



University of Kentucky
UKnowledge

International Grassland Congress Proceedings

21st International Grassland Congress / 8th
International Rangeland Congress

The Impact of Temperature on Seed Germination in Diverse Accessions of 4 Wild Vigna Species

Yanrong Wang
Lanzhou University, China

J. Hanson
International Livestock Research Institute, Ethiopia

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/21/14-1/9>

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.

The impact of temperature on seed germination in diverse accessions of 4 wild *Vigna* species

Y.R. Wang¹ and J. Hanson²

¹College of Pastoral Agriculture Science and Technology, Lanzhou University, China (E-mail: yrwang@lzu.edu.cn),

²Forage Diversity Project, International Livestock Research Institute, Ethiopia

Key words: *Vigna* species, seed germination, temperature, germination

Introduction Temperature is one of the most important factors controlling seed germination and emergence (Fenner and Thompson, 2005). Each species has specific temperature requirements: base (T_b) and ceiling (T_c) temperatures below and above which no germination occurs, and an optimum temperature (T_o) at which germination is rapid. When seeds are germinated at constant temperatures there is a linear relationship between temperature and the rate of seed germination (Craufurd *et al.*, 1996). Using these linear relations, species or genotypic differences in seed germination and emergence can be analyzed. The objective of this study was to quantify the cardinal temperatures (T_b , T_o , and T_c) for different accessions of 4 wild *Vigna* species selected because of their potential use as forages: *V. membranacea*, *V. oblongifolia*, *V. racemosa* and *V. vexillata*.

Materials and methods Three accessions each of *V. membranacea* and *V. racemosa* and 4 accessions each of *V. oblongifolia* and *V. vexillata* obtained from the ILRI Forage Genebank (Table 1) were germinated under 7 different temperatures: 10, 15, 20, 25, 30, 35 and 40°C. Four replicates of fifty seeds per accession were scarified with sandpaper to break dormancy and placed on top of moistened paper in petri dishes. The germinating seedlings were evaluated daily for 14 days. The T_b , T_o , and T_c were computed for each accession based on relations of temperature and germination rate Gt50 (reciprocal of the time taken for 50% of the seeds to germinate).

Results and discussion Although T_b , T_o , or T_c among the accessions within species was not significantly different in 3 of the 4 species tested, the T_c in one accession of *V. oblongifolia* was significantly lower ($P \leq 0.05$) than the other accessions (Table 1). Similar genotypic variation in temperature response of seed germination was also found in *V. unguiculata* (Craufurd *et al.*, 1996). Significant differences existed among the species for each of the cardinal temperatures. The T_b of *V. oblongifolia* was the lowest (9.9°C). This was significantly lower than the T_b for *V. vexillata*, but not for the other species. *V. racemosa* (33.8°C) and *V. oblongifolia* (44.8°C) had the highest T_o and T_c respectively. These were significantly higher than those for the other species (Table 1). The experimental results demonstrated that the variation in cardinal temperatures for germination differed between both genotypes and species. The correlation between the final percentage of germination and the temperature was significant for each species with R^2 ranging from 0.7183 (*V. oblongifolia*) to 0.9086 (*V. vexillata*) and the relations fitted to polynomial models.

Table 1 Mean cardinal temperatures estimated for each of 4 *Vigna* species.

Species	Number accessions tested	T_b	T_o	T_c
<i>V. membranacea</i>	3	10.5 ab	25.9 c	41.5 b
<i>V. oblongifolia</i>	4	9.9 b	29.8 b	44.8 a
<i>V. racemosa</i>	3	10.6 ab	33.8 a	42.0 ab
<i>V. vexillata</i>	4	11.5 a	30.6 b	41.5 b

The means within a column having different letters is significantly different at 5% level.

Acknowledgement The research was financed by National Basic Research Program (973 Program) of China (2007CB108904) and World Bank project Upgrading the Genebanks of the CGIAR.

References

- M. Fenner and K. Thompson (2005) (eds.). The Ecology of Seeds. Cambridge University Press, 110-116.
 P. Q. Craufurd, R. H. Ellis, R. J. Summerfield and L. Menin (1996). Development in cowpea (*Vigna unguiculata*). I. The influence of temperature on seed germination and seedling emergence. *Experimental Agriculture*, 32, 1-12.