Field Report

Assessing the Effect of Various Adjuvants on Weed Control

Globally, weeds are responsible for decreasing the production of the world's eight most important food and cash crops by 13.2%, making them a significant threat to the global food supply.[1] The loss is staggering, conservatively costing farmers $100 billion (U.S.) annually.[2]

For tens of thousands of years, people growing crops have battled losses stemming from various causes, including weather, natural disasters, pests, and weeds. While farmers have no control over weather-related losses, they can combat weeds which, in general, present the highest potential yield loss to crops along with pathogens (fungi, bacteria, etc.) and animal pests (insects, rodents, nematodes, mites, birds, etc.) which are of less concern.

Controlling weeds is also key to reducing hunger worldwide. Considering global grain production at ~2.1 billion metric tons, and assuming an overall yield loss of just 10% due to weeds,[3] the total loss in grain production is ~200 million metric tons. If this loss can be reduced by half, grain production would increase by 100 million metric tons, a significant amount.[4]

The importance of controlling weeds, whether by phytosanitary sprays or mechanical control, has never been more important. For example, dependent on individual crops and crop rotation, herbicide treatment ensured 13–50% higher crop yields than untreated plots.[5]

Unfortunately, many weeds, such as Amaranthus (red weed) which can grow up to five centimeters per day and produce 1.8 million seeds per season, have become resistant to herbicides like the glyphosate formulations commonly used worldwide.[6]

To combat herbicide resistance, it has become a common practice to combine popular herbicides to boost efficacy. In this field report, we'll explore the results of using the Gulf adjuvant in conjunction with popular herbicide mixes to control Amaranthus in Argentina. We'll compare those results against the impact of using the same herbicide mixes with other leading adjuvants as well as against the herbicide mixes alone.

Product compatibility

There were no product compatibility issues with the Gulf adjuvant. Excellent emulsion was observed for the Gulf adjuvant when mixed for the test application.

Product application

Fields were treated at doses of 0.75%, 1.00%, 1.25%, and 1.50% v/v. and then observed in five separate visits following the application: at 3,7,14, 21, and 38 days.

Breakout of product mixes, and concentrations tested

TREATMENT #	PRODUCT	ACTIVE INGREDIENT	CONCEN-TRATION	FORMULATION	DOSE % VOLUME
a	No Application				
b	Gulf adjuvant				0.75 v/v
	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700
c	Gulf adjuvant				1.00 v/v
	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700
d	Gulf adjuvant				1.25 v/v
	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700
e	Gulf adjuvant				1.50 v/v
	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700
f	Adjuvant Competitor 1				250 ml/ha
	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700
g	Adjuvant Competitor 2				200 ml/ha
	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700
h	Herbicide 1	Glifosato	480	SL	1700
	Herbicide 2	Ester Etilhexilico	643	EC	700

Adding the Gulf adjuvant increased the initial and final control of weeds when compared to the mix of a glyphosate-based soluble liquid herbicide and an ester-based emulsifiable concentrate herbicide being applied alone, without the addition of an adjuvant.

All adjuvants were tested at their manufacturer-recommended rates:
Gulf adjuvant was tested at multiple dosages (0.75%, 1.00%, 1.25%, and 1.50% v/v) as part of a dose-response evaluation.
Competitor 1 was applied at 200 ml/ha per 120L of spray mix.
Competitor 2 was applied at 200 ml/ha per 120L of spray mix.

