



University of Kentucky
UKnowledge

International Grassland Congress Proceedings

21st International Grassland Congress / 8th
International Rangeland Congress

Effects of Water and Nutrient Treatment on Gas Exchange and Water Relations of Two *Casuarina equisetifolia* Clones

Bala Makesh Kumar
Madurai Kamaraj University, India

Kailash Paliwal
Madurai Kamaraj University, India

Follow this and additional works at: <https://uknowledge.uky.edu/igc>

 Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/2-1/34>

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Effects of water and nutrient treatment on gas exchange and water relations of two *Casuarina equisetifolia* clones

B. Makesh Kumar and Kailash Paliwal

Department of Plant Sciences, School of Biological Sciences, Madurai Kamaraj University, Madurai 625 021 India. E-mail: bala.makeshkumar@gmail.com

Key words : *Casuarina equisetifolia*, nutrient treatment, water relations, gas exchange

Introduction The relative success of a plant, both in an evolutionary sense and in terms of biomass productivity, depends on its ability to sequester and efficiently utilize soil resources that often are scarce. Nitrogen (N) and water are considered to be the resources most often limiting survival, reproduction, or growth, although macro- or micro-nutrients, oxygen, physical space, or other soil factors also may be important in some circumstances. The ecophysiological responses of plants to fluctuations in available water and N, therefore, have been and will continue to be important subjects of research (Evans, 1989).

Methods Two *Casuarina equisetifolia* clones (CH and TCR) were grown in the pots and the pots received two different nitrogen treatments and water treatments starting from July to December 2000. Photosynthesis and WUE of the clones were measured seasonally and diurnally to determine different response of the clones.

Results and discussion Photosynthesis and stomatal conductance were well correlated in our study in both clones (Figure 1); r -values were in excess of 0.5. The slopes and intercepts of the two linear regressions were nearly identical. However, the data set for TCR contained more values in the upper range of photosynthesis (A) and stomatal conductance (g). The results showed that physiological processes in foliage of the *Casuarina* clones respond differently to water stress. Genotypic and population level difference in photosynthetic rate and water relations have been reported within hardwood genera or species (Abrams and Knapp 1986; Furukawa et al., 1990). Based on the earlier reports and from the present study, it can be concluded that high intrinsic rates of photosynthetic rate, light control of stomatal water loss, high WUE, and osmotic adjustment to cellular desiccation are all very desirable for the growth of the tree species. The physiology of CH appears to be more susceptible to extreme drought than does that of TCR. These results could lead to the conclusion that TCR would be a better choice for high biomass production under non irrigated in grassland ecosystem condition than CH.

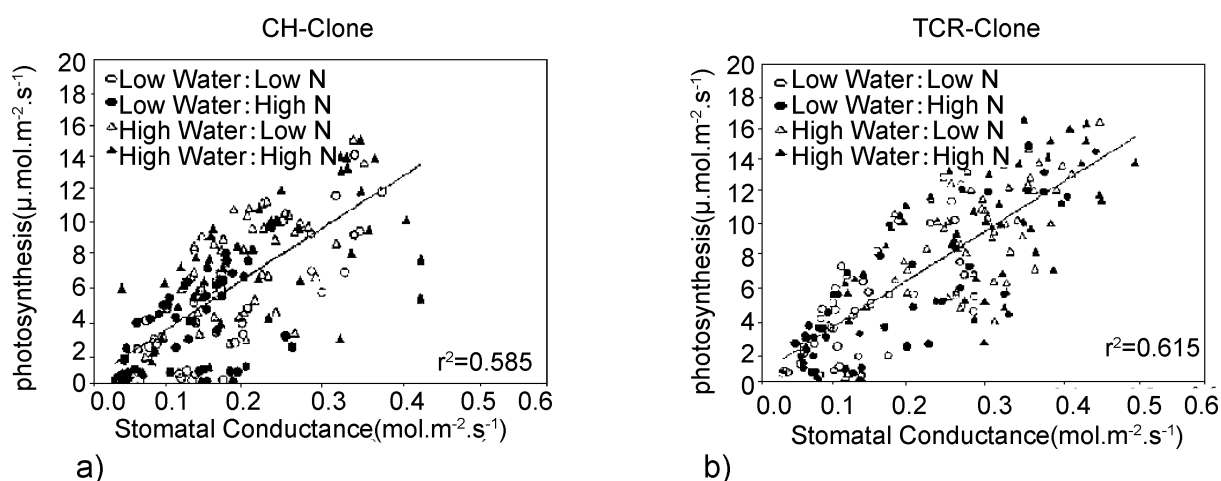


Figure 1 Linear regression of photosynthesis (A) vs. stomatal conductance (g) for a) CH and b) TCR clones of *Casuarina equisetifolia*. Data from all treatment combination and from seasonal and diurnal measurements.

References

- Evans, J.R. 1989. Photosynthesis and nitrogen relationships in leaves of C3 plants. *Oecologia*, 78: 9-19.
- Abrams, M.D. and Knapp, A.K. 1986. Seasonal water relations of three gallery forest hardwood species in northeast Kansas. *For. Sci.* 32: 687-696.
- Furukawa, A., Park, S-Y. and Fujinuma, Y. 1990. Hybrid poplar stomata unresponsive to changes in environmental conditions. *Trees*, 4: 191-197.