# Pest Control in Crops Grown in Northwestern New Mexico, 2006

Annual Data Report 100-2006

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## INTRODUCTION

Weeds cause more total crop losses than any other agricultural pest (Arnold, 1981–2008; Hall et al., 1995; Currie, 2004; Lorenzi and Jeffery, 1987). Weeds reduce crop yields and quality, harbor insects and plant diseases, and cause irrigation and harvesting problems (Chandler et al., 1984; Lorenzi and Jeffery, 1987; Currie, 2005; Massinga et al., 1999, 2003). As a result, weeds reduce the total value of agricultural products in the United States by 10 to 15% (Lorenzi and Jeffery, 1987). Estimated average losses during 1975 to 1979 in the potential production of field corn, potatoes, and onion ranged from 7 to 16% in the Mountain States Region, which includes New Mexico (Chandler et al., 1984). San Juan County ranks first in potato production, fourth in alfalfa production, and second in corn production among all New Mexico counties (New Mexico Agricultural Statistics, 2007).

An estimated 90% of all tillage operations are for weed control (J.G. Foster, personal communications, 2005–2007). Herbicides can reduce the number of required tillage operations and can be used where cultivation is not possible, such as within crop rows or in solid-seeded crops. With increasing fuel and labor costs, herbicides are often more economical than other methods of weed control.

Many herbicides are approved for use on crops grown on medium- and fine-textured, high-organic soils. Little information is available, however, regarding their effectiveness and safety on low-organic, coarse-textured soils that are common to northwestern New Mexico.

The Environmental Protection Agency (EPA) has become more stringent with regard to research data required for pesticide approval. Thus, it has become critical that state Agricultural Science Centers work closely with commercial companies developing new pesticides in order to obtain the research data required by the EPA. This cooperation will benefit the agricultural industry of the state and assist EPA pesticide registration.

Before 1980, the use of herbicides in northwestern New Mexico was limited. Most growers were still using 2,4-D in corn for broadleaf weed control, while annual grasses were left in check. In alfalfa, burning winter

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annual mustard and downy brome with propane was not uncommon. An herbicide field-screening program has provided essential information on the activity of new and old herbicides on crops grown in northwestern New Mexico (Arnold, 1981–2008).

As new land on the Navajo Indian Irrigation Project comes under cultivation, weed and insect problems are varied and may change with each successive crop. It is only through continued research that the demand for reliable information on the use of pesticides in northwestern New Mexico can be met.

I wish to express my sincere appreciation to the following companies for providing technical assistance, products, and/or financial assistance: Bayer CropSciences, BASF, E.I. DuPont, Gowan, BLM/FFO, FMC, Monsanto, Dow AgroSciences, Navajo Agricultural Products Industry, Pioneer Hi-Bred, Syngenta Crop Protection, and Southwest Seed.

## Broadleaf weed control in spring-seeded Roundup Ready alfalfa

### Introduction

Seedling alfalfa requires effective broad-spectrum weed control for successful establishment; however, few herbicides are registered for postemergence broadleaf weed control. Pursuit, Raptor, and recently Roundup applied to Roundup Ready alfalfa have been registered for broadleaf weed control in seedling alfalfa. Field trials were conducted to evaluate broadleaf weed control and Roundup Ready alfalfa tolerance to Raptor, Pursuit, and Roundup applied alone or in combination.

### Objectives

- Determine herbicide efficacy of Raptor, Pursuit, and Roundup applied alone or in combination for control of broadleaf weeds in Roundup Ready spring-seeded alfalfa.
- Determine Roundup Ready alfalfa tolerance to applied selected herbicides and yield.

### Materials and methods

A field experiment was conducted in 2006 on a Wall sandy loam (less than 1% organic matter) at Farmington, NM, to evaluate the response of spring-seeded Roundup Ready alfalfa and annual broadleaf weeds to postemergence applications of Raptor, Pursuit, and Roundup applied alone or in combination. The experimental design was a randomized complete block with three replications. Individual plots were 10 ft wide by 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Alfalfa (var. Dekalb RR05-060104) was planted at 20 lb/ac with a Massey Ferguson grain drill on May 16. Postemergence treatments were applied on June 6 when alfalfa was in the second trifoliolate leaf stage and weeds were small. Black nightshade, redroot and prostrate pigweed, and common lambsquarters infestations were heavy and Russian thistle infestations were light throughout the experimental area. Crop injury and weed control evaluations were made on July 6 and August 7. Alfalfa was harvested with an Almaco self-propelled plot harvester on August 7 and September 27. A grab sample was taken from each plot and separated into weeds and alfalfa, and both were then weighed. Amount of weeds per sample will be expressed as a percentage of the weed to alfalfa mixture. Another grab sample was taken from each plot to determine protein content and relative feed value. Results obtained were subjected to analysis of variance at P = 0.05.

### Results and discussion

**Weed control and injury evaluations:** Results of crop injury and weed control evaluations are given in Tables 1 and 2. No crop injury was noted from any of the treatments. All treatments rated in July gave 94% control or better of all weeds except the weedy check (Table 1). In August, all treatments gave 97% control or better of Russian thistle, prostrate pigweed, black nightshade, and common lambsquarters. Roundup WeatherMAX or Roundup Original Max at 1.95 lb ai/ac in combination with either Raptor or Pursuit at 0.047 or 0.094 lb ai/ac and Raptor and Pursuit alone at 0.047 and 0.094 lb ai/ac gave 88% control or better of redroot pigweed (Table 2).

**Yield and protein content:** Results of yield, protein content, and relative feed values for samples 1 and 2 are given in Tables 3 and 4. The weedy check had the highest yield during the first cutting at 2.5 ton/ac (Table 3). Select at 0.25 lb ai/ac had the highest percentage of weeds among herbicide treatments at 41.2%. There were no significant differences among treatments for relative feed value or percent protein content (Table 3). In sample 2, Roundup Original Max alone or in combination with Select at 1.95 and 0.25 lb ai/ac had the lowest yield among treatments at 1.2 ton/ac (Table 4). The weedy check had the highest percentage of weeds at 10.2% (Table 4). There were no significant differences among treatments for relative feed value or percent protein content (Table 4).

## Broadleaf weed control in field corn with preemergence and preemergence followed by sequential postemergence herbicides

### Introduction

Many herbicides can be used in sequential treatments. These trials are preemergence herbicides followed by sequential postemergence treatments. If weeds escape the preemergence treatment, a postemergence treatment may then be used to assist in weed control.

### Objectives

- Determine efficacy of selected herbicides for control of annual broadleaf weeds in field corn.
- Determine corn tolerance to applied selected herbicides and yield.

### Materials and methods

A field experiment was conducted in 2006 at Farmington, NM, to evaluate the response of field corn (var. Pioneer 34N45) and annual broadleaf weeds to preemergence and preemergence followed by sequential postemergence herbicides. Soils were fertilized according to New Mexico State University recommendations based on soil tests. The experimental design was a randomized complete block with four replications. Individual plots were four 34-in. rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Field corn was planted with flexi-planters equipped with disk openers on May 16. The preemergence treatments were applied on May 17 and immediately incorporated with 0.75 in. of sprinkler-applied water. Sequential postemergence treatments were applied on June 6 when field corn was in the 4th leaf stage and weeds were small (<2 in.). Black nightshade and redroot and prostrate pigweed infestations were heavy and Russian thistle and common lambsquarters infestations were light throughout the experimental area. Preemergence and preemergence followed by sequential postemergence treatments were evaluated visually on June 15 and July 6. Crop injury was evaluated on June 15. Stand counts were made on June 15 by counting individual plants per 10 ft of the third row of each plot. Field corn was harvested on December 6 by combining the center two rows of each plot using a John Deere 3300 combine equipped with a load cell. Results obtained were subjected to analysis of variance at $P = 0.05$.

### Results and discussion

**Weed control and injury evaluations:** Crop injury evaluations and stand counts are given in Table 5. Weed control evaluations are given in Tables 5 and 6. Outlook applied preemergence alone or in combination with Prowl at 0.75 and 0.75 plus 1.0 lb ai/ac had the highest injury ratings of 9. All treatments except the check gave excellent control of redroot and prostrate pigweed, black nightshade, and common lambsquarters. Outlook and Dual II Mag
applied preemergence at 0.75 and 1.25 lb ai/ac gave poor control of Russian thistle. The addition of Distinct at 0.25 lb ai/ac to either Outlook or Dual II Mag increased Russian thistle control by approximately 52% (Table 6).

**Crop yields:** Yields are given in Table 6. Yields were 185 to 214 bu/ac higher in herbicide-treated plots as compared to the check.

