

Variation of achene morphology in species of *Rhynchospora* (Cyperaceae) as an indicator of perennial or annual type



Brittany Dunegan*, Dale Kruse**

*Eastfield College, DCCCD, Mesquite, Tx, National Science Foundation, **Texas A&M University, College Station, Tx

Abstract

Sedges were collected in four units of the Big Thicket National Preserve—Lance Rosier, Cannon Creek, Beach Creek and Jack Gore Baygall. The purpose of this study was to aid in determining germination type—perennial or annual—through the achene morphology of several species of sedges *Rhynchospora plumosa*, *R. globularis*, *R. gracilentia*, and *R. mixta*. The areas of the achene being compared were the tubrical, bristles, body and ovary wall using the Hitachi TM-1000 scanning electron microscope. It was determined that the achenes of perennials were on average larger in size than the achenes of annuals for ensured dispersal via attachment to mammal fur. The thinner ovary wall of the perennials makes the achene more susceptible to imbibitions and accelerates germination.

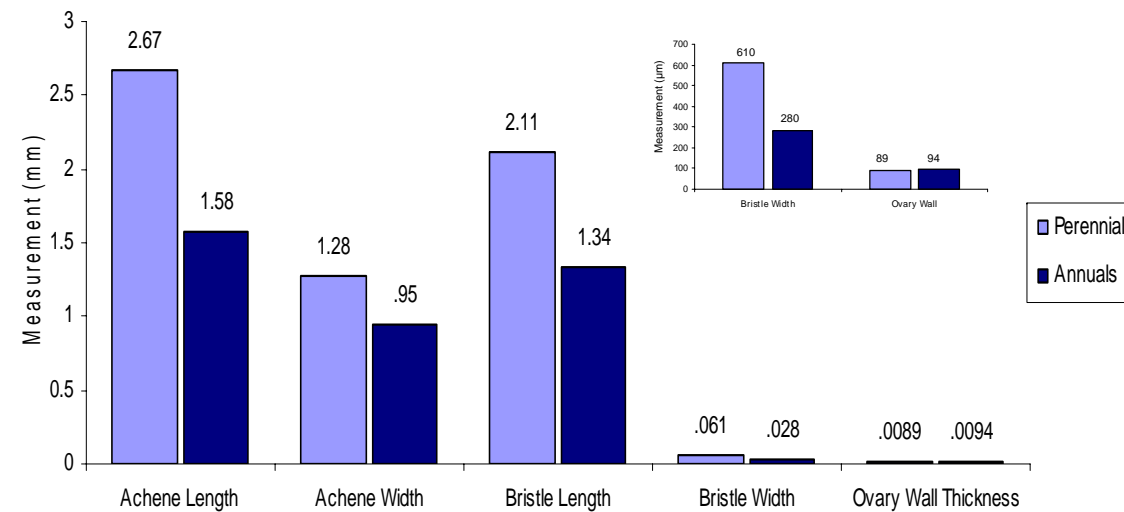
Introduction

Sedge is a common name for members of the family Cyperaceae, grass-like herbs found in all parts of the world. *Rhynchospora* is a genus in the family Cyperaceae, and was used in this study.

The achene of a sedge is a one-seeded indehiscent fruit, a fruit that will not open on its own to release its seeds. In *Rhynchospora*, the achene is equipped with bristles used to cling to animal fur for seed dispersal.

Achenes are found at the tips of the spikelet and are divided into three regions: the top region is the tubrical, the mid region is the ovary (body) containing the endosperm, and the bottom region connecting to the sedge are projections called perianth bristles (Fig 1,2).

Fig 5: Average Measurements of Perennials and Annuals



Methods

Specimens were harvested in early June of 2008 in four units of the Big Thicket National Preserve—Lance Rosier, Cannon Creek, Beach Creek and Jack Gore Baygall.

The sedges were collected in their entirety, numbered and placed in a plant press for one week. They were identified at the S. M. Tracy Herbarium, Texas A&M University by their curator, Dale Kruse.

