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Trumpetcreeper response to selected herbicides

Steven L. Pyle

To the Graduate Council:

I am submitting herewith a thesis written by Steven L. Pyle entitled "Trumpetcreeper response to selected herbicides." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Plant, Soil and Environmental Sciences.

William A. Krueger, Major Professor

We have read this thesis and recommend its acceptance:

David L. Coffey, Larry S. Jeffery

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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TRUMPETCREEPER RESPONSE TO SELECTED HERBICIDES

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Steven L. Pyle

March 1984

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ABSTRACT

Field studies were conducted to: (1) attempt trumpetcreeper [Campsis radicans (L.) Seem.] control with preemergence and foliar postemergence herbicides labelled for use in no-till soybeans [Glycine max (L.) Merr.], (2) determine the effect of repeated paraquat (1,1'-dimethyl-4,4'-bipyridinium ion) applications and, (3) attempt trumpetcreeper control in non-cropped areas.

Trumpetcreeper was not controlled by preemergence herbicides labelled for use in soybeans. Foliar postemergence herbicides were applied when trumpetcreeper shoots were approximately 1 meter long. Glyphosate [N-(phosphonomethyl)glycine] gave the most complete control of trumpetcreeper of the postemergence herbicides labelled for use in soybeans. Acifluorfen [5-(2-chloro-4-(trifluoromethyl)phenoxy)-2-nitrobenzoic acid], and dinoseb (2-sec-butyl-4,6-dinitrophenol) alone or in combination with naptalam (N-1-naphthylphthalamic acid) or alachlor [2-chloro-2',6'-diethyl-N-(methoxymethyl)acetanilide], gave initial trumpetcreeper control, but regrowth occurred quickly.

Repeated paraquat applications did not control trumpetcreeper. Regrowth occurred when paraquat was applied at 4 or 2 week intervals; however, total shoot necrosis was observed after the third treatment, regardless of the application interval. Applications at 2 week intervals prevented the formation of leaves. Repeated paraquat applications did not appear to reduce trumpetcreeper stands the season following applications.

Several herbicides were evaluated for trumpetcreeper control in non-cropped areas. Dicamba (3,6-dichloro-o-anisic acid), 2,4-D [(2,4-dichlorophenoxy)acetic acid], glyphosate, SC-0224 (chemistry not released), 2,4,5-T[(2,4,5-trichlorophenoxy)acetic acid], and XRM-4660 (chemistry not released) gave near complete control during the season of application. Dicamba, fosamine [ethyl hydrogen (aminocarbonyl)phosphonate],glyphosate, and SC-0224 gave near complete control the season following applications with no regrowth.

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CHAPTER I

INTRODUCTION

Soil erosion is a major problem in Tennessee. Middle and West Tennessee soil loss from erosion averages 90 metric tons/ha/year with some areas losing 225 metric tons/ha/year (46,59). Tennessee soil loss transcends the national soil loss average of 20 metric tons/ha/year by four-fold (59,61). A soil loss of 11 metric tons/ha/year is considered acceptable. A decrease in sustained soil productivity may be observed if soil loss exceeds 11 metric tons/ha/year (3,59). Fewer farmers than ever before are producing food on a declining number of ha because land is being diverted to non-agricultural uses; therefore, extreme soil loss and subsequent decreases in productivity are intolerable if food demands for an increasing population are to be met (4,5).

No-till crop production is one management practice used to reduce soil erosion to an acceptable level. In one study comparing no-till to conventional tillage practices researchers found soil losses of 330 kg/ha/year in a no-till system compared to soil losses of 242,000 kg/ha/year using conventional tillage practices, a decrease of 700 fold in soil loss (36). In addition to reduced soil loss, other advantages of no-till over conventional practices are (1) increased land use, (2) energy conservation, (3) water conservation, (4) improved timing of field operations, and (5) less soil compaction (36).

Soybean production in Tennessee has increased from 571,000 ha planted in 1972 to more than 2,000,000 ha planted in 1982, making soybeans the leading cash crop in the state (6,8). No-till soybean production is gaining popularity. In 1982, 121,000 ha of soybeans were planted no-till into wheat (Triticum aestivum L.) stubble compared to 28,000 ha planted by the same method in 1977. Soybeans planted into wheat stubble is the most popular no-till system in Tennessee (10).

No-till farming is not without problems. Perennial vine populations in croplands have increased as no-till cropping systems have increased (30,51). Storage roots and shoots of these plants are left virtually undisturbed where tillage implements are not used (48,52,55). Perennial vines in an undisturbed site are allowed to grow, produce new roots and shoots, and increase root storage capacity. Left undisturbed, perennial vines become harder to control with herbicides and may eventually overtake croplands. The most viable alternative for vine control in no-till situations is the use of herbicides. The most troublesome perennial vines are those which grow most rapidly during midsummer, therefore it would be desirable to have an effective chemical control program for soybeans in the wheat-soybean double cropping system.

The University of Tennessee does not recommend no-till crop production in areas heavily infested with perennial vines (11). In areas where large populations of perennial vines exist, the producer must either take the land out of no-till production and control the vines by tillage methods, or attempt to control them by using herbicides within the no-till system.

Perennial species that have been observed in no-till soybean fields in Tennessee are: (1) Redvine (Brunnichia cirrhosa Goertn.), (2) honeyvine milkweed [Ampelamus albidus (Nutt.) Britt.], (3) field bindweed (Convolvulus arvensis L.), and (4) trumpetcreeper. Trumpetcreeper was chosen for the research reported in this thesis because among the perennial vines: (1) populations seem to be increasing at the fastest rate, (2) current control measures are inadequate, and (3) dense, natural stands are available on the research stations of West Tennessee. The objectives of this study were to: (1) attempt trumpetcreeper control with preemergence and foliar postemergence herbicides labelled for use in no-till soybeans, (2) determine the effect of repeated paraquat applications for two consecutive years on trumpetcreeper stands, and (3) attempt trumpetcreeper control in non-cropped areas.

CHAPTER II

LITERATURE REVIEW

A. Redvine Biology

Redvine, also known as eardrop, ladies' eardrop, buckvine, and buckwheat vine, is a member of the buckwheat (Polygonaceae) family (23,26,47). It is a perennial, woody, high climbing vine with tendrils extending from the ends of grooved stems (9,26,47,53). The stems are much branched and may be 2 cm thick at the base (7,23).

Redvine is a deep rooted vine having a crown 20 cm or more below the soil surface. From a single crown, several shoots and roots may emerge. Subterranean stems may bear additional stems often emerging as above ground shoots. Underground stems are much branched, woody, and viny. The destruction of a shoot may stimulate sprout formation from two or three of the closest joints (39).

The deciduous leaves are alternate with ovate to ovate-lanceolate blades 3 to 15 cm long (7,47). Lower spikes are solitary in the axils, but several of the uppermost spikes form a loose, leafless panicle (26).

Flowers are small and greenish with two to five in a cluster. Flowering and fertilization occur in August and September. The mature triangular fruits are brown, and 2.5 to 3.5 cm long with each side being 4 to 7 cm wide (23,26,47,53). Flowering and subsequent seed production seldom occur in cultivated fields; however, vegetative reproduction occurs from the extensive root system (12).

