Roadside Development and Erosion Control

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16. ABSTRACT The information contained within this report addresses: 1) Implementation of roadside development and erosion control results, 2) Herbicide evaluation for the effective and economical eradication of undesirable roadside vegetation, 3) Evaluation of species and cultural practices for ground cover establishment, and 4) Fertilizer evaluations for maintenance of ground covers. The following are recommendations based upon the research results. 1) For control of johnsongrass alone or intermixed with silver bluestem, and bermudagrass release, apply 1.5 pints of Roundup plus 2 ounces of Oust in 20 to 40 gallons of water per acre during May after the bermudagrass has broken dormancy. 2) To control silver bluestem alone, apply 1.5 to 2.0 pints of Roundup in 20 to 40 gallons of water per acre during May, prior to seedhead formation. 3) For brush control: a) June application of 1 gallon Tordon K plus 1 gallon Garlon 4 in 50 gallons of water per acre (broadcast) or 100 gallons of water per acre (applied with handgun and spraying foliage to wet), or b) Krenite S at 3 gallons plus a crop oil in 50 gallons of water per acre (broadcast) or in 100 gallons of water per acre (handgun) applied in August to October, prior to first fall coloration; or c) Roundup at 1.5 gallons in 98.5 gallons of water per acre and applied as a spot-treatment with handgun only. 4) Kochia can be effectively controlled with a preemergence application of Karmex 80W at 3 pounds product in 25 to 40 gallons of water per acre, applied in February or early March, or a postemergence application of Banvel at 0.5 pounds active ingredient in 25 to 40 gallons of water per acre, applied in May or early June. 5) For preemergence control of annual grasses and broadleaf weeds, apply atrazine at 2 pounds active ingredient in 20 to 40 gallons of water per acre in February and not later than March 15. Karmex 80W can be used also at the same rate as given above for Kochia control.

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ROADSIDE DEVELOPMENT AND EROSION CONTROL

FINAL REPORT

by

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in cooperation with

The Department of Transportation

and

The Federal Highway Administration

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Oklahoma Department of Transportation and the Federal Highway Administration.

In order that the information in this publiction may be more useful, it was sometimes necessary to use tradenames of products, rather than complicated chemical names. As a result it is unavoidable in some cases that similar products which are on the market under other tradenames may not be cited. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

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EXECUTIVE SUMMARY
of the
FINAL REPORT
concerning
ROADSIDE DEVELOPMENT AND EROSION CONTROL

In 1981, a "Roadside Development and Erosion Control" project was initiated as a cooperative agreement between Oklahoma State University and the Oklahoma Department of Transportation. The objectives of this project were to optimize the expenditure of maintenance resources and enhance the environment by investigating the following four areas:

(1) Implementation of roadside development and erosion control results:

(2) Herbicide evaluation for the most effective and economical eradication of undesirable vegetation on roadsides;

(3) Evaluation of species and cultural practices for the establishment of soil erosion resistant ground covers; and

(4) Fertilizer evaluations for maintenance of soil erosion resistant ground covers.

The following recommendations are based upon the research results of the four subject matter areas mentioned above:

(1) For control of johnsongrass and subsequent release of common bermudagrass along Oklahoma roadsides, apply 1.5 pints of Roundup plus 2 ounces (product) of Oust in 20 to 40 gallons of water per acre. Application should be made during May after the bermudagrass has broken dormancy. This same treatment is recommended for control of silver bluestem when intermixed with johnsongrass.

(2) To control silver bluestem, apply 1.5 to 2.0 pints of Roundup in 20 to 40 gallons of water per acre during May, prior to seedhead formation.

(3) For brush control, the following treatments can be utilized:

(a) One gallon Tordon K plus one gallon Garlon 4 in 50 gallons of water per acre (broadcast) or 100 gallons of water per acre (applied with handgun and spraying foliage to wet) and applied in June;
(b) Krenite S at 3 gallons plus a crop oil in 50 gallons of water per acre (broadcast) or in 100 gallons of water per acre (handgun) applied in August to October, prior to first fall coloration; and
(c) Roundup at 1.5 gallons in 98.5 gallons of water per acre and applied as a spot-treatment with handgun only.

(4) Kochia can be effectively controlled with a preemergence application of Karmex 80W at 3 pounds product in 25 to 40 gallons of water per acre, applied in February or early March. For postemergence Kochia control, use Banvel at 0.5 pounds active ingredient in 25 to 40 gallons of water per acre, applied in May or early June.

(5) For preemergence control of annual grasses and broadleaf weeds, apply atrazine at 2 pounds active ingredient in 20 to 40 gallons of water per acre in February and not later than March 15. Karmex 80W can be used also at the same rate as given above for Kochia control.

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ACKNOWLEDGEMENTS

The research personnel from Oklahoma State University involved in this project express their appreciation to the personnel of the Oklahoma Department of Transportation and the Federal Highway Administration for their interest, suggestions, and cooperation in these investigations. Special recognition is due Mr. Gary Roach, project liaison, 1981-85.

Grateful acknowledgment is extended for the excellent cooperation and assistance in furtherance of these investigations given to us by all Division Engineers, Maintenance Engineers, and their employees. Without the complete support of these people, much of these research results would not have been possible.

Highest appreciation and acknowledgment is given to Dr. W. W. Huffine, Professor Emeritus at OSU, who originated this project and whose support and wisdom made this project possible.

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INTRODUCTION

Vegetation management along highways has two basic aims: to beautify America's roadsides, and to provide a safe, non-erosive buffer zone along the road at an economical price. Creation of a stress-resistant, sod-forming, uniform turf satisfies both of these aims.

Each year, costs for maintaining Oklahoma's roadside areas increase with inflation. Mowing, for example, which cost $9.29 per acre in 1978, jumped to $15.41 in 1982. Mowing for 1986 alone cost Oklahoma taxpayers nearly $2 million.

This research project was a five-year investigation into several facets of roadside turf improvement. Research was performed on herbicides and herbicide combinations for weed control in established turf. Weed control during planting, and growth regulators for vegetative height control, were also studied. Other studies included methods of turf establishment under harsh, on-site roadside conditions. Nitrogen fertilizers were evaluated for potential in improving turf stands thinned of weeds following herbicide treatment. Brush control experiments were also performed to discover suitable substitutes for phenoxy products, which are no longer used on Oklahoma rights-of-way.

An integral part of this project was an ongoing implementation effort. Research information from this project, and from previous ODOT/OSU projects, was made available to highway personnel. New methods and products were demonstrated on actual roadside turf. Tours for roadside personnel were organized, demonstrating research results to the consumers of the information. Videotapes, written reports, telephone correspondence, and on-site exchange of information were used to convey new information as soon as it became available.

* * *

Because of the volume of information presented in this report, an effort has been made to summarize the pertinent results from each study into a recommendations section. Each recommendation listed has been developed under a multi-site, multi-year testing regime.

Each study in this project is described in depth (e.g., location, products tested, etc.) under the appropriate heading of the task. A summary section precedes the data in each section, describing the breadth of experimentation in that area.

Figure 1. A johnsongrass control demonstration area near Shawnee, Oklahoma. Top photo shows area prior to herbicide treatment. Bottom photo of same area six weeks after treatment, with ODOT personnel looking at the dead johnsongrass in the treated area.

IMPLEMENTATION

In 1981, ODOT implemented the use of a bumper-mounted, solid stream-type herbicide applicator in an ongoing effort to aid in minimizing roadside maintenance costs. The results were a more effective, efficient, and economical means of roadside vegetation control.

During 1982, five demonstration areas were initiated in Divisions 3, 4, 5, 7 and 8 using Oust 75 DF for the preemergence and postemergence control of johnsongrass. The results obtained from these demonstrations at that particular time agreed with the recommended product rate of 4 ounces of Oust applied per acre for control of johnsongrass (although this recommendation has changed since this time).

In 1983, a demonstration area was designated in Division 8 to compare three herbicides, Bicep 4.5L, Surflan 75W, and Dual 8E for the preemergence control of annual grasses and broadleaf weeds. Bicep was found to be the most effective treatment for annual weed control.

From research conducted during 1983, ODOT implemented the use of Karmex 80W for preemergence control and Banvel for postemergence control of Kochia in 1984.

Information from 1983/84 research and a 1985 (Div. 4) field demonstration for silver bluestem control resulted in ODOT implementing the use of Roundup for such use in 1985.

Research during 1983-85 resulted in ODOT implementing the use of a combination treatment of Roundup plus Oust for the selective control of johnsongrass as an alternative to using MSMA or DSMA.

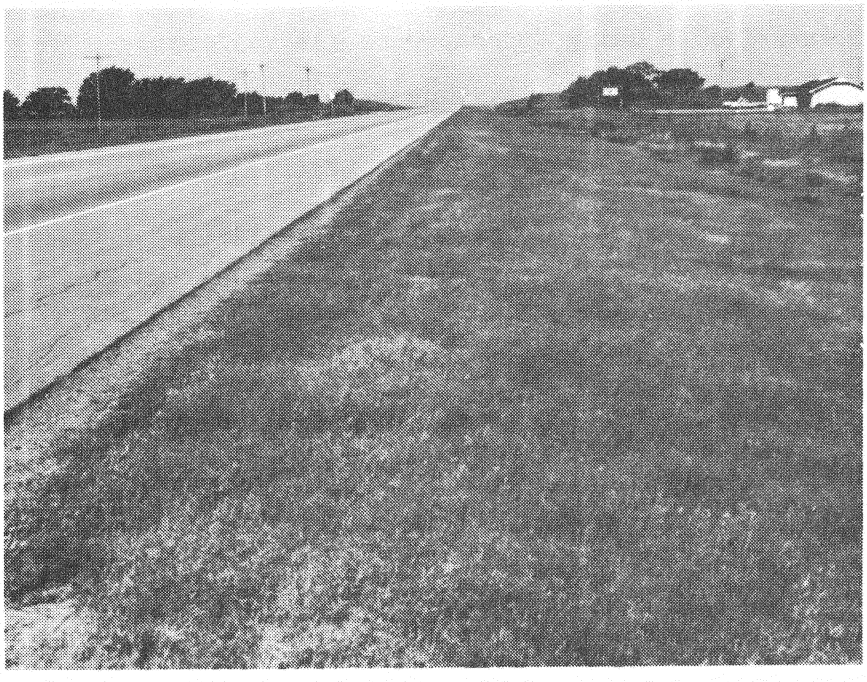

Figure 2. Oklahoma roadsides which have been treated with selective herbicides to control undesirable vegatation resulting in the subsequent release of desirable bermudagrass.

ROADSIDE DEVELOPMENT AND EROSION CONTROL

Recommendations for Johnsongrass Control

1. For control of johnsongrass and subsequent release of common bermudagrass along Oklahoma roadsides, apply 1.5 pints of Roundup plus 2 ounces (product) of Oust in 20 to 40 gallons of water per acre. Roundup must be added to the spray tank first, followed by Oust. Best results are achieved using a carrier rate closer to 20 GPA than 40 GPA. Application should be made during the month of May after the bermudagrass has broken dormancy, greened up and is actively growing. Sprayer equipment must be accurately calibrated to insure adequate johnsongrass control with minimal bermudagrass phytotoxicity.
2. As an alternative to using Roundup-Oust (above), apply MSMA liquid (6.0 lbs. active ingredient per gallon) at 0.5 gallon per acre in 20 to 40 gallons of water per treatment for the first application.

   Apply DSMA liquid (3.6 lbs. active ingredient per gallon) at 1.0 gallon per acre in 20 to 40 gallons of water per treatment for the second and third treatments at 2 to 3 week intervals (MSMA may be substituted for DSMA if economical to use). Applications with MSMA or DSMA can be made April through October when johnsongrass plants reach a height of 8 to 12 inches and are actively growing. Best results are obtained when the first application is made with MSMA, the air temperature is between 70^{o} and 80^{o} F, and the sun shining brightly. Two or three repeat applications of DSMA, at 2 to 3 week intervals when the air temperature is above 80^{o}F and the sun is shining brightly, may be needed for best control. Two or three applications per year for each of 2 or 3 years may be needed for complete eradication.

Recommendations for Silver Bluestem Control

1. For control of silver bluestem and subsequent release of bermudagrass along Oklahoma roadsides, apply 1.5 to 2.0 pints of Roundup in 20 to 40 gallons of water per acre during the month of May prior to silver bluestem seedhead formation. Best results may be achieved by using a carrier rate closer to 20 GPA than 40 GPA. Sprayer equipment must be accurately calibrated to insure adequate silver bluestem control with minimal bermudagrass phytotoxicity. Although some bermudagrass phytotoxicity may be observed soon after treatment, it should diminish within two to three weeks after treatment.
2. For control of silver bluestem in areas also infested with johnsongrass, apply the combination treatment of Roundup at 1.5 pints plus 2 ounces of Oust in 20 to 40 GPA per acre during the month of May. Add Roundup to spray tank first, then add Oust. See comments above pertaining to sprayer calibration and bermudagrass phytotoxicity.

Recommendations for Brush Control

1. The combination treatment of Tordon K at 1 (one) gallon plus 1 (one) gallon of Garlon 4 in 98 gallons water per acre controls a broad spectrum of brush species. Refer to respective herbicide labels for susceptible brush species. A broadcast application should be made in early June and no later than the first of July. Precautions should be taken to avoid drift to susceptible non-target plants. When spot treating with this combination, spray foliage to wet and dripping. A drift control additive should be utilized to minimize drift when using these products.

2. Alternative treatment offers minimal brownout effect on susceptible species; this makes an ideal treatment for aesthetic purposes. This treatment will only affect branches that are covered by spray. Use of Krenite S at 3 gallons plus a Crop Oil additive at 1.5 quarts in 96.5 gallons of water per acre is an effective treatment for controlling several brush species as a broadcast application. Refer to the Krenite S label for susceptible target species. Application should be made August to October, prior to first fall coloration. It is essential to have good coverage by spray to insure desired control. When spot treating with this product, spray foliage to wet. A drift control additive should be utilized to minimize drift during application.

3. Roundup at 1.5 gallons in 98.5 gallons of water per acre is also an effective control for several species of brush. Refer to the Roundup label for susceptible target species. This product is recommended for spot-treatment with handgun only. Do not broadcast treat brush with Roundup. Application should be made during August to October. Precautions should be taken to avoid drift to non-target susceptible plants. A drift control additive such as Nalco-Trol II, or equivalent, is recommended to be utilized to minimize drift when using Roundup.

Recommendations for Kochia Control

*1. Kochia can be effectively controlled with a preemergence application of Karmex 80W at 3 pounds product in 25 to 40 gallons of water per acre. Application should be made in February or early March.

2. For postemergence control of Kochia, use Banvel (4 pounds active ingredient per gallon) at 1 pint (0.5 lb. ai) in 25 to 40 gallons of water per acre. Application should be made in May or early June for best control, while the Kochia is in the seedling or early vegetative

stage of growth. One application per year should control not only Kochia but many other susceptible broadleaf weed species. Precautions should be taken to avoid drift to non-target susceptible plants and crops.

*A 24-C label (SLN-Supplemental labeling) must be in the possession of the user at the time of pesticide application when using Karmex 80W.

Recommendations for Annual Grass and Broadleaf Weed Control

*1. For the preemergence control of annual grasses and broadleaf weeds, apply Atrazine 4L at 2 quarts (2 pounds active ingredient), or Atrazine 80W (80% wettable powder) at 2.5 pounds product (2 pounds active ingredient), or Aatrex Nine-0 (90% water dispersible granule) at 2.2 pounds product (2 pounds active ingredient) in 20 to 40 gallons of water per acre. Application should be made in February, and not later than March 15. Apply in February to control early germinating species such as sweet clover.

*2. Karmex 80W can be used for the preemergence control of annual grasses and broadleaf weeds at a rate of 3 pounds product in 25 to 40 gallons of water per acre. Application should be made in February or early March.

*A 24-C label (SLN-Supplemental labeling) must be in the possession of the user at the time of pesticide application for each of these products.

Recommendations Using Fabric Mulches for Erosion Control in Seeded Stands of Turf

Fabric mulches can be effectively used to lower the erosion in seeded stands of turf. Fabric mulches should not replace present methods of

erosion control. Fabric mulches should be used only on highly erosive areas where conventional methods of soil stabilization are expected to fail, such as steep slopes or in ditch banks. Cost currently precludes widescale usage of fabric mulches. Fabric should be staked in place on the seedbed with wire stakes. The material should be removed after seedling emergence, or at approximately 3 weeks after the area first receives rainfall or irrigation. Only grey or white colored fabrics should be used, and they should be of the light weight grade (e.g., type 11/150). Use of fabric mulches should be minimized during the month of August.

Large-scale implementation of these recommendations should be withheld until the operator has first tried the material on a smaller scale. This trial period is necessary because of the inherent differences between the use of fabric mulches and the use of conventional mulching methods. Or, to put it more directly, get the crew accustomed to using fabric mulch on an isolated ditch bank before they try it on 100 acres.

Johnsongrass Control

Summary

Johnsongrass (*Sorghum halepense* L.) has been one of the most serious and major roadside weed problems in Oklahoma and much of the southern United States. It is a highly competitive perennial grass that has adapted to a wide variety of soils. Johnsongrass robs desirable plant species of nutrients, moisture, light, space and has the ability to produce large quantities of seed and rhizomes. Its tall growth characterisitcs necessitates the need for either mowing or chemical control, expecially in areas where sight distance is a problem (stop signs, intersections, etc.).

A total of twenty-four johnsongrass control and related experiments were initiated along Oklahoma roadsides during the five-year period encompassed by this cooperative project. Experiments were designated in three Divisions,-- 4, 7 and 8, with the majority of studies being treated in Division 4. Nineteen of these experiments were initiated in Division 4, one in Division 7 and four in Division 8.

Discussion

In 1981, six experiments were initiated to evaluate several herbicides for the control of johnsongrass and subsequent effects on bermudagrass (phytotoxicity). Four of these experiments were located in Division 4, one in Division 7 and one in Division 8.

Four months after treatment, significantly greater control of johnsongrass was obtained in experiment 4-H-1-81 (Table 1) from the preemergence application of Oust (DPX 5648) at 1/4, 1/2 and 1 lb ai/acre, or combinations of MSMA + Lasso at 3 + 3 lb ai/acre, MSMA + Dual at 3 + 2.5 lb ai/acre, and MSMA + Surflan at 3 + 4 lb ai/acre, than from Oust at 1/8 lb ai/acre applied either pre- or post- and the 1/4 lb ai/acre rate as a

postemergence treatment. Similar results were obtained in another experiment, 8-H-1-81 (Table 2) with the exception that both pre- and postemergence applications of Oust at 1/8 and 1/4 lb ai/acre were significantly less effective than the other treatments. In experiment 7-H-1-81 (Table 3) five months after the same preemergence treatments as above, and four months after the post-treatments, only the pre- and postemergence applications of Oust at 1/8 lb ai/acre, were significantly less effective than all other treatments.

Significant phytotoxicity, as determined by yellowing or burning of common bermudagrass leaves and stems, was observed in both 4-H-2-81 and 4-H-4-81 experiments (Tables 4 & 5) from all rates of Oust one month after treatment. Two weeks later only the 1/2 lb ai/acre rate was still exhibiting phytotoxic reactions. All symptoms of phytotoxicity had disappeared eight weeks after treatment. Significant topgrowth suppression of bermudagrass was noted 4 1/2 months after application of Oust at 1/2 lb ai/acre in 4-H-2-81, and the 1/8 and 1/4 lb ai/acre rates in 4-H-4-81. There was a significant reduction in seedhead production from all rates of Oust, six weeks after application.

In the 4-H-6-81 experiment (Table 6), when evaluated approximately one year after application, all rates and formulations of Oust (DPX 5648) were observed to significantly control johnsongrass. With the exception of DPX 5648 45 KWS at the lowest concentration (2500 ppm), all rope-wick applied treatments were equally effective in the control of johnsongrass. All DPX 5648 treatments applied with the CO_2 hand sprayer exhibited significantly better control of the johnsongrass, with two exceptions (DPX 5648 50 WS at 5000 ppm and DPX 5648 45 KWS at 10,000 ppm), when compared to those treatments applied with the rope-wick herbicide applicator.

In 1982, five johnsongrass control and bermudagrass phytotoxicity experiments were initiated. Four of these studies were located in Division 4 and one in Division 8. Approximately two months after treatment in experiment 8-H-2-82 (Table 7), all preemergence rates of Oust 75 DF were significantly more effective in the control of johnsongrass than all other treatments. However, it should be noted, that on this scoring date of June 1, the first postemergence treatments of MSMA, DSMA, Roundup and Bronco were applied. When the treatments were evaluated about three months after the initial application, only the preemergence treatments of Lasso, Surflan and Dual were significantly less effective than the other treatments in the control of johnsongrass. The same results were observed on July 27, about four months after the experiment was started and again on September 1 and October 11, approximately 5 and 6 months after treatment.

On September 1, approximately 5 months after the initial application, Oust 75 DF at 4 oz ai/A was observed to be signficantly less effective in the control of johnsongrass when compared to the four split applications (pre + post) of Oust 75 DF. The same results were observed on October 11, when in addition, Oust 75 DF at 4 oz ai/A was found to be significantly less effective than all the remaining treatments of Oust 75 DF in the control of johnsongrass. Although four applications of MSMA had been made by October 11, it would appear MSMA or the combination of MSMA with either Lasso, Surflan or Dual would be statistically as effective as the best Oust 75 DF treatment. At this point the cost/benefit would dictate which treatment would be preferred.

The preemergence application of Oust 75 DF, at all rates in experiment 4-H-7-82 (Table 8), was significantly more effective in the control of johnsongrass than all other treatments, when the first evaluation was made, approximately two and one-half months after treatment. It should be noted,

however, on this scoring date of June 1, the first postemergence treatments of MSMA, DSMA, Roundup and Bronco were applied.

Approximately four months after application, only the preemergence applications of Lasso 4 EC at 2.6 lbs. ai/A, Surflan 75 W at 4.0 lbs. ai/A and Dual 8 E at 2.5 lbs. ai/A were significantly less effective than the other treatments in the control of johnsongrass. When the treatments were evaluated about four and one-half months after the initial application, again the preemergence applications of Lasso 4 EC at 2.6 lbs. ai/A, Surflan 75 W at 4.0 lbs. ai/A and Dual 8 E at 2.5 lbs. ai/A in addition to the postemergence application of Roundup at 1.5 qts. product/A and Bronco at 1.0 gal. product/A were significantly less effective in the control of johnsongrass than the other treatments.

On September 7, about 6 months after the first treatments were applied, and 3 months after the post-application of MSMA and DSMA, again the preemergence treatments of Lasso, Surflan and Dual in addition to the postemergence treatment of Bronco were signficantly less effective in the control of johnsongrass than all other treatments. The same results were observed on October 12 when the last evaluations were made. Although three applications of MSMA were made at this time, it would appear MSMA or the combination of MSMA with either Lasso, Surflan, or Dual would be statistically as effective as the best Oust treatment.

All preemergence rates of Oust 75 DF in experiment 4-H-8-82 (Table 9) were significantly phytotoxic to bermudagrass when compared to the other treatments when evaluated 10 weeks after initial herbicide application. With the exception of the two lowest split application rates of Oust 75 DF, the remainder of the Oust 75 DF treatments were still exhibiting significant phytotoxicity to the bermudagrass moreso than the other treatments approximately 3 1/2 months after the herbicides were

applied. About 4 1/2 months after treatments were applied, all rates of Oust 75 DF, with the exception of the two lowest split application rates, were still causing significant reduction in the bermudagrass stand, even though no evidence of yellowing or burning of the bermudagrass was noted. Significant stand reduction of bermudagrass was still evident in all treatments of Oust 75 DF, with the exception of the two lowest split applications and the 5 oz ai/A rate, 7 months after initial treatment. The remainder of the herbicide treatments did not have any significant phytotoxic effect on the bermudagrass throughout the duration of this experiment.

Based on the results of this experiment, the use of Oust 75 DF as a preemergence treatment on bermudagrass to control johnsongrass will probably not be recommended as a maintenance practice for ODOT to use along highway roadsides due to the continual phytotoxic effects and the resulting decline or reduction in stand density of the bermudagrass.

Approximately four and six weeks after herbicide application was made in experiment 4-H-9-82 (Table 10), Velpar 90SP at 1.125 lbs. ai/A plus surfactant, Oust 75 DS at 0.5 and 1.0 lbs. ai/A, Roundup at 2.25 lbs. ai/A and Aatrex Nine-O at 9.9 lbs. ai/A were causing significiantly more phytotoxicity to the bermudagrass than any of the other treatments. Significant phytotoxicity was still observed after ten weeks from Bicep 4.5L at 9.0 lbs. ai/A, in addition to the treatments mentioned earlier. When the last evaluation was made in October, approximately four months after treatments were applied, no symptoms of discoloration of the bermudagrass were noted. But at the same time, it was evident the bermudagrass stand (density) had diminished somewhat in several of the treatments. For this reason, the final evaluation was made scoring the treatments on percent ground cover. Results indicated Velpar 90 SP at

1.125 lbs. ai/A plus surfactant, Oust 75 DF at 0.5 and 1.0 lbs. ai/A, Roundup at 2.25 lbs. ai/A, Aatrex Nine-0 at 9.9 lbs. ai/A and Bicep 4.5 L at 9.0 lbs. ai/A had significantly reduced the bermudagrass density when compared to the untreated check plot.

Experiment 4-H-10-82 (Table 11) was initiated in the fall of 1982 to evaluate the effectiveness of fall (1982) and spring (1983) applications of six preemergence and postemergence herbicides for the selective control of johnsongrass and subsequent release of common bermudagrass along Oklahoma highway rights-of-way. Approximately one month after initial herbicide application, Roundup at 1 and 1.5 qts., DSMA, MSMA, and all MSMA combinations were providing significantly better control of johnsongrass than all other treatments when the first evaluations were made in October 1982.

When the experiment was evaluated on May 5, 1983, all Oust treatments from 4 oz. ai to 8 oz. ai, along with both rates of Roundup were providing significantly better control of the johnsongrass. The same trend was still evident when the experiment was evaluated in July 1983 (10 months after initial treatment), with the exception that Oust at 3 oz. ai and DSMA were also exhibiting significantly better control of the johnsongrass. Both Roundup treatments (1.0 and 1.5 qts.) were by this time, significantly less effective than the better treatments of Oust and DSMA.

A similar pattern occurred when the experiment was evaluated in October, 1983 (13 months after initial application). At this time, Oust treatments from 3 oz. ai to 8 oz. ai, Roundup at 1.5 qts, DSMA and MSMA alone and in all combinations were providing significantly better control of the johnsongrass. When the percent bermudagrasss cover evaluations were made in October, 1983, all Oust treatments from 1 to 7 oz ai, DSMA and MSMA alone and in all combinations had significantly better bermudagrass cover

present than all other treatments. It appeared that more than one treatment of Roundup at 1 to 1.5 qts. and the high rate of Oust (8 oz. ai) may slow down the recovery rate (release) of the bermudagrass.

Six johnsongrass control and bermudagrass phytotoxicity experiments were initiated in 1983 to further refine herbicide rates for optimum johnsongrass control with minimal bermudagrass phytotoxicity. Four of these studies were located in Division 4 and the other two located in Division 8.

In experiment 4-H-11-83 (Table 12) approximately two and one-half months after the preemergence applications were made, Oust (pre) treatments from 1 to 4 oz. were exhibiting significantly better control of johnsongrass than any of the other treatments. When evaluations were made in July, four months after the initial preemergence applications and six weeks after the initial postemergence treatments were applied, Oust at 4 oz. (pre), Oust treatments (post) from 2 to 6 oz., SC-0224, and Roundup at 1 and 1.5 qts. were providing significantly better control of johnsongrass than any of the other treatments.

Five months after the preemergence and three months after the initial postemergence treatments were applied; all of the preemergence applications of Oust had lost their effectiveness and only the postemergence rates of Oust at 4 oz. to 6 oz., SC-0224, Roundup at 1 and 1.5 qts., DSMA and MSMA alone and in combination with either Surflan or Dual were providing significant control of johnsongrass. A similar pattern followed when the experiment was evaluated in October with the exception that Oust applied at 4 oz. preemergence was showing significant control of the johnsongrass along with the postemergence applications of Oust from 3 to 6 oz., SC-0224, Roundup at 1 and 1.5 qts., DSMA, MSMA alone and in combination with Surflan or Dual.

One month after followup treatments were applied in experiment 4-H-11-83 (Table 13), Oust at 3 oz./A (trmt. #10) and MSMA were exhibiting the best control of johnsongrass. This trend continued throughout the growing season. In addition, the followup treatment of Roundup at 1 qt./A in 20 GPA was providing good control of johnsongrass when the last evaluation was made in October.

It appears from these data that a followup treatment of Oust (1 year after initial treatment) at 3 oz./A (or possibly more) in 40 GPA carrier may be needed to control dense stands of johnsongrass. Also, it appears re-treatments of Roundup at 1 qt./A will be necessary to control dense stands of johnsongrass to an acceptable level.

All preemergence treatments of Oust in experiment 4-H-12-83 (Table 14) exhibited significantly more phytotoxicity to the bermudagrass than any of the other treatments, when the first evaluations were made, approximately ten weeks after the initial preemergence treatments were applied. When the experiment was evaluated in July, all treatments with the exceptions of Roundup at 1.5 qts., DSMA, MSMA alone and in combination with Surflan and Dual, were showing phytotoxic effects on the bermudagrass.

When the last two evaluations were made in August and October, treatments of SC-0224 at 1.6 qts. and Roundup at 1 and 1.5 qts. were exhibiting significantly more phytotoxicity to the bermudagrass than any of the other treatments. At the same time, the other treatments were not exhibiting significant phytotoxicity to the bermudagrass when compared to the untreated check.

Followup treatments in experiment 4-H-12-83 (Table 15) of Oust at 4 oz./A, SC-0224 at 1 qt./A and Roundup at 1 qt./A in 40 GPA were exhibiting significant phytotoxicity to bermudagrass one month after application.

However, in August no phytotoxicity (yellowing) was evident; therefore no phytotoxicity data was taken.

When the plots were evaluated for percent bermudagrass in September and October, significant differences were evident. In September, significant reductions in percent bermudagrass were noted in plots treated with Oust at 6 oz./A, SC-0224 at 1 qt./A and Roundup at 1 qt./A in 20 GPA carrier when compared to the untreated check plot. Only two treatments were significantly less in percent bermudagrass when compared to the untreated check plot when the experiment was evaluated in October: SC-0224 at 1 qt./A and Roundup at 1 qt./A in 20 GPA carrier.

On May 26, 1983 percent johnsongrass and bermudagrass cover scores were taken for each plot in experiment 4-H-14-83 (Table 16). The statistical analyses indicated no significant differences in the percent cover of either bermudagrass or johnsongrass throughout the experimental area. When the first johnsongrass control scores were taken on July 19, 1983, all treatments were providing significant control of johnsongrass as compared to the untreated check. The initial application of Roundup at 12 ozs. and 16 ozs. (treatments 1A-C, 2A-C) and the combination treatments of MSMA + Aatrex 4L (treatments 10A-C) were not performing as well as the other treatments when the first evaluations were made on July 19, approximately two months after the first treatments were applied.

By the time the experiment was evaluated on August 12 and again on October 12 (second and partial third treatments applied), all MSMA + Aatrex 4L (10A-C) and Roundup (2A-C) treatments were controlling the johnsongrass significantly. The remaining treatments provided significant control of the johnsongrass as well with the exception Roundup treatments 1A-C (12 ozs.) did not perform as well as the remaining treatments.

It appears from these data in this experiment one treatment of Oust at

4 ozs. per acre provides just as good control of johnsongrass as does combination treatments of Oust and Roundup. Furthermore, it may be possible to reduce the rates of Oust applied in combination with various low rates of Roundup to provide an effective and more economical treatment for the control of johnsongrass.

Bermudagrass phytotoxicity scores taken on July 19, 1983 (Table 16), indicated significant injury from the following initial treatments: Roundup at 32 oz., Roundup + Oust at 12 oz. + 4 oz., 16 oz. + 4 oz., 24 oz. + 4 oz. and 32 + 4 oz. per acre, respectively. The only treatments causing significant phytotoxicity to the bermudagrass when the final evaluation was made on August 12 are as follows: Roundup (R) at 32 oz., 32 oz. + 6 oz. (R), 32 oz. + 16 oz. (R) + 16 oz. (R), Roundup + Oust at 24 oz. + 4 oz. + 16 oz. (R) + 16 oz. (R), 32 oz. + 4 oz., 32 oz. + 4 oz. + 16 oz. (R) and 32 oz. + 4 oz. + 16 oz. (R) + 16 oz. (R), respectively. However, by October 12, when the final johnsongrass control scores were taken, no phytotoxic effects on bermudagrass were observed.

When the final observations were made on October 12 for percent bermudagrass cover, significant differences were noted among treatments. It appears from these data that a higher rate of Roundup + Oust treatment with followup treatments of Roundup does affect the recovery rate (slows down the release) of bermudagrass into the treated area.

Although not statistically different from several other treatments (Table 17), the following treatments were exhibiting the best johnsongrass control when the experiment was evaluated thirteen months after the initial treatments were applied: Roundup @ 16 oz. + 16 oz./A; the following combination treatments of Roundup plus Oust @ 12 oz. + 4 oz. plus 12 oz. Roundup (R); 24 oz. + 4 oz.; and Oust at 4 oz./A.

When the final evaluation was made in August, 15 months after the initial treatments were applied, the best treatments for johnsongrass control were as follows: the combination treatments of Roundup plus Oust @ 12 oz. + 4 oz.; 12 oz. + 4 oz. plus 12 oz. (R); and 24 oz. + 4 oz. With the following exceptions, all treatments were exhibiting acceptable johnsongrass control when the final evaluation was made in August: Roundup alone at 12 oz.; 12 oz. + 12 oz.; 12 oz. + 12 oz. + 12 oz.; 16 oz.; and 16 oz. + 16 oz.

It appears from these data in this experiment, three treatments of 16 oz./A each of Roundup per year, or more in an initial treatment such as 24 oz. or 32 oz. or in combination with 4 oz. of Oust is necessary to control johnsongrass.

Although there were significant differences in percent bermudagrass cover in the plots, it appears that treatments using 32 oz. of Roundup alone or in sequential treatments of Roundup or in combination with Oust does affect the recovery rate (release) of bermudagrass into the treated area.

Approximately six weeks after the initial herbicide application was made in experiment 4-H-15-83 (Table 18), all treatments exhibited significant control of johnsongrass. The same pattern existed when the experiment was evaluated in August. However, when the last evaluation was made in October, no significant differences could be detected statistically among treatments.

When evaluations were made concerning bermudagrass phytotoxicity, significant differences were shown to exist with all three combination treatments of SC-0224 and R-40244 and the higher rate of SC-0224 alone at 1.6 qts., exhibiting significantly more phytotoxicity than the other treatments.

This trend continued over through the next two evaluations in August and October. At this time, not only did all three combination treatments of SC-0224 and R-40244 and SC-0224 alone at 1.6 qts. exhibit significantly phytotoxicity to the bermudagrass, but also Roundup at 1.5 qts. However two applications of Roundup were applied, whereas only one application of the SC-0224 and R-40244 compounds.

When the experiment was evaluated in October for percent bermudagrass cover, treatments using SC-0224 alone and in combination with R-40244 did not significantly slow down the recovery rate (release) of bermudgrass into the treated area. The higher rate of Roundup (1.5 qts.) acts similarly.

Two months after the initial preemergence applications were made in experiment 8-H-4-83 (Table 19), Oust (pre) treatments from 1 to 4 oz. provided significantly better control of johnsongrass than any of the other treatments. When evaluations were made approximately three and one-half months after the preemergence treatments and one month after the postemergence treatments were applied, Oust applied pre at 2 to 4 oz., applied post at 1 to 6 oz., SC-0224 and Roundup at 1 and 1.5 qts. were providing significantly better control of the johnsongrass. A similar pattern followed for the next two evaluations made in August and again in October with the exceptions that the preemergence applications of Oust at 1 to 4 oz. and the postemergence applications of Oust from 1 to 4 oz. diminished significantly in their control of johnsongrass. DSMA, MSMA alone and in combination with either Surflan or Dual treatments provided significantly better control of the johnsongrass along with Oust at 5 and 6 oz., SC-0224, and Roundup at 1 and 1.5 qts.

Approximately ten weeks after the initial preemergence treatments were applied in experiment 8-H-5-83 (Table 20), all preemergence treatments of

Oust were exhibiting significantly more phytotoxicity to bermudagrass than any of the other treatments when the first evaluations were made.

Three and one-half months after the initial preemergence treatments and five weeks after the initial postemergence treatments were applied, all treatments with the exception of Oust at 1 oz. (post), DSMA, MSMA alone and in combination with either Surflan or Dual were exhibiting some phytotoxicity to the bermudagrass.

When the experiment was evaluated in August, SC-0224 at 1.6 qts. and both rates of Roundup (1 and 1.5 qts.) were exhibiting significantly more phytotoxicity to the bermudagrass than any of the other treatments. The same results were obtained as in the August evaluation when the experiment was evaluated in October. During 1984, four experiments were initiated along Oklahoma roadsides in Division 4 to further refine herbicide rates for the control of johnsongrass.

No significant differences in percent johnsongrass and bermudagrass were evident among treatments in experiment 4-H-17-84 (Table 21) when the initial evaluation was made in May. When the last evaluation was made in October, no significant differences in percent bermudagrass among treatments were present. However, there were significant differences among treatments in percent johnsongrass in the plots when the final evaluation was made in October. Significant amounts of johnsongrass remained in not only the check plots but those treated with the following: Roundup at 1 qt./A in 20, 30, and 40 GPA; SC-0224 at 1 qt./A in 20, 30 and 40 GPA; and Arsenal at 0.25, 0.50, and 1.0 pt./A in 40 GPA.

Significant differences did exist among treatments for johnsongrass control for each of the four evaluation dates. Several treatments were providing an acceptable level of controlling johnsongrass when the final evaluation was made in September and are as follows: the combination

treatments of Oust plus Roundup at 2 oz. + 1 pt./A in 20 GPA; 3 oz. + 1 pt./A in 20 and 40 GPA; 2 oz. + 1 qt./A in 20, 30 and 40 GPA; 4 oz. + 1 qt./A in 20, 30 and 40 GPA; 3 oz. + 1 qt./A in 20 and 40 GPA; 4 oz. + 1 pt./A in 30 and 40 GPA; 3 oz. + 1 qt./A in 30 and 40 GPA. The remainder of the treatments did not provide an acceptable level of johnsongrass control.

Although significant bermudagrass phytotoxicity was observed when the first evaluation was made in June, by the second and third evaluations in July and August, all phytotoxic effects had diminished.

Only two evaluations of experiment 4-H-18-84 (Table 22) were made due to a fire which destroyed one-half of the experimental area shortly after the second evaluation in July. However, some trends were observed in at least some of the treatments. When the first evaluation was made one month after the initial treatments were applied, the following treatments were exhibiting the best johnsongrass control: the combination treatments of Roundup plus Oust at 1.5 pts. + 2 oz./A in 20, 30, and 40 GPA; 2 pts. + 2 oz./A in 20, 30, and 40 GPA; 1 pt. + 2 oz. in 30 and 40 GPA; 0.75 pt. + 2 oz./A in 40 GPA; and Oust at 4 oz./A in 20, 30 and 40 GPA.

When the final evaluation was made in July, the best treatments for johnsongrass control were as follows: the combination treatments of Roundup plus Oust at 2 pts. + 2 oz. in 20, 30 and 40 GPA; 1.5 pts. + 2 oz. in 30 and 40 GPA; 1.0 pt. + 2 oz. in 30 GPA; MSMA at 0.5 gal./A in 20, 30 and 40 GPA; and Oust at 4 oz./A in 40 GPA.

