

GERMINATION AND DORMANCY IN CEDAR GLADE PLANTS. I. *Aristida longespica* AND *Sporobolus vaginiflorus*

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INTRODUCTION

Aristida longespica Poir. and *Sporobolus vaginiflorus* (Torr.) Wood are summer dominants of grassy areas in cedar glades of Middle Tennessee (Quarterman, 1950). The seeds of these annual grasses germinate in the spring after they have over-wintered in the field. The plants flower in late summer, and mature fruits are shed in late fall and early winter. The present study is an investigation of seed dormancy and germination in these two annual grasses.

GENERAL METHODS

Seeds of *Aristida longespica* and *Sporobolus vaginiflorus* were collected from a cedar glade near Murfreesboro, Tennessee in November 1966. Germination tests were performed in petri dishes containing 2 sheets of Whatman No. 1 filter paper moistened with distilled water. Three replications of 50 seeds each were used for each treatment except as noted. Unless otherwise stated, germination tests were carried out in incubators (Hotpack Corp.) at 30 C for *A. longespica* and at 25 C for *S. vaginiflorus*, temperatures which were near optimal for these species, and at a 12-hour photoperiod. The lemma and palea were left intact on all seeds, and seeds were considered to be germinated when the radicle emerged from these bracts.

EXPERIMENTAL PROCEDURES AND RESULTS

Initial Experiment. An experiment was set up to test for germination in freshly-harvested seeds of *Aristida longespica* and *Sporobolus vaginiflorus*. The experiment involved two series of treatments. In one series, seeds of *A. longespica* and *S. vaginiflorus* were placed at 10, 20, and 30 C at a 12-hour photoperiod. In the second series, seeds of *A. longespica* and *S. vaginiflorus* were wrapped in aluminum foil to insure constant darkness, and placed at 10, 20, and 30 C. After two weeks, no germination had occurred in either species. It was concluded, therefore, that freshly harvested seeds of *A. longespica* and *S. vaginiflorus* were dormant.

Absorption of Water. Duplicate lots of 150 seeds each of *Aristida longespica* and *Sporobolus vaginiflorus* were placed on moist filter paper in petri dishes at 25 C and at a 12-hour photoperiod. Initially, the seeds were allowed to remain in the petri dishes for 5 minutes. They were then removed from the petri dishes, blotted, weighed, and returned to the dishes in the incubator. At the end of 24 hours, the seeds were again removed

from the dishes, blotted, and weighed. The seeds gained slightly over 30% in weight in 24 hours. The seed coats and pericarps of the caryopses were thus shown to be permeable to water, and dormancy was not due to lack of absorption of water.

Chemical Treatments. An experiment was set up to test the effect of certain chemicals on germination. Freshly harvested seeds of *Aristida longespica* and *Sporobolus vaginiflorus* were placed on filter paper moistened with solutions of a 10% potassium salt of gibberellic acid (200 ppm), thiourea (10^{-2} M) and potassium nitrate (0.2%). Seeds of *A. longespica* were placed at 30 C and those of *S. vaginiflorus* at 25 C; both at a 12-hour photoperiod. At the end of one month, no germination had occurred in either species.

Embryo Dormancy. To test for embryo dormancy (Crocker and Barton, 1953), 50 embryos each of *Aristida longespica* and *Sporobolus vaginiflorus* were dissected free of endosperm tissue and placed on filter paper moistened with distilled water. Embryos of *A. longespica* and *S. vaginiflorus* were placed at 30 and 25 C respectively, at a 12-hour photoperiod. After two weeks, 92% of the *A. longespica* embryos and 100% of the *S. vaginiflorus* embryos had germinated. It was concluded that the embryos of neither species were dormant.

