

EVALUATION OF HERBICIDE PERFORMANCE IN WINTER FALLOW BEDS

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Summary

Fallow bed weed management for lettuce is often difficult to obtain in winter due to limited field accessibility and the sensitivity of seedling lettuce. Therefore, an herbicide application method that will provide good weed control for the duration of the fallow winter period is beneficial for long-term weed management in vegetable crops. Two evaluations of herbicide efficacy for fallow bed weed control were conducted near Salinas, California. Four herbicides were applied to peaked/fallow beds at monthly pre-plant intervals, beginning three months prior to crop planting. Weed control was evaluated prior to planting and during crop establishment. Residual herbicide effects on crop vigor (phytotoxicity), stand and yield were monitored. The highest rate (0.188 lb ai/A) of Chateau/Valor, when applied up to 90 days pre-plant, significantly damaged and reduced the crop stand, therefore reducing the yield. To prevent carryover and lettuce yield reduction, Chateau/Valor at 0.188 lb ai/A should not be applied within 90 days of planting. The 0.063 lb/A rate of Chateau/Valor, Shark, and all the Goal treatments show promising results and have some potential for use as pre-plant fallow bed herbicides for lettuce. The variation in weed control and crop effects seen between the Hartnell and Spence studies may be attributable to the differing soil textures; and to the higher amount of rainfall that occurred during the Spence study period, which moved the herbicides deeper into the soil horizon.

Objective

The research objective was to evaluate pre-plant herbicide application timings for potential use in winter fallow beds prior to lettuce cropping.

Materials and Methods

Two trials were established to evaluate pre-plant herbicide application timings for weed control on fallow beds prior to lettuce planting. The trials were initiated in January 2003 (Hartnell farm) and December 2003 (Spence farm) on USDA-ARS properties, near Salinas, CA. Each experiment was established in a randomized complete block design, containing four replicate plots per treatment. Each plot consisted of a single, 40-inch wide bed. Plot lengths were 25 feet at Hartnell and 20 feet at Spence. The Hartnell test site contained sandy loam soil, with 2.1% organic matter and a pH of 7.0. The Spence test site contained loamy sand soil, with 1.0% organic matter and a pH of 7.2.

Pre-plant herbicides, Chateau/Valor (flumioxazin) 50WG at 0.063, 0.094, and 0.188 lb ai/A, Goal (oxyfluorfen) 4F at 0.25 and 0.5 lb ai/A, Goal (oxyfluorfen) 2E at 0.25 and 0.5 lb ai/A, and Shark (carfentrazone) 2E at 0.032 lb ai/A were applied to fallow unshaped (peaked) beds at approximately 3 months (~ 90 days), 2 months (~ 60 days) and 1 month (~ 30 days) prior to planting. Applications were made using a CO₂ pressurized backpack sprayer with handheld spray boom. A single, 8002 even-fan nozzle was used to band the spray solution over the peaked beds. The spray system was calibrated to deliver 40 GPA.

Iceberg lettuce 'Sharpshooter' was planted (direct seeded) on April 30, 2003 (Hartnell) and March 8, 2004 (Spence). Following planting, a preemergence application of Kerb (pronamide)

50W at 1.2 lb ai/A was made to the entire test plot. The Kerb was applied as a 5-inch band over each of the two seed lines per 40-inch bed.

Weed populations were quantified prior to thinning and cultivation/hand weeding. Weed densities at Hartnell were measured using a 0.25m² quadrat on April 16 and May 21, 2003. Weed densities at Spence were measured using a 0.25m² quadrat on March 3 and a .265m² quadrat on April 6, 2004. The total weeds/0.25m²/plot were calculated, and the herbicide efficiency (% weed control) for each treatment was determined. The major weeds present were shepherd's-purse (Hartnell/Spence), burning nettle (Hartnell) and pigweed (Spence). Lettuce stand was measured just prior to thinning on May 16, 2003 (Hartnell) and March 25, 2004 (Spence). Crop injury ratings (0–10 scale: 0 = no injury, 10 = all plants dead) were taken on May 21, 30, June 6 and 13, 2003 (Hartnell), and April 27, 2004 (Spence). Marketable heads were harvested at crop maturity and sorted by size on July 8, 2003 (Hartnell) and May 25, 2004 (Hartnell). The sorted heads were counted, weighed, and then combined for total yield. All weed and crop assessment data were subjected to ANOVA, with mean separation performed using Student-Newman-Keuls' LSD (P=0.05).

Results

At the pre-plant weed density count for Hartnell; all treatments in the three pre-plant application intervals significantly reduced total weed populations, with the exception of Shark at the 3 month pre-plant, when compared to untreated check. At the same evaluation for Spence, only the Chateau/Valor, Goal 4F and Goal 2E treatments at 90 days pre-plant, and the Goal 2E at 0.5 lb ai/acre treatment at 60 days pre-plant significantly reduced total weed populations. Chateau/Valor at 0.188 lb ai/A applied 90, 60, and 30 days before planting and Chateau/Valor at 0.094 lbs ai/A applied 60 and 30 days before planting reduced the lettuce stand in 2003 but not 2004. The Shark and Goal treatments did not reduce lettuce stand either year. In visual injury evaluations, Chateau/Valor at 0.188 lb ai/A damaged the lettuce at all application dates, while Chateau/Valor at 0.094 lb/A resulted in lettuce injury ratings >2.0 only at the 30-day interval in 2003. Chateau/Valor at 0.188 lb/A applied 60 and 30 days prior to planting reduced the number of lettuce heads, and reduced lettuce fresh weights in both 2003 and 2004 when applied 90, 60 and 30 days before planting. Chateau/Valor at 0.094 lb ai/A applied 30 days pre-plant reduced lettuce fresh weights in 2004 only. Chateau/Valor at 0.063 lb ai/A applied 90 days pre-plant was safe on lettuce in 2003 & 2004. The Goal treatments did not reduce yield in 2003; however in 2004 Goal 4F at 0.5 lb ai/A applied 30 days pre-plant reduced yields. Shark applied 30 days pre-plant reduced lettuce head numbers and fresh weights in 2004 but not 2003.

Conclusions

The results indicate that the highest rate (0.188 lb ai/A) of Chateau/Valor at any pre-plant interval would significantly damage and reduce the crop stand, therefore reducing the yield. Therefore, to prevent carryover and lettuce yield reduction, Chateau/Valor at 0.188 lb ai/A should not be applied within 90 days of planting. The 0.063 lb/A rate of Chateau/Valor, Shark, and all the Goal treatments show promising results and have some potential for use as pre-plant fallow bed herbicides for lettuce.