## Broadleaf weed control in Roundup Ready field corn with preemergence followed by sequential postemergence treatments of Roundup WeatherMAX alone or in combination

### Introduction

Many herbicides can be used in sequential treatments. These trials are preemergence herbicides followed by sequential postemergence treatments. If weeds escape the preemergence treatment, a postemergence treatment may then be used to assist in weed control.

### Objectives

- Determine efficacy of selected herbicides for control of annual broadleaf weeds in field corn.
- Determine corn tolerance to applied selected herbicides and yield.

### Materials and methods

A field experiment was conducted in 2006 at Farmington, NM, to evaluate the response of Roundup Ready field corn (Pioneer 35N45) and annual broadleaf weeds to preemergence followed by postemergence applications of Roundup WeatherMAX applied alone or in combination. Soils were fertilized according to New Mexico State University recommendations based on soil tests. The experimental design was a randomized complete block with four replications. Individual plots were four 34-in. rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Field corn was planted with flexi-planters equipped with disk openers on May 16. Preemergence herbicides were applied on May 17 and immediately incorporated with 0.75 in. of sprinkler-applied water. Postemergence treatments were applied on June 6 when field corn was in the 4th leaf stage and weeds were small (<2 in.). Black nightshade and redroot and prostrate pigweed infestations were heavy, common lambsquarters infestations were moderate, and Russian thistle infestations were light throughout the experimental area. Preemergence and preemergence followed by sequential postemergence treatments were evaluated visually on June 15 and July 6. Crop injury was evaluated on June 15. Stand counts were made on June 15 by counting individual plants per 10 ft of the third row of each plot. Field corn was harvested on December 4 by combining the center two rows of each plot using a John Deere 3300 combine equipped with a load cell. Results obtained were subjected to analysis of variance at P = 0.05.

### Results and discussion

**Weed control and injury evaluations:** Weed control and crop injury evaluations are given in Tables 7 and 8. There was no crop injury from any of the treatments. The preemergence treatments gave 94% or better control of broadleaf weeds employed in this study (Table 7). In July, redroot pigweed control was fair to excellent with all treatments except Harness Xtra at 3.3 lb ai/ac, Roundup WeatherMAX at 0.75 lb ai/ac, and the weedy check. The higher rate of Roundup WeatherMAX at 1.5 lb ai/ac gave approximately 13, 2, 45, and 29% better control of redroot and prostrate pigweed, Russian thistle, and common lambsquarters, respectively, as compared to the lower rate of 0.75 lb ai/ac (Table 8).

**Crop yields:** Yields are given in Table 8. Yields were 87 to 190 bu/ac higher in herbicide-treated plots as compared to the check. Redroot pigweed infestations broke after the last weed control rating in research plots of Resolve plus atrazine applied preemergence followed by a sequential postemergence treatment of Roundup WeatherMAX, yielding 167 bu/ac. Both postemergence rates of Roundup WeatherMAX yielded 151 and 162 bu/ac (Table 8).

## Headline for control of vomatoxin in four varieties of Pioneer field corn

### Introduction

Vomatoxin is a chemical compound of Fusarium molds. These molds are found in grains, such as wheat and corn. Spring and fall weather conditions across many areas of excess moisture can result in vomatoxin production by Fusarium molds in corn. Any vomatoxin levels over 2.0 ppm can cause illness in pets, affecting the immune system and causing death.

### Materials and methods

A field demonstration experiment was conducted in 2006 at Farmington, NM, to evaluate the response of Headline for control of vomatoxin in Pioneer seed corn (var. 35F38, 37D25, 36K67, and 36W66). Soils were fertilized according to New Mexico State University recommendations based on soil tests. Individual plots were four 34-in. rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Pioneer field corn varieties were planted with flexi-planters equipped with disk openers on May 16. Headline was applied at 6.0 oz/ac with COC at 1.0% v/v to varieties 35F38 and 37D25 on July 25, and to varieties 36K67 and 36W66 on July 31. Treatments were applied when corn varieties were at the first sign of silking. Field corn was harvested on December 4 by combining the center two rows of each plot using a John Deere 3300 combine equipped with a load cell. A random sample was taken from each plot and sent to the Navajo Agricultural Products Industry (NAPI) soils laboratory for vomatoxin determination.

### Results and discussion

**Vomatoxin determination and crop yields:** Yields and vomatoxin results are given in Table 9. The overall average yields for 35F38, 37D25, 36K67, and 36W66 were 257, 250, 249, and 251 bu/ac, respectively. The variety 35F38 had a 10 bu/ac increase with Headline application (Table 9). All vomatoxin ratings were less than 1 ppm (Table 9).

## Broadleaf weed control in dry beans

### Introduction

Approximately 97% of New Mexico's dry bean production occurs in northwestern New Mexico. Most of this production occurs under sprinkler irrigation on coarse-textured soils. Pinto bean growers usually preplant incorporate one or two herbicides in combination and then follow with one mechanical cultivation for annual weed control. Weeds compete vigorously with dry beans, and yield reductions exceeding 70% have been recorded. Many growers are not achieving effective full-season weed control, which has led to the development of Pursuit, Raptor, and recently Valor for weed control in dry edible beans.

### Objectives

- Determine broadleaf weed control under applied selected herbicides.
- Determine dry bean tolerance to applied selected herbicides and yield.

### Materials and methods

A field experiment was conducted in 2006 at Farmington, NM, to evaluate the response of dry edible beans (var. Bill Z) and annual broadleaf weeds to preemergence and preemergence followed by sequential postemergence herbicides. Soils were fertilized according to New Mexico State University recommendations based on soil tests. The experimental design was a randomized complete block with four replications. Individual plots were four 34-in. rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Dry beans were planted with flexi-planters on May 30. Preemergence treatments were applied on May 31 and immediately incorporated with 0.75 in. of sprinkler-applied water. Crop injury and weed control evaluations were made on June 27. Sequential postemergence treatments were applied on June 29 after cultivation and when dry beans were in the fourth trifoliolate leaf stage and weeds were small (<2 in.). Black nightshade and redroot and prostrate pigweed infestations were heavy, common lambsquarters infestations were moderate, and Russian thistle infestations were light throughout the experimental area. Preemergence followed by sequential postemergence treatments were evaluated on August 1. Dry beans were hand harvested on September 4 and left in the field until September 11 when they were thrashed and weighed. Results obtained were subjected to analysis of variance at P = 0.05.

### Results and discussion

**Weed control evaluations:** Weed control evaluations are given in Tables 10 and 11. Only Valor and Outlook in combination with Prowl $H_2O$ at 0.05, 0.56, and 0.8 lb ai/ac, respectively, showed injury symptoms of <2% (data not shown). All treatments gave excellent control of redroot and prostrate pigweed, common lambsquarters, and black nightshade. Russian thistle control was poor with those preemergence treatments containing Outlook, Prowl, and Prowl $H_2O$, regardless of rate and combination. Valor applied preemergence at 0.05 lb ai/ac or in combination with Prowl or Prowl $H_2O$ at 0.8 lb ai/ac gave excellent control of Russian thistle (Table 10). All treatments gave 86% or better control of redroot and prostrate pigweed, common lambsquarters, and black nightshade. Russian thistle control increased significantly when Raptor plus Basagran at 0.032 plus 0.25 lb ai/ac was included as a sequential postemergence treatment to preemergence treatments of Outlook, Prowl, and Prowl $H_2O$ (Table 11).

**Crop yields:** Yields are given in Table 11. Yields were 2,459 to 3,804 lb/ac higher in the herbicide-treated plots as compared to the check.

## Headline for dry bean production

### Introduction

Approximately 97% of New Mexico's dry bean production occurs in northwestern New Mexico. Most of this production occurs under sprinkler irrigation on coarse-textured soils. Keeping a plant healthy through the growing season adds to total production after harvest. Headline is a fungicide that has some properties of keeping a plant healthy so maximum production can be achieved.

### Objective

- Determine application timing of Headline for maximum dry bean production.

### Materials and methods

A field experiment was conducted in 2006 at Farmington, NM, to evaluate the response of dry edible beans (var. Bill Z) to Headline. Soils were fertilized according to New Mexico State University recommendations based on soil tests. The experimental design was a randomized complete block with four replications. Individual plots were four 34-in. rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Dry beans were planted with flexi-planters on May 30. Headline treatments were applied on June 29, July 17 and 31, and August 14, depending on dry bean growth stages. Valor was applied at 0.05 lb ai/ac on May 31 and immediately incorporated with 0.75 in. of sprinkler-applied water. Raptor plus Basagran was applied postemergence at 0.032 plus 0.25 lb ai/ac on June 29. COC and 32-0-0 were added to the mixture at 1 and 2% v/v, respectively. Dry beans were hand harvested on September 4 and left in the field until September 11 when they were thrashed and weighed. Results obtained were subjected to analysis of variance at P = 0.05.