Significant bermudagrass phytotoxicity was noted in the first evaluation in June; however, by the time the second evaluation was made in July, all significant phytotoxic effects had diminished.

Initial scores of experiment 4-H-19-84 (Table 23) taken in May of percent johnsongrass and bermudagrass showed no significant differences among treatments. When the last evaluation was made in October, no

significant diferences in percent bermudagrass among treatments were detected. However, there were significant differences among treatments in percent johnsongrass when the last evaluation was made in October. Plots treated with Arsenal at 0.25 and 0.50 pt./A and the check plots contained significantly more johnsongrass than any of the other treated plots.

Although significant differences among treatments did occur for each of the evaluation dates for johnsongrass control, most treatments provided an acceptable level of johnsongrass control. The following treatments did not provide an acceptable level of johnsongrass control in this experiment: Arsenal at 0.25 and 0.50/A; Roundup at 1 qt. in 20 and 30 GPA; and the combination treatments of MSMA and Oust at 1 pt. + 2 oz./A in 30 GPA; and 1 pt. + 3 oz. in 30 GPA. The remaining treatments provided an acceptable level of johnsongrass control.

Significant bermudagrass phytotoxicity was observed when the first evaluation was made in June; however, when the second evaluation was made in July, all significant phytotoxic effects among treatments had diminished.

Bermudagrass phytotoxicity in experiment 4-H-21-84 (Table 24) was observed in both May and June, 1985, from all Oust treatments; however, they were not statistically different from the untreated check. When the study was rated in July, no bermudagrass phytotoxicity was observed among any of the Oust treatments.

No significant differences in percent bermudagrass cover were observed when the experiment was evaluated in May. Two treatments, Oust at 2 oz. applied in November and Oust at 3 oz. applied in December had significantly less bermudagrass cover (compared to the untreated check) when the study was scored in June. A July evaluation revealed only one treatment, Oust at 1 oz. applied in December had significantly less bermudagrass cover than

the untreated check. Oust at 2 oz. applied in November had significantly less bermudagrass cover (compared with the untreated check) when the experiment was rated in August. This same treatment along with Oust at 1 oz. applied in December, had significantly less bermudagrass cover (compared to the untreated check) when the experiment was evaluated in September.

An explanation for not having more differences in bermudagrass phytotoxicity and percent bermudagrass cover among treatments may have been possibly due to an above normal amount of rainfall which inundated the entire experimental area several times throughout the growing season. This may have possibly allowed the Oust to migrate throughout the experimental area and move off-target from the specific herbicide treatments.

In 1985, three experiments were initiated in Division 4 to further refine and develop recommendations (these are found in the recommendations section in this report) for the control of johnsongrass and subsequent release of common bermudagrass along Oklahoma roadsides.

No significant differences in percent bermudagrass cover among treatments were observed in experiment 4-H-24-85 (Table 25) throughout the duration of the experiment.

When the experiment was evaluated in April, the only treatment with significantly more johnsongrass present than the untreated check was Arsenal at 0.125 lbs. ai./A (applied in April). The treatments having the least amount of johnsongrass in August and September were: Oust at 0.07 lbs. ai./A (applied in May); Roundup + Oust at 1 qt. + 2 oz./A (applied in May); and MSMA at 3.0 lbs. ai./A (applied in May). These same treatments also provided the only acceptable johnsongrass control throughout the duration of the experiment. The other treatments were ineffective for the control of johnsongrass.

Significant bermudagrass phytotoxicity was observed (Table 26) initially in the May and June ratings, but by August all phytotoxic effects had diminished.

Bermudagrass height was significantly reduced by all rates of Arsenal (except 0.063 and 0.094 lbs. ai./A rates applied in May), Oust and the combination treatment of Roundup + Oust when the experiment was evaluated in June. However, in July, only the highest rate of Arsenal (0.188 lbs. ai./A applied in April), all Arsenal rates applied in May, both Oust treatments and the Roundup + Oust combination treatment were significantly suppressing bermudagrass height. When the experiment was rated in August and September, no significant differences in bermudagrass height suppression were observed.

Excellent bermudagrass seedhead suppression was observed for all herbicide treatments (with one exception being the MSMA treatment), when the experiment was evaluated in June. The same trend was evident again when the experiment was rated in July. However, Arsenal at 0.063 lbs. ai./A (applied in April), was not exhibiting significant bermudagrass seedhead suppression. No seedhead suppression were observed among the treatments when the experiment was evaluated in August. However, when the experiment was rated in September, the only treatment exhibiting significant bermudagrass seedhead suppression was the combination treatment of Roundup + Oust.

A May evaluation of experiment 4-H-25-85 (Table 27) revealed no significant differences in percent bermudagrass cover among treatments. Both treatments of MSMA at 2 qts. in 20 and 40 GPA had the most bermudagrass cover when the experiment was rated in July, although not significantly different from the untreated check. This trend was observed throughout the duration of the experiment.

The following treatments had significantly more bermudagrass cover than the check when a rating was made in August: Oust + Roundup at 2 oz. + 1 pt. in 40 GPA; 2 oz. + 1.5 pts. in 40 GPA and Oust + MSMA at 2 oz. + 1.5 pts. in 40 GPA. When an evaluation was made in September, MSMA treatments had significantly more bermudagrass cover than the untreated check. No significant differences in bermudagrass cover were observed among the remaining treatments, when compared to the check. Throughout the duration of the experiment, some significant differences did occur in the amounts of bermudagrass present within treatments; however, none were observed to have less bermudagrasss cover, when compared to the untreated check.

No significant differences in percent johnsongrass were observed among treatments when evaluated in May (Table 27). However, the following treatments had significantly less johnsongrass present when a rating was made in August: Oust + Roundup at 2 oz. + 1 pt. in 20 and 40 GPA; 2 oz. + 1.5 pts. in 20 and 40 GPA; 2 oz. + 1 qt. in 20 and 40 GPA; Oust + MSMA at 2 oz. + 1.5 pts. in 20 and 40 GPA; 2 oz. + 1 qt. in 40 GPA; Oust at 3 and 4 oz. in 40 GPA; and MSMA at 2 qts. in 20 and 40 GPA. This same trend was observed in September, with Oust at 4 oz. in 40 GPA added to, and Oust + MSMA at 2 oz. + 1.5 pts. in 40 GPA deleted from the list.

Significant bermudagrass phytotoxicity was observed in all Oust + Roundup treatments and Oust at 4 oz. in 20 and 40 GPA when the experiment was rated in June. The following is a list of treatments exhibiting significant bermudagrass phytotoxicity when an evaluation was made in July: Oust + Roundup at 2 oz. + 1 pt. in 40 GPA; 2 oz. + 1.5 pts. in 20 GPA; 2 oz. + 1 pt. in 20 and 40 GPA; and MSMA at 2 qts. in 40 GPA (for an unknown reason). When the experiment was rated in August, no significant bermudagrass phytotoxicity was observed.

Acceptable johnsongrass control was provided by the following treatments when an evaluation was made in June: Oust + Roundup at 2 oz. + 1 pt. in 40 GPA; 2 oz. + 1.5 pts. in 20 and 40 GPA; 2 oz. + 1 qt. in 20 and 40 GPA; Oust + MSMA at 2 oz. + 1 qt. in 40 GPA; and MSMA at 2 qts. in 20 and 40 GPA. This trend continued for two more months when ratings were made in July and August. When the experiment was evaluated in September, only the following treatments were providing acceptable control of johnsongrass: Oust + Roundup at 2 oz. + 1.5 pts. in 20 and 40 GPA; 2 oz. + 1 qt. in 20 and 40 GPA; and MSMA at 2 qts. in 20 and 40 GPA. The remaining treatments did not provide acceptable season-long control of johnsongrass.

No significant differences were obtained in experiment 4-H-26-85 (Table 28) in either percent bermudagrass or percent johnsongrass densities within the experimental area when treatments were applied in May. A significant difference (increase) in percent bermudagrass was noted with Roundup + Oust at 0.5 qt. + 2 oz., when compared to the two treatments of Roundup + Oust + Frigate at 0.75 qt. + 2 oz. + 0.4 qt. and 1 qt. + 2 oz. + 0.4 qt. when the experiment was evaluated in September, four months after treatments were applied.

Johnsongrass densities (percent) were significantly reduced by all combination treatments of Roundup + Oust alone and with the addition of Frigate, for all scoring dates. Significant johnsongrass control (acceptable levels) was obtained with all combination treatments of Roundup + Oust alone and with Frigate throughout the entirety of this experiment.

Significant bermudagrass phytotoxicity was observed with these same treatments (mentioned above) up to two months after treatments were applied. However, when the experiment was evaluated in August, three months after treatment, no phytotoxic effects were observed.

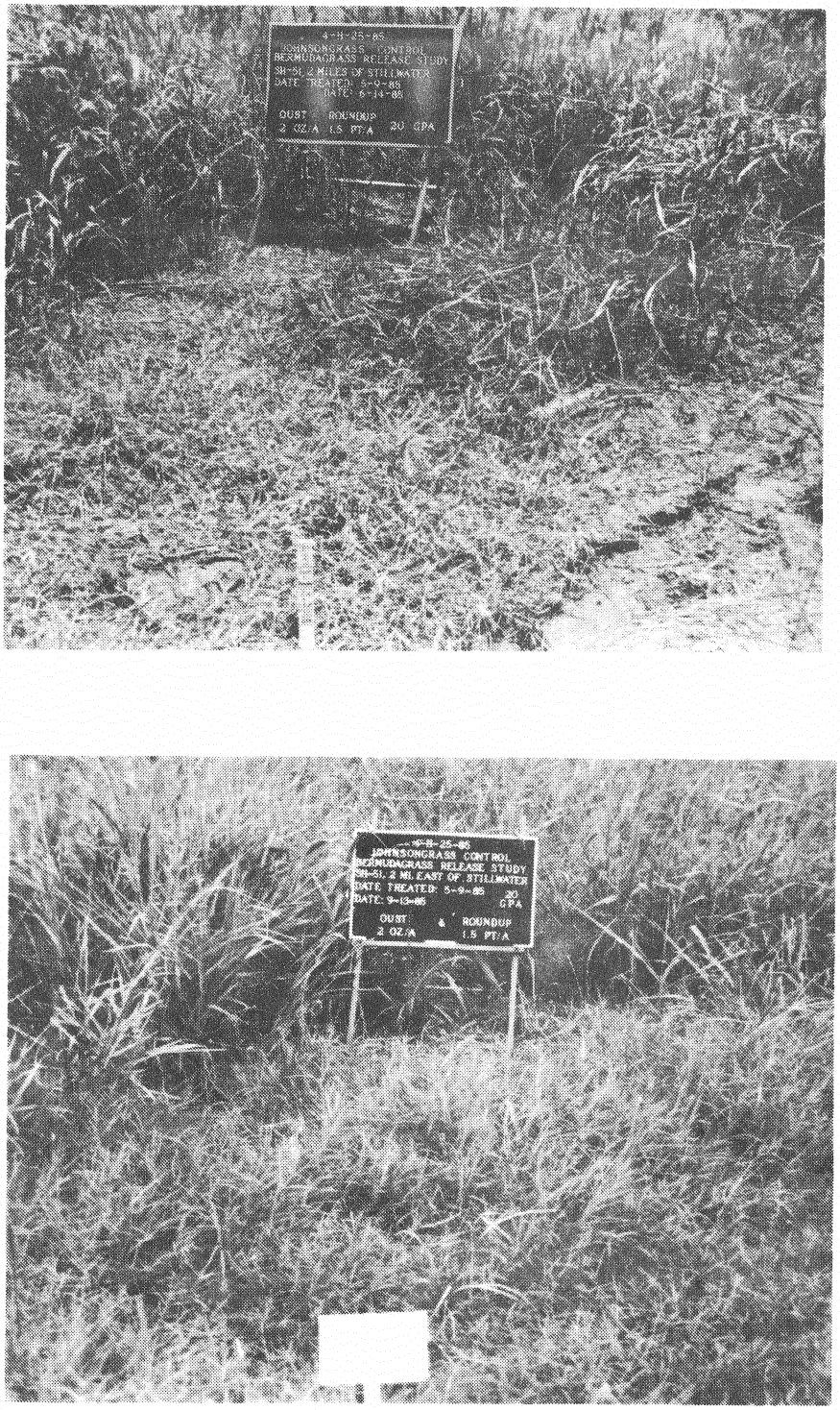

Figure 3. Research plot of a recommended treatment for johnsongrass control along Oklahoma roadsides. Top photo shows the treatment one month after application. Bottom photo shows the same plot four months after herbicide treatment and the subsequent release of bermudagrass.

Table 1

Expt. 4-H-1-81. Herbicide evaluation for the selective control of johnsongrass along Oklahoma roadsides.

Objective: Evaluate the effectiveness of five preemergence and postemergence herbicides for the selective control of johnsongrass along Oklahoma roadsides.

Dates of Treatments: 4-16-81 (preemergence treatments 1-7); 5-13-81 (postemergence treatments 8-9); treatments 1-3 were treated with postemergence applications of MSMA @ 3 lbs. ai./A in 40 GPA on 4-16-81, 5-13-81, 6-17-81, 7-15-81 and 8-25-81.

County: Payne

Location: Junction of SH-33 and SH-108, west of Cushing.

Soil Type: Kirkland Silt Loam

Plot Size: 5 ft. by 10 ft. Carrier Rate: 40 GPA

Field Design: Randomized complete block with three replications.

Method of Scoring: Johnsongrass Control - 1 = No Effect; 10 = Complete Control.

Treatments	Rate lbs. ai./A	Johnsongrass Control					
		5-13-81	6-17-81	7-15-81	8-3-81	8-25-81	9-29-81
1. Lasso 4EC	3.0	3.50	5.00	8.93	9.90	9.27	8.83
2. Dual 8E	2.5	3.50	5.67	8.83	9.62	8.17	8.17
3. Surflan 75W	4.0	3.17	5.67	8.67	9.70	8.67	8.83
4. Oust 80WP	0.125	9.77	9.33	6.50	7.00	4.67	4.00
5. Oust 80WP	0.25	9.87	9.90	9.10	7.75	8.47	6.83
6. Oust 80WP	0.50	9.83	9.93	9.87	9.73	9.90	9.60
7. Oust 80WP	1.0	9.90	10.0	9.93	9.90	9.93	9.90
8. Oust 80WP	0.125	2.00	8.67	5.67	4.00	3.00	2.00
9. Oust 80WP	0.25	1.00	8.67	7.17	5.00	5.67	3.00
10. Check	----	1.00	1.00	1.00	1.00	1.00	1.00
Statistical Difference		**	**	**	**	**	**
CV (Percent)		7.1	6.9	10.5	13.9	15.2	13.2
LSD .01		0.89	1.20	1.86	2.40	2.45	1.93
LSD .05		0.65	0.87	1.36	1.76	1.79	1.41

Table 2

Expt. 8-H-1-81. Herbicide evaluation for the selective control of johnsongrass along Oklahoma roadsides.

Objective: Evaluate the effectiveness of five preemergence and postemergence herbicides for the selective control of johnsongrass along Oklahoma roadsides.

Dates of Treatments: 4-24-81 (preemergence treatments 1-7); 5-14-81 (postemergence treatments 8-9); treatments 1-3 were treated with postemergence applications of MSMA @ 3 lbs. ai/A in 40 GPA on 4-24-81, 5-14-81, 6-17-81, 7-16-81 and 8-27-81.

County: Pawnee

Location: SH-18, 2.4 miles north of Junction SH-15, north of Pawnee, west side.

Soil Type: Zaneis

Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with three replications.

Carrier Rate: 40 GPA

Method of Scoring: Johnsongrass Control - 1 = No Effect; 10 = Complete Control.

Treatments	Rate lbs. ai./A	Johnsongrass Control 5-14-81	6-17-81	7-16-81	8-27-81	9-29-81
1. Lasso 4EC	3.0	5.33	5.17	8.83	8.70	9.83
2. Dual 8E	2.5	5.33	5.67	9.27	9.80	9.93
3. Surflan 75W	4.0	4.00	3.00	7.93	8.30	9.73
4. Oust 80WP	0.125	8.83	9.60	8.43	4.63	4.63
5. Oust 80WP	0.25	8.50	9.20	7.50	5.33	6.30
6. Oust 80WP	0.50	8.67	9.87	9.87	8.33	8.43
7. Oust 80WP	1.0	9.00	10.0	10.0	9.63	9.63
8. Oust 80WP	0.125	3.00	9.60	6.77	5.67	5.83
9. Oust 80WP	0.25	2.00	9.50	9.47	7.33	7.50
10. Check	----	1.67	1.00	1.00	1.33	2.00
Statistical Difference		**	**	**	**	*
CV (Percent)		19.3	19.4	15.8	24.8	32.1
LSD .01		2.55	3.30	2.94	4.02	5.57
LSD .05		1.86	2.41	2.15	2.93	4.07

Table 3

Expt. 7-H-1-81. Selective control of johnsongrass with preemergence and postemergence herbicides.

Objective: Evaluate the effectiveness of five preemergence and postemergence herbicides for the selective control of johnsongrass along Oklahoma roadsides.

Dates of Treatments: 4-9-81 (preemergence treatments 1-7); 5-6-81 (postemergence treatments 8-9); treatments 1-3 were treated with postemergence applications of MSMA @ 3 lbs/ ai./A in 40 GPA on 4-9-81, 5-6-81, 6-11-81, 7-17-81 and 9-2-81.

County: Grady

Location: US-81, 2.3 miles south of Junction SH-19, west side.

Soil Type: Minco Silt Loam

Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with three replications.

Carrier Rate: 40 GPA

Method of Scoring: Johnsongrass Control - 1 = No Effect; 10 = Complete Control.

Treatments		Rate lbs. ai./A	Johnsongrass Control 5-6-81	6-11-81	7-17-81	9-2-81	9-30-81
1. Lasso	4EC	3.0	2.00	5.83	7.83	9.37	9.60
2. Dual	8E	2.5	1.67	5.33	8.00	9.30	9.77
3. Surflan	75W	4.0	1.67	6.00	7.33	8.30	9.50
4. DPX 5648	75DF	0.125	9.80	9.73	7.63	5.50	4.17
5. DPX 5648	75DF	0.25	9.83	9.87	9.70	8.73	8.17
6. DPX 5648	75DF	0.50	9.87	9.93	9.90	9.83	9.47
7. DPX 5648	75DF	1.0	9.90	9.97	9.90	9.83	9.77
8. DPX 5648	75DF	0.125	1.00	4.67	3.00	2.00	1.00
9. DPX 5648	75DF	0.150	1.67	6.00	7.83	7.00	6.33
10. Check		----	1.00	1.00	1.00	1.00	1.00
Statistical Difference			**	**	**	**	**
CV (Percent)			15.3	14.4	16.6	21.1	14.9
LSD .01			1.74	2.31	2.05	3.52	3.78
LSD .05			1.27	1.68	2.81	2.57	2.76

Table 4

Expt. 4-H-2-81. Evaluation of Oust herbicide for common bermudagrass phytotoxicity.

Objective: Evaluate the effects of three postemergence treatments of Oust herbicide for common bermudagrass phytotoxicity and subsequent effects on bermudagrass heights.

Date of Treatment: 5-13-81

County: Payne

Location: Junction of SH-33 and SH-108, west of Cushing.

Soil Type: Kirkland Silt Loam

Plot Size: 5 ft. by 10 ft. Carrier Rate: 40 GPA

Field Design: Randomized complete block with three replications.

Methods of Scoring: Bermudagrass Phytotoxicity - 1 = No Effect; 10 = Complete Yellowing.
Bermudagrass Height - Average height measured in inches.

Treatments	Rate lbs. ai./A	Bermudagrass Phytotoxicity						Bermudagrass Height				
		6-17-81	7-2-81	7-15-81	8-3-81	8-25-81	9-29-81	7-2-81	7-15-81	8-3-81	8-25-81	9-29-81
1. Oust 80 WP	0.125	3.00	1.67	1.00	1.00	1.00	1.00	7.50	10.67	10.33	14.00	12.00
2. Oust 80 WP	0.250	4.00	1.33	1.00	1.00	1.00	1.00	6.67	9.00	8.50	13.00	10.67
3. Oust 80 WP	0.50	4.67	3.00	2.00	1.00	1.00	1.00	5.42	6.00	7.00	10.00	10.33
4. Check	----	1.00	1.00	1.00	1.00	1.00	1.00	13.0	16.00	13.67	15.00	12.00
Statistical Difference		**	**	NS	NS	NS	NS	**	**	**	**	*
CV (Percent)		9.1	26.9	--	--	--	--	7.6	17.5	16.1	10.1	6.1
LSD .01		0.87	1.43	--	--	--	--	1.88	5.53	4.82	4.00	2.08
LSD .05		0.58	0.94	--	--	--	--	1.24	3.65	3.18	2.64	1.37

Table 5

Expt. 4-H-4-81. Effects of five rates of Oust herbicide on common bermudagrass.

Objective: Evaluate five different rates of Oust herbicide and their effects on common bermudagrass phytotoxiciy, heigh and seedhead suppression.

Date of Treatment: 7-14-81

County: Payne

Location: OSU Agronomy Research Station - Turf Plots.

Soil Type: Kirkland Silt Loam

Plot Size: 5 ft. by 10 ft. Carrier Rate: 40 GPA

Field Design: Randomized complete block with three replications.

Methods of Scoring: Bermudagrass Phytotoxicity - 1 = No Effect; 10 = Complete Yellowing
Bermudagrass Height - Average height measured in inches.
Percent Bermudagrass Seedhead Suppression - 0 = None; 100 = Complete Seedhead Suppression

Treatments	Rate lbs. ai./A	Bermudagrass Phytotoxicity 8-13-81	Bermudagrass Phytotoxicity 8-28-81	Bermudagrass Phytotoxicity 9-28-81	Bermudagrass Height 8-28-81	Bermudagrass Height 9-28-81	Ber. Seedhead Suppression 8-28-81	Ber. Seedhead Suppression 9-28-81
1. Oust 80 WP	1.0	5.00	2.67	1.00	1.50	2.17	95.7	16.7
2. Oust 80 WP	0.75	5.00	1.67	1.00	1.83	2.25	95.3	3.3
3. Oust 80 WP	0.50	5.00	1.00	1.00	1.83	2.50	96.0	0.0
4. Oust 80 WP	0.25	3.33	1.33	1.00	2.17	2.00	81.7	23.3
5. Oust 80 WP	0.125	3.00	1.00	1.33	3.00	2.83	53.3	0.0
6. Check	----	1.00	1.00	1.33	3.50	2.83	0.0	10.0
Statistical Difference		**	**	NS	**	**	**	NS
CV (Percent)		13.6	30.1	31.5	17.1	10.2	8.5	220.9
LSD .01		1.31	1.12	0.64	1.02	0.45	10.9	35.7
LSD .05		0.92	0.79	0.90	0.72	0.64	15.5	50.8

Table 6

Herbicide evaluation for the selective control of johnsongrass on highway rights-of-way based on 10 as complete control and 1 as no effect.

Expt. No. 4-H-6-81. US-177, 5.8 miles south of Stillwater. Treatments were applied 9-15-81. Treatments 1-6 were applied with the Bobar Rope-Wick herbicide applicator at 2 mph. Treatments 8-10 were applied with the CO_2 sprayer with 40gpa carrier.

	Treatments	Rate	Johnsongrass Control (Scores) 8-20-82
1.	DPX 5648 50 WS	10,000 PPM	5.50
2.	DPX 5684 50 WS	5,000 PPM	7.33
3.	DPX 5648 50 WS	2,500 PPM	5.50
4.	DPX 5648 45 KWS	10,000 PPM	7.83
5.	DPX 5648 45 KWS	5,000 PPM	6.33
6.	DPX 5648 45 KWS	2,500 PPM	4.00
7.	Check		1.00
8.	DPX 5648 50 WS	4 oz. ai/A	9.93
9.	DPX 5648 75 DF	4 oz. ai/A	9.77
10.	DPX 5648 45 KWS	4 oz. ai/A	8.67
	Statistical Difference		* *
	CV (Percent)		26.9
	LSD .01		4.17
	LSD .05		3.04

Table 7

Herbicide evaluation for the selective control of johnsongrass on highway rights-of-way based on 10 as complete control and 1 a effect.

Expt. No. 8-H-2-82. N.E. of Ralston, Jcts SH-20 and SH 18. Preemergence treatments 1-14 were applied 4-9-82; postemerg treatments 13-19 were applied 6-1-82; postemergence treatments 6-9 13-17 were applied 7-7-82; postemergence treatments 13-19 were applie 7-27-82; postemergence treatments 13-17 were applied 9-1-82.

	Treatments	Rate(s) ai/A	Type of Application	Johnsongrass Control (Scores) 6-1-82	7-7-82	7-27-82	9-1-82	10-11-8
1.	Oust 75 DF	4 oz.	Pre (Preemergence)	9.80	8.67	7.17	6.83	4.33
2.	Oust 75 DF	5 oz.	Pre	9.90	9.30	9.17	7.83	8.93
3.	Oust 75 DF	6 oz.	Pre	9.93	9.27	8.33	8.17	7.83
4.	Oust 75 DF	7 oz.	Pre	9.93	9.50	9.43	9.10	7.67
5.	Oust 75 DF	8 oz.	Pre	9.93	9.70	9.43	8.83	7.67
6.	Oust 75 DF (split appl.)	2 oz. + 2 oz.	Pre + Post (Postemergence)	9.73	8.17	9.50	9.37	8.93
7.	Oust 75 DF (split appl.)	2 oz. + 4 oz.	Pre + Post	8.93	7.67	8.43	9.77	8.80
8.	Oust 75 DF (split appl.)	3 oz. + 3 oz.	Pre + Post	9.90	8.50	9.50	9.43	9.33
9.	Oust 75 DF (split appl.)	3 oz. + 4 oz.	Pre + Post	9.63	7.97	9.00	9.63	9.43
10.	Lasso 4 EC	2.6 lbs.	Pre	1.00	1.00	1.00	1.00	1.00
11.	Surflan 75 W	4.0 lbs.	Pre	1.33	2.00	1.00	1.33	2.00
12.	Dual 8 E	2.5 lbs.	Pre	1.67	2.33	3.33	4.33	2.00
13.	Surflan 75 W + MSMA	4.0 lbs. + 3.0 lbs.	Pre + Post	1.00	6.83	9.57	9.27	9.43
14.	Dual 8 E + MSMA	2.5 lbs. + 3.0 lbs.	Pre + Post	1.00	7.83	9.73	9.70	9.87
15.	MSMA	3.0 lbs.	Post	1.00	8.00	9.73	9.30	9.73
16.	DSMA	3.6 lbs.	Post	1.00	6.50	9.00	8.50	9.47
17.	MSMA + DSMA	3.0 lbs. + 3.6 lbs.	Post	1.00	6.00	9.00	9.00	9.60
18.	Roundup	1.5 qts. product	Post	1.00	8.50	6.33	9.33	9.30
19.	Bronco	1.0 gal. product	Post	1.00	8.83	7.67	8.10	8.57
20.	Check	------	----	1.00	1.00	1.00	1.00	1.00
	Statistical Difference			**	**	**	**	**
	CV (Percent)			9.4	17.4	14.7	16.5	13.9
	LSD .01			1.04	2.66	2.40	2.74	2.22
	LSD .05			0.78	1.98	1.79	2.05	1.66

Table 8

Herbicide evaluation for the selective control of johnsongrass on highway rights-of-way based on 10 as complete control and 1 as n effect.

Expt. No. 4-H-7-82. US-77, 5.7 miles south of Stillwater. Preemergence treatments 1-14 were applied 3-15-82; postemergence treatment 13-19 were applied 6-1-82; postemergence treatments 13-17 were applie 7-7-82; postemergence treatments 18 and 19 were applied 7-27-82 postemergence treatments 6-9 and 13-17 were applied 9-7-82.

	Treatments	Rate(s) ai/A	Type of Application	Johnsongrass Control (Scores) 6-1-82	7-7-82	7-27-82	9-7-82	10-12-82
1.	Oust 75 DF	4 oz.	Pre (Preemergence)	9.90	9.77	9.00	9.83	9.75
2.	Oust 75 DF	5 oz.	Pre	9.93	9.87	9.10	9.73	9.92
3.	Oust 75 DF	6 oz.	Pre	9.93	9.87	9.53	9.90	9.85
4.	Oust 75 DF	7 oz.	Pre	9.97	9.80	10.0	9.90	9.83
5.	Oust 75 DF	8 oz.	Pre	9.97	9.93	9.83	9.77	9.92
6.	Oust 75 DF	2 oz. + 2 oz.	Pre + Post (Postemergence)	9.87	9.70	8.50	9.70	9.63
7.	Oust 75 DF	2 oz. + 4 oz.	Pre + Post	9.77	9.60	9.00	9.60	9.77
8.	Oust 75 DF	3 oz. + 3 oz.	Pre + Post	9.90	9.83	8.77	9.77	9.77
9.	Oust 75 DF	3 oz. + 4 oz.	Pre + Post	9.90	9.70	9.10	9.73	9.92
10.	Lasso 4 EC	2.6 lbs.	Pre	1.00	2.33	1.67	1.00	4.00
11.	Surflan 75 W	4.0 lbs.	Pre	1.00	3.33	2.33	3.50	4.00
12.	Dual 8 E	2.5 lbs.	Pre	1.00	3.00	2.33	2.67	4.33
13.	Surflan 75 W + MSMA	4.0 lbs. + 3.0 lbs.	Pre + Post	1.00	9.00	9.93	9.87	9.92
14.	Dual 8 E + MSMA	2.5 lbs. + 3.0 lbs.	Pre + Post	1.00	7.67	9.93	9.73	9.93
15.	MSMA	3.0 lbs.	Post	1.00	6.17	9.20	9.40	9.58
16.	DSMA	3.6 lbs.	Post	1.00	7.67	9.77	9.87	9.97
17.	MSMA + DSMA	3.0 lbs. + 3.6 lbs.	Post	1.00	8.67	9.00	9.60	9.93
18.	Roundup	1.5 qts. product	Post	1.00	8.83	6.00	8.77	9.38
19.	Bronco	1.0 gal. product	Post	1.00	8.33	4.17	6.33	6.50
20.	Check	------	----	1.00	1.00	1.00	1.00	1.00
	Statistical Difference			* *	* *	* *	* *	* *
	CV (Percent)			1.2	15.5	16.3	16.6	9.5
	LSD .01			0.13	2.65	2.67	2.93	1.76
	LSD .05			0.10	1.98	2.00	2.19	1.32

Table 9

Herbicide phytotoxicity on common bermudagrass on Oklahoma highway rights-of-way.

Expt. No. 4-H-8-82. US-177, 4.0 miles south of Stillwater. Preemergence treatments 1-12 were applied 3-17-82; postemergence treatm 13 and 14 applied 6-1-82 and 7-27-82; postemergence treatments 6-9 applied 9-7-82.

	Treatments	Rate(s) ai/A	Type of Application	Bermudagrass Phytotoxicity (Scores)[1] 6-1-82	7-7-82	7-27-82	9-7-82	10-12-8
1.	Oust 75 DF	4 oz.	Pre (Preemergence)	9.97	6.50	4.00	3.33	7.13
2.	Oust 75 DF	5 oz.	Pre	10.00	7.17	3.67	2.33	7.67
3.	Oust 75 DF	6 oz.	Pre	10.00	9.17	5.00	3.33	7.00
4.	Oust 75 DF	7 oz.	Pre	10.00	9.33	4.67	3.67	7.17
5.	Oust 75 DF	8 oz.	Pre	10.00	9.50	4.67	3.33	6.50
6.	Oust 75 DF (split appl.)	2 oz. + 2 oz.	Pre + Post (Postemergence)	8.33	2.33	1.67	1.00	9.33
7.	Oust 75 DF (split appl.)	2 oz. + 4 oz.	Pre + Post	8.50	2.17	2.33	1.67	8.67
8.	Oust 75 DF (split appl.)	3 oz. + 3 oz.	Pre + Post	9.13	4.83	3.00	2.33	7.50
9.	Oust 75 DF (split appl.)	3 oz. + 4 oz.	Pre + Post	9.60	3.83	2.67	1.67	7.97
10.	Lasso 4 EC	2.6 lbs.	Pre	1.00	1.00	1.00	1.00	9.55
11.	Surflan 75 W	4.0 lbs.	Pre	1.00	1.00	1.00	1.00	9.77
12.	Dual 8 E	2.5 lbs.	Pre	1.00	1.00	1.00	1.00	9.58
13.	Roundup	1.5 qts. product	Post	1.00	2.00	1.33	1.67	8.67
14.	Bronco	1.0 gal. product	Post	1.00	1.00	1.00	1.00	9.08
15.	Check	-------	----	1.00	1.00	1.00	1.00	9.25
	Statistical Difference			* *	* *	* *	* *	* *
	CV (Percent)			3.8	30.1	36.3	50.4	13.3
	LSD .01			0.52	2.80	2.08	2.22	2.49
	LSD .05			0.38	2.01	1.54	1.65	1.85

[1]Scoring dates 6-1-82 and 7-7-82 were based on 10 as complete discoloration and 1 as no effect. Scoring dates 7-27-82 and 9-7-82 based on 10 as complete thinning out and 1 as no effect. Scoring date 10-12-82 was based on 10 as complete ground cover and 1 as ground.

Table 10

Herbicide Phytotoxicity on common Bermudagrass on Oklahoma highway rights-of-way based on 10 as complete discoloration a
1 as no effect.

Expt. No. 4-H-9-82. US-77, 4.0 miles south of Stillwater. All treatments were applied 6-7-82.

	Treatments[1]	Rate lbs. product/A	Rate lbs. ai/A	Common Bermudagrass Phytotoxicity (Scores) 7-6-82	7-14-82	8-20-82	10-12-82[2]
1.	Velpar 90 SP + surfactant	0.75	0.675	4.00	3.00	3.00	7.67
2.	Velpar 90 SP + surfactant	1.25	1.125	7.00	6.00	5.00	6.33
3.	Karmex 80 WP + surfactant	3.0	2.4	2.67	2.67	3.00	7.17
4.	Karmex 80 WP + surfactant	4.0	3.2	3.33	2.67	2.67	7.17
5.	Oust 75 DF	0.67	0.5	8.00	5.67	7.67	5.00
6.	Oust 75 DF	1.33	1.0	8.00	8.33	8.00	5.83
7.	Roundup	1 qt.	0.75	5.00	4.00	5.33	8.17
8.	Roundup	3 qts.	2.25	9.00	8.00	7.67	5.33
9.	Kerb 50 W	2.0	1.0	1.00	1.00	1.67	8.33
10.	Kerb 50 W	4.0	2.0	1.33	1.33	1.67	8.33
11.	Aatrex Nine-0	5.6	5.0	4.33	2.67	3.33	7.67
12.	Aatrex Nine-0	11.0	9.9	7.00	7.00	6.33	5.33
13.	Igran 80 W + surfactant	3.75	3.0	2.67	1.00	2.00	8.67
14.	Igran 80 W + surfactant	5.0	4.0	1.33	1.33	1.00	9.33
15.	Bicep 4.5 L	1.33 gal.	6.0	1.67	1.00	1.67	8.83
16.	Bicep 4.5 L	2.0 gal.	9.0	4.00	2.00	5.33	5.00
17.	Princep 80 W	4.0	3.2	2.00	1.00	1.00	8.67
18.	Princep 80 W	5.0	4.0	2.33	1.67	2.33	8.00
19.	Check	---	---	1.00	1.00	1.00	9.00
	Statistical Difference			* *	* *	* *	* *
	CV (Percent)			29.4	29.9	32.0	19.0
	LSD .01			2.60	2.15	2.60	3.10
	LSD .05			1.94	1.60	1.94	2.31

[1] Treatments 1, 2, 3, 4, 13, and 14 had Surfactant WK added at the equivalant rate of 1 quart per 100 gallons of spr
mixture.

[2] On this date, bermudagrass was showing no symptoms of discoloration; therefore, treatments were scored on perce
ground cover based on 10 as total (100%) ground cover and 1 as bare ground.

Table 11

Herbicide evaluation for the selective control of johnsongrass on highway rights-of-way based on 10 as complete control and 1 as no effect.

Expt. No. 4-H-10-82. SH-33, 0.6 mile east of Jct. SH-108. Treatments 1-14 applied 9-14-82; treatments 13 and 14 were applied as a tank mix; only MSMA portions of treatments 15 and 16 were applied on 9-14-82. Treatments 15 and 16 (Surflan and Dual) applied 3-7-83; treatments 11-16 (post) were applied 5-25-83 and 7-5-83; treatments 9-10 were applied 8-10-83.

JOHNSONGRASS CONTROL SCORES

	Treatments	Rate(s) ai/A	10-11-82	5-5-83	7-5-83	8-10-83	10-5-83	Percent Bermudagrass Cover 10-5-83
1.	Oust 75 DF	1 oz	4.33	4.67	5.33	3.67	7.00	63.3
2.	Oust 75 DF	2 oz	4.00	7.00	6.33	5.33	7.50	68.3
3.	Oust 75 DF	3 oz	4.67	7.67	7.17	7.33	8.67	85.0
4.	Oust 75 DF	4 oz	4.00	8.00	7.50	7.83	8.33	61.7
5.	Oust 75 DF	5 oz	4.33	8.83	8.67	8.63	9.03	71.0
6.	Oust 75 DF	6 oz	5.00	9.33	9.17	9.17	9.50	78.3
7.	Oust 75 DF	7 oz	4.33	9.50	9.00	8.83	9.17	88.3
8.	Oust 75 DF	8 oz	5.33	9.77	9.17	9.50	9.60	55.0
9.	Roundup	1 qt product	9.33	8.50	5.33	5.67	7.17	35.0
10.	Roundup	1.5 qts product	8.83	8.83	5.00	3.00	8.47	10.0
11.	DSMA	3.6 lbs	8.67	4.33	7.00	9.93	9.97	98.3
12.	MSMA	3.0 lbs	8.67	3.67	4.67	9.93	9.90	94.3
13.	MSMA + Surflan 75W	3.0 lbs + 4.0 lbs	8.67	4.00	5.00	9.97	9.87	97.3
14.	MSMA + Dual 8E	3.0 lbs + 2.5 lbs	8.33	3.00	4.00	9.87	9.73	84.7
15.	MSMA + Surflan 75W	3.0 lbs + 4.0 lbs	9.00	5.33	6.00	9.93	9.90	95.0
16.	MSMA + Dual 8E	3.0 lbs + 2.5 lbs	8.83	4.00	6.17	10.0	9.97	98.3
17.	Check	-----	1.00	1.00	1.00	1.00	1.00	11.7
	Statistical Difference		**	**	**	**	**	**
	CV (Percent)		11.0	13.9	16.0	11.5	11.3	26.3
	LSD .01		1.55	1.96	2.24	1.95	2.15	41.7
	LSD .05		1.15	1.46	1.66	1.45	1.60	30.8

Table 12

Expt. 4-H-11-83. Herbicide evaluation for the selective control of johnsongrass on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of seven preemergence and postemergence herbicides for the selective control of johnsongrass on highway rights-of-way.

Dates of Application: March 8, 1983 - treatments 1-4, 16-17 (Surflan & Dual); May 25, 1983 - post treatments 5-17; July 5, 1983 - post treatments 11-17; August 10, 1983 - post treatments 14-17.

Replications: Three

Dates scored: May 25, 1983; July 5, 1983; August 10, 1983; October 5, 1983.

