Chemical Control of Brooms and Gorse

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Brooms and gorse are shrubs in the Fabaceae family. Most are natives to the Mediterranean region. They were mainly introduced as horticultural species and have since become established in many areas. Gorse, french broom, and scotch broom are now listed as noxious weeds. Control techniques for these plants include pulling, cutting, burning, grazing, biological control, and the use of chemicals. This paper will focus on the chemical control of these species in California. The second part of the paper is the results of an experimental eradication of spanish broom.

Scotch Broom

Glyphosate has been used as a foliar spray for Scotch broom (Cytisus scoparius) with good results. The problem with this method is drift to non-target species. 2,4-D in water-oil emulsion (2 %) applied in March will give excellent results. Triclopyr ester in oil (4 to 8 lb./100 gal of solution for basal, 2 to 4 lb./100 gal of solution for foliar application) has had excellent results when applied July - August (William et al 1996). Disking thickets and then burning debris promotes seed germination and then resprouting can be spot treated.

French Broom

Dr. Carla Bossard, in association with CalEPPC, has tested a variety of techniques for controlling French broom (Genista monspessulana). The most effective method she found was to treat the stems 5 cm above ground level with 30 % Triclopyr in 70 % Penevator oil, cut the dead stems and burn them on site, and then spray any new seedlings with Glyphosate (Bossard et al 1995).

Spanish Broom

Pathfinder II -- 13 % Triclopyr ester in vegetable oil -- provided excellent control spring through summer. Plants were treated at 1,10, and 20 % of the height of the plant. Small plants were killed at all treatments, medium plants show mixed results, and large plants were killed at the highest rate when applied in brown pod stage. Damage to the plant seems to be quickest when the plant is actively growing, but the best results occurred in mid summer with effects being slow to manifest themselves (Rusmore, this publication).

Gorse

Thomas Reed and Associates has been treating gorse and broom on San Bruno Mountain using a 2 % foliar spray of Garlon 4 and Surtec surfactant. They have been recording a greater than 90 % kill rate with this method. They have also reported some problems with drift.

A combination of Picloram and 2,4-D gives enough control for reforestation but not for eradication. Metsulfuron (2 oz ai/A at 10 gal spray/A) gave excellent control in New Zealand. Unfortunately, neither of these herbicides are registered for use in California. Also in New Zealand, Ivens (1979) found that treating with 2,4-D alone after cutting was the most effective method.

Scotch broom (Cytisus scoparius)

• Triclopyr ester (Garlon 4) or Triclopyr amine +2,4-D LV ester (Crossbow)	Rate:	0.5 to 1.5% concentration of Garlon 4 or Crossbow 1 to 1.5% concentration of Garlon 3 or Redeem
	Time:	Foliar, when actively growing
	Remarks:	Thorough wetting required
• Triclopyr ester (Garlon 4)	Rate:	4 to 8 lb./ 100 gal oil solution for basal; 2 to 4 lb. for foliar
	Time:	July-August for basal/foliar, March for broadcast
	Remarks:	Excellent control expected.
• Glyphosate (Roundup,Accord)	Rate:	1.5 to 2% solution
	Time:	Apply to actively growing plants in spring
	Remarks:	Addition of a recommended surfactant will improve results
• 2,4-D	Rate:	2 lb./ 100 gal water-oil emulsion
	Time:	March
	Remarks:	Excellent control expected

French broom (Genista monspessulana)

• Triclopyr ester (Garlon 4)	Rate:	25-30 % in Penevator oil applied to basal bark
	Time:	Spray green seed stage, cut summer, burn winter, spray seedlings following spring
	Remarks:	Not removing cut broom interfered with all control methods

Spanish broom (Spartium junceum)

• Triclopyr ester (Garlon 4)	Rate:	13 % in vegetable oil (Pathfinder) applied to basal bark up to 20 % the height of bush
	Time:	No statistical difference although kill time is quicker during active growth & higher at brown pod stage
	Remarks:	Must treat all stems

Gorse (Ulex europaea)

• Triclopyr ester (Garlon 4)	Rate:	2 % with surfactant, foliar
	Time:	All year
	Remarks:	Problems with drift
• 2,4-D	Rate:	Applied to regrowth at 50 cm
	Time:	Spring

Spanish Broom Eradication Test Plots
Effie Yeaw Interpretive Center
Ancil Hoffman Park
American River Parkway

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Study site

A large population of Spanish Broom (Spartium junceum L.) has become established on about 15 acres of land in Ancil Hoffman Park along the American River Parkway, Sacramento, CA. The site is a gravel bar along the river with scattered live oaks and some native shrubs.

Introduction

Despite more than eight years and hundreds of hours of hand- and wrench-pulling, the population of spanish broom continues to increase in size and stature. Recent findings (Bossard et al 1995) prompted the establishment of a series of test plots to test the efficacy of low volume basal bark spray in this species.

