

VARIABILITY IN SEED DORMANCY AND GERMINATION POTENTIAL IN *Desmodium* DESV. (LEGUMINOSÆ)*

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ABSTRACT

A study was conducted in order to compare the germination potential and the level of dormancy of four native Brazilian *Desmodium* species, *D. barbatum*, *D. discolor*, *D. incanum* and *D. tortuosum* (two populations). In the first trial, scarified and nonscarified seeds of each species were exposed to constant and alternating temperatures, over a range of 15 to 45°C, and of 15-30, 20-35, 25-35, and 25-40°C, respectively. *D. discolor* and *D. incanum* showed the lowest dormancy and *D. barbatum* the highest at all temperatures. Nonscarified seeds had a higher dormancy breaking rate when subjected to the highest temperatures, up to a maximum at 40°C. Scarified seeds of all species germinated at high percentages, 20 to 40°C. Germination at 15°C was low, especially for *D. barbatum* and *D. incanum*. In the second trial, families within these species were exposed to 40°C for the germination tests. The coefficients of intraspecific genetic variation and genotypic determination were estimated. The results showed significant differences among families of *D. discolor*, *D. incanum*, and *D. tortuosum* (population 2) for seed dormancy. These three species also had a higher coefficient of genotypic determination (> 84%), indicating the possibility of selection for seed dormancy. *D. tortuosum* (population 2) had the highest coefficient of intraspecific genetic variation, which implies that a higher proportion of the observed variation was genetic rather than environmental. These results indicate the possibility of selection for either a higher or a lower level of dormancy within *Desmodium* species.

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INTRODUCTION

Hard or water impermeable seeds occur frequently in the Leguminosae (Quinlivan, 1971; Rolston, 1978) and is characteristic of most forage legumes, such as those in the genus *Desmodium* Desv. (Leguminosae - Papilionoideae). The genus *Desmodium* includes about 500 species distributed throughout the tropical and subtropical regions of the world (Younge *et al.*, 1964). They have been reported in the floras of all continents except Europe (Imrie *et al.*, 1983). Approximately 24 species are native to Brazil (Hoehne, 1921). These species occur in several types of environments and usually have a wide geographical distribution. A number of species have shown potential as pasture and forage plants and cover crops (Lenné and Stanton, 1990). The most intensive studies on this aspect have taken place in Australia, Hawaii and East Africa (Younge *et al.*, 1964; Bryan, 1969), and, more recently, in Colombia (CIAT, 1984; Lenné and Stanton, 1990).

Seed dormancy is an important factor in the dynamics of natural populations. It is related to the adaptation of plants to environmental heterogeneity. Dormancy ensures that seedling emergence occurs at the most advantageous time and place (Bewley and Black, 1985; Baskin and Baskin, 1985). Several studies have demonstrated the existence of inter- intraspecific variability in the level of dormancy in tropical forage legumes (Barriga, 1979; Oliveira, 1979; Battistin, 1981; Pontes and Martins, 1982; Reis, 1984; Vieira, 1987), and in various other plant species of temperate regions (Frost and Cavers, 1975; Naylor and Jana, 1976; Jana and Naylor, 1980; Jain, 1982; Naylor, 1983). They indicate that such variability has genetic and environmental components.

Reports from Derieux (1971), Skerman (1977), Oliveira (1979), Dias Filho and Serrão (1984), have shown variability in the level of dormancy among as well as within various *Desmodium* species. The objectives of our study were: to determine the level of dormancy in four native Brazilian *Desmodium* species; to evaluate the effect of constant and alternating temperatures on dormancy break and germination of scarified and nonscarified seeds; to determine the variation in the level of dormancy among families within these species; and to provide physiological, ecological, and genetic information for a better understanding of their role in plant population dynamics.

MATERIALS AND METHODS

Four native Brazilian species of *Desmodium* Desv., collected from different regions in the State of São Paulo, Brazil, were studied: *D. barbatum* (L.) Benth., a short-lived perennial, growing to a height of 1 m; *D. discolor* Vog., an upright

perennial growing to a height of 2.5 to 3 m, with stems which become woody when mature; *D. incanum* (Sw.) DC., a perennial with woody upright stems growing to a height of 30 to 60 cm, and fibrous to woody trailing and creeping stems; and *D. tortuosum* (Sw.) DC., an erect, short-lived annual or perennial herb, growing to a height of 0.6 to 3 m (Skerman, 1977). *D. tortuosum* came from two populations of different origins.

The seeds were multiplied in a field trial located at the Genetics Department, of the Escola Superior de Agricultura "Luiz de Queiróz"/USP, in Piracicaba, SP. The experiment was arranged in a randomized complete block design with five treatments (species), four replications, and four plants per plot. The plants were initially grown in a greenhouse and transplanted to the field in March 1985. Seeds were collected weekly from individual plants during the reproductive period of each species. *D. incanum* and *D. tortuosum* produced seeds from September to December 1985, whereas *D. barbatum* and *D. discolor* produced seeds from March through May 1986. Harvested seeds were stored in paper bags at room temperature prior to testing.

For the germination trials, the seeds were treated with the fungicide Arasan, placed on filter paper in plastic boxes, and moistened daily with distilled water to keep them moist. Germinated seeds, based on emergence of the radicle, were counted every 24 hours, over a period of 21 and 15 days, for constant and alternating temperatures, respectively. The number of dead, abnormal, viable ungerminated and hard seeds was recorded at the end of each test. Germinated seeds either without a radicle or with injured cotyledons were considered abnormal. Viable ungerminated seeds were those which absorbed water but remained firm until the end of the test.

a) Experiment 1: Dormancy and germination potential of seeds at constant and alternating temperatures

Seeds scarified with sandpaper and nonscarified seeds of each species were incubated over a range of constant (15, 20, 25, 30, 35, 40 and 45°C) and alternating temperatures (15-30, 20-35, 25-35 and 25-40°C) in constant darkness. At the alternating temperatures, the thermoperiod consisted of 16 hours for the lower temperatures and 8 hours for the higher. An equal quantity of seed from each individual plant was pooled to form a bulk of seeds for each species and population. A completely randomized design was used, with five treatments (species) and four replications of 50 seeds each.

