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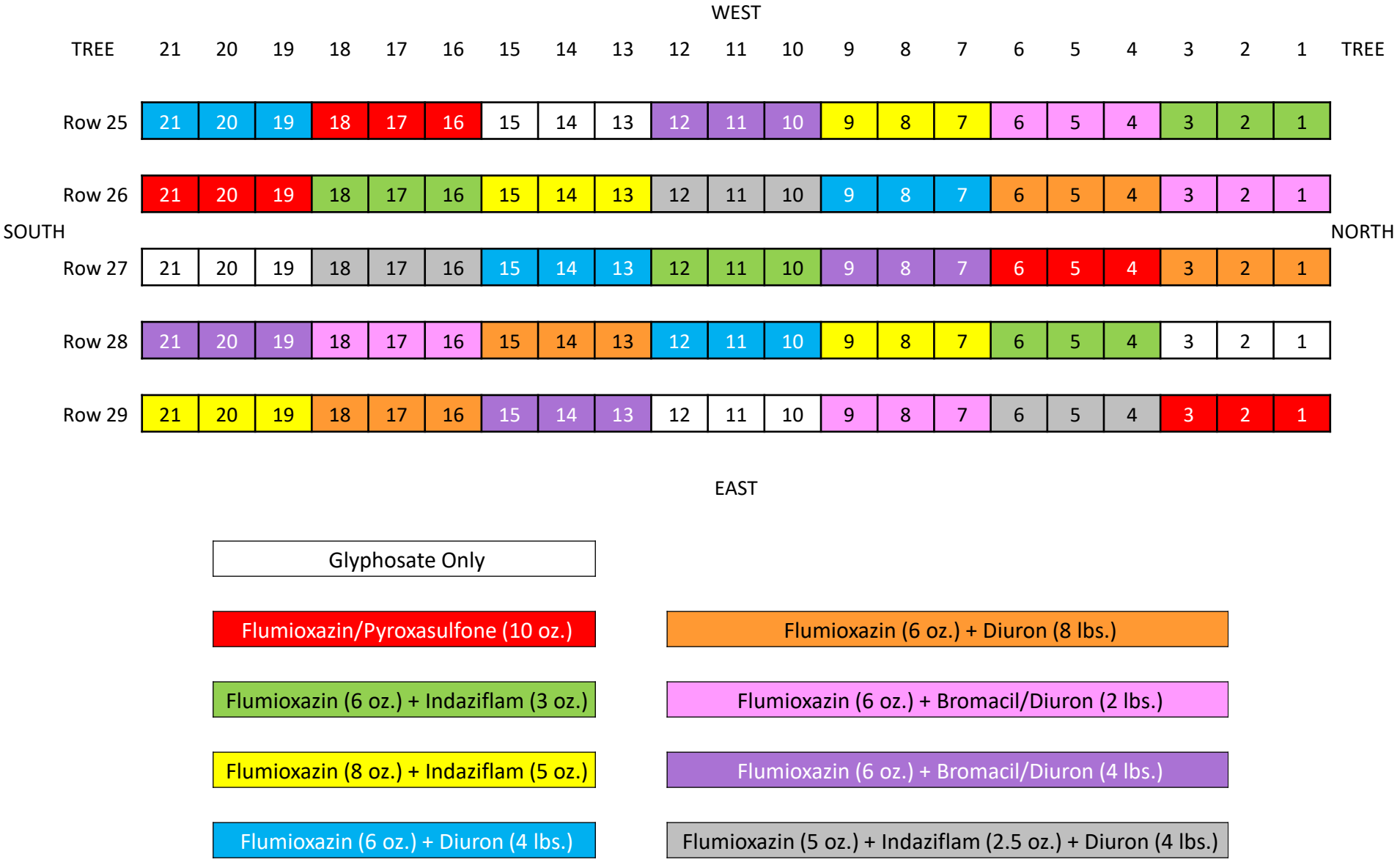
Field Plot Map of Pre-Emergent Herbicide Synergy Trial in Citrus



Glyphosate Only	
Flumioxazin/Pyroxasulfone (10 oz.)	Flumioxazin (6 oz.) + Diuron (8 lbs.)
Flumioxazin (6 oz.) + Indaziflam (3 oz.)	Flumioxazin (6 oz.) + Bromacil/Diuron (2 lbs.)
Flumioxazin (8 oz.) + Indaziflam (5 oz.)	Flumioxazin (6 oz.) + Bromacil/Diuron (4 lbs.)
Flumioxazin (6 oz.) + Diuron (4 lbs.)	Flumioxazin (5 oz.) + Indaziflam (2.5 oz.) + Diuron (4 lbs.)