Redvine is distributed in the extreme southern coastal areas of the United States from Florida to Texas and north to Illinois along the Mississippi River Valley (7). Infestations in Tennessee are localized in the western part of the state along cleared river bottoms (23,26,53).

B. Redvine Control

Strachan and Duncan (50) evaluated the performance of dicamba applied in the fall on redvine. Dicamba applied at 1.1, 1.5, and 2.2 kg/ha gave 85 to 90 percent control nine months after treatments were applied. Significant regrowth of plants on plots treated with 1.1 kg/ha of dicamba resulted in only 70 percent control 12 months after application. Conversely, Baker (12) reported poor redvine control with 2.2 kg/ha of dicamba after one year. A dicamba application of 4.5 kg/ha produced excellent redvine control for three years, but injury to subsequent soybeans and cotton (Gossypium hirsutum L.) was noted one year after treatments were applied (12). Greater than 90 percent control of Redvine was reported with 2.2 kg/ha of dicamba (17). Dicamba (1.12 kg/ha) in combination with 2,4-D (0.56 kg/ha) and glyphosate (1.12 kg/ha) produced similar control to dicamba alone (17). Picloram (4-amino-3,5,6-trichloropicolinic acid) at 1.1 kg/ha gave redvine control comparable to dicamba with no injury reported in subsequent crops (12).

Powers et al. (38) reported fall applications of 2,4-D, 2,4,5-T, and their combinations produced 90 percent or better control of redvine for three years. Number two diesel fuel was used as a carrier at a rate of 40 to 45 liters/ha. Excellent seasonal control of redvine in non-cropped sites was noted by Rea (39) with 2,4,5-T and 2,4,5-TP [(2,4,5-trichlorophenoxy)propionic acid] when multiple applications were made per season. Redvine was suppressed vegetatively for 60 to 90 days after treatments were made in July.

A single summer or fall application of glyphosate at 3.4 kg/ha did not control redvine; however, redvine was controlled for one year with a sequential summer and fall application of glyphosate at 3.4 kg/ha (20). Defelice and Oliver (17) also reported excellent redvine control with sequential glyphosate treatments of 3.4 kg/ha in spring and fall, or summer and fall.

G. Honeyvine Milkweed Biology

Honeyvine milkweed, which is also called climbing milkweed, sand vine, blue vine, and honeyvine, is a member of the milkweed (Asclepiadaceae) family (26,53). It is a deep rooted, long, twining vine (53). Stems may climb 3 to 4 meters high (23).

The root system of honeyvine milkweed is very extensive. Vegetative reproduction occurs from the formation of new roots and shoots from subterranean bulbs (42). Soteres and Murray (48) reported the root system of honeyvine milkweed extended downward in excess of 200 cm and laterally 111 cm from the point of origin.

A single plant started from seed produced 45 daughter shoots in 131 days, furthermore, one vegetatively propagated segment produced 27 daughter shoots in 131 days.

Honeyvine milkweed leaves are opposite with long petioles. Leaves are triangular-lanceolate, deeply cordated with rounded basal lobes. Leaves are 3.5 to 12 cm long and 3.5 to 12 cm wide (22,23, 26,53).

Honeyvine milkweed produces small, whitish flowers that grow in clusters, and produce a sweet, sickening odor (42). Flowering and fertilization occur from July through September (23). Fifty pods per plant may be produced, with each pod containing 100 to 200 seeds. Each seed has a long, silky tuft of hair at its apex making it easily dispersed by wind (23,42). Very few if any new plants emerging in Illinois corn fields were seedlings (15).

Geographical distribution of honeyvine milkweed extends west from Alabama to Texas and north to Pennsylvania and Iowa (23). It is found in low, moist woods or fields, in fence rows, and in cultivated row crops (15,26,53).

D. Honeyvine Milkweed Control

Honeyvine milkweed was controlled by 2,4-D or 2,4,5-T applied at 1.1 kg/ha rate and their combinations at half this rate when applied in early summer before vines began climbing on corn (*Zea mays* L.) stalks. Later treatments required higher rates of 2,4-D and 2,4,5-T for adequate control (15). Timing is important.

Applications of 2,4-D and 2,4,5-T should be made before the bud or bloom stage and before vines are 30 cm long (21,22). Different formulations of 2,4-D may produce variable responses of honeyvine milkweed (21).

Foliar applications of 2,4-D or 2,4,5-T in combination with picloram resulted in excellent honeyvine milkweed control when applied in early summer. Picloram and dicamba combinations also gave good control (15); however, dicamba, bentazon [3-isopropyl-1H-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide], and atrazine [2-chloro-4-(ethylamino)-6-(isopropyl-amino)-s-triazine] alone were ineffective on honeyvine milkweed in corn (15,21). Acifluorfen may burn the tops of honeyvine milkweed in soybeans, but regrowth occurs quickly (22).

Selleck et al. (45) reported honeyvine milkweed control with 3.4 kg/ha glyphosate, but lesser rates were not effective. Similar results were noted by Fawcett (21) with glyphosate at 3.4 kg/ha. Glyphosate applications should be made in late summer to mature vines for complete control with no regrowth (22).

Intensive cultivation with a duckfoot cultivator at 2, 3, and 4 week intervals failed to eradicate honeyvine milkweed in 2 years. A significant population reduction was noted where cultivation occurred at 2 and 3 week intervals, but not at 4 week intervals (54).

Early emerging, closely planted crops such as alfalfa (*Medicago sativa* L.) and small grains are often effective in competing with honeyvine milkweed and subsequently reducing the stand (22).

E. Field Bindweed Biology

Field bindweed is a member of the morningglory (Convolvulaceae) family. Other names of field bindweed are wild morningglory, European bindweed, creeping jenny, and possession vine (18,19,37). This deep rooted perennial vine has slender glabrous to pubescent stems that are 1 to 3 meters long. The stems are twining and spread over the surface of the ground (7,26,53).

The root system is branched and very extensive, often 6 to 9 meters deep (7,9). Field bindweed was observed having a primary vertical taproot with numerous branch roots. Several of the more favorably located branch roots grew extensively and became permanent parts of the root system (24).

In a single season, one seedling under optimum conditions is able to produce a root system that penetrates 120 cm deep and extends outward 75 cm in all directions from the point of origin. In three growing seasons the root may extend downward 6 meters and outward forming a circle 5.5 meters in diameter (18).

Leaves are alternate, ovate-oblong in shape, glabrous and up to 5 cm long with lengthy petioles (7).

Flowers are usually white and sometimes pink. They are bell-shaped, 1.2 to 2.5 cm wide and 1.5 to 2.0 cm long and usually born singly in the axils of leaves. Flowering and fertilization occur from June through September, producing a straw colored spherical pod about 0.75 cm in diameter. The pods are two celled, with each cell containing two brownish-black seeds about 0.3 cm long. Each seed usually has one convex side and two flattened sides. The seed coat is slightly roughened (7,26,37,53). Reproduction occurs either from seeds or vegetatively from rootstocks.