The statistical analyses of the data, transformed in $\arcsin \sqrt{\%}$ (Steel and Torrie, 1980), consisted of an analysis of variance and a Tukey test for each trial, and

a joint analysis for all constant and all alternating temperature trials. The effect of constant temperature on germination of scarified and nonscarified seeds was analysed by a regression analysis using orthogonal polynomials (Sokal and Rohlf, 1969). The germination rate, expressed by the reciprocal of the average germination time (\bar{t}), was also evaluated in each trial (Labouriau, 1970).

b) Experiment 2: Variability in the level of dormancy among families, within species

Nonscarified seeds taken from 15 families (seed progeny from single maternal parents) of *D. barbatum* and *D. tortuosum* (populations 1 and 2), 12 families of *D. incanum*, and 11 families of *D. discolor*, were incubated at a temperature of $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, which was effective in breaking dormancy in experiment one, in constant darkness. The reduced number of families of the latter two species was due to poor seed production and death of some of the plants. The experimental design was a completely randomized one, with a variable number of treatments (families), depending on the species, and two replications of 50 seeds each.

The statistical analysis consisted of an analysis of variance for each species (Steel and Torrie, 1980), estimating the genetic variance among families ($\hat{\sigma}_f^2$) and the phenotypic variance ($\hat{\sigma}_F^2$), by the following equations:

$$[1] \quad \hat{\sigma}_f^2 = (Q1 - Q2)/r$$

$$[2] \quad \hat{\sigma}_F^2 = Q1/r$$

where $Q1$ = mean square of families, $Q2$ = mean square of error, r = number of replicates. With these estimates the coefficient of intraspecific genetic variation (CVg_i) and the coefficient of genotypic determination (b_i) were obtained for each species, as follows:

$$[3] \quad CVg_i = \sqrt{\hat{\sigma}_f^2} / m \times 100$$

$$[4] \quad b_i = \hat{\sigma}_f^2 / \hat{\sigma}_F^2$$

where m = general mean. The germination rate, expressed by the reciprocal of the average time (Labouriau, 1970), was evaluated. The coefficients of intraspecific genetic variation (CVg_i) and genotypic determination (b_i) were also estimated for germination rate.

RESULTS

a) Experiment 1

a.1) Constant temperatures

Germination of nonscarified seeds of all species, especially *D. incanum*, increased as the temperature increased to 40°C (Figure 1A), after which no germination occurred. Highly significant differences in germination percentages were observed among species at all temperatures. The joint analysis showed significant differences among species and among temperatures, and also a significant interaction between species and temperatures. The regression analysis (Figure 2) showed a cubic effect of the temperatures over germination for all species, except for *D. barbatum*, which showed a fourth degree significant effect. For all four species, germination was lowest at 15°C and highest at 40°C, showing the efficiency of higher temperatures in breaking seed dormancy. Differences among species in the level of dormancy (Figure 1A) was significant at each temperature. However, considering all temperatures, *D. discolor* and *D. incanum* had the lowest levels of dormancy, followed by *D. tortuosum* (populations 1 and 2), and *D. barbatum*.

Scarified seeds of all four species (Figure 1A) had higher germinations at 20 to 40°C. Nonscarified seeds, however, germinated best at 40°C. The Tukey test showed the greatest differences among species at 15°C, although the individual analyses of variance detected significant differences at 15, 20, 30, and 40°C. The joint analysis showed significant differences among species, among temperatures, and interaction among species and temperatures. The regression analysis (Figure 2) showed a significant fourth degree effect of temperature upon germination of the scarified seeds for all species. Germination was low for all species at 15°C, but especially for *D. barbatum* and *D. incanum*, because of the higher number of viable ungerminated seeds at this temperature, also observed in the nonscarified seed trials, mainly at 15 and 20°C, for *D. incanum*.

Germination rate was almost always higher for the scarified than non-scarified seeds (Figure 3). In most trials, *D. barbatum* and *D. incanum* had the slowest germination rates, and *D. discolor* the fastest. Lower germination rates also occurred at temperatures of 15 and 20°C.

a.2) Alternating temperatures

Germination of nonscarified seeds increased with an increase in the minimum and maximum temperatures (Figure 1B). These results are similar to those of

