The effects of single and multiple applications of glyphosate and aminopyralid on simple constructed plant communities

Thomas Pfleeger[1], Matthew Blakeley-Smith[1], E. Henry Lee[1], George King[2], Milton Plocher[2] and David Olszyk[1]

[1]US Environmental Protection Agency
National Health and Environmental Effects Research Laboratory
Western Ecology Division
200 SW 35th St.
Corvallis, Oregon 97333

[2]Dynamac Corporation
200 SW 35th St.
Corvallis, Oregon 97333

Abstract

Plant tests required for the registration of pesticides are generally performed under controlled laboratory/greenhouse conditions using single exposures, and the results may or may not be relevant to protecting plant communities or ecosystems. We report results from a field test to determine the effects of multiple applications of glyphosate or aminopyralid at below field application rates (FAR) on individual species and community performance. Three native Oregon plant species (*Prunella vulgaris* L.var. *lanceolata* Fern.(Self-heal), *Festuca roemeri* (Pavlick) Alexeev. (Roemer's fescue), and *Clarkia amoena* (Lehm.) Nels. (Farewell to spring)) were grown together with an introduced species *(Cynosurus echinatus* L. (Bristly dogstail grass)). The experiment was replicated repeated for three years at one location and two years at a second location with glyphosate at target concentrations of 0, 0.01, 0.1, and 0.2 x FAR (Field Application Rate) of 1122 g/ha active ingredient (ai); and for two years at two locations with aminopyralid at 0, 0.037, 0.136, and 0.5 x FAR of 123 g/ha ai. Plants received one, two or three applications of each herbicide in each year. Application of either herbicide produced similar results at both locations and all years with several exceptions. When exposed to glyphosate, all species decreased in plant volume, with *C. echinatus* the most dramatically affected even at 0.01 x FAR. In general, decreases in volume became greater with increasing number of applications of glyphosate. Plant communities exposed at the two highest concentrations initially had different successional trajectories in total volume than the control treatments, but then appear to recover and increase in similarity to the control community as the season progressed. Recovery was slower with more glyphosate applications. With exposure to aminopyralid, *C. amoena* was essentially eliminated from the communities even at 0.037 x FAR, while the other 3 species had tended to have significant increases in volume, especially at the two lower FARs. Increasing the number of aminopyralid applications produced variable results. The successional trajectories for total community volume with aminopyralid treatments never showed any tendency for recovery. Our experiments with multiple applications indicated that there is no simple conclusion in terms of herbicide responses. Instead, the community response depends on a number of variables including the type of herbicide, concentration of the herbicide, species and number of exposures. Our work supports previous claims that potential drift rates of

herbicides can alter plant communities, and demonstrates a test methodology to help evaluate risks to plant communities.