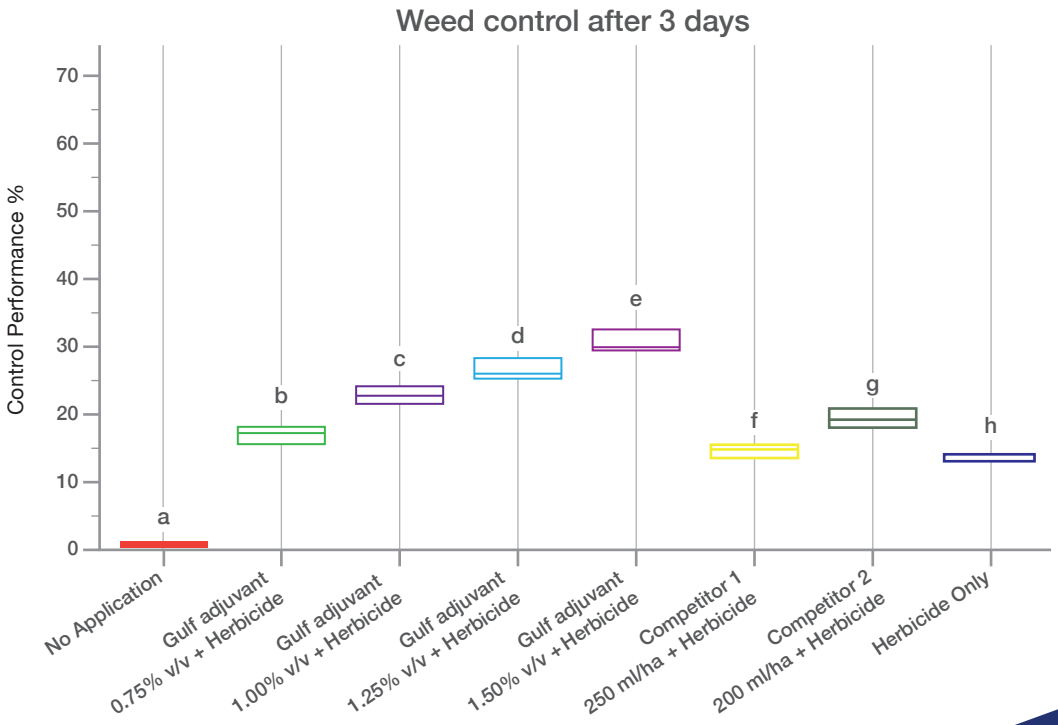
Competitor dosages reflect their standard application rates, as per manufacturer recommendations, ensuring a fair comparison of products at commonly used field rates. Gulf adjuvant is a mineral oil-based adjuvant, whereas Competitors formulation applied silicone-based surfactants, ethoxylated surfactants, or methylated seed oils (MSO). These differences in formulation type may contribute to variations in performance beyond just dosage levels.

Results

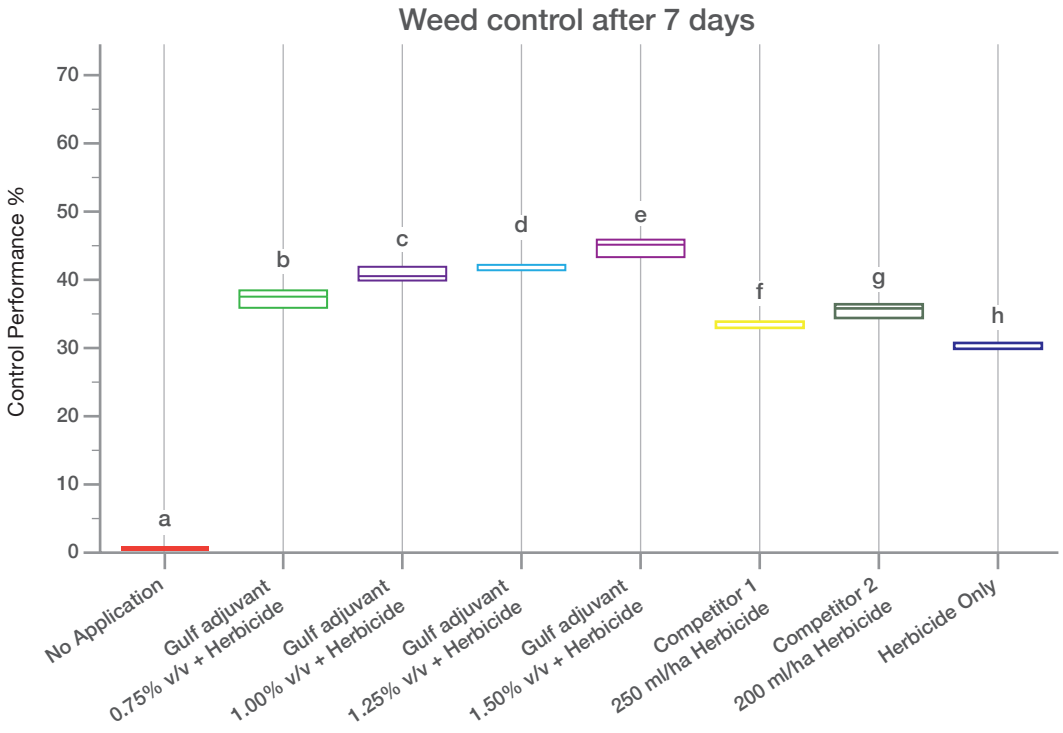
The most significant results were realised when the adjuvant was used at higher concentrations. All higher doses of Gulf adjuvant (1.00%, 1.25%, and 1.50% v/v) demonstrated better control performance in both initial and final testing.