The geographical distribution of field bindweed extends throughout the United States except the extreme Southeast. Heavy infestations in Tennessee are found in both cultivated and uncultivated conditions (7,53).

F. Field Bindweed Control

Less than 60 percent control of field bindweed was noted with 0.6 to 2.2 kg/ha of 2,4-D (13). A spring treatment of 2.2 kg/ha 2,4-D gave 62 percent control after 1 year (49). Davison (16) reported the aerial growth control of field bindweed for one season with 2,4-D, 2,4,5-T, or MCPA [((4-chloro-O-tolyl)oxy) acetic acid], each at 2.5 kg/ha. Ogg (35) and Schweizer et al. (44) recorded similar effects with 2,4-D. The addition of picloram to 2,4-D enhanced 2,4-D movement in field bindweed (1). Biannual 2,4-D applications gave more complete control than single applications. The first application in spring prevented seed production, killed susceptible plants, and weakened more resistant plants enabling the fall application to kill the remaining plants more efficiently (19).

Dicamba at 1.7 kg/ha gave acceptable field bindweed control (29). Dicamba (3.4 kg/ha) resulted in 90 percent control of field bindweed when applied at full bloom (13); conversely, only 62 percent control was noted with 4.4 kg/ha dicamba after one growing season (49). Schweizer et al. (44) reported 64 percent control of field bindweed with a single application of dicamba.

Dicamba alone at 1.1 kg/ha and in combination with 2,4-D at 0.6 and 1.1 kg/ha, respectively, gave excellent field bindweed control (60). Comparable results with combinations of 2,4-D and dicamba were achieved by Jones and Evans (29). The most effective field bindweed control in asparagus (*Asparagus officinalis* L.) was obtained with three applications of a 2,4-D and dicamba combination (35).

Glyphosate at 2.2 and 4.5 kg/ha resulted in 80 and 95 percent control, respectively, of field bindweed. When a second application was added, control was increased to 88 percent for 2.2 kg/ha and 99 percent for 4.5 kg/ha (28). When applied at full bloom, 4.5 kg/ha glyphosate resulted in 80 percent control 310 days after the treatment was applied (13). Fall applications of glyphosate resulted in near complete control of field bindweed (25). Others (16,60) also reported excellent control of field bindweed with glyphosate; however, some noted considerably less field bindweed control with glyphosate (41,49).

In non-cropped areas, field bindweed may be controlled with picloram and 2,3,6-TBA(2,3,6-trichlorobenzoic acid) (57,58).

Wiese (56) indicates the possible eradication of field bindweed with four to six applications of picloram over a 2 or 3 year period. Treatments were made at a rate of 0.3 kg/ha acid equivalent in a wheat-fallow-wheat rotation (56). Granular formulations were more effective than liquid formulations of picloram and 2,3,6-TBA. Increased control was due in part to longer persistence of granular formulations of these compounds (33).

Repeated applications of diquat [6,7-dihydrodipyrido(1,2-α:2',1'-C) pyrazinediium ion] at 1 kg/ha at 2 week intervals throughout the growing season reduced the size of underground parts of field bindweed (16). Trifluralin (α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine) severely reduced bindweed stands in direct seeded tomatoes (Lycopersicon esculentum Mill.), but diphenamid (N,N-dimethyl-2,2-diphenylacetamide) had no effect (32). During the year of treatment, dichlorprop [2-(2,4-dichlorophenoxy) propionic acid], MCPB[4-((4-chloro-o-tolyl)oxy)butyric acid] mecoprop [2-((4-chloro-o-tolyl)oxy)propionic acid], glyphosate, and dicamba gave near complete control in orchards (16).

In a study comparing different cropping systems and herbicide applications, field bindweed was most effectively controlled in a 3 year system of cultivation in combination with annual 2,4-D applications (43). Intensive cultivation in conjunction with 2,4-D applications greatly reduce field bindweed stands (18,19,57). Wiese and Phillips (57) indicate the need for tillage at 2 week intervals and the application of 2,4-D at rates ranging from 0.6 to 1.7

kg/ha (57). Derscheid (18) essentially eliminated field bindweed infestations in 1 year with intensive cultivation. Best results occurred when eight tillage operations were conducted throughout the growing season at 2 to 3 week intervals.

When tillage operations and 2,4-D applications are coupled with proper cropping systems, excellent field bindweed suppression and control can be achieved (18,19,43). Crops such as small grains, row crops, and perennial forage crops are effective in reducing field bindweed stands.

G. Trumpetcreeper Biology

Trumpetcreeper, also known as cowitch, cowitch vine, trumpetvine, and trumpetflower, is in the trumpetcreeper (Bignonaceae) family (7,14,53). It is native to the United States and because of its colorful flower, is often cultivated as an ornamental (2,7,14). The cultivation of trumpetcreeper has led to greater infestations and increased distribution of stands (2). It is a drought resistant, woody, perennial vine that is especially abundant and troublesome in the southeastern United States (17,31).

The stems are glabrous, woody, and viny, usually 6 to 12 meters long except in cultivated areas where stems are considerably shorter. Vines may grow 4 meters in a single season (7,9,52). Early shoot growth is erect, climbing by aerial rootlets. If support is not available once the shoots are 0.5 meter long, shoots will traverse along the ground (39,53).

Trumpetcreeper is a deep rooted vine that often becomes a problem in cultivated fields. The depth of the storage roots is well below the depth of any ordinary plow, which is about 15 cm (2). Vines often root at nodes as it spreads along the soil surface (52). Growth of roots and stems may be restricted by mowing, grazing, and conventional tillage practices; however, when roots and shoots are restricted in this manner, new branches may emerge. Apparently, repeated defoliation and the disturbance of the root system results in restricted plant growth, but it may persist several years under these conditions (2,52).

Leaves are opposite, 20 to 40 cm long, and pinnately compound. Each leaf has 3 to 13 ovate to lanceolate leaflets 4 to 8 cm long with toothed margins and rounded at the base (7).

The orange, trumpet-shaped flowers are 6 to 8 cm long and occur in stemmed clusters (9,14). Flowering and fertilization occur from May through September (14). Pollen is transported primarily by birds and insects, with very little, if any, carried by wind (27). The mature fruit is 10 to 20 cm long and encloses several hundred broadly winged seeds measuring 15 mm long by 7 mm wide (7,14,26). One sample yielded 300,000 seeds/kg. Results from four tests averaged 66 percent germination capacity (7).

Trumpetcreeper is found throughout the eastern half of the United States, except in the northern most areas. The heaviest infestations occur in the South (7,23). Habitats include fence rows, cultivated fields, pastures, gardens, low woods and thickets (23,53).

H. Trumpetcreeper Control

Chemical control of trumpetcreeper is dependent upon: (1) physiological stage of growth at the time of application, (2) the lack of environmental/physiological stress to the plants, and (3) applying the proper rate of herbicide and obtaining uniform spray coverage of the trumpetcreeper (34).

