TWO YEARS OF PRE-PLANT RESIDUAL HERBICIDE EFFICACY TRIALS ON TEXAS HIGH PLAINS COTTON

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Abstract

With the development of glyphosate resistant pigweed on the Texas High Plains, producers in the region have been struggling to return to using pre-plant residual products for maximum weed efficacy with current production practices. These trials field tested the efficacy of the maximum rate of commonly used pre-plant incorporated herbicide products. Both trials were of randomized complete block design with four replications where an additional pre-emergence factorial herbicide treatment was evaluated. All pre-plant herbicides were applied at the earliest practical labeled date and incorporated via the cooperator's preferred method and concluded in mid-July. In 2014, the trial was placed into a conventional-tillage field. Pre-plant herbicide treatments were an untreated check, Prowl H2O, Treflan, Valor, and a Prowl H2O + Treflan mix with the factorial treatment being Cotoran. In 2015, the trial was placed into a no-till field. Treatments were an untreated check, Prowl H2O, Direx, Valor, and a Prowl H2O + Treflan mix with the factorial treatment of Cotoran. In both seasons, all treatments were significantly different from the untreated check early in the trial. By mid-July in the 2014 trial, the Prowl H2O and the Prowl, Treflan mix treatments remained significantly different from the check and all treatments containing the Cotoran factorial remained superior while the Valor and Treflan alone treatments were not significantly different from the check. By mid-July for the 2015 trial, all treatments remained significantly different from the check with the Prowl H2O and the Cotoran factorial treatment separating out as superior to all other treatments.

Introduction

In 2011 Palmer amaranth, aside from being the most common weed found in West Texas production fields (commonly referred to as pigweed or careless weed locally), was confirmed to be resistant to over the top glyphosate cotton field applications in several counties in the Texas High Plains region (International Survey of Herbicide Resistant Weeds). This building problem initiated the need for a massive shift in weed IPM management strategies for area producers away from a glyphosate only centered management plans in cotton fields back to a more integrated approach to dealing with this long time and very prolific weed pest species while maintaining overall weed control for all weed pest species. Producers quickly began to struggle with going back to utilizing the once commonly used pre-plant residual herbicides for cotton effectively under modern production practices.

The purpose of these trials were to evaluate the maximum efficacy of several of the commonly available pre-plant residual herbicides labeled for cotton production in Texas under modern production practices on a local level and to present the findings to area producers for the benefit of cotton production in the region.

Materials and Methods

For both the 2014 and 2015 trials a small plot randomized complete block design with 4 replications was utilized. Both fields utilized for the trials were in heavy clay Pullman Mollisols. All plots consisted of 4, 40 inch rows by 36 feet long. Both trials consisted of 5 pre-plant herbicide treatments which included an untreated check and a post planting, pre-emergence herbicide factorial treatment giving both trials 10 distinct treatments. All applications were made with a CO2 backpack sprayer at 10.5 gallons per acre. All pre-plant treatments were targeted for the earliest practical application date and the factorial pre-emergence was made post planting and pre crop emergence. A regional standard surfactant treatment of 0.25 % v/v was added to all treatments. Both trials were incorporated by the cooperator's best preferred modern standard method. Weed counts began 2-4 weeks before planting and continued on a bi-weekly basis but were also conducted on targeted dates of interest. Actual weed counts were

taken early in both trials until weed populations increased to a point that made actual counts impractical. Once weed populations reach were deemed too high to count, a percent control compared to the untreated check was taken in place of weed counts. Data was also collected on cotton crop-herbicide damage on all counting dates. Both trials were concluded in early July in conjunction with the plots being utilized as demonstrations for field days. No in-season over the top herbicide was applied or any cultural weed control practice was utilized on the plots for the duration of the trials. Following the conclusion of both trials, all surviving weeds in all plots were hand hoed and weeded until weed free.

2014

The 2014 trial was conducted in a conventionally tilled, furrow irrigated field. The treatments utilized for the 2014 trial are found in Table 1.

Table 1. 2014 Residual Herbicide in Cotton Trial Treatments.

