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Effects of phosphorus fertilizer application on Verano stylo (*Stylosanthes hamata*) for fodder production in semi-arid Nigeria

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Introduction

Profitable ruminant livestock production in Nigeria is often constrained by an inadequate. Although natural grazing lands provide most forage for most animals, these pastures like those throughout most of the tropical world, are grossly deficient in energy, crude protein and minerals, particularly during the dry season, and so cannot meet the requirements for meat and milk production (Akinolai *et al.* 2010). Sown pastures have proved to a valuable technology to improve livestock nutrition. However, a major limitation to the use of sown tropical species is infertile soil. This is certainly the case in the north western region of Nigeria where soils are very low in the phosphorus (P) content available to plants (Ezekiel and Gabriel 2006). Sakaba (2011) also reported very low available phosphorus content (<5 ppm) in the soil of the study area in Sokoto. Possible reasons for the low P status include: low pH value, excessive degradation caused by overgrazing and the effects of desertification. This study was conducted to evaluate the performance of Verano under different P fertilizer levels in the semi-arid ecosystem of northwestern Nigeria.

Materials and methods

The experiments were carried out in the rainy seasons of 2007 and repeated in 2008 at Dabagi Farm of the Usmanu Danfodiyo University, Sokoto. The area lies between latitude 13°1'N and longitude 5°15'E. Sokoto is located in the Sudano-Sahelian vegetation zone of Nigeria. The area receives a mean annual rainfall of about 692.5mm in 110 days between June and September (SERC, 2008).

The experiment consisted of five phosphorus rates (0, 10, 15, 20 and 25 kg P/ha) with three replications laid out in a split plot design. Single superphosphate (18% P₂O₅) was used. Each block consisted of 15, 4 x 3 m plots. A buffer of 0.5 m separated plots with a 1 m buffer separating blocks. Seeds were drilled manually using a seed rate of 3 kg/ha. Data were collected at 2, 4, 6, 8, 10, 12 and 14 Weeks After Sowing (WAS). Three randomly selected plants from each plot were used to measure growth parameters. Plant height was measured from the ground level to the end of the terminal bud, using a meter rule (roots were not considered). Leaf length was measured from the base of the leaf stalk to the tip, using a meter rule. Leaf width was measured from the widest portion of the leaf using a meter rule. The number of leaves per plant were counted from the

three randomly selected plants within a plot at 2 to 14 WAS (Harper 1983). The canopy spread was measured from the vertical and horizontal sections of the plants.

Herbage yield was taken by cutting all the plants at about 5cm above the ground from the net plot area and the fresh yield determined using weighing balance. Sub samples were oven-dried at 65°C for 48 hours to estimate the dry matter (DM) yield expressed in kg/ha. All obtained data were subjected to analysis of variance (ANOVA), where there were significant differences between treatment means, the Least Significant Difference (LSD) method was used for comparison (SAS 1988).

Results and Discussion

This study demonstrated that reasonably high Verano yield can be obtained in the first season after planting, even in the absence of fertiliser. This is not an uncommon observation as it is well established that species from the *Stylosanthes* genus are extremely efficient at utilising P and have a noted ability to flourish on P-deficient soils (Akinolai *et al.* 2010). However, the ability to extract P from low P soils does not mean that *Stylosanthes* legumes do not respond to P fertilizer applications. In this experiment, highest dry matter yields of 4651 and 6831 recorded for the years 2007 and 2008 were measured in plots receiving 25 kg P/ha (Fig. 1). This represented a yield increase of 230% compared to the control. This was due to the combined effect of a slight increase in plant height, but more importantly, to the production of more leaves than the control (data not shown). Of equal importance to the yield increase is the improvement in the nutritive value of the fertilizer Verano because as Jones (1990) pointed out, the P concentration in *Stylosanthes* forage produced on low P soils without fertiliser can be very low. Although we speculate this to be the same for Verano growing in Sokoto, further analysis of feed quality is needed to confirm this point.

Conclusion

It is concluded that the application of 25 kg P/ha significantly improved the performance of Verano stylo in the semi-arid of Nigeria.

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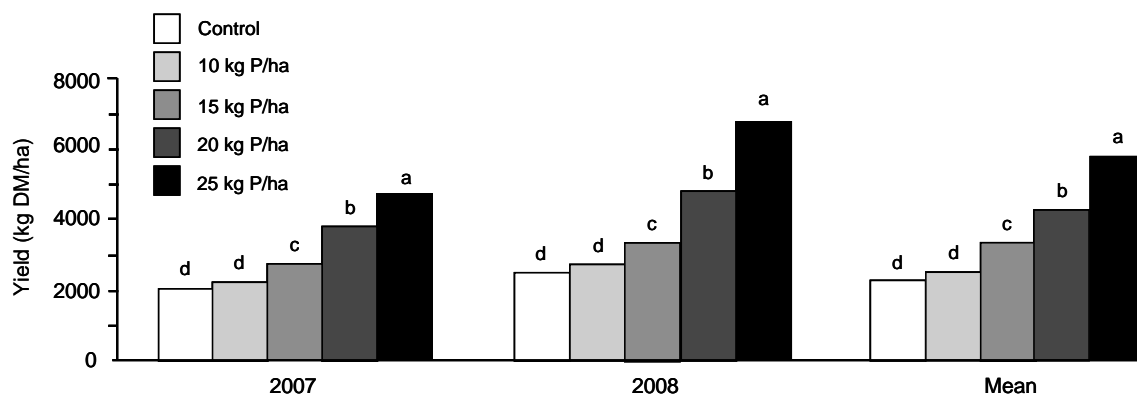


Figure 1. Dry matter yield of *S. hamata* cv Verano as influenced by phosphorus levels in 2007, 2008 and years combined.

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