Mineral-oil based adjuvants are widely recognised for their ability to enhance herbicide performance by improving spray coverage, retention, and penetration into the leaf surface. Unlike silicone or ethoxylated surfactant-based adjuvants, mineral oils create a uniform film that reduces evaporation and increases herbicide uptake, particularly under challenging environmental conditions such as drought or high temperatures. This results in more consistent weed control and prolonged herbicide efficacy. The dose-response evaluation in this study demonstrates how Gulf adjuvant, a mineral oil-based formulation, enhances the activity of systemic herbicides, leading to improved initial and final control

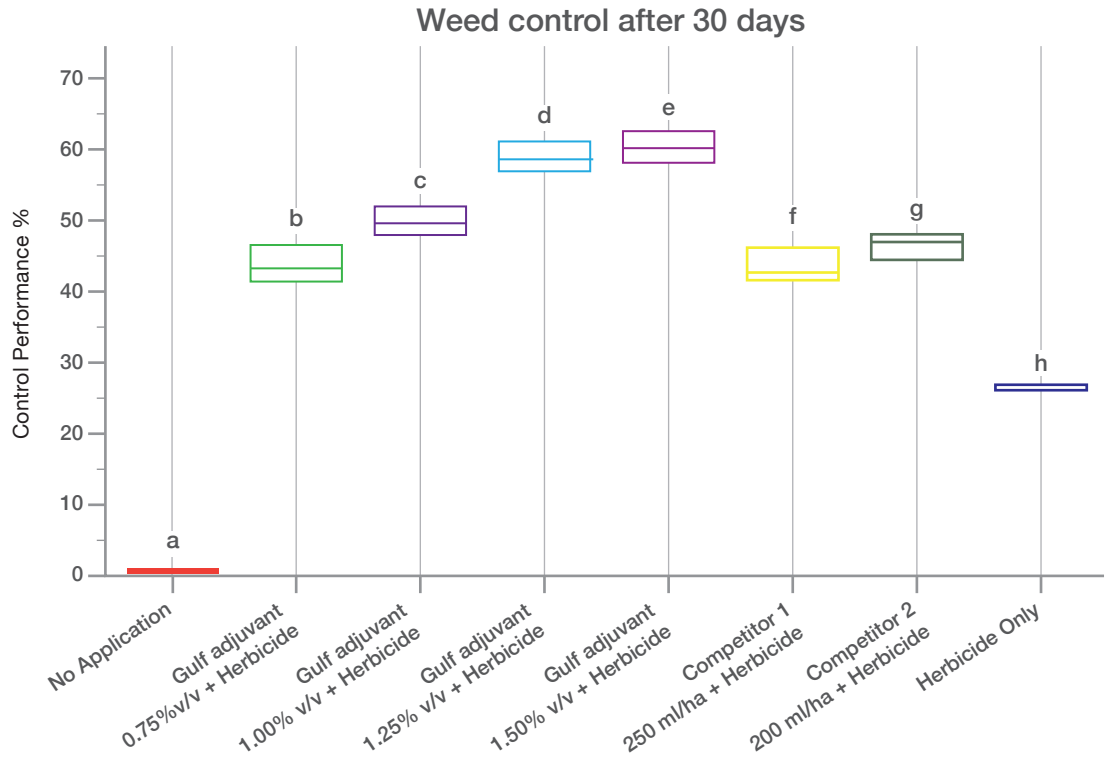
Weed control 3 days after the initial application of the various formulations



Weed control 7 days after the initial application of the various formulations



Weed control 30 days after the initial application of the various formulations



Conclusion

Overall, as expected, all treatments using the Gulf adjuvant significantly outperformed those not using an adjuvant. In addition, significantly improved weed-control results were seen when the Gulf adjuvant was used at the highest suggested concentration level.

Given the USD 100 billion annual cost of crops lost to weeds, just a 50% increase in control performance could save farmers worldwide USD 50 billion annually. When Gulf adjuvant was added to herbicide application, after 30 days the control performance was over 60%.

