Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 12 *Keeping up with Research*

Article 142

2003

Weed Control with Imazaquin and Pendimethalin around Newly Planted Shrub and Tree Seedlings

Wayne A. Geyer

Walter H. Fick

Eric Rhodenbaugh

Recommended Citation

Geyer, Wayne A.; Fick, Walter H.; and Rhodenbaugh, Eric (2003) "Weed Control with Imazaquin and Pendimethalin around Newly Planted Shrub and Tree Seedlings," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 12. https://doi.org/10.4148/2378-5977.7379

Weed Control with Imazaquin and Pendimethalin around Newly Planted Shrub and Tree Seedlings

Keywords

Keeping up with research; SRL 138 (Mar. 2003); Weed control; Imazaquin; Pendimethalin; Shrub seedlings; Tree seedlings

ABOUT THE AUTHORS

Wayne Geyer, Professor, Horticulture, Forestry and Recreation Resources

Walter H. Fick, Associate Professor, Agronomy

Eric Rhodenbaugh, Associate Editor, Communications, K-State Research and Extension

All authors are affiliated with Kansas State University, Manhattan, Kansas.

ACKNOWLEDGEMENTS

This research was partially supported by BASF Corp., Research Triangle Park, NC.

Contribution no. 03-307-S from the Kansas Agricultural Experimental Station.

Note: Trade names are used to identify products. No endorsement is intended, nor is any criticism implied of similar products not mentioned.

This publication was produced by the Department of Communication, K-State Research and Extension. K-State Research and Extension Publications are available at *http://oznet.ksu.edu*

Kansas State University Agricultural Experiment Station and Cooperative Extension Service **Manhattan, Kansas 66506**

SRL 138 March 2003

Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, Marc A. Johnson, Director. 500

Keeping Up With Research 138

Weed Control With Imazaquin And Pendimethalin Around Newly Planted Shrub And Tree Seedlings

Wayne A. Geyer, Walter H. Fick, and Eric Rhodenbaugh

Vegetation management is an important component for successful establishment of woody plants for riparian buffers, windbreaks, aesthetics or forest plantings in the Great Plains region. Reducing herbaceous competition improves survival and growth of the desired woody species. Competition control strategies include cultivation, herbicide applications, and mulches. Many herbicides have been evaluated and approved for use in woody crops over the past five decades and new products are continually under development. Problems with using herbicides include lack of effectiveness throughout the growing season and target plant resistance to the chemicals. Two products have recently been introduced that show promise for release of woody species. These are imazaquin (SCEPTER® 70 DG) and pendimethalin (PENDULUM®). Imazaquin is registered for use in controlling weeds when applied before the bud swell stage and over-the-top of actively growing hybrid poplar plantations (1, 3, 4). It can be used in combination with pendimethalin in dormant plantings (2).

The objective of these studies was to compare weed control effectiveness and herbicide tolerance of selected woody plants to imazaquin and pendimethalin when applied alone or in combination as a dormant season over-spray. Survival and stem growth were assessed on several woody plant species following herbicide applications.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