Method of Scoring: 10 = Complete Control
1 = No Control

	Treatments	Rate(s)/A	Type of Application	Dates Scored 5-25-83	7-5-83	8-10-83	10-5-83
1.	Oust 75 DF	1 oz product	Pre (Preemergence)	3.33	4.67	1.33	1.67
2.	Oust 75 DF	2 oz product	Pre	6.83	4.00	2.67	4.83
3.	Oust 75 DF	3 oz product	Pre	8.00	5.67	2.33	4.00
4.	Oust 75 DF	4 oz product	Pre	9.63	7.17	5.83	7.77
5.	Oust 75 DF	1 oz product	Post (Postemergence)	1.00	5.33	2.67	3.00
6.	Oust 75 DF	2 oz product	Post	1.00	6.00	3.00	3.33
7.	Oust 75 DF	3 oz product	Post	1.00	8.17	7.00	5.50
8.	Oust 75 DF	4 oz product	Post	2.67	7.50	7.33	7.17
9.	Oust 75 DF	5 oz product	Post	1.00	8.43	8.93	9.10
10.	Oust 75 DF	6 oz product	Post	1.00	9.17	8.83	9.17
11.	SC-0224	1.6 qts product	Post	1.00	8.67	9.27	6.33
12.	Roundup	1.0 qt product	Post	1.00	7.17	8.83	5.67
13.	Roundup	1.5 qts product	Post	1.00	9.17	9.87	8.67
14.	DSMA	3.6 lbs ai	Post	1.00	5.67	8.80	9.77
15.	MSMA	3.0 lbs ai	Post	1.00	5.33	7.83	8.83
16.	MSMA + Surflan 75W	3 lbs ai + 4 lbs ai	Post + Pre	1.00	4.33	8.67	9.60
17.	MSMA + Dual 8E	3 lbs ai + 2.5 lbs ai	Post + Pre	1.00	5.67	7.83	9.00
18.	Check	-----	-----	1.00	1.00	1.00	1.00
	Statistical Difference			**	**	**	**
	CV (Percent)			36.7	24.3	20.2	31.5
	LSD .01			1.97	3.40	2.80	4.46
	LSD .05			1.47	2.53	2.09	3.32

Table 13

Expt. 4-H-11-83. (Follow up). Herbicide evaluation for the selective control of johnsongrass on Oklahoma highway rights-of-way.

Objective: Evaluate the effects of followup treatments of four postemergence herbicide applications for the selective control of johnsongrass on Oklahoma highway rights-of-way.

Dates of Treatments: June 27, 1984 (treatments 7-13, 15, 18); July 25, 1984 (treatment 15).

Soil Type: Norge Loam

Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with 3 replications

County: Payne

Location: SH-108, 0.5 mile north of Jct. SH-33 (west side).

Method of Scoring: Johnsongrass control 10 = complete control
1 = no effect

Treatments	1983 Product Rate/A	1984 Product Rate/A	Carrier Rate GPA	Johnsongrass Control 7-25-84	8-24-85	9-28-84	10-19-84
7. Oust	3 oz.	3 oz.	40	6.17abc*	6.8ab*	5.97abc*	6.83ab*
8. Oust	4 oz.	2 oz.	40	6.83ab	6.5ab	7.5ab	7.83a
9. Oust	5 oz.	2.5 oz.	40	7.0ab	7.67ab	7.27ab	7.43a
10. Oust	6 oz.	3.0 oz.	40	9.13a	8.9ab	9.43a	9.5a
11. SC-0224	1.6 qts.	1 qt.	40	3.33bcd	5.67bc	4.33bcd	3.33bc
12. Roundup	1.0 qt.	1 qt.	40	2.67cd	2.67cd	2.67cd	2.33c
13. Roundup	1.5 qts.	1 qt.	20	7.83a	7.50ab	6.83ab	8.5a
15. MSMA	2 qts.	2 qts.	40	9.7a	9.63a	9.17a	9.43a
18. Check	---	---	--	1.0d	1.0d	1.0d	1.0c
Statistical Difference				**	**	**	**
CV (Percent)				36.2	30.6	38.0	35.2

*Means with the same letter are not significantly different (Waller-Duncan K-Ratio T-Test).

Table 14

Expt. 4-H-12-83. Evaluation of herbicide phytotoxicity on common bermudagrass on Oklahoma highway rights-of-way.

Objective: Evaluate the phytotoxicity of seven preemergence and postemergence herbicides on common bermudagrass on Oklahoma rights-of-way.

Dates of Application: March 8, 1983 - treatments 1-14, 16-17 (Surflan & Dual); May 25, 1983 - post treatments 5-17; July 5, 1983 - post treatments 11-17; August 10, 1983 - post treatments 14-17.

Replications: Three

Dates Scored: May 25, 1983; July 5, 1983; August 10, 1983; October 5, 1983.

Method of Scoring: 10 = complete yellowing or burning
1 = no effect

	Treatments	Rate(s)/A	Type of Application	Dates Scored 5-25-83	7-5-83	8-10-83	10-5-83
1.	Oust 75 DF	1 oz product	Pre (Preemergence)	5.33	2.33	1.00	1.00
2.	Oust 75 DF	2 oz product	Pre	5.00	2.33	1.00	1.33
3.	Oust 75 DF	3 oz product	Pre	4.33	2.00	1.00	1.00
4.	Oust 75 DF	4 oz product	Pre	5.67	3.00	1.00	1.00
5.	Oust 75 DF	1 oz product	Post (Postemergence)	1.00	1.33	1.00	1.00
6.	Oust 75 DF	2 oz product	Post	1.00	2.00	1.00	1.00
7.	Oust 75 DF	3 oz product	Post	1.00	2.33	1.00	1.00
8.	Oust 75 DF	4 oz product	Post	1.00	3.00	1.00	1.00
9.	Oust 75 DF	5 oz product	Post	1.00	3.33	1.00	1.33
10.	Oust 75 DF	6 oz product	Post	1.00	4.00	1.00	1.00
11.	SC-0224	1.6 qts product	Post	1.00	2.33	5.67	8.00
12.	Roundup	1.0 qt product	Post	1.00	1.33	3.67	4.83
13.	Roundup	1.5 qts product	Post	1.00	1.00	4.67	7.00
14.	DSMA	3.6 lbs ai	Post	1.00	1.00	1.00	1.33
15.	MSMA	3.0 lbs ai	Post	1.00	1.00	1.00	1.00
16.	MSMA + Surflan 75W	3 lbs ai + 4 lbs ai	Post + Pre	1.00	1.00	1.00	1.00
17.	MSMA + Dual 8E	3 lbs ai + 2.5 lbs ai	Post + Pre	1.00	1.00	1.00	1.00
18.	Check	-----	-----	1.00	1.00	1.00	1.00
	Statistical Difference			**	**	**	**
	CV (Percent)			17.4	42.2	25.3	38.7
	LSD .01			0.74	1.85	0.91	1.72
	LSD .05			0.55	1.37	0.68	1.28

Table 15

Expt. 4-H-12-83. (Followup). Evaluation of herbicide phytotoxicity on common bermudagrass on Oklahoma highway rights-of-way.

Objective: Evaluate the phytotoxicity of followup treatments of four postemergence herbicide applications on common bermudagrass on Oklahoma highway rights-of-way.

Date of Treatments: 5-18-84 (trmt. 8); 6-27-84 (trmts. 7, 9-13, 15, 18); 7-25-84 (trmt. 15).

County: Payne

Location: Jct. of SH-33 and SH-108 south of Ripley.

Method of Scoring: Bermudagrass Phytotoxicity 10 = complete yellow, 1 = no effect; Percent bermudagrass 100 = complete cover, 0 = none

Soil Type: Norge Loam

Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with 3 replications.

Treatments	1983 Product Rate/A	1984 Product Rate/A	Carrier Rate GPA	Bermudagrass Phytotoxicity 7-25-84	Percent Bermudagrass 9-28-84	Percent Bermudagrass 10-19-84
7. Oust	3 oz.	3 oz.	40	1.0b*	98.3*a	96.7*a
8. Oust	4 oz.	4 oz.	40	3.33a	78.3bc	85.0ab
9. Oust	5 oz.	5 oz.	40	1.0b	93.3ab	93.3a
10. Oust	6 oz.	6 oz.	40	2.0ab	76.7bc	85.0ab
11. SC-0224	1.6 qts.	1 qt.	40	3.33a	66.7c	75.0b
12. Roundup	1.0 qt.	1 qt.	40	2.67a	83.3abc	85.0ab
13. Roundup	1.5 qts.	1 qt.	20	2.33ab	66.7c	73.3b
15. MSMA	2 qts.	2 qts.	40	1.0b	96.7a	96.7a
18. Check	---	---	--	1.0b	100a	100a
Statistical Difference				**	**	**
CV (Percent)				42.7	11.3	10.3

*Means with the same letter are not significantly different (Waller-Duncan K Ratio T-Test).

Table 16

Expt. 4-H-14-83 Herbicide evaluation for the selective control of johnsongrass and bermudagrass release on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of four herbicides alone and in combinations for the selective control of johnsongrass and bermudagrass release on Oklahoma highway rights-of-way.

Dates of Application: May 26, 1983 - treatments 1A-10C; July 19, 1983 - treatments 1-8 (BC), 10 B-C; August 12, 1983 - treatments 1C, 2C, 6C.

Replications: Three

Dates Scored: May 26, 1983; July 19, 1983; August 12, 1983; October 12, 1983.

Methods of Scoring: Percent Johnsongrass Cover (0-100); Percent Bermudagrass Cover (0-100); Johnsongrass Control (1=No Control, 10=Complete Control); Bermudagrass Phytotoxicity (1=No Effect, 10=Complete Yellowing)

Treatments	*Product Rate(s) per Acre	% Johnson-grass Cover	Johnsongrass Control			Bermudagrass Phytotoxicity		% Bermuda-grass Cover		Net % Inc. in Bermuda Cover
		5/26/83	7/19	8/12	10/12	7/19	8/12	5/26/83	10/12/83	
1A. Roundup	(12 oz)	53.3	5.33	6.00	7.83	1.33	1.00	43.3	81.7	38.3
1B. Roundup	(12 oz) + 12 oz	50.0	5.33	6.00	5.83	1.33	1.00	30.0	60.0	30.0
1C. Roundup	(12 oz) + 12 oz + 12 oz	36.7	5.33	7.60	8.63	1.33	1.00	46.7	78.3	31.7
2A. Roundup	(16 oz)	46.7	7.50	9.10	9.60	1.33	1.33	46.7	90.0	43.0
2B. Roundup	(16 oz) + 16 oz	53.3	7.50	7.83	8.60	1.33	1.33	33.3	85.0	51.7
2C. Roundup	(16 oz) + 16 oz + 16 oz	33.3	7.50	9.60	9.73	1.33	1.33	53.3	91.0	37.7
3A. Roundup	(24 oz)	43.3	9.70	9.47	9.73	3.33	2.33	28.3	81.0	52.7
3B. Roundup	(24 oz) + 16 oz	43.3	9.70	9.87	9.90	3.33	2.33	46.7	86.7	40.0
3C. Roundup	(24 oz) + 16 oz + 16 oz	30.0	9.70	9.80	9.83	3.33	2.00	31.7	61.7	30.0
4A. Roundup	(32 oz)	56.7	9.47	9.50	9.70	4.33	3.67	30.0	61.7	31.7
4B. Roundup	(32 oz) + 16 oz	43.3	9.47	9.43	9.60	4.33	4.00	43.3	68.3	25.0
4C. Roundup	(32 oz) + 16 oz + 16 oz	43.3	9.47	9.50	9.50	4.33	4.00	46.7	63.3	23.3
5A. Roundup + Oust 75 DF	(12 oz + 4 oz)	56.7	8.93	9.17	9.10	4.33	2.00	36.7	80.0	43.3
5B. Roundup + Oust 75 DF	(12 oz + 4 oz) + 12 oz Roundup(R)	41.7	8.93	9.47	9.77	4.33	2.00	40.0	81.7	41.7
5C. Roundup + Oust 75 DF	(12 oz + 4 oz) + 12 oz (R) + 12 oz (R)	63.3	8.93	8.00	8.10	4.33	1.33	23.3	70.0	46.7
6A. Roundup + Oust 75 DF	(16 oz + 4 oz)	46.7	9.17	8.93	9.30	4.00	1.67	18.3	66.7	48.3
6B. Roundup + Oust 75 DF	(16 oz + 4 oz) + 16 oz (R)	40.0	9.17	9.77	9.80	4.00	3.00	40.0	55.0	15.0
6C. Roundup + Oust 75 DF	(16 oz + 4 oz) + 16 oz (R) + 16 oz (R)	56.7	9.17	9.27	9.30	4.00	2.00	43.3	58.3	15.0
7A. Roundup + Oust 75 DF	(24 oz + 4 oz)	43.3	9.60	9.97	9.93	6.00	3.33	50.0	75.0	25.0
7B. Roundup + Oust 75 DF	(24 oz + 4 oz) + 16 oz (R)	46.7	9.60	9.60	9.97	6.00	3.33	18.3	50.0	31.7
7C. Roundup + Oust 75 DF	(24 oz + 4 oz) + 16 oz (R) + 16 oz (R)	63.3	9.60	9.63	9.80	6.00	3.67	36.7	60.0	23.3
8A. Roundup + Oust 75 DF	(32 oz + 4 oz)	43.3	9.97	10.0	8.97	8.00	5.67	46.7	55.0	11.7
8B. Roundup + Oust 75 DF	(32 oz + 4 oz) + 16 oz (R)	60.0	9.97	9.97	9.93	8.00	5.00	33.3	40.0	6.7
8C. Roundup + Oust 75 DF	(32 oz + 4 oz) + 16 oz (R) + 16 oz (R)	36.7	9.97	9.97	9.80	8.00	5.33	33.3	43.3	10.0
**9. Oust 75 DF	(4 oz)	41.1	9.17	8.73	9.14	3.00	1.00	36.7	82.6	45.9
10A. MSMA + Aatrex 4L	(1/2 gal + 1/2 gal)	40.0	6.67	8.30	8.63	1.33	1.67	33.3	75.0	41.7
10B. MSMA + Aatrex 4L	(1/2 gal + 1/2 gal) + 1/2 gal MSMA(M)	46.7	6.67	9.80	9.77	1.33	1.00	40.0	94.7	54.7
10C. MSMA + Aatrex 4L	(1/2 gal + 1/2 gal) + 1/2 gal (M) + 1/2 gal(M)	53.3	6.67	9.80	9.83	1.33	1.00	36.7	92.3	55.7
**11. Check	-----	52.3	1.00	1.00	1.56	1.00	1.00	35.6	44.4	8.8
Statistical Difference		NS	**	**	**	**	**	NS	**	*
CV (Percent)		36.5	10.9	12.6	12.9	33.7	52.6	40.0	26.9	56.5
LSD .01		37.2	1.86	2.28	2.40	2.52	2.53	32.3	40.4	40.6
LSD .05		28.0	1.40	1.72	1.80	1.90	1.91	24.3	30.4	30.6

* Initial treatments are in parenthesis.
**Treatments 9 and 11 scores are based on an average of nine readings.

Table 17

Expt. 4-H-14-83, Herbicide evaluation for the selective control of johnsongrass and bermudagrass release on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of four herbicides alone and in combinations for the selective control of johnsongrass and bermudagrass release on Oklahoma highway rights-of-way.

Treatments: May 26, 1983 - treatments 1A-10C; July 19, 1983 - treatments 1-8 (BC); August 12, 1983 - treatments 1C, 2C, 6C.

County: Payne

Location: SH-33, 1 mile west of Drumright (center median).

Dates Scored: May 26, 1983; July 19, 1983; August 12, 1983; October 12, 1983; June 26, 1984; August 2, 1984.

Methods of Scoring: Percent johnsongrass cover (0-100); Percent bermudagrass cover (0-100); Johnsongrass control (1=no control, 10=complete control)

Treatments	*Product Rate(s) per Acre	Johnsongrass Control		% Bermudagrass Cover			Net Increase (%) in Bermuda Cover
		6-29-84	8-2-84	5-26-83	6-29-84	8-2-84	
1A. Roundup	(12 oz.)	7.17 e***	7.83 f***	43.3	86.7 ab***	86.7 abc***	43.4 a-d***
1B. Roundup	(12 oz.) + 12 oz.	7.33 d	8.0 ef	30.0	73.3 a-e	80.0 abc	50.0 abc
1C. Roundup	(12 oz.) + 12 oz. + 12 oz.	9.0 abc	9.0 bcd	46.7	91.7 a	90.0 a	43.3 a-d
2A. Roundup	(16 oz.)	8.33 cd	9.0 bcd	46.7	86.7 ab	85.0 abc	38.3 a-d
2B. Roundup	(16 oz.) + 16 oz.	8.5 bc	8.83 cde	33.3	83.3 abc	88.3 ab	55.0 ab
2C. Roundup	(16 oz.) + 16 oz. + 16 oz.	9.6 a	9.3 a-d	53.3	91.7 a	90.0 a	36.7 a-d
3A. Roundup	(24 oz.)	8.83 abc	9.43 a-d	28.3	85.0 ab	86.7 abc	58.4 a
3B. Roundup	(24 oz.) + 16 oz.	9.33 abc	9.77 ab	46.7	85.0 ab	86.7 abc	40.0 a-d
3C. Roundup	(24 oz.) + 16 oz. + 16 oz.	9.33 abc	9.33 a-d	31.7	73.3 a-e	70.0 a-d	38.3 a-d
4A. Roundup	(32 oz.)	8.33 cd	8.97 bcd	30.0	78.3 a-d	78.3 a-d	48.3 abc
4B. Roundup	(32 oz.) + 16 oz.	9.0 abc	8.67 def	43.3	76.7 a-e	85.0 abc	41.7 a-d
4C. Roundup	(32 oz.) + 16 oz. +16 oz.	8.33 cd	9.0 bcd	46.7	66.7 a-e	75.0 a-d	28.3 a-d
5A. Roundup + Oust 75 DF	(12 oz. + 4 oz.)	9.33 abc	9.9 a	36.7	78.3 a-d	86.7 abc	50.0 abc
5B. Roundup + Oust 75 DF	(12 oz. + 4 oz.) + 12 oz. Roundup (R)	9.83 a	9.93 a	40.0	76.7 a-e	85.0 abc	45.0 a-d
5C. Roundup + Oust 75 DF	(12 oz. + 4 oz.) + 12 oz. (R) + 12 oz. (R)	8.83 abc	9.0 bcd	23.3	75.0 a-e	76.7 a-d	53.4 abc
6A. Roundup + Oust 75 DF	(16 oz. + 4 oz.)	9.33 abc	9.63 abc	18.3	66.7 a-e	70.0 a-d	51.7 abc
6B. Roundup + Oust 75 DF	(16 oz. + 4 oz.) + 16 oz. (R)	9.17 abc	9.3 a-d	40.0	71.7 a-e	81.7 abc	41.7 a-d
6C. Roundup + Oust 75 DF	(16 oz. + 4 oz.) + 16 oz. (R) + 16 oz. (R)	8.83 abc	9.33 a-d	43.3	60.0 b-e	61.7 a-d	18.4 cd
7A. Roundup + Oust 75 DF	(24 oz. + 4 oz.)	9.83 a	9.93 a	50.0	71.7 a-e	66.7 a-d	16.7 cd
7B. Roundup + Oust 75 DF	(24 oz. + 4 oz.) + 16 oz. (R)	9.0 abc	9.5 a-d	18.3	50.0 d-e	55.0 bcd	36.7 a-d
7C. Roundup + Oust 75 DF	(24 oz. + 4 oz.) + 16 oz. (R) + 16 oz. (R)	9.47 ab	9.6 abc	36.7	76.7 a-e	78.3 a-d	41.6 a-d
8A. Rounduo + Oust 75 DF	(32 oz. + 4 oz.)	9.33 abc	9.47 a-d	46.7	65.0 a-e	61.7 a-d	15.0 cd
8B. Roundup + Oust 75 DF	(32 oz. + 4 oz.) + 16 oz. (R)	9.17 abc	9.8 ab	33.3	58.3 b-e	66.7 a-d	33.4 a-d
8C. Roundup + Oust 75 DF	(32 oz. + 4 oz.) + 16 oz. (R) + 16 oz. (R)	9.43 ab	9.63 abc	33.3	48.3 e	55.0 bcd	21.7 b-d
**9. Oust 75 DF	(4 oz.)	9.56 a	9.76 ab	36.7	85.6 ab	85.0 abc	48.3 abc
10A. MSMA + Aatrex 4L	(1/2 gal + 1/2 gal)	8.83 abc	9.43 a-d	33.3	80.0 abc	80.0 abc	46.7 a-d
10B. MSMA + Aatrex 4L	(1/2 gal + 1/2 gal) + 1/2 gal MSMA(M)	9.33 abc	9.77 ab	40.0	91.7 a	95.0 a	45.0 ab
10C. MSMA + Aatrex 4L	(1/2 gal + 1/2 gal) + 1/2gal(M) + 1/2gal(M)	9.17 abc	9.63 abc	36.7	90.0 a	91.7 a	55.0 ab
**11. Check	-----	1.0 f	1.0 g	35.6	57.2 cde	54.4 bcd	19.8 bcd
Statistical Difference		**	**	NS	**	**	**
CV (Percent)		8.7	6.7	40.0	20.0	20.6	39.9

* Initial treatments are in parenthesis.
** Treatments 9 and 11 scores are based on an average of nine readings.
*** Means with the same letter are not significantly different (Waller-Duncan K-Ratio T- Test).

Table 18

Expt. 4-H-15-83: Herbicide evaluation for the selective control of johnsongrass and percent bermudagrass release along Oklahoma roadsides.

Objective: Evaluate the effectiveness of seven postemergence herbicides for the selective control of johnsongrass and the resulting percent increase in bermudagrass cover along Oklahoma roadsides.

Dates of Application: June 3, 1983 - treatments 1-14; July 19, 1983 - treatments 11-14.

Replications: Three

Dates Scored: July 19, 1983; August 12, 1983; October 12, 1983.

Methods of Scoring: Johnsongrass Control 10 = complete control, 1 = no control; Bermudagrass Phytotoxicity 10 = complete yellowing or burning, 1 = no effect

Percent Bermudagrass Cover 100 = complete cover, 0 = none

	Treatments	Rate(s)/A	Dates Scored Johnsongrass Control 7-19-83	8-12-83	10-12-83	Dates Scored Bermudagrass Phytotoxicity 7-19-83	8-12-83	10-12-83	% Bermuda-grass cover 10-12-83
1.	Oust 75 DF	2 oz product	5.50	7.10	6.80	1.67	1.33	2.00	60.0
2.	Oust 75 DF	3 oz product	6.33	7.93	8.13	2.00	1.33	2.00	73.3
3.	Oust 75 DF	4 oz product	6.67	8.17	8.30	1.67	1.33	2.00	60.0
4.	Oust 75 DF	5 oz product	8.17	9.17	9.90	3.00	1.67	1.00	58.3
5.	Oust 75 DF	6 oz product	6.83	9.10	9.47	3.00	1.67	1.67	63.3
6.	SC-0224 + R-40244	1.5 lbs + 1.0 lbs	9.90	10.00	9.93	7.33	4.00	6.67	35.0
7.	SC-0224 + R-40244	2.0 lbs + 2.0 lbs	9.17	9.17	8.30	7.33	5.33	6.67	11.7
8.	SC-0224 + R-40244	2.0 lbs + 3.0 lbs	9.77	9.50	9.30	7.00	5.00	6.33	28.3
9.	SC-0224	1.07 qts product	8.83	9.43	9.50	2.77	1.33	1.33	76.7
10.	SC-0224	1.6 qts product	9.60	9.50	9.17	5.67	3.67	5.00	36.7
11.	Roundup	1.0 qt product	9.33	9.73	9.63	2.33	2.67	4.33	40.0
12.	Roundup	1.5 qts product	9.30	10.00	9.40	4.00	7.00	7.67	13.3
13.	DSMA	3.6 lbs ai	9.00	9.50	9.87	1.67	1.33	1.33	81.7
14.	MSMA	3.0 lbs ai	8.83	9.60	6.67	1.67	1.00	1.00	64.7
15.	Check	------	1.00	1.00	3.97	1.00	1.00	1.00	55.0
	Statistical Difference		**	**	NS	**	**	**	**
	CV (Percent)		14.5	14.0	28.6	33.9	42.3	43.1	42.3
	LSD .01		2.58	2.71	5.53	2.65	2.52	3.24	48.2
	LSD .05		1.91	2.01	4.10	1.97	1.87	2.40	35.7

Table 19

Expt. 8-H-4-83: Herbicide evaluation for the selective control of johnsongrass on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of seven preemergence and postemergence herbicides for the selective control of johnsongrass on Oklahoma highway rights-of-way.

Dates of Applications: March 11, 1983 - treatments 1-4, 16-17 (Surflan & Dual); May 24, 1983 - post treatments 5-17; June 30, 1983post treatments 11-17; August 11, 1983 - post treatments 14-17.

Replications: Three

Dates Scored: May 24, 1983; June 30, 1983; August 11, 1983; October 13, 1983

Method of Scoring: 10 = complete control
1 = no control

	Treatments	Rate(s)/A	Type of Application	Dates Scored 5-24-83	6-30-83	8-11-83	10-13-83
1.	Oust 75 DF	1 oz product	Pre (Preemergence)	6.17	3.67	2.00	2.67
2.	Oust 75 DF	2 oz product	Pre	8.50	6.00	4.33	5.67
3.	Oust 75 DF	3 oz product	Pre	9.27	5.33	3.00	3.00
4.	Oust 75 DF	4 oz product	Pre	9.90	7.00	5.50	5.33
5.	Oust 75 DF	1 oz product	Post (Postemergence)	1.00	6.00	3.30	3.67
6.	Oust 75 DF	2 oz product	Post	1.00	6.33	6.00	5.33
7.	Oust 75 DF	3 oz product	Post	1.00	7.83	5.67	4.33
8.	Oust 75 DF	4 oz product	Post	1.00	8.33	6.17	4.83
9.	Oust 75 DF	5 oz product	Post	1.00	7.83	8.50	7.67
10.	Oust 75 DF	6 oz product	Post	1.00	8.50	8.67	7.17
11.	SC-0224	1.6 qts product	Post	1.00	5.33	8.83	8.17
12.	Roundup	1.0 qt product	Post	1.00	5.00	8.00	6.50
13.	Roundup	1.5 qts product	Post	1.00	5.33	8.00	5.67
14.	DSMA	3.6 lbs ai	Post	1.00	4.33	8.67	9.00
15.	MSMA	3.0 lbs ai	Post	1.00	3.67	8.33	8.60
16.	MSMA + Surflan 75W	3 lbs ai + 4 lbs ai	Post + Pre	1.00	4.00	7.67	8.87
17.	MSMA + Dual 8E	3 lbs ai + 2.5 lbs ai	Post + Pre	1.00	5.67	8.83	9.17
18.	Check	-----	-----	1.00	1.00	1.00	1.00
	Statistical Difference			**	**	**	**
	CV (Percent)			18.2	28.7	24.8	28.4
	LSD .01			1.08	3.60	3.45	3.74
	LSD .05			0.80	2.68	2.57	2.79

Table 20

Expt. 8-H-5-83: Evaluation of herbicide phytotoxicity on common bermudagrass on Oklahoma highway rights-of-way.

Objective: Evaluate the phytotoxicity of seven preemergence and postemergence herbicides on common bermudagrass on Oklahoma highway rights-of-way.

Dates of Application: March 11, 1983 - treatments 1-4, 16-17 (Surflan & Dual); May 24, 1983 - post treatments 5-17; June 30, 1983 - post treatments 11-17; August 11, 1983 - post tretments 14-17.

Replications: Three

Dates Scored: May 24, 1983; June 30, 1983; August 11, 1983; October 13, 1983

Method of Scoring: 10 = complete yellowing or burning
1 = no effect

	Treatments	Rate(s)/A	Type of Application	Dates Scored 5-24-83	6-30-83	8-11-83	10-13-83
1.	Oust 75 DF	1 oz product	Pre (Preemergence)	4.33	2.33	1.00	1.33
2.	Oust 75 DF	2 oz product	Pre	5.67	2.00	1.00	1.00
3.	Oust 75 DF	3 oz product	Pre	5.33	2.00	1.00	1.00
4.	Oust 75 DF	4 oz product	Pre	6.33	3.00	1.00	1.33
5.	Oust 75 DF	1 oz product	Post (Postemergence)	1.00	1.33	1.00	2.00
6.	Oust 75 DF	2 oz product	Post	1.00	2.33	1.00	2.33
7.	Oust 75 DF	3 oz product	Post	1.00	3.33	1.00	1.33
8.	Oust 75 DF	4 oz product	Post	1.00	4.67	1.00	2.67
9.	Oust 75 DF	5 oz product	Post	1.00	4.67	1.00	2.33
10.	Oust 75 DF	6 oz product	Post	1.00	5.33	1.00	2.00
11.	SC-0224	1.6 qts product	Post	1.00	5.33	9.60	8.67
12.	Roundup	1.0 qt product	Post	1.00	4.33	5.33	5.33
13.	Roundup	1.5 qts product	Post	1.00	2.67	6.33	6.67
14.	DSMA	3.6 lbs ai	Post	1.00	1.00	1.00	1.00
15.	MSMA	3.0 lbs ai	Post	1.00	1.00	1.00	1.00
16.	MSMA + Surflan 75W	3 lbs ai + 4 lbs ai	Post + Pre	1.00	1.00	1.00	1.00
17.	MSMA + Dual 8E	3 lbs ai + 2.5 lbs ai	Post + Pre	1.00	1.00	1.00	1.00
18.	Check	-----	-----	1.00	1.00	1.00	1.00
	Statistical Difference			**	**	**	**
	CV (Percent)			18.6	41.7	33.6	25.4
	LSD .01			0.82	2.50	1.51	1.35
	LSD .05			0.61	1.86	1.12	1.01

Table 21

Expt. 4-H-17-84 Herbicide evaluation for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of six postemergence herbicide applications, alone and in combinations, at three different carrier rates, for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Dates of Treatments: 5-17-84 (trmts. 1-33); 6-21-84 (trmts. 8, 18, 28); 7-18-84 (trmts. 8, 18, 28).

County: Payne Location: US-177, 7.5 miles south of Stillwater

Soil Type: Navina Loam (Norge) Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with 3 replications.

Methods of Scoring: Johnsongrass control 10 = complete control, 1 = no effect; Bermudagrass Phytotoxicity 10 = complete yellowing, 1 = no effect

*Treatments:	Rate(s)/A	GPA	Percent Bermudagrass		Percent Johnsongrass		Johnsongrass Control				Bermudagrass Phytotoxicity		
			5-17-84	10-10-84	5-17-84	10-10-84	6-21-84	7-18-84	8-17-84	9-20-84	6-21-84	7-18-84	8-17-84
1. Oust + Roundup	2 oz. + 1 pt.	20	16.7	80.0	6.7	20.0** b-h	8.33** a-d	6.50** b-e	6.67** b-h	8.0**a-e	1.0** e	1.0	1.0
2. Oust + Roundup	3 oz. + 1 pt.	20	23.3	70.0	10.0	15.7 b-h	9.43 a	7.77 a-e	7.50 a-e	8.77 a-d	2.33 a-e	1.0	1.0
3. Oust + Roundup	4 oz. + 1 pt.	20	17.3	58.3	11.7	20.0 b-h	9.33 a	7.50 a-e	6.83 a-h	7.67 a-e	1.33 de	1.0	1.0
4. Oust + Roundup	2 oz. + 1 qt.	20	23.3	63.3	10.0	12.0 b-h	9.43 a	8.93 abc	8.77 a-f	8.43 a-e	2.67 a-e	1.0	1.0
5. Oust + Roundup	3 oz. + 1 qt.	20	13.3	48.3	11.7	15.0 b-h	9.70 a	9.30 a-g	8.30 a-g	7.30 a-g	2.0 b-e	1.0	1.0
6. Oust + Roundup	4 oz. + 1 qt.	20	15.0	53.3	10.0	12.0 b-h	9.50 a	8.93 abc	8.97 a-f	8.97 a-d	3.0 a-d	1.0	1.0
7. Oust	4 oz.	20	22.3	58.3	10.0	15.0 b-h	8.67 abc	8.10 a-e	8.00 a-g	8.17 a-e	1.67 c-e	1.0	1.0
8. MSMA	0.5 gal.	20	20.7	63.7	10.0	13.3 b-h	7.33 a-f	8.30 a-d	9.67 abc	8.00 a-e	1.0 e	1.0	1.67
9. Roundup	1 qt.	20	27.3	58.3	10.0	28.3 a-e	6.50 c-g	6.50 b-e	6.50 c-h	6.63 c-g	1.0 e	1.0	1.33
10. SC-0224	1 qt.	20	24.0	56.7	10.0	34.0 abc	5.93 e-g	4.27 fg	4.60 hi	4.60 f-h	1.0 e	1.0	1.33
11. Oust + Roundup	2 oz. + 1 pt.	30	15.7	58.3	10.0	22.3 b-h	9.33 a	7.83 a-e	7.83 a-h	7.33 a-g	1.33 de	1.0	1.0
12. Oust + Roundup	3 oz. + 1 pt.	30	16.7	58.3	13.3	21.7 b-h	9.33 a	7.83 a-e	7.00 a-h	6.83 b-g	2.67 a-e	1.0	1.0
13. Oust + Roundup	4 oz. + 1 pt.	30	26.7	63.3	10.0	11.0 c-h	9.60 a	9.57 a	9.30 a-e	8.47 a-e	4.0 a	1.0	1.0
14. Oust + Roundup	2 oz. + 1 qt.	30	12.3	66.7	10.0	8.7 d-h	9.33 a	9.03 abc	8.63 a-f	8.80 a-d	3.0 a-d	1.0	1.0
15. Oust + Roundup	3 oz. + 1 qt.	30	24.0	76.7	10.0	5.0 e-h	9.60 a	9.60 a	9.50 a-d	9.50 abc	2.33 a-e	1.0	1.0
16. Oust + Roundup	4 oz. + 1 qt.	30	18.3	66.3	10.0	8.7 d-h	9.80 a	9.83 a	9.00 a-f	9.33 abc	4.0 a	1.0	1.0
17. Oust	4 oz.	30	30.0	63.3	10.0	20.3 b-h	9.60 a	8.53 abc	7.93 a-g	7.60 a-f	3.33 abc	1.0	1.0
18. MSMA	0.5 gal.	30	24.0	65.0	11.7	2.0 g-h	5.33 e-g	9.43 ab	9.77 ab	9.67 ab	1.0 e	1.0	1.0
19. Roundup	1 qt.	30	15.0	65.0	10.0	26.7 a-f	6.83 b-f	5.17 e-g	6.00 f-h	6.17 d-g	1.0 e	1.0	1.0
20. SC-0224	1 qt.	30	15.0	36.7	5.0	46.7 a	4.33 g	2.33 gh	2.67 ij	2.67 hi	1.33 de	1.0	1.0
21. Oust + Roundup	2 oz. + 1 pt.	40	17.3	61.7	10.0	21.7 b-h	9.17 ab	8.17 a-e	7.50 a-h	7.60 a-f	1.67 c-e	1.0	1.0
22. Oust + Roundup	3 oz. + 1 pt.	40	20.7	55.3	10.0	19.0 b-h	9.50 a	9.27 abc	8.33 a-g	8.60 a-e	2.33 a-e	1.0	1.0
23. Oust + Roundup	4 oz. + 1 pt.	40	21.7	56.7	11.7	18.7 b-h	9.70 a	8.97 abc	8.80 a-f	8.30 a-e	3.33 abc	1.0	1.0
24. Oust + Roundup	2 oz. + 1 qt.	40	26.7	58.3	8.3	11.3 b-h	9.60 a	9.43 ab	9.60 abc	9.27 abc	1.67 c-e	1.0	1.0
25. Oust + Roundup	3 oz. + 1 qt.	40	20.7	58.3	10.0	4.0 f-h	9.50 a	9.60 a	9.30 a-e	9.47 abc	2.33 a-e	1.0	1.0
26. Oust + Roundup	4 oz. + 1 qt.	40	17.3	56.7	10.0	2.3 gh	9.73 a	9.37 ab	9.13 a-f	9.40 abc	4.0 a	1.33	1.0
27. Oust	4 oz.	40	20.0	61.7	16.7	13.7 b-h	9.60 g	9.47 ab	8.97 a-f	7.80 a-e	3.67 ab	1.0	1.0
28. MSMA	0.5 gal.	40	24.0	91.0	10.0	1.0 h	6.0 d-g	9.47 ab	9.93 a	9.93 a	1.0 e	1.0	1.0
29. Roundup	1 qt.	40	18.3	58.3	10.0	31.7 a-d	8.17 a-e	5.50 d-f	6.0 f-h	4.33 gh	1.33 de	1.0	1.0
30. SC-0224	1 qt.	40	30.0	53.3	10.0	30.3 a-d	6.17 d-g	5.27 e-g	5.30 g-i	5.63 e-h	1.0 e	1.0	1.0
31. Arsenal	0.25 pt.	40	18.3	58.3	13.3	25.0 a-g	6.83 b-f	6.33 c-f	6.50 c-h	6.17 d-g	1.33 de	1.0	1.33
32. Arsenal	0.5 pt.	40	16.7	56.7	10.0	35.0 ab	6.50 c-g	6.50 b-e	6.17 e-h	6.17 d-g	1.67 c-e	1.0	1.67
33. Arsenal	1 pt.	40	20.7	50.0	10.0	31.7 a-d	6.83 b-f	6.50 b-e	6.33 d-h	6.67 b-g	2.33 a-e	2.33	3.00
34. Check	--	--	25.0	65.0	10.0	31.7 a-d	1.0 h	1.0 h	1.0 j	1.0 i	1.0 e	1.0	1.0
Statistical Difference			NS	NS	NS	**	**	**	**	**	**	NS	NS
CV (Percent)			48.5	23.8	23.7	65.2	19.1	23.7	25.0	23.8	47.5	38.6	57.8

*All treatments except 8, 18, 28, 33-33 had X-77 spreader added at the equivalent rate of 0.5 percent by volume.

**Means with the same letter are not significantly different (Waller-Duncan K-Ratio T Test).

Table 22

Expt. 4-H-18-84 Herbicide evaluation for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of three postemergence herbicide applications, alone and in combinations, at three different carrier rates, for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Dates of Treatments: 5-18-84 (trmts. 1-30); 6-21-84 (trmts. 10, 20, 30); 7-18-84 (trmts. 10, 20, 30).

County: Payne
Soil Type: Norge Loam
Location: SH-33, 0.6 miles east of Jct. SH-108.
Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with 3 replications.

