U of M Update

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During February and March at the Earle Brown Center, the Minnesota Department of Agriculture (MDA) in conjunction with the University of Minnesota, completed another round of four pesticide applicator training days for commercial and non-commercial turf and ornamental applicators. While there were a few superintendents present, the majority of you will receive 1995 certification next December at the annual conference.

This year's PAT planning committee was very pleased with the response to the activities which stressed concurrent and break-out sessions throughout the day. In the morning the group was divided for the MDA presentation, and other major speakers. After the morning break, speakers switched rooms and repeated their presentation to complete the cycle. Smaller audiences improved both attentiveness and participation.

During the workshop portion of the day attendees could choose one of four workshops the first hour, and then a second workshop, since the same four workshops were repeated during the second hour. By doing this everyone got two of the four. All attendees then assembled in the same room for the keynote speaker.

Based on attendees' comments from the previous year, I was asked to develop a workshop on lawn and weed grass identification. My first thought was that the topic would be too basic for this group, all of whom were already directly involved in turf management. It was interesting to note, however, that out of eight workshops and 480 applicators that chose that workshop, only a few indicated they felt confident in their identification abilities. It was a *good reminder* that all of us can use a review of the basic nuts and bolts information.

One of the handouts for the day was an abbreviated identification key (partially adapted with the permission of Scotts) from the Proturf Guide to the Identification of Grasses. I am enclosing it as one of those *good reminders* for you to use and share with the crew.

Short Cuts to Grass Identification

I. Leaves folded in the bud
  A. Ligule membranous
    1. Ligule prominent or large
      a. Orchardgrass
        Sheaths very flattened, blades over ¼" and long, lax, ligule very tall.
      b. Annual bluegrass
        Apple-green color, medium ligule, forming patches and whitish seedheads in low-cut turf.
      c. Roughstalk bluegrass
        A light yellow-green plant, ligule pointed, blades sticky and tapering to a "boat-shaped" tip, sheaths rough, spreading by stolons.
    2. Ligule not prominent
      a. Goosegrass
        Ligule with jagged edges, divided in the center, long hairs at the collar edges.
      b. Kentucky bluegrass
        A dark green plant, spreading by rhizomes, forming good turf, blades with parallel sides and a "boat-shaped" tip.
      c. Fine fescue
        Sheath wider than the blade, blade less than ⅛" wide, short ligule, creeping by short rhizomes or bunch type, forming a fine-bladed turf.
      d. Perennial ryegrass
        Shiny, tough, dark green blades with pointed tips, used as a durable turf.
  B. Ligule hairy
    1. Sandbur
      Sheaths flattened, yellow-green color, forming patches with sharp burrs.
  C. Ligule absent
    1. Barnyardgrass
      Sheaths flattened, broad, purplish, growing prostrate in turf, seedhead rather coarse.

II. Leaves rolled in the bud
  A. Membranous ligule
    1. Large (Hairy) crabgrass
      Ligule tall, rounded, jagged edges, long hairs at the collar edges and near the ligule, bunch type grass.
    2. Timothy
      Ligule medium tall, toothed at the corners and center, base of the plant swollen, bulb-like, bunch type grass.
    3. Annual ryegrass
      Fast growing, yellow-green plant often used as a temporary turf or nurse crop, slender, clasping, claw-like auricies, bunch type grass.
    4. Creeping bentgrass
      Rooting at the lower nodes and creeping in the lawn by long stolons to form a dense turf. Used for putting greens.
    5. Quackgrass
      Slender, claw-like auricles clasping the stems. ¼" blue-green blades, creeping by strong, thick rhizomes.
    6. Reed canarygrass
      Ligule rounded, very large, jagged across the top, blades flat, ½" wide, tapered, spreads by vigorous rhizomes.

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7. Smooth bromegrass
   Blades with a constricted "M" or "W", ligule short, creeping by strong rhizomes used for erosion control, annual.
8. Smooth crabgrass
   Tall rounded ligule with long hairs at the collar edges. Plant reddish-purple at seeding time, especially at the base, prostrate. Seedhead finger-like, bunch type annual grass.
9. Tall fescue
   Short ligule, blades broad, prominently veined, leaves rough on the edges, used as a durable turf in transition zones, bunch type grass.

B. Hairy ligule

1. Green foxtail
   A bright green erect plant, blades flat, tapered, seedhead a nodding brush-like spike, bunch type annual grass.
2. Witchgrass
   A coarse plant covered with hairs, leaves broad, sheaths reddish-purple at the base, bunch type annual grass.
3. Yellow foxtail
   Sheaths tinged with red, leaves spiraling upward, seedhead an erect, coarse brush-like spike, long hairs near ligule, bunch type annual grass.

Partially adapted from: Proturf Guide to the Identification of Grasses

One of my responsibilities as turf specialist is to serve as a liaison between the University and the turf and grounds industry. One way to meet this responsibility is to better communicate to you what is happening at the University and how that information may be of benefit to you. Therefore, as often as possible the *U of M Update* will contain an article or report from one of the faculty, staff or students at the University regarding their turf and grounds work. This month's article is by Paul G. Johnson and Dr. Donald White. Paul is a Ph.D. candidate in the Department of Horticultural Science. His research interests are in turfgrass management, with emphasis in breeding and genetics as well as turfgrass ecology. Paul has a B.S. from Iowa State University in Horticulture and a M.S. from the U of MN in Horticulture. Paul is a 1994 GCSAA - J.R. Watson Fellow. Dr. White is a professor in the Department of Horticultural Science.