### Results and discussion

**Crop yields:** Single and multiple applications of Headline at 6.0 oz/ac did not show any significant yield increase over the untreated check. Headline applied at 6.0 oz/ac at the R3 pod initiation stage on July 31 and then 6.0 oz/ac 14 days later on August 14 showed the highest-yielding treatment of 4,649 lb/ac (Table 12).

## Control of downy brome in Great Basin Wildrye in Montezuma County, Colorado

### Introduction

Over the past few years, downy brome has increased in native grass fields, causing harvest problems and seed cleaning operations. Downy brome infestations, if left unchecked, can become severe.

### Objectives

- Determine efficacy of selected herbicides for control of downy brome in Great Basin Wildrye.
- Determine Great Basin Wildrye tolerance to applied selected herbicides.

### Materials and methods

A field experiment was conducted from 2005 to 2006 in Montezuma County, CO, to evaluate the response of downy brome and Great Basin Wildrye to selected herbicides applied postemergence. The experimental designs were a randomized complete block with three replications. Individual plots were 12 ft wide by 25 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Treatments were applied on October 18 and 20, 2005, when Great Basin Wildrye was in the dormant stage. Downy brome was approximately <1.0 in. in height when herbicide treatments were applied. Treatments were evaluated on April 11, 2006. All treatments were applied with a COC and 32-0-0 at 1% v/v. Results obtained were subjected to analysis of variance at $P = 0.05$.

### Results and discussion

**Weed control evaluations:** Weed control and grass injury evaluations for downy brome control in Great Basin Wildrye are given in Tables 13 and 14. Accent plus Cimarron applied at 0.047 plus 0.009 lb ai/ac and Oust XP plus Telar at 0.047 plus 0.023 and 0.035 plus 0.017 lb ai/ac had the highest injury ratings of 1, 9, and 7, respectively. Velpar plus Cimarron, Oust XP plus Telar at 0.5 plus 0.009, 0.047 plus 0.028 and 0.035 plus 0.017 lb ai/ac gave 88 percent or better control of downy brome (Tables 13 and 14).

## Control of downy brome in Arizona fescue in Montezuma County, Colorado

### Introduction

Over the past few years, downy brome has increased in native grass fields, causing harvest problems and seed cleaning operations. Downy brome infestations, if left unchecked, can become severe.

### Objectives

- Determine efficacy of selected herbicides for control of downy brome in Arizona fescue.
- Determine Arizona fescue tolerance to applied selected herbicides.

### Materials and methods

A field experiment was conducted in 2006 in Montezuma County, CO, to evaluate the response of downy brome and Arizona fescue to selected herbicides applied postemergence. The experimental designs were a randomized complete block with three replications. Individual plots were 12 ft wide by 25 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Treatments were applied on April 12 when Arizona fescue was <6 in. in height. Downy brome was approximately <2.0 in. in height when herbicide treatments were applied. Treatments were evaluated on May 25. All treatments were applied with a COC and 32-0-0 at 1% v/v. Results obtained were subjected to analysis of variance at $P = 0.05$.

### Results and discussion

**Weed control evaluations:** Weed control and grass injury evaluations for downy brome control in Arizona fescue are given in Tables 15 and 16. Velpar plus Cimarron and Velpar plus Karmex plus Cimarron at 0.5 plus 0.009 and 0.5 plus 0.75 plus 0.009 lb ai/ac, respectively, had the highest injury rating of 72 and 87, respectively (Tables 15 and 16). Accent at 0.013, 0.047, and 0.063 lb ai/ac in combination with Cimarron at 0.009 lb ai/ac, and Accent plus Cimarron at 0.06 plus 0.009 lb ai/ac gave 95% or better control of downy brome (Tables 15 and 16).

## Canada thistle control in Montezuma County, Colorado

### Introduction

Today, over 100 million acres on the North American continent are struggling against invasive plants that have no respect for property boundaries. This invasion poses a serious threat to the integrity and productivity of our nation's landscape. One such invasive noxious weed is Canada thistle, which has spread tremendously throughout San Juan County, NM, and Southwestern Colorado.

### Objectives

- Determine efficacy of selected herbicides for control of Canada thistle in Montezuma County, CO.
- Determine grass pasture tolerance to applied selected herbicides.

### Materials and methods

A field experiment was conducted in 2006 in Montezuma County, CO, to evaluate the response of herbicides for Canada thistle control at the ranch of Mr. Clark Root. The experimental design was a randomized complete block with four replications. Individual plots were 12 ft wide by 25 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Treatments were applied on October 20, 2005, when Canada thistle was in the small rosette stage. The Canada thistle in these plots had been harvested during the growing season for forage production. Treatments were applied with a COC and 32-0-0 at 1% v/v. Treatments were rated on May 25, 2006.

### Results and discussion

**Weed control evaluations:** Weed control evaluations and injury evaluation for Canada thistle and pasture are given in Table 17. Telar at 0.047 and 0.035 lb ai/ac or in combination with Cimarron plus Tordon or Cimarron plus Transline at 0.038 plus 0.029 or 0.25 lb ai/ac had the highest injury rating of 43, 36, and 41, respectively. Canada thistle control was excellent with all treatments except the check (Table 17).

## Russian thistle and kochia control in OP 367 hybrid poplar trees on the Navajo Agricultural Products Industry poplar tree farm

### Introduction

Hybrid poplar has been recognized as one of the fastest growing temperate tree species in North America. The Navajo Agricultural Products Industry (NAPI) has poplar trees that are approximately two to three years old. Weeds, especially Russian thistle and kochia, cause significant problems by interfering with the drip system and depleting the soil system of nutrients that could otherwise be used by the poplar trees.

### Objectives

- Determine efficacy of selected herbicides for control of Russian thistle and kochia and hybrid poplar injury at the NAPI poplar tree farm.

### Materials and methods

OP 367 hybrid poplar tree sprigs were planted, approximately, in the spring of 2004. Sprigs were approximately 9 in. in length and were planted to a depth of 7 in. The field was fertilized, disked, and leveled before sprigs were planted. Sprigs were planted on a 12 by 12 spacing. Drip tape with dripper spacing of 3 ft was laid out on both sides of the sprigs at a distance of 1 ft. Individual plots were 10 ft wide by 25 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/ac at 30 psi. Fall and spring treatments were applied on December 20, 2005 and March 24, 2006. No weeds were present when treatments were applied in either year. Poplar injury and weed control evaluations were made on May 25 and August 22, 2006.

### Results and discussion

**Weed control and injury evaluations:** No hybrid poplar OP 367 injury was noted in any of the treatments whether fall- or spring-applied (Tables 18 and 19). Fall-applied treatments showed that Russian thistle control evaluated on May 25 gave 98% control or better except for Oust plus Escort at 0.035 plus 0.009 lb ai/ac and the weedy check (Table 18). On August 22, Russian thistle control was poor with the combination treatments of Sinbar plus Karmex and the weedy check (Table 18). Kochia control rated on May 25 indicated that all treatments gave 91% control or better except for Oust plus Escort at 0.035 plus 0.009 lb ai/ac and the weedy check (Table 18). On August 22, treatments of Oust plus Telar at 0.06 plus 0.04 lb ai/ac, Sinbar plus Karmex at 1.2 and 1.6 and 1.6 plus 1.6 lb ai/ac, and Princep at 1.6 lb ai/ac gave 90% control or better of kochia (Table 18). Spring-applied treatments showed that Russian thistle control evaluated on May 25 gave 88% control or better except for Princep at 1.6 lb ai/ac and the weedy check (Table 19). However, by August 22, control of Russian thistle with Princep at 1.6 lb ai/ac increased approximately 48% (Table 19). Spring-applied treatments of Oust plus Telar at 0.03 plus 0.02 lb ai/ac and Sinbar plus Karmex at 1.2 plus 1.6 lb ai/ac gave 100% control of kochia when rated on May 25 (Table 19). On August 22, spring-applied treatments of Sinbar at 1.2 and 1.6 lb ai/ac in combination with Karmex at 1.6 lb ai/ac gave 93% control or better of kochia.

## Broadleaf weed control in sunflowers with preemergence herbicides

### Introduction

Sunflower is a crop that is usually planted in dryland situations under limited rainfall. Sunflower seed is mainly harvested for its oil content. The sunflower is adapted for oil seed production where corn is successful in the northern two-thirds of the U.S. Little information is available for the use of herbicides for control of broadleaf weeds in sunflower on coarse-textured soils.