Methods of Scoring: Johnsongrass control 10 = complete control 1 = no effect
Bermudagrass Phytotoxicity 10 = complete yellowing 1 = no effect

Treatments:	Rate(s)/A	GPA	Johnsongrass Control		Bermudagrass Phytotoxicity	
			6-21-84	7-18-84	6-21-84	7-18-84
1. Roundup	0.75 pt.	20	5.50 e-g	4.33 ef	1.0 e	1.0
2. Roundup	1.0 pt.	20	5.00 e-g	4.67 def	1.0 e	1.0
3. Roundup	1.5 pts.	20	4.00 fg	3.00 fg	1.0 e	1.0
4. Roundup	2.0 pts.	20	5.67 e-g	4.50 ef	1.33 de	1.0
5. Roundup + Oust	0.75 pt. + 2 oz.	20	8.83 ab	7.50 abc	2.0 bc	1.0
6. Roundup + Oust	1.0 pt. + 2 oz.	20	5.67 e-g	6.17 cde	2.0 bc	1.0
7. Roundup + Oust	1.5 pts. + 2 oz.	20	9.33 a	7.83 abc	2.33 ab	1.0
8. Roundup + Oust	2.0 pts. + 2 oz.	20	9.6 a	9.47 a	2.67 a	1.33
9. Oust	4 oz.	20	9.0 a	7.83 abc	2.33 ab	1.0
10. MSMA	0.5 gal.	20	6.0 d-g	8.77 ab	1.0 e	1.0
11. Roundup	0.75 pt.	30	4.0 fg	4.67 def	1.0 e	1.0
12. Roundup	1.0 pt.	30	4.33 e-g	3.33 fg	1.0 e	1.0
13. Roundup	1.5 pts.	30	6.50 b-e	4.67 def	1.33 de	1.0
14. Roundup	2.0 pts.	30	6.33 c-f	4.33 ef	1.33 de	1.0
15. Roundup + Oust	0.75 pt. + 2 oz.	30	8.50 abc	8.17 abc	2.0 bc	1.0
16. Roundup + Oust	1.0 pt. + 2 oz.	30	9.43 a	9.0 ab	2.0 bc	1.0
17. Roundup + Oust	1.5 pts. + 2 oz.	30	9.6 a	8.77 ab	2.0 bc	1.0
18. Roundup + Oust	2.0 pts. + 2 oz.	30	9.53 a	8.33 abc	2.33 ab	1.0
19. Oust	4 oz.	30	8.83 ab	7.00 bcd	1.67 c	1.0
20. MSMA	0.5 gal.	30	5.00 e-g	8.83 ab	1.0 e	1.0
21. Roundup	0.75 pt.	40	4.67 e-g	4.67 def	1.0 e	1.0
22. Roundup	1.0 pt.	40	3.67 g	2.33 fg	1.0 e	1.0
23. Roundup	1.5 pts.	40	4.33 e-g	6.17 cde	1.0 e	1.0
24. Roundup	2.0 pts.	40	6.00 d-g	7.00 bcd	1.0 e	1.0
25. Roundup + Oust	0.75 pt. + 2 oz.	40	8.67 abc	7.33 abc	2.33 ab	1.0
26. Roundup + Oust	1.0 pt. + 2 oz.	40	8.33 a-d	7.17 abc	2.0 bc	1.0
27. Roundup + Oust	1.5 pts. + 2 oz.	40	9.00 a	8.67 ab	2.33 ab	1.0
28. Roundup + Oust	2.0 pts. + 2 oz.	40	9.43 a	8.17 abc	2.33 ab	1.0
29. Oust	4 oz.	40	9.43 a	8.50 abc	2.33 ab	1.0
30. MSMA	0.5 gal.	40	5.33 e-g	9.37 ab	1.0 e	1.0
31. Check	--	--	1.0 h	1.0 g	1.0 e	1.0
Statistical Difference			**	**	**	NS
CV (Percent)			22.9	23.7	24.8	10.3

*All treatments except 10, 20, 30 and 31 has X-77 spreader added at the equivalent rate of 0.5 percent by volume.

**Means with the same letter are not significantly different (Waller-Duncan K-ratio T test).

Table 23

Expt. 4-H-19-84 Herbicide evaluation for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of four postemergence herbicide applications, alone and in combinations, at three carrier rates, for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Dates of Treatments: 5-18-84 (trmts. 1-30); 6-21-84 (trmts. 7, 16, 25); 7-18-84 (trmts. 7, 16, 25).

County: Payne Location: SH-33, 2 miles east of Cushing

Soil Type: Steedum - Lucien - Shidler Complex Plot Size: 5 ft. by 10 ft.

Field Design: Randomized complete block with 3 replications.

Methods of Scoring: Johnsongrass control 10 = complete control, 1 = no effect; Bermudagrass Phytotoxicity 10 = complete yellowing, 1 = no effect

Treatments	Rate(s)/A	GPA	Percent Johnsongrass		Percent Bermudagrass		Johnsongrass Control					Bermudagrass Phytotoxicity	
			5-25-84	10-19-84	5-25-84	10-19-84	6-27-84	7-25-84	8-24-84	9-28-84	10-19-84	6-27-84	7-27-84
1. MSMA + Oust	1 pt. + 2 oz.	20	46.7	7.0 e-h	8.3	36.7	8.60 a-f	7.83 g-i	7.67 d-g	8.83 a-e	9.30 a-d	2.33 a-d	1.67
2. MSMA + Oust	1 pt. + 3 oz.	20	63.3	12.0 c-h	1.7	1.7	7.63 e-g	8.10 e-i	7.50 e-g	7.77 d-i	8.80 a-d	1.67 b-d	2.0
3. MSMA + Oust	1.5 pts. + 2 oz.	20	55.0	15.0 c-f	5.3	16.7	9.17 abc	8.50 b-i	7.17 g	7.17 g-i	8.50 a-e	2.33 a-d	1.67
4. MSMA + Oust	1.5 pts. + 3 oz.	20	55.0	5.0 f-h	5.7	11.7	9.17 abc	8.50 b-i	8.17 b-g	8.50 a-g	9.50 abc	2.0 a-d	3.33
5. MSMA + Oust	2 pts. + 2 oz.	20	61.7	9.0 d-h	1.7	3.33	8.83 a-f	8.33 c-i	8.33 b-g	9.00 a-e	9.10 a-d	1.33 cd	2.33
6. MSMA + Oust	2 pts. + 3 oz.	20	38.3	3.3 f-h	25.7	35.0	9.70 a	9.50 a-d	8.83 a-e	9.50 ab	9.67 ab	2.33 a-d	2.00
7. MSMA	0.5 gal.	20	38.3	1.7 gh	24.0	35.0	7.93 c-g	9.43 a-e	8.93 a-e	8.80 a-f	9.83 a	1.33 cd	1.67
8. Oust	4 oz.	20	53.3	7.7 d-h	5.0	13.3	8.93 a-e	8.80 a-h	9.10 a-d	9.13 a-e	9.23 a-d	2.33 a-d	2.0
9. Roundup	1 qt.	20	46.7	18.3 c-e	1.7	6.7	9.17 abc	8.83 a-h	8.17 b-g	7.33 f-i	8.17 c-e	1.67 b-d	1.67
10. MSMA + Oust	1 pt. + 2 oz.	30	65.0	20.0 cd	7.3	10.0	7.50 fg	7.50 h-j	7.00 g	6.50 hi	8.00 de	2.33 a-d	2.0
11. MSMA + Oust	1 pt. + 3 oz.	30	55.0	13.3 c-g	7.3	11.7	8.67 a-f	7.33 ij	7.33 f-g	6.67 hi	8.33 b-e	2.33 a-d	2.00
12. MSMA + Oust	1.5 pt. + 2 oz.	30	53.3	12.0 c-h	5.7	15.0	8.83 a-f	8.0 f-i	7.67 d-g	8.33 b-g	8.80 a-d	2.67 abc	2.00
13. MSMA + Oust	1.5 pt. + 3 oz.	30	38.3	7.0 e-h	27.3	35.7	9.70 a	9.30 a-f	7.93 c-g	8.77 a-f	9.30 a-d	2.33 a-d	2.00
14. MSMA + Oust	2 pts. + 2 oz.	30	70.0	5.0 f-h	7.3	11.7	9.43 ab	9.33 a-f	8.67 a-f	9.17 a-d	9.50 abc	2.33 a-d	2.00
15. MSMA + Oust	2 pt. + 3 oz.	30	41.7	4.3 f-h	19.0	30.0	9.27 abc	9.37 a-e	9.00 a-d	9.30 abc	9.57 abc	2.33 a-d	1.67
16. MSMA	0.5 gal.	30	48.3	1.0 gh	12.3	35.0	8.17 b-g	9.90 a	10.0 a	9.93 a	9.90 a	2.00 a-d	1.67
17. Oust	4 oz.	30	30.0	1.3 gh	24.0	30.7	9.33 ab	9.67 abc	9.50 ab	9.63 ab	9.87 a	3.33 a	2.33
18. Roundup	1 qt.	30	75.0	23.3 c	3.3	23.3	9.10 abc	8.17 d-i	7.33 f-g	6.33 i	7.33 e	1.67 b-d	1.67
19. MSMA + Oust	1 pt. + 2 oz.	40	48.3	8.3 d-h	4.0	11.7	8.67 a-f	9.00 a-g	6.67 d-g	7.83 c-h	9.17 a-d	2.00 a-d	2.00
20. MSMA + Oust	1 pt. + 3 oz.	40	33.3	2.0 gh	26.7	38.3	9.60 a	9.33 a-f	8.67 a-f	9.63 ab	9.80 a	2.67 abc	2.00
21. MSMA + Oust	1.5 pt. + 2 oz.	40	60.0	11.7 c-h	8.3	31.7	9.00 a-d	8.17 d-i	8.00 c-g	7.67 e-i	8.83 a-d	1.67 b-d	1.33
22. MSMA + Oust	1.5 pt. + 3 oz.	40	50.0	4.0 f-h	5.0	10.0	9.33 ab	9.53 abc	8.83 a-e	8.93 a-e	9.60 abc	2.33 a-d	2.00
23. MSMA + Oust	2 pt. + 2 oz.	40	46.7	5.3 f-h	6.7	20.0	9.27 abc	9.13 a-g	8.47 b-g	9.10 a-e	9.47 abc	2.00 a-d	2.33
24. MSMA + Oust	2 pt. + 3 oz.	40	51.7	10.0 d-h	1.7	13.3	8.67 a-f	8.67 a-i	7.83 d-g	7.83 c-h	9.00 a-d	1.67 b-d	2.00
25. MSMA	0.5 gal	40	71.7	0.7 h	5.0	38.3	8.50 a-g	9.87 a	9.97 a	9.90 a	9.93 a	1.67 b-d	1.33
26. Oust	4 oz.	40	48.3	1.7 gh	2.3	6.7	9.27 abc	9.30 a-f	9.33 abc	9.47 ab	9.83 a	2.33 a-d	2.33
27. Roundup	1 qt.	40	26.7	4.0 f-h	30.0	48.3	9.33 ab	9.73 ab	8.83 a-e	9.10 a-e	9.60 abc	1.33 cd	1.00
28. Arsenal	0.25 pt.	40	58.3	68.3 a	4.7	3.7	2.67 h	2.0 k	1.00 i	1.00 j	1.33 g	1.67 b-d	1.33
29. Arsenal	0.5 pt.	40	58.3	46.7 b	11.7	15.0	7.0 g	6.50 j	2.67 h	2.33 j	3.17 f	3.33 a	2.33
30. Arsenal	1 pt.	40	38.3	10.0 d-h	5.0	8.3	7.67 d-g	9.43 a-e	8.67 a-f	8.33 b-g	9.00 a-d	3.00 ab	2.67
31. Check	--	—	66.7	71.7 a	6.7	11.7	1.00 i	1.00 k	1.00 i	1.00 j	1.00 g	1.00 d	1.00
Statistical Difference			NS	**	NS	NS	**	**	**	**	**	*	NS
CV (Percent)			35.9	62.1	170.8	115.0	10.7	10.9	12.9	12.8	11.4	33.3	34.9

*Means with the same letter are not significantly different (Waller-Duncan K-Ratio T-Test).

Table 24

Expt. 4-H-21-84. Herbicide evaluation of different Oust rates and dates of application effects on bermudagrass and its release along Oklahoma highway rights-of-way.

Objective: Evaluate four rates of Oust applied at four dates and the subsequent effects on bermudagrass.

Dates of Application: November 15, 1984 (trmts. 1-4); December 19, 1984 (trmts. 5-8); January 30, 1985 (trmts. 9-12); February 28, 1985 (trmts. 13-16).

Soil Type: Seminole loam

County: Payne

Plot Size: 5 ft. by 10 ft.

Location: SH-99, 1 mile south of Junction SH-33 (east side).

Field Design: Randomized complete block with three replications.

Dates Scored: May 16, 1985; June 18, 1985; July 18, 1985; August 20, 1985; September 23, 1985.

Carrier Rate: 40 GPA

Methods of Scoring: Percent Bermudagrass - 0 = None; 100 = Complete Cover
Bermudagrass Phytotoxicity - 1 = No Effect; 10 = Complete Yellowing

Treatments	Product Rate/A	Time of Application	Bermudagrass Phytotoxicity			Percent Bermudagrass				
			5-16-85	6-18-85	7-18-85	5-16-85	6-18-85	7-18-85	8-20-85	9-23-85
1. Oust	1 oz.	November	2.0a*	2.0a*	1.0a*	25.0a*	31.7ab*	40.0a*	41.7ab*	51.7a*
2. Oust	2 oz.	November	2.3a	2.0a	1.0a	10.7a	10.0b	15.0bc	16.7c	21.7c
3. Oust	3 oz.	November	2.3a	2.0a	1.0a	17.3a	25.0ab	26.7a-c	33.3a-c	38.3a-c
4. Oust	4 oz.	November	3.0a	2.0a	1.0a	12.5a	15.0ab	20.0a-c	32.5a-c	37.5a-c
5. Oust	1 oz.	December	2.7a	2.0a	1.0a	8.7a	11.7ab	10.0c	18.3bc	21.7c
6. Oust	2 oz.	December	2.7a	2.0a	1.0a	10.0a	23.3ab	26.7a-c	43.3a	48.3ab
7. Oust	3 oz.	December	2.3a	2.0a	1.0a	11.7a	10.0b	15.0bc	31.7a-c	35.0a-c
8. Oust	4 oz.	December	3.0a	2.0a	1.0a	16.7a	25.0ab	31.7a-c	40.0a-c	48.3ab
9. Oust	1 oz.	January	2.3a	2.0a	1.0a	15.7a	25.0ab	18.3a-c	30.0a-c	33.3a-c
10. Oust	2 oz.	January	2.3a	2.0a	1.0a	6.7a	11.7ab	18.3a-c	26.7a-c	31.7a-c
11. Oust	3 oz.	January	2.7a	2.0a	1.0a	9.7a	11.7ab	13.3bc	21.7a-c	25.0bc
12. Oust	4 oz.	January	2.7a	2.3a	1.0a	10.7a	20.0ab	23.3a-c	26.7a-c	33.3a-c
13. Oust	1 oz.	February	2.7a	2.0a	1.0a	16.7a	21.7ab	18.3a-c	25.0a-c	30.0a-c
14. Oust	2 oz.	February	2.7a	2.0a	1.0a	10.0a	11.7ab	13.3bc	20.0a-c	26.7a-c
15. Oust	3 oz.	February	2.3a	2.0a	1.0a	10.0a	18.3ab	16.7a-c	31.7a-c	36.7a-c
16. Oust	4 oz.	February	2.3a	2.0a	1.0a	10.7a	16.7ab	16.7a-c	20.0a-c	26.7a-c
17. Check	-----	--------	2.0a	2.0a	1.0a	20.0a	33.3a	36.7ab	43.3a	50.0ab

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Table 25

Expt. 4-H-24-85. Herbicide evaluation for the selective control of johnsongrass and subsequent bermudagrass release along Oklahoma highway rights-of-way.

Objective: Evaluate the effects of four herbicides on bermudagrass and the selective control of johnsongrass.

Date of application: April 19, 1985
(Treatments 1-5; 50% bermudagrass greenup)
May 9, 1985 (Treatments 6-12;
bermudagrass actively growing)

County: Payne

Soil type: Norge loam

Location: Junction of SH-33 and SH-108, south of Ripley.

Plot size: 5 ft. by 10 ft.

Dates scored: April 19, 1985; May 16, 1985; June 14, 1985; July 16, 1985; August 16, 1985; September 13, 1985

Field design: Randomized complete block with three replications

Methods of Scoring: Percent Bermudagrass - 0=None; 100=Complete Cover
Percent Johnsongrass - 0=None; 100=Complete Johnsongrass Cover
Johnsongrass Control - 1=No Effect; 10-Complete Control

Treatments	Rate(s) lbs. ai/A	Percent Bermudagrass				Percent Johnsongrass			Johnsongrass Control				
		4-19-85	5-16-85	8-16-85	9-13-85	4-19-85	8-16-85	9-13-85	5-16-85	6-14-85	7-16-85	8-16-85	9-13-85
1. Arsenal	0.063	11.7a*	33.3a*	56.7a-c*	51.7a-d*	11.7a-b*	38.3a-e*	38.3a-d*	3.3bc*	1.0g*	4.2c*	5.0cd*	5.2b-d*
2. Arsenal	0.094	13.3a	20.0a	40.0bc	38.3cd	10.0ab	53.3a-c	51.7ab	5.7ab	2.0g	2.3cd	3.3d	2.3d
3. Arsenal	0.125	4.3a	10.0a	26.7c	25.0d	20.0a	70.0a	68.3a	5.7ab	2.7fg	1.3d	2.3d	2.0d
4. Arsenal	0.188	11.7a	21.7a	45.0bc	38.3cd	15.7ab	50.0a-c	50.0a-c	5.7ab	4.7de	2.0cd	2.7d	3.0cd
5. Oust	0.07	12.3a	21.7a	45.0bc	50.0a-d	10.0ab	23.3c-f	21.7b-d	8.3a	7.5bc	6.5b	6.7a-d	6.8a-c
6. Arsenal	0.063	13.3a	21.7a	53.3a-c	51.7a-d	7.3b	38.3a-e	33.3a-d	1.0c	4.3ef	1.7d	4.7d	3.0cd
7. Arsenal	0.094	8.3a	25.3a	35.0bc	36.7cd	13.3ab	65.0ab	58.3ab	2.0c	4.3ef	1.7d	2.7d	2.7cd
8. Arsenal	0.125	17.3a	33.3a	46.7bc	45.0b-d	9.0ab	50.0a-c	53.3ab	1.0c	6.3cd	6.8b	4.0d	3.7cd
9. Arsenal	0.188	24.0a	30.0a	55.0a-c	48.3a-d	9.0ab	40.3a-d	42.0a-d	1.0c	8.0bc	8.0ab	4.6d	5.0cd
10. Oust	0.07	8.7a	20.0a	78.3ab	86.7ab	6.7b	6.7d-f	5.7cd	2.0c	9.1ab	9.5a	9.3a-c	9.4ab
11. Roundup + Oust	1qt.+2oz.**	6.7a	23.3a	7.77ab	80.0a-c	5.7b	2.3ef	2.7d	7.7a	10.0a	9.9a	9.8ab	9.7a
12. MSMA	3.0	23.3a	45.0a	96.3a	96.3a	5.7b	1.0f	1.0d	5.3ab	8.8ab	9.9a	9.9a	9.9a
13. Check	----	15.0a	23.3a	61.7a-c	51.7a-d	7.3b	32.3b-f	38.3a-d	1.0c	1.0g	1.0d	5.2b-d	5.2b-d

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.
**Product Rate

Table 26

Expt. 4-H-24-85. Herbicide evaluation for the selective control of johnsongrass and subsequent bermudagrass release along Oklahoma highway rights-of-way.

Objective: Evaluate the effects of four herbicides on bermudagrass and the selective control of johnsongrass.

Date of application: April 19, 1985 (Treatments 1-5; 50% bermudagrass greenup) May 9, 1985 (Treatments 6-12; bermudagrass actively growing)

County: Payne

Soil type: Norge loam

Location: Junction of SH-33 and SH-108, south of Ripley.

Plot size: 5 ft. by 10 ft.

Dates scored: April 19, 1985; May 16, 1985; June 14, 1985; July 16, 1985; August 16, 1985; September 13, 1985

Field design: Randomized complete block with three replications

Carrier Rate: 20 GPA

Methods of Scoring:

Percent Bermudagrass	- 0=None; 100=Complete Cover
Percent Johnsongrass	- 0=None; 100=Complete Johnsongrass Cover
Johnsongrass Control	- 1=No Effect; 10-Complete Control

Treatments	Rate(s) lbs. ai/A	Percent Bermudagrass				Percent Johnsongrass			Johnsongrass Control				
		4-19-85	5-16-85	8-16-85	9-13-85	4-19-85	8-16-85	9-13-85	5-16-85	6-14-85	7-16-85	8-16-85	9-13-85
1. Arsenal	0.063	11.7a*	33.3a*	56.7a-c*	51.7a-d*	11.7a-b*	38.3a-e*	38.3a-d*	3.3bc*	1.0g*	4.2c*	5.0cd*	5.2b-d*
2. Arsenal	0.094	13.3a	20.0a	40.0bc	38.3cd	10.0ab	53.3a-c	51.7ab	5.7ab	2.0g	2.3cd	3.3d	2.3d
3. Arsenal	0.125	4.3a	10.0a	26.7c	25.0d	20.0a	70.0a	68.3a	5.7ab	2.7fg	1.3d	2.3d	2.0d
4. Arsenal	0.188	11.7a	21.7a	45.0bc	38.3cd	15.7ab	50.0a-c	50.0a-c	5.7ab	4.7de	2.0cd	2.7d	3.0cd
5. Oust	0.07	12.3a	21.7a	45.0bc	50.0a-d	10.0ab	23.3c-f	21.7b-d	8.3a	7.5bc	6.5b	6.7a-d	6.8a-c
6. Arsenal	0.063	13.3a	21.7a	53.3a-c	51.7a-d	7.3b	38.3a-e	33.3a-d	1.0c	4.3ef	1.7d	4.7d	3.0cd
7. Arsenal	0.094	8.3a	25.3a	35.0bc	36.7cd	13.3ab	65.0ab	58.3ab	2.0c	4.3ef	1.7d	2.7d	2.7cd
8. Arsenal	0.125	17.3a	33.3a	46.7bc	45.0b-d	9.0ab	50.0a-c	53.3ab	1.0c	6.3cd	6.8b	4.0d	3.7cd
9. Arsenal	0.188	24.0a	30.0a	55.0a-c	48.3a-d	9.0ab	40.3a-d	42.0a-d	1.0c	8.0bc	8.0ab	4.6d	5.0cd
10. Oust	0.07	8.7a	20.0a	78.3ab	86.7ab	6.7b	6.7d-f	5.7cd	2.0c	9.1ab	9.5a	9.3a-c	9.4ab
11. Roundup + Oust	1 qt. + 2 oz product	6.7a	23.3a	77.7ab	80.0a-c	5.7b	2.3ef	2.7d	7.7a	10.0a	9.9a	9.8ab	9.7a
12. MSMA	3.0	23.3a	45.0a	96.3a	96.3a	5.7b	1.0f	1.0d	5.3ab	8.8ab	9.9a	9.9a	9.9a
13 Check	----	15.0a	23.3a	61.7a-c	51.7a-d	7.3b	32.3b-f	38.3a-d	1.0c	1.0g	1.0d	5.2b-d	5.2b-d

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Table 27

Expt. 4-H-25-85. Herbicide evaluation for the selective control of johnsongrass and subsequent bermudagrass release along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of several herbicides, alone and in combination for the selective control of johnsongrass and subsequent release of common bermudagrass.

Date of application: May 9, 1985

Soil type: Coil loam

Plot size: 5 ft. by 10 ft.

Field design: Randomized complete block with three replications

County: Payne

Location: SH-51, 2 miles east of Stillwater (south side).

Dates scored: May 16, 1985; June 14, 1985; July 10, 1985; August 15, 1985; September 13, 1985

Methods of Scoring:
- Percent Bermudagrass - 0=None, 100=Complete Bermuda Cover
- Percent Johnsongrass - 0=None, 100=Complete Johnsongrass Cover
- Johnsongrass Control - 1=No Effect, 10=Complete Control
- Bermudagrass phototoxicity - 1=No Effect, 10=Complete Yellowing

Treatments	Rate(s)/A	Carrier rate GPA	Percent Bermudagrass				Percent Johnsongrass			Bermudagrass Phytotoxicity			Johnsongrass Control			
			5-16-85	7-10-85	8-15-85	9-13-85	5-16-85	8-15-85	9-13-85	6-14-85	7-10-85	8-15-85	6-14-85	7-10-85	8-15-85	9-13-85
1. Oust + Roundup	2 oz. + 1 pt.	20	43.3a*	33.3b*	51.7c*	58.3ab*	43.3a*	15.0f-h*	26.7d-f*	3.3b-d*	1.7b-d*	1.0a*	6.7c-g*	8.0a-c*	8.0a-c*	7.3a-c*
2. Oust + Roundup	2 oz. + 1 pt.	40	30.0a	45.0ab	60.0ab	63.3ab	53.3a	20.0e-h	18.3e-h	4.7b	2.3a-c	1.0a	7.7a-e	9.0a-c	7.2b-e	8.2ab
3. Oust + Roundup	2 oz. + 1.5 pts.	20	36.7a	31.7b	46.7c	65.0ab	50.0a	8.3gh	7.3gh	7.0a	3.3a	1.0a	9.3ab	9.5a	9.2ab	9.3a
4. Oust + Roundup	2 oz. + 1.5 pts.	40	38.3a	46.7ab	58.3ab	63.3ab	50.0a	20.0e-h	13.3f-h	4.3bc	1.3cd	1.0a	8.1a-d	8.2a-c	7.7a-d	8.7ab
5. Oust + Roundup	2 oz. + 1 qt.	20	30.0a	21.7b	33.3c	63.3ab	50.0a	3.0h	3.0h	8.3a	2.7ab	1.0a	9.9a	9.8a	9.7a	9.7a
6. Oust + Roundup	2 oz. + 1 qt.	40	56.7a	28.3b	53.3bc	63.3ab	33.3a	5.7h	11.7f-h	7.8a	2.7ab	1.0a	9.6ab	9.4ab	9.1ab	8.8a
7. Oust + MSMA	2 oz. + 1 pt.	20	31.7a	43.3ab	46.7c	43.3b	53.3a	48.3abc	51.7abc	2.7c-e	1.0d	1.0a	5.7e-g	4.0g	4.3fg	2.7f-h
8. Oust + MSMA	2 oz. + 1 pt.	40	33.3a	38.3ab	46.7c	35.0b	55.0a	50.0ab	58.3a	2.0de	1.3cd	1.0a	4.7g	4.3fg	4.0fg	3.0e-h
9. Oust + MSMA	2 oz. + 1.5 pts.	20	36.7a	41.7ab	56.7abc	50.0b	46.7a	30.0c-e	36.7b-c	2.0de	1.7b-d	1.0a	5.0g	4.8e-g	5.8d-f	5.0d-f
10. Oust + MSMA	2 oz. + 1.5 pts.	40	40.0a	36.0ab	58.3ab	50.0b	51.7a	33.3b-f	43.3a-d	2.0de	1.0d	1.0a	6.0d-g	6.8c-e	5.2ef	4.3d-g
11. Oust + MSMA	2 oz. + 1 qt.	20	30.0a	41.7ab	45.0c	40.0b	63.3a	40.0a-d	53.3ab	2.0de	1.0d	1.0a	6.8c-g	5.3d-g	4.0fg	2.0gh
12. Oust + MSMA	2 oz. + 1 qt.	40	23.3a	31.7b	35.0c	45.0b	65.0a	20.0e-h	21.7e-h	1.3.e	1.0d	1.0a	8.3a-c	8.0a-c	7.3b-d	7.2a-c
13. Oust	3 oz.	20	33.3a	35.0ab	46.7c	56.7ab	50.0a	43.3a-d	43.3a-d	2.3de	1.0d	1.0a	4.7g	4.3fg	3.0gh	3.7d-g
14. Oust	3 oz.	40	40.0a	46.7ab	46.7c	41.7b	48.3a	30.0c-e	25.0d-g	2.3de	1.3cd	1.0a	5.7e-g	6.7c-f	6.0cf	4.0d-g
15. Oust	4 oz.	20	43.3a	40.0ab	46.7c	55.0ab	35.0a	35.0a-e	33.3d-g	3.3b-d	1.3cd	1.0a	6.0d-g	7.0b-e	5.0fg	5.3d-e
16. Oust	4 oz.	40	50.0a	50.0ab	50.0c	60.0ab	41.7a	26.7d-g	26.7d-f	4.3bc	1.7b-d	1.0a	5.3fg	7.5a-d	6.0c-f	6.2b-d
17. MSMA	2 qts.	20	50.0a	83.3a	89.3ab	86.7a	36.7a	5.7h	5.7h	1.0e	2.0b-d	1.0a	8.0a-d	8.8a-c	9.6a	9.4a
18. MSMA	2 qts.	40	41.7a	66.7ab	90.0a	83.3a	48.3a	2.3h	5.7h	1.0e	2.3a-c	1.0a	7.5b-f	9.3ab	9.7a	9.4a
19. Check	----------	--	46.7a	41.7ab	43.3c	43.3b	46.7a	53.3a	56.7a	1.0e	1.0d	1.0a	1.0g	1.0h	1.0h	1.0h

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Table 28

Expt. 4-H-26-85. Herbicide evaluation for the selective control of johnsongrass and subsequent release of bermudagrass along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of three herbicide combinations with and without an additive (Frigate) for the selective control of johnsongrass and subsequent release of common bermudagrass.

Date of Application: May 17, 1985

Soil Type: Coyle loam

Plot Size: 5 ft. x 10 ft.

Field Design: Randomized complete block with three replications.

Carrier Rate: 20 gallons per acre

County: Payne

Location: SH-51, 2 miles east of Stillwater (south side).

Dates Scored: May 17, 1985; June 24, 1985; July 16, 1985; August 15, 1985; September 13, 1985.

Methods of Scoring:
Percent Bermudagrass - 0 = None, 100 = Complete bermuda cover
Percent Johnsongrass - 0 = None, 100 = Complete johnsongrass cover
Johnsongrass Control - 1 = No Effect, 10 = Complete Control
Bermudagrass Phytotoxicity - 1 = No Effect, 10 = Complete Yellowing

Treatments	Product Rates/A	Percent Bermudagrass			Percent Johnsongrass			Johnsongrass Control				Bermudagrass Phytotoxicity		
		5-17-85	7-15-85	9-13-85	5-17-85	7-15-85	9-13-85	6-24-85	7-16-85	8-15-85	9-13-85	6-24-85	7-16-85	8-15-85
1. Roundup + Oust	0.5 qt. + 2 oz.	33.3a**	53.3ab**	81.7a**	36.7a**	2.7b**	2.7b**	9.47c**	9.77b**	9.73b**	9.73a**	3.7b**	2.3c**	1.0a**
2. Roundup + Oust	0.75 qt. + 2 oz.	46.7a	51.7ab	73.3ab	26.7a	0.7b	1.7b	9.50bc	9.90ab	9.93a	9.83a	5.0b	3.7b	1.0a
3. Roundup + Oust	1.0 qt. + 2 oz.	26.7a	16.7b	55.0abc	25.0a	0.7b	1.7b	9.90ab	9.93a	9.93a	9.90a	7.7a	6.0a	1.0a
4. Roundup + Oust + Frigate*	0.5 qt. + 2 oz. + 0.4 qt.	50.0a	43.3ab	55.0abc	20.0a	0.3b	0.3b	9.97a	9.93a	9.97a	9.97a	4.0b	2.3c	1.0a
5. Roundup + Oust + Frigate*	0.75 qt. + 2 oz. + 0.4 qt.	48.3a	40.0ab	48.3bc	23.3a	1.0b	1.0b	9.93a	9.90ab	9.90a	9.90a	4.0b	2.3c	1.0a
6. Roundup + Oust + Frigate*	1.0 qt. + 2 oz. + 0.4 qt.	36.7a	20.0ab	43.3c	20.0a	0.3b	0.3b	10.0a	9.93a	9.97a	9.97a	7.3a	6.0a	1.0a
7. Check	----------	45.0a	58.3a	68.3abc	21.7a	30.0a	26.7a	1.0d	1.0c	1.0c	1.0b	1.0c	1.0d	1.0a

* Frigate rate (0.4 qt./A) is equivalent to 0.5% (V/V).

** Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Silver Bluestem (Andropogon saccaroides) Control

Summary

Silver bluestem, a native prairie grass, is quickly becoming a major problem in roadside vegetation management. In past years, herbicide programs for the control of johnsongrass have left the roadsides open to the natural succession of grasses. Areas which were once occupied by johnsongrass are now being taken over by silver bluestem. Herbicides used for the control of johnsongrass, for the most part, are ineffective in the control of silver bluestem.

During the past four years a total of seven field experiments and one greenhouse experiment have been initiated to screen herbicides and rates for the control of silver bluestem. The greenhouse experiment was initiated in the winter of 1981/82 in Stillwater, Oklahoma. A total of three experiments were conducted in 1983, one experiment was conducted in each of the Divisions 3, 4 and 8. In 1984, two experiments were initiated, one in Division 4 and the other in Division 8. In 1985 two experiments were conducted, both of which were located in Division 4.

Discussion

In 1981/82, a greenhouse experiment was conducted to screen herbicides and rates for silver bluestem control. Dormant silver bluestem crowns were collected from roadsides in Division 4, after which they were planted in pots and allowed to break dormancy before herbicide treatments were applied to the actively growing plants on March 10, 1982.

One week after herbicide treatment, both rates of Roundup and both rates of Igran 80 W + surfactant were significantly more effective in the control of silver bluestem than all other treatments. When the treatments

Figure 4. Oklahoma roadsides invaded by moderate populations (top photo) and very high concentrations (bottom photo) of silver bluestem.

were evaluated three weeks after the initial application, Velpar 90 SP at the 1.125 lbs. ai/A rate plus surfactant, Karmex 80 WP at 2.4 lbs. ai/A, Roundup at 0.75 and 2.25 lbs. ai/A, Igran 80 W at 3.0 and 4.0 lbs. ai/A were significantly more effective than the other treatments. For the next three evaluation dates, five, seven and eight weeks after the experiment was started, all rates of Velpar 90 SP plus surfactant, Karmex 80 WP plus surfactant, Roundup, Igran 80 W plus surfactant, Princep 80 W at 4.0 lbs. ai/A and Aatrex Nine-O at 9.9 lbs. ai/A exhibited significantly better control of silver bluestem than all other treatments. Significant control of the silver bluestem was still occurring when evaluated approximately ten weeks and three months after herbicide application by the following treatments: Velpar 90 SP at 0.675 and 1.125 lbs. ai/A plus surfactant, Karmex 80 WP at 2.4 and 3.2 lbs. ai/A plus surfactant, Roundup at 2.25 lbs. ai/A, Aatrex Nine-O at 9.9 lbs. ai/A, Igran 80 W at 3.0 and 4.0 lbs. ai/A plus surfactant. Igran 80 W at 4.0 lbs. ai/A plus surfactant rate, when evaluated three months after treatment, was not significantly controlling the silver bluestem as it had when scored two weeks previously (Table 29).

In 1983, three experiments were conducted continuing the screening process in the field. An experiment (3-H-1-83), located 0.25 mile west of Ada on SH-33, was initiated on June 8, 1983 to evaluate six postemergence herbicides for silver bluestem control. When evaluations were made in July, one month after herbicide application, significant control of silver bluestem was obtained by treatments of Rodeo at 1.0 and 1.5 qts., Roundup at 1.0 and 1.5 qts., and Igran 80 W at 4.0 lbs. a.i. per acre. The remainder of the treatments did not provide significant control of silver bluestem.

These same treatments mentioned above along with the additional treatment of Igran 80 W at 3.0 lbs. a.i. per acre exhibited significantly

better control of silver bluestem than all other treatments when the experiment was evaluated seven weeks after herbicide application. On August 31, when the final evaluation was made, Roundup at 1.0 and 1.5 qts., Rodeo at 1.0 and 1.5 qts., and Igran 80 W at 3.0 and 4.0 lbs. a.i. per acre were again exhibiting significantly better control of silver bluestem than all other treatments. Treatments of Velpar, Karmex, and DPX-Y6206-7 were totally ineffective for the control of silver bluestem in this experiment. (Table 30).

Another experiment (4-H-13-83), located 0.8 mile south of Jct. SH-33 on SH-99, was initiated on March 8, 1983 to evaluate five preemergence and postemergence herbicides for silver bluestem control. On July 7, four months after the preemergence treatments were applied and one month after the postemergence treatments were applied, Rodeo at 1.0 and 1.5 qts. and Roundup at 1.0 and 1.5 qts. per acre were exhibiting significantly better control of silver bluestem than all other treatments. The postemergence treatments of Igran 80 W at 3.0 and 4.0 lbs. a.i. and Karmex 80 W at 3.0 and 4.0 lbs. ai. and Karmex 80 W at 3.2 lbs. a.i. per acre were providing significant control of silver bluestem. The remaining treatments were not exhibiting control of silver bluestem. At this same time, both Rodeo and Roundup treatments were causing significantly more phytotoxicity to bermudagrass than any of the other treatments. By the time the plots were scored on July 27, no bermudagrass phytotoxic effects were noted by any of the herbicide treatments.

When evaluations were made on July 27 and August 31, significant control of silver bluestem was being obtained with postemergence treatments of Igran 80 W at 3.0 and 4.0 lbs. a.i., Rodeo at 1.0 and 1.5 qts. and Roundup at 1.0 and 1.5 qts. per acre. However, Roundup and Rodeo treatments provided significantly better control of silver bluestem than

all other treatments. All preemergence and postemergence treatments of Velpar 90 SP, Karmex 80 W and the preemergence treatments of Igran 80 W were totally ineffective for the control of silver bluestem (Table 31).

The final 1983 silver bluestem control experiment (8-H-7-83) was located 2 miles west of Cleveland on US-64. This experiment was treated on March 11, 1983 and was identical in design to 4-H-13-83. On July 8, approximately four months after the preemergence herbicide treatments were applied and one month after the postemergence herbicide treatments were applied, postemergence treatments of Igran 80 W at 3.0 and 4.0 lbs. a.i., Roundup at 1.0 and 1.5 qts., and Rodeo at 1.0 and 1.5 qts. per acre were exhibiting significantly better control of the silver bluestem than all other treatments (Table 32). Some control was obtained with the postemergence treatments of Velpar 90 SP at 0.675 lbs. a.i. per acre and Karmex 80 W at 2.4 and 3.2 lbs. a.i. per acre. The remainder of the treatments were not providing control of silver bluestem at this same time.

When the experiment was evaluated on July 26 and again on August 30, all preemergence and postemergence treatments of Velpar 90 SP, Karmex 80 W and the preemergence treatments of Igran 80 W were exhibiting no control of silver bluestem. Postemergence treatments of Igran 80 W at 3.0 and 4.0 lbs. a.i., Rodeo at 1.0 and 1.5 qts. and Roundup at 1.0 and 1.5 qts. were exhibiting significant control of silver bluestem.

Two experiments were conducted in 1984 to evaluate and refine the control recommendations for silver bluestem. The 1984 experiments were designed to evaluate herbicides, herbicide rates and carrier rates. One experiment (4-H-20-84) located 4.5 miles south of Jct. SH-33 on SH-99 was initiated on June 13, 1984. When the experiment was evaluated one month after the treatments were applied, the following eleven treatments were exhibiting the best silver bluestem control: Roundup at 1.5 pts./A in 20

and 40 GPA; Roundup at 2 pts./A in 20 and 40 GPA; Roundup plus Oust at 0.75 pt. + 2 oz./A in 40 GPA, 1.5 pts. + 2 oz./A in 40 GPA, 2.0 pts. + 2 oz./A in 40 GPA and 1.0 pt. + 3 oz. in 40 GPA; Rodeo @ 1 qt./A in 20 and 40 GPA; and SC-0224 at 1 qt./A in 40 GPA.

Two months after the plots were treated, only seven treatments were providing the best control of silver bluestem: Roundup at 1.5 pts./A in 20 and 40 GPA; Roundup at 2.0 pts./A in 20 and 40 GPA; Roundup plus Oust at 1.5 pts. + 2 oz./A in 40 GPA and 2 pts. + 2 oz./A in 40 GPA; and SC-0224 at 1 qt. in 40 GPA.

When the final evaluation was made in September, only six of the seven previously significant treatments were controlling silver bluestem. Roundup at 1.5 pts./A in 40 GPA did not provide adequate control. All rates of Assure and Igran 80 W failed to provide adequate silver bluestem control throughout the duration of the experiment.

Significant bermudagrass phytotoxicity occurred from several treatments one month after the treatments were applied. However, by the time the experiment was evaluated in August, two months after the plots were treated, no treatments were exhibiting any phytotoxic effects (Table 33).