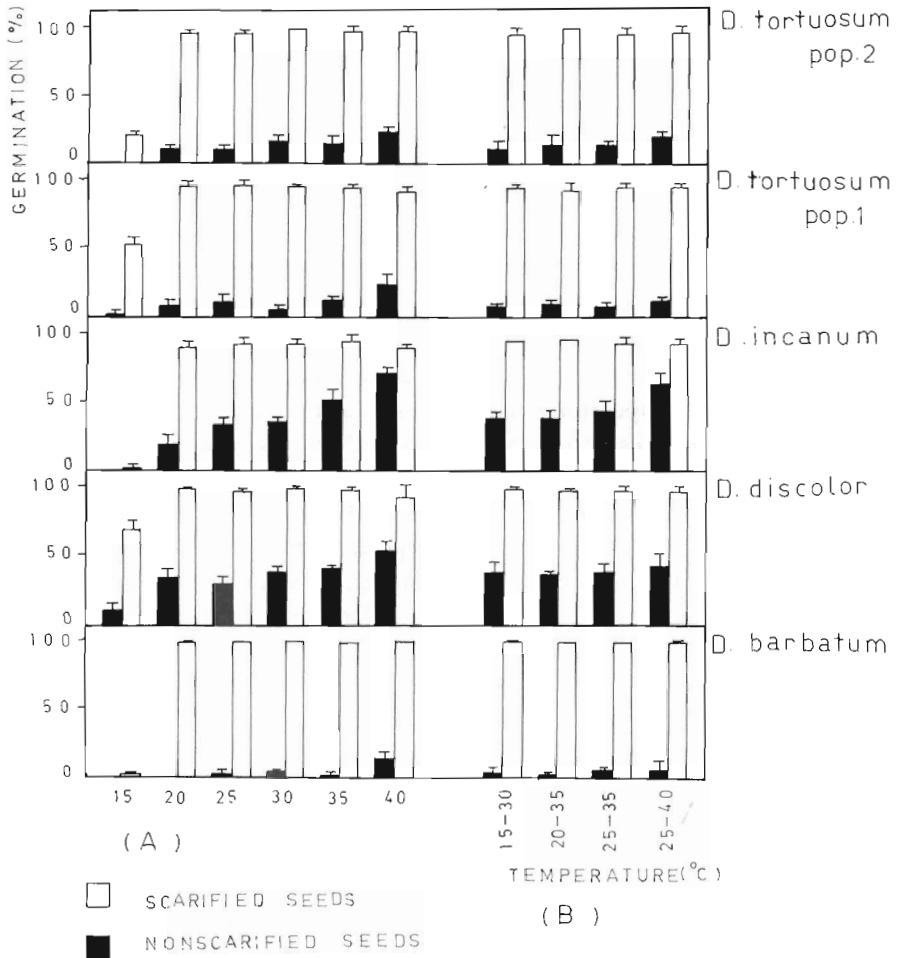


Figure 1 - Germination of scarified and nonscarified seeds of four *Desmodium* species at six constant (A) and four alternating (B) temperatures. Lines at the tops of bars indicate one standard deviation.

the constant temperature trials (Figure 1A). The highest germination percentage obtained for all four species was at 25-40°C. However, this percentage was lower than that obtained at 40°C. Highly significant differences among species at all temperatures were obtained in the individual variance analyses. The same patterns in the level of dormancy among species for constant temperatures were observed for the alternating temperatures, with *D. discolor* and *D. incanum* showing the lowest levels, followed by *D. tortuosum*, populations 1 and 2, and *D. barbatum* (Figure 1B). The

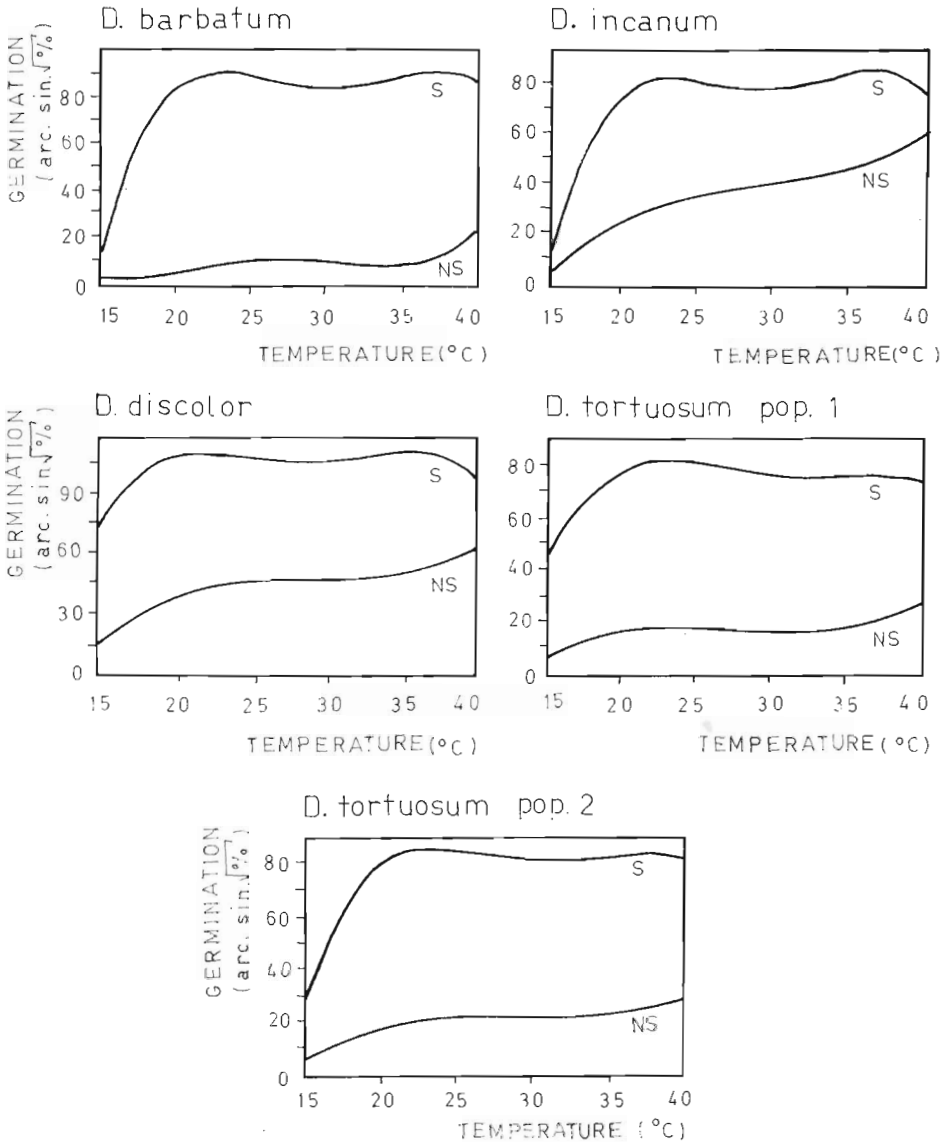


Figure 2 - Effect of seven constant temperatures on germination of scarified (S) and nonscarified (NS) seeds of four *Desmodium* species.