### Objectives

- Determine efficacy of selected herbicides for control of annual broadleaf weeds in sunflowers.
- Determine sunflower tolerance to applied selected herbicides and yield.

### Materials and methods

A field demonstration trial was conducted in 2006 at Farmington, NM, to evaluate the response of sunflowers (var. 8050) and annual broadleaf weeds to preemergence herbicides. Sunflowers were planted on June 5 with flexi-planters equipped with disk openers. Soils were fertilized according to New Mexico State University recommendations based on soil tests. Plots were four 34-in. rows 30 ft long. Preemergence herbicides were applied on June 5 and immediately incorporated with 0.75 in. of sprinkler-applied water. Crop injury and weed control evaluations were made on July 6 and August 8. Black nightshade and prostrate and redroot pigweed infestations were heavy and common lambsquarters and Russian thistle infestations were light throughout the experimental area. Sunflowers were harvested on October 19 by combining the center two rows of each plot using a John Deere 3300 combine equipped with a load cell.

### Results and discussion

**Weed control and injury evaluations:** Crop injury evaluations are given in Table 20. Weed control evaluations are given in Tables 20 and 21. Outlook at 0.75 lb ai/ac had the highest sunflower injury of 40 (Table 20). In July, all treatments except the weedy check gave 90% control or better of redroot and prostrate pigweed, black nightshade, and common lambsquarters (Table 20). Spartan at 0.094 lb ai/ac alone or in combination with either Outlook, Dual II Mag, and Prowl $H_2O$ at 0.56, 1.25, and 1.0 lb ai/ac, respectively, gave 95% control or better of Russian thistle (Table 20). In August, all treatments except the check gave 84% control or better of redroot and prostrate pigweed, black nightshade, and common lambsquarters (Table 21). Again, only those treatments with Spartan gave 93% control or better of Russian thistle (Table 21).

**Crop yields:** Crop yields are given in Table 21. Yields were 1,657 to 2,131 lb/ac higher in the herbicide-treated plots as compared to the weedy check.

**Table 1. Control of Annual Broadleaf Weeds with Postemergence Applications of Raptor, Pursuit, and Roundup Applied Alone or in Combination in Spring-Seeded Roundup Ready Alfalfa on July 6; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments | Rate (lb/ai) | Crop Injury[b] (%) | Weed Control[b,c] Saskr (%) | Amare | Amabl | Solni | Cheal |
|---|---|---|---|---|---|---|---|
| Roundup WeatherMAX | 1.95 | 0 | 100 | 98 | 100 | 100 | 100 |
| Roundup Original Max | 1.95 | 0 | 100 | 98 | 100 | 100 | 100 |
| Roundup WeatherMAX + Raptor[a] | 1.95 + 0.047 | 0 | 100 | 99 | 100 | 100 | 100 |
| Roundup Original Max + Raptor[a] | 1.95 + 0.047 | 0 | 100 | 100 | 100 | 100 | 100 |
| Roundup WeatherMAX + Pursuit[a] | 1.95 + 0.094 | 0 | 100 | 100 | 100 | 100 | 100 |
| Roundup Original Max + Pursuit[a] | 1.95 + 0.094 | 0 | 100 | 99 | 100 | 100 | 100 |
| Roundup WeatherMAX + Buctril[a] | 1.95 + 0.25 | 0 | 100 | 100 | 100 | 100 | 100 |
| Roundup Original Max + Buctril[a] | 1.95 + 0.25 | 0 | 100 | 100 | 100 | 100 | 100 |
| Roundup WeatherMAX + Select[a] | 1.95 + 0.25 | 0 | 100 | 97 | 100 | 100 | 100 |
| Roundup Original Max + Select[a] | 1.95 + 0.25 | 0 | 100 | 98 | 100 | 100 | 100 |
| Raptor[a] | 0.047 | 0 | 100 | 99 | 100 | 100 | 100 |
| Pursuit[a] | 0.094 | 0 | 100 | 99 | 100 | 100 | 100 |
| Buctril[a] | 0.25 | 0 | 100 | 94 | 100 | 100 | 100 |
| Select[a] | 0.25 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roundup Original Max + Select + Raptor[a] | 1.95 + 0.25 + 0.047 | 0 | 100 | 100 | 100 | 100 | 100 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | 0 | 7 | 2 | 7 | 7 | 7 |

[a]Treatments applied with NIS and AMS at 0.25 and 2% v/v, respectively.

[b]Based on visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[c]Saskr = Russian thistle, Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, and Cheal = common lambsquarters.

**Table 2. Control of Annual Broadleaf Weeds with Postemergence Applications of Raptor, Pursuit, and Roundup Applied Alone or in Combination in Spring-Seeded Roundup Ready Alfalfa on August 7; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments | Rate (lb/ai) | Crop Injury[b] (%) | Weed Control[b,c] (%) Saskr | Amare | Amabl | Solni | Cheal |
|---|---|---|---|---|---|---|---|
| Roundup WeatherMAX | 1.95 | 0 | 100 | 78 | 100 | 100 | 100 |
| Roundup Original Max | 1.95 | 0 | 100 | 78 | 100 | 100 | 99 |
| Roundup WeatherMAX + Raptor[a] | 1.95 + 0.047 | 0 | 100 | 98 | 100 | 100 | 100 |
| Roundup Original Max + Raptor[a] | 1.95 + 0.047 | 0 | 100 | 97 | 100 | 100 | 100 |
| Roundup WeatherMAX + Pursuit[a] | 1.95 + 0.094 | 0 | 100 | 99 | 100 | 100 | 100 |
| Roundup Original Max + Pursuit[a] | 1.95 + 0.094 | 0 | 100 | 93 | 100 | 100 | 100 |
| Roundup WeatherMAX + Buctril[a] | 1.95 + 0.25 | 0 | 100 | 71 | 100 | 100 | 100 |
| Roundup Original Max + Buctril[a] | 1.95 + 0.25 | 0 | 100 | 82 | 100 | 100 | 100 |
| Roundup WeatherMAX + Select[a] | 1.95 + 0.25 | 0 | 100 | 76 | 100 | 100 | 99 |
| Roundup Original Max + Select[a] | 1.95 + 0.25 | 0 | 100 | 77 | 100 | 100 | 99 |
| Raptor[a] | 0.047 | 0 | 97 | 88 | 100 | 100 | 99 |
| Pursuit[a] | 0.094 | 0 | 100 | 95 | 100 | 100 | 96 |
| Buctril[a] | 0.25 | 0 | 100 | 56 | 100 | 100 | 100 |
| Select[a] | 0.25 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roundup Original Max + Select + Raptor[a] | 1.95 + 0.25 + 0.047 | 0 | 100 | 98 | 100 | 100 | 100 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | 0 | 2 | 15 | 7 | 7 | 2 |

[a]Treatments applied with NIS and AMS at 0.25 and 2% v/v, respectively.

[b]Based on visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[c]Saskr = Russian thistle, Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, and Cheal = common lambsquarters.

**Table 3. First Cutting Yield, Protein, and Relative Feed Value of Dekalb RR05-060104 Alfalfa Sprayed with Postemergence Applications of Raptor, Pursuit, and Roundup Applied Alone or in Combination on August 7; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments | Rate (lb ai/ac) | Percent Yield (ton/ac) | Weeds[b] (%) | RFV[c] (no.) | Protein Content (%) |
|---|---|---|---|---|---|
| Roundup WeatherMAX | 1.95 | 2.2 | 18.7 | 167.3 | 18.6 |
| Roundup Original Max | 1.95 | 2.0 | 16.5 | 168.1 | 20.7 |
| Roundup WeatherMAX + Raptor[a] | 1.95 + 0.047 | 2.1 | 3.3 | 183.0 | 22.7 |
| Roundup Original Max + Raptor[a] | 1.95 + 0.047 | 2.1 | 2.0 | 184.0 | 22.4 |
| Roundup WeatherMAX + Pursuit[a] | 1.95 + 0.094 | 2.1 | 2.0 | 176.2 | 22.9 |
| Roundup Original Max + Pursuit[a] | 1.95 + 0.094 | 2.0 | 0 | 199.7 | 22.6 |
| Roundup WeatherMAX + Buctril[a] | 1.95 + 0.25 | 2.4 | 32.7 | 163.8 | 18.6 |
| Roundup Original Max + Buctril[a] | 1.95 + 0.25 | 2.1 | 14.5 | 169.1 | 20.7 |
| Roundup WeatherMAX + Select[a] | 1.95 + 0.25 | 2.1 | 22.6 | 171.6 | 20.1 |
| Roundup Original Max + Select[a] | 1.95 + 0.25 | 1.9 | 12.8 | 182.2 | 21.4 |
| Raptor[a] | 0.047 | 1.9 | 23.9 | 171.5 | 21.7 |
| Pursuit[a] | 0.094 | 1.9 | 7.5 | 177.7 | 21.0 |
| Buctril[a] | 0.25 | 2.6 | 28.1 | 165.1 | 19.3 |
| Select[a] | 0.25 | 2.7 | 41.2 | 167.2 | 18.2 |
| Roundup Original Max + Select + Raptor[a] | 1.95 + 0.25 + 0.047 | 2.1 | 1.7 | 176.6 | 18.2 |
| Weedy check | | 2.5 | 47.6 | 158.9 | 16.9 |
| LSD 0.05 | | 0.3 | 18.4 | ns | ns |

[a]Treatments applied with NIS and AMS at 0.25 and 2% v/v, respectively.