What is so appealing about this method is the small amount of active ingredient applied (about 1 ml), its being applied directly to the bark of the plant just above the soil line (thus reducing drift and runoff), and its high success rate (up to 100% of treated plants killed within 4 weeks).

Methods and Materials

The most commonly recommended timing for this application is after the seeds have been set, yet before they are mature. However, in another on-going spraying project on San Bruno Mountain by Thomas Reed and Associates, the time of year seems to have little effect on the outcome of the spraying. We addressed this question by applying the treatment at 3 times: (1) yellow flower stage--as the plant is actively growing at this stage, the herbicide may be transported to growing points and then back to the roots through translocation; (2) green-pod stage--the plant may be sending more of its resources to the root, so may carry the herbicide with the storage materials; (3) mature pod stage--the plants are withdrawing minerals and nutrients from the leaves to store them in the stem or roots and may carry the herbicide with them. Efficacy was rated as number of plants killed during each time period out of total treated plants.

While the size of the plant had no effect on the results in Dr. Bossard's study, some treatments have been affected by the size of the plant. We tested this aspect of the treatment by applying the treatment to three size categories: (1) less than 1m; (2) 1-2 m; (3) above 2 m.

The method has proved effective at the 25/75 rate of Garlon to oil. The above tests used a rate of 13/87 which came already

prepared under the trade name of Pathfinder II and was donated by Dow Elanco.

Each treatment was applied to ten of the plants in each plot with 5 replications of plots. The plants were marked with spray paint and flagging to facilitate locating them for the study and for evaluation of the project.

A separate group of plants was also tested to see if moisture, position, or stress would influence the kill rate. Nitrogen was also applied to some of the plants to see if the kill rate would be affected.

Results

There was little statistical difference in any of the treatments except for the lowest amount of stem treated of the largest plants at the yellow flower stage [>2, 1%, Fl] (Figure 1). Plants that were less than 1 m tall were easily killed at all times and at all stem treatment heights.

While not statistically significant, there were several trends in the kill rates. Not surprisingly, it is more difficult to kill larger plants. Also, the more of the stem of the larger plants that were treated, the better the kill rate. However, in the larger plants, as the season progressed, the kill rates increased (Figure 2). Stress levels, as measured by a pressure bomb, increased through the day. The kill rates, although not statistically significantly different, tended to increase with the level of stress (Figure 3). Contrary to expectation, kill rates were not affected by watering the plants with or without nitrogen (Figure 4). In fact, dry plants had the highest rates, followed by wet and then wet with nitrogen.

The pressure bomb readings and kill rates were not significantly different in three environmentally different sites. The pressure bomb readings increased from shade to partial shade to open site. The kill rates also tended to increase from the shade to open sites.

Discussion

We expected the larger plants to be harder to kill and that the more Pathfinder applied, the higher the kill rate would be. What was unexpected was the increase in kill rate from flowering to green seed to mature seeds. From other studies, we had anticipated that that the green seed stage would have the best results (Bossard et al 1995).

If we assume that the plants are more stressed at this stage, then it would also follow that the kill rates are higher when the plants are more stressed during a single day.

Not only were the dry plants killed at higher rates than those plants watered only or watered with nitrogen, but the plants in the sun were also killed at higher rates than those in the shade and partial shade.

Recommendations

Since the differences are very slight, any treatment with Pathfinder at any time or any stage will be quite effective with our kill rate average at over 90%. Especially at the flowering stage, all stems need to be treated to get complete kill--and re-application may be needed. Small plants require treatment of only 1% of the stem while plants over 1m will require treatment of 20% of the stem. If only one application can be made, then a warm day when there are brown pods on the bush would probably provide the best kill rate.

Figure 1. Kill Rates of Spanish Broom from all Treatments. Fl represents the yellow flower stage, GP represents the green pod stage, and BP represents the mature pod stage. The error bars represent the confidence interval at .95.

