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TURFGRASS TRENDS

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WEED CONTROL

Weeds
Shedding Light on an Old Foe

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Weeds are opportunistic plant species that possess the ability to colonize open or thinned areas of turf quickly. Human activities and disturbances are the major means for introducing weeds. It should be no secret then, that the great majority of the 2,000 plant species considered weeds are not native to the United States.

Weeds are often grouped into broad groups according to life cycle (winter or summer annual, biennial or perennial), and morphological characteristics (monocot, dicot). Recognizing other ways of grouping weeds can help turfgrass managers devise effective management control programs.

Classification based on Carbon Fixation

Classification of weeds can also be based on their photosynthetic pathway. All plants carry on photosynthesis, the process whereby a plant captures radiant energy (light) from the sun and converts it into a usable form.

Photosynthesis is comprised of two main steps. The first is the light-dependent reaction where radiant energy is converted into biologically useful energy called ATP (adenosine triphosphate). The second, or dark (light independent), step is the storage of this energy into the chemical bonds of sugars and carbohydrates. Central to the light-independent reaction is the fixation of carbon dioxide (CO_2) known as the Calvin cycle. The cycle is a series of reactions where CO_2 is fixed. The initial step is the attachment of CO_2 to a 5-carbon compound, ribulose bisphosphate (RuBP) that quickly divides into two 3-carbon compounds. The term C3 cycle comes from the catalyzation of the 3-carbon compounds. Cool-season turfgrasses are often referred to as C3 plants.

Some plants however fix CO_2 differently. In many tropical plants, CO_2 is initially fixed to phosphoenolpyruvate (PEP) prior to entering the Calvin cycle. This additional reaction step is known as the C4 Dicarboxlic Acid Pathway. Most C4 plants are warm-season grasses. Generally speaking, C4 plants capture CO_2 more efficiently under increasing light and temperature conditions. Conversely, C3 plants capture CO_2 more efficiently under more moderate light and temperature conditions.

In 1969, Black proposed that plant-weed competition could be based on photosynthetic efficiency. Based on the efficiency of capturing CO_2, the competitive outcome between a C3 and a C4 plant is predictable. Under increasing temperature and light intensity, the more efficient capture of CO_2 (C4) would provide a competitive advantage over

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