[b]Percent weeds expressed as percentage of alfalfa weed mixture.

[c]RFV = relative feed value.

**Table 4. Second Cutting Yield, Protein, and Relative Feed Value of Dekalb RR05-060104 Alfalfa Sprayed with Postemergence Applications of Raptor, Pursuit, and Roundup Applied Alone or in Combination on September 27; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments | Rate (lb ai/ac) | Yield (ton/ac) | Percent Weeds[b] (%) | RFV[c] (no.) | Protein Content (%) |
|---|---|---|---|---|---|
| Roundup WeatherMAX | 1.95 | 1.4 | 2.6 | 227 | 21.5 |
| Roundup Original Max | 1.95 | 1.2 | 4.4 | 249 | 21.9 |
| Roundup WeatherMAX + Raptor[a] | 1.95 + 0.047 | 1.3 | 0 | 229 | 21.7 |
| Roundup Original Max + Raptor[a] | 1.95 + 0.047 | 1.4 | 0.5 | 199 | 21.62 |
| Roundup WeatherMAX + Pursuit[a] | 1.95 + 0.094 | 1.4 | 0 | 223 | 21.7 |
| Roundup Original Max + Pursuit[a] | 1.95 + 0.094 | 1.4 | 1.6 | 233 | 23.3 |
| Roundup WeatherMAX + Buctril[a] | 1.95 + 0.25 | 1.4 | 8.4 | 233 | 21.8 |
| Roundup Original Max + Buctril[a] | 1.95 + 0.25 | 1.3 | 7.5 | 210 | 22.5 |
| Roundup WeatherMAX + Select[a] | 1.95 + 0.25 | 1.3 | 4.4 | 218 | 20.7 |
| Roundup Original Max + Select[a] | 1.95 + 0.25 | 1.2 | 4.3 | 243 | 22.5 |
| Raptor[a] | 0.047 | 1.3 | 0.5 | 229 | 20.7 |
| Pursuit[a] | 0.094 | 1.3 | 0 | 246 | 22.3 |
| Buctril[a] | 0.25 | 1.3 | 2.5 | 241 | 21.6 |
| Select[a] | 0.25 | 1.4 | 3.3 | 246 | 22.3 |
| Roundup Original Max + Select + Raptor[a] | 1.95 + 0.25 + 0.047 | 1.3 | 0 | 207 | 22.9 |
| Weedy check | | 1.3 | 10.2 | 207 | 20.2 |
| LSD 0.05 | | 0.08 | 5.7 | ns | ns |

[a]Treatments applied with NIS and AMS at 0.25 and 2% v/v, respectively.

[b]Percent weeds expressed as percentage of alfalfa weed mixture.

[c]RFV = relative feed value.

**Table 5. Control of Annual Broadleaf Weeds with Preemergence and Preemergence Followed by Sequential Postemergence Herbicides in Field Corn on June 15; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments[a] | Rate (lb ai/ac) | Crop Injury[d] (%) | Stand Count (no.) | Weed Control[d,e] Amare | Amabl | Solni | Cheal | Saskr |
|---|---|---|---|---|---|---|---|---|
| | | | | (%) | | | | |
| Guardsman Max (pm) | 0.85 | 0 | 22 | 95 | 98 | 95 | 97 | 94 |
| Guardsman Max (pm) | 1.9 | 2 | 22 | 99 | 100 | 99 | 100 | 99 |
| Bicep Lite II Mag (pm) | 0.83 | 0 | 22 | 97 | 97 | 98 | 97 | 96 |
| Bicep Lite II Mag (pm) | 1.65 | 0 | 20 | 100 | 100 | 99 | 100 | 100 |
| Outlook | 0.75 | 9 | 20 | 99 | 100 | 98 | 97 | 50 |
| Dual II Mag | 1.25 | 0 | 22 | 100 | 100 | 95 | 97 | 51 |
| Outlook/Distinct[b,c] | 0.75/0.25 | 9 | 21 | 100 | 100 | 97 | 98 | 53 |
| Outlook + Prowl $H_2O$/Distinct[b,c] | 0.75 + 1.0/0.17 | 9 | 21 | 100 | 100 | 96 | 99 | 86 |
| Guardsman Max (pm) + Prowl $H_2O$ | 1.9 + 1.0 | 5 | 21 | 100 | 100 | 97 | 99 | 98 |
| Guardsman Max (pm)+ Prowl $H_2O$/Distinct[b,c] | 1.9 + 1.0/0.17 | 4 | 20 | 100 | 100 | 98 | 99 | 98 |
| Dual II Mag/Distinct[b,c] | 1.25/0.25 | 0 | 21 | 100 | 100 | 97 | 98 | 55 |
| Weedy check | | 0 | 21 | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | 2 | ns | 2 | 1 | 2 | 1 | 5 |

[a]pm = packaged mix.

[b]First treatment applied preemergence followed by a sequential postemergence treatment.

[c]Sequential postemergence treatment applied with NIS and 32-0-0 at 0.25 and 1% v/v, respectively.

[d]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[e]Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, Cheal = common lambsquarters, and Saskr = Russian thistle.

**Table 6. Control of Annual Broadleaf Weeds with Preemergence and Preemergence Followed by Sequential Postemergence Herbicides in Field Corn on July 6; NMSU Agricultural Science Center at Farmington, NM, 2006**

| | | Weed Control[d,e] | | | | | |
|---|---|---|---|---|---|---|---|
| | Rate | Amare | Amabl | Solni | Cheal | Saskr | Yield |
| Treatments[a] | (lb ai/ac) | (%) | | | | | (bu/ac) |
| Guardsman Max (pm) | 0.85 | 89 | 91 | 91 | 95 | 89 | 277 |
| Guardsman Max (pm) | 1.9 | 96 | 97 | 95 | 99 | 98 | 277 |
| Bicep Lite II Mag (pm) | 0.83 | 92 | 94 | 94 | 96 | 91 | 278 |
| Bicep Lite II Mag (pm) | 1.65 | 97 | 97 | 96 | 98 | 97 | 272 |
| Outlook | 0.75 | 90 | 93 | 93 | 96 | 51 | 267 |
| Dual II Mag | 1.25 | 91 | 91 | 92 | 98 | 51 | 270 |
| Outlook/Distinct[b,c] | 0.75/0.25 | 99 | 98 | 97 | 99 | 98 | 276 |
| Outlook + Prowl $H_2O$/Distinct[b,c] | 0.75 + 1.0/0.17 | 98 | 99 | 98 | 99 | 99 | 257 |
| Guardsman Max (pm) + Prowl $H_2O$ | 1.9 + 1.0 | 94 | 98 | 94 | 95 | 92 | 283 |
| Guardsman Max (pm) + Prowl $H_2O$/Distinct[b,c] | 1.9 + 1.0/0.17 | 99 | 98 | 97 | 99 | 98 | 254 |
| Dual II Mag/Distinct[b,c] | 1.25/0.25 | 99 | 98 | 97 | 99 | 99 | 254 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 69 |
| LSD 0.05 | | 3 | 2 | 2 | 2 | 3 | 17 |

[a]pm = packaged mix.

[b]First treatment applied preemergence followed by a sequential postemergence treatment.

[c]Sequential postemergence treatment applied with NIS and 32-0-0 at 0.25 and 1% v/v, respectively.

[d]Based on a visual scale from 0-100, where 0 = no control and 100 = dead plants.

[e]Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, Cheal = common lambsquarters, and Saskr = Russian thistle.

