Volume 12, Number 1 **December 2017**

In This Issue

Introduction

Whitney Brim-DeForest, Editor

It is with a heavy heart that we open this issue with news of the passing of Steve Orloff, a long-time member of CWSS, as well as a dear friend and colleague to many. Over his career, Steve served on the CWSS board, including as a previous editor of this newsletter. He gave countless presentations, served on program committees, and was given the Honorary Member award just last year (2017). He will be missed.

As the newest member of the California Weed Science Society Board of Directors, I would also like to take this opportunity to introduce myself. As a student at the University of California, Davis, I felt lucky to have the opportunity to benefit from the support of the CWSS. I received several scholarships and yearly travel funds to attend conferences, and my attendance at the conferences enabled me to form lasting connections throughout the California weed science community. When I started as a UCCE Advisor last year, I wanted to become more involved in CWSS, to ensure that the tradition of this strong community continues with the newest generation of weed science professionals.

We look forward to seeing you at the conference in January!

-Whitney

Friends, Family, Industry Mourn Loss of Steve Orloff, UCCE Farm Advisor

Daniel H Putnam, UCCE Specialist; Rob Wilson, UCCE Farm Advisor
University of California Cooperative Extension and Department of Plant Sciences, Davis, CA

Family and friends mourn the loss of Steve Orloff, University of California Cooperative Extension Farm Advisor, who passed away October 3, 2017 from cancer.

Steve is remembered for his great sense of humor, his dedication to his family, his friendship to many, and his immense service to agricultural science. He served as a University of California Cooperative Extension Farm Advisor for more than 33 years.

UCCE Farm Advisor Steve Orloff advised many farmers and industry members and conducted research on many crops.

A True Agronomist. Steve Orloff was a true agronomist with broad knowledge and in-depth expertise related to most fields of agriculture science. He published hundreds of articles reporting on his original research related to pest management, irrigation, harvest management fertilization and variety selection. Steve worked with many crops including alfalfa, grass hays, small grains, onions, and several specialty crops. His accomplishments played a vital role in progressing California agriculture and helping solve many regional problems related to pests, water conservation, and economic stability. The publications “Intermountain Alfalfa Management' which he led in the 1990s, and “Irrigated Alfalfa Management for Desert and Mediterranean Zones” (2008) which he made significant contributions on are considered the leading nationwide references to management of alfalfa.

From Southern California. Steve grew up in Lancaster, California, where he learned to appreciate agriculture in the high-desert communities of Los Angeles County. It was also in Southern California that Steve learned

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to surf the waves, literally, and became an expert surfer – a passion he continued to cultivate throughout his life. Steve spent several years in Central America serving in the Peace Corps, primarily El Salvador, where he worked with marginal farmers struggling to survive in this tropical, crowded region. He met his wife-to-be in Honduras during this period. After graduation with an MS in Crop Sciences from San Luis Obispo, Steve took the University of California Farm Advisor position at Lancaster, CA. Although he had said that the job required a steep learning curve, he was aided by the many experts in crop production in the region, farmers and ranchers, PCAs, and crop specialists at UC Davis and UC Riverside who appreciated his dedication to his scientific solutions to important problems.

To the Northern Mountains. After making significant contributions in the high desert region, Steve made a momentous change in his life-to move his young family, now with three children, from the high desert of Los Angeles County to the high mountains of California, to take a position in agronomic crops at the UC Cooperative Extension office in Yreka, Siskiyou County, where he has lived for more than 24 years. In many respects, this was a good fit- given the dominance of alfalfa as a major crop, the confluence of crop rotations with small grains, pasture, and specialty crops, and the importance of irrigation in a dry environment. There Steve quickly established himself as a regional expert on many crops including alfalfa, conducting significant research on-farm as well as at the University of California Intermountain Research and Extension Center at Tulelake, CA.