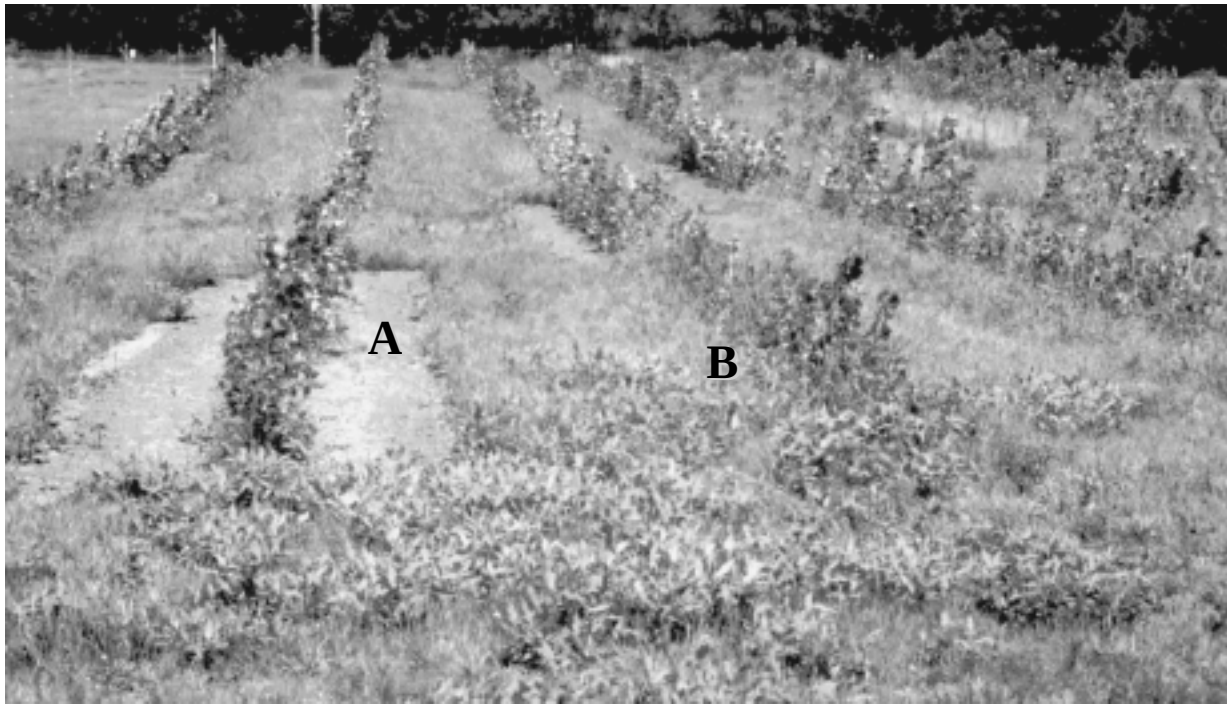

Figure 2. Mid-season weed control. Complete control was seen with pendimethalin (A) and poor grass control with imazaquin (B).

LITERATURE CITED

1. American Cyanamid. 1997. Scepter 70DG. Supplemental labeling. American Cyanamid Company. PE-12331. 2 pp.

2. American Cyanamid. 1998. Pendulum WDG Herbicide. Specimen label. 6 pp.

3. Miller, R..O. 1999. Herbicide screening for phytoxicity in hybrid poplars, aspen, and larch. North Central Weed Control Conference Proc. Vol. 54. 122-127.

4. Quicke, H. E., E. Hoien, and L. Beaudrot. 1999. Imazaquin, imazapic, and pendimethalin for weed control in hybrid poplar: The 1998 Clatskanie, Oregon study. American Cyanamid Forestry Tech. Service Research Report No. 99-01: 10 pp.

5. Weed Science Society of America. 2002. Herbicide Handbook. Lawrence, KS: Weed Science Society of America. 493 pp.

RECOMMENDED PUBLICATIONS

Additional information may be found in Kansas Forest Service publications: *Chemical Weed Control in Tree Plantings*, MF-656; *Tree Planting Guide*, L-596; *Conservation Tree Planting Schedule*, L-871.

These publications are available through a local K-State Research and Extension office or on the Web at: ***http://www.oznet.ksu.edu***

Table 2. Analyses of variance of survival, height, and damage frequency of treated woody plants in the 1999 study.

Source	Degrees of freedom	Survival (mean sq.)	Height (mean sq.)
Replication	2	0.063[ns]	6.408[ns]
Treatment	5	1.642*	30.988**
Species	14	6.502**	69.773**
Treatment by species	70	0.452[ns]	8.001[ns]

[1] ns = not significant
* = significant at $0.01<p<0.05$
** = significant at $p<0.01$

Table 3. Survival, height, and damage of treated plants in the 1999 study.