**Table 7. Control of Annual Broadleaf Weeds with Preemergence Followed by Sequential Postemergence and Postemergence Herbicides in Roundup Ready Field Corn on June 15; NMSU Agricultural Science Center at Farmington, NM, 2006**

| | | Stand | Crop | Weed Control[b,c] | | | | |
|---|---|---|---|---|---|---|---|---|
| | Rate | Count | Injury | Amare | Amabl | Solni | Saskr | Cheal |
| Treatments[a] | (lb ai/ac) | (no.) | (%) | (%) | | | | |
| Resolve + atrazine | 0.015 + 0.8 | 22 | 0 | 99 | 98 | 97 | 98 | 99 |
| Cinch ATZ | 1.1 | 22 | 0 | 94 | 98 | 97 | 99 | 99 |
| Harness Xtra | 1.75 | 21 | 0 | 97 | 97 | 96 | 98 | 97 |
| Harness Xtra | 3.3 | 21 | 0 | 99 | 99 | 99 | 100 | 100 |
| Weedy check | | 21 | 0 | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | ns | ns | 2 | 2 | 2 | 1 | 2 |

[a]Treatments applied preemergence and rated on June 15.

[b]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[c]Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, Saskr = Russian thistle, and Cheal = common lambsquarters.

**Table 8. Control of Annual Broadleaf Weeds with Preemergence Followed by Sequential Postemergence and Postemergence Herbicides in Roundup Ready Field Corn on July 6; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments[a] | Rate (lb ai/ac) | Weed Control[e,f] Amare (%) | Amabl | Solni | Saskr | Cheal | Yield (bu/ac) |
|---|---|---|---|---|---|---|---|
| Resolve + atrazine/Roundup WeatherMAX[b] | 0.015 + 0.8/0.75 | 98 | 99 | 99 | 98 | 98 | 167 |
| Cinch ATZ/Steadfast + Callisto + atrazine[c] | 1.1/0.035 + 0.06 + 0.8 | 99 | 100 | 99 | 99 | 99 | 254 |
| Harness Xtra/Roundup WeatherMAX[b] | 1.75/0.75 | 99 | 100 | 97 | 96 | 96 | 248 |
| Harness Xtra | 3.3 | 65 | 94 | 87 | 89 | 84 | 231 |
| Roundup WeatherMAX[b] | 0.75 | 70 | 79 | 84 | 46 | 53 | 151 |
| Roundup WeatherMAX + Resolve[b] | 0.75 + 0.015 | 95 | 93 | 87 | 68 | 80 | 229 |
| Roundup WeatherMAX + Resolve + Harness[b] | 0.75 + 0.015 + 0.9 | 94 | 98 | 91 | 62 | 91 | 237 |
| Steadfast + Callisto + atrazine[c] | 0.035 + 0.06 + 0.8 | 99 | 99 | 99 | 93 | 98 | 230 |
| Lumax + Accent + Harmony GT[d] | 0.98 + 0.023 + 0.001 | 90 | 93 | 95 | 75 | 91 | 239 |
| Steadfast + Clarity[c] | 0.035 + 0.06 | 95 | 98 | 99 | 99 | 98 | 248 |
| Roundup WeatherMAX[b] | 1.5 | 83 | 81 | 83 | 91 | 82 | 162 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 64 |
| LSD 0.05 | | 4 | 3 | 3 | 5 | 4 | 29 |

[a]First treatment applied preemergence followed by a slash then a postemergence treatment and rated on July 6.

[b]Treatments applied postemergence with ammonium sulfate at 2 lb/ac.

[c]Treatments applied postemergence with ammonium sulfate and COC at 2 lb/ac and 1% v/v, respectively.

[d]Treatment applied postemergence with ammonium sulfate and NIS at 2 lb/ac and 0.25% v/v, respectively.

[e]Based on a visual scale from 0-100, where 0 = no control and 100 = dead plants.

[f]Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, Saskr = Russian thistle, and Cheal = common lambsquarters.

**Table 9. Yield and Control of Vomatoxin in Four Pioneer Corn Varieties on December 5; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Pioneer Varieties | Headline Yield (bu/ac) | No Headline Yield (bu/ac) | Overall Average Yield (bu/ac) | No Headline (ppm Vomatoxin) | Headline Applied (ppm Vomatoxin) |
|---|---|---|---|---|---|
| 35F38[a] | 262 | 252 | 257 | 0.63 | 0.58 |
| 37D25[a] | 252 | 248 | 250 | 0.70 | 0.26 |
| 36K67[b] | 249 | 249 | 249 | 0.26 | 0.30 |
| 36W66[b] | 253 | 252 | 251 | 0.15 | 0.11 |

[a]Headline applied on July 25 at 6 oz/ac with COC at 1% v/v.

[b]Headline applied on July 31 at 6 oz/ac with COC at 1% v/v.

**Table 10. Control of Annual Broadleaf Weeds in Dry Beans with Preemergence and Preemergence Followed by Sequential Postemergence Treatments on June 27; NMSU Agricultural Science Center at Farmington, NM, 2006**

| | | Weed Control[b,c] | | | | |
|---|---|---|---|---|---|---|
| | Rate | Cheal | Amare | Amabl | Solni | Saskr |
| Treatments | (lb ai/ac) | (%) | | | | |
| Valor | 0.05 | 100 | 99 | 100 | 100 | 99 |
| Outlook | 0.56 | 100 | 98 | 100 | 97 | 35 |
| Valor + Prowl | 0.05 + 0.8 | 100 | 100 | 100 | 100 | 100 |
| Valor + Prowl $H_2O$ | 0.05 + 0.8 | 100 | 100 | 100 | 100 | 100 |
| Outlook + Prowl | 0.56 + 0.8 | 100 | 100 | 100 | 100 | 63 |
| Outlook + Prowl $H_2O$ | 0.56 + 0.8 | 100 | 100 | 100 | 100 | 64 |
| Valor/Raptor + Basagran[a] | 0.05/0.032 + 0.25 | 100 | 99 | 100 | 100 | 99 |
| Outlook/raptor + Basagran[a] | 0.56/0.032 + 0.25 | 100 | 99 | 100 | 98 | 50 |
| Outlook + Prowl/Raptor + Basagran[a] | 0.56 + 0.8/0.032 + 0.25 | 100 | 100 | 100 | 100 | 65 |
| Outlook + Prowl $H_2O$/Raptor + Basagran[a] | 0.56 + 0.8/0.032 + 0.25 | 100 | 100 | 100 | 100 | 66 |
| Valor + Prowl $H_2O$/Raptor + Basagran[a] | 0.05 + 0.8/0.032 + 0.25 | 100 | 100 | 100 | 100 | 99 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | 1 | 1 | 1 | 1 | 6 |

[a]First treatment applied preemergence and evaluated on June 27, followed by a sequential postemergence treatment. Postemergence treatments were applied with a COC and 32-0-0 at 0.5 and 2% v/v, respectively.

[b]Based on a visual scale from 0-100, where 0 = no control and 100 = dead plants.

[c]Cheal = common lambsquarters, Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, and Saskr = Russian thistle.

**Table 11. Control of Annual Broadleaf Weeds in Dry Beans with Preemergence and Preemergence Followed by Sequential Postemergence Treatments on August 1; NMSU Agricultural Science Center at Farmington, NM, 2006**

| | | Weed Control[a,b] | | | | | Bill Z |
|---|---|---|---|---|---|---|---|
| | Rate | Cheal | Amare | Amabl | Solni | Saskr | Yield |
| Treatments | (lb ai /ac) | (%) | | | | | (lb/ac) |
| Valor | 0.05 | 100 | 97 | 97 | 97 | 97 | 4,226 |
| Outlook | 0.56 | 100 | 90 | 90 | 86 | 28 | 2,997 |
| Valor + Prowl | 0.05 + 0.8 | 100 | 97 | 97 | 96 | 99 | 4,342 |
| Valor + Prowl $H_2O$ | 0.05 + 0.8 | 100 | 96 | 97 | 96 | 98 | 4,342 |
| Outlook + Prowl | 0.56 + 0.8 | 100 | 92 | 93 | 92 | 35 | 3,342 |
| Outlook + Prowl $H_2O$ | 0.56 + 0.8 | 100 | 96 | 95 | 92 | 49 | 3,304 |
| Valor/Raptor + Basagran[a] | 0.05/0.032 + 0.25 | 100 | 100 | 98 | 99 | 99 | 4,111 |
| Outlook/Raptor + Basagran[a] | 0.56/0.032 + 0.25 | 100 | 99 | 99 | 99 | 92 | 4,226 |
| Outlook + Prowl/Raptor + Basagran[a] | 0.56 + 0.8/0.032 + 0.25 | 100 | 99 | 99 | 99 | 94 | 3,919 |
| Outlook + Prowl $H_2O$/Raptor + Basagran[a] | 0.56 + 0.8/0.032 + 0.25 | 100 | 98 | 97 | 100 | 94 | 3,919 |
| Valor + Prowl $H_2O$/Raptor + Basagran[a] | 0.05 + 0.8/0.032 + 0.25 | 100 | 99 | 98 | 99 | 98 | 4,226 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 538 |
| LSD 0.05 | | 1 | 3 | 2 | 3 | 6 | 569 |

[a]First treatment applied preemergence and rated on June 27, followed by a sequential postemergence treatment and rated on August 1. Postemergence treatments were applied with a COC and 32-0-0 at 0.5 and 2% v/v, respectively.