Pre-plant treatment	Pre-emerge treatment	rate(s)
untreated	untreated	na
Prowl H2O	untreated	3 PT / na
Trifluralin	untreated	3 PT / na
Valor	untreated	2 oz. / na
Prowl H2O + Trifluralin	untreated	1.5 PT + 1.5 PT/ na
untreated	Cotoran	na / 4 PT
Prowl H2O	Cotoran	3 PT / 4 PT
Trifluralin	Cotoran	3 PT / 4 PT
Valor	Cotoran	2 oz. / 4 PT
Prowl H2O + Trifluralin	Cotoran	1.5 PT + 1.5 PT / 4 PT

All pre-plant herbicide treatments for this trial were made on March 12, 2014. Incorporation was done later on March 12 via lister tillage. On April 10 the trial area was pre-irrigated via flood irrigation. Weed counts began on April 21. Early in the trial, counts were made for individual weed species until it was noted later that the only weed of significance in the trial was pigweed. At that point, only total weed counts were made with no differentiation in weed species. The trial area was mechanically 'rod-weeded' on May 9 and cotton was planted on May 12. The pre-emergence Cotoran treatments were made on May 14. The cotton field containing the trial experienced a weather induced failure to establish a viable cotton stand. The field and trial area was 'rod-weeded' again on June 1 and was replanted on June 2. The trial was concluded with the last weed count date of July 7.

2015

The 2015 trial was planted into a no-till, pivot irrigated field with terminated wheat cover. The treatments utilized for the 2015 trial are found in Table 2.

Table 2. 2015 Residual Herbicide in Cotton Trial Treatments

pre-plant treatment	pre-emerge treatment	rate(s)
untreated	untreated	na
untreated	Cotoran	na / 3 PT
Prowl H2O	untreated	3 PT / na
Prowl H2O	Cotoran	3 PT / 3 PT
Valor	untreated	2 oz. / na
Valor	Cotoran	2 oz. / 3 PT
Direx 4L	untreated	1.6 QT / na
Direx 4L	Cotoran	1.6 QT / 3 PT
Prowl H2O + Trifluralin	untreated	1.5 PT + 1.5 PT / na
Prowl H2O + Trifluralin	Cotoran	1.5 PT + 1.5 PT / 3 PT

All pre-plant herbicide treatments were made on March 30, 2015. Incorporation was done via 2 inch irrigation on the night of March 30-31. Weed counts began on April 20. No differentiation in weed species were ever made in weed counts in 2015. The field was planted on May 15 and Cotoran pre-emergence treatments were made on May 18. The rate of the pre-emergence treatment of Cotoran was reduced from the 2014 rate for economic concerns from 4 PT/ac to 3 PT/ac. The trial was concluded with the last weed count date of July 13.

Results and Discussion

Only selected dates for weed counts will be shared from both trials to prevent replication in data reporting. No cotton damage was noted from any herbicide treatment including all of the Cotoran pre-emergence treatments.

2014

Differences between the untreated check and any residual herbicide treatment were noted by the first weed count date of April 21 and continued through the hectic month of May following the first planting (P=0.0432). On April 21, all plots treated with any residual herbicide remained weed free, while those plots left untreated by a pre-plant residual herbicide or not treated yet with the pre-emergence Cotoran treatment had notable weed populations.

By June 5, the Trifluralin treatment was no longer significantly different from the untreated check and treatments with the newly applied pre-emergence treatment of Cotoran added began to significantly differentiate from Trifluralin (P=0.0034).