Trumpetcreeper under no-till systems was more vigorous and harder to control than under conventional tillage practices (40). Plants generated from short (10 cm) root segments were more easily controlled than those generated from long (45 cm) root segments. Root segments present in cultivated or tilled areas would be shorter, less vigorous, and more susceptible to herbicide treatments (51,52). Thompson (51) reported difficulty in controlling trumpetcreeper in no-till corn.

Trumpetcreeper was controlled with an application of 1.1 kg/ha 2,4-D, but regrowth occurred quickly (40,52). Dicamba appeared to be more effective than 2,4-D because of better absorption and translocation (51,52). Dicamba was slower acting initially than 2,4-D, but longer lasting control was observed (40). Fall applications of dicamba and 2,4-D combinations gave more complete season long control than either of the compounds alone (40).

Summer applications of a 1 to 2 percent v/v of formulated glyphosate gave 90 to 100 percent control of trumpetcreeper 200 days after the treatments were made (34). Rates exceeding 3.3 kg/ha were needed for favorable trumpetcreeper control in vineyards (45); however, as rates below 3.3 kg/ha increased, percentage control also increased (20). Two applications of glyphosate at 1.1 kg/ha in July and September gave essentially 100 percent control after 1 year (20). Dalapon (2,2 dichloropropionic acid) at 5.5 kg/ha controlled trumpetcreeper immediately after application, but only 30 percent control was recorded 102 days after the treatment (20).

I. Perennial Vine Interference

Perennial vines compete with crops for water, nutrients, and to some extent, light (60). Crop yields are frequently reduced 30 to 50 percent by severe field bindweed infestations (18,25). Eight South Dakota wheat fields showed an average yield reduction of 42 percent where field bindweed interfered with the crop (18). Similar field bindweed studies in Kansas indicated a 30 percent reduction in wheat yield over a 12 year period (60). Yield was reduced 33 percent in 12 South Dakota oat (*Avena sativa* L.) fields due to field bindweed interference. Barley (*Hordeum vulgare* L.) and grain sorghum (*Sorghum bicolor*) showed similar yield reductions from dense field bindweed populations. Barley yield was reduced 65 percent and grain sorghum 48 percent by field bindweed interference (18). DeFelice and Oliver (17) reported the possibility of soybean yield reductions because of redvine and trumpetcreeper interference. Thompson et al. (52) stated that trumpetcreeper vines covered young corn plants and restricted their growth.

In addition to crop interference, perennial vines interfere with normal tillage and harvest operations (12,17,52). The long, thick vines often become entangled in cultivators, combines, and other machinery. Perennial vines are troublesome in most all cropping situations where they occur.

CHAPTER III

MATERIALS AND METHODS

A. Trumpetcreeper Response to Herbicides Labelled for Use in Soybeans

Several herbicides used in soybeans were evaluated for trumpetcreeper response during 1982 and 1983 at two locations in Tennessee. Experiments were conducted in a typic fragiudalf (Loring silt loam) at Ames Plantation near Grand Junction and at the Milan Experiment Station, Milan. Plots were 1.8 meters by 6.1 meters and separated by 0.6 meter. The preemergence and post-emergence studies were arranged in a randomized complete block design with four replications.

Natural infestations of trumpetcreeper were utilized at both locations; however, at Ames Plantation some transplanting was necessary in order to obtain a minimum population of five plants per plot in some plots receiving postemergence treatments.

Herbicide applications were made using a hand-held carbon-dioxide powered sprayer calibrated to deliver 296 liters/ha in 1982 and 187 liters/ha in 1983 at 2.1 kg/cm^2 pressure.

Trumpetcreeper response to herbicides was evaluated using a visual rating system (Table 1). Total response (100 points) was divided into leaf response (60 points), stem response (20 points), and regrowth (20 points). Zero points indicates no response and 100

Table 1. Visual rating system used to evaluate the phytotoxic response[a] of trumpetcreeper to herbicides labelled for use in soybeans.

Response		Points
Leaf Response		60
No response	0	
Chlorosis	20	
Necrotic edges	20	
Chlorosis with necrotic edges	30	
50% no response; 50% chlorosis	30	
50% no response; 50% necrosis	30	
50% no response; 50% defoliation	30	
Complete necrosis	60	
Complete defoliation	60	
Stem Response		20
No response	0	
Partial necrosis	10	
Complete necrosis	20	
Regrowth		20
No initial necrosis	0	
Complete regrowth	0	
Partial regrowth	10	
No regrowth	20	
Total Response		100

[a]Major points can be interpolated.

points indicates apparent necrosis of the above ground portion of the plants. No soybeans were planted in this study.

Preemergence Herbicides

The preemergence herbicides (Table 2) evaluated for trumpetcreeper response were: alachlor, dinoseb in combination with naptalam, linuron [3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea], metolachlor [2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide], metribuzin [4-amino-6-*tert*-butyl-3-(methylthio)-*as*-triazin-5(4*H*)-one], and oryzalin (3,5-dinitro-N^4,N^4-dipropylsulfanilamide). Applications were made to coincide with double-cropped soybean planting dates in Tennessee. Treatments were applied June 14, 1982, and June 16, 1983, at Ames Plantation and June 24, 1982, and June 17, 1983, at the Milan Experiment Station. Paraquat at 0.6 kg/ha and surfactant at 1.5 ml/liter were combined with the preemergence herbicides to kill trumpetcreeper shoots and other existing vegetation at the time of application. The plot area was clipped at approximately 30 cm prior to applications at both locations in 1983 to reduce interference from other weeds.

Postemergence Herbicides

The postemergence treatments (Table 3) evaluated for trumpetcreeper response were: acifluorfen, bentazon, 2,4-DB [4-(2,4-dichlorophenoxy)butyric acid], dinoseb, dinoseb plus alachlor, dinoseb plus naptalam, glyphosate, linuron, metribuzin, metribuzin plus 2,4-DB, naptalam plus 2,4-DB, oxyfluorfen

Table 2. Preemergence herbicides labelled for use in soybeans evaluated for trumpetcreeper response, Ames Plantation and Milan Experiment Station, 1982 and 1983.

Treatment	Rate
	(kg/ha)
Alachlor*	2.8
Dinoseb + naptalam*	1.7 + 3.4
Linuron*	1.1
Metolachlor*	2.2
Metribuzin*	0.6
Oryzalin*	1.1

*Paraquat (0.6 kg/ha) + ortho X-77 surfactant (1.5 ml/liter) tank mixed with preemergence herbicides.

Table 3. Postemergence herbicides labelled for use in soybeans evaluated for trumpetcreeper response, Ames Plantation and Milan Experiment Station, 1982 and 1983.

Treatment	Rate
	(kg/ha)
Acifluorfen	0.6
Bentazon	1.7
2,4-DB	0.6
Dinoseb	1.7
Dinoseb + alachlor	1.7 + 2.8
Dinoseb + naptalam	1.7 + 3.4
Glyphosate	3.4
Linuron*	0.6
Metribuzin*	0.6
Metribuzin + 2,4-DB*	0.6 + 0.3
Naptalam + 2,4-DB	3.4 + 0.3
Oxyfluorfen + 2,4-DB	0.6 + 0.2
Paraquat*	0.6

*Ortho X-77 surfactant added (1.5 ml/liter).