joint analysis showed significant differences among species as well as temperatures, but there were no significant interactions between species and temperatures. Scarified seed trials (Figure 1B) showed highly significant differences among species

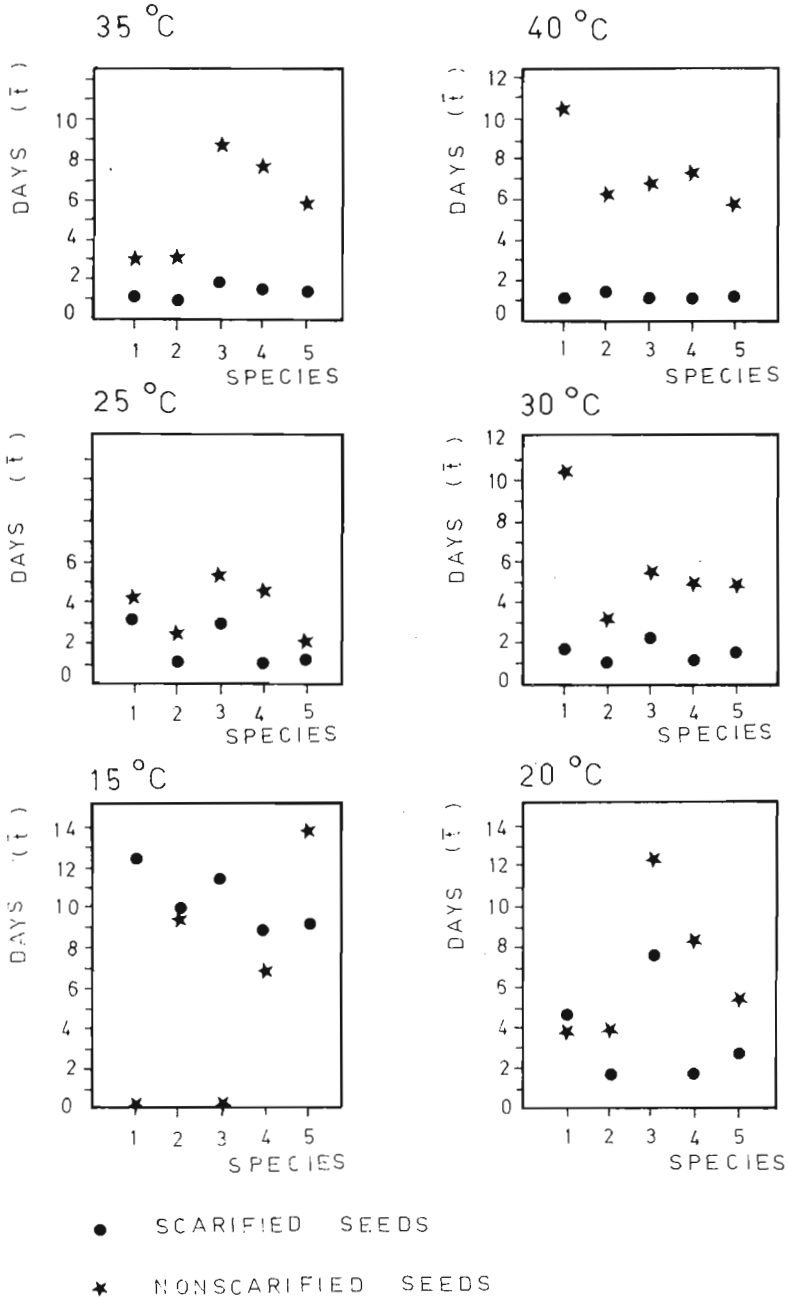


Figure 3 - Average germination time (\bar{T}) of *Desmodium barbatum* (1), *D. discolor* (2), *D. incanum* (3), *D. tortuosum*, pop. 1 (4), and *D. tortuosum*, pop. 2 (5), at six constant temperatures.

only at 15-30°C. The joint analysis detected significant differences only among species.

Both scarified and nonscarified seeds of *D. incanum* had slower germination rates at almost all temperatures while those of *D. discolor* had faster rates (Figures 3 and 4). The higher the temperature the faster the germination rate.