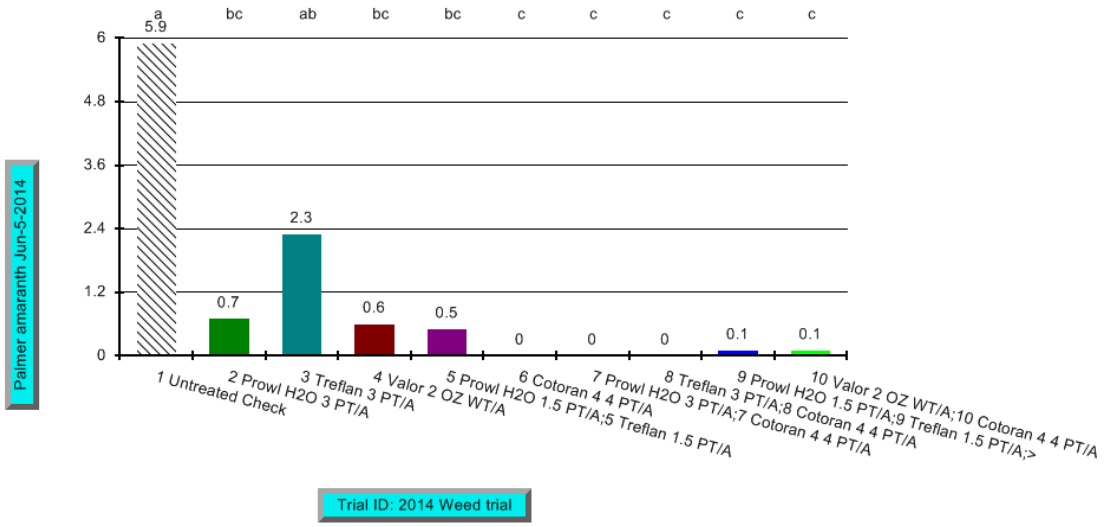

Figure 2. Number of emerged pigweeds per plot on June 5, 2014 (P=0.0034).

By the July 7 final weed count date, taken in terms of percent control compared to the check, Trifluralin and Valor were not significantly different from the untreated check. Prowl H2O remained significantly different from the check but not significantly different from Trifluralin or Valor. The Prowl H2O + Trifluralin treatment was significantly different from the check, Trifluralin and Valor and was statistically similar to all other treatments. All treatments that included the Cotoran pre-emergence treatment were significantly different from the check, Trifluralin, Valor and Prowl H2O treatment with the exception of the Trifluralin / Cotoran treatment which remained similar to the Prowl H2O treatment (P=0.0001).

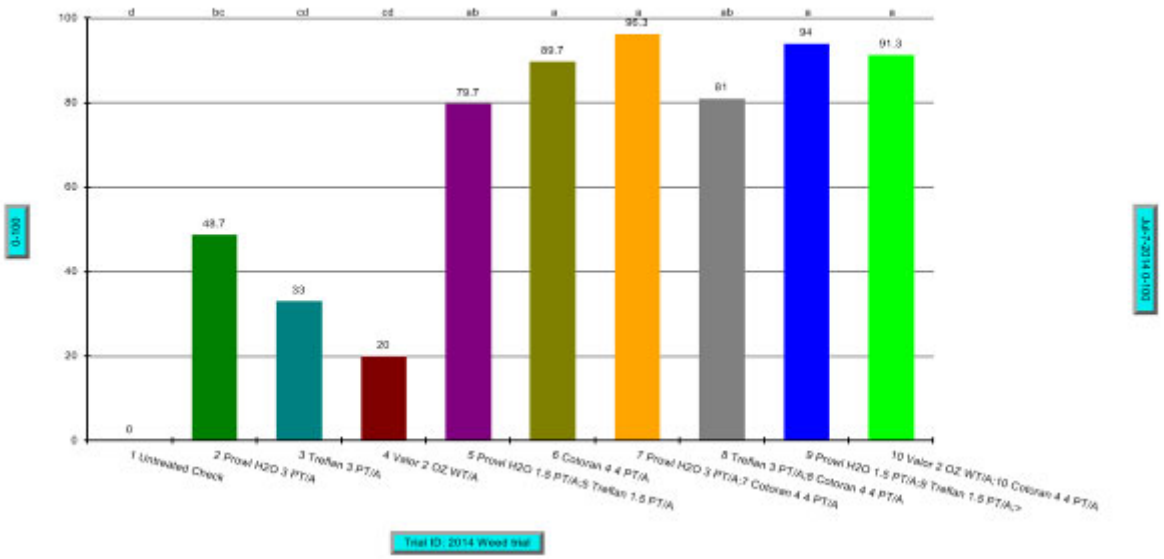

Figure 3. Percent weed control compared to the untreated checks, July 7, 2014 (P=0.0001).