[b]Based on a visual scale from 0-100, where 0 = no control and 100 = dead plants.

[c]Cheal = common lambsquarters, Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, and Saskr = Russian thistle.

**Table 12. Yield of Dry Beans after Headline Application at Different Growth Stages; NMSU Agricultural Science Center at Farmington, NM, 2006**

| Treatments[a] | Rate (oz/ac) | Growth Stage of Dry Beans | Date of Application | Yield (lb/ac) |
|---|---|---|---|---|
| Headline | 6.0 | 3rd to 4th trifoliolate leaf stage, with herbicide | June 29 | 4,572 |
| Headline | 6.0 | R1- beginning bloom | July 17 | 4,495 |
| Headline | 6.0 | R3- pod initiation | July 31 | 4,457 |
| Headline | 6.0 + 6.0 | R1- 10 to 14 days later | July 17 and July 31 | 4,457 |
| Headline | 6.0 + 6.0 | R3- 10 to 14 days later | July 31 and August 14 | 4,649 |
| Untreated check | | | | 4,611 |

[a]Treatments applied with a COC and 32-0-0 at 1 and 2% v/v, respectively.

**Table 13. Control of Downy Brome in Great Basin Wildrye at Southwest Seed Production Fields in Montezuma County, Colorado, April 11, 2006**

| Treatments[a] | Rate (lb ai/ac) | Great Basin Wildrye Injury[b] (%) | Weed Control[b] Brote[c] (%) |
|---|---|---|---|
| Accent + Cimarron | 0.013 + 0.009 | 0 | 67 |
| Accent + Cimarron | 0.047 + 0.009 | 1 | 67 |
| Accent + Cimarron | 0.063 + 0.009 | 0 | 75 |
| Karmex + Cimarron | 0.8 + 0.009 | 0 | 28 |
| Karmex + Cimarron | 1.6 + 0.009 | 0 | 41 |
| Velpar + Cimarron | 0.25 + 0.009 | 0 | 38 |
| Velpar + Cimarron | 0.38 + 0.009 | 0 | 37 |
| Velpar + Cimarron | 0.5 + 0.009 | 0 | 88 |
| Sinbar + Cimarron | 0.4 + 0.009 | 0 | 48 |
| Sinbar + Cimarron | 0.8 + 0.009 | 0 | 53 |
| Everest + Cimarron | 0.025 + 0.009 | 0 | 20 |
| Everest + Cimarron | 0.052 + 0.009 | 0 | 27 |
| Weedy check | | 0 | 0 |
| LSD 0.05 | | ns | 18 |

[a]Treatments applied postemergence on October 20, 2005, with COC and 32-0-0 at 1% v/v and rated on April 11, 2006.

[b]Based on a visual scale from 0-100, where 0 = no control or grass injury and 100 = dead plants.

[c]Brote = downy brome.

**Table 14. Control of Downy Brome in Great Basin Wildrye at Southwest Seed Production Fields in Montezuma County, Colorado, April 11, 2006**

| Treatments[a] | Rate (lb ai/ac) | Great Basin Wildrye Injury[b] (%) | Weed Control[b] Brote[c] (%) |
|---|---|---|---|
| Oust XP + Telar | 0.047 + 0.023 | 9 | 94 |
| Oust XP + Telar | 0.035 + 0.017 | 7 | 92 |
| Oust XP + Telar | 0.023 + 0.011 | 0 | 82 |
| Matrix + Telar | 0.008 + 0.023 | 0 | 55 |
| Matrix + Telar | 0.016 + 0.023 | 0 | 79 |
| Matrix + Telar | 0.031 + 0.023 | 0 | 86 |
| Telar + Cimarron | 0.047 + 0.038 | 0 | 57 |
| Weedy check | | 0 | 0 |
| LSD 0.05 | | 3 | 17 |

[a]Treatments applied postemergence on October 18, 2005 with COC and 32-0-0 at 1% v/v and rated on April 11, 2006.

[b]Based on a visual scale from 0-100, where 0 = no control or grass injury and 100 = dead plants.

[c]Brote = downy brome and rated on April 11, 2006.

**Table 15. Control of Downy Brome in Arizona Fescue at Southwest Seed Production Fields in Montezuma County, Colorado, May 25, 2006**

| Treatments[a] | Rate (lb ai/ac) | Arizona Fescue Injury[b] (%) | Weed Control[b] Brote[c] (%) |
|---|---|---|---|
| Accent + Cimaron | 0.013 + 0.009 | 43 | 100 |
| Accent + Cimaron | 0.047 + 0.009 | 23 | 100 |
| Accent + Cimarron | 0.063 + 0.009 | 23 | 100 |
| Karmex + Cimarron | 0.8 + 0.009 | 0 | 72 |
| Karmex + Cimarron | 1.6 + 0.009 | 7 | 78 |
| Velpar + Cimarron | 0.25 + 0.009 | 0 | 42 |
| Velpar + Cimarron | 0.38 + 0.009 | 15 | 52 |
| Velpar + Cimarron | 0.5 + 0.009 | 72 | 93 |
| Sinbar + Cimarron | 0.4 + 0.009 | 0 | 23 |
| Sinbar + Cimarron | 0.8 + 0.009 | 10 | 85 |
| Everest + Cimarron | 0.025 + 0.009 | 31 | 68 |
| Everest + Cimarron | 0.052 + 0.009 | 38 | 83 |
| Weedy check | | 0 | 0 |
| LSD 0.05 | | 19 | 23 |

[a]Treatments applied postemergence on April 12 with COC and 32-0-0 at 1% v/v and rated on May 25.

[b]Based on a visual scale from 0-100, where 0 = no control or grass injury and 100 = dead plants.

[c]Brote = downy brome.

**Table 16. Control of Downy Brome in Arizona Fescue at Southwest Seed Production Fields in Montezuma County, Colorado, May 25, 2006**

| Treatments[a] | Rate (lb ai/ac) | Arizona Fescue Injury[b] (%) | Weed Control[b] Brote[c] (%) |
|---|---|---|---|
| Accent + Cimarron | 0.039 + 0.006 | 2 | 90 |
| Accent + Cimarron | 0.049 + 0.008 | 0 | 93 |
| Accent + Cimarron | 0.06 + 0.009 | 0 | 98 |
| Velpar + Cimarron | 0.25 + 0.009 | 10 | 77 |
| Velpar + Cimarron | 0.38 + 0.009 | 20 | 93 |
| Velpar + Cimarron | 0.5 + 0.009 | 83 | 93 |
| Velpar + Karmex + Cimarron | 0.25 + 0.38 + 0.009 | 3 | 93 |
| Velpar + Karmex + Cimarron | 0.38 + 0.5 + 0.009 | 62 | 100 |
| Velpar + Karmex + Cimarron | 0.5 + 0.75 + 0.009 | 87 | 100 |
| Weedy check | | 0 | 0 |
| LSD 0.05 | | 10 | 18 |

[a]Treatments applied postemergence on April 12 with COC and 32-0-0 at 1% v/v and rated on May 25.

[b]Based on a visual scale from 0-100, where 0 = no control or grass injury and 100 = dead plants.

[c]Brote = downy brome.

**Table 17. Control of Canada Thistle with Herbicides in a Forage Production Field at the Mr. Clark Root Ranch in Montezuma County, Colorado, May 25, 2006**

| | | | Weed Control[b] |
|---|---|---|---|
| | Rate | Pasture Injury[b] | Cirar[c] |
| Treatments[a] | (lb ai/ac) | (%) | (%) |
| Telar + Cimarron + Tordon | 0.012 + 0.009 + 0.5 | 4 | 99 |
| Telar + Cimarron + Tordon | 0.023 + 0.019 + 0.5 | 12 | 100 |
| Telar + Cimarron + Tordon | 0.047 + 0.038 + 0.5 | 43 | 100 |
| Telar + Cimarron + Transline | 0.012 + 0.009 + 0.25 | 1 | 100 |
| Telar + Cimarron + Transline | 0.035 + 0.029 + 0.25 | 36 | 100 |
| Telar + Cimarron + Transline | 0.047 + 0.038 + 0.25 | 41 | 100 |
| Tordon | 0.5 | 0 | 100 |
| Transline | 0.25 | 0 | 98 |
| Weedy check | | 0 | 0 |
| LSD 0.05 | | 6 | 2 |

[a]Treatments applied on October 20, 2005 with a COC and 32-0-0 at 1% v/v and rated on May 25, 2006.