[2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene] plus 2,4-DB, and paraquat. Applications were made over-the-top of trumpetcreeper when shoots were approximately 1 meter long. Paraquat (0.6 kg/ha) plus metolachlor (2.2 kg/ha) plus surfactant (1.5 ml/liter) were tank mixed and applied 1 month prior to the postemergence applications for annual grass control. The plot area was clipped at approximately 30 cm prior to applications at both locations in 1983 to reduce interference from other weeds. Sethoxydim [2-(1-(ethoxyimino)butyl)-5-(2-ethylthio)propyl)-3-hydroxy-2-cyclohexen-1-one] was applied in 1983 at Ames Plantation for midseason grass control.

Paraquat

Trumpetcreeper was evaluated for response to repeated paraquat applications. Paraquat (0.6 kg/ha) plus surfactant (1.5 ml/liter) was applied at 2 or 4 week intervals throughout two growing seasons (Table 4). The paraquat treatments used each year were: (1) no application (weedy check), (2) one application in June, (3) applications at 4 week intervals, and (4) applications at 2 week intervals. The first paraquat application each year was combined with metolachlor at 2.2 kg/ha for annual grass control. The treatments were arranged in a Latin square design with four treatments repeated four times. Plots were clipped at approximately 30 cm prior to the first paraquat application at both locations in 1983 to reduce interference from other weeds.

Table 4. Intervals of paraquat[a] applications, Ames Plantation and Milan Experiment Station, 1982 and 1983.

Treatments	Weeks After Initial Application					
	0[b]	2	4	6	8	10
Paraquat (1 application)	X					
Paraquat (4 week intervals)	X		X		X	
Paraquat (2 week intervals)	X	X	X	X	X	X
Weedy check	-	-	-	-	-	-

[a]Paraquat (0.6 kg/ha) + Ortho X-77 surfactant (1.5 ml/liter).

[b]Initial applications made June 22, 1982 and June 23, 1983.

B. Trumpetcreeper Control with Herbicides Used in Non-cropped Areas

Several herbicides used in non-cropped areas (Table 5) were evaluated for trumpetcreeper control in 1982 and 1983 at the Milan Experiment Station, Milan, Tennessee. The herbicides used in this study were: 2,4-D, dicamba, fosamine, glyphosate, hexazinone [3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione], prometon [2,4-bis(isopropylamino)-6-methoxy-s-triazine], SC-0224, 2,4,5-T, tebuthiuron [N-(5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl)-N,N'-dimethylurea], triclopyr [((3,5,6-trichloro-2-pyridinyl)oxy)acetic acid], sulfometuron methyl [methyl 2-(((((4,6-dimethyl-2-pyrimidinyl)amino)carbonyl)amino)sulfonyl)benzoate], and XRM-4660. The experiment was conducted in a typic hapludalf (Memphis silt loam) soil. Individual plots were 3.7 meters by 6.1 meters with 0.9 meter separating plots. The experimental design was a randomized complete block with four replications.

The area used in this study had not been cropped for several years. Trumpetcreeper density was approximately 3 plants/square meter. Plants were vigorous, each containing one to four shoots, with some shoots more than 6 meters long.

The herbicide treatments were applied using a hand-held carbon-dioxide powered sprayer calibrated to deliver 384 liters/ha at 2.1 kg/cm^2 pressure. Treatments were applied July 21, 1982 and evaluated two times in 1982 and one time in 1983.

Table 5. Herbicides used in non-cropped areas evaluated for trumpetcreeper control, Milan Experiment Station, 1982 and 1983.

Treatment	Rate
	(kg/ha)
2,4-D	4.5
Dicamba	9.0
Fosamine	13.4
Glyphosate	3.4
Hexazinone	13.4
Prometon	16.8
SC-0224	3.4
Sulfometuron methyl	0.8
2,4,5-T	4.5
Tebuthiuron	2.2
Triclopyr	3.4
XRM-4660	3.4

A visual rating system (Table 6) was used to evaluate trumpetcreeper control with herbicides used in non-cropped areas in 1982. Percentage control was obtained from assigning points to leaf response (30 points), stem response (20 points), and regrowth (50 points). A rating of zero points indicates 0 percent control and a rating of 100 points indicates 100 percent control. Trumpetcreeper control in 1983 was determined by comparing treated plots with untreated controls and expressing the results as percentage control.

C. Trumpetcreeper Control with Glyphosate and SC-0224

A study was initiated to compare the response of trumpetcreeper to glyphosate and SC-0224 at the Milan Experiment Station, Milan, Tennessee. Experiments were conducted on a typic fragiaqualf (Henry silt loam) soil. Treatments were applied vertically from top to bottom to existing stands of trumpetcreeper that were intertwined with and supported by a chain-link fence. The stand has been present for at least 20 years. Plots were 3 meters by 3 meters vertically on the chain-link fence with 3 meters separating each plot. The experimental design was a randomized complete block with four replications. Treatments were applied with a hand-held carbon-dioxide powered sprayer calibrated to deliver 295 liters/ha at 2.1 kg/cm^2 pressure.

Glyphosate at 3.4 kg/ha and SC-0224 at 2.2 kg/ha, 3.4 kg/ha, and 4.5 kg/ha were applied on July 9, 1982. Percentage control was

Table 6. Visual rating system[a] used to evaluate trumpetcreeper control with herbicides used in non-cropped areas.

Response		Points
Leaf Response		30
No response	0	
Chlorosis	10	
Necrotic edges	10	
Chlorosis with necrotic edges	15	
50% no response; 50% chlorosis	5	
50% no response; 50% necrosis	15	
50% no response; 50% defoliation	15	
Complete necrosis	30	
Complete defoliation	30	
Stem Response		20
No response	0	
Partial necrosis	10	
Complete necrosis	20	
Regrowth		50
No initial necrosis	0	
Complete regrowth	0	
Partial regrowth	25	
No regrowth	50	
Total Response		100

[a]Major points can be interpolated.

determined two times in 1982 using the visual rating system for non-cropped areas (Table 6) and one time in 1983 comparing the treated plots with untreated control plots.

CHAPTER IV

RESULTS AND DISCUSSION

A. Trumpetcreeper Response to Herbicides Labelled for Use in Soybeans

Preemergence Herbicides

Alachlor, dinoseb plus naptalam, linuron, metolachlor, metribuzin, and oryzalin applied in combination with paraquat to existing trumpetcreeper did not give adequate control. Total necrosis was observed 2 weeks after applications were made, but regrowth was observed. All symptoms and damage to trumpetcreeper resulted from paraquat activity. The treatments, usually applied preemergence to soybeans did not affect the resumption of growth or the rate of regrowth and were not effective on trumpetcreeper.

