Tragopogon porrifolius
Salsify, Oyster plant
Asteraceae

The vast majority of information available relevant to this species is that published concerning the congeners *T. pratensis* and, to a lesser extent, *T. dubius*. Unless otherwise noted, the information in this summary pertains to *T. pratensis*. This species is similar to *T. porrifolius* in general form, reproduction, and habit, so the information collected for *T. pratensis* should be useful in the assessment and control of *T. porrifolius*. One exception to the general lack of information on the biology of *T. porrifolius* is that some valuable insight concerning control of this species is available. An assessment of the effectiveness of four different herbicides applied to this species in the northwest indicates that 2,4-D is fairly effective, receiving a rating of "good," which means that one treatment per year maintains 85-94% suppression of top growth or more than 95% of the population is killed by two or three applications. Three other herbicides, dicama I, picloram, and glycophosphate all received ratings of "I", indicating that insufficent data exists to assess their effectiveness agains *T. porrifolius*. In the same report, 2,4-D received a "good" rating against *T. pratensis*, while dicamba I and picloram I received ratings of "excellent" indicating that over 95% of the population can be killed by a single treatment. Glycophosphate effectiveness against *T. pratensis* could not be evaluated due to lack of data.

T. pratensis (goat's beard) is a biennial that is rapidly infesting Canadian rangelands. As is the case with *T. porrifolius*, the factors controlling the abundance of this species are poorly understood. Life history characteristics such as the amount and timing of seed production, critical rosette diameter, root crown diameter and seed dormancy may all play an important role in the persistance of populations of this species. Recent studies on these attributes of *T. pratensis* indicate that it reproduces sexually and produces many seeds per plant (up to 300). There are two apparent germination peaks, one in the fall 2-3 months after burial, and a second in the spring. Seed germination was found to decrease with increasing burial depth, and 75% of naturally distributed seeds were found to be innately dormant (a study by Grime et al. 1981 found a 90% germination rate however). *T. dubius*, on the other hand show no innate dormancy. In 1989, after 2 months of ripening, 65 % of seeds placed on the surface germinated, while only 9% of the seeds placed at 2 cm and 1% at 5 cm germinated. In 1990 these values were 39% at the surface, 24% at 2 cm, and 7% at 5 cm. The authors speculate that the high rate of germination at the surface is due to environmental fluctuations; large temperature fluctuations and wetting-drying cycles can stimulate germination by releasing seed dormancy. The result of this could be to distribute seed germination over time, facilitating the persistance of populations of this species. Light was apparently not important in stimulating germination in this population, which is different from results reported by Cresswell and Grime (1981). The seed bank was found to be short lived, with more than 60% of the seed population depleted due to germination on the soil surface in late fall of 1989; it was also nearly depleted in 1990. In both years fewer than 3% of all seed remained after 1 year of

burial. The impact of these remaining seeds on long term persistence of the population remains to be explored.

Seedling mortality was found to be 50% by the end of the first growing season and 85% at the end of the first year. Approximately 12% of the established seedlings survived to the second winter. During the first year of the study, a peak of seedling mortality occurred during a period of pronounced high temperatures and low precipitation, but the same conditions did not induce mortality during the second year. Winter mortality was higher than that during other periods of the year, particularly when temperatures fell below 0°C. Seedling mortality was found to be density independent. The authors conclude that destruction of seedlings in the spring, which will eliminate seedlings emerging in both the fall and spring should effectively reduce the seed bank. The fact that no seeds are produced prior to the second winter could be helpful in management (Qi et al. 1993). In general, prolific seed production combined with long vegetative survival seem to be important strategies contributing to the long-term success of these populations (Meiquin et al. 1996).

Knowledge of leaf surface characteristics of weedy species and the influence of the environment on these characteristics may be very important in understanding the ecophysiological mechanisms underlying the survival and spread of weedy species. Upadhyaya and Furness (1994) undertook a study of the influence of light intensity and water stress on the leaf surface characteristics of several economically important weeds, including *T. pratensis* and *T. dubius*. They found that both species lacked trichosomes, but had a covering of tubular crystalline epicuticular wax on both the abaxial and adaxial surfaces. Leaf surface characteristics of the two species were indistinguishable from one another. Development at lower light intensities led to lower amounts of wax on the adaxial surface than on leaves developing at higher light intensities. Denser wax covering at high light intensities might help leaves reduce moisture loss by providing a hydrophobic covering on the leaf surface and increasing reflection.

Tragopogon dubius is known to be a favorite food to pocket gophers, who may consume 20-80% of the primary root, while aboveground foliage is consumed by deer, squirrels and rabbits (Reichman and Smith 1991). Simulated herbivory in which one or more flowers were removed from plants led to the production of significantly more flowers than plants without flower loss. Simulated herbivory had no long-term impacts on nutrient allocation patterns however, while removal of removal of root or leaf tissue reduced biomass as compared with controls (Reichmann and Smith 1991).

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