GROWTH COMPONENTS AND FORGAE YIELD OF *Centrosema pascuorum* AS INFLUENCED BY INTER-ROW SPACING AND AGE OF HARVEST IN MAIDUGURI

[1]Munza, B.M., [2]Abdullahi, A. S., [3]Salihu, D. Y., [4]Zagi, S. P., [1]Ayeye, T. E. and [5]Attah, M.G.

[1]Department of Animal Science, Faculty of Agriculture, University of Maiduguri, Nigeria.
[2]Department of Agricultural Education, FCT College of Education Zuba, Abuja, Nigeria.
[3]Department of Animal Production and Health, Federal College of Animal Health and Production Technology, Vom, Jos, Plateau State
[4]Department of Agricultural Science Education, School of Vocational and Technical Education, Aminu Saleh College of Education, Azare, Bauchi State.
[5]Department of Animal Production and Health, Federal University of Technology, Akure, Ondo State
Corresponding Author: bellomunza@gmail.com , Phone No: +2347038737250

ABSTRACT

This study was conducted during the 2024 rainy season at the Pasture Unit of the Livestock Teaching and Research Farm, University of Maiduguri. It evaluated the growth components and forage yield of *Centrosema pascuorum* in response to inter-row spacing (30, 60, and 90 cm) and age of harvest (4, 8, 12, and 16 weeks after planting – WAP). A 3 × 4 factorial experiment, arranged in a Randomized Complete Block Design (RCBD) with three replicates was employed. Data collected included; number of leaves, leaf length, leaf width, number of branches, and fresh and dry forage yields. Significant effects ($P<0.05$) were observed for both spacing and age on all parameters measured. Wider spacing (90 cm) produced the highest leaf length (9.16 cm), leaf width (0.95 cm), branch number (5.35), fresh yield (6.11 t/ha), and dry yield (2.18 t/ha). The highest number of leaves (256.00), fresh (8.70 t/ha), and dry yield (3.08 t/ha) were recorded at 16 WAS. No significant interaction effect was observed. For optimal yield, planting at 90 cm spacing and harvesting at 16 WAS could be recommended.

DESCRIPTION OF PROBLEM

Livestock production in sub-Saharan Africa is heavily constrained by seasonal shortages of quality forage, especially during the dry season (1). Leguminous forages, such as *Centrosema pascuorum*, are highly valued for their protein content, nitrogen-fixing ability, and resilience to tropical conditions (2). Their integration into pasture systems improves both animal productivity and soil fertility (3). *Centrosema pascuorum* (Centa) is a drought-tolerant, perennial tropical legume well-suited to the semi-arid conditions of Northern Nigeria, including Maiduguri. It is a valuable forage crop due to its high crude protein content, palatability, and ability to improve soil fertility through nitrogen fixation (Alhassan *et al*., 2018). In the face of climate change and increasing feed scarcity, optimizing its cultivation practices is crucial for sustainable livestock production in the region.

The critical agronomic practices that significantly influence the productivity of forage legumes are inter-row spacing and age at harvest. Inter-row spacing determines plant population density, affecting intra-specific competition for light, water, and nutrients (2). The age at harvest determines the physiological stage of the plant, impacting the balance between vegetative growth and reproductive maturity (4). This paper examines how these factors influence the growth and yield of *Centrosema pascuorum* in Maiduguri.

MATERIALS AND METHODS

Study Location: The experiment was conducted in Maiduguri (Lat. 11°05′N, Long. 13°00′E), characterized by a short rainy season (June–September), 300–500 mm annual rainfall, and average temperatures ranging from 25°C to 40°C (5).

Sources of experimental materials: The seeds were sourced from the NAPRI, Shika, Ahmadu Bello University, Zaria. The field was ploughed, harrowed and levelled to provide a good seedbed for proper seed germination and seedlings establishment.

Experimental Design: The experiment was laid out in 3 x 4 factorial arrangements in a Randomized Complete Block Design (RCBD) with 3 replicates (Blocks). The factors were inter-row spacing (30, 60 and 90 cm) and age of harvest (4, 8, 12 and 16) weeks after planting (WAP). A total land area of 11 x 8 m (88 m^2) was used for the experiment. The field was divided into 3 blocks of 9 x 3 m (27 m^2) and 1m apart. Each block contained 3 experimental plots which were 2 x 3m (6 m^2) at 0.5m spacing apart. Seed was drilled using the plant spacing in June 2024 at a seed rate of 25kg/ha. All plots were hand weeded as the need arises. The forage was harvested at 16th week after planting.