Postemergence Herbicides

The average response of trumpetcreeper to postemergence herbicides in 1982 and 1983 is summarized in Table 7 for Ames Plantation and in Table 8 for the Milan Experiment Station. Percentage control was variable between locations and years because of differing environmental factors. Lynn et al. (34) reported the importance of uniform spray coverage when controlling trumpetcreeper. An extremely dense stand of non-target weeds prevented adequate spray coverage at the Milan Experiment Station in 1982 resulting in less response than at Ames Plantation in 1982 and

Table 7. Trumpetcreeper response to postemergence herbicides, Ames Plantation, 1982 and 1983.[a]

	Trumpetcreeper Response							
	Time After Application							
	1982				1983			
Treatments	2 Weeks		3 Weeks		2 Weeks		3 Weeks	
	-------------------(%)-------------------							
Acifluorfen	38	def	43	bc	63	bcde	14	bcd
Bentazon	28	efg	29	bcde	35	fgh	13	bcd
2,4-DB	25	efg	13	cde	18	hi	28	bc
Dinoseb	55	cd	35	bcd	45	fgh	15	bcd
Dinoseb + alachlor	95	a	75	a	54	cdef	10	cd
Dinoseb + naptalam	29	efg	38	bcd	74	bc	11	cd
Glyphosate	78	ab	78	a	100	a	100	a
Linuron	40	de	23	cde	50	defg	25	bc
Metribuzin	31	efg	30	bcde	28	gh	11	cd
Metribuzin + 2,4-DB	33	efg	40	bcd	71	bcd	33	b
Naptalam + 2,4-DB	15	fgh	8	de	16	hi	19	bcd
Oxyfluorfen + 2,4-DB	11	gh	8	de	13	hi	15	bcd
Paraquat	73	ab	60	ab	78	b	12	cd
Weedy check	0	h	0	e	0	i	0	d

[a]Means within a column followed by the same letter are not significantly different at the .05 level by Duncan's multiple range test.

Table 8. Trumpetcreeper response to postemergence herbicides, Milan Experiment Station, 1982 and 1983.[a]

Treatments	Trumpetcreeper Response — Time After Application							
	1982				1983			
	2 Weeks		4 Weeks		2 Weeks		4 Weeks	
	(%)							
Acifluorfen	28	abc	3	bc	93	a	45	b
Bentazon	8	cd	18	bc	26	de	15	e
2,4-DB	10	cd	18	bc	20	e	0	f
Dinoseb	10	cd	5	bc	75	bc	28	d
Dinoseb + alachlor	20	abcd	3	bc	69	c	43	bc
Dinoseb + naptalam	15	bcd	6	bc	73	c	40	bc
Glyphosate	33	ab	38	a	84	ab	90	a
Linuron	14	bcd	0	c	33	d	0	f
Metribuzin	15	bcd	20	b	28	de	13	e
Metribuzin + 2,4-DB	36	a	15	bc	34	d	15	e
Naptalam + 2,4-DB	10	cd	15	bc	20	e	0	f
Oxyfluorfen + 2,4-DB	20	abcd	5	bc	20	e	10	rf
Paraquat	35	ab	15	bc	79	bc	33	cd
Weedy check	0	d	0	c	0	f	0	f

[a]Means within a column followed by the same letter are not significantly different at the .05 level by Duncan's multiple range test.

both locations in 1983 for most treatments. Researchers (51,52) have stated that trumpetcreeper plants regenerated from short root segments are more susceptible to herbicide injury than plants regenerated from long root segments. Plants regenerated from transplanted root segments at Ames Plantation in 1982 and treated with foliar post-emergence herbicides were more easily injured than plants in naturally occurring stands at either location in 1983.

Severe necrosis of trumpetcreeper leaves and stems occurred within 2 weeks of a glyphosate application. Response at the Milan Experiment Station in 1982 was only 38 percent, probably because of poor spray coverage in the dense growth. Glyphosate treatments gave 78 percent control at Ames Plantation in 1982. Near complete season long control was observed at both locations in 1983. Little, if any, regrowth was observed on trumpetcreeper plants treated with glyphosate. Similar trumpetcreeper control by glyphosate has been reported by others (20,34,45).

Trumpetcreeper response to acifluorfen was variable. Initial phytotoxic response at Ames Plantation and the Milan Experiment Station was 63 percent and 93 percent in 1983 and 38 percent and 28 percent in 1982, respectively. Variable trumpetcreeper response with acifluorfen is probably a result of variable amounts of soil moisture between locations and years. Low soil moisture promotes environmental stress to the plants, thus making them more susceptible to acifluorfen activity. Acifluofen provided some necrosis of stems and leaves 2 weeks after treatment applications;

however, considerable regrowth was observed after 4 weeks. Fawcett (22) stated that regrowth occurred quickly after acifluorfen burned the tops of honeyvine milkweed.

Dinoseb resulted in good trumpetcreeper leaf and stem necrosis 2 weeks after treatments were applied. It gave 75 percent initial control at the Milan Experiment Station in 1983. Results were less at Ames Plantation with 55 percent and 45 percent for 1982 and 1983, respectively. The response of trumpetcreeper at the Milan Experiment Station in 1982 was only 10 percent, probably because of poor spray coverage.

Dinoseb in combination with naptalam showed similar results to dinoseb alone. Trumpetcreeper response was approximately 74 percent in 1983, but response to this treatment was considerably less in 1982.

Dinoseb in combination with alachlor gave variable responses. Trumpetcreeper response was 69 percent at the Milan Experiment Station in 1983, but only 20 percent in 1982 because of poor spray coverage. The treatment at Ames Plantation gave 54 percent response in 1983; however, 95 percent response was observed in 1982 because of trumpetcreeper transplant susceptibility to herbicides.
Dinoseb alone and in combination with naptalam or alachlor resulted in considerable regrowth of trumpetcreeper after two weeks.

Paraquat gave approximately 75 percent initial suppression of trumpetcreeper. Plants appeared completely necrotic, but within 2 weeks considerable regrowth was observed. Percentage response was less at the Milan Experiment Station in 1982 because of poor spray coverage.

Bentazon, 2,4-DB, linuron, metribuzin, metribuzin plus 2,4-DB, naptalam plus 2,4-DB, and oxyfluorfen plus 2,4-DB all consistently gave less than 50 percent response in both years and at both locations. The only exception is metribuzin in combination with 2,4-DB which gave 71 percent response at the Milan Experiment Station in 1983.

Paraquat

Paraquat, applied one time to trumpetcreeper, did not give season long control. A single application resulted in complete necrosis of leaves and severe damage to stems and shoots within 2 days; however, regrowth occurred shortly thereafter. Paraquat gave 70 percent suppression 2 weeks after treatments were applied, 35 percent 4 weeks after treatments were applied, and 10 percent 6 weeks after treatments were applied. No trumpetcreeper suppression was noted after 6 weeks. Results from paraquat applications to trumpetcreeper at Ames Plantation and the Milan Experiment Station in 1982 and 1983 were consistent (Table 9).

Paraquat applied at 4 week intervals suppressed trumpet-creeper 70 percent after 2 weeks and 35 percent after 4 weeks. Total stem necrosis was observed after the third paraquat application resulting in 80 percent suppression after 2 weeks and 45 percent suppression after 4 weeks. Regrowth was observed after each treatment.