The last 1984 silver bluestem control experiment (8-H-11-84) was located 5.6 miles southeast of Cleveland on US-64. This experiment was treated June 14, 1984 and was identical in design to 4-H-20-84. Rodeo at 1 qt./A in 20 and 40 GPA, SC-0224 at 1 qt./A in 40 GPA and all treatments of Roundup, alone and in combination with Oust, were providing significant silver bluestem control when the experiment was evaluated one month after treatemtn. When the experiment was evaluated in August, the following treatments were exhibiting the best silver bluestem control: Roundup at 1.5 pts./A in 20 GPA; Roundup at 2 pts./A in 20 and 40 GPA; the combination

treatment of Roundup plus Oust at 1.5 pts. + 2 oz./A in 40 GPA; Rodeo at 1 qt./A in 20 and 40 GPA; and SC-0224 at 1 qt./A in 40 GPA. This trend continued for one more month when the final evaluation was made in September. Exceptions were: SC-0224 at 1 qt./A in 40 GPA was not exhibiting adequate silver bluestem control, and Roundup plus Oust at 2 pts. + 2 oz./A in 40 GPA had begun to provide adequate silver bluestem control. All treatments of Assure and Igran 80W failed to provide adequate silver bluestem control throughout the duration of this experiment (Table 34).

Additional information is presented from all three 1983 experimental sites and both 1984 sites. This information included soil description and rainfall (Table 35).

Two experiments were conducted in 1985 to further refine the control recommendations for silver bluestem. Combinations of Oust and Roundup were evaluated along with reduced carrier rates. These combinations were evaluated in an experiment (4-H-27-85) located 4.6 miles south of Jct. SH-33 on SH-99. This experiment was treated on May 24, 1985.

Significant bermudagrass phytotoxicity occurred one month after this study was initiated with all Roundup treatments, alone and in combination with Oust and Frigate. Two months after initial herbicide application, these same treatments were still exhibiting significant phytotoxic effects to bermudagrass with one exception: Roundup at 1.5 pts. in 40 GPA. When the experiment was evaluated in August, three months after treatment, only one treatment was exhibiting significant bermudagrass phytotoxicity: Roundup + Oust + Frigate @ 2 pts. + 2 oz. + 0.4 qt. in 20 GPA. No bermudagrass phytotoxicity was observed in treatments of MSMA, alone and in combination with Lexone and crop oil, and in treatments of Poast + crop oil throughout the duration of this experiment. Bermudagrass phytotoxicity was

not evident among any treatments when the study was rated in September, four months after treatments were applied.

Excellent silver bluestem seedhead suppression occurred throughout the entirety of this experiment from all Roundup treatments, alone and in combination with Oust and Frigate. Also, all treatments of Poast + crop oil significantly suppressed silver bluestem seedhead formation for one month after treatments were applied. Significant seedhead suppression was still observed with the two highest rates of Poast (16 and 24 oz.) + crop oil three months after application. Among the Poast + crop oil treatments, the 16 oz. rate was the only treatment exhibiting a significant reduction in the number of silver bluestem seedheads when the experiment was evaluated in September. All treatments of MSMA, alone and in combination with Lexone and crop oil, had no effect on silver bluestem seedheads throughout the duration of this experiment.

Excellent silver bluestem control was achieved by all treatments of Roundup, alone and in combination with Oust and Frigate, up to three months after treatments were applied. Although there were no significant differences in control among these same treatments when rated in September, Roundup at 2 pts. in 20 or 40 GPA and the combination treatments of Roundup + Oust + Frigate @ 2 pts. + 2 oz. + 0.4 qt. in 20 GPA and Roundup + Oust at 2 pts. + 2 oz. in 40 GPA were providing the most acceptable silver bluestem control. All treatments of MSMA, alone and in combination with Lexone and crop oil, and all treatments of Poast + crop oil were totally ineffective and unacceptable in silver bluestem control (Table 36).

The final 1985 experiment was identical to 4-H-27-85. This experiment (4-H-30-85) was located 0.5 mile east of Jct. SH-74 on US-64 and was treated on May 29, 1985.

All treatments of Roundup, alone and in combination with Oust and

Frigate, and the highest rate of Poast + crop oil were exhibiting significant bermudagrass phytotoxicity one month after application, when rated in June. Two months after treatment, when the experiment was evaluated in July, the following treatments were still showing significant bermudagrass phytotoxicity: Roundup at 2 pts. in 20 and 40 GPA; Roundup + Oust + Frigate at 1 pt. + 2 oz. + 0.4 qt. in 20 GPA; 2 pts. + 2 oz. + 0.4 qts. in 20 GPA; Roundup + Oust at 1.5 pts. + 2 oz. in 20 GPA; and 2 pts. + 2 oz. in 20 GPA. This trend continued for the next two months, August and September, although some of the above treatments effects diminished to non-significant levels of phytotoxicity. However, three treatments, Roundup + Oust + Frigate at 2 pts. + 2 oz. + 0.4 qts. in 20 GPA and Roundup + Oust at 2 pts. + 2 oz. in 20 and 40 GPA continued to have significant phytotoxic effects on the bermudagrass. All treatments of MSMA alone and in combination with Lexone and crop oil and all Poast + crop oil treatments (with the exception of the highest rate, 24 oz.), did not produce any phytotoxic effects on bermudagrass throughout the duration of this experiment.

Excellent silver bluestem seedhead suppression occurred with all Roundup treatments, alone and in combination with Oust and Frigate throughout the entire growing season. Also, the highest rate of Poast (24 oz.) + crop oil exhibited excellent silver bluestem seedhead suppression one month after treatment, but no vegetative control of silver bluestem. However, two to three months after treatment, this effect began to diminish. No silver bluestem seedhead suppression was observed in the MSMA alone and in combination with Lexone and crop oil treatments throughout the duration of this experiment.

Excellent silver bluestem control was obtained with all Roundup treatments, alone and in combination with Oust and Frigate throughout the

entirety of this experiment. Although significant differences did occur amont some of the above treatments, all were still providing acceptable silver bluestem control (90 percent or greater) by the end of the growing season (Table 37).

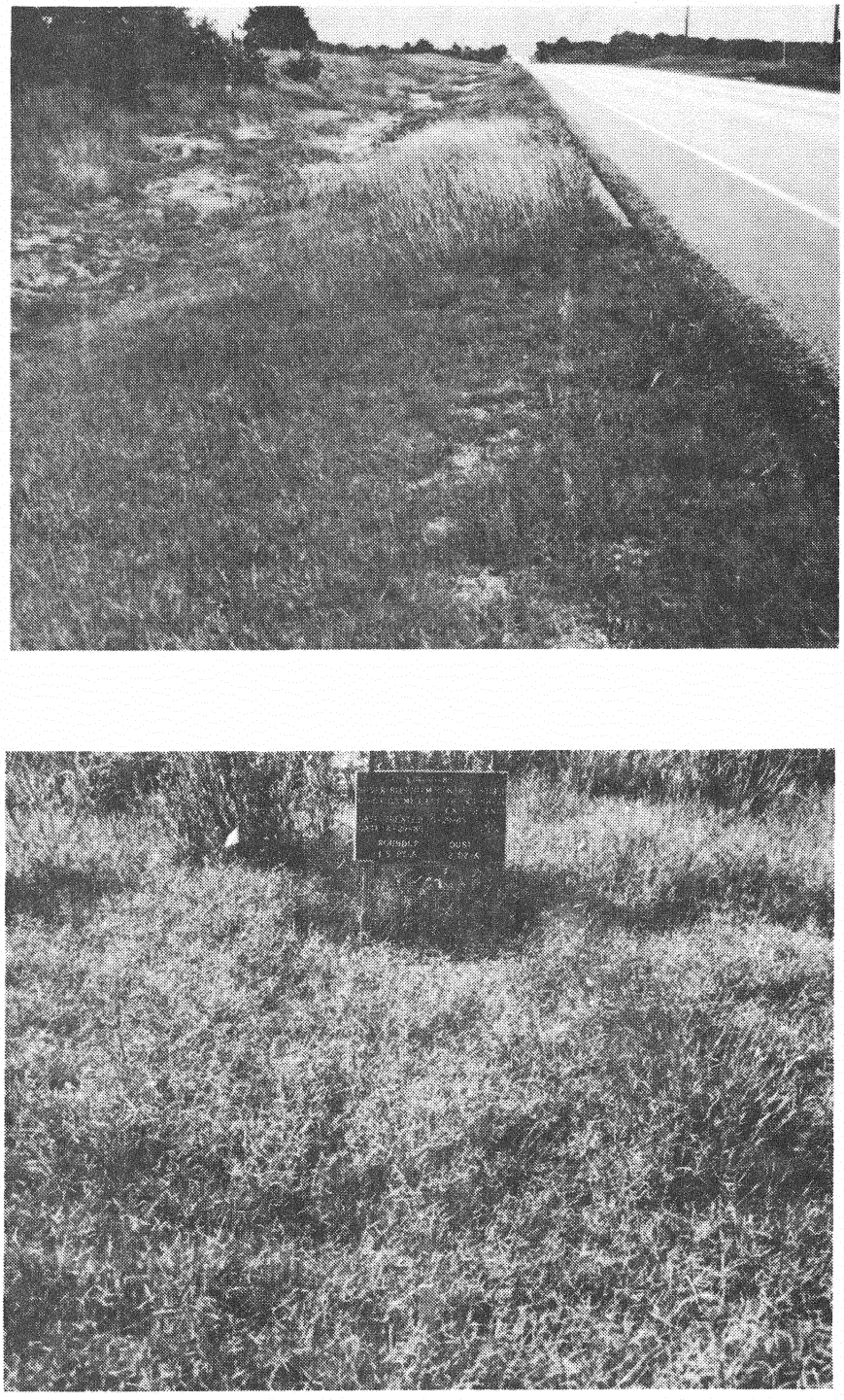

Figure 5. Two recommended herbicide treatments for silver bluestem control along Oklahoma roadsides. Top photo shows an area treated with Roundup at one quart per acre. Bottom photo shows a research plot treated with a combination treatment of Roundup + Oust at 1.5 pts. + 2 oz. per acre.

Table 29

Herbicide evaluation for the selective control of silver bluestem (Andropogon saccharoides) based on 10 as complete control and 1 as no effect.

Greenhouse study Treatments were applied 3-10-82.

	Treatments[1]	Rate lbs. product/A	Rate lbs. ai/A	Silver Bluestem Control (Scores) 3-17-82	3-31-82	4-16-82	4-26-82	5-7-82	5-24-82	6-18-82
1.	Velpar 90 SP + surfactant	0.75	0.675	2.00	5.33	7.67	9.67	9.33	9.33	9.00
2.	Velpar 90 SP + surfactant	1.25	1.125	3.00	7.33	9.67	9.97	10.00	10.00	10.00
3.	Karmex 80 WP + surfactant	3.0	2.4	4.00	7.33	8.00	9.63	9.33	9.33	8.67
4.	Karmex 80 WP + surfactant	4.0	3.2	3.00	5.33	7.00	9.30	9.67	9.67	9.67
5.	Oust 75 DF	0.67	0.5	2.00	3.00	2.33	3.00	3.00	2.33	1.00
6.	Oust 75 DF	1.33	1.0	1.33	2.67	2.00	3.00	3.00	2.67	2.33
7.	Roundup	1 qt.	0.75	7.00	9.00	7.67	8.00	6.33	5.67	1.33
8.	Roundup	3 qts.	2.25	9.00	10.00	10.00	10.00	10.00	10.00	8.67
9.	Kerb 50 W	2.0	1.0	2.33	3.00	2.00	2.00	1.00	1.00	1.00
10.	Kerb 50 W	4.0	2.0	2.67	4.00	3.00	2.00	2.00	1.00	1.00
11.	Aatrex Nine-0	5.6	5.0	2.67	4.33	3.00	2.00	2.00	1.00	1.33
12.	Aatrex Nine-0	11.0	9.9	3.33	5.67	8.67	9.67	9.67	9.83	9.00
13.	Igran 80 W + surfactant	3.75	3.0	8.00	8.00	8.67	8.67	8.00	8.83	8.00
14.	Igran 80 W + surfactant	5.0	4.0	5.67	8.33	8.33	7.33	6.33	6.33	4.67
15.	Bicep 4.5 L	1.33 gal.	6.0	3.67	4.67	2.67	2.00	2.67	2.00	1.33
16.	Bicep 4.5 L	2.0 gal.	9.0	4.00	4.33	3.67	2.33	3.00	4.00	3.00
17.	Princep 80 W	4.0	3.2	2.00	4.67	3.33	4.00	5.00	4.50	3.33
18.	Princep 80 W	5.0	4.0	3.00	6.33	5.67	7.00	6.00	4.67	4.33
19.	Check	----	---	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Statistical Difference			* *	* *	* *	* *	* *	* *	* *
	CV (Percent)			19.1	12.1	19.6	17.0	22.6	32.5	33.8
	LSD .01			1.55	1.48	2.39	2.20	2.83	3.92	3.51
	LSD .05			1.16	1.11	1.78	1.64	2.11	2.92	2.62

[1]Treatments 1, 2, 3, 4, 13 and 14 had Surfactant WK added at the equivalent rate of 1 quart per 100 gallons of spray mixture.

Table 30

Expt. 3-H-1-83. Herbicide evaluation for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of six postemergence herbicides for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Date of Application: June 8, 1983

Replications: Three

Dates Scored: July 7, 1983; July 27, 1983; August 31, 1983

Method of Scoring: 10 = complete control
1 = no control

	Treatments	Rate(s) lbs. ai/A	Dates Scored 7-7-83	7-27-83	8-31-83
*1.	Velpar 90SP	0.45	1.67	1.00	1.00
*2.	Velpar 90SP	0.675	1.33	1.00	1.00
*3.	Karmex 80W	2.4	2.00	1.67	1.67
*4.	Karmex 80W	3.2	2.00	1.00	2.67
*5.	Igran 80W	3.0	3.00	8.50	8.50
*6.	Igran 80W	4.0	3.67	8.67	7.50
7.	Roundup	1.0 qt. product	5.33	8.00	7.17
8.	Roundup	1.5 qts. product	7.33	9.50	8.67
9.	Rodeo	1.0 qt. product	5.67	8.93	8.00
10.	Rodeo	1.5 qts. product	6.00	9.50	8.83
11.	DPX-Y 6202-7	1/16 oz.	1.33	1.00	1.00
12.	DPX-Y 6202-7	1/8 oz.	1.00	1.00	2.00
13.	DPX-Y 6202-7	1/4 oz.	1.00	1.00	1.00
14.	DPX-Y 6202-7	1.2 oz.	1.33	1.00	1.00
15.	Check	------	1.00	1.00	1.00
	Statistical Difference		**	**	**
	CV (Percent)		36.7	14.5	25.9
	LSD .01		2.41	1.37	2.42
	LSD .05		1.79	1.01	1.79

*Surfactant WK added at the equivalent rate of 1 quart per 100 gallons of spray mixture.

Table 31

Expt. 4-H-13-83. Herbicide evaluation for the selective control of silver bluestem on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of five preemergence and postemergence herbicides for the selective control of silver bluestem on Oklahoma highway rights-of-way.

Dates of Application: March 8, 1983 - treatments 1-2, 5-6, 9-10; June 3, 1983 - treatments 3-4, 7-8, 11-16.

Replications: Three

Dates Scored: July 7, 1983, July 27, 1983, August 31, 1983

Method of Scoring: Silver Bluestem 10 = complete control, 1 = no control; Bermudagrass Phytotoxicity 10 = complete yellowing, 1 = no effect

	Treatments	Rate lbs. ai/A	Type of Application	Bermudagrass Phytotoxicity 7-7-83	Silver Bluestem Control Dates Scored 7-7-83	7-27-83	8-31-83
1.	Velpar 90SP	0.45	Pre (Preemergence)	1.67	1.00	1.00	1.00
2.	Velpar 90SP	0.675	Pre	1.33	1.67	1.00	1.00
*3.	Velpar 90SP	0.45	Post (Postemergence)	2.33	1.33	1.00	1.00
*4.	Velpar 90SP	0.675	Post	1.67	1.00	1.00	1.00
5.	Karmex 80W	2.4	Pre	1.00	1.00	1.00	1.00
6.	Karmex 80W	3.2	Pre	1.00	1.00	1.00	1.00
*7.	Karmex 80W	2.4	Post	1.00	1.33	1.00	1.00
*8.	Karmex 80W	3.2	Post	1.00	2.67	1.67	1.67
9.	Igran 80W	3.0	Pre	1.00	1.00	1.00	1.00
10.	Igran 80W	4.0	Pre	1.00	1.33	1.00	1.00
*11.	Igran 80W	3.0	Post	1.00	3.67	4.33	3.00
*12.	Igran 80W	4.0	Post	1.00	4.00	4.33	3.33
13.	Roundup	1.0 qt. product	Post	5.67	8.00	9.17	9.33
14.	Roundup	1.5 qts. product	Post	6.00	8.33	9.47	9.50
15.	Rodeo	1.0 qt. product	Post	3.33	8.00	8.33	7.83
16.	Rodeo	1.5 qts. product	Post	4.33	8.67	9.63	9.50
17.	Check	------		1.00	1.00	1.00	1.00

*Surfactant WK added at the equivalent rate of 1 quart per 100 gallons of spray mixture.

Statistical Difference	**	**	**	**
CV (Percent)	30.9	15.3	14.3	23.5
LSD .01	1.44	1.11	1.07	1.67
LSD .05	1.07	0.82	0.80	1.24

Table 32

Expt. 8-H-7-83. Herbicide evaluation for the selective control of silver bluestem on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of five preemergence and postemergence herbicides for the selective control of silver bluestem on Oklahoma highway rights-of-way.

Dates of Application: March 11, 1983 - treatments 1-2, 5-6, 9-10; June 3, 1983 - treatments 3-4, 7-8, 11-16.

Replications: Three

Dates Scored: July 8, 1983; July 26, 1983; August 30, 1983

Method of Scoring: 10 = complete control
1 = no control

	Treatments	Rate lbs. ai/A	Type of Application	Dates Scored 7-8-83	7-26-83	8-30-86
1.	Velpar 90SP	0.45	Pre (Preemergence)	1.00	1.00	1.00
2.	Velpar 90SP	0.675	Pre	1.00	1.00	1.00
*3.	Velpar 90SP	0.45	Post (Postemergence)	1.00	1.00	1.00
*4.	Velpar 90SP	0.675	Post	2.33	1.00	1.00
5.	Karmex 80W	2.4	Pre	1.00	1.00	1.00
6.	Karmex 80W	3.2	Pre	1.00	1.00	1.00
*7.	Karmex 80W	2.4	Post	3.00	1.00	1.00
*8.	Karmex 80W	3.2	Post	2.67	1.00	1.00
9.	Igran 80W	3.0	Pre	2.00	1.00	1.00
10.	Igran 80W	4.0	Pre	1.67	1.00	1.00
*11.	Igran 80W	3.0	Post	8.33	9.00	9.17
*12.	Igran 80W	4.0	Post	9.00	9.00	9.50
13.	Roundup	1.0 qt. product	Post	9.00	9.33	9.97
14.	Roundup	1.5 qts. product	Post	9.00	9.90	10.0
15.	Rodeo	1.0 qt. product	Post	9.00	9.47	9.97
16.	Rodeo	1.5 qts. product	Post	9.00	9.77	9.93
17.	Check	----	----	1.00	1.00	1.00
	Statistical Difference			**	**	**
	CV (Percent)			16.4	3.6	1.9
	LSD .01			1.53	0.32	0.17
	LSD .05			1.14	0.24	0.13

*Surfactant WK added at the equivalent rate of 1 quart per 100 gallons of spray mixture.

Table 33

Expt. 4-H-20-84. Herbicide evaluation for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of two carrier rates and six herbicides alone and in combinations for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Date of Treatments: June 13, 1984

Soil Type: Darnell - Stephensville

County: Lincoln

Plot Size: 5 ft. by 10 ft.

Location: SH-99, 4.5 miles south of Jct. SH-33.

Field Design: Randomized complete block with 3 replications.

Method of Scoring: Silver Bluestem Control — 10 = Complete Control, 1 = No Effect

Bermudagrass Phytotoxicity — 10 = Complete Yellowing, 1 = No Effect

*Treatments	Rate(s)/A	GPA	Silver Bluestem Control (Average of 3 Reps) 7-12-84 ***	8-16-84 ***	9-13-84 ***	Bermudagrass Phytotoxicity 7-12-84 ***
**1. Assure	0.25 oz. + Crop Oil	40	1.0 h	1.0 m	1.0 g	1.0 e
**2. Assure	0.50 oz. + Crop Oil	40	1.0 h	1.0 m	1.0 g	1.0 e
**3. Assure	1.0 oz. + Crop Oil	40	1.0 h	1.0 m	1.0 g	1.0 e
**4. Assure	2.0 oz. + Crop Oil	40	1.0 h	1.0 m	1.67 fg	1.33 de
5. Roundup	0.75 pt.	20	3.0 gh	4.33 g-k	3.67 ef	1.0 e
6. Roundup	1.0 pt.	20	6.17 bcdef	4.33 g-k	3.67 ef	2.0 bcde
7. Roundup	1.5 pt.	20	8.5 abc	8.87 abc	8.67 ab	3.33 a
8. Roundup	2.0 pt.	20	9.5 a	9.7 a	9.17 a	2.67 abc
9. Roundup	0.75 pt.	40	6.27 bcdef	4.67 f-j	3.33 ef	2.0 bcde
10. Roundup	1.0 pt.	40	6.33 bcdef	6.33 c-h	4.33 de	1.67 cde
11. Roundup	1.5 pt.	40	8.33 abc	7.5 a-e	6.33 cd	2.67 abc
12. Roundup	2.0 pt.	40	8.67 ab	7.27 a-e	7.17 abc	2.67 abc
13. Roundup + Oust	0.75 pt. + 2 oz.	40	7.5 abcd	3.00 i-m	4.33 de	2.33 abcd
14. Roundup + Oust	1.0 pt. + 2 oz.	40	4.83 defg	5.5 e-i	3.67 ef	2.00 bcde
15. Roundup + Oust	1.5 pt. + 2 oz.	40	7.17 abcde	7.17 a-f	8.0 abc	3.33 a
16. Roundup + Oust	2.0 pt. + 2 oz.	40	8.83 ab	8.6 abcd	8.0 abc	3.0 ab
17. Roundup + Oust	1.0 pt. + 3 oz.	40	7.83 abc	4.0 h-k	3.33 ef	3.0 ab
18. Rodeo	1 qt.	20	8.0 abc	6.0 d-h	4.33 de	2.67 abc
19. Rodeo	1 qt.	40	9.17 a	6.93 b-f	6.63 bc	2.67 abc
20. SC-0224	1 qt.	40	9.33 a	9.43 ab	8.5 ab	2.67 abc
21. Igran 80W	3 lbs. a.i.	20	4.5 efg	1.67 lm	2.33 efg	2.33 abcd
22. Igran 80W	3 lbs. a.i.	40	5.83 cdef	2.67 j-m	4.33 de	1.67 cde
23. Igran 80W	3 lbs. a.i.	20	4.0 fg	1.33 lm	1.33 fg	1.67 cde
24. Igran 80W	3 lbs. a.i.	40	4.33 fg	2.0 j-m	1.67 fg	1.67 cde
25. Check	----	--	1.0 h	1.0 m	1.0 g	1.0 e
Statistical Difference			**	**	**	**
CV (Percent)			31.4	37.2	31.2	35.6

* All treatments except 1 - 4, 20, 23 - 25 had X-77 spreader added at an equivalent rate of 0.5 percent by volume.

** Treatments 1 - 4 had a crop oil added at an equivalent rate of 0.5 percent by volume.

*** Means with the same letter are not significantly different (Waller-Duncan K-Ratio T Test).

Table 34

Expt. 8-H-11-84. Herbicide evaluation for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of two carrier rates and six herbicides alone and in combinations for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Date of Treatments: June 14, 1984

Soil Type: Dale

County: Pawnee

Plot Size: 5 ft. by 10 ft.

Location: US-64, 5.6 miles southeast of Cleveland

Field Design: Randomized Complete Block with 3 Replications.

Method of Scoring: Silver Bluestem Control: 10 = Complete Control
1 = No Effect

*Treatments	Rate(s) / A	GPA	Silver Bluestem Control (Average of 3 Reps) 7-12-84 ***	8-16-84 ***	9-13-84 ***
**1. Assure	0.25 oz. + Crop Oil	40	1.0 e	1.0 h	1.0 h
**2. Assure	0.50 oz. + Crop Oil	40	1.0 e	1.0 h	1.67 h
**3. Assure	1.0 oz. + Crop Oil	40	1.0 e	1.0 h	1.0 h
**4. Assure	2.0 oz. + Crop Oil	40	1.0 e	1.0 h	1.33 h
5. Roundup	0.75 pt.	20	7.5 ab	2.33 f-h	6.33 a-g
6. Roundup	1.0 pt.	20	8.5 a	5.67 a-f	6.83 a-f
7. Roundup	1.5 pts.	20	9.17 a	7.87 abc	7.57 a-d
8. Roundup	2.0 pts.	20	9.17 a	8.77 ab	9.63 a
9. Roundup	0.75 pt.	40	5.67 bc	4.5 c-h	4.67 b-h
10. Roundup	1.0 pt.	40	7.67 ab	3.33 e-h	3.67 d-h
11. Roundup	1.5 pts.	40	9.33 a	5.5 b-g	6.33 a-g
12. Roundup	2.0 pts.	40	9.0 a	8.1 ab	8.27 abc
13. Roundup + Oust	0.75 pt. + 2 oz.	40	7.67 ab	2.0 gh	3.67 d-h
14. Roundup + Oust	1.0 pt. + 2 oz.	40	8.5 a	4.5 c-h	3.93 c-h
15. Roundup + Oust	1.5 pts. + 2 oz.	40	9.5 a	9.17 a	8.87 ab
16. Roundup + Oust	2.0 pts. + 2 oz.	40	8.77 a	6.93 abcd	7.27 a-e
17. Roundup + Oust	1.0 pt. + 3 oz.	40	7.67 ab	6.17 a-e	4.0 c-h
18. Rodeo	1.0 qt.	20	9.5 a	9.0 ab	7.3 a-e
19. Rodeo	1.0 qt.	40	9.5 a	8.77 ab	9.17 a
20. SC-0224	1.0 qt.	40	9.5 a	7.83 abc	6.5 a-f
21. Igran 80W	3 lbs. a.i.	20	2.67 de	1.67 h	3.0 e-h
22. Igran 80W	3 lbs. a.i.	40	3.67 cd	2.0 gh	2.0 g-h
23. Igran 80W	3 lbs. a.i.	20	3.0 de	1.0 h	2.67 f-h
24. Igran 80W	3 lbs. a.i.	40	4.5 cd	3.5 d-h	1.67 h
25. Check	---	---	1.0 e	1.0 h	1.67 h

*All treatments except 1-4, 17, 20, 23-25 had X-77 spreader added at an equivalent rate of 0.5 percent by volume.
**Treatments 1-4 had a crop oil added at an equivalent rate of 0.5 percent by volume.

Statistical Difference	**	**	**
CV (Percent)	21.7	49.0	52.9

*** Means with the same letter are not significantly different (Waller - Duncan K-Ratio T Test).

Table 35

Description of experimental sites, location, soils, application dates, growth status of silver beardgrass, and rainfall in Oklahoma, 1983 and 1984.

Year/ site no.	Location in Oklahoma	Soil type/ (subgroup)	Appl. date	Growth status	Monthly precipitation[a]							
					Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.
					(cm)							
1983 ---												
One	Northcentral	Seminole loam (typic Natrustoll)	Mar. 8 June 3	dormant actively growing	8.1	7.1	22	6.9	0.1	2.6		
Two	Northcentral	Norge Silt loam (udic Pauleustoll)	Mar. 11 June 3	dormant actively growing	8.6	6.0	19	10	1.7	0.5		
Three	Southcentral	Talpa-rock outcrop complex (lithic Haplustoll)	June 8	actively growing	5.3	8.7	25	0	3.8	2.5		
1984 ---												
Four	Northcentral	Darnell-Stephenville fine sandy loam (udic Ustrochreptutic Haplustalf)	June 13	actively growing				5.3	0.5	5.8	4.0	12
Five	Northcentral	Dennis loam (aquic Palendoll)	June 14	actively growing				6.0	1.1	3.5	4.4	14

[a]Precipitation was recorded approximately 13 km NW of sites of investigations one and four, 24 km NW of sites two and five, and 0.5 km east of site three. National Oceanic and Atmospheric Administration. 1983. Climatological Data Oklahoma. 92(3-8). National Oceanic and Atmospheric Administration. 1984. Climatological Data Oklahoma. 93(6-10).

Table 36

Expt. 4-H-27-85. Herbicide evaluation for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of eighteen herbicide treatments for the selective control of silver bluestem.

Date of application: May 24, 1985

County: Lincoln

Soil type: Darnell-Stephensville

Location: SH-99, 4.6 miles south of Jct. SH-33 (east side).

Plot size: 5 ft. by 10 ft.

Field design: Randomized complete block with three replications

Dates scored: June 26, 1985; July 24, 1985; August 23, 1985; September 25, 1985

Methods of Scoring: Silver bluestem control - 1 = No Effect
10=Complete Control
Silver bluestem seedheads- number per square foot
(3 readings per plot)
Bermudagrass phototoxicity-1 = No Effect
10=Complete yellowing

Treatments	Rate(s)/A	Carrier rate	Bermudagrass Phytotoxicity			Silver Bluestem Seedheads				Silver Bluestem Control			
		GPA	6-26-85	7-24-85	8-23-85	6-26-85	7-24-85	8-23-85	9-25-85	6-26-85	7-24-85	8-23-85	9-25-85
1. Roundup	1.5 pts.	20	3.00d*	2.33de*	1.00b*	0.00e*	0.11f*	0.56e*	2.44de*	9.87ab*	9.73a-c*	8.93a*	8.77a*
2. Roundup	1.5 pts.	40	3.00d	1.67ef	1.00b	0.00e	0.22f	1.22e	2.67de	9.77b	9.30d	8.30a	7.93a
3. Roundup	2.0 pts.	20	4.67bc	3.33cd	1.00b	0.00e	0.00f	0.56e	1.22de	9.90ab	9.93ab	9.77a	9.47a
4. Roundup	2.0 pts.	40	4.00cd	2.67c-e	1.00b	0.00e	0.11f	0.33e	1.33de	9.90ab	9.87ab	9.77a	9.77a
5. Roundup + Oust	1 pt. + 2 oz	20	3.33d	3.00cd	1.00b	0.00e	0.56ef	2.00e	3.22de	9.77b	9.30d	8.50a	8.33a
6. Roundup + Oust + Frigate	1 pt. + 2 oz. + 0.4 qts.	20	5.33b	4.67b	1.00b	0.00e	0.11f	1.22e	3.11de	9.77b	9.63a-d	8.80a	8.67a
7. Roundup + Oust	1.5 pts. + 2 oz.	20	5.33b	3.67bc	1.00b	0.00e	0.22f	1.44e	3.56de	9.87ab	9.47cd	8.50a	7.83a
8. Roundup + Oust	1.5 pts. + 2 oz.	40	4.67bc	3.00cd	1.00b	0.00e	0.33ef	1.22e	5.33d	9.93a	9.63a-d	8.50a	7.33a
9. Roundup + Oust	2 pts. + 2 oz.	20	4.00cd	2.33de	1.00b	0.00e	0.33ef	1.67e	3.67d	9.90ab	9.60bd	9.00a	8.83a
10. Roundup + Oust + Frigate	2 pts. + 2 oz. + 0.4 qts.	20	7.33a	7.00a	2.33a	0.00e	0.00f	0.11e	0.89e	9.97a	9.93ab	9.93a	9.83a
11. Roundup + Oust	2 pts. + 2 oz.	40	5.67b	4.67b	1.00b	0.00e	0.00f	0.22e	0.67e	10.00a	9.97a	9.80a	9.67a
12. MSMA	3 lbs. ai.	20	1.00e	1.00f	1.00b	2.56ab	5.56ab	14.44ab	17.11ab	1.00c	1.00e	1.00b	1.00c
13 MSMA + Lexone	1.5 lbs. ai. + 0.5 lb. ai.	20	1.00e	1.00f	1.00b	2.33b	6.22a	10.44cd	17.00ab	1.00c	1.00e	1.00b	1.00c
14. MSMA + Lexone + Crop Oil	1.5 lbs. ai. + 0.5 lb. ai. + 0.4 qts.	20	1.00e	1.00f	1.00b	3.11a	5.22ab	15.00a	17.67ab	1.00c	1.00e	1.00b	1.00c
15. Poast + Crop Oil	8 oz. + 1 qt.	20	1.00e	1.00f	1.00b	0.78cd	4.44bc	15.11a	16.33abc	1.00c	1.00e	1.00b	1.00c
16. Poast + Crop Oil	12 oz. + 1 qt.	20	1.00e	1.00f	1.00b	1.00c	5.78ab	14.89ab	19.67a	1.00c	1.00e	1.00b	1.00c
17. Poast + Crop Oil	16 oz. + 1 qt.	20	1.00e	1.00f	1.00b	0.22de	3.11cd	8.33d	12.78c	1.00c	1.00e	3.33b	3.83b
18. Poast + Crop Oil	24 oz. + 1 qt.	20	1.00e	1.00f	1.00b	0.00e	1.89de	7.89d	15.00bc	1.00c	1.00e	3.00b	3.50bc
19. Check	----------	---	1.00e	1.00f	1.00b	2.67ab	5.11ab	11.78bc	17.00ab	1.00c	1.00e	1.00b	1.00c

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Table 37

Expt. 4-H-30-85. Herbicide evaluation for the selective control of silver bluestem along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of eighteen herbicide treatments for the selective control of silver bluestem.

Date of application: May 29, 1985

County: Garfield

Soil type: Kirkland-Renfrow silt loam

Location: US-64, 0.5 miles east of Jct. SH-74, east of Enid (south side).

Plot size: 5 ft. by 10 ft.

Field design: Randomized complete block with three replications

Dates scored: June 28, 1985; July 29, 1985; August 29, 1985; September 27, 1985

Methods of Scoring: Silver bluestem control - 1 = No Effect
10=Complete Control
Silver bluestem seedheads- number per square foot
(3 readings per plot)
Bermudagrass phototoxicity-1 = No Effect
10=Complete yellowing

Treatments	Rate(s)/A	Carrier rate GPA	Bermudagrass Phytotoxicity				Silver Bluestem Seedheads				Silver Bluestem Control			
			6-28-85	7-29-85	8-29-85	9-27-85	6-28-85	7-29-85	8-29-85	9-27-85	6-28-85	7-29-85	8-29-85	9-27-85
1. Roundup	1.5 pts.	20	3.67f*	1.33ef*	1.33ef*	1.00d*	0C*	0f*	0e*	0.22e*	9.77a*	10.00a*	9.97a*	9.77a-c*
2. Roundup	1.5 pts.	40	4.00ef	1.67d-f	1.33ef	1.00d	0C	0.11f	0.33 e	0.22e	9.77a	9.80a	9.80b	9.60b-d
3. Roundup	2.0 pts.	20	6.33bc	2.67b-d	2.00c-e	1.33cd	0C	0f	0e	0.11e	9.90a	10.00a	10.00a	9.90ab
4. Roundup	2.0 pts.	40	5.33cd	2.33b-e	1.00f	1.00d	0C	0f	0e	0e	9.97a	9.83a	9.93ab	9.97a
5. Roundup + Oust	1 pt. + 2 oz	20	4.00ef	2.00c-f	2.33cd	1.33cd	0C	0.11f	0.56e	2.11e	8.80c	9.80a	9.50c	9.00e
6. Roundup + Oust + Frigate	1 pt. + 2 oz. + 0.4 qts.	20	5.00de	3.00bc	2.67bc	2.00bc	0C	0f	0e	0.11e	9.77a	9.93a	9.80b	9.43d
7. Roundup + Oust	1.5 pts. + 2 oz.	20	4.67df	3.00bc	2.33cd	1.00d	0C	0f	0e	0e	9.17bc	9.93a	9.90ab	9.80a-c
8. Roundup + Oust	2 pts. + 2 oz.	40	4.67df	2.00c-f	1.67d-f	1.33cd	0C	0f	0e	0.11e	9.47ab	9.93a	9.87ab	9.77a-c
9. Roundup + Oust	2 pts. + 2 oz.	20	7.00ab	3.33b	3.33ab	2.67ab	0C	0f	0e	0e	9.77a	9.97a	9.87ab	9.67b-d
10. Roundup + Oust + Frigate	2 pts. + 2 oz. + 0.4 qts.	20	7.67a	4.67a	4.00a	3.33a	0C	0f	0e	0e	9.90a	10.00a	9.97a	9.77a-c
11. Roundup + Oust	2 pts. + 2 oz.	40	5.00de	2.00c-f	2.33cd	2.33b	0C	0f	0e	0e	9.77a	10.00a	9.97a	9.90ab
12. MSMA	3 lbs. ai.	20	1.00h	1.33ef	1.00f	1.00d	0.56 a-c	3.22a-c	7.44bc	8.78d	1.00d	3.67b	1.00d	1.00f
13. MSMA + Lexone	1.5 lbs. ai. + 0.5 lb. ai.	20	1.00h	1.00f	1.00f	1.00d	0.33 bc	2.78bc	9.67ab	10.78cd	1.00d	1.00c	1.00d	1.00f
14. MSMA + Lexone + Crop Oil	1.5 lbs. ai. + 0.5 lb. ai. + 0.4 qts.	20	1.00h	1.00f	1.00f	1.00d	1.00 a	2.89a-c	6.89bc	10.78cd	1.00d	1.00c	1.00d	1.00f
15. Poast + Crop Oil	8 oz. + 1 qt.	20	1.00h	1.00f	1.00f	1.00d	0.67 ab	3.89a	9.33ab	15.11ab	1.00d	1.00c	1.00d	1.00f
16. Poast + Crop Oil	12 oz. + 1 qt.	20	1.00h	1.00f	1.00f	1.00d	0.22 bc	2.44cd	5.56cd	10.22cd	1.00d	1.00c	1.00d	1.00f
17. Poast + Crop Oil	16 oz. + 1 qt.	20	1.00h	1.00f	1.00f	1.00d	0.56 a-c	3.67ab	11.56a	17.56a	1.00d	1.00c	1.00d	1.00f
18. Poast + Crop Oil	24 oz. + 1 qt.	20	2.33g	1.33ef	1.00f	1.00d	0C	0.67ef	7.00bc	13.22bc	1.33d	1.00c	1.00d	1.00f
19. Check	----------	---	1.00h	1.00f	1.00f	1.00d	1.00 a	1.56de	3.89d	8.67d	1.00d	1.00c	1.00d	1.00f

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Kochia (Kochia scoparia) Control

Summary

Kochia, a warm season annual, is more widespread in the western one-half of Oklahoma but is rapidly becoming established in northern and eastern portions of the state. Areas which seem to be prone to Kochia infestations include guardrails, bridge-ends and roadsides where the soil has been disturbed. Kochia has a natural tolerance to triazine herbicides such as atrazine. The problem of tolerance became evident in the early 1980's, requiring researchers to screen herbicides for the control of Kochia.

A total of three experiments have been conducted since 1983 to evaluate the effectiveness of herbicides for Kochia control. The study in 1983 was conducted in Division 8; the other two studies were initiated in Division 4 during 1984 and 1985.

Discussion

A Kochia control experiment (8-H-6-83) was conducted 1 mile east of the Broken Arrow interchange (center median) on I-44. This experiment was initiated on March 25 (preemergence treatments 1-3, 5-6, 9-10) and June 16, 1983 (postemergence treatments 4, 7-8).