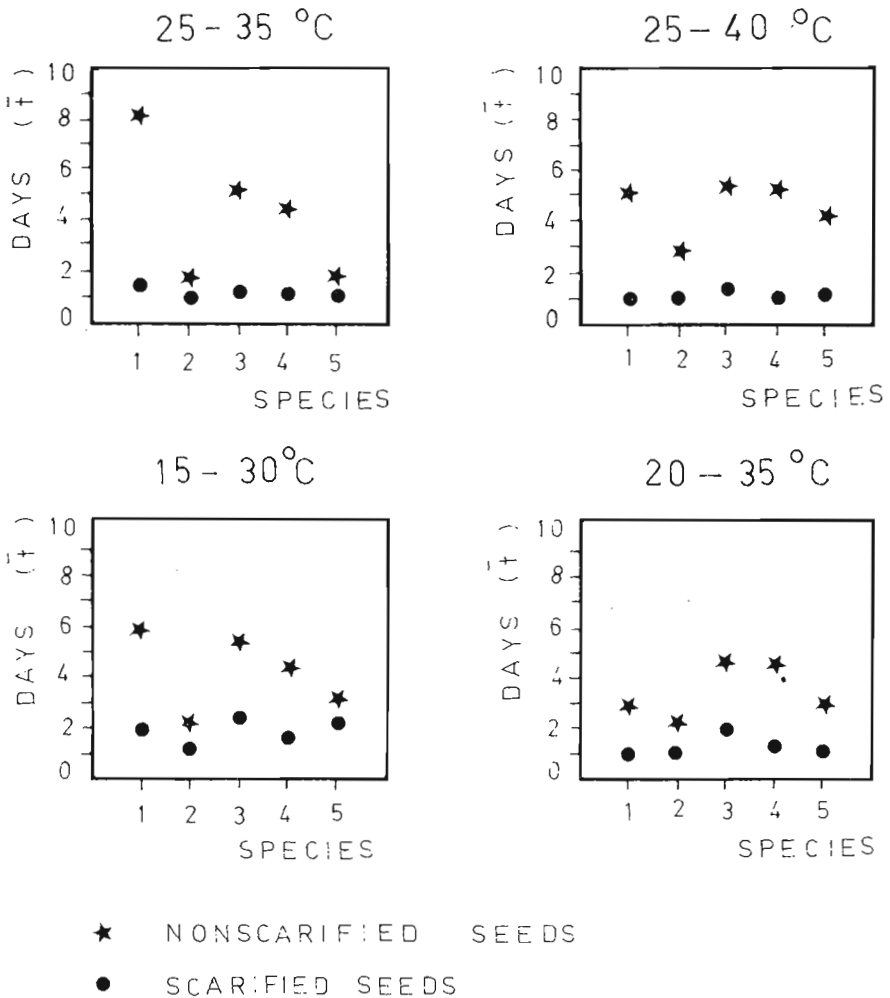


Figure 4 - Average germination time (\bar{T}) of *Desmodium barbatum* (1), *D. discolor* (2), *D. incanum* (3), *D. tortuosum*, pop. 1 (4), and *D. tortuosum*, pop. 2 (5), at four alternating temperatures.

b) Experiment 2

The results showed an intraspecific variation in relation to the level of dormancy (Figure 5) for *D. discolor*, *D. incanum*, and *D. tortuosum* (population 2), with highly significant differences among families of these species, as indicated by the Tukey test (Table I) and the analyses in Table II. The greatest variation among families was observed for *D. tortuosum* (pop. 2), where the highest percentage of germination was 56% and the lowest only 3%. This is a difference of 53% compared with a 40% difference for both *D. discolor* and *D. incanum*. *D. tortuosum* (pop. 2) also showed the highest value for the coefficient of intraspecific genetic variation, indicating that a high proportion of the observed variation was genetic, and thus easily selected. The coefficient of genotypic determination was higher than 80% for the three species described above, indicating the possibility of plant selection with either higher or lower dormancy levels.

Table I - Percent (mean of two replicates \pm SE) germination per family of nonscarified seeds at 40°C \pm 2°C for 15 days for four *Desmodium* species.

Families	Species				
	<i>D. barbatum</i>	<i>D. discolor</i>	<i>D. incanum</i>	<i>D. tort.</i> , p.1	<i>D. tort.</i> , p.2
1	8.0 \pm 2.8c	16.0 \pm 2.8c	79.0 \pm 4.2a	10.0 \pm 0.0a	3.0 \pm 1.4f
2	4.0 \pm 5.7a	43.0 \pm 7.1ab	54.0 \pm 2.8bcd	11.0 \pm 0.0a	8.0 \pm 2.8 ef
3	0.0 \pm 0.0a	23.0 \pm 7.1bc	62.0 \pm 5.7abc	16.0 \pm 2.8a	16.0 \pm 5.7cdef
4	3.0 \pm 1.4a	48.0 \pm 0.0ab	39.0 \pm 9.9d	9.0 \pm 4.2a	12.0 \pm 2.8def
5	5.0 \pm 1.4a	56.0 \pm 5.7a	57.0 \pm 4.2bcd	18.0 \pm 2.8a	22.0 \pm 0.0cde
6	3.0 \pm 1.4a	34.0 \pm 11.3abc	47.0 \pm 4.2bcd	6.0 \pm 2.8a	4.0 \pm 5.7f
7	3.0 \pm 1.4a	47.0 \pm 1.4ab	56.0 \pm 0.0bcd	5.0 \pm 7.1a	10.0 \pm 0.0def
8	5.0 \pm 1.4a	41.0 \pm 1.4ab	50.0 \pm 11.3bcd	6.0 \pm 5.7a	16.0 \pm 0.0cdef
9	3.0 \pm 1.4a	36.0 \pm 2.8abc	51.0 \pm 1.4bcd	6.0 \pm 2.8a	51.0 \pm 7.1ab
10	2.0 \pm 2.8a	46.0 \pm 11.3ab	67.0 \pm 4.2ab	2.0 \pm 2.8a	29.0 \pm 4.2bcd
11	3.0 \pm 1.4a	36.0 \pm 8.5abc	66.0 \pm 0.0ab	3.0 \pm 4.2a	33.0 \pm 7.1abc
12	3.0 \pm 1.4a		44.0 \pm 2.8cd	8.0 \pm 0.0a	10.0 \pm 2.8def
13	1.0 \pm 1.4a			9.0 \pm 7.1a	24.0 \pm 2.8cde
14	7.0 \pm 4.2a			5.0 \pm 4.2a	4.0 \pm 2.8f
15	7.0 \pm 4.2a			7.0 \pm 4.2a	56.0 \pm 5.7a
Mean	3.4	38.3	56.2	7.2	17.5

NOTE: The values in each column followed by the same letter do not differ from each other at the 5% level (Tukey test). The marginal means were obtained from arcsin $\sqrt{\%}$ transformed data.