Table 9. Trumpetcreeper suppression[a] with paraquat, Ames Plantation and Milan Experiment Station, 1982 and 1983.

	Trumpetcreeper Suppression							
	Weeks After Initial Application							
Treatments[b]	0	2	4	6	8	10	12	14
	(%)							
Paraquat (1 application)	0*	70	35	10	0	0	0	0
Paraquat (4 week intervals)	0*	70	35*	70	35*	80	45	20
Paraquat (2 week intervals)	0*	70*	70*	80*	80*	80*	80	45
Weedy check	0	0	0	0	0	0	0	0

[a]Plant suppression occurred after each paraquat application, but regrowth always occurred.

[b]Paraquat (0.6 kg/ha) + surfactant (1.5 ml/liter).

*Paraquat applied.

Paraquat, applied at 2 week intervals, prevented leaf formation in trumpetcreeper. Shoots and stems were partially necrotic until after the third paraquat application, when total necrosis occurred. Regrowth occurred after each treatment; however, suppression was maintained at 80 percent after the third treatment.

Complete trumpetcreeper suppression with paraquat was not achieved regardless of application intervals. Regrowth always occurred. Applications of paraquat throughout the summer of 1982 did not reduce trumpetcreeper stands the following spring; however, when treatments were applied at 2 or 4 week intervals, viable shoots did not exist at the end of the season. Davison (16) reported that diquat sprayed on field bindweed reduced the size of underground parts when applied at 2 week intervals. Similar results can be expected with paraquat on trumpetcreeper, but visual observations of above ground parts cannot confirm this. Observations of these plots will continue in the summer of 1984.

B. Trumpetcreeper Control with Herbicides Used in Non-cropped Areas

The average response of trumpetcreeper to herbicides used in non-cropped areas at the Milan Experiment Station is summarized in Table 10.

Trumpetcreeper control from 2,4-D was 100 percent 7 weeks after treatments were applied, but only 20 percent after 15 months because of regeneration from old root tissue. Similar results were

Table 10. Control of trumpetcreeper in non-cropped areas following herbicide applications in 1982, Milan Experiment Station.[a]

Treatments[b]	Trumpetcreeper Control Time After Application 1 Week		6 Weeks		15 Months	
	--------	--------	(%)	--------	--------	--------
2,4-D	89	a	100	a	20	c
Dicamba	100	a	100	a	96	a
Fosamine	31	cd	21	c	95	a
Glyphosate	15	de	96	a	98	a
Hexazinone	70	ab	43	b	40	b
Prometon	93	a	28	c	15	c
SC-0224	45	bc	90	a	94	a
Sulfometuron methyl	11	de	21	c	15	c
Tebuthiuron	29	cd	16	c	48	b
Triclopyr	100	a	100	a	83	a
XRM-4660	94	a	100	a	75	a
Weedy check	0	e	0	d	0	c

[a]Means within a column followed by the same letter are not significantly different at the .05 level by Duncan's multiple range test.

[b]Treatments applied July 21, 1982.

reported with 2,4-D on redvine (38,39), honeyvine milkweed (15,21,22), field bindweed (13,49,16,35,44) and trumpetcreeper (40,52) by others. Fawcett (21) reported less regrowth could be expected if applications to honeyvine milkweed were made before the bloom stage when vines were less than 30 cm long. Similar results can be expected with trumpetcreeper.

Trumpetcreeper responses to 2,4,5-T were similar to those from 2,4-D. Near complete control was recorded after 7 weeks, but only 43 percent control was recorded after 15 months because of regeneration from old root tissue. Results of 2,4,5-T applications to trumpetcreeper are in agreement with results of its application to perennial vines by other researchers (15,16,38,39). More complete control may have been achieved if 2,4,5-T had been applied prior to the bloom stage when vines were less than 30 cm long (21).

Dicamba gave 100 percent trumpetcreeper control throughout the season of application and 96 percent control after 15 months. Little, if any, regrowth occurred. Acceptable perennial vine control was obtained with dicamba by several researchers (12,13, 17,29,44,49,50,51,52,60); however, substantial regrowth was noted by some (12,49,50).

Fosamine did not give adequate trumpetcreeper control during the season of application, but 95 percent control was recorded after 15 months. The chemical properties of fosamine are such that it requires several months to move downward into the soil profile before roots can adequately absorb the compound.

Hexazinone gave 70 percent trumpetcreeper control after 1 week, 43 percent control after 7 weeks, and 40 percent control after 15 months. Poor control was obtained because no surfactant was added to the hexazinone.

Glyphosate gave 15 percent trumpetcreeper control 1 week after treatments were applied and 96 percent control 7 weeks after treatments were applied. Trumpetcreeper control was 98 percent 15 months after glyphosate was applied. Virtually no regrowth was observed. Acceptable perennial vine control with glyphosate has been reported by several researchers (13,16,20,21,22,25,28,34,45,60).

SC-0224 gave 45 percent trumpetcreeper control 1 week after the treatment was applied. Control was 90 percent after 7 weeks and 94 percent after 15 months with little, if any, regrowth.

Tebuthiuron did not give adequate trumpetcreeper control. It is speculated that the compound was not moved into the soil profile because of inadequate rainfall.

Triclopyr gave complete trumpetcreeper control in 1982 and 83 percent control 15 months after the treatment was applied. XRM-4660 gave complete season long control and 75 percent control after 15 months. Prometon defoliated trumpetcreeper, but regrowth occurred quickly. Trumpetcreeper showed tolerance to sulfometuron methyl.

C. Trumpetcreeper Control with Glyphosate and SC-0224

The average response of trumpetcreeper to glyphosate and SC-0224 at the Milan Experiment Station is summarized in Table 11. Glyphosate at 3.4 kg/ha and SC-0224 at 2.2, 3.4, and 4.5 kg/ha gave 100 percent control 4 days after the treatments were applied. Complete control was observed on all treatments 15 months after treatments were applied. No trumpetcreeper regrowth was noted with any treatments.

Lynn et al. (34) stated the importance of optimum environmental conditions for maximum trumpetcreeper control with glyphosate. Normal glyphosate activity and subsequent phytotoxic symptoms usually require at least 2 weeks; however, complete trumpetcreeper control was observed in 4 days at the Milan Experiment Station. High temperatures (30 C) coupled with 5 cm of rainfall prior to the applications resulted in a high relative humidity at the time of application.

Table 11. Trumpetcreeper control following glyphosate and SC-0224 applications in 1982, Milan Experiment Station.[a]

Treatment[b]	Rate	Trumpetcreeper Control July 13, 1982	Trumpetcreeper Control Sept. 8, 1982	Trumpetcreeper Control Sept. 26, 1983
	(kg/ha)	(%)	(%)	(%)
Glyphosate	3.4	100 a	100 a	100 a
SC-0224	2.2	100 a	100 a	100 a
SC-0224	3.4	100 a	100 a	100 a
SC-0224	4.5	100 a	100 a	100 a
Weedy check	---	0 b	0 b	0 b

[a]Means within a column followed by the same letter are not significantly different at the .05 level by Duncan's multiple range test.

