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

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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.

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