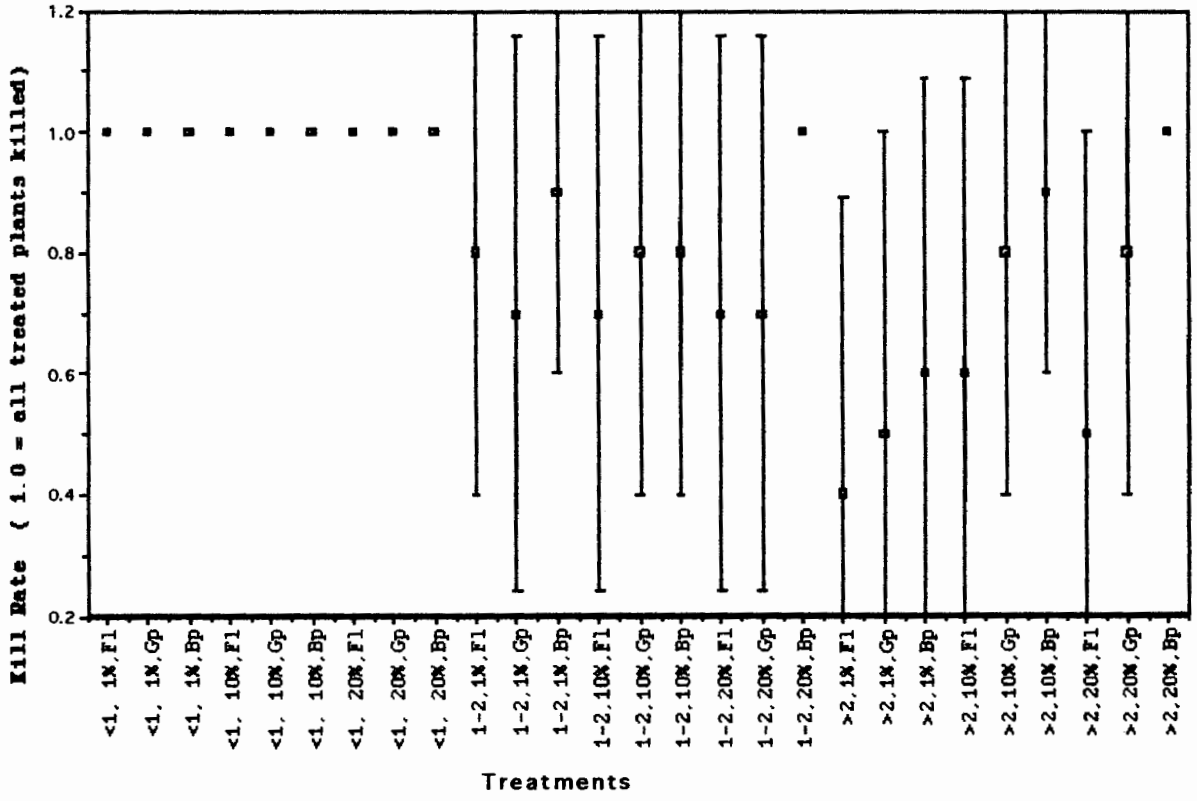


Figure 2. Kill Rates by Stage of Plant for plants > 2m. Diamonds indicate plants that had 1 % of the stem treated, squares indicate 10%, and triangles indicate 20%.

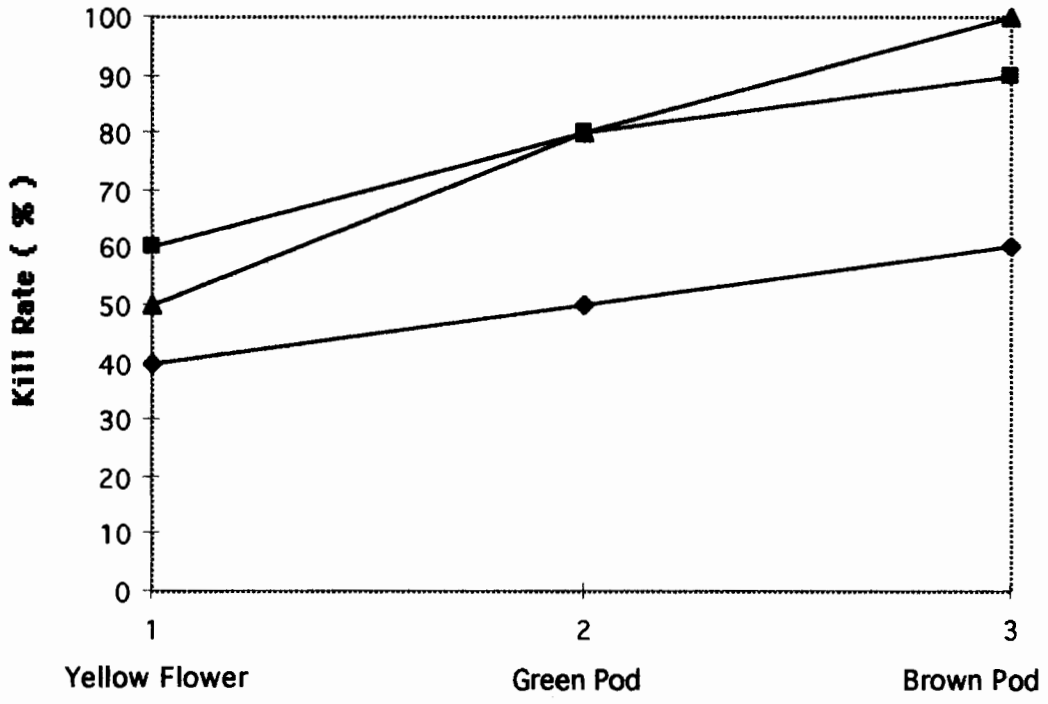


Figure 3. Average kill rates and pressure bomb readings. Diamonds indicate kill rates, and squares indicate bars of pressure.