[b]Treatments applied July 9, 1982.

CHAPTER V

SUMMARY

The purpose of this study was to: (1) attempt trumpetcreeper control with preemergence and foliar postemergence herbicides labelled for no-till soybeans, (2) determine the effect of repeated paraquat applications for two consecutive years on trumpetcreeper stands, and (3) attempt trumpetcreeper control in non-cropped areas.

Field experiments were conducted at Ames Plantation and at the Milan Experiment Station in 1982 and 1983 to determine the response of trumpetcreeper to six preemergence and 13 postemergence herbicides labelled for use in soybeans. The preemergence herbicides were applied to coincide with soybean planting dates in Tennessee; however, no soybeans were planted. Trumpetcreeper was not controlled by preemergence herbicides. Postemergence herbicides were applied to trumpetcreeper when shoots were approximately 1 meter long. Glyphosate gave the most complete season long trumpetcreeper control with no regrowth. Acifluorfen, and dinoseb alone or in combination with either naptalam or alachlor, gave initial trumpetcreeper suppression but regrowth occurred quickly.

Paraquat, applied at 4 week or 2 week intervals to trumpet-creeper, did not give adequate control at Ames Plantation or the Milan Experiment Station in 1982 or 1983. Regrowth always occurred; however, total shoot necrosis was observed after the third application regardless of the application interval. Paraquat applications at 2 week intervals prevented the formation of leaves. Repeated paraquat applications did not appear to reduce trumpet-creeper stands the season following applications.

Thirteen herbicides used in non-cropped areas were evaluated for trumpetcreeper control at the Milan Experiment Station. Dicamba, 2,4-D, glyphosate, SC-0224, 2,4,5-T, triclopyr, and XRM-4660 gave almost complete trumpetcreeper control during the season of application. Dicamba, fosamine, glyphosate, and SC-0224 gave almost complete control the season following applications.

Glyphosate or SC-0224 when applied to existing trumpetcreeper stands at the Milan Experiment Station provided excellent control without regrowth. No difference in efficacy was observed between the two compounds.

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LITERATURE CITED

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APPENDIXES

APPENDIX A

Table A-1. Rainfall data, Ames Plantation, 1982.

Day	May	June	July	Aug.	Sept.
	(cm)				
1		2.66	1.60		
2			0.20		
3		0.23			0.15
4		1.70	0.89		
5		0.99			
6				3.05	
7	0.25			0.84	
8	1.14			0.66	
9			0.58	0.03	
10		0.36		0.20	
11			0.53		
12		0.08	T	1.07	
13		0.03		T	1.40
14				2.57	
15	0.53			0.08	0.51
16	0.40	1.78		0.13	3.83
17		0.10		1.30	
18					
19					0.25
20	1.44				0.08
21	0.10		1.70		
22		0.41			
23	0.53		0.08		
24			0.03		T
25	1.55		T	T	T
26	1.37	0.46		0.56	
27	0.53				T
28	1.85	0.10		1.12	
29		1.29	0.03		
30					
31			3.58	0.91	
Total	9.69	10.19	9.22	12.53	6.22

APPENDIX B

Table A-2. Rainfall data, Milan Experiment Station, 1982.

Day	May	June	July	Aug.	Sept.
	(cm)				
1	T	T			
2	0.99				
3		0.23			0.33
4			0.28		
5			7.09		
6					
7	0.64		T		
8	0.46		T		
9			5.08	0.15	0.15
10		2.49			
11					
12		0.15			0.05
13		0.03			34.54
14				2.31	
15	T				
16	1.55	2.08		0.13	0.53
17	0.81	0.30		0.08	
18					
19			0.30		T
20	0.20				0.08
21	0.76				
22			0.05		
23	1.30				
24			0.23	3.56	0.03
25	T		T	0.30	0.10
26	0.08	0.51			2.06
27	T	0.81			
28	0.69	0.05			
29	T	0.20	1.09		
30		0.13			
31			0.85	0.56	
Total	7.48	6.98	14.97	7.09	37.87

APPENDIX C

Table A-3. Rainfall data, Ames Plantation, 1983.

Day	May	June	July	Aug.	Sept.
	(cm)				
1	3.35		0.05		
2					
3	2.24			1.40	
4	0.05	3.23			
5			0.33		
6			0.33	0.03	
7					
8				1.50	T
9					0.10
10					0.79
11					
12	3.58			2.57	1.60
13	T				
14					T
15	3.71	0.66			
16	1.02				
17					
18		4.54			
19	7.49				
20					T
21	0.89				3.00
22	3.02	T			
23					
24		0.20			
25					
26	1.88		1.65		0.03
27		0.25			
28		T			
29	1.98	T			
30		6.17			
31	T				
Total	29.21	15.05	2.36	5.50	5.52

APPENDIX D

Table A-4. Rainfall data, Milan Experiment Station, 1983.

Day	May	June	July	Aug.	Sept.
	--------	--------	(cm)	--------	--------
1					
2			5.08		
3	0.95				
4					
5					
6					
7	0.15				
8					
9					
10	1.10				
11					
12					
13					
14		5.08			
15					
16		1.78			
17	3.10				
18	3.65				
19					
20		1.68			
21	1.20				
22					
23		2.03			
24					
25					
26		0.51			0.51
27		1.98			
28					
29		7.62			
30					
31					
Total	10.15	20.68	5.08	0.00	0.51

APPENDIX E

Table A-5. Trade names of herbicides used in this study.

Common or Code Name	Trade Name
Acifluorfen	Blazer
Alachlor	Lasso
Bentazon	Basagran
2,4-D	Formula 40
2,4-DB	Butoxone
Dicamba	Banvel
Dinoseb	Premerge 3
Fosamine	Krenite
Glyphosate	Roundup
Hexazinone	Velpar
Linuron	Lorox
Metolachlor	Dual
Metribuzin	Sencor
Naptalam	Alanap
Oryzalin	Surflan
Oxyfluorfen	Goal
Paraquat	Paraquat
Prometon	Pramitol
SC-0224	Not released
Sulfometuron methyl	Oust
2,4,5-T	Veon 245
Tebuthiuron	Spike
Triclopyr	Garlon
XRM 4660	Not released

VITA

Steven L. Pyle was born on May 18, 1959, in Dothan, Alabama. He is the son of Mr. and Mrs. Clayton M. Pyle of Maryville, Tennessee. He attended public schools in Maryville, Tennessee, at Fairview Elementary School, Maryville Junior High School, and Maryville High School where he graduated in May 1977. He entered Middle Tennessee State University, Murfreesboro, in September 1977 and earned his Bachelor of Science degree with honors in May 1981, with a major in Plant and Soil Science. He entered the Graduate School at The University of Tennessee, Knoxville, in September 1981. He received the Master of Science degree in Plant and Soil Science with emphasis in weed science in March 1984. He was a Graduate Research Assistant in the Department of Plant and Soil Science. He is a member of the Weed Science Society of America, Southern Weed Science Society, and Tennessee Agricultural Chemicals Association.