2015

By the first weed count date of April 20, numeric but not significant differences could be noted between plots treated with any residual herbicide and those that had not been treated or not yet treated. Plots treated with any residual herbicide contained an average of 0.22 weeds per plot while untreated plots contained an average of 0.88 weeds per plot.

By May 18, significant differences were noted between plots treated with any residual herbicide and the check but no plots were weed free (*P*=0.0087).

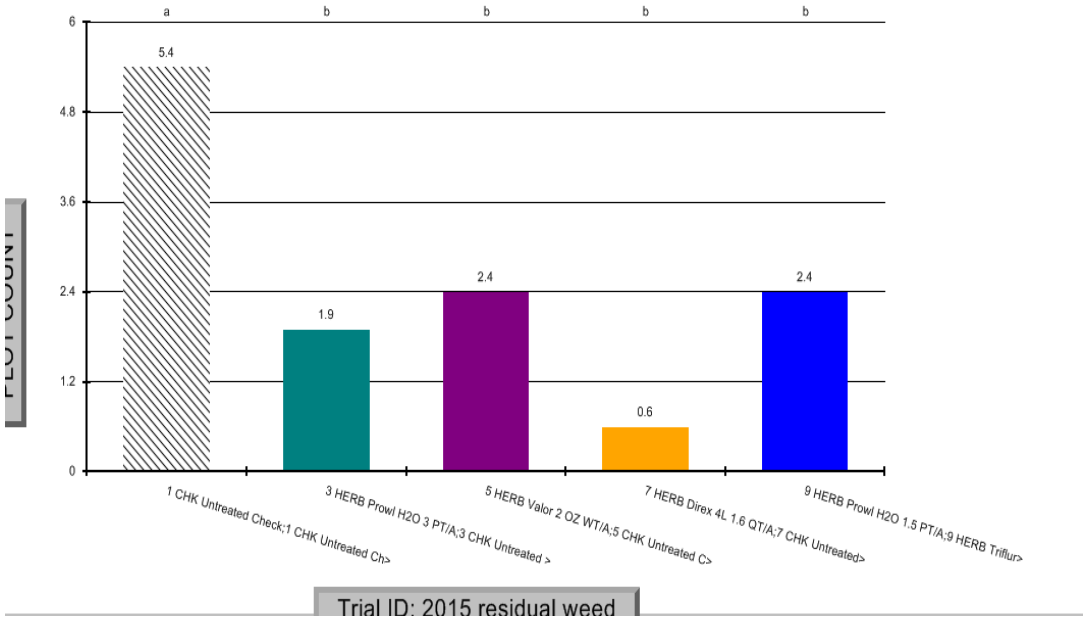

Figure 5. Weeds per plot May 18, 2015 (*P*=0.0087).

By June 10, all treatments had been applied and significant differences from the check increased for all treatments. All treatments that included the pre-emergence Cotoran treatment were significantly different from all single chemistry treatments except the Direx 4L / Cotoran treatment. While not significant the Direx 4L / Cotoran treatment held the same numeric trend as those treatments with significance (*P*=0.0001).

