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Summer Injection of 2,4-D and Tordon Herbicides to Control Unwanted Trees in Kansas Woodlands[1]

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Kansas woodlands often need to be upgraded by removing unwanted, low-quality trees. Selectively removing or killing them promotes growth of the high-quality ones remaining.

Controlling undesirable trees with herbicides is an accepted forestry practice, but new chemicals must be evaluated to find the safest and most effective ones. As herbicide results vary from region to region and among species and climates, we conducted a series of tests on typical Kansas hardwood trees. Earlier results had shown that Tordon* 101 Mixture was an effective herbicide (Geyer and Biles, 1975).

The Studies and Results

We treated trees at three sites in northeastern Kansas. Two were black walnut sapling-pole stands on intermittent streams and one was a large pole-small sawtimber cottonwood stand on the Kansas River.

The herbicides killed a high percentage of trees at all locations. All were injected through the bark at 3-inch

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* Trademark of the DOW Chemical Co. Mention of trade names is for better understanding only; no endorsement of products named is intended.

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intervals around bases of the trees with a Jim-Gem metering injector (Figure 1). About one milliliter of herbicide was injected into each cut (Figure 2) in late spring or early summer after the trees had leafed out.

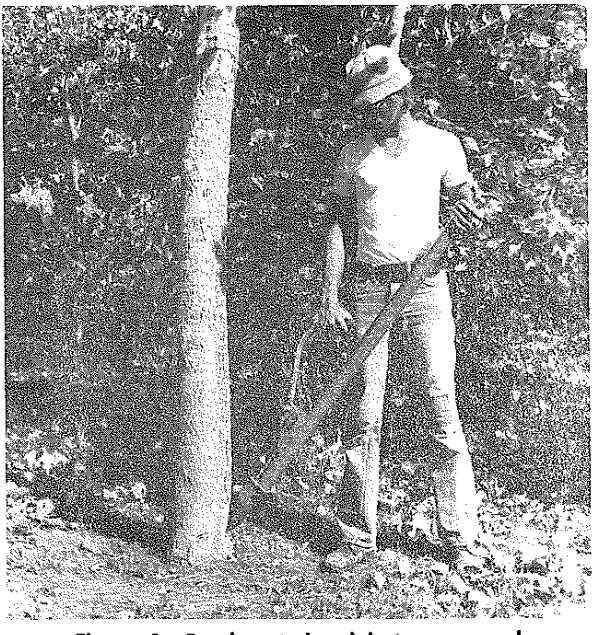

Figure 1.—Basal metering injector we used.

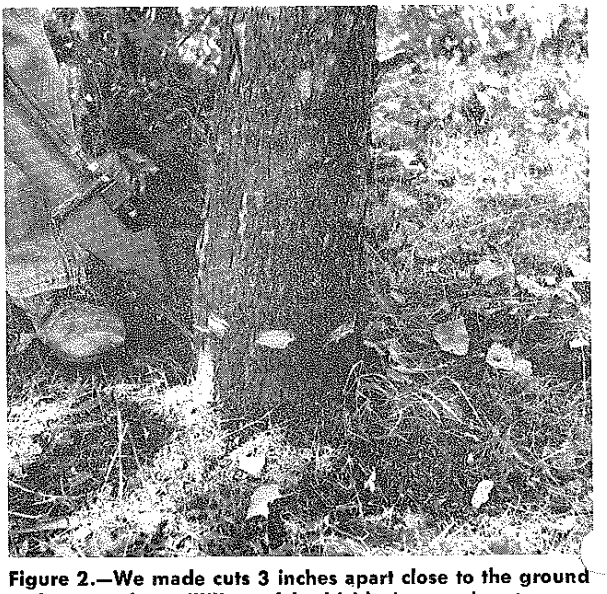

Figure 2.—We made cuts 3 inches apart close to the ground and metered 1 milliliter of herbicide into each cut.

We injected three herbicides: 2,4-D, Tordon 22K, and Tordon 101 Mixture. The concentrated amine form of 2,4-D at 4 pounds acid equivalent per gallon was used. Tordon 22K, a potassium salt formulation containing 2 lb. ai/gal. of picloram, was diluted with 3 parts water. Tordon 101 Mixture, a marketed combination of 2,4-D and picloram was mixed 1:1 with water. All are water soluble and generally considered more effective than ester formulations of the same chemicals injected into a tree's vascular system.

Only Tordon 101 Mixture was used in the two walnut stands; all three herbicides were used in the cottonwood stand.

Seventeen species (977 trees) were treated: American elm (**Ulmus americana** L.), black cherry (**Prunus serotina** Ehrh.), black walnut (**Juglans nigra** L.), black willow (**Salix nigra** Marsh.), box elder (**Acer negundo** L.), cottonwood (**Populus deltoides** Marsh.), dogwood (**Cornus stolonifera** Michx.), hackberry (**Celtis occidentalis** L.), hawthorn spp. (**Crataegus** L.), honey locust (**Gleditsia triacanthos** L.) Kentucky coffeetree (**Gymnocladus dioicus** [L.] K. Koch), mulberry spp. (**Morus** L.), osage orange (**Maclura pomifera** [Raf.] Schneid), red bud (**Cercis canadensis** L.), red elm (**Ulmus rubra** Muhl.), silver maple (**Acer saccharinum** L.), and sycamore (**Platanus occidentalis** L.).