Flowering Habits in *Poa annua L.* Selections

Introduction

Most of you know that the University has been conducting a *Poa annua* collection, selection and breeding program for a number of years. The project has been supported by the University, USGA and O. J. Noer Foundation. The philosophy of approach has always been: "When life serves you lemons - make lemonade." In other words we have been trying to make lemonade by working to combine the good characteristics and develop desirable golf turf types. One objective is to develop a variety that flowers and seeds for only a short time and does not affect putting quality. Our primary goal is to produce perennial varieties that will require fewer inputs while providing a better playing surface than the wild type *Poa annua*.

This article describes a portion of an inheritance study of flowering habits in *Poa annua*. The knowledge of how flowering characteristics are inherited is important to efficient breeding and may be useful in management of *Poa annua* turfs. I will first try to classify the flowering patterns in the species, describe the fairly simple inheritance of the characteristics, and finally discuss some implications of this work.

But first, we need to deal with nomenclature. The name "*Poa annua*" is a misnomer. It really only describes a portion of the population on your golf courses. We need a new name because we are dealing strictly with **perennial** types in this project. On that basis we will use the name *Poa reptans* for perennial types. (*reptans* is from the Latin "repto", meaning "creeping".)

Description of the Flowering Types

As most golf turf managers know, *Poa annua* has a repu-

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tation of flowering all season long, even under very short mowing heights. However many perennial types of *Poa annua* flower only in the spring. It's these that we favor in our breeding program. There are at least three flowering types of *Poa annua*: 1) a true annual type bunch grass which flowers prolifically; 2) a perennial type with season long flowering, and 3) a perennial type that flowers only in spring. Table 1 summarizes the flowering habit and other characteristics. Most of the *Poa annua* on Minnesota golf courses are of the latter two types.

Table 1. Summary of *Poa annua* and *P. reptans* flowering types

Type	Botanical variety†	Flowering pattern	Growth habit
Annual	*annua*	Continual: flowers at a young age and continues until death of the plant.	erect, bunch type
Perennial	*reptans*	Continual: flowers season long with a flush in the spring.	prostrate, stoloniferous
Perennial	*reptans*	Seasonal: flowers only in the spring of the year	prostrate, stoloniferous

†Botanical variety is a classification within a species.

Poa annua has been the subject of interesting ecological research projects around the world (mostly in Australia, Great Britain and California). They have shown how annual and perennial forms may associate with particular golf course situations. The annual plants (*annua*) are adapted to harsh, unpredictable and frequently disturbed environments. Since seed is a reliable way of avoiding environmental stresses, flowering and producing seed is an important characteristic. Perennial types (*reptans*) reproduce by stolons, and have fewer flowers. The perennial forms dominate in less disturbed locations and are very competitive in areas with compacted soil and considerable foot traffic. Therefore, golf course greens and fairways are nearly ideal for competitive growth of *Poa reptans*. Our research on flowering habits fits into this ecological work.

Inheritance of the Flowering Habit

A primary goal in studying the diverse flowering habits of *Poa annua* is to determine if the different habits are controlled by genetics rather than environmental conditions. If the traits are genetic, we ask how might flowering habit be inherited so the selection of desirable types is more effective? It was clear fairly quickly that the flowering types are indeed inherited. The inheritance between the three, and maybe four, perennial types in our research seems to involve one gene, with the continual flowering type being dominant to seasonal flowering. This means that flowering pattern is a "yes or no" trait.

Now for some genetics. Each plants carries two copies or **alleles** of each gene; one from each parent. Continual flowering is **dominant** and can be represented by "F". Seasonal flowering is **recessive** and is shown by "f". "F" is **completely dominant** to "f". Since each plant carries two copies of the genes, there are three possible combinations: "FF", "Ff", and "ff". The complete dominance of continual flowering means that if one of the two alleles is "F", the plant will be continually flowering. Therefore "FF" and "Ff" are continual flowering plants, but "ff" individual is a seasonal flowering plant. If two seasonal flowering plants are **crossed** or genetically combined, only seasonal type plants result ("ff" crossed with "ff" can only give "ff" offspring). In general, the flowering habit may not be as simple as explained here, but additional research indicates that the habit involves relatively few genes. Environment also has some modifying effects on inheritance patterns.

What Does This Mean?

"Why not throw away types that flower all season long and only keep those that flower like we want?" In the breeding work it is desirable to cross or combine traits from the various *Poa annua* plants. Even though some plants may flower undesirably, they may have other good characteristics like disease resistance, better seed production, prostrate growth habit, etc. Understanding how the flowering is inherited makes it easier to cross plants and select out the undesirable flowering type, yet keep the desirable traits.

Implications

After studying the genetics of flowering habit, some might ask, "Might a continual flowering type contaminate a seasonal flowering variety?" This is a good question and one we have asked many times. *Poa annua* plants are typically **self-pollinated**, which tends to maintain true-breeding types. The environment on a golf green favors this self pollination even more because identical (or at least similar) plants grow closely together and flowers cannot grow very tall to spread pollen a great distance. Field trials with some selected *Poa annua* selections have shown little if any contamination of plots. In addition, perennial type plants are very competitive and prevent other *Poa annua* plants from gaining a foothold in a colony. Future research may improve the true breeding behavior, as added insurance.

Some *Poa annua* selections are currently in the seed increase stage, and newer types are nearing a point where they may be evaluated for release also. The flowering inheritance information reported here has assisted in the development of these next generation varieties.

Another part of my research involves the physiology of *Poa annua* flowering types. **Flowering requirements**, or the environmental triggers causing a plant to flower, may be important differences between the flowering types. A discussion of this research will be the topic of a future article here in *Hole Notes*.

As I have studied *Poa annua* in my graduate work, I have developed a great respect for the plant and its ability to grow almost anywhere. I also see much potential for improvement as a turf species. Even Linneaus, the father of modern botany and plant classification back in the 18th century, had a great respect for the plant and wrote that ". . .this grass makes the finest of turfs."