

# Die invloed van N-peil, grondtipe en waterstremming op die produksie en watergebruiksdoeltreffendheid van *Panicum maximum* cv. Gatton

PA Pieterse\*, NFG Rethman en J van Bosch

Afdeling Weidingkunde, Departement Grondkunde en Plantproduksie, Fakulteit Landbouwetenskappe, Universiteit van Pretoria, Pretoria 0002, Suid-Afrika

## Abstract

The influence of N fertilisation, soil type and water stress on the growth rate and water use efficiency of *Panicum maximum* was evaluated in a pot trial at the University of Pretoria. There were 5 levels of N application on 3 different soil types and the treatments were replicated under conditions of water stress. It was concluded that N fertilization, at levels higher than 80 kg N-ha<sup>-1</sup>, does have a significant effect on both growth rate and water-use efficiency, but that its influence was overshadowed by soil type and availability of groundwater. Water-use efficiency also decreases as the season progresses. From the results of this trial it seems to be good policy, to irrigate only till the first cut or the first half of the summer.

## Uittreksel

Die invloed van N-bemesting, grondtipe en waterspanning op die groeitempo en watergebruiksdoeltreffendheid van *Panicum maximum* is in 'n polproef aan die Universiteit van Pretoria ondersoek. Daar was 5 N-peile en 3 verskillende grondtipes. Al die behandelingskombinasies is onder toestande van voldoende grondwater en onder waterstremming toegepas. Daar is tot die gevolgtrekking gekom dat N-bemesting, by vlakke van meer as 80 kg N-ha<sup>-1</sup>, 'n betekenisvolle invloed op beide groeitempo en watergebruiksdoeltreffendheid het, maar dat die effek oorskadu word deur die invloed van die grondtipe en die beskikbaarheid van grondwater. Watergebruiksdoeltreffendheid het ook afgeneem soos die seisoen gevorder het. Dit mag dus goeie beleid wees om volle besproeiing van die gewas tot en met die eerste snysel of die eerste helfte van die groeiseisoen te beperk.

## Extended summary

The aim of the trial was to determine the influence of N fertilisation, soil type and water stress on the growth rate and water-use efficiency of *Panicum maximum*. The trial was conducted in pots in a controlled environment over 3 seasons, using a different type of soil each season. In the 1989/90 season, it was on a clay loam soil and the fertilisation levels were 0, 20, 60, 180 and 300 kg N-ha<sup>-1</sup>. In the 1990/91 season, it was on sandy clay loam and the N levels were 0, 20, 60, 180, and 540 kg-ha<sup>-1</sup>. In the 1991/92 season, it was done on a clay soil with N levels of 0, 80, 160, 240 and 320 kg-ha<sup>-1</sup>. All the N was applied in a single dressing. There were 2 levels of irrigation, one half of the pots were watered to 90% of the mass at field capacity every 2 to 3 d and the other half received on average 1 l of water every week. The grass was harvested at a height of 7 cm, when the first inflorescences appeared, resulting in 4 cuts per season.

From the results it is clear that N levels up to 60 kg N-ha<sup>-1</sup> had little or no effect on the growth rate or water-use efficiency of the grass. The highest growth rate and water-use efficiency were obtained with the highest level of fertilisation when water was freely available and even under stress conditions, on 2 of the 3 soils in the trial. The highest stubble mass was also obtained with the highest N application. Water-use efficiency also decreased as the season progressed. It may therefore be good policy to use expensive irrigation water only up to the first cut, after which the crop should produce and survive on natural precipitation.

Different reactions to N application and water stress were observed on the different soils and it has been concluded that although the level of N application does have an influence on growth rate and water-use efficiency, other soil factors overshadow this influence.

## Inleiding

*Panicum maximum* cv. Gatton word deur Humpreys (1974) beskryf as 'n variëteit van medium hoogte, afkomstig vanaf Suid-Rhodesië (Zimbabwe). Die spesie is inheems aan die subtropiese gebiede van Suidelike Afrika, waar dit veral in die onderboom subhabitatvoorkom (Smit en Rethman, 1989). Kennard en Walker (1973) het, na aanleiding van navorsing wat in Rhodesië (Zimbabwe) gedoen is, hierdie assosiasie toegeskryf aan die feit dat die saailinge van *P. maximum* beter aangepas is by die onderboom subhabitat, terwyl die saailinge van *Heteropogon coniochloa* en *Hyparrhenia filipendula*, wat gewoonlik saam met *P. maximum* in dieselfde veldtipe aangetref word, nie daar kan oorleef nie. Bosch en Van Wyk (1970) was van mening dat die assosiasie eerder aan die verbeterde grondvrugbaarheid in die subhabitat toegeskryf kan word en dat stikstof 'n belangrike rol in aanpasbaarheid speel, aangesien die gras veral met peuldraende bome, wat bekend is vir hul vermoë om stikstof te bind, geassosieer word. Donaldson et al. (1984) het ook aangetoon dat die spesie floreer onder toestande van relatief hoë grondfosfaaten stikstofinhoud. Du Pisani et al. (1986) het, in 'n ondersoek na die invloed van grondvrugbaarheid op die produksie van cv. "Green Panic", ook hoër opbrengste by hoër fosfaat- en stikstofvlakke verkry.

Ng et al. (1975) het die invloed van waterstremming op die groei en waterverhoudings van *P. maximum* var. *Trichoglume*

\* To whom all correspondence should be addressed.

Received 19 November 1993; accepted in revised form 14 March 1994.