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Weed Control Using Pre-Emergent Herbicide Mixes in Citrus

Trial Results, Summer 2018

Percent Total Weed Coverage of citrus experimental plot following applications of selected residual herbicides and their combinations.									
				Days After Treatment					
Trt Color	**Active Ingredient(s)**	**Trade Name(s)**	**Product Rate (per acre)**	**48**	**60**	**91**	**117**	**150**	**184**
White	Control	--	--	47.5A	72.5A	100A	100A	100A	100A
Red	Flumioxazin/Pyroxasulfone	Fierce Alone	10 oz.	0.0B	2.25B	6.75BC	30.00CD	45.00CD	75.00A
Green	Flumioxazin + Indaziflam	Chateau + Alion	6 oz. + 3 oz.	0.25B	3.00B	6.75BC	10.50DE	18.25DE	26.25BC
Yellow	Flumioxazin + Indaziflam	Chateau + Alion	8 oz. + 5 oz.	0B	2.25B	13.00BC	14.25CDE	18.25DE	19.75BC
Blue	Flumioxazin + Diuron	Chateau + Karmex	6 oz. + 4lbs.	0.50B	4.50B	14.50BC	20.25CDE	32.50DE	40.00B
Orange	Flumioxazin + Diuron	Chateau + Karmex	6 oz. + 8 lbs.	0.25B	0.75B	1.00C	1.00E	4.25E	7.00C
Pink	Flumioxazin + Bromacil/Diuron	Chateau + Krovar	6 oz. + 2 lbs.	0.25B	1.00B	9.25BC	35.00BC	62.50BC	75.00A
Purple	Flumioxazin + Bromacil/Diuron	Chateau + Krovar	6 oz. + 4 lbs.	0.25B	1.75B	22.25B	53.00B	82.50AB	86.75A
Grey**	Flumioxazin + Indaziflam + Diuron	Chateau + Alion + Karmex	5 oz + 2.5 oz. + 4 lbs.	0.0B	0.66B	2.33C	7.67E	19.00 DE	26.67CB
CV				158.1	68.8	53.0	45.8	44.8	36.4
P-Value				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

*Means separated using Least Significant Differences (LSD) at α = 0.05. Values with the same letter do not significantly differ.
**Grey treatment has only a total of 3 replications to all other treatments 4 replications.
All treatments including control received glyphosate (Roundup Power Max) at 88oz product per acre & adjuvants, Quest and Induce, both at 1Qt/100gal (0.25% v/v).

Utilization of Liquid Carbon Dioxide for Efficient Herbicide Application

Small-scale sprayers are practical and versatile systems for a wide range of targeted applications, including herbicides, insecticides, fungicides, and other agriculture chemicals. Advantages of using sprayers pressurized with compressed carbon dioxide (CO_2) are that they produce relatively steady pressure and consistent spray quality, which reduces off-target drift, without requiring repeated pumping mid-application. In addition, precise pressure during spraying is easier to achieve as opposed to power take off (PTOs) units or other motorized pumping systems. The latter system requires pressure to build up for adequate spray application.

Most commonly, using CO_2 for spraying crops and other areas has principally involved a "backpack sprayer" consisting of small propellant tanks with no more than a few gallons of spray material, and a single spray tipped wand. Capacity is limited by what an applicator can carry. Using the same principles, this method could be scaled up using equipment able to carry larger tanks, which would expand the application to several acres and reduce the need to reload propellant or spray material. All-terrain vehicles (ATV's) may be used instead of larger, heavier, and more costly equipment. ATV's allow for more flexibility in range, maneuverability, and type of terrain covered (for example, citrus grove swales).

Figure 1 Liquid Carbon Dioxide and Spray Tank Assembly

Tractor or all-terrain vehicle (ATV) mounted CO_2-pressurized sprayers are commonly used for pesticide application. Such vehicles equipped with compressed system sprayers would benefit from utilizing liquid CO_2 as the pressurizing agent. Since significantly more liquid CO_2 could be stored in the pressurizing tank compared to gaseous CO_2, a higher volume of spray solution could be applied before needing to refill or replace the tank. Significant benefits would be seen when spraying large farms and plots, where frequent tank refills have been a hindrance

to using this type of spray system. This would result in an effective pesticide application by improving cost efficiency and maintaining accuracy.

A one-kilogram tank of liquid CO_2 can displace over 100 gallons of spray material when utilized in properly designed spray system (Figure 1). For citrus herbicide applications, 30 gallons per acre rate is generally used. As currently set up in ATV (Figure 2), the compressed CO_2 spray system is useful for small areas. This is ideal for our chemical efficacy trials with a full- sized boom of approximately 8-foot-wide band.

Pesticide applicators maintain a high level of interest in CO_2 pressurized sprayers because of their convenience, precision, and cost. Observations from a recent study found comparable spray quality between conventional gas CO_2 and liquid CO_2 in backpack sprayers. Our studies suggest liquid CO_2 is a viable, effective option for pressurizing sprayers to attain longer duration sprays without frequently changing the CO_2 tanks in handheld or vehicle-mounted compressed system sprayers. Utilizing liquid CO_2 for pressurizing these sprayers could offer hours of continuous use on a single tank, making large-scale jobs more manageable to complete, such as spraying pesticides in large lawns, farms, and nurseries.

Figure 2. Citrus Herbicide Boom with Compressed Carbon Dioxide Sprayer Mounted on an ATV

Reference:

Gairhe B and Kanissery R (2018) Evaluation of Liquid CO_2 as a Pressurizing Agent for Effective and Long-Term Pesticide Sprays. *Adv Crop Sci Tech* 6: 408. DOI: 10.4172/2329-8863.1000408

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