Growth components: Number of leaves, leaf length, leaf width, number of branches and fresh and dry forage yields were measured and determined according to the methods of (6). The data generated were analyzed using (7) and significant means were separated using DMRT (8).

RESULTS AND DISCUSSIONS

Growth components of *Centrosema pascuorum* as influenced by inter-row spacing, age of harvest and their interaction

The growth components of *Centrosema pascuorum* as influenced by inter-row spacing, age of harvest and their interaction is shown in Table 1. The effect of inter-row spacing on growth components is highly varied in which the higher ($P<0.05$) number of leaves obtained at 30 cm inter-row spacing could be attributed to the narrow spacing which makes the plant to compete for sunlight and other environmental resources as a result of more plant population (9). The productivity of plants depends on solar radiation which provides the energy necessary for photosynthetic processes (4). Whereas, longer, broader and more leaf length, leaf width and number of branches recorded at 90 cm and 30 cm inter-row spacing justify the report of (3) that *Centrosema* grew faster which was attributed to their aggressive growth habit unlike other legume forages. Increased growth components provide more green area for increased photosynthetic activities and assimilates needed for grain filling (3).

Table 1: Growth components of *Centrosema pascuorum* as influenced by inter-row spacing, age of harvest and their interaction

Treatments	NL (No.)	LL (cm)	LW (cm)	NB (No.)
Inter-row Spacing (cm)				
30	186.72^{a}	8.91^{a}	0.89^{a}	5.33^{a}
60	81.32^{b}	7.60^{b}	0.80^{b}	3.88^{b}
90	120.09^{b}	9.16^{a}	0.95^{a}	5.35^{a}
SEM	23.00*	0.36*	0.04*	0.50*
Age at Harvest (WAP)				
4	11.23^{c}	5.37^{d}	0.54^{c}	1.00^{c}
8	36.73^{c}	10.76^{a}	0.99^{ab}	9.00^{a}
12	213.53^{b}	9.35^{b}	1.05^{a}	4.87^{b}
16	256.00^{a}	8.74^{c}	0.93^{b}	5.56^{b}
SEM	17.25*	0.27*	0.03*	0.38*
Interaction				
S*W	0.064	0.710	0.264	0.255

^{abc}Means with different superscript within column differed significantly ($P<0.05$), SEM = Standard error of the mean, NL = Number of leaves, LL = Leaf length, LAI = Leaf area index, , WAS = Weeks after planting, S = Spacing, W = Weeks.

Higher number of leaves for *C. pascuorum* observed indicated proper ground cover. These results agreed with the report of (4) (10) and where ground cover was good with *C. pascuorum*.Similarly, the effect of age of harvest was also varied for growth components in which number of leaves increased when harvesting was delayed from 4WAP to 16WAP. Longer and more leaf length and number of branches recorded at 8WAP indicates that the leaf length and number of branches declined with advancement in age of harvest beyond 8WAP. The variations may be attributed to the environmental conditions. The number of leaves (85.33 – 108.17) reported by (10) was lower than the values recorded in this present study while number of branches (32.83 – 42.67) reported by (11) was higher than the values obtained in this study where could be due to variation in soil type and the growing conditions.

Fresh and dry forage yields of *Centrosema pascuorum* as influenced by inter-row spacing, age of harvest and their interaction

The fresh and dry forage yields of *C. pascuorum* as influenced by inter-row spacing, age of harvest and their interaction is presented in Table 2. Higher ($P<0.05$) fresh and dry forage yields recorded at 90 cm inter-row spacing in this study could be attributed to the available space which helps reduced competition for environmental resources resulting in more vegetative growth of the stands. Increased growth components provide more green area for increased photosynthetic activities and assimilate needed for grain filling (3). Stage of growth influenced the yield of plants (4) and hence, dry matter yield increases as the plant age increases. The variation might be related to differences in geographical location, date of sowing, initial stand counts, soil type and competitive ability of legumes (12).

Conclusion and Application

In conclusion, the growth components, fresh and dry forage yields of *C. pascuorum* forage were higher at 90 cm inter-row spacing while *C. pascuorum* forage harvested at 16WAP gave higher growth components and better fresh and dry forage yield. It can be recommended that for higher growth component, fresh and dry forage yields, *C. pascuorum* should be planted at 90 cm inter-row spacing and harvested at 16 WAP.