Stratification and After-ripening. An experiment was set up to test the effect of stratification and of after-ripening in dry storage on subsequent germination. The experiment involved two series of treatments. In the first series, freshly harvested seeds of *Aristida longespica* and *Sporobolus vaginiflorus* were placed in petri dishes on moist filter paper and allowed to remain at 5 C for various intervals from 3 weeks to 24 weeks (Table I). In the second series, seeds of *A. longespica* and *S. vaginiflorus* were stored dry in the laboratory. After each treatment, *A. longespica* seeds were placed at 30 C and *S. vaginiflorus* seeds at 25 C for two weeks. Six weeks of stratification were quite effective in promoting germination in *A. longespica* seeds. Increasing the length of the cold treatment, up to 14 weeks, resulted in increasing germination. Seeds stored at laboratory temperature failed to germinate. On the other hand, *S. vaginiflorus* seeds germinated well only after 14 weeks of stratification or 16 weeks of dry lab storage. With further increase in length of treatment, both stratified and lab-stored seeds of *S. vaginiflorus* gave higher percentages of germination (Table I).

Temperature Range of Germination. An experiment was carried out to determine the range of temperatures

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at which *Sporobolus vaginiflorus* and *Aristida longespica* germinate. Seeds of both species which had been stratified for 4 months and seeds which had been lab-stored for 4 months were placed at temperatures ranging from 10-40 C at 5° intervals and allowed to remain for two weeks. Cold-treated seeds of *A. longespica* germinated well at temperatures ranging from 25-40 C, with an optimum of 35 C. Lab-stored seeds of *A. longespica* failed to germinate (Table II).

TABLE I

PERCENTAGE GERMINATION IN COLD-MOIST-STORED AND IN LAB-STORED SEEDS OF *Aristida longespica* AND *Sporobolus vaginiflorus*

DURATION OF STORAGE (Wks)	PERCENTAGE GERMINATION			
	<i>Aristida</i> (30 C)		<i>Sporobolus</i> (25 C)	
	Cold	Lab	Cold	Lab
3	0.0	0.0	0.0	0.0
6	52.0	0.0	0.0	0.0
8	70.0	0.0	0.0	0.0
10	80.0	0.0	3.3	13.3
12	87.0	0.0	8.7	26.0
14	91.0	0.0	64.0	37.3
16	90.0	0.0	88.7	64.0
20	—	—	96.7	84.0
24	93.3	0.0	—	95.3

TABLE II

TEMPERATURE RANGE OF GERMINATION IN COLD-MOIST-STORED AND IN LAB-STORED 4-MONTH OLD SEEDS OF *Aristida longespica* AND *Sporobolus vaginiflorus*

TEMPERATURE (C)	PERCENTAGE GERMINATION			
	Cold		Lab	
	Cold	Lab	Cold	Lab
10	0.0	0.0	67.3	0.0
15	1.0	0.0	80.0	0.0
20	1.3	0.0	96.0	17.3
25	74.0	0.0	89.3	64.7
30	87.3	0.0	80.7	22.0
35	97.3	0.0	58.0	10.0
40	75.3	0.0	6.0	0.0

Sporobolus vaginiflorus seeds which had been stratified for 4 months germinated well at all temperatures tested except 40 C. In the lab-stored seeds, some germination occurred at temperatures ranging from 20-35 C; however, at all these temperatures, germination was noticeably higher in the stratified than in the non-stratified seeds. The optimal temperature for germination was 25 C for non-stratified seeds and 20 C for stratified seeds.

SUMMARY AND DISCUSSION

Upon maturity practically all seeds of *Sporobolus vaginiflorus* and *Aristida longespica* were dormant. The embryos were viable and non-dormant and the seeds absorbed water readily. Chemical treatments did not overcome dormancy. Seeds of *A. longespica* germinated well after 6-8 weeks of stratification. However, seeds of *S. vaginiflorus* germinated well only after as much as 14 weeks of stratification or 16 weeks of dry storage.

Seeds of *Aristida longespica* require a minimum temperature of approximately 25 C for good germination; seeds of *Sporobolus vaginiflorus* germinated well at 10 C. The short period of stratification necessary to break the dormancy in seeds of *A. longespica* means that the seeds are probably ready to germinate before spring, but the temperature requirement for germination prevents them from doing so. On the other hand, seeds of *S. vaginiflorus*, which are capable of germinating at the lower temperatures, are prevented from doing so because of the long after-ripening period required to break dormancy. Thus, in both species, germination in nature does not occur until spring, when conditions are favorable for seedling establishment.

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