

Evaluation of Imazapyr and Aminopyralid for Invasive Plant Management

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Imazapyr

Imazapyr only recently (2004) received an aquatic registration in California under the trade name Habitat[®]. While it was previously registered for use in forestry (Arsenal AC[®], Chopper[®]) and non-crop areas (Stalker[®]), these formulations are not allowed near water. Both Chopper[®] and Stalker[®] are emulsifiable concentrates formulated at 2 lb ae/gal, whereas Arsenal AC[®] is a water soluble formulation at 4 lb ae/gal. Habitat[®] is also a water soluble formulation, but is produced at 2 lb ae/gal.

This new formulation of imazapyr provides an effective tool for the management of very invasive emerged aquatic species, such as the cordgrasses (*Spartina* spp.), or woody invasives along riparian corridors or wetland areas, including perennial pepperweed (*Lepidium latifolium*), saltcedar or tamarisk (*Tamarix* spp.), and tree-of-heaven (*Ailanthus altissima*). In terrestrial environments, imazapyr can be applied foliarly using several techniques, including broadcast applications, directed treatments, rope wick methods, or to woody stems by cut stump, basal bark, or hack-and-squirt (stem injection) techniques. These same applications techniques can also be employed with Habitat[®] in aquatic areas.

For example, broadcast foliar treatments have now been widely used to control *Spartina alterniflora* in Willapa Bay, Washington, and *Spartina alterniflora* x *S. foliosa* hybrids in the San Francisco Bay. Directed or broadcast foliar treatments of Habitat[®] are the most common chemical choice for control of *Tamarix* spp. in California and other western states (Brenton 2003). For *Tamarix* seedling control, rope wick applications of Habitat[®] can also be used with success (Duncan and McDaniel 1998). The aquatic formulation of imazapyr also provides a very valuable option for management of perennial pepperweed in aquatic and riparian areas where other options, such as chlorsulfuron, are not available.

In studies comparing triclopyr, glyphosate, and imazapyr for the management of tree-of-heaven, imazapyr provided the best control using cut stump and hack-and-squirt methods, and also gave control equal to triclopyr using basal bark application technology (DiTomaso and Kyser, unpublished results).

In summary, Habitat[®] has and will continue to provide a low toxicity and effective tool for difficult to control invasive herbaceous perennial and woody plants in riparian and aquatic (both freshwater and marine) sites.

Aminopyralid

Aminopyralid (Milestone[™]) is a new picolinic acid (pyridine) herbicide for control of invasive knapweeds and thistles and other species in the sunflower family, as well as legumes, solanaceous weeds (such as tropical soda apple [*Solanum viarum*]), fiddleneck (*Amsinckia* spp.),

and a few other problem broadleaf species in wildlands, pastures and rangelands. Aminopyralid received a reduced risk designation by the United States EPA and was registered for use in 2005. It is expected to be registered in California by the end of 2006. The registered use rate of the product will range between 3 oz/A (0.75 oz ae/A) and 7 oz/A (1.75 oz ae/A). Results of studies on the control of several invasive thistles, fiddleneck, and Russian knapweed are presented.

Yellow starthistle (Centaurea solstitialis)

Results of studies conducted in Oregon, Washington, Idaho and California show that spring treatments of aminopyralid provided excellent control of yellow starthistle, even at rates as low as 2 oz product/A (0.5 oz ae/A) (unpublished results of several researchers). In subsequent studies in Siskiyou County, Steve Orloff (unpublished results) demonstrated complete control of yellow starthistle at 0.75 oz ae/A, and this rate gave comparable to clopyralid (Transline™) at its lowest registered rate of 1.5 oz ae/A.

In more detailed studies conducted at the University of California Davis, DiTomaso and Kyser (unpublished results) demonstrated that, at the rosette stage, aminopyralid was equally effective as clopyralid (1.5 and 3.0 oz ae/A) for control of yellow starthistle at all rates tested between 0.5 and 1.0 oz ae/A. However, aminopyralid was not as effective as clopyralid when plants were treated in the bolting stage. As an additional benefit to early season control, total grass forage in the year after application was nearly twice as great with rosette applications as compared to treatments made to bolting plants. In a subsequent timing study, they showed that the optimal timing for yellow starthistle control at the lowest registered rate of aminopyralid (0.75 oz ae/A [3 oz product/A]) was between December and February. Slightly higher rates were required to obtain complete control in later timings and November applications did not provide season long control. Previously published results by DiTomaso et al. (1999) showed that January to March was the optimal yellow starthistle treatment timing for clopyralid.

Fiddleneck (Amsinckia menziesii)

Clopyralid treatments for yellow starthistle control in rangelands and pastures can often release fiddleneck, which is unaffected by the herbicide even at high rates. This can create a problem for ranchers or ranchette owners because fiddleneck contains pyrrolizidine alkaloids that are very toxic to livestock. In contrast to clopyralid, aminopyralid provided better than 90% control with a December or January application at all rates, including the lowest registered rate.

Artichoke thistle (Cynara cardunculus)

Early spring aminopyralid treatments to artichoke thistle in the rosette stage gave excellent control at 1.2 and 1.75 oz ae/A, but only 80% control at 0.75 oz ae/A (DiTomaso and Kyser, unpublished results). Clopyralid also gave excellent control at 3.75 oz ae/A. However, it is important to recognize that injury to plants occurred slowly with both herbicides, generally requiring months to eventually kill the plants. By the end of the growing season, treated plants did not flower. Whether plants were completely killed or not is yet to be determined, as plots will require revisiting in 2006. In addition to flower suppression, aminopyralid and clopyralid also

completely prevented the development of new seedlings. In contrast, glyphosate gave excellent control of mature plants and death occurred within two months of treatment. Because glyphosate is non-selective and has no soil activity, it did not control subsequent artichoke thistle germination and, as a result, many new seedlings were present by the end of the growing season.

Russian knapweed (Acroptilon repens)

Russian knapweed is a widespread invasive weed in the western United States. It is less common in California, but appears to be spreading rapidly. Russian knapweed is one of the more difficult knapweed species to control in California. While picloram is an effective tool in other western states, it is not registered for use in this state. Currently, clopyralid is the only feasible option, but even at the highest registered rate it only provides about 75% control (R. Wilson, pers. comm.). In studies conducted in Lassen and Shasta counties, DiTomaso, Kyser and Wilson (unpublished results) showed that fall applications of aminopyralid were more effective than spring applications at the lowest registered rate, although both gave good control. Thus, it will now be possible to achieve excellent and affordable management of this noxious perennial weed.

Scotch thistle (Onopordum acanthium)

Scotch thistle is a California Department of Food and Agriculture (CDFA) 'A' listed noxious weed. In 2005 studies conducted in Modoc County, DiTomaso and Kyser (unpublished results) showed that early summer aminopyralid applications to plants in the rosette stage caused significant injury to Scotch thistle and prevented flowering at all rates tested between 0.5 and 1.75 oz ae/A. Since this plant is a biennial, control would be considered complete in this growing season. However, the plots will require revisiting in 2006 to determine whether aminopyralid controlled plants only in their first year of growth, or also provided residual control of new germinants. In this study, clopyralid at 3 oz ae/A and dicamba at 8 oz ai/A also gave excellent control, but these rates were considerably higher than the effective rates of aminopyralid.

In conclusion, aminopyralid will play a key role in the management and eradication of important invasive species in California, particularly the noxious thistles and knapweeds. Its activity on yellow starthistle is about three times that of clopyralid and it also shows good activity at low rates on several other important noxious weeds. Furthermore, it promises to be a more affordable option in the control of some of the states most invasive species.

Literature Cited

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