[b]Based on a visual scale form 0-100, where 0 = no control or pasture injury and 100 = dead plants.

[c]Cirar = Canada thistle.

**Table 18. Control of Russian Thistle and Kochia with Fall-Applied Herbicides at the Navajo Agricultural Products Industry Tree Farm on OP 367 Hybrid Poplar and Evaluated on May 25 and August 22; San Juan County, NM, 2006**

| | | | Weed Control[b] | | | |
|---|---|---|---|---|---|---|
| | | | May 25, 2006 | | August 22, 2006 | |
| | Rate | OP 367 Injury[b] | Saskr | Kchsc | Saskr | Kchsc |
| Treatments[a] | (lb ai/ac) | (%) | (%) | | | |
| Oust + Escort | 0.035 + 0.009 | 0 | 78 | 77 | 100 | 83 |
| Oust + Escort | 0.07 + 0.18 | 0 | 100 | 99 | 100 | 73 |
| Oust + Escort | 0.105 + 0.027 | 0 | 100 | 98 | 87 | 83 |
| Oust + Telar | 0.03 + 0.02 | 0 | 100 | 100 | 100 | 82 |
| Oust + Telar | 0.06 + 0.04 | 0 | 99 | 99 | 100 | 95 |
| Oust + Telar | 0.09 + 0.06 | 0 | 98 | 98 | 100 | 77 |
| Sinbar + Karmex | 0.8 + 1.6 | 0 | 100 | 91 | 60 | 70 |
| Sinbar + Karmex | 1.2 + 1.6 | 0 | 100 | 100 | 73 | 92 |
| Sinbar + Karmex | 1.6 + 1.6 | 0 | 98 | 99 | 63 | 94 |
| Princep | 1.6 | 0 | 100 | 96 | 70 | 90 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | | 2 | 2 | 10 | 22 |

[a]Treatments applied on December 20, 2005, and rated on May 25 and August 22, 2006.

[b]Based on a visual scale form 0-100, where 0 = no control or tree injury and 100 = dead plants, and Saskr = Russian thistle and Kchsc = kochia.

**Table 19. Control of Russian Thistle and Kochia with Spring-Applied Herbicides at the Navajo Agricultural Products Industry Tree Farm on OP 367 Hybrid Poplar and Evaluated on May 25 and August 22; San Juan County, NM, 2006**

| | | | Weed Control[b] | | | |
|---|---|---|---|---|---|---|
| | | | May 25, 2006 | | August 22, 2006 | |
| | Rate | OP 367 Injury[b] | Saskr | Kchsc | Saskr | Kchsc |
| Treatments[a] | (lb ai/ac) | (%) | (%) | | | |
| Oust + Escort | 0.035 + 0.009 | 0 | 91 | 66 | 75 | 58 |
| Oust + Escort | 0.07 + 0.18 | 0 | 100 | 68 | 77 | 67 |
| Oust + Escort | 0.105 + 0.027 | 0 | 100 | 97 | 100 | 93 |
| Oust + Telar | 0.03 + 0.02 | 0 | 98 | 100 | 95 | 77 |
| Oust + Telar | 0.06 + 0.04 | 0 | 99 | 100 | 97 | 88 |
| Oust + Telar | 0.09 + 0.06 | 0 | 88 | 90 | 97 | 82 |
| Sinbar + Karmex | 0.8 + 1.6 | 0 | 100 | 90 | 75 | 83 |
| Sinbar + Karmex | 1.2 + 1.6 | 0 | 100 | 100 | 95 | 97 |
| Sinbar + Karmex | 1.6 + 1.6 | 0 | 100 | 100 | 75 | 93 |
| Princep | 1.6 | 0 | 43 | 17 | 91 | 83 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | | 3 | 4 | 16 | 22 |

[a]Treatments applied on March 24, 2006, and rated on May 25 and August 22, 2006.

[b]Based on a visual scale from 0-100, where 0 = no control or tree injury and 100 = dead plants, and Saskr = Russian thistle and Kchsc = kochia.

**Table 20. Control of Annual Broadleaf Weeds in 8050 Sunflowers with Preemergence Herbicides on July 6; NMSU Agricultural Science Center at Farmington, NM, 2006**

| | | Crop | Weed Control[a,b] | | | | |
|---|---|---|---|---|---|---|---|
| | Rate | Injury[a] | Amare | Amabl | Solni | Cheal | Saskr |
| Treatments | (lb ai/ac) | (%) | (%) | | | | |
| Outlook | 0.56 | 4 | 96 | 99 | 96 | 100 | 47 |
| Duall II Mag | 1.25 | 2 | 97 | 99 | 95 | 100 | 43 |
| Prowl $H_2O$ | 1.0 | 0 | 93 | 99 | 90 | 100 | 71 |
| Outlook + Prowl $H_2O$ | 0.56 + 1.0 | 4 | 99 | 100 | 97 | 100 | 67 |
| Dual II Mag + Prowl $H_2O$ | 1.25 + 1.0 | 3 | 99 | 100 | 97 | 100 | 73 |
| Spartan | 0.094 | 7 | 99 | 100 | 97 | 100 | 95 |
| Spartan + Outlook | 0.094 + 0.56 | 5 | 100 | 100 | 99 | 100 | 97 |
| Spartan + Dual II Mag | 0.094 + 1.25 | 6 | 100 | 100 | 98 | 100 | 97 |
| Spartan + Prowl $H_2O$ | 0.094 + 1.0 | 5 | 100 | 100 | 94 | 100 | 99 |
| Outlook | 0.75 | 40 | 99 | 100 | 98 | 100 | 49 |
| Dual II Mag | 1.65 | 14 | 99 | 100 | 98 | 100 | 47 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 0 |
| LSD 0.05 | | 4 | 2 | 1 | 2 | 1 | 5 |

[a]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[b]Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, Cheal = common lambsquarters, and Saskr = Russian thistle.

**Table 21. Yield and Control of Annual Broadleaf Weeds in 8050 Sunflowers with Preemergence Herbicides on August 8; NMSU Agricultural Science Center at Farmington, NM, 2006**

| | | Weed Control[a,b] | | | | | |
|---|---|---|---|---|---|---|---|
| | Rate | Amare | Amabl | Solni | Cheal | Saskr | Yield |
| Treatments | (lb ai/ac) | (%) | | | | | (lb/ac) |
| Outlook | 0.56 | 87 | 96 | 94 | 98 | 45 | 2,420 |
| Duall II Mag | 1.25 | 87 | 96 | 93 | 99 | 41 | 2,606 |
| Prowl $H_2O$ | 1.0 | 84 | 96 | 87 | 95 | 68 | 2,461 |
| Outlook + Prowl $H_2O$ | 0.56 + 1.0 | 92 | 98 | 95 | 99 | 62 | 2,681 |
| Dual II Mag + Prowl $H_2O$ | 1.25 + 1.0 | 90 | 98 | 92 | 99 | 65 | 2,853 |
| Spartan | 0.094 | 93 | 96 | 95 | 95 | 93 | 2,619 |
| Spartan + Outlook | 0.094 + 0.56 | 93 | 99 | 96 | 100 | 94 | 2,695 |
| Spartan + Dual II Mag | 0.094 + 1.25 | 92 | 98 | 95 | 99 | 94 | 2,592 |
| Spartan + Prowl $H_2O$ | 0.094 + 1.0 | 96 | 99 | 91 | 100 | 96 | 2,509 |
| Outlook | 0.75 | 96 | 96 | 94 | 97 | 46 | 2,675 |
| Dual II Mag | 1.65 | 95 | 96 | 94 | 99 | 45 | 2,379 |
| Weedy check | | 0 | 0 | 0 | 0 | 0 | 722 |
| LSD 0.05 | | 2 | 2 | 3 | 2 | 7 | 449 |

[a]Based on a visual scale from 0-100, where 0 = no control and 100 = dead plants.

[b]Amare = redroot pigweed, Amabl = prostrate pigweed, Solni = black nightshade, Cheal = common lambsquarters, and Saskr = Russian thistle.

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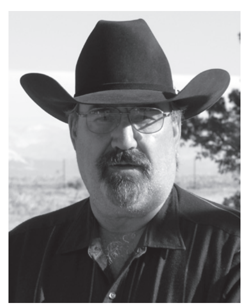


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# Notes

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