Herbicide Treatment	Survival (%)	Height (in.)	Damage [1]
Imazaquin (0.123 lb a.i./acre)	89ab [2]	13.0c	Slight
Imazaquin (0.245 lb a.i./acre)	81b	13.4bc	Slight
Pendimethalin (1.98 lb a.i./acre)	91a	14.3ab	Slight
Pendimethalin (3.96 lb a.i./acre)	90a	15.4a	Slight
Imazaquin + pendimethalin (0.124 + 4.0 lb a.i./acre)	92a	14.0bc	Slight
Imazaquin + pendimethalin (0.248 + 4.0 lb a.i./acre)	91a	14.2abc	Slight

[1] About 50% silver maple had red leaves, 40% golden currant exhibit stunting, and 30% Oriental arborvitae had brown leaves.
[2] Values in the same column followed by different letters are significant at $p\leq 0.05$.

PROCEDURES

Two studies were conducted near Manhattan, KS. The first was initiated in 1999 on newly planted shrubs and trees; the second in 2002, three years after planting. The study site is on alluvial land and was well-cultivated for several years prior to planting. The soil is silty clay loam having a pH of 7.3. All species were planted on March 1, 1999. Six-inch cuttings of poplar clones were planted; seedlings were planted of other species. Species/clones studied were:

black walnut (*Juglans nigra*)
choke cherry (*Prunus virginiana*)
fragrant sumac (*Rhus aromatica*)
green ash *(Fraxinus pennsylvanica*)
golden currant (*Ribes odoratum*)
hackberry (*Celtis occidentalis*)
Oriental arborvitae (*Thuja orientalis*)
ponderosa pine (*Pinus ponderosa*)
eastern redbud (*Cercis canadensis*)
Russian mulberry (*Morus alba var. tatarica*)
silver maple (*Acer saccharinum*) and
Poplar clones:

Kansas clone#	Iowa clone I.D.	Parentage
P-18	96.18	*Populus deltoides*
P-26	107.14	*Populus deltoides x nigra*
P-48	91.D5-10	*Populus deltoides*
P-56	EUGENE	*Populus deltoides x nigra*

The study was initiated in 1999 using a randomized design with three replications. Subplots of five of each species were located randomly in each plot, with six rows per replication for a total of 18 rows. Rows were 12 feet apart and trees were planted at one foot spacing. No weeds were present at the time of planting. No untreated controls were established because survival and growth without weed control would be minimal. In the second study (2002), the same planting as in 1999 was used for evaluating herbicide treatments.

Herbicides were applied on March 15, 1999 for study 1 and April 5, 2002 for study 2. All applications were done with a CO_2-powered research sprayer set at 30 psi (Figure 1). Chemicals and rates applied were imazaquin at 0.123 + 0.245 lb a.i./acre, pendimethalin at 1.98 and 3.96 lb a.i./acre, and imazaquin + pendimethalin at 0.124 + 4.0 and 0.248 + 4.0 lb a.i./acre.

In the second study only the higher rates were applied on each side of the plants, along with tillage-only and mow-only treatments. Cultivated plots were not included in 1999 since the initial objective of the study was to evaluate efficacy of the herbicides relative to one another.

In 1999 at 90 days after treatment weed control was visually evaluated as percent bare ground (0=complete coverage with weeds; 100=completely bare ground); total tree height, survival, and leaf damage were also recorded at 90 days after treatment. Woody plant growth was not measured in 2002. In 2002, efficacy (percent bare ground) was evaluated at 90 days after treatment and at 130 days after treatment. Data from 1999 were analyzed using analysis of variance to detect treatment effects, species differences, and species x treatment interactions. Dependent variables were percent bare ground, survival (%), and height (in.). Percent bare ground from 2002 was summarized, but not statistically analyzed. Data analyses were conducted using SAS (SAS Institute, Inc., Cary, NC).

RESULTS AND DISCUSSION

After 90 days greater than 80% control was achieved for both broadleafs and grasses when using the high rate of pendimethalin or both rates of imazaquin + pendimethalin in both years. Imazaquin alone did not control foxtail in 1999, but gave good weed control results in 2002 (Table 1). Pendimethalin resulted in at least 75% bare ground at low and high rates (Table 1). The lack of adequate rainfall in March 1999 (0.89 in.) may account for the poor foxtail control in study 1. The 30-year-average rainfall in March measured at nearby Tuttle Creek Lake, KS, is 2.20 in. Precipitation was 3.03 in. for April 2002, slightly above the 30-year average of 2.77 in. (Kansas Weather Data Library, a service of K-State Research and Extension). Adequate soil moisture within 7 days after application of imazaquin is necessary for optimal weed control (1). The high rate of pendimethalin, alone or in combination with imazaquin, resulted in better early results in spite of the relatively dry early spring in 1999 (Figure 2).

