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SEED GERMINATION ENHANCEMENT FOR *CAREX NEBRASCENSIS* (NEBRASKA SEDGE)

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INTRODUCTION

Little is known concerning the germination requirements of Nebraska Sedge, *Carex nebrascensis* (CANE2). Efforts at the Interagency Riparian/Wetland Plant Development Project, Aberdeen PMC and elsewhere have had low germination success. *Carex* seeds are known to require relatively high temperatures for germination (Grime et al 1981). Light is also essential for germination (Baskin and Baskin 1988, Hurd and Shaw 1991, etc.). Shaw and Hurd (1992) found that CANE2 responds positively to stratification. Removal of the perigynia has shown mixed results in the literature. Dyrness (1960's) had higher germination rates when perigynia were removed. Shaw and Hurd (1992) did not remove perigynia. Other investigators found no significant differences in germination rates as related to perigynia removal. This discrepancy may be due to inherent genetic differences between populations. The purpose of this study is to test the effects of perigynia removal and various stratification media on the rates of germination.

METHODS

Three populations of *Carex nebrascensis* were used for both the stratified and non-stratified portions of the study. Seeds were collected from Trout Creek, near Jackpot, NV; Sterling Wildlife Management Area (WMA), near Aberdeen, ID; and Malheur National Wildlife Refuge (NWR), near Burns, OR. Three treatments were used for this non-stratified portion of the study; population, perigynia removal, and scarification. In all, 12 treatment combinations were evaluated. Each of the populations were evaluated for the following: 1) perigynia intact, not scarified; 2) perigynia intact, scarified; 3) perigynia removed, not scarified. Perigynia were removed by soaking the seeds for 15 minutes in deionized water to soften the perigynia and then removing it with forceps. To scarify the seeds (which would also remove the perigynia) a small topless box was constructed. The scarification box measured 4" X 6" and 1" deep out of scrap pine lumber. The bottom of the box was lined with 100 grit sand paper, and cut a small piece of wood which would fit in box and wrapped it with 100 grit sand paper. To begin the perigynia removal process, 60 to 100 seeds were put in the bottom of the box. The block was then drawn lightly back and forth over the seeds for about 10 to 15 seconds. 60 seeds for each of the treatment combinations were placed on a germination blotter in petri dishes and kept moist with deionized water. Each of the treatment combinations consisted of four replications of 60 seeds. All of the petri dishes were then placed on a Pro-Grow Propagation mat. Temperatures were set at 78°F for a nighttime low and 98°F for a daily high. Seeds were illuminated for 24 hours a day

using a 100 watt fluorescent light placed 60 cm above the petri dishes. Seeds were monitored daily for 30 days. As seeds germinated, they were counted and removed from the petri dish.

For the stratified portion of the study, the same three populations of CANE2 were used. Three treatments were used for this portion of the study; population, perigynia removal and subsequent scarification, and stratification medium. A total of 18 treatment combinations were analyzed in this portion of the study. To scarify the seeds, the scarification box was used in the same manner as for the non-stratified portion. The perigynia was removed as the seeds were scarified.

The stratification process involved placing the seeds in a 8 oz. covered cup and filling it with deionized water. One cup contained 8 g of sphagnum moss wrapped in cheese cloth and deionized water. The second cup contained 8 g activated charcoal wrapped in cheese cloth and deionized water, the third cup was deionized water only. Cups were then placed in a cooler for 32 days at 37°F. A total of 50 seeds for each of the treatment combinations were placed on a germination blotter in petri dishes and kept moist with deionized water. The combinations were replicated five times. All of the petri dishes were then maintained under the same germination conditions as the non-stratified portion of the study.

RESULTS

All petri dishes for both the stratified and non-stratified seeds were monitored for 30 days after being placed in the petri dishes. The general trend of the results indicated that the germination rate increased when the perigynia was removed from the seed. The germination rate also increased when the seeds were scarified.

Table 1: *Effects of perigynia removal and scarification on germination rates of 3 populations of Carex nebrascensis. The seeds were not stratified.*

	Perigynia Not Removed		**Perigynia Removed**	
	Not Scarified	Scarified	Not Scarified	Scarified
Trout Cr.	37.5%	50.0%	50.4%	45.0%
Sterling WMA	24.2%	NA	62.5%	57.9%
Malheur NWR	19.2%	35.4%	NA	NA

Table 2: *Effects of scarification and stratification on germination rate of Carex nebrascensis. Numbers in parenthesis represent the number of days until that treatment reached 50% or greater germination.*

	Not Scarified		
Population	Deionized Water	Sphagnum	Activated Charcoal
Trout Cr.	51.6% (20)	58.4% (13)	47.6%
Sterling WMA	66.0% (15)	60.0% (15)	54.8% (17)
Malheur NWR	32.0%	44.0%	44.4%

		Scarified	
Population	Deionized Water	Sphagnum	Activated Charcoal
Trout Cr.	67.2% (7)	73.2% (7)	64.8% (8)
Sterling WMA	61.6% (12)	77.6% (9)	71.2% (12)
Malheur NWR	44.0%	49.6%	48.4%

The germination rate tended to increase when the seeds were scarified. The germination rate also increased when the seeds were stratified with sphagnum moss. When activated charcoal was used instead of sphagnum moss, the germination rate increased, but not as much as when the sphagnum was used.

There were major differences with the different populations in terms of germination rate. The Malheur Selection showed the lowest germination rate overall. This could be because the collection area had been drained in preparation for haying about one month before the collection was made. The other two populations were not drained.

CONCLUSIONS

In the non-stratified portion of the study it was determined that removing the perigynia significantly improved germination. The removal method did not matter however. While there were differences in germination rates between populations, perigynia removal and a 30 day stratification with sphagnum moss produced significantly higher germination rates. This was reflected in the fact that germination began consistently in less than one week when the seeds were stratified after the perigynia was removed. Where as, the seeds with the perigynia intact and no stratification often took over two weeks to begin to germinate.

There is no specific reason that the authors are aware of as to why the perigynia would inhibit germination of the achene. There could be everything from a chemical inhibition to a different reproductive strategy. It was not the purpose of this study to determine the reason why.

For a production nursery with limited greenhouse space, this method (30 day stratification with sphagnum moss and scarified seeds) can greatly reduce the amount of time between planting and resale. This shorter amount of time in the greenhouse will also allow the grower to produce multiple crops during the year.

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