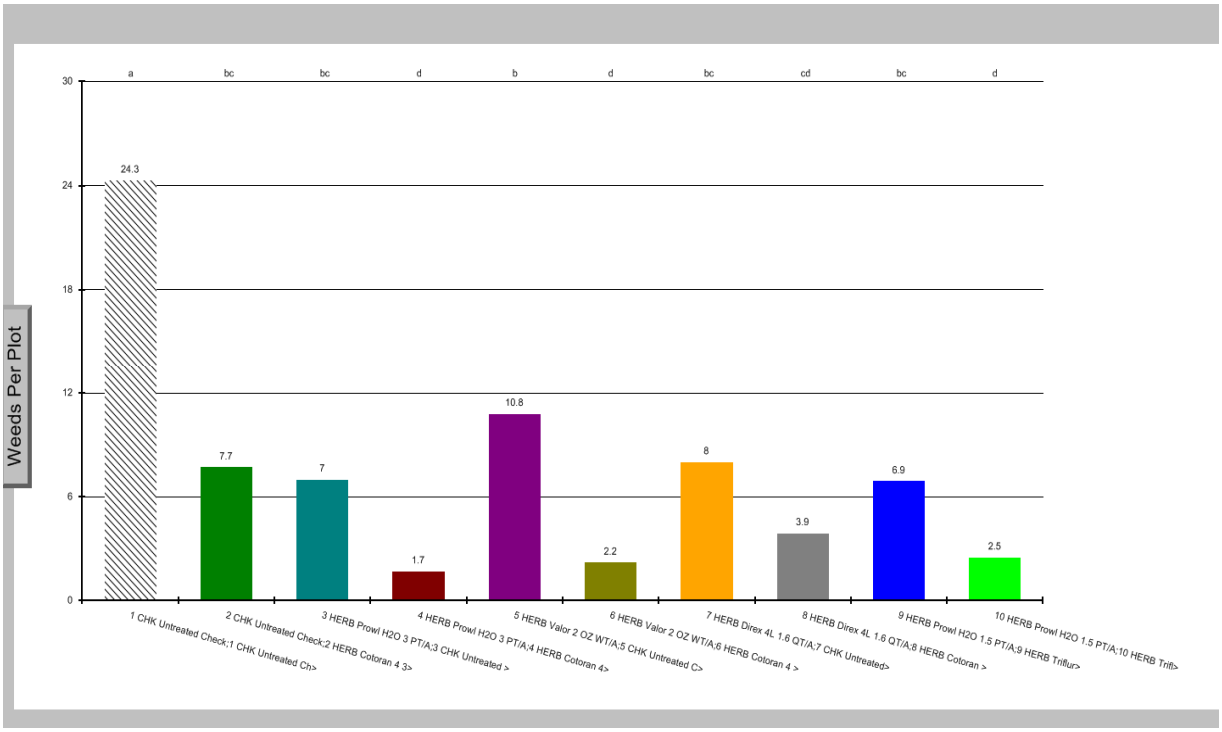

Figure 6. Number of weeds per plot on June 10, 2015 (*P*=0.0001).

On the final count date of July 13, all treatments remained significantly different from the check. The numeric trend of increased percent weed control by adding the Cotoran pre-emergence treatment continued, but this trend was not significantly different for any treatment except the Prowl H2O / Cotoran treatment which was superior to all other treatments numerically but remained statistically similar to the untreated / Cotoran treatment and the Prowl H2O + Trifluralin / Cotoran treatment (*P*=0.001).

