Do silicon fertilizers improve the fodder value of tropical grass species ?

Kindomihou Valentin[1] , Ma Jian Feng[2] , Sinsin Brice[1] , Meerts Pierre[3]
(1) Laboratory of Applied Ecology , Faculty of Agronomic Sciences , Abomey Calavi University , Benin ; 05 BP 325 Cotonou , vkindomihou@yahoo .fr ; (2) Group of Physiology and Molecular Biology of Plant Stress response , Research Institute for Bioresources , Kurashiki , Okayama University , Japan ; (3) Laboratory of Plant Genetic and Ecology , Université Libre de Bruxelles , Belgium .

Key words : silicon fertilizer ,grass silicification ,fodder value ,tropical ,improve

Introduction Silicon has been reported as beneficial element for promoting growth and yield of plants . A wide range of species was found among tropical grasses : species with much higher concentration i .e . *Pennisetum unisetum* (>13 .5% in blades) , *Panicum maximum* Jacq (>7 .5%) , and species having contents between 2 .2% and 6 .9% (Kindomihou 2005) . An important preoccupation is how to reduce silica concentration in their leaves to improve their palatability , digestibility and nutrient value for animal high productivity . We examine the effect of silicon supply on Silica accumulation and other structural and functional traits of some tropical fodder grass species .

Plant and soil materials , Fodder grass experiment , Measurements Six tropical grasses were selected by their high forage value and because they provide essential tropical grassland biomass for animal consumption : *Andropogon gayanus var* Bisquamulatus (Hochst .) Hack , *Brachiaria ruziziensis* , *Panicum maximum* cultivar ORSTOM C1 , *Panicum maximum* cultivar T673 , *Panicum maximum* cultivar T58 and *Panicum maximum* Jacq . cultivar local . The soil used in the experiment , taken from the Research Institute for Bioresources station of Kurashiki in Okayama University (Japan) , is a clay soil .

A complete randomized design with 3 replications was prepared using silica gel treatments . Fractions of soil that had passed a 2 mm sieve were used for pot culture . Grass clumps were cultured in pots for 2 weeks and then transplanted in another pots containing 3 .3 kg of soil . Each pot contained 3 tillers per replication in 3 replications (i .e . 9 tillers per pot) and the soil was irrigated with distilled water every day . The soil had received 0 or 100 g of silica gel which was known with no effect on soil pH , to create two treatments : plus silicon and minus silicon . Plants were grown in greenhouse for three months after transplantation (29 April-29 July 2006) , and harvested .

Shoot biomass was measured . Si and P concentrations in shoots were analysed by the colorimetric method using Spectrophotometer (Jasco , Japan) . Morphological traits i .e . leaf blades length , width , and leaf area were determined . Functional and structural traits i .e . specific leaf area , specific leaf mass , leaf water content , shoot water content , leaf density and leaf thickness were recorded . ANOVA , Pearson Coefficient analysis and Post hoc test were performed using STATISTICA 7 .0 .

Results and discussion Shoot biomass increased significantly in response to Si supply and species respond differently in Si accumulation . *Panicum maximum T58* showed the highest values for shoot biomass and P concentration while *P . maximum C1* showed the lowest shoot biomass and the highest Si concentration . *Andropogon gayanus* showed the lowest Si and P concentrations in response to Si supply . Globally , Si supply increased water content in shoots , as well as the leaf dry matter and the leaf area . Changes were also highlighted in correlations between traits : negative correlation between shoot Si and blade width/blade dry matter , leaf Area and leaf density . Supplying silicon significantly increased both Si and P concentration in shoot and blades which are the most grazed parts of fodder grasses . These results show that Silicon fertilizer could improved fodder value of some tropical grass species as previously suggested by investigations on fodder grasses (Eneji *et al* . 2005) , maize and other crops (Chunchua *et al* . 2001) and rice (Mauad *et al* . 2003) .

References

Chunhua L . , Tianduo C . , Xianbao L . , Dingjin H . , Jun R . 2001 . Yield response to silicon and combined use of SiZnMn fertilizer in China . In Datnoff L .E . , Snyder G .H & Korndörfer G . H . Silicon in Agriculture . *Studies in Plant Science* , 8 . Elsevier Science B . V . , Amsterdam , the Netherlands . p 380 .

Eneji E . , Inanaga S . , Muranaka S . , Li J . , An P . , Hattori T . , Tsuji W . 2005 . Effect of calcium silicate on growth and dry matter yield of *Chloris gayana* and *Sorghum sudanense* under two soil water regimes . *Grass and Forage science* , 60 , 393-398 .

Kindomihou V . 2005 . Tropical grasses silicification : Genetic interspecific variations , effect of growth conditions and relation with the foliar structure . *PhD Thesis . Université Libre de Bruxelles , Belgium* . 193p .

Mauad M . , Crusiol A .C .C . , Filho H . , G . , Correa J .C . 2003 . Nitrogen and silicon fertilization of upland rice . *Scientia Agricola* , 60 (4) 761-765 .