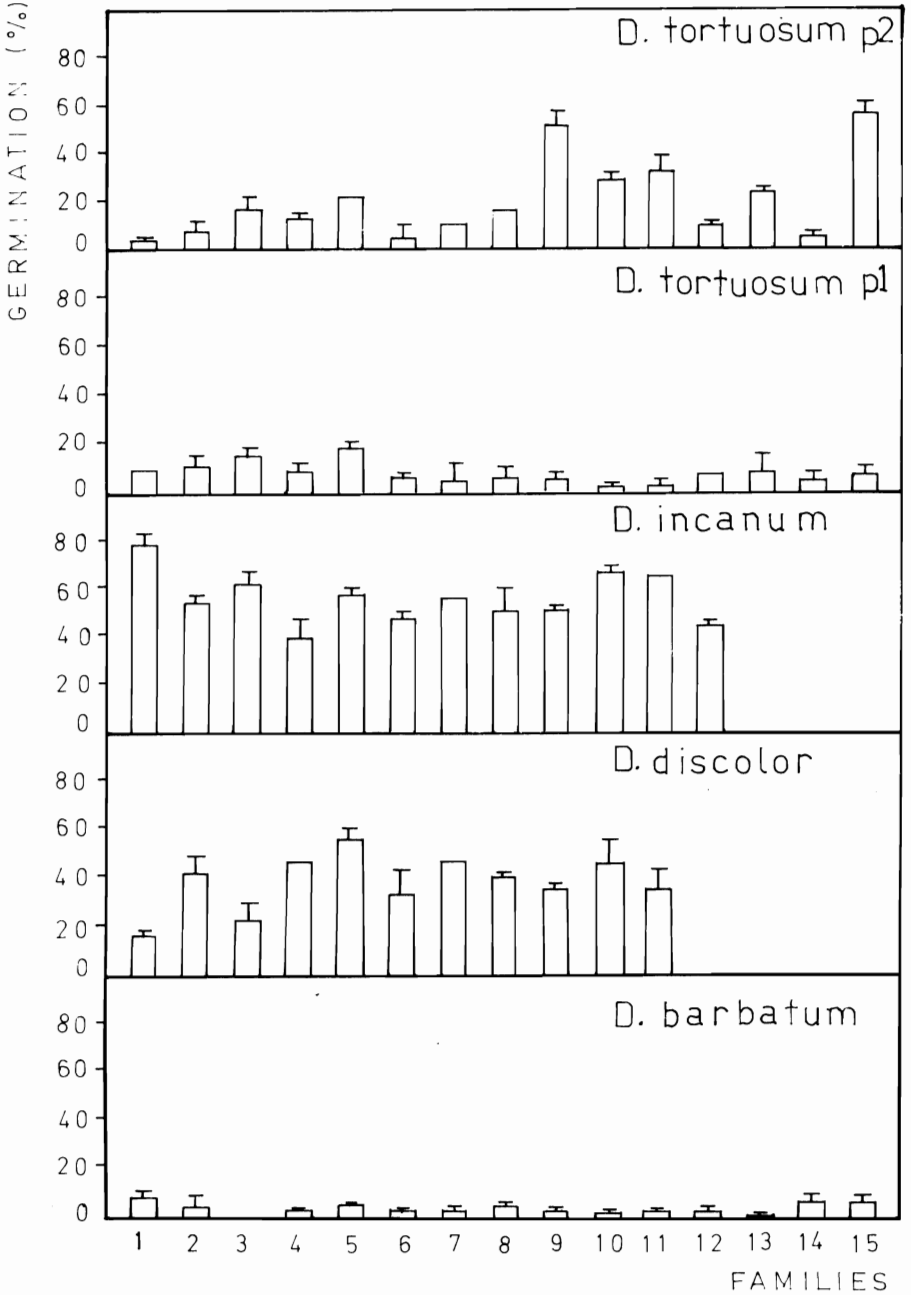


Figure 5 - Germination percentage of families within each of the four *Desmodium* species evaluated.

Table II - Germination trial analyses of arcsin $\sqrt{\%}$ transformed data for the level of dormancy, and its respective coefficients of variation (CV), genotypic determination (b_i), and intraspecific genetic variation (CVg_i) of four *Desmodium* species.

Source of variation	Mean squares				
	<i>D. barbatum</i>	<i>D. discolor</i>	<i>D. incanum</i>	<i>D. tort.</i> , p.1	<i>D. tort.</i> , p.2
Families	22.30	102.55**	88.76**	46.03	283.85**
Error	14.10	15.99	10.10	27.72	13.32
Mean %	10.6	38.2	48.6	15.6	24.7
CV%	35.4	10.5	6.5	33.8	14.8
b_i	0.37	0.84	0.89	0.40	0.95
CVg_i	19.1	17.2	12.9	19.4	47.1

NOTE: ** denotes significance at the 1% level.

The average germination time of each family for each species is shown in Figure 6. Significant differences among families for this character were not observed for any of the species evaluated (Table III). The coefficient of genotypic determination (b_i) was low for all species, being a little higher for *D. tortuosum* (pop. 2). This species also had the highest variation among families for germination percentage (Table II). These results indicate that the germination rate within these species is not easily altered by selection. The relatively high coefficient of intraspecific genetic variation (41.3% for *D. barbatum*) was probably due to the low number of replications, as indicated by the high coefficient of variation (Table III).