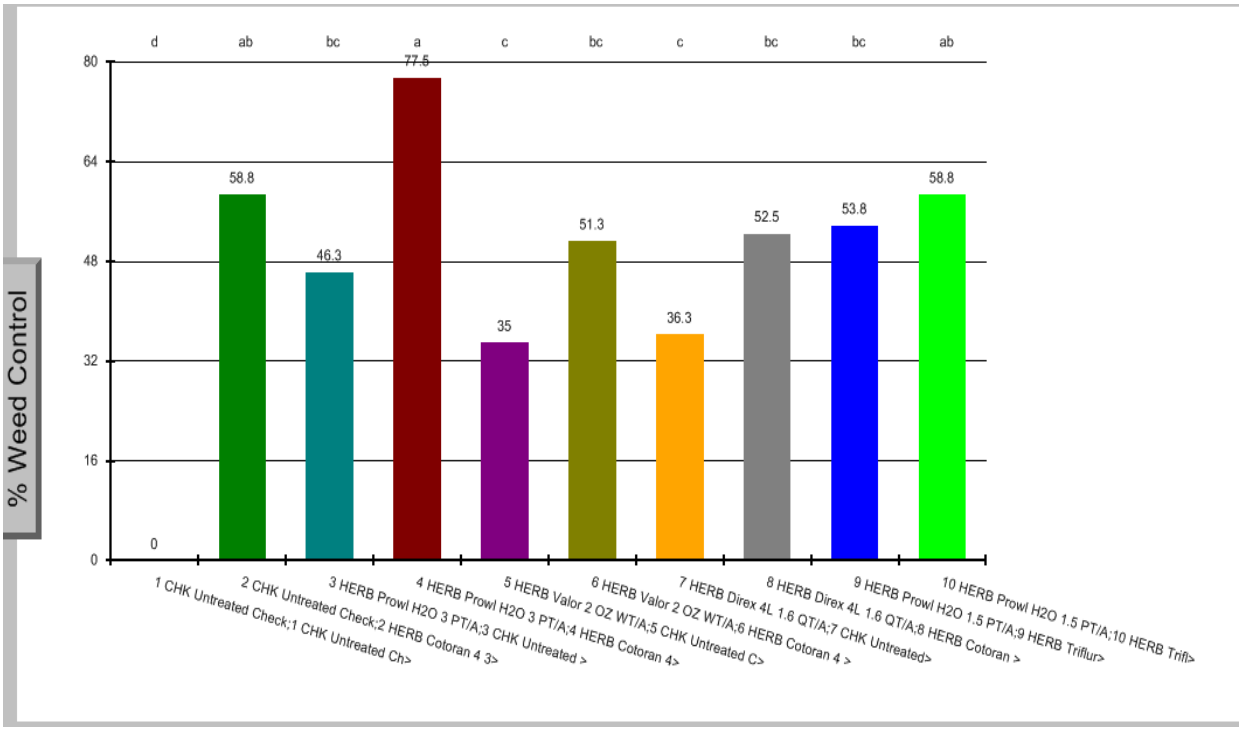

Figure 7. Percent weed control on July 13, 2015 (*P*=0.001).

Summary

First, it should be noted that all pre-plant residuals were significantly superior compared to the untreated checks at some point in both trials proving that all pre-plant incorporated cotton herbicides have value on the Texas High Plains under modern production practices. While some individual treatments, at least numerically and somewhat significantly, appeared to hold a longer residual than others, the product characteristics of the treatments tested vary greatly. For example, some products will incorporate with water far better than others. These more readily soil incorporated products are very likely to not remain stable and active in the weed seed germination zone as long. In many modern cotton production situations an increase in effective incorporation could be an ideal trade for length of residual as long as the length of effective efficacy is understood and additional modes of action are in place from a solid weed IPM plan that are in place.

It should also be noted that the addition of the pre-emergence treatment of Cotoran as a second mode of residual herbicide action trended numerically and sometimes quite significantly in both trials to increase weed control. It should also be underscored that no herbicide damage from this or any other treatment was noted throughout both trials. While the threat of crop damage from Cotoran remains, this treat might not be as great in heavier clay soils and could be less than suspected for most soil types. This could be of special significance in situations similar to the 2014 trial with the failure to establish a cotton stand due to weather issues as the pre-emergence treatment of Cotoran was actually applied pre-replant. Also to be underscored is the fact that the 2014 untreated / Cotoran pre-emergence alone treatment was twice mechanically plowed and was made weed-free. Prior to this mechanical plowing for seedbed preparation, these plots had substantial populations of weeds present.

The performance of the Prowl H2O + Trifluralin treatment in the 2014 trial was a surprise and looks to be a very good fit for conventionally tilled cotton fields. The reasons for the increased performance over both the Prowl H2O and the Trifluralin alone treatments is not understood at this time as both products contain almost identical active ingredients. It is suspected that a wider band of incorporation might be responsible for this mixtures success but no information has been gathered to substantiate this suspicion. This mixture does not seem to hold the same advantage over Prowl H2O alone in no-till situations in the 2015 trial.

No treatment for either trial obtained 100 % weed control for the duration of the trials. The results from these trials do show that the products tested with these treatments are and should be substantial tools in modern production practices in maintaining weed control through IPM and that additional modes of action and / or methods of control should be utilized to achieve optimum weed control.

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References

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