After 130 days the pendimethalin herbicides applied in 2002 produced good control of pigweed and foxtail, but other grasses invaded, including barnyardgrass and crabgrass (Table 1). These annual grasses might be expected to occur later in the season, as seen 130 days after treatment, as the average half-life of pendimethalin is 44 days (5).

Survival of woody plants (1999 study only) was significantly different for both treatments and species with no significant species by treatment interaction (Table 2); thus, survival data for herbicides are averaged over species, and data for species are averaged over treatment. All treatments had at least 81% survival; the high rate of imazaquin resulted in the least survival (Table 3). Survival of the other treatments averaged 90% or greater, indicating little difference among the six herbicide treatments.

Survival by species is not presented in detail due to the large number of species tested and the similarity in survival among species. When averaged across treatments, Poplar clone P-

Table 1. Weed control (percent bare ground) of the six chemical treatments.

	1999 Results			2002 Results				
	90 days			90 days		130 days		
Herbicide Treatment	Pigweed spp.	Foxtail spp.	Lambsquarters	Pigweed spp.	Foxtail spp.	Pigweed spp.	Foxtail spp.	Escape spp.
Imazaquin 0.123 lb a.i./acre	50c[1]	0c	38c	Not applied	–	–	–	—
Imazaquin 0.245 lb a.i./acre	96a	0c	88b	95	100	65	100	Crabgrass (54%) Pigweed (30%)
Pendimethalin 1.98 lb a.i./acre	72b	82b	100a	Not applied	–	–	–	—
Pendimethalin 3.96 lb a.i./acre	90a	98a	100a	98	90	95	90	Barnyardgrass (80%)
Imazaquin + pendimethalin 0.124 + 4.0 lb a.i./acre	92a	95a	100a	Not applied	–	–	—	—
Imazaquin + pendimethalin 0.248 + 4.0 lb a.i./acre	95a	94a	100a	95	100	50	98	Pigweed (50%)

[1] Values in the same row followed by different letters are significant at $P \leq 0.05$.

Note: After 130 days there was 98% foxtail in the mow-only plots and 80% foxtail and 20% other grasses in the tillage-only plot, which was tilled in March and June.

18 had the least survival at 62%, and was significantly less than ponderosa pine, hybrid poplars P-48 and P-56 (70%), and all others, which had survival of 94%. Survival of ponderosa pine and poplar clones P-48 and P-56 were also significantly less than the remaining species.

Total tree height differed significantly among treatments and also by species. Poplar clones were the tallest and redbud the shortest. Only the height of poplar clone P-26 was reduced significantly by any of the herbicide treatments. When averaged across species, both levels of imazaquin and imazaquin + pendimethalin reduced total height significantly, but height reductions were slight (Table 3).

SUMMARY AND CONCLUSIONS

Control of both broadleaf and grassy weeds is necessary for successful establishment and growth of tree plantings in the Great Plains region. Imazaquin alone may not control grasses sufficiently and needs to be combined with another herbicide, especially in the absence of adequate early spring precipitation. Pendimethalin alone and in combination with imazaquin, as applied in this study, can be used for controlling weeds with little damage noted 90 days after treatment to the woody plants tested. About 88% had slight damage or no damage, and 7% had slight damage, with slight reddening of silver maple and some brown leaves on arborvitae. Only one of the four *Populus* clones tested, P-26, and golden currant, showed any substantive reduction in height, and survival was good for all species. These results show that any of the four pendimethalin treatments applied during the dormant season on the 15 clones/species of woody plants studied were effective in controlling weeds while causing little or no damage to the plants.

Figure 1. Spray rig used to apply herbicides over the seedlings. The nozzle positions allowed application to the side of seedlings.