DISCUSSION

a) Experiment 1

Temperature regulates germination in nature in three ways: a) by determining the capacity and the rate of germination; b) by removing primary and/or secondary dormancy; and c) by inducing secondary dormancy (Bewley and Black, 1985). The purpose of the trials with nonscarified seeds in the present study was to (1) verify the

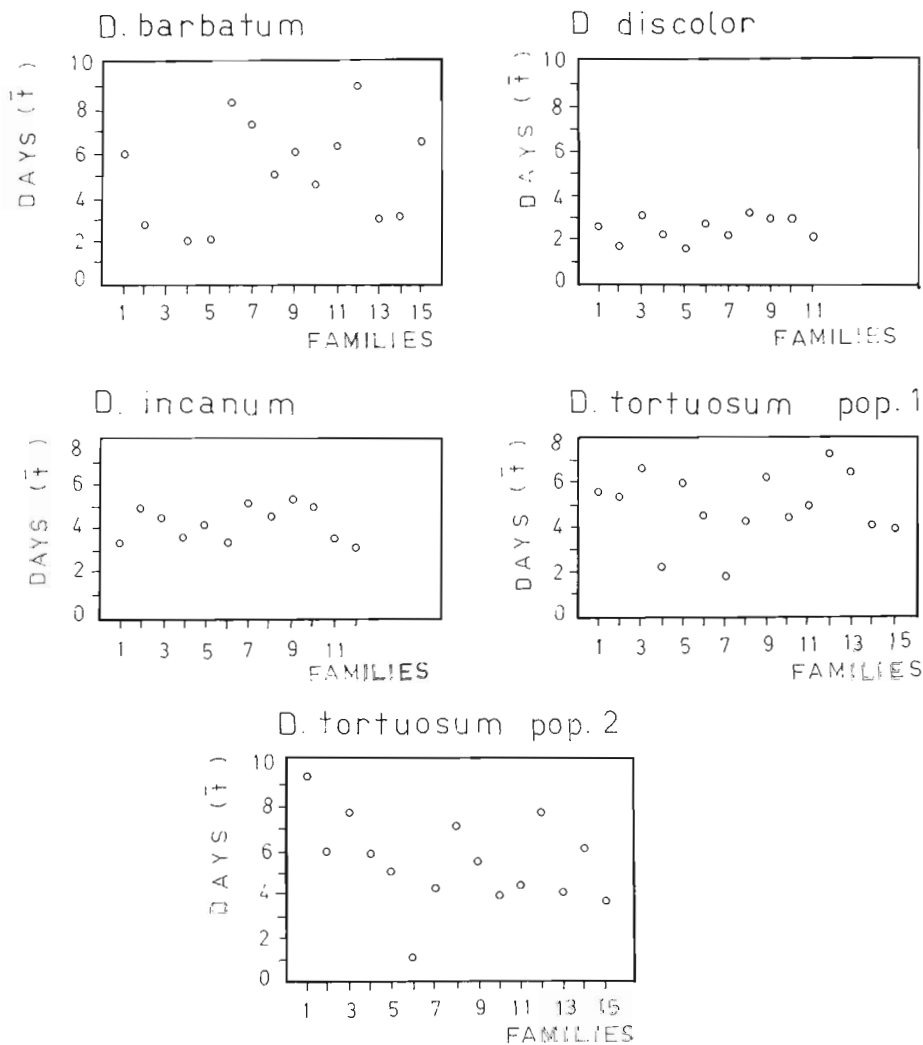


Figure 6 - Average germination time (\bar{T}) of each family of the four *Desmodium* species evaluated.

effect of temperature in breaking dormancy, which is due to a hard seed coat in the four *Desmodium* species, and (2) check the variability among species for seed dormancy. Dormancy breaking rate increased with an increase in temperature, up to a maximum limit at 40°C. Quinlivan (1961) found that the softening of hard seeds of some legume species appears to be a continuous process even at constant low

temperatures, but it is accelerated by high constant temperatures and is further accelerated by fluctuating temperatures. He also observed that maximum softening occurred at temperature fluctuations very similar to those experienced under natural field conditions during the summer months. Mott *et al.* (1981) and McKeon and Mott (1982) also found that the highest dormancy breaking rates occurred when seeds of *Stylosanthes* species were exposed to the highest temperatures on the soil surface, around 60°C. According to Bewley and Black (1985), dormancy favours the distribution of germination in time by the dependency of dormancy breakage on some environmental factor, which itself has a time distribution. So, if the seeds ripen during Autumn or in the beginning of Winter, as is the case with these *Desmodium* species, a higher percentage of dormant seeds probably will only germinate in Spring or Summer, coinciding with the beginning of the rains when temperatures are higher, thus providing a better chance for seedling survival.

Table III - Germination trial analyses for the average times of seed germination, and its respective coefficients of variation (CV), genotypic determination (b_i), and intraspecific genetic variation (CV_{g_i}) of four *Desmodium* species.

Source of variation	Mean squares				
	<i>D. barbatum</i>	<i>D. discolor</i>	<i>D. incanum</i>	<i>D. tort.</i> , p.1	<i>D. tort.</i> , p.2
Families	19.33	0.63	1.21	7.93	8.54
Error	12.18	0.38	0.83	6.93	4.17
Mean	4.6	2.5	4.3	4.5	5.2
CV%	76.2	24.5	21.1	58.2	39.2
b_i	0.37	0.39	0.32	0.12	0.51
CV_{g_i}	41.3	13.9	10.1	15.6	28.4

In relation to the level of dormancy, *D. discolor* and *D. incanum* had the lowest levels and *D. barbatum* the highest. In describing *D. barbatum*, Skerman (1977) reported that 96% of the seeds are hard. The hard seed percentages of populations 1 and 2 of *D. tortuosum* at 40°C were 70.5% and 71%, respectively. These values for *D. tortuosum* were higher than the 50% obtained for this species by Derieux (1971),

and 40% by Ararat and Malaver (1975). At 35°C, the hard seed percentage observed for *D. incanum* was 35.5%. Our experimental data does not agree in some instances with that reported in the literature, due to various environmental as well as genetic factors. The genetic factors are related to variability within species represented by different ecotypes for seed dormancy (Frost and Cavers, 1975; Jain, 1982; Probert *et al.*, 1985). Environmental factors that could affect seed dormancy are time of seed harvest, length of storage, relative humidity, and photoperiod (Baskin and Baskin, 1973). In this study, the seeds were not collected all at the same time, because of the differences in the period of seed production among, as well as within, species and among single plants. Therefore, the level of dormancy observed may have been affected by environmental factors. Germination rate, however, was not correlated with germination percentage. For instance, the maximum germination percentage for the nonscarified seeds was at 40°C, but the germination rate at this temperature was lower. Percentage germination and germination rate probably are independent variables which are influenced by different environmental factors.