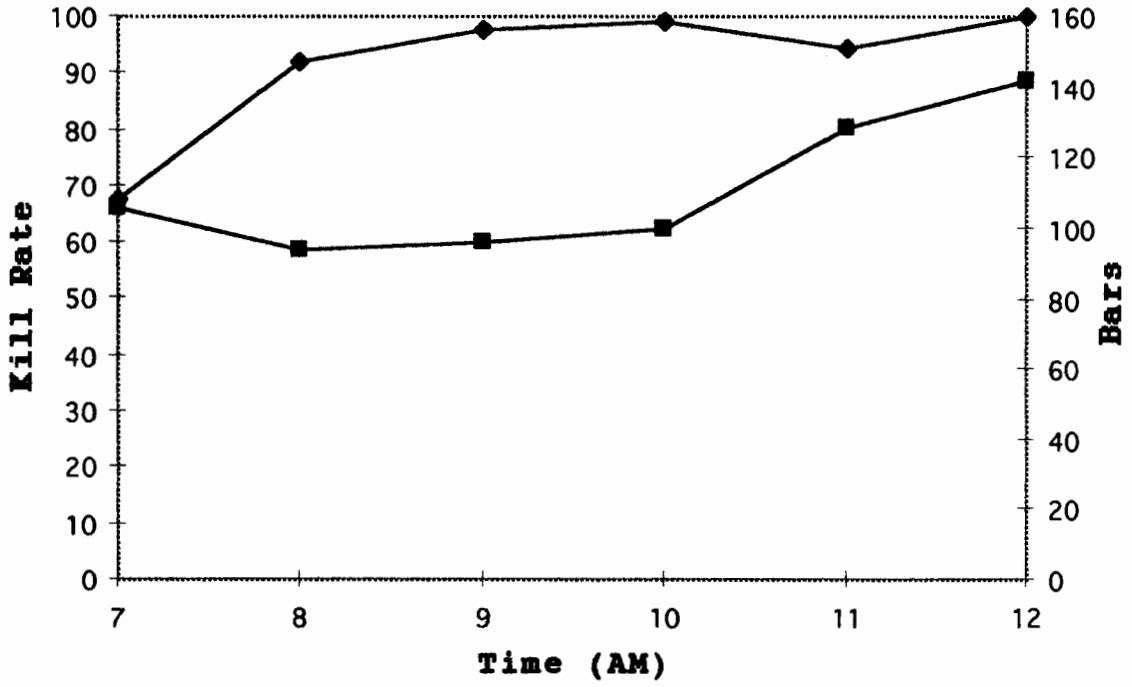
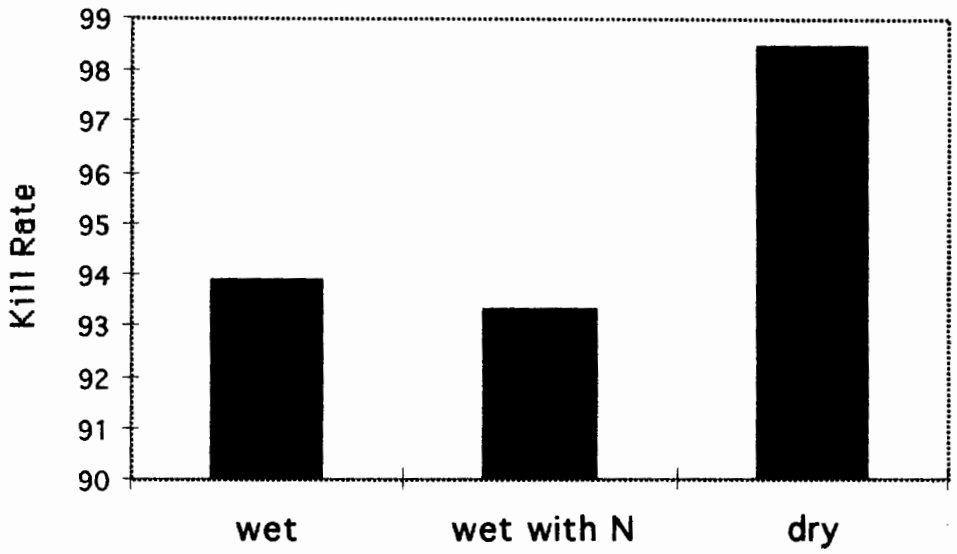


Figure 4. Kill rates by moisture. The bars represent the percentage of treated plants killed. The differences are not statistically significant at the .95 level of confidence.



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