The preemergence treatments of Karmex 80W at 2.4 and 3.2 lbs a.i. and Oust 75 DF at 1.0 and 2.0 oz. provided significantly better control of Kochia than did treatments of Lexone 75 DF at 0.5 lbs. a.i. and Igran 80 W at 3.0 and 4.0 lbs a.i. per acre when evaluated on June 16, approximately two and one-half months after application. When the experiment was evaluated on July 26, Karmex 80 W at 2.4 and 3.2 lbs. a.i., Banvel II at 1.0 qt., preemergence and postemergence treatments of Oust 75 DF at 1.0 and

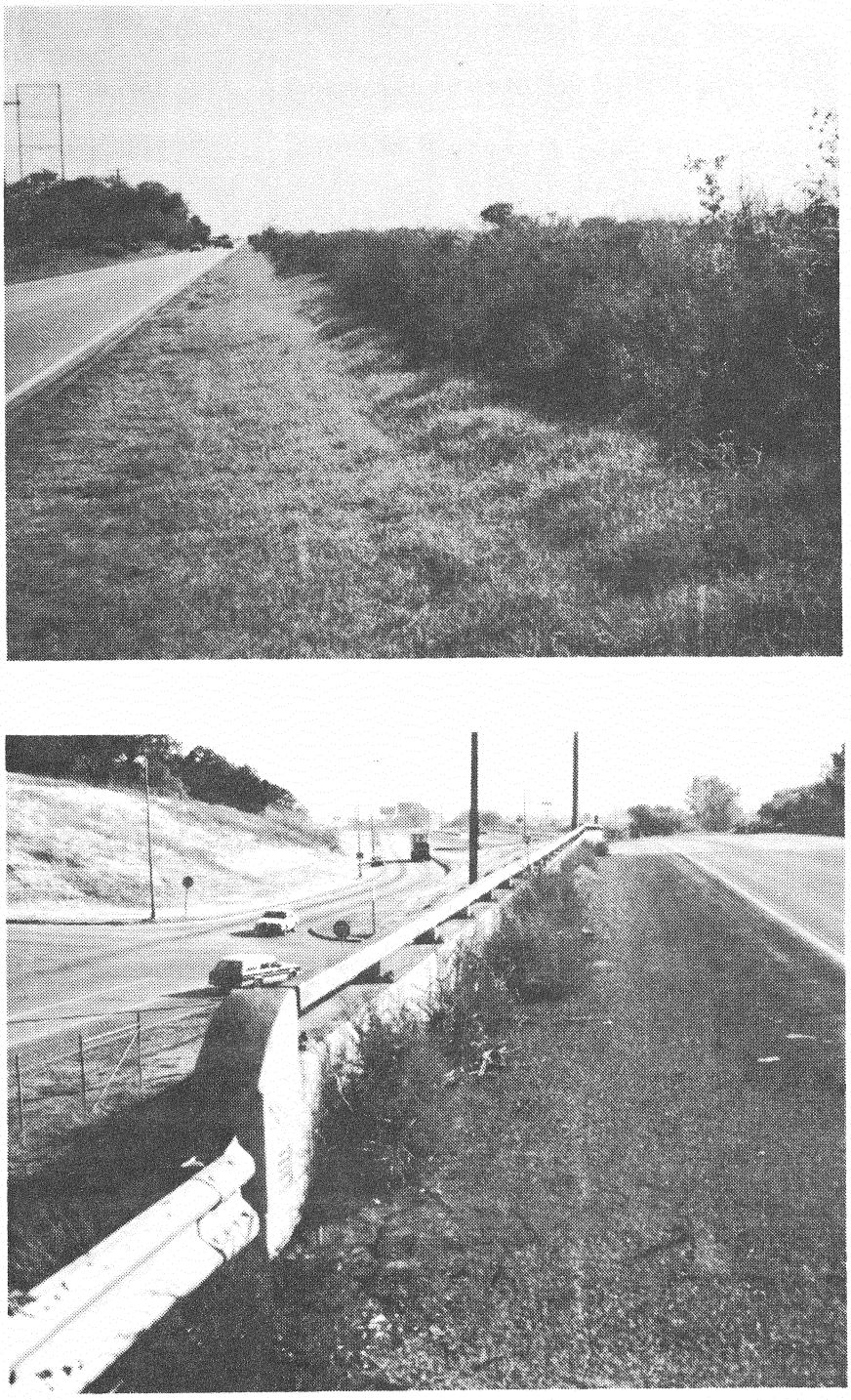

Figure 6. Areas infested with kochia along Oklahoma roadsides. Top photo shows an area in Northcentral Oklahoma being invaded by kochia. Bottom photo shows kochia growing in a Tulsa urban area along the bridge-end and guardrail section of an overpass.

2.0 oz. provided significantly better control of Kochia than all other treatments. Lexone 75 DF at 0.5 lbs. a.i. and Igran 80 W at 3.0 and 4.0 lbs. a.i. per acre were not significantly different from the untreated check plot. The same results occurred when the final evaluation was made on October 18, with the exception of the postemergence treatment of Oust 75 DF at 1 oz. per acre was found not to be significantly different from the untreated check plot for the control of Kochia (Table 38).

An experiment (4-H-16-84) was conducted 1.2 miles south of Ponca City on US-177 to evaluate the effectiveness of several preemergence and postemergence herbicide treatments for Kochia control. The postemergence applications of Oust, applied in the fall of 1983 at 4, 5 and 6 oz./A, provided excellent control of Kochia throughout the duration of this experiment, but at the same time caused significant phytotoxicity to the bermudagrass, even up to 9 months after application. Oust applied at 4 oz./A as a postemergence treatment in 25, 30 or 40 GPA carrier on June 12, 1984, did not adequately control Kochia and caused significant phytotoxicity to the bermudagrass as well. Karmex 80W, applied at 3 lbs. product per acre in 25, 30 and 40 GPA carrier, provided significant control of Kochia, 3 and 4 months after application. Control had diminished somewhat when evaluated 5 months after application. Buctril applied as a postemergence application at 2 and 4 qts. per acre in 40 GPA carrier provided excellent control of Kochia. Both of these treatments were significantly better in control when compared to Buctril applied at 1 qt./A in 40 GPA carrier, which did not provide an acceptable level of Kochia control. Banvel II applied at 1 qt./A in 25 and 40 GPA carrier was providing excellent control of Kochia when evaluations were made 2 months after application.

Treatments which provided satisfactory control of Kochia were: the preemergence application of Karmex 80W at 3 lbs. product per acre in 25-40 GPA carrier; the postemergence application of Buctril at 2 or 4 qts./A in 40 GPA carrier; and the postemergence application of Banvel II at 1 qt./A in 25-40 GPA carrier (Table 39).

A final Kochia control experiment (4-H-23-85) was conducted 6.3 miles south of Hennessey on US-81. Treatments were applied on March 8, 1985 (preemergence treatments 1-3, 7-10) and May 10, 1985 (postemergence treatments 4-6,11-12).

When the experiment was evaluated in May 1985, the combination treatment of Roundup + Oust at 1 qt. + 2 oz. was exhibiting significant bermudagrass phytotoxicity. At the same time, none of the other treatments were observed to have significant phytotoxic effects on the bermudagrass. This same trend occurred for a period of two months when the experiment was rated in June and July. However, no bermudagrass phytotoxicity was evident among any treatments when the study was evaluated in August. Excellent Kochia control was achieved with most herbicide treatments when the first evaluation was made in May. However, postemergence applications of DPX-T6376 at 0.33, 0.67 and 1 oz./A were not providing adequate Kochia control at this time. When the experiment was rated in June, all treatments (except preemergence application of DPX-T6376 at 0.25 oz./A) were exhibiting excellent Kochia control. Evaluations made in July, August and September revealed all herbicide treatments were providing satisfactory control of Kochia (Table 40).

Figure 7. Two herbicide treatments recommended for kochia control along Oklahoma roadsides. Top photo shows a research plot that has been treated with a preemergence application of Karmex. Bottom photo shows a research plot treated with a postemergence application of Banvel.

Table 38

Expt. 8-H-6-83. Herbicide evaluation for the selective control of Kochia on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of five preemergence and postemergence herbicides for the selective control of Kochia on Oklahoma highway rights-of-way.

Dates of Application: March 25, 1983 - treatments 1-3, 5-6, 9-10; June 16, 1983 - treatments 4, 7-8.

Replications: Three

Dates Scored: June 16, 1983; July 26, 1983; October 18, 1983

Method of Scoring: 10 = complete control
1 = no control

	Treatments	Rate(s) lbs. ai/A	Type of Application	Dates Scored 6-16-83	7-26-83	10-30-86
1.	Karmex 80W	2.4	Pre (Preemergence)	6.33	8.67	9.27
2.	Karmex 80W	3.2	Pre	8.00	8.17	8.83
3.	Lexone 75DF	0.5	Pre	1.00	1.00	2.33
4.	Banvel II	1 qt. product	Post (Postemergence)	1.00	9.60	9.30
5.	Oust 75DF	1 oz. product	Pre	5.00	7.00	6.67
6.	Oust 75 DF	2 oz. product	Pre	6.00	8.67	9.30
7.	Oust 75 DF	1 oz. product	Post	1.00	5.67	6.00
8.	Oust 75 DF	2 oz. product	Post	1.00	7.67	7.33
9.	Igran 80W	3.0	Pre	1.00	1.33	1.00
10.	Igran 80W	4.0	Pre	1.33	2.33	3.33
11.	Check	----	----	1.33	1.00	2.33
	Statistical Difference			**	**	**
	CV (Percent)			52.3	24.4	22.8
	LSD .01			3.65	3.15	3.16
	LSD .05			2.67	2.31	2.32

Table 39

Expt. 4-H-16-83. Herbicide evaluation for the selective control of Kochia on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of three carrier rates and four preemergence and postemergence herbicides. applications for the selective control of Kochia on Oklahoma highway rights-of-way.

Dates of Treatments: 10-13-83 (trmts. 1-3); 3-16-84 (trmts. 7-9); 6-12-84 (trmts. 4-6, 10-14).

County: Kay

Soil Type: Waurika Silt Loam

Location: US-177, 1.2 miles south of Ponca City (west side of ROW).

Plot Size: 5 ft. by 10 ft.

Method of Scoring: Kochia Control - 10 = Complete Control
1 = No Effect
Bermudagrass - 10 = Complete Yellowing
Phytotoxicity 1 = No Effect

Field Design: Randomized Complete Block with 3 Replications.

Treatments	Product Rate/A	Carrier Rate GPA	Type of Application	Kochia Control (Average of 3 Reps)*** 6-12-84	7-11-84	8-13-84	Bermudagrass Phytotoxicity 6-12-84	7-11-84	% Bermudagrass 8-13-84
1. Oust	4 oz.	40	*Post (Fall 1983)	9.93 a	10.0 a	9.67 ab	7.5 a	3.0 a	53.3 a-d
2. Oust	5 oz.	40	Post (Fall 1983)	9.9 a	10.0 a	10.0 a	7.67 a	3.33 a	50.0 a-d
3. Oust	6 oz.	40	Post (Fall 1983)	9.93 a	10.0 a	10.0 a	7.83 a	3.0 a	43.3 b-d
4. Oust	4 oz.	25	Post (Spring 1984)	1.0 c	4.33 c	3.33 fg	1.0 b	4.0 a	38.3 cd
5. Oust	4 oz.	30	Post (Spring 1984)	1.0 c	5.0 c	3.33 fg	1.0 b	3.0 a	65.0 a-d
6. Oust	4 oz.	40	Post (Spring 1984)	1.0 c	5.0 c	4.33 d-f	1.0 b	4.0 a	26.7 d
7. Karmex 80W	3 lbs.	25	**Pre (Spring 1984)	9.5 ab	8.97 a	8.0 abc	1.0 b	1.0 b	71.7 a-d
8. Karmex 80W	3 lbs.	30	Pre (Spring 1984)	9.07 bc	8.63 ab	6.33 c-f	1.0 b	1.67 b	45.0 b-d
9. Karmex 80W	3 lbs.	40	Pre (Spring 1984)	9.60 a	9.13 a	6.67 b-e	1.0 b	1.0 b	90.0 a
10. Buctril	1 qt.	40	Post (Spring 1984)	1.0 c	5.67 bc	4.0 e-g	1.0 b	1.0 b	46.7 a-d
11. Buctril	2 qts.	40	Post (Spring 1984)	1.0 c	9.13 a	9.0 abc	1.0 b	1.0 b	95.0 a
12. Buctril	4 qts.	40	Post (Spring 1984)	1.0 c	9.77 a	10.0 a	1.0 b	1.0 b	83.3 abc
13. Banvel II	1 qt.	25	Post (Spring 1984)	1.0 c	9.6 a	7.33 a-d	1.0 b	1.0 b	75.0 a-d
14. Banvel II	1 qt.	40	Post (Spring 1984)	1.0 c	8.93 a	9.33 a-d	1.0 b	1.0 b	95.0 a
15. Check	---	--	----	1.0 c	4.3 c	1.0 g	1.0 b	1.0 b	36.7 cd
Statistical Difference				**	**	**	**	**	*
CV (Percent)				7.9	22.9	29.7	11.3	33.5	40.0

* Postemergence Application
** Preemergence Application

*** Means with the same letter are not significantly different (Waller - Duncan K-Ratio T Test).

Table 40

Expt. 4-H-23-85. Herbicide evaluation for the selective control of Kochia and subsequent release of common bermudagrass along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of six herbicides for the selective control of Kochia.

Dates of Application: March 8, 1985 (preemergence treatments 1-3; 7-10)
May 10, 1985 (postemergence treatments 4-6; 11-12)

County: Kingfisher

Location: US-81, 6.3 miles south of the City Hall in Hennessey (west side

Soil Type: Pratt loamy fine sand

Plot Size: 5 ft. x 10 ft.

Field Design: Randomized complete block with three replications

Carrier Rates: 20 GPA (treatments 1-9; 11-12)
25 GPA (treatment 10)

Dates Scored: May 17, 1985; June 18, 1985; July 17, 1985; August 20, 1985; September 23, 1985.

Methods of Scoring: Kochia Control - 1 = No Effect
10 = Complete Control
Bermudagrass Phytotoxicity - 1 = No Effect
10 = Complete Yellowing

Treatments	Rate(s)/A	Bermudagrass Phytotoxicity				Kochia Control				
		5-17-85	6-18-85	7-17-85	8-20-85	5-17-85	6-18-85	7-17-85	8-20-85	9-23-85
1. DPX-T6376	0.25 oz.	1.00b*	1.00b*	1.00b*	1.00a*	8.27a*	6.17b*	9.27a*	9.00a*	8.67a*
2. DPX-T6376	0.50 oz.	1.00b	1.00b	1.00b	1.00a	9.87a	9.83a	9.77a	9.77a	9.77a
3. DPX-T6376	0.75 oz.	1.00b	1.00b	1.00b	1.00a	9.93a	9.93a	9.77a	9.77a	9.77a
4. DPX-T6376	0.33 oz	1.00b	1.00b	1.00b	1.00a	2.33c	9.77a	9.47a	8.93a	8.67a
5. DPX-T6376	0.67 oz.	1.00b	1.00b	1.00b	1.00a	4.33bc	9.57a	9.50a	9.00a	9.17a
6. DPX-T6376	1.00 oz.	1.00b	1.00b	1.00b	1.00a	4.33bc	9.80a	9.60a	9.13a	9.00a
7. Cotoran 4L	1.0 lb. ai.	1.00b	1.00b	1.00b	1.00a	9.90a	9.53a	9.60a	8.73a	9.00a
8. Cotoran 4L	2.0 lbs. ai.	1.33b	1.00b	1.00b	1.00a	9.90a	9.83a	9.90a	9.90a	9.77a
9. Cotoran 4L	3.0 lbs. ai.	1.00b	1.00b	1.00b	1.00a	9.93a	9.93a	9.93a	9.97a	9.93a
10. Karmex 80W	3.0 lbs.	1.00b	1.00b	1.00b	1.00a	9.93a	9.97a	9.97a	9.93a	9.93a
11. Banvel II	1 qt.	1.00b	1.00b	1.00b	1.00a	7.67a	9.77a	9.60a	9.60a	9.43a
12. Roundup + Oust	1 qt. + 2 oz.	4.00a	5.67a	3.33a	1.33a	7.33ab	10.0a	9.80a	9.87a	9.80a
13. Check	-----	1.00b	1.00b	1.00b	1.00a	3.67c	3.67b	3.67b	3.67b	3.67b

* Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Summary

Oklahoma roadsides are currently infested with many species of brush, ranging from vinelike species (trumpet creeper, moonvine, wild grape) to trees (elm, sassafras, pecan, pine, willow). Most of these species can be controlled with herbicides.

During the last four years there have been four brush control experiments initiated and completed. In 1982, an experiment was conducted in Division 8 to evaluate five herbicides for their effectiveness in controlling willow and other brush species. In 1983 two experiments were initiated in Divisions 2 and 8 to evaluate the effectiveness of five herbicides for the control of several species of brush. In 1985 a pine control experiment was initiated in Division 2 to evaluate six herbicides for pine control. Most of these experiments were evaluated during the year of initiation and evaluations continued throughout the following growing season.

Discussion

The 1982 brush control experiment (8-H-3-82) was located 3.4 miles north of Skiatook on SH-11 and was initiated on July 22, 1982. This study was primarily geared towards controlling willow; however, several other brush species were also evaluated for control.

Two months after application, Garlon 4 + Tordon 22 K, Tordon 101 Mixture and Tordon 22 K + 2,4-DP treatments were causing significantly more browning than any of the other treatments. It should be noted, however, Krenite treatments will not usually exhibit control until the spring following treatment. Both rates of Roundup and Krenite were still less

effective than the other treatments in the browning of the brush species when evaluated approximately three months after the initial herbicide applications (Table 41).

Two experiments were initiated in 1983 to evaluate herbicide effectiveness in controlling a broad spectrum of brush species. The first of these experiments (2-H-1-83) was located 5 miles east of Atoka on SH-7, and initial treatments were applied on June 7, 1983 to several species of brush (winged wild elm, plum, sassafras, trumpet creeper, eastern red cedar). Two months after the initial herbicide application, the combination treatment of Garlon 4 and Tordon 22 K along with the treatment of Tordon 101 Mixture were providing significantly better control of brush than Graslan. The same results were exhibited when the experiment was evaluated in September, approximately three and one-half months after treatment. However, when the last evaluation was made in October, all treatments were exhibiting significant control of brush. There were no significant statistical differences among the treatments of Tordon 101 Mixture, Graslan, Roundup and the combination treatment of Garlon 4 and Tordon 22 K for the control of brush when the last evaluation was made in October. At the same time, Tordon 101 Mixture, Roundup and the combination treatment of Garlon 4 and Tordon 22 K were significantly better in controlling brush than Krenite S. This would be expected as usually no visible effects are evident from a Krenite treatment until the spring following application. The addition of a crop oil to the Krenite S treatment may account for the amount of browning occurring. Approximately one year after the treatments were applied, the best treatments for brush control were the combination of Garlon 4 plus Tordon 22K and Tordon 101 Mixture. This trend continued throughout the duration of the experiment. Graslan and Roundup did provide satisfactory control of brush species,

however, they were not as effective as the two treatments previously mentioned. Krenite was providing only marginal control of brush when evaluated in June 1984. When evaluated in October 1984, all treatments were exhibiting satisfactory brush control (Table 42).

The final 1983 brush control experiment (8-H-10-83) was located 7 miles northwest of Jct. SH-20 in Skiatook on SH-11. Initial treatments were applied on June 17, 1983 to several different species of brush (predominantly trumpet creeper, native pecan, elm, and wild grape).

One month after the initial herbicide application, Tordon 101 Mixture and the combination treatment of Garlon 4 and Tordon 22 K were exhibiting significantly better control of brush than Graslan. The same results were repeated when the experiment was evaluated in September, approximately three months after the initial herbicide application. When the last evaluation was made in October, Roundup, Tordon 101 Mixture and the combination treatment of Garlon 4 and Tordon 22 K were exhibiting signficantly better control of the brush species than either Graslan and Krenite S. The lack of moisture throughout the summer may account for the poor control exhibited by the Graslan treatment. Control from Krenite S is not usually evident until the spring following application. When evaluations were made in June 1984, approximately one year after treatment, and again in October 1984, Roundup and Krenite were exhibiting the best brush control. The combination treatment of Garlon 4 plus Tordon 22K and Tordon 101 Mixture provided satisfactory brush control throughout the duration of the experiment. The only treatment which did not provide adequate brush control in this experiment was Graslan. This may be attributed to the resistant species of brush present in the plots for which control was not expected (according to the label) (Table 43).

A pine control experiment (2-H-2-85) was initiated in 1985, 0.5 mile

south of Jct. SH-3 on SH-98 west of Broken Bow. Initial treatments were applied on June 20, 1985 using an OC-40 nozzle (treatments 1, 2, 4), cyclone spreader (treatment 3), and handgun spot-treatment (treatments 5-8).

One month after treatments 1-3 were applied, the combination treatment of Garlon 4 + Tordon K and Tordon 101 Mixture were providing excellent pine control. No effects of the Graslan treatment were visible at this time. However, two months after application, the effects of Graslan treatment were evident and had began to exhibit good pine control. When the last evaluation was made in October, all three treatments (1-3) were providing excellent pine control. Treatments (4-8) of Krenite S, Roundup and Rodeo were just beginning to show some control of pine in October after being applied in September. However, none of these treatments were providing acceptable levels of control.

In June of 1986, the experiment was again evaluated and pine control became more evident from treatments 4-8. All treatments (excluding Roundup) were producing significant levels of pine control. Also all treatments, excluding the low rate of Rodeo and both Roundup treatments, were providing more than 93% control of pine (Table 44).

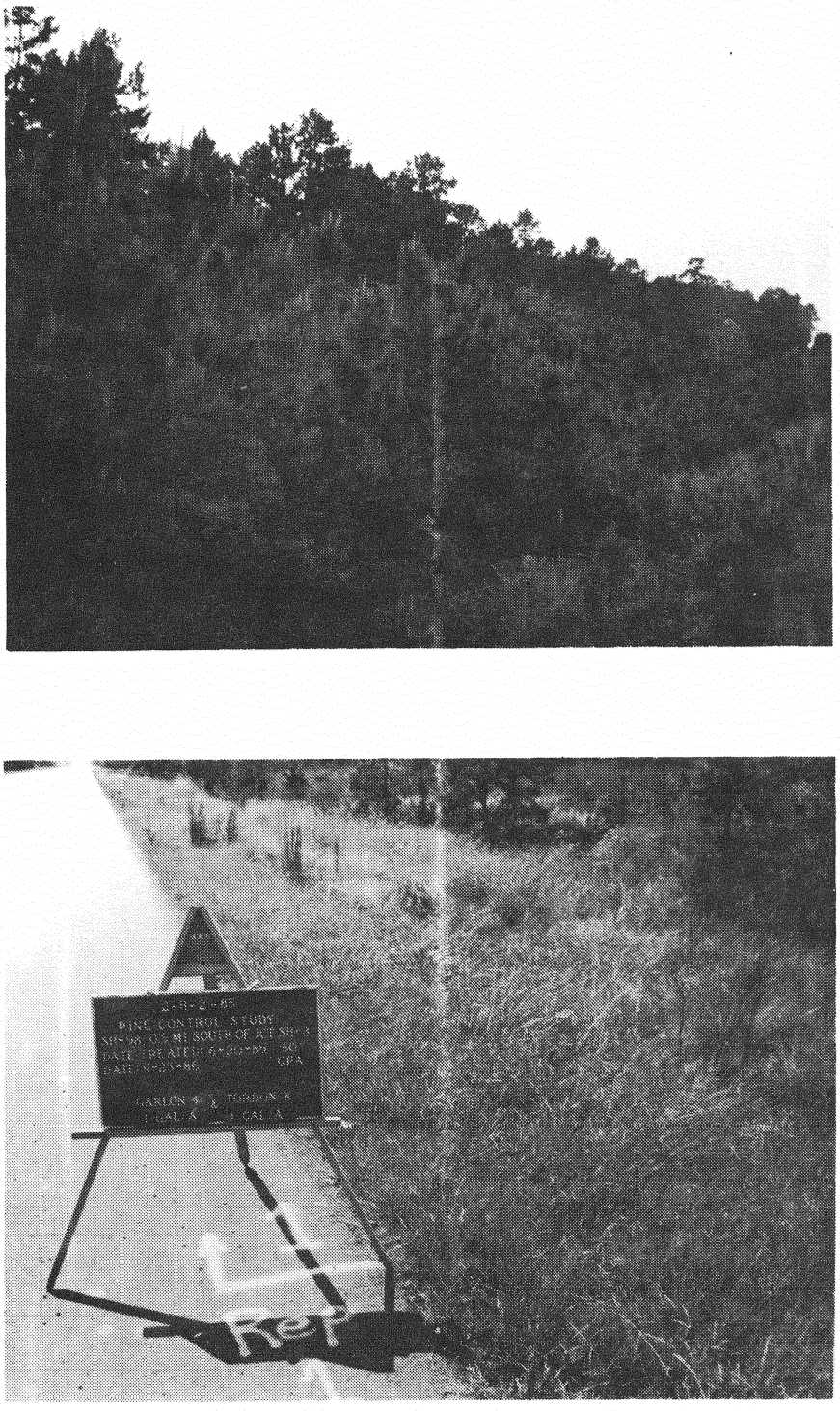

Figure 8. Top photo shows the encroachment of pines along a roadside in Southeastern Oklahoma. Botton photo shows a recommended herbicide treatment for pine control resulting in a desirable cover of grasses.

Table 41

Herbicide evaluation for brush control on Oklahoma roadsides based on 100 as total brownout (percent) and 0 as no effect.

Expt. No. 8-H-3-82. SH-11, 3.4 miles north of Skiatook. Treatments 1-5 were applied 7-22-82. Treatments 6 and 7 were applied 8-21-82. Treatments 1-5 had Nalco-Trol added at the equivalent rate of 16 ounces per 100 gallons of spray mixture. Treatments 6 and 7 had Nalco-Trol added at the equivalent rate of 8 ounces per 100 gallons of spray mixture.

	Treatments	Rate(s)	Brush Control (Scores) 9-21-82	10-27-82
1.	Garlon 4 + Tordon 22 K	1 gal. + 1 gal. in 98 gal. water	97.7	98.7
2.	Roundup	1.5 gal. in 98.5 gal. water	23.3	65.0
3.	Roundup	2.0 gal. in 98 gal. water	53.3	69.0
4.	Tordon 101 Mixture	2.0 gal. in 98 gal. water	96.0	89.3
5.	Tordon 22 K + 2,4-DP	1.5 gal. + 5.0 gal. in 93.5 gal. water	99.0	99.6
*6.	Krenite	1.5 gal. in 98.5 gal. water	0	0
*7.	Krenite	3.0 gal. in 97 gal. water	0	11.7
	Statistical Difference		* *	* *
	CV (Percent)		10.2	23.2
	LSD .01		13.4	35.7
	LSD .05		9.6	25.5

*Treatments 6 and 7 had a surfactant (Surf-King) added to the spray mixtures at an equivalent rate of 0.5% by volume.

Table 42

Expt. 2-H-1-83. Herbicide evaluation for brush control on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of six herbicides for brush control on Oklahoma highway rights-of-way.

Dates of Application: June 7, 1983 - treatments 1-3; September 29, 1983 - treatments 4-5.

Soil Type: Bernow fine sandy loam.

Plot Size: 20 ft. by 100 ft.

Field Design: Randomized complete block with 4 replications.

County: Atoka (SH-7, 5 miles east of Atoka).

Dates Scored: August 2, 1983; September 29, 1983; October 26, 1983; June 28, 1984; October 23, 1984.

Method of Scoring: 100 = complete brownout
0 = no control

Treatments	Rate(s)	Dates Scored 8-2-83	9-29-83	10-26-83	6-28-84	10-23-84
*1. Garlon 4 + Tordon 22K	1 gal. + 1 gal. in 98 gal. H_2O	95.0	99.8	99.5	99.8** a	99.5 a
*2. Tordon 101 Mixture	2 gal. in 98 gal. H_2O	98.3	98.3	99.3	99.3 a	98.3 ab
3. Graslan (20% pellets)	4 lbs. ai/A	32.5	68.8	78.3	79.5 ab	88.8 ab
*4. Roundup	1.5 gal. in 98.5 gal. H_2O	0	0	91.3	77.5 ab	80.0 ab
*5. Krenite S + Crop Oil	3.0 gal. + 1.5 qts. in 96.6 gal. H_2O	0	0	51.3	60.8 b	71.3 b
6. Check	----------	0	0	0	0 c	0 c
Statistical Difference		**	**	**	**	**
CV (Percent)		10.7	25.7	24.2	30.1	26.6
LSD .01		8.3	23.8	35.2		
LSD .05		6.0	17.2	25.5		

*Naleo-Trol added at the equivalent rate of 8 ounces per 100 gallon of spray mixture.

** Means with the same letter are not significantly different (Waller-Duncan K-ratio T Test).

Table 43

Expt. 8-H-10-83. Herbicide evaluation for brush control on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of six herbicides for brush control on Oklahoma highway rights-of-way.

Dates of Application: June 17, 1983 - treatments 1-3; September 27, 1983 - treatments 4-5.

Soil Type: Osage Silty Clay

Plot Size: 10 ft. by 75 ft.

Field Design: Randomized complete block with 4 replications

County: Osage

Location: SH-11; 7 miles northwest of Jct. SH-20 in Skiatook.

Dates Scored: July 21, 1983; September 27, 1983; October 25, 1983; June 28, 1984; October 23, 1984.

Method of Scoring: 100 = complete brownout
0 = no control

Treatments	Rate(s)	Dates Scored 7-21-83	9-27-83	10-25-83	6-28-84	10-23-84
*1. Garlon 4 + Tordon 22K	1 gal. + 1 gal. in 98 gal. H_2O	86.5	80.0	89.3	85.3** a	78.8 ab
*2. Tordon 101 Mixture	2 gal. in 98 gal. H_2O	87.0	77.5	82.5	79.8 a	70.0 b
3. Graslan (20% pellets)	4 lbs. ai/A	5.0	10.0	17.5	27.5 b	28.8 c
*4. Roundup	1.5 gal. in 98.5 gal. H_2O	0.25	0	98.5	90.0 a	97.0 a
*5. Krenite S + Crop Oil	3.0 gal. + 1.5 qts. in 96.6 gal. H_2O	0	0	0	92.5 a	82.5 ab
6. Check	---	0	0	0	0 b	0 d
Statistical (Difference)		**	**	**	**	**
CV (Percent)		25.5	38.7	19.3	32.6	26.7
LSD .01		15.?	22.5	19.2		
LSD .05		11.4	16.3	13.9		

*Nalco-Trol added at the equivalent rate of 8 ounces per 100 gallons of spray mixture.

** Means with the same letter are not significantly different (Waller-Duncan K-ratio T Test)

Table 44

Expt. 2-H-2-85. Herbicide evaluation for the selective control of pine along Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of eight herbicide treatments for the selective control of pine.

Dates of Application: June 20, 1985 (trmts. 1-3); September 26, 1985 (trmts. 4-8). County: McCurtain

Soil Type: Carnasaw-Zafra complex

Location: SH-98, 0.5 mile south of Junction SH-3, west of Broken Bow

Plot Size: 15 ft. x 100 ft.

Dates Scored: July 22, 1985; August 22, 1985; September 26, 1985; October 23, 1985

Field Design: Randomized complete block with three replications

Method of Scoring: Percent Pine Control - 0 = None, 100 = Complete Control

Treatments	Rate(s)/A	Carrier Rate GPA	Percent Pine Control			
			7-22-85	8-22-85	9-26-85	10-23-85
1. Garlon 4 + Tordon K + Nalco-Trol	1 gal. + 1 gal. + 8 oz.	50	96.3b[1/]	99.0a[1/]	97.7a[1/]	98.0a[1/]
2. Tordon 101 Mixture + Nalco-Trol	3 gal. + 8 oz.	50	99.0a	98.7a	98.3a	97.0a
3. Graslan 40% P	4 lbs. ai.	--	0 c	81.7b	91.0b	94.3a
4. Krenite S + sodium glutenate	3 gal.	40	0 c	0 c	0 c	1.3d
*5. Roundup	1% solution	--	0 c	0 c	0 c	2.0d
*6. Roundup	2% solution		0 c	0 c	0 c	4.0d
**7. Rodeo	0.75% solution		0 c	0 c	0 c	15.0c
**8. Rodeo	1.5% solution		0 c	0 c	0 c	27.7b
9. Check	----------		0 c	0 c	0 c	0 d

* Treatments 5-8 applied with handgun on a spray-to-wet basis.

** X-77 surfactant added to Rodeo treatments at 1/2% V/V (2 quarts X-77 per 100 gallons of water).

[1/] Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Growth Regulators

Summary

Application of plant growth regulators (PGR) to turf can save considerable amounts of money in mowing costs. Increasing fuel, machinery, and labor costs, and danger of mowing sloped areas are but a few of the reasons why PGR's are gaining popularity. Advantages of PGR applications range from reduced mowing frequency to a reduction in water requirements of turf.

Roadside turfgrasses in northern states consist primarily of cool-season grass species. Many northern states currently apply chemicals specifically for the purpose of regulating the growth of roadside turf. There are several chemicals presently on the market which successfully reduce mowing frequencies and eliminate seedhead formation of cool-season grass species. However, growth regulatory responses of these same chemicals on warm-season grass species is much less dramatic. Most of the chemicals which are showing positive growth regulating effects to warm-season grass species are some of the herbicides which are currently being used for roadside weed control in southern states, including Oklahoma. Herbicides used in weed control programs on warm-season grasses are sprayed primarily for their herbicidal effects, but their growth regulating properties are an advantage which is sometimes overlooked.

A total of five experiments were conducted in the last five years to test various growth regulating compounds. In 1981, two experiments were conducted, both in Division 4, to test several growth regulators effectiveness in suppressing growth of switchgrass, a tall-growing native grass species. In 1983, an experiment was conducted at the Agronomy Research Station in Stillwater, Oklahoma to test several plant-growth

regulators for their effectiveness in reducing mowing frequency. In 1984 and 1985, plant growth regulator research was done by graduate research assistant Douglas P. Montgomery towards his thesis requirements. His thesis work on bermudagrass was conducted at the Oklahoma Turfgrass Research Center. The primary objective was to test the influence of two plant growth regulators when applied to dormant versus actively growing bermudagrass.

Discussion

In 1981, two experiments were conducted to test the effectiveness of several growth regulators on the suppression of switchgrass. The first experiment (4-GR-3-81) was located 7 miles west of Stillwater on SH-51 (median) and was initiated on June 5, 1981.

Significant suppression of switchgrass plant growth was detected from all treatments with Oust, beginning three weeks after application, and lasting more than three months. The growth suppression was highly significant in all but the first and last evaluation. For some unexplained reason, in the July 30 evaluation only, significant growth suppression was detected in the Cutlass (EL500) treatment of 2 lb. ai/acre, and from Embark at 1 lb. ai/acre. These data tend to indicate switchgrass plant growth can be effectively suppressed for a period of approximately three months, from an application of Oust, at rates as low as 1/8 lb. ai/acre. This may be directly related to the time of application, as the plants in this experiment were from one and one-half to three feet tall, and actively growing (Table 45).

The final 1981 experiment (4-GR-5-81) was located 8.8 miles west of Stillwater on SH-51 and was identical in design to 4-GR-3-81. This experiment was initiated on July 22, 1981.

Results showed that some growth suppression (but not significant) could be detected in the switchgrass plants approximately one week after application of the growth regulator treatments. However, more time was required for the chemicals to bring about significant reductions in plant growth. When the treatments were evaluated approximately six weeks after application, Cutlass (EL500) at 2, 3, and 6 lb. ai/acre, Oust at 1/8, 1/4, and 1/2 lb. ai/acre, and Embark at 1 lb. significantly suppressed the growth of switchgrass. But when evaluated about three weeks later, only Oust at all rates exhibited significant growth suppression. These data tend to confirm results obtained in the earlier experiment (4-GR-3-81), in that Oust, even at the low rate of 1/8 lb. ai/acre, will effectively suppress the growth of switchgrass for a period of at least two months.

On August 31, approximately five weeks after chemical application, definite phytotoxicity, as evidenced by a characteristic purple discoloration of the switchgrass plants, was observed from all Oust treatments. This discoloration persisted more than two months after treatment (Table 46).

An experiment was conducted in 1983 to test several plant growth regulators for effectiveness in minimizing the need for mowing of bermudagrass. Treatments were applied on May 20-23, 1983.

In general, none of the PGR treatments tested possessed the ability to completely eliminate mowing. In fact, most of the treatments were no better than the untreated check. Trim mowing at the time of PGR application was found to generally enhance the appearance of the turf. Hence, it is believed that the presently available PGRs may be useful for reducing but not eliminating the need for mowing.

Mefluidide (Embark) was applied before and after an unexpected 1-inch thundershower. Since mefluidide is a foliar-uptake material (many of the

other products are root uptake), a poorer response was obtained where the rain washed it from the foliage. Melfluidide, even when used in low volume (1 gal./A) carrier rates, yielded a significant degree of growth regulation.

The one treatment which produced the most growth suppression was Ethrel (ethephon). However, a great deal of phytotoxicity was noted with its use. Thus, Ethrel's growth regulatory properties may lie in its ability to stunt or damage the grass rather than simply slow its growth.

At the rates tested, Oust showed some growth regulating activity. Field observations have shown that perhaps higher rates (2-4 oz. a.i./A) may be necessary to obtain a desired level of growth suppression.

On July 6, several of the treated plots had significantly more broadleaf weeds than the check. Other plots had significantly fewer. Apparently, certain products may retard turf growth and allow the weeds to grow uninhibited. Other products (e.g., the combination herbicide-PGR products) controlled the weeds quite adequately (Table 47).

Experiments conducted in 1984 and 1985 involved applying PGR materials to dormant bermudagrass to produce a dwarfed plant as dormancy begins to break in the spring. Rate and timing of this dormant application seem to be the keys to successfully inhibiting the growth of the turf. Applying a PGR to actively growing bermudagrass may not suppress the turf if the turf has already established a large amount of growth.

The objective of this study was to determine the effects of Oust (sulfometuron) and Cutlass (flurprimidol) applied to dormant and actively growing bermudagrass. The desired results from a PGR application on dormant bermudagrass would be a dwarfing effect as the turf breaks dormancy with little or no injury from the dormant application.

In the 1984 study five chemical treatments (Table 48) were applied

each month for three consecutive months. The first application being approximately one month before the spring green-up of bermudagrass.

Both PGR's showed significant control of weeds which lasted into mid-summer (Table 48). Oust treatments have been shown by other researchers to produce excellent weed control on several species of annual grasses and broadleaves. Weed control was essentially the same from the three application dates (Table 49).

Growth ratings taken 60 days-after-treatment (DAT) showed that all treatments, except the low rate of Cutlass significantly reduced topgrowth (All DAT are based on the dormant application date). By the 90 DAT rating, only the two highest rates of Oust showed topgrowth inhibition (Table 48). A significant treatment X application date interaction was noticed. The dormant applications produced significantly greater topgrowth reduction than the application on actively growing bermudagrass. Clipping fresh weights taken 125 DAT have shown that both PGR's applied as dormant applications reduced topgrowth, but only the 15 Apr. application had a significant reduction. Suppression of topgrowth by Oust applications on warm-season grasses has been noted by several researchers.

Visual ratings of discoloration from Cutlass treatments showed no injury to the turf (Table 48 & 49). Oust injury was present from all three rates at 90 DAT. Internode lengths taken 90 DAT showed no significant reduction from chemical treatment (Table 48 & 49).

Results from the 1984 study indicated that reduced rates of Oust should be used in 1985 in conjunction with earlier application dates to minimize injury. Other researchers have shown that Oust can reduce bermudagrass topgrowth but the rate and more importantly the timing of application will determine the amount of suppression and also injury to the turf.

In the 1985 study, reduced chemical rates applied as split applications were used to hopefully suppress bermudagrass growth, with little or no injury during spring green-up. Also in the 1985 study a fertility variable was added to see what possible advantages or disadvantages there would be if chemical treatments were applied to low vs. higher fertility areas.

Analysis of data from the 1985 field study indicated no significant fertility level X treatment interaction for several of the parameters; therefore, these parameters were pooled (Table 50).