The purpose of the trials with scarified seeds was to evaluate the effect of temperature on germination of nondormant seeds. Popinigs (1977) stated that as seeds lose their residual dormancy, the optimum temperature for germination increases, and the seeds become less specific in their temperature requirements. In this study, germination was high at 20°C to 40°C for all species. Seeds subjected to temperatures close to the minimum or maximum for their germination had different responses. At temperatures close to the minimum, a higher percentage of viable ungerminated seeds was recorded, while at the temperature closer to maximum most of the seeds were dead.

The results obtained in the alternating temperature trials do not show that alternating temperatures are more effective than constant temperatures for dormancy break and germination. In this study, 40°C was more effective in breaking dormancy than 25-40°C. The results with alternating temperatures were very similar to those of constant temperatures; i.e., a higher dormancy breaking rate was obtained at the higher temperatures.

Species differences in the temperature requirements for germination are important in determining the distribution of plants, for they obviously limit germination to regions that have suitable temperatures (Bewley and Black, 1985). In the present study, the data suggest the possibility of these *Desmodium* species having a wide geographical distribution, because they germinated well in a wide range of temperatures. Hooper (1978) reported that germination of *D. tortuosum* seeds occurred between 21.5 and 44.0°C, which is similar to the data in the present study. The geographical distribution of all species evaluated in the present study is between 5°N and 35°S in Brazil (Azevedo, 1981).

b) Experiment 2

Several studies have demonstrated the existence of intraspecific variability for seed dormancy, which can be either inter- or intrapopulation. Reis (1984) obtained high variability among species and families of *Stylosanthes* spp. The genotypic determination coefficient values estimated for *S. guianensis* var. *canescens* and *S. humilis* were $b_i = 0.8935$ and $b_i = 0.7171$, respectively, suggesting the possibility of selection of plants with either higher or lower seed dormancy. Vieira (1987) obtained a high interpopulational variability for seed dormancy in *S. angustifolia*.

The results of Jain (1982) provide clear evidence of variation in seed dormancy among different populations of a single species, as well as a genetic component allowing the modification of dormancy levels through natural selection. Jana and Naylor (1980) estimated the heritability of seed dormancy in populations of *Avena fatua*; they obtained values close to 50%. Studies on the inheritance of seed dormancy were also conducted for this species (Jana *et al.*, 1979; Naylor, 1983). Their results showed that the phenotypic differences in dormancy observed in natural populations do not depend on a single physiological mechanism or on alternative allelic forms of a single gene.

The results in the present study indicate the existence of intraspecific variability, with higher coefficients of genotypic determination values ($> 80\%$) for some species. Thus, there is a possibility of selection for either higher or lower degree of dormancy. Different results were obtained for the two *D. tortuosum* populations. One was highly variable, and the other very uniform for seed dormancy. These results may indicate the existence of different adaptive strategies to the different environments in which they occur, or simply may be due to inadequate sampling.

No variation among families was observed for germination rate. This probably indicates that dormancy and germination rate are independent variables influenced by different environmental factors.

Our results provide clear evidence for the existence of intraspecific variability and a high genetic component for seed dormancy in the four *Desmodium* species studied. Thus, natural or artificial selection can act upon this character to either increase or decrease the level of seed dormancy. However, there are still some questions to be clarified. These are related to the inheritance of seed dormancy, to the adaptive meaning of this heterogeneity in nature, either inter- or intrapopulation, and to the importance of this variability to the plant population dynamics and life history strategies of these species. Further studies correlating data obtained under controlled conditions with data from nature would provide interesting results for the comprehension of the dynamics of the populations and the adaptive strategies of these species in tropical and subtropical environments.

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RESUMO

Este estudo teve como objetivo determinar o potencial germinativo das sementes e a variação no grau de dormência tanto entre como dentro de quatro espécies nativas de *Desmodium*, ou seja, *D. barbatum*, *D. discolor*, *D. incanum* e *D. tortuosum* (duas populações). No primeiro ensaio, sementes escarificadas e não escarificadas de cada espécie foram submetidas a temperaturas constantes e alternadas, variando de 15 a 45°C e de 15-30, 20-35, 25-35, e 25-40°C, respectivamente. As espécies *D. discolor* e *D. incanum* apresentaram os menores graus de dormência e a espécie *D. barbatum* o maior grau em todas as temperaturas. As sementes não escarificadas tiveram maior quebra de dormência quando submetidas às temperaturas mais altas, atingindo um máximo à 40°C. As sementes escarificadas de todas as espécies apresentaram altas porcentagens de germinação nas temperaturas de 20 a 40°C. A germinação à 15°C foi baixa, principalmente para *D. barbatum* e *D. incanum*. No segundo ensaio, famílias dentro dessas espécies foram submetidas à 40°C para os testes de germinação. Foram estimados os coeficientes de variação genética intraespecífica e determinação genotípica. Os resultados mostraram diferenças significativas entre famílias de *D. discolor*, *D. incanum*, e *D. tortuosum* (população 2) para dormência de sementes. Essas três espécies também apresentaram um valor alto para o coeficiente de determinação genotípica (> 84%), indicando a possibilidade de seleção para dormência de sementes. A espécie *D. tortuosum* (população 2) apresentou o valor mais alto para o coeficiente de variação genética intraespecífica, indicando que uma alta proporção da variação observada foi genética e não ambiental. Esses resultados indicam a possibilidade de seleção para maior ou menor grau de dormência dentro de espécies de *Desmodium*.

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