Crown kill was observed during the first and second growing seasons. More than 90% of the injected trees the first year, and still more the second year had 100% crown kill from Tordon 101 Mixture (Table 1). Silver maple, with a 64% crown kill appears to be somewha difficult to control. Putting injections at closer spacing than 3 inches apart might improve its effectiveness on silver maple. Only a few trees produced basal stem sprouts after two growing seasons.

Picloram (Tordon 22K), 2,4-D (Formula 40), and picloram plus 2,4-D (Tordon 101 Mixture) were compared on 4 species in the cottonwood stand (Table 2). Only 2,4-D amine alone was ineffective on silver maple, while Tordon 101 Mixture was better (64% complete crown kill). Straight picloram (Tordon 22K) was 100% effective. Black willow and cottonwood appear to be easy to kill by any of the 3 herbicide formulations.

Table 1.—Effects of Tordon 101 Mixture on several hardwood species after two growing seasons.[1]

Species	Crown Kill, %		No. of Trees Treated
	Substantial[2]	Complete	
American elm	3	94	159
Black cherry		100	2
Black willow		100	20
Black walnut	4	93	256
Box elder	12	88	8
Cottonwood		100	59
Dogwood		100	2
Hackberry	25	70	20
Hawthorn		100	5
Honeylocust	1	91	161
Kentucky coffeetree		100	11
Mulberry	6	94	16
Osage orange	19	78	32
Red bud		100	5
Red elm	12	88	25
Silver maple		64	11
Sycamore		100	1
All species, avg.	3	92	793

1. Tordon 101 Mixture 1:1 with water basal-injected at 3-inch intervals during the summer at 3 sites.
2. Substantial ½ to nearly complete.

Table 2.—Effects of 2,4-D, Tordon 22K, and Tordon 101 Mixture after 2 growing seasons.[1]

Species	Herbicide Injected					
	2,4-D		Tordon 22K		Tordon 101	
	% Complete	No. Trees	% Complete	No. Trees	% Complete	No. Trees
Black willow	100	12	100	32	100	20
Cottonwood	100	45	100	57	100	59
Mulberry	100	1	100	3	100	6
Silver maple	9	11	100	17	64	11
Sycamore			100	3	100	1

1. Concentrated 2,4-D amine, Tordon 22K with 3 parts water; Tordon 101 Mixture 1:1 with water, each basal-injected at 3-inch intervals during growing season.

Discussion

Apparently basal-injected, Tordon herbicides (Tordon 101 Mixture and Tordon 22K) will effectively control ndesirable hardwood trees in eastern Kansas. Both are more effective than 2,4-D amine alone on the hard-to-kill silver maple during the growing season.

Comparative trials of 2,4-D amine and Tordon 101 Mixture on a variety of hardwood species in the mountains of Arkansas showed picloram effective on many species, including some resistant to 2,4-D alone (Ferguson and Lawson, 1975, Voeller and Holt, 1973). Tree species that we and others (Southwick, 1975) have controlled with Tordon 101 Mixture are listed in Table 3. Maples should not be injected during heavy sap flow because of the washing action of sap.

Tordon 101 Mixture, due to freezing temperature susceptibility, is difficult to use in the winter. A new ready-to-use product now sold includes anti-freeze. We are now testing that product during the dormant (winter) season.

Tree injection gradually exposes "crop" trees to environmental forces, while felling unwanted trees with a chainsaw immediately opens up the stand. The exposed cambial layer of cut stumps still require painting or spraying. In either immediate or delayed felling, unwanted trees may be used later as firewood.

Table 3.—Tree species effectively controlled with injected Tordon 101 Mixture.[1]

SPECIES	SPECIES
American beech	Hickory spp.
American elm	Honeylocust
Big tooth aspen	Kentucky coffeetree
Big leaf maple	Mulberry spp.
Black birch	Osage orange
Black cherry	Pecan
Black locust	Persimmon
Black gum	Post oak
Black oak	Red bud
Black oak (Calif.)	Red elm
Blackjack oak	Red maple
Black walnut	Red oak
Black willow	Scarlet oak
Box elder	Service berry
Chestnut oak	Silver maple
Cottonwood	Southern red oak
Eastern hophorn bean	Sugar maple
Eastern red cedar	Sweetgum
Elm spps.	Sycamore
Flowering dogwood	Tan oak (Calif.)
Gray birch	Winged elm
Green ash	White birch
Hackberry	White oak
Hawthorn	

1. Based on our study and those Southwick reviewed.

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Information in this report is for woodland owners, colleagues, industry cooperators, and other interested persons.

It is not a recommendation, but represents research at three locations.

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