Green-up delay rating taken 50 DAT showed that the Oust and Cutlass treatments caused significant delay in green-up of the turf (Table 50). February treatments were used in 1985 instead of March to hopefully reduce this delay. However, green-up delay noticed from both Oust and Cutlass seemed to be a delayment of 2 to 3 weeks. Growth reductions (visual ratings and clipping weights), 80 DAT, indicated that all Oust and Cutlass treatments were reducing growth significantly (Table 50). By 110 DAT, all Oust treatments, excluding the 0.14 kg ha^{-1} (Feb.) treatment, were still maintaining significant growth reduction. Cutlass treatments at 110 DAT were showing more activity from May applied treatments than February treatments.

Internode lengths at 110 DAT showed that all Oust treatments, except the 0.14 kg ha^{-1} (Feb.) treatment, significantly reduced internode lengths across all fertility levels, when compared to the untreated check plot (Table 51). An ideal characteristic of a successful bermudagrass growth regulator would be its ability to shorten internodes. The split applications of Oust showed the ability to reduce internode lengths and to produce dwarf plants and maintain this dwarfness with a second application.

Discoloration ratings at 100 DAT showed only four treatments exhibiting any significant effect (Figure 9). The discoloration at this rating was a yellowing of the turf. Treatments of Oust showed increasing amounts of discoloration with fertility levels. The amount of discoloration from the Oust treatments seemed considerably less than was noticed from similar treatments in the previous year (at the 90 DAT discoloration rating). Cutlass showed significant levels of discoloration in 1985 which decreased as fertility increased. This level of discoloration exhibited by both chemicals might be acceptable on low or medium maintenance turf areas (e.g., roadsides) but would probably be unacceptable on higher maintenance areas.

Results from 1984 and 1985 have shown that both Oust and Cutlass can be used to suppress bermudagrass growth when applied before or after dormancy break. PGR treatments made during dormancy or at dormancy break were most successful in suppressing bermudagrass growth. The split application in the 1985 study resulted in approximately the same amount of growth suppression as the single applications of similar rates in the 1984 study. The advantage in the split applications was the reduction in green-up delay as compared to single applications of similar rates in 1984.

Figure 9. Discoloration influenced by fertility level, timing, and rate of growth regulating chemical application to bermudagrass (LSD 0.05 within fertility level=0.89, within chemical treatment=0.91). 1985 .

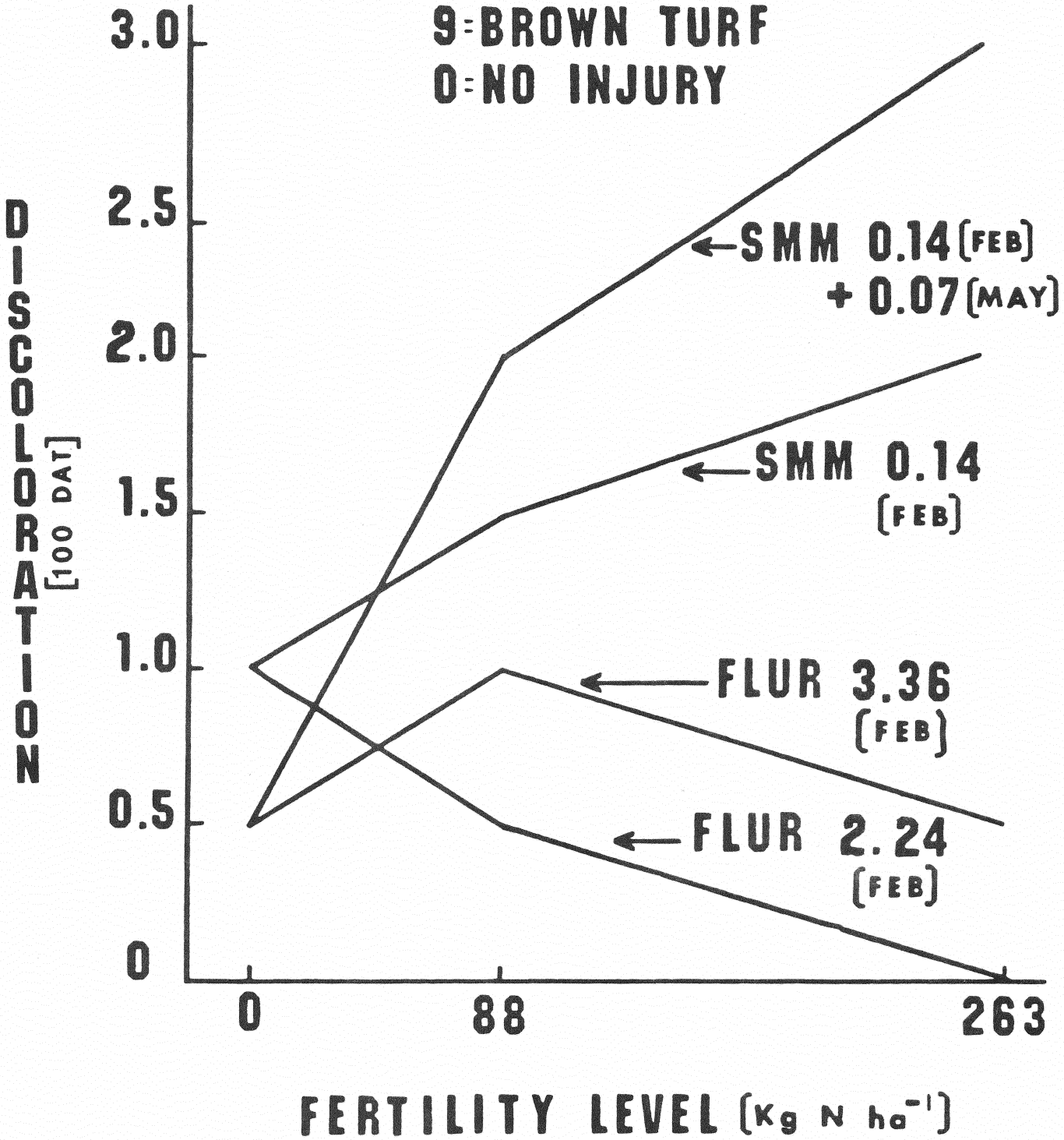

Table 45

Experiment: (4-GR-3-81) Evaluation of Growth Regulators on Switchgrass (Panicum virgatum)

Location: SH-51 median, 7 miles west of Stillwater, (Payne County) Oklahoma, on a Vernon, very fine sandy loam soil

Date of Treatment: June 5, 1981

Experimental Design: Randomized, Complete Block

Plot Size: 5 ft. by 10 ft. Replications: Three

Carrier: Water @ 40 gpa Type of Applicator: CO_2, hand held boom

Dates Scored: June 26, July 21, July 30, August 31, and September 28, 1981

Method of Scoring: Mean height in inches of switchgrass plants as determined from three measurements per plot, minus initial height in inches as determined on June 5, 1981.

	Treatment	Rate lb. ai/Acre	Mean difference in plant height in inches in relation to height on 6-5-81				
			6-26-81	7-21-81	7-30-81	8-31-81	9-28-81
1.	EL500 50W	1	16.0	14.6	10.6	13.6	10.0
2.	EL500 50W	2	13.2	8.6	6.7	8.8	5.7
3.	EL500 50W	3	15.6	12.1	10.4	13.0	8.2
4.	EL500 50W	6	14.8	14.0	12.8	13.0	9.2
5.	Oust 80WP	1/8	10.0	5.9	6.0	6.0	6.1
6.	Oust 80WP	1/4	10.6	7.1	5.4	6.9	4.4
7.	Oust 80WP	1/2	8.1	3.3	4.8	6.0	3.2
8.	Embark 2S	0.375	11.8	9.9	9.0	9.0	6.9
9.	Embark 2S	0.5	14.5	12.0	10.6	10.9	9.3
10.	Embark 2S	1	13.2	11.0	7.7	9.4	6.0
11.	Check		13.0	10.7	10.0	11.2	5.8
	Statistical Difference		*	**	**	**	NS
	CV (Percent)		22	30	26	27	40
	LSD .05		4.7				
	LSD .01			6.9	5.1	6.0	

Table 46

Experiment: (4-GR-5-81) Evaluation of Growth Regulators on Switchgrass (Panicum virgatum)

Location: SH-51 median, 8.8 miles west of Stillwater, (Payne County) Oklahoma

Date of Treatment: July 22, 1981

Experimental Design: Randomized, Complete Block

Plot Size: 5 ft. by 10 ft. Replications: Three

Carrier: Water @ 40 gpa Type of Applicator: CO_2, hand held boom

Dates Scored: July 30, August 31, and September 22, 1981

Method of Scoring: Mean height in inches of switchgrass plants as determined from three measurements per plot, minus initial height in inches as determined on July 22, 1981.

Treatment	Rate lb. ai/Acre	Mean difference in plant height in inches in relation to height on 7-22-81		
		7-30-81	8-31-81	9-22-81
1. EL500 50W	1	3.3	12.6	11.3
2. EL500 50W	2	3.2	9.0	7.1
3. EL500 50W	3	4.4	9.4	7.9
4. EL500 50W	6	4.3	8.5	7.1
5. Oust 80WP	1/8	3.9	5.3	4.2
6. Oust 80WP	1/4	3.6	4.3	3.6
7. Oust 80WP	1/2	4.3	4.0	3.5
8. Embark 2S	0.375	2.9	11.0	8.6
9. Embark 2S	0.5	3.6	11.3	9.5
10. Embark 2S	1	2.8	9.1	8.2
11. Check		5.1	13.3	10.0
Statistical Difference		NS	**	**
CV (Percent)		42	18	31
LSD .01			3.7	5.3

Table 47. Evaluation of growth regulators for effectiveness in minimizing the need for mowing of bermudagrass.

Treatments	Rates ai/A	Trim mowed =X	Bermuda regrowth June 13	Bermuda regrowth Sep. 28	Weed density June 13	Weed density Sep. 28	July 6 Weeds ft^{-2}	June 13 Discolor Rating	July 7 Seedheads ft^{-2}	July 8 Intrernode length (mm)	Sept. 28 Bermudagrass density rating	Oct. 31 Fresh wt. (grams)
1. Check	-0-		7.8 ab	7.3 a	7.0 ab	5.5 abc	3 g-j	1.3 g	34 a	1.8	7	329
		X	5.4 f-i	5.0 b-g	6.4 a-d	4.4 a-e	4 d-j	2.1 efg	20 d-l	1.5	6	233
2. Mefluidide	1/2 lb.		6.0 d-g	5.0 b-g	5.8 a-g	4.8 a-e	6 b-i	2.3 efg	16 g-o	1.6	6	318
		X	4.2 ij	5.8 a-e	4.4 d-g	4.2 a-e	6 b-g	2.4 efg	13 j-o	1.4	5	227
3. Mefluidide	1 lb.		6.5 b-f	5.5 a-g	6.5 abc	5.8 ab	5 d-j	1.8 fg	13 l-o	1.5	7	341
		X	3.8 j	4.5 b-g	5.8 a-g	4.5 a-e	6 b-h	2.0 efg	11 mno	1.3	6	286
4. Mefluidide (mower inj.)	1 lb.		—	—	--	--	--	--	--	—	--	--
		X	4.8 g-i	4.8 c-g	5.8 a-g	4.3 a-e	5 c-j	2.5 efg	19 e-m	1.1	6	152
5. Mefluidide (rope wick)	1 lb.		6.3 c-f	4.5 d-g	5.3 b-g	4.0 a-e	2 j	4.5 bc	12 l-o	1.6	6	110
		X	2.0 k	4.0 fg	4.0 fg	3.3 de	2 ij	4.0 cd	12 l-o	1.4	7	116
6. PP-333	1/2 lb.		6.3 c-f	6.0 a-e	7.5 a	5.5 abc	4 e-j	1.5 fg	17 f-o	1.3	7	159
		X	4.5 hij	5.3 b-g	4.5 c-g	4.5 a-e	4 e-j	2.5 efg	18 e-m	1.5	6	179
7. PP-333	1 lb.		8.0 a	5.8 a-f	7.3 ab	5.5 abc	4 e-j	1.5 fg	24 b-g	1.3	7	172
		X	4.3 ij	5.3 b-g	6.0 a-f	5.0 a-e	3 g-j	1.5 fg	29 abc	1.4	7	198
8. PP-333	2 lb.		7.3 a-d	6.8 ab	5.8 a-g	4.0 a-e	2 j	2.5 efg	24 b-g	1.6	7	378
		X	4.3 ij	5.0 b-g	4.3 efg	3.3 de	2 hij	2.8 def	25 b-f	1.5	7	169
9. PP-333 + Mefluidide	3/8 + 1/8 lb.		6.8 a-f	5.8 a-f	7.5 a	5.8 ab	5 b-j	2.0 efg	18 e-n	1.4	6	397
		X	4.8 g-j	5.0 b-g	5.5 a-g	5.5 abc	5 b-j	2.0 efg	15 h-o	1.5	6	285
10. PP-333 + Mefluidide	1 + 1/4 lb.		7.0 a-e	6.5 abc	6.5 abc	4.5 a-e	5 b-j	1.8 fg	18 e-n	1.6	7	259
		X	4.8 g-j	5.3 b-g	7.0 ab	5.3 a-d	6 b-g	2.5 efg	9 o	1.6	6	237
11. EL-500	3/4 lb.		7.3 a-d	6.0 a-e	6.5 abc	5.0 a-e	5 c-j	2.0 efg	30 ab	1.8	7	146
		X	4.8 g-j	4.8 c-g	5.8 a-g	4.5 a-e	5 c-j	1.8 fg	15 i-o	1.2	6	209
12. EL-500	1 lb.		7.5 abc	7.3 a	7.0 ab	4.8 a-e	4 d-j	1.8 fg	21 b-j	1.2	7	209
		X	4.8 g-j	5.0 b-g	6.3 a-e	4.8 a-e	7 b-f	2.0 efg	19 e-m	1.3	6	150
13. EL-500	1.5 lb		6.5 b-f	5.5 a-g	7.5 a	5.5 abc	9 ab	1.8 fg	10 no	1.5	6	349
		X	4.3 ij	3.8 g	6.5 abc	6.0 a	11 a	2.0 efg	13 j-o	1.3	6	493
14. EL-500 + Mefluidide	3/4 + 1/8 lb.		7.0 a-e	6.5 abc	6.8 ab	5.0 a-e	3 e-j	2.3 efg	21 c-k	1.6	7	394
		X	4.3 ij	5.0 b-g	5.5 a-g	3.8 b-e	3 f-j	2.3 efg	25 b-e	1.5	7	177
15. EL-500 + Mefluidide	3/4 + 3/8 lb.		6.8 a-f	5.5 a-g	6.5 abc	5.5 abc	8 bcd	2.0 efg	15 h-o	1.2	6	471
		X	4.0 ij	5.0 b-g	6.5 abc	5.0 a-e	8 abc	2.0 efg	15 i-o	1.5	6	275
16. Oust	1/4 oz.		5.8 e-h	6.3 a-d	6.0 a-f	4.3 a-e	4 d-j	2.8 def	22 b-j	1.4	7	304
		X	1.8 k	4.3 efg	3.8 g	4.8 a-e	5 c-j	3.3 cde	16 g-o	1.7	6	195
17. Oust	1 oz.		6.8 a-f	6.5 abc	6.5 abc	5.8 ab	7 b-e	2.3 efg	9 o	1.5	7	460
		X	5.8 e-h	5.5 a-g	6.8 ab	5.8 ab	6 b-g	2.3 efg	9 o	1.4	6	304
18. Ethrel	6 lb.		4.0 ij	4.8 c-g	4.5 c-g	3.5 cde	2 j	6.0 a	14 j-o	1.6	6	269
		X	1.3 k	4.0 fg	3.8 g	3.0 e	5 d-j	5.5 ab	13 k-o	1.4	7	392
19. Eptam	2.5 lb.		7.0 a-e	6.3 a-d	6.8 ab	4.8 a-e	2 ij	2.0 efg	28 a-d	1.5	7	92
		X	4.0 ij	5.0 b-g	5.8 a-g	4.0 a-e	5 e-j	1.5 fg	23 b-h	1.4	7	152

Table 48

Influence of growth regulating chemicals on growth and development of bermudagrass. 1984.

Treatment	Rate	Weed Control Rating[a]		Growth Rating[b]		Green-up Delay Ratings	Discoloration Rating[c]	Internode Lengths 90 DAT	Harvest fresh weights 125 DAT
		30 DAT	60 DAT	60 DAT	90 DAT	30 DAT	90 DAT		
	kg ha^{-1}							cm	$9/2.2m^2$
Flurprimidol	.84	3.3 b*	2.3 b	2.7 cd	1.7 b	0.9 c	0.7 b	2.2 a	1160 b
Flurprimidol	1.12	4.1 b	2.1 bc	4.3 bc	2.6 b	1.3 c	2.1 b	1.8 ab	813 bc
Sulfometuron methyl	.07	3.0 b	0.8 c	5.0 ab	3.1 b	2.6 b	2.9 b	1.9 ab	1099 b
Sulfometuron methyl	.14	4.0 b	1.0 bc	6.9 a	6.7 a	3.4 a	6.2 a	1.7 ab	680 c
Sulfometuron methyl	.28	3.9 b	1.4 bc	6.4 ab	6.7 a	3.4 a	6.2 a	1.3 b	638 c
Check	---	7.7 a	6.0 a	1.7 d	3.0 b	1.0 c	2.3 b	2.0 ab	1562 a

* Means followed by the same letter are not significantly different at the 5% level as determined by the Waller-Duncan K-ratio t-test.

a Weed control ratings were visually rated on a 0-9 scale, 9 = no weed control.

b Growth ratings were visually rated on a 0-9 scale, 9 = no regrowth.

c Discoloration and Green-up delay ratings were visually rated on a 0-9 scale, 9 = brown turf.

Table 49

Influence of timing of application of growth regulating chemicals applied to dormant and actively growing bermudagrass. 1984.

Application Date	Weed Control Rating[a]		Growth[b] Rating		Green-up Rating	Discoloration[c] Rating	Internode Lengths 90 DAT	Harvest fresh weights 125 DAT
	30 DAT	60 DAT	60 DAT	90 DAT	30 DAT	90 DAT		
							cm	9/2.2m^2
(3-15-84) 4 weeks prior to greenup	2.1 b*	1.7 a	5.1 a	4.5 a	5.1 a	3.9 a	1.8 a	922 ab
(4-17-84) week of greenup	5.1 a	1.8 a	6.4 a	4.9 a	0.8 b	4.3 a	1.6 a	760 b
(4-15-84) 4 week after greenup	4.9 a	2.0 a	2.9 b	2.7 b	0.3 b	2.4 a	2.0 a	1082 a

* Means followed by the same letter are not significantly different at the 5% level as determined by the Waller-Duncan K-ratio t-test.

a Weed control ratings were visually rated on a 0-9 scale, 9 = no weed control.

b Growth ratings were visually rated on a 0-9 scale, 9 = no regrowth.

c Discoloration and Green-up delay ratings were visually rated on a 0-9 scale, 9 = brown turf.

Table 50

Effects of timing and rate of growth regulating chemicals applied on dormant and actively growing bermudagrass. 1985.

Treatment[a]	Rate	Application Date	Green-up Delay rating[b] 50 DAT	Discoloration rating 80 DAT	Clipping weight 80 DAT	Growth rating[c] 110 DAT	Growth rating[c] 135 DAT
	kg ha^{-1}				g $1.4m^2$		
Sulfometuron methyl	0.07 + 0.07	Feb + May	6.5 ab*	5.8 e	118 d	3.0 d	8.3 a
Sulfometuron methyl	0.14	Feb	7.5 a	5.7 e	95 d	7.7 ab	7.8 a
Sulfometuron methyl	0.14 + 0.07	Feb + May	6.5 ab	6.0 e	113 cd	2.2 d	6.3 b
Sulfometuron methyl	0.21	May	---	---	---	2.7 d	4.7 cd
Flurprimidol	1.12	Feb	3.5 d	7.7 bc	173 cd	7.2 b	9.0 a
Flurprimidol	2.24	Feb	3.8 cd	7.2 cd	146 cd	8.8 a	8.8 a
Flurprimidol	3.36	Feb	5.3 bc	6.5 de	175 cd	8.3 ab	8.5 a
Flurprimidol	1.12	May	---	---	---	7.2 b	8.2 a
Flurprimidol	2.24	May	---	---	---	5.2 bc	5.7 bc
Flurprimidol	3.36	May	---	---	---	2.7 d	3.5 d
Check	---	---	0.0 e	9.0 a	318 ab	9.0 a	9.0 a

* Means followed by the same letter are not significantly different at the 5% level as determined by the Waller-Duncan K-ratio t-test.

a February treatments were applied on 25 Feb., 1985.
May treatments were applied on 15 May, 1985.
All DAT's refer to Feb. treatment date.

b Green-up delay rating was visually rated on a 0-9 scale, 9 = brown turf.

c Growth rating was visually rated on a 0-9 scale, 9 = complete regrowth.

Table 51

Influence of fertility level, timing and rate of growth regulating chemical application on internode lengths of bermudagrass. 1985.

Treatment[a]	Application Rate	Application Date	Internode lengths 100 DAT Fertility levels kg N ha^{-1} 0	88	263
	kg ha^{-1}			cm	
Sulfometuron methyl	0.07 + 0.07	Feb + May	1.07*	0.96	1.15
Sulfometuron methyl	0.14	Feb	1.58	1.97	2.72
Sulfometuron methyl	0.14 + 0.07	Feb + May	0.85	0.88	1.11
Sulfometuron methyl	0.21	May	0.82	1.10	1.40
Flurprimidol	1.12	May	1.94	1.67	3.19
Flurprimidol	2.24	May	1.69	1.89	2.52
Flurprimidol	3.36	May	0.93	1.52	1.58
Check	---	---	2.11	2.08	2.67

* LSD 0.05 within columns = 0.98, within row = 4.12
a February treatments were applied on 25 Feb., 1985.
May treatments were applied on 15 May, 1985
All DAT's refer to Feb. treatment date.

Annual Grass and Broadleaf Weed Control

Summary

Annual grasses and broadleaf weeds continue to be major roadside weed problems throughout the entire state of Oklahoma. Problem weed species of annual grasses include cool-season types such as cheat and downy brome (*Bromus* spp.) and warm-season types such as crabgrass (*Digitaria* spp.) and foxtails (*Setaria* spp.). Annual broadleaf weed problems include a cool-season specie of hairy vetch (*Vicia villosa* Roth.) and warm-season species of Kochia (*Kochia scoparia*), sunflower (*Helianthus annuus* L.) and wild carrot (*Daucus carota* L.).

Discussion

In 1983, two experiments were initiated to evaluate several herbicides for annual weed control in Division 8.

In experiment 8-H-8-83 (Table 52), the preemergence application of the following herbicide treatments provided significant annual grass (*Bromus spp.*) control when evaluated on June 17, two months after application: Aatrex 80 W at 2.0 and 4.0 lbs. a.i., Karmex 80 W at 3.0 lbs. a.i., Evik 80 W at 3.2 lbs. a.i., Spike 80 W at 1.0 lb. a.i., all combination treatments of Spike 80 W and Aatrex 80 W, Princep 80 W at 4.0 lbs. a.i., Velpar 90 SP at 0.7 and 0.9 lbs. a.i., Hyvar X 80 WP at 1.0 and 1.4 lbs. a.i. per acre and the combination treatment of Spike 80 W and Karmex 80 W.

The following treatments were not significantly different for annual grass control when compared to the untreated check: Igran 80 W at 2.0 and 2.4 lbs. a.i., Karmex 80 W at 2.0 lbs. a.i., Evik 80 W at 4.8 lbs. a.i., Princep at 2.0 lbs. a.i. and Spike 80 W at 0.25 and 0.5 lbs. a.i. per acre.

When the final evaluation was made on July 21, all treatments were providing significant control of annual grasses when compared to the

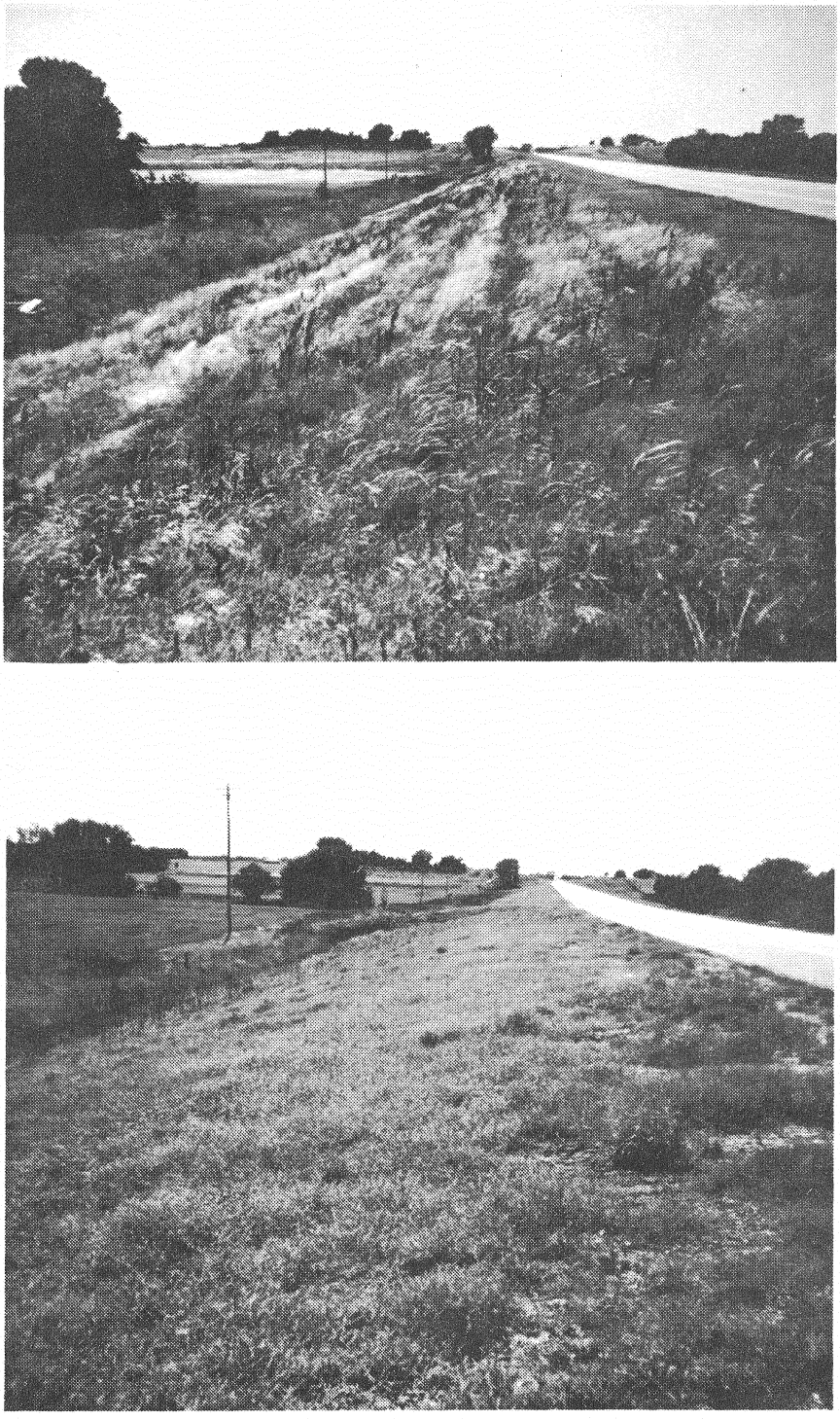

Figure 10. A heavy weed infestation along a roadside in central Oklahoma (top photo). Bottom photo shows the same area one year later after being treated with herbicides to control annual grasses, broadleaf weeds and johnsongrass, resulting in the subsequent release of bermudagrass.

untreated check; however, there were no significant differences among these same treatments (excluding the check). When the experiment was evaluated for percent broadleaf weeds present on June 17 and again on July 21, the better treatments which performed very satisfactory for the control of broadleaf weeds (these same treatments were also very effective for annual grass control) are as follows: Aatrex 80 W at 2.0 and 4.0 lbs. a.i., Karmex 80 W at 3.0 lbs. a.i., Spike 80 W at 1.0 lb. a.i; the combination treatments of Spike 80 W and Aatrex 80 W at 1.0 lb. a.i. plus 1.0 lb. a.i. and 1.5 lbs. a.i. plus 1.5 lbs. a.i., Princep 80 W at 4.0 lbs. a.i. and Velpar 90 SP at 0.7 and 0.9 lbs. a.i. per acre.

When the first evaluation of experiment 8-H-9-83 (Table 53) was made on May 24, five weeks after the preemergence treatments were applied, all preemergence treatments with the exception of DPX-T-6376-20 DF at 1/16 ounce per acre were exhibiting significant control of hemp dogbane (Apocynum cannabium L.). On July 21, when the final evaluation was made, the statistical analyses indicated no significant differences in control among any treatments; however, Banvel II at 2.0 pts. per acre provided the best control of hemp dogbane. Unfortunately, the experimental area contained only one perennial broadleaf weed, hemp dogbane, which resulted in a less than desirable experimental situation.

A third and final annual weed control study, 4-H-22-85 was initated along an Oklahoma roadside in 1985 to evaluate and compare three rates of prodiamine 4F with three commercially available preemergence herbicides, Oust 75 DF, Aatrex 4L, and Karmex 80W. Treatments were applied using a hand-held, three nozzle CO_2 sprayer equipped with 80015 SS spray tips. A strip-plot design was employed with three replications. One strip was treated with one quart of Roundup (glyphosate) per acre two days prior to

preemergence applications on March 1, 1985. The other strip was not treated with Roundup.

Evaluations 50 and 77 DAT showed treatments which had Roundup applied previously, (Tables 54 and 55) provided excellent control of annual weeds; however, there were no significant differences in regrowth of annual weeds among treatments, including the check. Annual weeds present in the experimental area included downy brome (Bromus tectorum L.), cheat (Bromus secalinus L.), wild carrot (Daucus carota L.) and hairy vetch (Vicia villosa Roth).

Oust at 2 oz./A exhibited significantly more bermudagrass phytotoxicity than any of the remaining treatments 50 DAT, both in the Roundup treated and untreated strips (Tables 56 and 57). Bermudagrass phytotoxicity among treatments was not present 77 DAT. Applications (excluding prior Roundup treatment) of Oust at 1 and 2 oz./A, Aatrex at 2 lbs. ai/A in 20 and 40 GPA, and Karmex at 3 lbs./A in 25 and 40 GPA (Tables 54 and 55) exhibited significantly better postemergence control of annual weeds than all rates of prodiamine 4F (2, 4, 8 lbs. ai/A) 50 and 77 DAT. An explanation for the poor control as shown in this experiment by prodiamine 4F may be due in part that most of the annual weeds emerged prior to treatment.

Recommendations for annual weed control are given in the recommendation section (Page 9).

Table 52

Expt. 8-H-8-83. Herbicide evaluation for the selective control of annual grasses and broadleaf weeds on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of eight preemergence herbicides for the selective control of annual grasses and broadleaf weeds on Oklahoma highway rights-of-way.

Date of Application: April 15, 1983

Replications: Three

Dates Scored: June 17, 1983; July 21, 1983

Method of Scoring: Annual Grass Control 10 = complete control, 1 = no control; % broadleaf weeds 100 = complete cover, 0 = none

	Treatments	Rate(s) lbs. ai/A	Annual Grass Control 6-17-83	Annual Grass Control 7-21-83	Percent Broadleaf Weeds 6-17-83	Percent Broadleaf Weeds 7-21-83
1.	Aatrex 80W	2.0	10.0	10.0	5.0	3.3
2.	Aatrex 80W	4.0	10.0	10.0	0.0	0.0
3.	Karmex 80W	2.0	5.67	9.10	40.0	21.7
4.	Karmex 80W	3.0	9.00	9.17	20.0	13.3
5.	Evik 80W	3.2	7.50	9.50	35.0	21.7
6.	Evik 80W	4.8	5.33	8.50	55.0	18.3
7.	Spike 80W	0.5	4.33	7.33	46.7	28.3
8.	Spike 80W	1.0	9.67	9.67	11.7	10.0
9.	Spike 80W	0.25	3.67	6.67	75.0	36.7
10.	Spike 80W + Aatrex 80W	0.5 + 0.5	9.17	10.0	46.7	16.7
11.	Spike 80W + Aatrex 80W	1.0 + 1.0	10.0	9.33	6.7	5.0
12.	Spike 80W + Aatrex 80W	1.5 + 1.5	10.0	10.0	1.7	0.0
13.	Princep 80W	4.0	9.17	9.67	23.3	5.0
14.	Princep 80W	2.0	5.00	6.33	53.3	21.7
15.	Igran 80W	2.4	6.00	8.67	38.3	21.7
16.	Igran 80W	2.0	5.00	7.00	60.0	31.7
17.	Velpar 90SP	0.7	10.0	10.0	23.3	8.3
18.	Velpar 90SP	0.9	10.0	10.0	0.0	0.0
19.	Hyvar X 80WP	1.0	9.67	9.83	60.0	21.7
20.	Hyvar X 80WP	1.4	10.00	10.00	35.0	18.3
21.	Spike 80W + Karmex 80W	0.5 + 1.5	9.00	9.17	36.7	20.0
22.	Check	------	1.00	1.00	66.7	36.7
	Statistical Difference		**	**	**	**
	CV (Percent)		29.8	19.3	66.2	76.3
	LSD .01		5.04	3.68	49.1	27.5
	LSD .05		3.77	2.76	36.7	20.6

Table 53

Expt. 8-H-9-83. Herbicide evaluation for the selective control of broadleaf weeds on Oklahoma highway rights-of-way.

Objective: Evaluate the effectiveness of four preemergence and postemergence herbicides for the selective control of broadleaf weeds on Oklahoma highway rights-of-way.

Dates of Application: April 15, 1983 - treatments 1-3; May 24, 1983 - treatments 14-26.

Replications: Three

Dates Scored: May 24, 1983; July 21, 1983.

Method of Scoring: 10 = complete control; 1 = no control

	Treatments	Rates ai/A	Type of Application	Dates Scored 5-24-83	Dates Scored 7-21-83
1.	DPX-T-6376-21 70DF	1/16 oz.	Pre (Preemergence)	1.33	1.00
2.	DPX-T-6376-21 70DF	1/8 oz.	Pre	7.00	1.00
3.	DPX-T-6376-21 70DF	1/4 oz.	Pre	6.17	1.00
4.	DPX-T-6376-21 70DF	1/2 oz.	Pre	6.27	2.67
5.	DPX-T-6376-21 70DF	1 oz.	Pre	9.20	4.00
6.	DPX-T-6376-21 70DF	2 oz.	Pre	7.83	4.00
7.	DPX-T-6376-21 70DF + Oust 75 DF	1/16 oz. + 1/16 oz.	Pre	6.30	5.00
8.	DPX-T-6376-21 70DF + Oust 75 DF	1/8 oz. + 1/8 oz.	Pre	9.23	4.00
9.	DPX-T-6376-21 70DF + Oust 75 DF	1/4 oz. 1/4 oz.	Pre	9.00	4.00
10.	DPX-T-6376-21 70DF + Oust 75 DF	1/2 oz. + 1/2 oz.	Pre	9.17	1.00
11.	DPX-T-6376-21 70DF + Oust 75 DF	1 oz. + 1 oz.	Pre	9.10	4.00
12.	DPX-T-6376-21 70DF + Oust 75 DF	2 oz. + 2 oz.	Pre	9.83	4.00
13.	Aatrex 80W	2 lbs.	Pre	8.20	4.67
14.	DPX-T-6376-21 70DF	1/16 oz.	Post (Postemergence)	2.67	4.00
15.	DPX-T-6376-21 70DF	1/8 oz.	Post	1.00	1.00
16.	DPX-T-6376-21 70DF	1/4 oz.	Post	1.00	3.33
17.	DPX-T-6376-21 70DF	1/2 oz.	Post	1.67	2.00
18.	DPX-T-6376-21 70DF	1 oz.	Post	1.00	5.00
19.	DPX-T-6376-21 70DF	2 oz.	Post	1.00	2.67
20.	Oust 75DF	1 oz.	Post	1.00	5.33
21.	Oust 75DF	2 oz.	Post	2.33	6.33
22.	Oust 75DF	4 oz.	Post	2.33	5.33
23.	Oust 75DF	6 oz.	Post	1.00	4.00
24.	Banvel II	1 pint	Post	1.00	6.33
25.	Banvel II	2 pints	Post	1.00	9.33
26.	Banvel II	4 pints	Post	1.00	6.67
27.	Check	-------	----	1.00	1.00
	Statistical Difference			**	NS
	CV (Percent)			31.5	92.5
	LSD .01			3.03	7.68
	LSD .05			2.28	5.76

TABLE 54. Annual Weed Control Along Oklahoma Roadsides

Plots treated with Roundup @ 1 qt./A in 40 GPA.

	TREATMENTS	Rate/A	Carrier Rate (GPA)	77 DAT *Annual Weed Control
1.	Oust 75 DF	1 oz.	40	10 a
2.	Oust 75 DF	2 oz.	40	10 a
3.	Aatrex 4L	2 lbs. ai	20	10 a
4.	Aatrex 4L	2 lbs. ai	40	10 a
5.	Karmex 80W	3 lbs.	25	10 a
6.	Karmex 80W	3 lbs.	40	10 a
7.	Prodiamine 4L	2 lbs. ai	40	10 a
8.	Prodiamine 4L	4 lbs. ai	40	10 a
9.	Prodiamine 4L	8 lbs. ai	40	10 a
10.	Check	—	--	10 a

TABLE 55. Annual Weed Control Along Oklahoma Roadsides

Plots not treated with Roundup.

	TREATMENTS	Rate/A	Carrier Rate (GPA)	77 DAT *Annual Weed Control
1.	Oust 75 DF	1 oz.	40	10 a
2.	Oust 75 DF	2 oz.	40	10 a
3.	Aatrex 4L	2 lbs. ai	20	9.8a
4.	Aatrex 4L	2 lbs. ai	40	10 a
5.	Karmex 80W	3 lbs.	25	6.5b
6.	Karmex 80W	3 lbs.	40	7.6ab
7.	Prodiamine 4L	2 lbs. ai	40	1.0c
8.	Prodiamine 4L	4 lbs. ai	40	1.0c
9.	Prodiamine 4L	8 lbs. ai	40	1.0c
10.	Check	—	--	1.0c

*Annual Weed Control 1=No Effect, 10=Complete Control

TABLE 56. Annual Weed Control Along Oklahoma Roadsides

Plots treated with Roundup @ 1 qt./A in 40 GPA.

	TREATMENTS	Rate/A	Carrier Rate (GPA)	50 DAT *Annual Weed Control	50 DAT **Bermuda Phyto.
1.	Oust 75 DF	1 oz.	40	10 a	1.0 b
2.	Oust 75 DF	2 oz.	40	9.3a	2.0 a
3.	Aatrex 4L	2 lbs. ai	20	10 a	1.0 b
4.	Aatrex 4L	2 lbs. ai	40	10 a	1.0 b
5.	Karmex 80W	3 lbs.	25	9.7a	1.0 b
6.	Karmex 80W	3 lbs.	40	10 a	1.0 b
7.	Prodiamine 4L	2 lbs. ai	40	9.3a	1.0 b
8.	Prodiamine 4L	4 lbs. ai	40	9.7a	1.0 b
9.	Prodiamine 4L	8 lbs. ai	40	9.7a	1.0 b
10.	Check		--	9.3a	1.0 b

TABLE 57. Annual Weed Control Along Oklahoma Roadsides

Plots not treated with Roundup.