For Scanning Electron Microscope (SEM) examination, the entire achene, a cut section of the achene ovule and endosperm were fixed on a carbon sticky and viewed using the Hitachi TM-1000 SEM on charge reduction mode.

There were two perennials, *R. plumosa* and *R. gracilentia*, and two annuals, *R. mixta* and *R. globularis*, known prior to conducting the study.

Results

The achenes of the perennials were larger than those of the annuals:

	<i>plumosa</i>	<i>gracilentia</i>	<i>globularis</i>	<i>mixta</i>
Germination type	Perennial	Perennial	Annual	Annual
Achene body length	1.75mm	3.58mm	1.42mm	1.74mm
Achene Body Width	1.19mm	1.37mm	1.04mm	0.86mm
Perianth Bristle length	1.52mm	2.70mm	0.531mm	2.15mm
Perianth Bristle width	49.1µm	72.9µm	26.5µm	31.0 µm
Ovary wall thickness	77 µm	101µm	72 µm	116 µm

The perennials had more elaborate bristle structures than the annuals. Perennial *R. plumosa* (Fig 3) had the most elaborate bristles. Annual *R. globularis* had subtle bristles (Fig 4).

In every measurement the perennials were on average larger than the annuals, except in ovary wall thickness (Fig 5). The annuals had a slightly thicker ovary than the perennials.

Discussion

A perennial is a plant that lives for more than two years. An annual is a plant that germinates and dies in one year.

The results showed a strong trend (Fig 5); the perennials' achenes are consistently larger than those of the annuals. The achenes of the perennials also have more elaborate bristles to ensure portability and dispersal by means of animal fur.

The ovaries of the annuals were thicker than those of the perennials. The thinner ovary wall makes the achene more susceptible to imbibitions and accelerates germination.

Because annuals spend most of the year as seeds, to survive dry conditions it would appear that the annual achenes would need a thicker ovary wall in order to survive the extremes and make it to germination.

Acknowledgments

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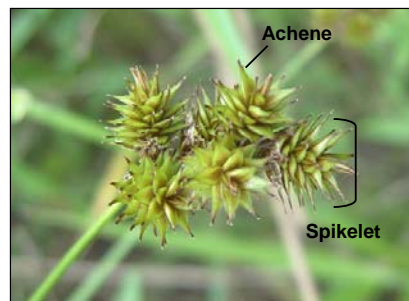


Fig 1 Achene in spikelet

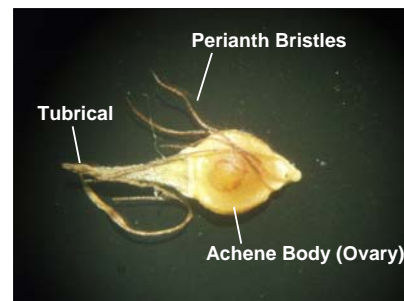


Fig 2 *R. gracilentia* achene

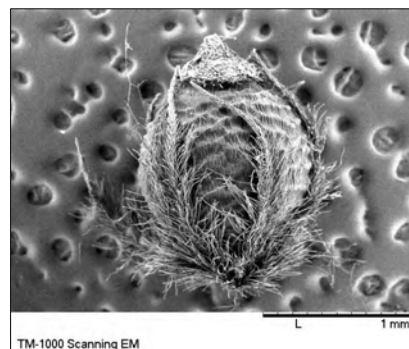


Fig 3 *R. plumosa* achene

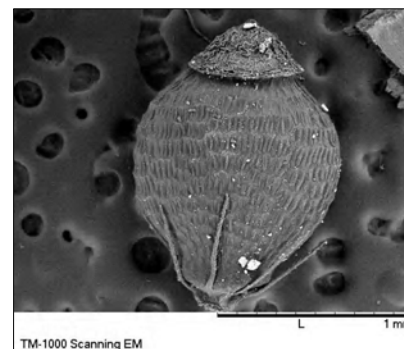


Fig 4 *R. globularis* achene