Table 2: Fresh and dry forage yields of *Centrosema pascuorum* as influenced by inter-row spacing, age of harvest and their interaction

Treatment	Fresh forage yield (t/ha)	Dry forage yield (t/ha)
Inter-row Spacing (cm)		
30	5.43[a]	1.85[a]
60	2.45[b]	0.75[b]
90	6.11[a]	2.18[a]
SEM	1.26*	0.48*
Age at Harvest (WAP)		
8	0.96[c]	0.46[b]
12	4.32[b]	1.23[b]
16	8.70[a]	3.08[a]
SEM	1.26*	0.48*
Interaction		
S x W	0.576	0.650

[abc]Means with different superscript within column differed significantly ($P<0.05$), SEM = Standard error of the mean, WAP = Weeks after planting, S = Spacing, W = Weeks

References

1. Lamidi, A.A. and Ologbose, F.I. (2014.) Dry season feeds and feeding: A treat to sustainable ruminant animal production in Nigeria. *Journal of Agriculture and Social Research*, 14: 18-31.
2. Akinola, J. O., Adekunle, I. O. and Aderinola, O. A. (2021). Effect of plant spacing on the growth and yield of two forage legumes in a derived savanna zone of Nigeria. *Nigerian Journal of Animal Production*, 48(2), 154-163.
3. Muhammad, I., Amodu, J. T. and Sheriff, O. (2020). Growth and dry matter yield of Centrosema pascuorum as affected by row spacing and phosphorus fertilization in Maiduguri, Nigeria. *Journal of Agricultural Science and Practice*, 5(1), 10-16.
4. Alhassan, W. S., Ndahi, W. B. and Mohammed, I. (2018). Forage yield and quality of *Centrosema pascuorum* as influenced by cutting management in the Sudan Savanna of Nigeria. *Agriculture and Biology Journal of North America*, 9(1), 12-18.
5. NiMet (2023). Nigerian Meteorological station, Maiduguri. Meteorological Data Information of Maiduguri and its Environs.
6. Tarawali, S. A., Tarawali, G., Larbi, A. and Hanson, J. (1995). Methods of evaluation of legumes, grasses and fodder tress for use as livestock feed. *International Livestock Research Institute*, Manual. Nairobi, Kenya. Pp. 1-12.
7. SAS Institute Inc. (2005). SAS/STAT User's Guide, Version 8.1. SAS Institute Inc., Cary, NC, USA.
8. Duncan, D. B. (1955). Multiple Range and Multiple F-tests. Biometrics, 11(1), 1–42.
9. Munza, B. M., Girgiri, A. Y., Asheikh, L. G., Nwankwo, C. A. and Kabo, H. M. (2022). Growth components of white lablab (*Lablab purpureus* L. Sweet) as influenced by intra-row spacing and cutting age. In: Bello, K.M., Abubakar, M., Kalla, D.J.U., Sir, S.M. and Muhammad, A.S. (eds). Proceedings of the11th Joint Annual Meeting of Animal Science Association of Nigeria and Nigerian Institute of Animal Science. Held at Zaranda Hotel, Bauchi, Bauchi State. 23rd – 27th October, 2022. Pp. 759-762.
10. Okonkwo, C. A. and Nwobashi, H. U. (2019). Response of some forage legumes to varying inter-row spacing in a Sudano-Sahelian environment. Global *Journal of Agricultural Science*s, 18, 19-25. https://doi.org/10.4314/gjass.v18i1.3
11. Gumel, I.A., Mohammed, J., Babandi, B., Umar, Z., Isyaku. R., Ado F.H., Biliyaminu, A., Iliyasu K.A., Sani, T., Tajuddeen I. and 3Murtala, I. (2021). Effect of planting methods and fertilizer rate on forage yield of Centrosema pascuorum in Semi-Arid zone of Nigeria. *Journal of Pharmacy and Biological Sciences*, 16(1): 36-39.
12. Asheikh, L.G., Mohammed, I. D., Igwebuike, J. U. and Kolo, U. M. (2016). Growth and dry matter yield of selected pasture grasses and legumes in the semiarid region. *Sahel Journal of Veterinary Science*, 15(2): 61-68.