	TREATMENTS	Rate/A	Carrier Rate (GPA)	50 DAT *Annual Weed Control	50 DAT **Bermuda Phyto.
1.	Oust 75 DF	1 oz.	40	6.3b	1.0 b
2.	Oust 75 DF	2 oz.	40	9.3a	2.0 a
3.	Aatrex 4L	2 lbs. ai	20	9.3a	1.0 b
4.	Aatrex 4L	2 lbs. ai	40	9.3a	1.0 b
5.	Karmex 80W	3 lbs.	25	8.3ab	1.0 b
6.	Karmex 80W	3 lbs.	40	7.7ab	1.0 b
7.	Prodiamine 4L	2 lbs. ai	40	1.0c	1.0 b
8.	Prodiamine 4L	4 lbs. ai	40	1.0c	1.0 b
9.	Prodiamine 4L	8 lbs. ai	40	1.0c	1.0 b
10.	Check		--	1.0c	1.0 b

*Annual Weed Control 1=No Effect, 10=Complete Control

**Bermuda Phyto. 1=No Effect, 10=Complete yellowing

ESTABLISHMENT AND EROSION CONTROL

Summary

Four field experiments were performed to evaluate mulch materials and seeding methods on establishment of seeded turfgrasses. Three of these studies were conducted in Div. 4 and one in Div. 5. In addition, a doctoral thesis was written on establishment of roadside seeded species in conjunction with herbicide applications. Summaries of the experiments and applicable tables have been extracted from the dissertation of Dr. Thomas J. Samples (1985, Oklahoma State Univ.) and presented herein.

Discussion

Several mulch materials were evaluated in a two-year series of investigations aimed at determining the effectiveness of several of the new mulch materials on the market. The objective of the first study, initiated in 1983, was to evaluate 16 mulch materials which seem to hold promise for erosion control on high-risk areas such as banks and ditches. Products were evaluated on their ability to provide a suitable growing environment for seedlings of a warm-season and a cool-season grass.

Data (Table 58) indicated that wood fiber, wood blanket, and straw mulches were the most satisfactory for enhancing seedling survival in this trial (Physical properties of the mulch materials listed in Table 58 are described in Appendix A, Table A-1). The fabric mulches were applied directly on top of the seedbed, as were the other materials. But several of the fabrics did not induce a satisfactory seedling stand. Seedling growth tended to be poorer with the thicker and darker colored fabrics. The thinner and lighter colored fabrics allowed adequate moisture penetration to the soil and a lower temperature and yielded a better stand of grass. However, if the fabric remained in place over the seedlings for an extended period of time, some death of the seedlings occurred.

Therefore, we recommend that if fabric mulches are used, that the fabric be removed after the seedlings emerge (approximately 2 to 3 weeks after planting).

Soil Gard, a liquid "paint-like" material, proved satisfactory for sealing the soil surface to the escape of moisture but did not prohibit emergence of the stand. A 1:50 dilution of Soil Gard to water was used; the soil was wetted but not puddled during application of the product.

A follow-up study, initiated in 1984, used several of these mulch materials in a mock-rainstorm situation, for evaluating their effectiveness as an erosion block. The objective of this study was to evaluate the effectiveness of seven mulch materials, whose manufacturers claim possess the abilities to minimize erosion under highly erosive conditions. Seed displacement via water washing on a slope was used as an indicator of whether the mulch did in fact minimize erosion (Figure 11).

The eight treatments (Table 59) showed significant differences in three of the six parameters evaluated. There were no treatment differences in field survival of the seedlings, in distance of displacement at 1 month, or in plant densities in the 2-4 ft. displacement region at 3 months.

The two non-woven fabrics, Trevira and Supac, showed a great deal of promise in minimizing erosion and seedling displacement. At 3 months, Trevira plots had more plant density in the furrow and fewer displaced seedlings than most of the other treatments. Five percent of the lovegrass seedlings in the Trevira plots were displaced, compared with up to 65% of the seedlings in other plots. Perhaps the reason behind the success of these fabrics lies in their water shedding abilities. In our 1983 trials, we found that the fabric mulches in general, and Trevira in particular, were slow to wet and tended to repel water initially. This type of response proved to be damaging to the seedlings after a prolonged period of

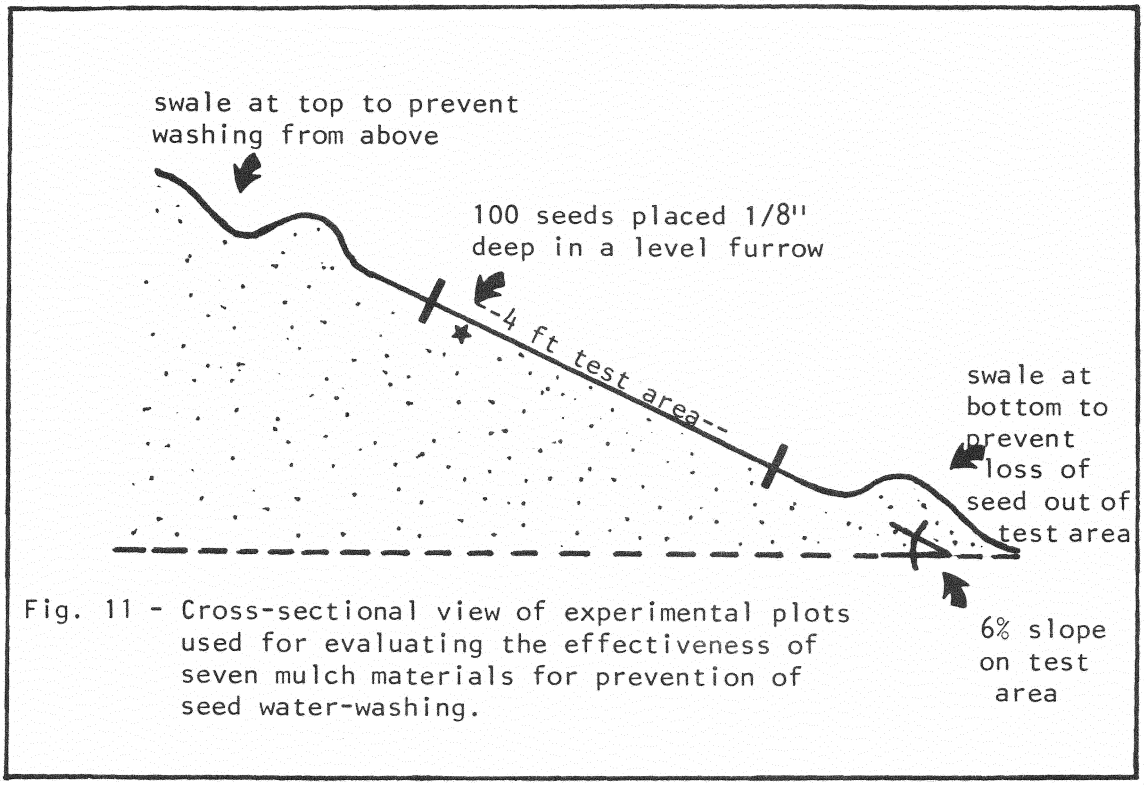

Fig. 11 - Cross-sectional view of experimental plots used for evaluating the effectiveness of seven mulch materials for prevention of seed water-washing.

time, and it became necessary to remove this mulch to insure continued seedling growth. However, if these fabric mulches are removed after seedling emergence, they can be reused at another site -- providing a cost savings over products that cannot be reused. If used as recommended, these fabric mulches can effectively lower erosion.

The wood chips and the Excelsior regular-strength blanket did not provide an adequate degree of erosion protection in this trial. In both examples, there was a greater percentage of seedlings displaced than were displaced on a bare soil surface.

Water washing of seed from erosion may act detrimentally to stand establishment, in addition to the obvious problems associated with soil loss. In general, the greater the percentage of seedlings that were displaced, the lower was the overall field survival of the seeds planted. In other words, water washing reduced the ability of the seeds to produce plants in the field. This was evidenced by a significant, negative correlation between field survival and seedling displacement ($r = -0.38$).

Two investigations were undertaken (SH-33 near Cushing and US-183 north of Seiling, OK) to determine optimum seeding methods, seed mixtures, and mulch materials for establishment of seeded species under dryland conditions. Three seeding methods were employed: Nesbit Drill, Brillion, and Broadcast .

Five species or mixtures were employed:

Species	Rate
Weeping Lovegrass (*Eragrostis curvula*)	4 lbs. PLS*/Acre
Plains Bluestem (*Bothriochloa ischaemum* var. *ischaemum*)	2 lbs. PLS/Acre
Guymon Bermudagrass (*Cynodon dactylon*)	5 lbs. PLS/Acre

*Pure Live Seed (PLS) equals the percent germination, multiplied by the percent purity, divided by 100.

Mixture A, a combination of species recommended for eastern Oklahoma contained the following species:

	Rate
Indiangrass (Sorghastrum nutans)	3.1 lbs. PLS/Acre
Weeping Lovegrass (Eragrostis curvula)	2 lbs. PLS/Acre
Plains Bluestem (Bothriochloa ischaemum var. ischaemum)	7.2 lbs. PLS/Acre
Little Bluestem (Ansropogon scoparius)	8 lbs. Bulk/Acre

Mixture B, recommended for dry areas of western Oklahoma, contained:

	Rate
Sideoats Grama (Bouteloua curtipendula)	2.5 lbs. PLS/Acre
Blue Grama (Bouteloua gracilis)	6.1 lbs. PLS/Acre
Buffalograss (Buchloe dactyloides)	1.3 lbs. PLS/Acre
Indiangrass (Sorghastrum nutens)	3.1 lbs. PLS/Acre
Little Bluestem (Andropogon scoparius)	2 lbs. Bulk/Acre
Plains Bluestem (Bothriochloa irchaemum var. ischaemum)	7.2 lbs. PLS/Acre
Weeping Lovegrass (Eragrostis curvula)	2 lbs. PLS/Acre

Two mulch materials were applied to the seeded plots following establishment:

Wheat Straw	1 ton/Acre
Wood Cellulose	1 ton/Acre

Data taken at the Cushing site, August 12, 1982, approximately 2 months after establishment, revealed significant differences among species and mulch materials. Mixture A and mixture B yielded significantly greater ($P=0.05$) mean seedling counts per 6" quadrat than weeping lovegrass, plains bluestem, and Guymon bermudagrass. The wood cellulose mean seedling count

of 3.6 was significantly greater than the 2.5 mean seedling count for wheat straw. A significant mulch X species interaction was detected upon analysis of variance of point frame vegetative ground cover determination.

On October 25, 1982, approximately 4 months after establishment, vegetative ground cover provided by plains bluestem, mixture A, and mixture B did not differ significantly (P=0.05). Bermudagrass and weeping lovegrass produced significantly less vegetative cover than either plains bluestem, mixture A, and mixture B.

At the Seiling site at 2 months, on August 19, mixture B provided significantly greater vegetative ground cover than weeping lovegrass, plains bluestem, and Guymon bermudagrass. Order of means from greatest to least vegetative ground cover was mixture B (61 percent) mixture A (53 percent) weep lovegrass (43 percent) plains bluestem (28 percent) bermudagrass (9 percent). No significant differences occurred among the Nesbit drill or Brillion seeding methods. Mixture A and mixture B produced greater numbers of seedlings than weeping lovegrass, plains bluestem, and bermudagrass.

At 4 months, on November 9, plains bluestem, weeping lovegrass, and Guymon bermudagrass yielded significantly less vegetative ground cover than Mixtures A and B. Plots on which seed was broadcast showed significantly less vegetative ground cover than those seeded with the Brillion seeder.

Dr. Thomas Samples, in his doctoral dissertation, investigated establishment methods for seeded grasses in conjunction with herbicides to prevent weed problems. Complete text of his dissertation is on file at Oklahoma State University and can be obtained through Dissertation Abstracts, Ann Arbor, MI. The following represents a summary of his investigations.

Establishment of seed propagated, warm-season grasses may be enhanced

using selective preemergence herbicides. The objectives of the first series of studies was to evaluate the effect of (i) preemergence applications of eight selected herbicides, and (ii) the time interval from preplant herbicide treatment to planting on stand establishment of weeping lovegrass [Eragrostis curvula (Schrad.) Nees.], 'Plains' bluestem [Bothriochloa ischaemum var. ischaemum (L.) Keng.], and 'Guymon x 10978b' bermudagrass [Cynodon dactylon (L.) Pers.] from seed. The influence of four preemergence herbicides on stolon growth of bermudagrass established with sprigs was also investigated.

Preemergence applications of pronamide [3,5-dichloro(N-1,1-dimethyl-2-propynyl) benzamide] at 1.1 kg/ha, metribuzin [4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)-one] at 0.7 kg/ha, and atrazine (2-chloro-4-(ethylamino)-6-(isopropylamino)-s- triazine] at 1.3 kg/ha did not reduce root and shoot dry weight of the three species grown from seed in pots for 122 days (Table 60). Oryzalin (3, 5-dinitro-N^4,N^4-dipropylsulfanilamide) at 1.2 kg/ha, diuron [3-(3,4-dichlorophenyl)-1,1-dimethylurea] at 2.7 kg/ha, sulfometuron methyl [Methyl 2-(((((4,6-dimethyl-2-pyrimidinyl) amino)-carbonyl)amino) sulfonyl) benzoate] at 0.1 kg/ha, and DCPA (dimethyl tetrachloroterephthalate) at 8.4 kg/ha were extremely toxic to seeds and emerging seedlings.

The eight preemergence herbicide treatments exhibited variable persistence. Generally, fewer Plains bluestem and bermudagrass seedlings established when seeded 2 or 30 days after preplant herbicide treatment (DAT) in comparison to weeping lovegrass. A significant increase in seedling numbers occurred between the 2 and 30 DAT planting dates within atrazine, pronamide, and DCPA treatments at one of the two locations.

When preemergence herbicides were applied to exposed soil encircling bermudagrass sprigs, diuron at 2.7, 5.4 and 8.1 kg/ha, sulfometuron methyl at 0.1, 0.2, and 0.3 kg/ha, and atrazine at 1.3, 2.7, and 4.0 kg/ha reduced stolon growth by 27 to 80 percent, and number of nodes per stolon by 32 to 81 percent (Table 61). Oryzalin at 1.2, 2.5, and 3.7 kg/ha did not affect number of rooted nodes per stolon.

The results indicate that phytotoxicity of selected herbicides on three warm-season grasses established from seed was influenced by herbicide treatment, species, and time interval from treatment to planting.

A second series of studies investigated 'Plains' bluestem [Bothriochloa ischaemum var. ischaemum (L.) Keng.] establishment. Plains bluestem is a quickly established, warm-season grass used for soil stabilization and erosion control throughout the southern Great Plains. Successful establishment of this species is often limited by annual grass and broadleaf weed competition. Preemergence herbicides with selectivity between all ischaemum ecotypes comprising the cultivar Plains and closely related weed species may be unavailable.

Investigations were conducted to evaluate the phytotoxic effect of eight selected herbicides on establishment of Plains bluestem from seed and herbicide inactivation by activated carbon, bentonite, and activated sewage sludge. Effectiveness of the three materials in absorbing pronamide [3,5-dichloro(N-1,1-dimethyl-2-propynyl)benzamide] and oryzalin (3,5-dinitro-N^4, N^4-dipropylsulfanilamide) from aqueous solution was also investigated.

Terbutryn [2-(tert-butylamino)-4-(3thylamino)-6-(methylthio)-s-triazine] at 2.2 kg/ha, oryzalin at 1.2 kg/ha, diuron [3-(3,4-dichlorophenyl)-1,1-dimethylurea] at 2.7 kg/ha, and sulfometuron methyl [Methyl 2-(((((4,6-dimethyl-2-pyrimidinyl)amino)-carbonyl)amino)

sulfonyl)benzoate] at 0.1 kg/ha were extremely toxic to germinating seed and emerging seedlings. No reduction in shoot or root mass occurred 122 days following an atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine] application of 1.3 kg/ha. Activated carbon at 2013 and 4026 kg/ha reduced phytotoxicity of all premergence herbicides.

In germination trials, optimum inactivation of oryzalin and pronamide occurred at carbon: herbicide ratios of between 89 to 111:1 and 83 to 100:1, respectively. Bentonite and sludge did not effectively neutralize oryzalin and pronamide concentrations in aqueous solution.

The results indicate that use of activated carbon as a herbicide adsorbent applied to the soil surface above the seed zone may protect emerging Plains bluestem seedlings and prevent a shift in ecotype composition due to selective tolerance to a preemergence herbicide.

A third series of studies determined the effectiveness of activated carbon in protecting weeping lovegrass and bermudagrass ['Guymon x 10978b'] seedlings from selected preemergence herbicides under field conditions at two locations.

Generally, an increase in diameter of an activated carbon circle on the soil surface directly above the seed zone improved protection of weeping lovegrass and bermudagrass from preemergence herbicides (Table 62). Activated carbon at 1120 kg/ha within an 82 cm^2 circle on the surface of a Norge (udic Paleustoll) loam subsoil above bermudagrass seeds provided adequate protection from seven of eight herbicides.

Sulfometuron, metribuzin, and atrazine, at 0.1, 0.7, and 1.3 kg/ha respectively, reduced root growth of weeping lovegrass and bermudagrass establishing within carbon at both experimental sites. Activated carbon applied at 1120 kg/ha within a 5 cm^2 circular area on the soil surface

above weeping lovegrass and bermudagrass seed inactivated a preemergence pronamide application of 1.1 kg/ha. A 5.1-cm carbon band on the surface of Norge topsoil above the seeded row protected emerging bermudagrass seedlings from pronamide, diuron and terbutryn at 1.1, 2.7, and 2.2 kg/ha, respectively.

Bermudagrass shoot mass above seeded row 91 cm wide was greater in contrast to rows spaced 41 cm apart. Pronamide at 1.1 kg/ha and diuron at 2.7 kg/ha applied preemergence in conjunction with activated carbon did not affect bermudagrass ground cover 49 days after treatment. Bermudagrass establishment varied with row spacing and preemergence herbicide applications on Norge topsoil and subsoil with slopes of 1, 5, 6, and 8 percent.

Table 58

Experiment: Influence of 16 mulch materials on the field survival of bermudagrass and tall fescue.

Date of establishment: July 1 and 2, 1983.

Replications: Three

Species: Guymon bermudagrass (Cynodon dactylon) and Clemfine tall fescue (Festuca arundinacea).

Dates scored: Seedling counts were made on July 15, July 22, and Aug. 1, 1983. Soil moisture was visually rated on July 22, twenty-four hours after the previous watering. Soil temperature in the top inch of the soil was measured at 1 pm on Aug. 1, a clear, sunny day with an air temperature of 97°F and a soil temperature in an unmulched, unwatered area of 113°F (the previous watering on the mulch plots had been 24-hours earlier).

Method of Scoring: Seedling counts represented plants produced per 20 seeds planted.
Soil moisture: 9=very moist, 1=dry.

Mulch Product	Soil moisture rating	Soil temperature	Bermudagrass field survival Week 2	Bermudagrass field survival Week 3	Bermudagrass field survival Week 4	Tall fescue field survival Week 2	Tall fescue field survival Week 3	Tall fescue field survival Week 4
		°F	count per 20 seeds					
1. Evacell wood fiber 1400 lb/A	9.0a*	95.0bcd	2ab	2ab	1ab	5abc	14a	12ab
2. Excelsior wood fiber 1400 lb/A	9.0a	93.7d	1abc	2ab	2ab	7a	13a	13a
3. Excelsior High-Vel. wood blanket	8.7ab	93.5d	2abc	2ab	2ab	6ab	12ab	9bc
4. Excelsior Regular wood blanket	8.7ab	95.3bcd	3a	3ab	2ab	1def	11abc	7c
5. Wheat straw 1 1/2 inches	8.7ab	94.3cd	1abc	1ab	1ab	2c-f	8cd	8c
6. Soil Gard liquid	8.0abc	94.5bcd	1abc	2ab	2ab	3b-f	7cd	6cd
7. Excelsior fabric (black)	8.0abc	96.7ab	1abc	1ab	1ab	0f	0fg	0e
8. Excelsior fabric (white)	8.0abc	96.7ab	1abc	1b	0b	4a-d	8cd	0e
9. Trevira fabric (grey) 11/150	7.7abc	95.3bcd	1abc	3a	1ab	1ef	5d-f	3de
10. Gulf States paper	7.7abc	96.3abc	2abc	2ab	1ab	1ef	2e-g	1e
11. Trevira fabric (grey) 11/200	7.3abc	95.2bcd	1abc	1ab	1ab	2def	4d-g	2e
12. Trevira fabric (grey) 11/450	7.0abc	93.7d	0c	1ab	0b	0f	7cde	3de
13. Trevira fabric (grey) 11/350	7.0abc	93.7d	1abc	0b	1ab	3b-e	8cd	3e
14. Composted peat 1/2 inch	6.7bc	97.8a	1bc	0b	0ab	0f	0g	0e
15. Trevira fabric (grey) 11/270	6.0cd	95.2bcd	1bc	2ab	0ab	0f	7cd	3de
16. Trevira fabric (grey) 11/550	4.3d	93.8d	0c	0b	0b	0ef	0fg	0e

*Means followed by the same letter are not significantly different according to the Waller-Duncan t-Test, p=0.05

Table 59

Experiment: Evaluation of seven mulch materials for the prevention of seed displacement on a slope following simulated rainfall.

Date of Application: July 25, 1984.

Method of Application: A series of 2.5 x 5 ft. plots were prepared on a uniform 6%-sloped silt-loam soil in Payne County. The area was fumigated with methyl bromide to remove existing bermuda and weed seed, and was tilled and raked smooth. One hundred weeping lovegrass seeds were placed in a 1/8-inch-deep furrow, located 8 inches from the top of the plot, running horizontally (level) (Fig. 1). The seeds were covered with 1/8 inch of soil and were firmed in place. The mulch material were placed over the areas and, when applicable, staked in place. Soil Gard, a product of Walsh Chemical Co., was applied at a rate of 2 gal. product/1000 ft^2 in a 1:50 dilution of product to water. Excelsior wood chips were applied at 1400 lb. per acre. All mulches except the Soil Gard and wood chips were removed at seedling emergence. The mulches were removed to prevent confounding of water-washing results with the various other physical properties of the materials. Rainfall was simulated at 3 days after planting by use of a hydromulch machine which shot a stream of pure water high into the air. Approximately 550 gallons of water were applied, equivalent to a 3-inch rainfall over a period of 2 hours.

Replications: Three

Method of Scoring: At one month after planting, plants were counted and measured in relation to their proximity to the original furrow. At three months, visual ratings of plant densities were taken in three areas of each plot: in the furrow, at a distance from 0 to 2 feet below the furrow, and at 2 to 4 feet below the furrow.

Mulch Material	Seedling counts (@ 1 month)			Relative plant densities (@ 3 mo.)		
	Field survival	Displaced seedlings	Distance displaced	In furrow (not displaced)	Displaced 0-2 ft.	Displaced 2-4 ft.
	%	% of emerged seedlings	inches	— 1 to 9 rating scale, 9 = most —		
Wood chips	15a*	63a	22a	3.0b	3.7ab	2.7a
Regular Excel. blanket	27a	57a	13a	3.7b	4.3a	3.0a
High-vel. Excel. blanket	23a	27ab	12a	4.7b	2.7abc	2.0a
Supac fabric	24a	24ab	7a	5.0ab	2.0bc	1.7a
Soil Gard	24a	16ab	10a	4.0b	2.3abc	1.7a
Check (no mulch)	19a	7b	6a	3.7b	1.7bc	1.0a
Trevira fabric	40a	5b	24a	7.3a	1.3c	1.0a
Soil Gard + Supac	33a	3b	8a	4.7b	1.7bc	1.3a

*Means followed by the same letter are not significantly different according to the Waller-Duncan t-test, p = 0.05.

Table 60. Effect of eight preemergence herbicide treatments on seedling emergence, tiller number, and weight of shoot and root dry matter of three warm-season grass species.

Treatment	Rate	Weeping lovegrass				Plains bluestem				Bermudagrass			
		Days after treatment											
		43		122		43		122		43		122	
		Seedling number	Tiller number	Shoot mass	Root mass	Seedling number	Tiller number	Shoot mass	Root mass	Seedling number	Tiller number	Shoot mass	Root mass
	kg/ha			Dm(g)	Dm(g)			Dm(g)	Dm(g)			Dm(g)	Dm(g)
Untreated Check	0.0	6.7a+	17.6a	3.4a	2.6a	7.3a	24.8a	3.1bc	2.3bc	2.5a	5.0a	3.2a	1.3a
Pronamide	1.1	3.1bc	8.7b	3.2a	2.4a	1.2cd	5.2c	2.0bc	1.3bc	2.2a	6.1a	1.9a	1.4a
Metribuzin	0.7	4.7b	11.8b	2.7a	2.4a	1.4c	3.6cd	3.1bc	1.5bc	2.1a	4.2a	2.2a	1.6a
Atrazine	1.3	3.2bc	8.5b	3.8	3.1a	3.3b	10.0b	8.4a	4.2a	1.5a	1.6b	1.2a	0.6a
Terbutryn	2.2	1.5cd	3.0c	3.9a	2.6a	0.1cd	0.1d	0.3c	0.2c	0.1b	0.2c	0.1a	0.1a
Oryzalin	1.2	0.0d	0.0c	----	----	0.0d	0.0d	-----	-----	0.0b	0.0c	----	----
Diuron	2.7	0.0d	0.0c	----	----	0.0d	0.0d	-----	-----	0.0b	0.0c	----	----
Sulfometuron methyl	0.1	0.0d	0.0c	----	----	0.0d	0.0d	-----	-----	0.0b	0.0c	----	----
DCPA	8.4	0.0d	0.0c	----	----	0.0d	0.0d	1.0c	0.5c	0.0b	0.0c	----	----

+Means followed by the same letter are not significantly different according to the Waller-Duncan K-ratio t-test (K ratio = 100).

Table 61. Mean effects of twelve herbicide treatments on bermudagrass stolon and root growth, locations 1 and 2, Experiment II.

Treatment	Rate	Stolon number: Location 1	Stolon number: Location 2	Stolon length+	Internode length+	Root length+	Nodes per stolon+	Rooted nodes per stolon+	Root number per node+
	kg/ha			cm	cm	cm			
Atrazine	1.3	18b-e++	15b-e	86bcd	3.5abc	3.5ab	26bcd	12a-d	5.4ab
Atrazine	2.7	17cde	9ef	68cde	3.0cd	4.0a	21bcd	9cde	5.2ab
Atrazine	4.0	12def	11def	56cf	2.8de	3.1b	17def	9cde	4.5b
Diuron	2.7	16c-f	12c-f	66de	3.4abc	3.6ab	17def	10bcd	5.5ab
Diuron	5.4	8ef	7ef	29g	3.5abc	1.8c	7g	3f	2.0c
Diuron	8.1	6f	5f	24g	3.1bcd	1.7c	8fg	4ef	2.7c
Oryzalin	1.2	32a	18a-d	90bc	3.7a	1.5cd	26bc	14abc	5.6ab
Oryzalin	2.5	22abc	21ab	99ab	3.6ab	0.8d	27b	15ab	5.3ab
Oryzalin	3.7	21bcd	22ab	93b	3.5abc	0.8d	29ab	16a	4.8b
Sulfometuron methyl	0.1	9ef	20abc	54ef	2.3ef	1.4cd	21bcd	14abc	5.4ab
Sulfometuron methyl	0.2	11ef	12 f	26g	2.0fg	0.9cd	10efg	8def	4.6b
Sulfometuron methyl	0.3	22bcd	11def	35fg	1.8g	0.9cd	17cde	12abcd	4.8b
Untreated Check	0.0	27ab	25a	118a	3.5abc	3.7ab	38a	16a	6.2a

+ Data from both locations were averaged when analysis of variance indicated no significant (0.05) herbicide by location interaction.

++ Means followed by the same letter are not significantly different according to the Waller-Duncan K-ratio t-test (K ratio = 100).

Table 62. Mean effect of eight preemergence herbicide treatments averaged over activated carbon circle diameter on emerged seedling count and weight of root dry matter of weeping lovegrass and bermudagrass on Norge topsoil and subsoil, Experiment I.

		Weeping lovegrass			Bermudagrass		
		Location					
		Topsoil	Subsoil		Topsoil	Subsoil	
Herbicide	Rate	Root mass[++]	Seedling count[++]	Root mass[++]	Root mass[++]	Seedling count[++]	Root mass[++]
	kg/ha	DM(g)		DM(g)	Dm(g)		DM(g)
Untreated check[+]	0.0	1.9a[++]	9.0a	0.48a	0.85ab	5.3a	1.1a
Atrazine	1.3	0.3cd	7.8ab	0.22bc	0.19cd	1.4de	0.0d
DCPA	8.4	0.8bcd	6.3ab	0.37ab	0.27cd	1.7d	0.3cd
Diuron	2.7	0.1cd	8.0ab	0.37ab	0.16d	1.7d	0.2cd
Metribuzin	0.7	0.1d	1.2c	0.05cd	0.01d	0.0e	0.0d
Oryzalin	1.2	0.6bcd	4.3bc	0.21bcd	0.66abc	2.5cd	0.5cd
Pronamide	1.1	1.1b	8.0ab	0.39ab	1.0a	4.4ab	1.0ab
Sulfometuron methyl	0.1	0.0d	0.5c	0.01d	0.07d	0.2e	0.0d
Terbutryn	2.2	0.9b	5.8ab	0.23bc	0.40cd	3.2bc	0.7abc

[+]Untreated check: subplots with activated carbon at 1120 kg/ha on the soil surface above the seed zone receiving no herbicide treatment.

[++]Means followed by the same letter are not significantly different according to the Waller-Duncan K-ratio t-test (K-ratio = 100).

FERTILIZATION OF ROADSIDE TURF

Summary

Two experiments were initiated in Div. 4 near Cushing on SH-33 in 1985. The purpose of these studies was to determine whether potential use of fertilizer materials exists for encouragement of bermudagrass on areas where weeds have been eradicated. Present recommendations for weed control herbicides may sometimes produce nearly bare ground conditions in locations where little bermuda understory exists.

Discussion

On both sites, no significant differences in percent bermudagrass or percent total ground cover were noted among any fertilizer treatments throughout the duration of these experiments (Tables 63 and 64). An explanation for this may be due in part to an application of Roundup + Oust over both of the entire experimental areas by an ODOT spray operation after the fertility treatments were applied. This herbicide treatment has growth regulating effects on bermudagrass. As a result, this may have very well masked any differences among fertilizer treatments which could have possibly occurred on the rate of growth and release of the bermudagrass in both experimental areas.

Figure 12. Experimental site of a fertility study along a roadside in central Oklahoma. Top photo shows site prior to fertilizer application; bottom photo shows growth response of bermudagrass four months later.

Table 63

Expt. 4-F-28-85. Effect of ten fertilizer treatments on the growth and release of bermudagrass on a north-facing fill slope along Oklahoma highway rights-of-way.

Objective: Evaluate the effects of ten fertilizer treatments on the growth rate and release of common bermudagrass on a north facing fill slope.

Date of Application: May 22, 1985

County: Payne

Soil Type: Easpur loam

Location: SH-33, 3 miles east of Cushing (center median on east side of Euchee Creek bridge).

Plot Size: 20 ft. by 25 ft.

Dates Scored: May 24, 1985; August 21, 1985; September 24, 1985.

Field Design: Randomized complete block with three replications.

Methods of Scoring: Percent Bermudagrass - 0 = None; 100 = Complete Cover
Percent Total Ground Cover - 0 = None; 100 = Complete Cover

Fertilizer Treatments	Analysis	Rate lbs. N/A	Percent Bermudagrass			Percent Total Ground Cover		
			5-24-85	8-21-85	9-24-85	5-24-85	8-21-85	9-24-85
1. Ammonium Nitrate	34-0-0	40	8.3a*	18.3a*	21.7a*	16.7a*	18.3a*	22.7a*
2. Milorganite	6-2-0	40	5.7a	13.3a	15.0a	11.7a	13.3a	16.0a
3. Lakeshore (SCU)	16-0-31	40	4.2a	8.3a	10.0a	9.0a	8.3a	11.0a
4. Lesco (SCU)	28-0-10	40	10.0a	20.0a	21.7a	15.0a	20.0a	22.7a
5. Lesco (SCU)	28-3-9	40	7.0a	18.3a	18.3a	13.3a	18.3a	17.3a
6. Lakeshore (SCU)	30-5-10	40	4.0a	8.3a	8.3a	10.0a	8.3a	10.3a
7. Lakeshore (SCU)	36-0-0	40	6.2a	11.7a	11.7a	10.0a	11.7	13.7a
8. Lesco (SCU)	37-0-0	40	7.7a	15.3a	15.3a	11.7a	15.3a	17.3a
9. Lesco (SCU)	37-0-0	80	11.7a	21.7a	23.3a	16.7a	21.7a	24.7a
10. Lesco (SCU)	37-0-0	120	8.3a	15.0a	16.7a	13.3a	15.0a	18.3a
11. Check	------	---	8.3a	15.0a	16.7a	13.3a	15.0a	17.7a

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

Table 64

Expt. 4-F-29-85. Effect of ten fertilizer treatments on the growth and release of bermudagrass along Oklahoma highway rights-of-way.

Objective: Evaluate the effects of ten fertilizer treatments on the growth rate and release of common bermudagrass on a relatively flat soil surface.

Date of Application: May 22, 1985

County: Payne

Soil Type: Agra silt loam

Location: SH-33, 2.4 miles east of Cushing (south side).

Plot Size: 20 ft. by 25 ft.

Dates Scored: May 23, 1985; August 21, 1985; September 24, 1985

Field Design: Randomized complete block with three replications.

Methods of Scoring: Percent Bermudagrass - 0 = None; 100 = Complete Cover
Percent Total Ground Cover - 0 = None; 100 = Complete Cover

Fertilizer Treatments	Analysis	Rate lbs. N/A	Percent Bermudagrass			Percent Total Ground Cover		
			5-23-85	8-21-85	9-24-85	5-23-85	8-21-85	9-24-85
1. Ammonium Nitrate	34-0-0	40	22.3*	43.3a*	41.7a*	38.3a*	61.7a*	58.3a*
2. Milorganite	6-2-0	40	13.7a	26.7a	25.0a	36.7a	50.0a	48.3a
3. Lakeshore (SCU)	16-0-31	40	10.3a	31.7a	26.7a	28.3a	46.7a	41.7a
4. Lesco (SCU)	28-0-10	40	8.0a	20.0a	20.0a	21.7a	38.3a	36.7a
5. Lesco (SCU)	28-3-9	40	13.7a	30.0a	30.0a	31.7a	53.3a	51.7a
6. Lakeshore (SCU)	30-5-10	40	8.7a	20.0a	20.0a	25.0a	35.0a	35.0a
7. Lakeshore (SCU)	36-0-0	40	15.0a	28.3a	26.7a	30.0a	53.3a	48.3a
8. Lesco (SCU)	37-0-0	40	16.7a	38.3a	36.7a	36.7a	56.7a	53.3a
9. Lesco (SCU)	37-0-0	80	16.7a	38.3a	35.0a	33.3a	61.7a	55.0a
10. Lesco (SCU)	37-0-0	120	20.0a	45.0a	41.7a	36.7a	60.0a	58.3a
11. Check	------	---	12.3a	31.7a	28.3a	38.3a	50.0a	45.0a

*Means with the same letter are not significantly different as determined by the Waller-Duncan K-Ratio T-Test.

TABLE A-1

Physical properties of mulch materials as listed in Table 58

Physical Properties	MULCH MATERIALS															
	Evacell Wood Fiber	Excelsior Wood Fiber	Excelsior High-Vel Wood Blanket	Excelsior Regular Wood Blanket	Wheat Straw	Soil Gard Liquid	Excelsior fabric (black)	Excelsior fabric (white)	Trivira fabric 11/50	Trevira fabric 11/200	Trevira fabric 11/270	Trevira fabric 11/350	Trevira fabric 11/450	Trevira fabric 11/550	Gulf States Paper	Composted Peat
Fabric Weight (oz/yd^2)	--	NA	25.6 (±10%)	15.6(±10%)	NA	NA	--	--	4.5	6	8	10	13	16	--	--
Thickness (mils) (ASTM D-1777)	--	NA	--	--	NA	--	--	--	85	100	125	150	175	210	--	--
Grab Strength (LB,MD/CD*)(ASTM D-1682)	--	--	--	--	--	--	--	--	130/110	175/155	260/225	340/300	430/390	525/485	--	--
Grab Elongation (%MD/CD)(ASTM D-1682)	--	--	--	--	--	--	--	--	85/95	85/95	85/90	90/95	90/95	90/95	--	--
Trapezoid Tear Strength (LB,MD/CD)(ASTM D-1117)	--	--	--	--	--	--	--	--	50/45	65/60	100/95	130/130	185/180	205/200	--	--
Puncture Strength - 5/16" (LB)(ASTM D-751)	--	--	--	--	--	--	--	--	60	90	125	155	200	260	--	--
Mullen Burst Strength (PSI)(ASTM D-3786)	--	--	--	--	--	--	--	--	220	300	380	500	600	800	--	--
Vertical Water Flow ($Gal/Min/Ft^2$)(HFI Test)	--	--	--	--	--	--	--	--	325	300	280	265	240	220	--	--
EOS (CW-02215)	--	--	--	--	--	--	--	--	70^+	50-70	70-100	70^+-100^+	100^+-120^+	120^+	--	--
Std. Roll Widths (Ft.)	--	NA	4(±1 inch)	4(±1 inch)	NA	--	--	--	<---------- 12.5, 14.5 and 16.0 ---------->							
Std. Roll Length (Ft.)	--	NA	100	180	NA	--	--	--	<---------- 300 and 1000 ---------->				<--- 300 and 600 --->			

*MD = Machine Direction, CD = Cross Machine Direction

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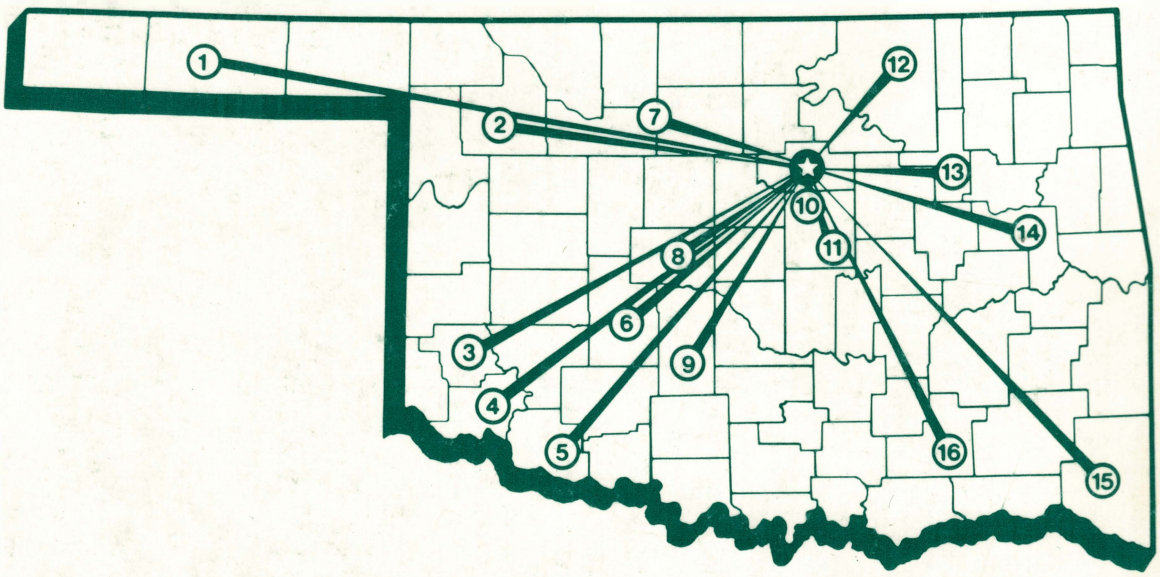

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