Seed Germination of Fox Sedge and Broadleaf Arrowhead

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Introduction

Restoration of wetland and riparian areas requires propagation of many native species. Some species are propagated vegetatively, but propagation from seed would reduce costs and add flexibility to planting schedules. We developed viability and seed germination testing protocols for fox sedge (*Carex vulpinoidea*, Family Cyperaceae) and broadleaf arrowhead (*Sagittaria latifolia*, Family Alismataceae), two common North American species.

Fox Sedge

Fox sedge grows in standing water and marshes in lowlands and foothills of Canada and the United States. Culms are stiff, triangular, 2 to 10 dm tall. Leaves originate along the lower half of the culms and exceed them in height. Inflorescences are cylindrical with numerous achenes, each enveloped in a saclike perigynium. Embryos are rudimentary and imbedded in endosperm.

Achenes are harvested by hand stripping or clipping inflorescences in late summer or early fall. Dried fruits are cleaned by hand rubbing; debris and empty fruits are removed using sieves and a seed blower. Perigynia are not removed by this process. There are about 2.8 million achenes kg^{-1} (Hurd and Shaw 1992).

To estimate viability by tetrazolium chloride (TZ) testing, achenes are imbibed with the perigynia intact, sliced crosswise through the center, and the basal halves placed in a 1% TZ solution for 6 to 14 hours at 20°C. The basal halves are then sliced lengthwise and the embryos evaluated in place (Hurd and Shaw 1992).

Cleaned fox sedge achenes from Nampa (1990, 1991, and 1992 collections) and New Plymouth, ID (1991 and 1992 collections) stored dry at room temperature averaged 99% fill and 97% viability in December 1992. Germination was tested using five replications of 100 achenes per treatment. Differences in germination among treatments were detected by analyses of variance and means were separated using Fisher's

protected least significant difference at P≤ 0.05. Germination of untreated achenes was 5% when incubated at 25/15°C (8 hrs/16 hrs) with exposure to light at the high temperature and 90% or more with 2, 4, 6, or 8 weeks of wet prechilling at 3°C. Average days to 50% germination declined from 22 for untreated achenes to 12 for achenes prechilled for 2, 4, 6, or 8 weeks. Thus achenes of fox sedge can be stored dry for at least 2.5 years. Afterripening does not occur, but good germination of 0.5 to 2.5-year old achenes is obtained with a 2- to 8-week prechill.

Broadleaf Arrowhead

Broadleaf arrowhead, an emergent aquatic perennial, grows in swamps and mudflats from southern Canada to central America. Plants are rhizomatous, tuberous, and up to 1.5 m tall. Submerged leaves are ribbonlike; emergent leaves are sagittate. Terminal inflorescences produce white flowers with numerous pistils. Achenes are borne in dense heads. Seeds have well-developed embryos and a thin endosperm (Collon and Velasquez 1989).

Fruits are harvested by hand stripping the inflorescences in fall. Many fruits remain on the plant well into winter (Karl 1978). Dried material is cleaned as described for fox sedge. There are about 2.5 million achenes kg^{-1}.

For viability testing, achenes are rubbed lightly by hand or on a rubbing board to remove the pericarps. Seeds are imbibed, slit at the cotyledon end, and soaked for 12 hours at 20°C in 1% TZ. They are then cleared with a 3 to 6 hour soak in 85% lactic acid. Embryos are read in place.

Fresh broadleaf arrowhead achenes harvested in October 1995 near St. Maries, ID were prechilled at 3°C on wet blotters or submerged in water beneath blotters. At 30-day intervals through 150 days, samples of prechilled achenes on and beneath blotters were transferred to a 21-day incubation at 25/15°C (8 hrs/16 hrs) with exposure to light at the high temperature. Additional fresh achenes were dried, stored at room temperature, and, at 30-day intervals through 150 days, samples were placed on wet blotters or submerged beneath blotters and transferred to incubation. There were four replications of 25 achenes per treatment. Data were analyzed as described for fox sedge. Germination of prechilled and dry achenes incubated on wet blotters was less than 10%. Germination was improved to 55% by storing achenes dry for 90 to 120 days and incubating them submerged beneath blotters and to more than 80% by prechilling achenes submerged beneath blotters for 30 to 150 days.

Literature Cited

Collon, G.E., and J. Velasquez. 1989. Dispersion, germination and growth of seedlings of *Sagittaria lancifolia* L. Folia Geobotanica et Phytotaxonomica 24:37-39.

Hurd, E.G., and N.L. Shaw. 1992. Seed technology of *Carex* and *Juncus* species of the Intermountain region, pp. 74-83. T. Landis, tech. coord. USDA-FS, Rocky Mountain Research Station, Fort Collins, CO.

Kaul, R.B. 1978. Morphology of germination and establishment of aquatic seedlings in Alismataceae and Hydrocharitaceae. Aquatic Botany 5:139-147.