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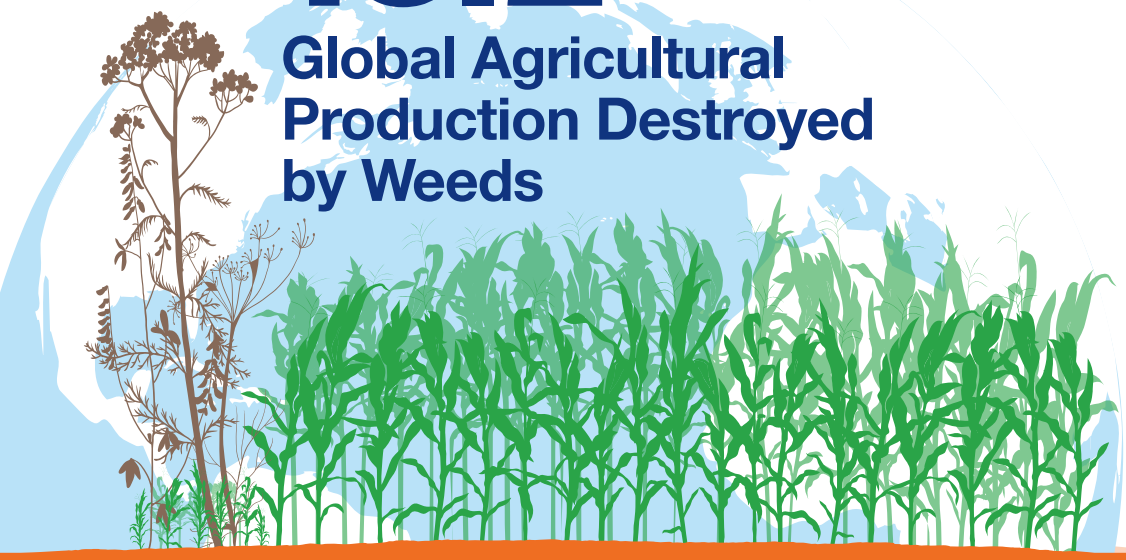
Weed Control

Assessing the Impact of Agricultural Adjuvants

Adjuvants help to optimise the performance of agrochemical products, making them more effective and efficient throughout the application process.

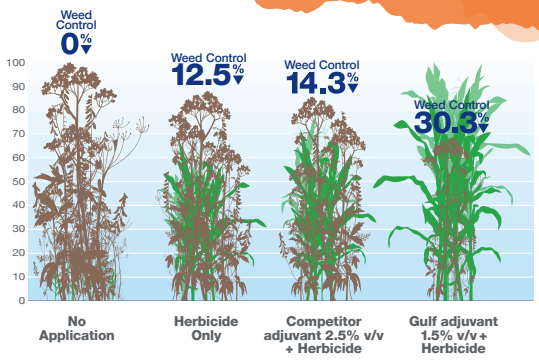
13.2%

Global Agricultural Production Destroyed by Weeds



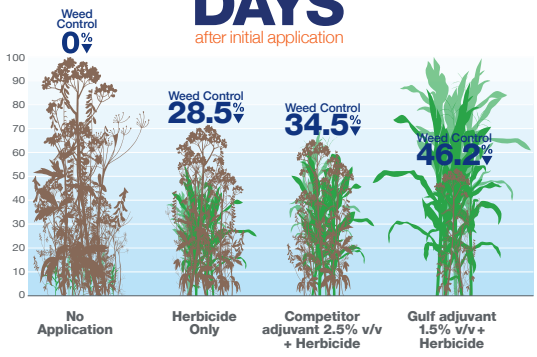
USD 100 BILLION

Annual Cost to Farmers of Crops Lost to Weeds

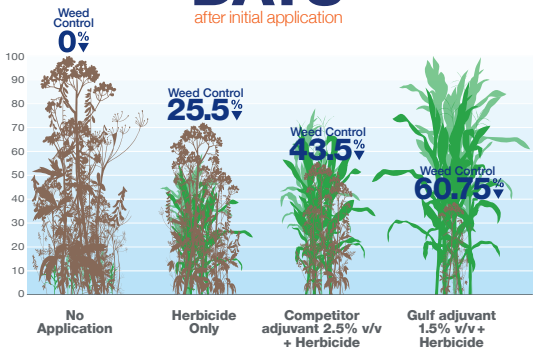


3 DAYS
after initial application

7 DAYS
after initial application



30 DAYS
after initial application



Sources

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