weeks after planting.

Figure 3. *Otoptera burchellii* showing the pods.

Figure 4. *Vigna lobatifolia* growing in its natural environment

0.093; *C. heidmannii* 0.214 ± 0.109; *C. obtusifolia* 0.151 ± 0.116; *L. purpureus* 0.874 ± 0.102; *O. burchellii* 0.079 ± 0.093; *V. lobatifolia* 0.012 ± 0.124; *V. unguiculata* 0.219 ± 0.102. Measurements could not be reliably taken on *M. sativa* because it was repeatedly grazed by wild animals. Slower growth rates were observed for *O. burchelli* and *V. lobatifolia*, which were established from plantlets possibly because these two species have a slower rate of root establishment.

Research application

Higher seeding rates are recommended for *C. heidmannii* on account of its low germination percentage. Based on these preliminary analyses, *L. purpureus* appears to have the highest biomass production potential, but other legumes could accelerate their growth rates as their root systems get established. It is difficult to make any firm comparisons at this stage and more data needs to be collected on biomass production, persistence, resistance to frost damage and insect damage, among other desirable attributes of a forage legume.

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