Steve had as special interest in weed management. His work on the control of dodder, a major weed in alfalfa production in California, during the 1980s became the gold standard for management strategies for this important and difficult parasitic weed. More recently he conducted much of the university evaluations with Roundup-Ready alfalfa, including techniques to prevent weed shifts and resistance in this system. His sharp observations and excellent field research also identified a novel crop injury phenomenon in intermountain Roundup-Ready alfalfa in 2015-2017. He continued his field research right up until the time of his recent diagnosis in August 2017.

Widely Appreciated by Farmers. Steve was beloved by growers and industry representatives in California, the West, and nationwide due to his robust research program, excellent crop management knowledge, and his great ability to extend information in a fun and easy to understand style. He was a widely sought-after speaker at state-wide and regional events, including the Western and California Alfalfa Symposium, Western and California Weed Science Society Conferences, and annual grower meetings in New Mexico, Utah, Nebraska, Washington, Arizona, Idaho, Oregon, and Nevada. He was a regular contributor to research presentations at the UC Intermountain Research and Extension Center, and at UC Davis. His thoughtful analysis and presentation of his own research data was always a highlight of any meeting, including his incorporation of humor that always enlivened the crowd.

Steve gave many talks and conducted programs internationally in alfalfa and agricultural development, including Spain, Romania, Chile, Argentina, China and Mexico. His talent and his in-depth knowledge was appreciated not only by many farmers and industry members in California, but throughout the nation, as well

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as internationally. He has received many awards including the Jim Kuhn Service Award from the California Alfalfa & Forage Association in 2011.

The most important attribute of Steve, though were his personal characteristics. He was personal friends to many farmers, industry members and university colleagues. He was valued not only for his accomplishments and intelligence, but his ability to light up a room and to engage on nearly every subject. He deeply loved his family and community and will be sorely missed by all. Steve is survived by his wife Islia, sons Rob, Michael and Danny, mother Carol and sisters Lisa and Diane.

Understanding Growers' Perceptions and Priorities to aid Herbicide Resistance Management Strategies

Liberty Galvin, PhD Student
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Herbicide resistant weeds are well-documented pests occurring in almost every agricultural setting across California. Herbicide resistance is the coping mechanism that plants have when exposed to a toxin, much like a human immune system responding to a virus, and is caused by continual use of a single mode of action (MOA). Resistance is dependent on the crop type and weed ecology of the infestation, but is heavily influenced by growers' choices. Many resistance management protocols describe technical options such as rotating modes of action, tillage, burning, mowing, etc., but often fail to acknowledge the motivation behind choosing certain strategies over others. Additionally, there are common misconceptions surrounding resistance may influence the effectiveness of long-term management efforts. Misinformation can make it difficult for growers to determine which practices are best for their setting and can cause distrust in otherwise reputable sources. Resistance prevention, management, and outreach efforts should incorporate growers' perceptions and priorities to ensure long-term efficacy and diversity of weed control strategies.

From an advisory position, filling in knowledge gaps related to how resistance occurs can help improve management decisions. There are two common misconceptions among growers that hinder adoption of more rigorous resistance prevention and management. First, there is the belief that the industry will produce new technology at such a rate that resistance management is not necessary. This perception was reinforced when glyphosate resistant crops were introduced after resistance issues arose from ALS-inhibitors. Even though the industry constantly produces new products, a new MOA has not been introduced to the market in over 20 years. Once a weed is resistant to a single MOA, there is only a brief window of time before that weed spreads across fence lines. Second, many growers believe that resistance in inevitable. While herbicide resistance in

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weeds is indeed inevitable, how fast this process occurs is dependent on application choices and the collective effort to reduce and control pest populations.

Ensuring growers have the right information is the first step, but ultimately decisions are made based on a set of priorities that impact some aspect of their livelihoods. For most growers, maximizing economic returns is the top objective each season. Most achieve a steady income by implementing the same practices each year, decreasing the risk from switching practices and costs associated with new equipment. Because of this, many growers are hesitant to adopt new strategies that do not have apparent aggregate benefits to the whole operation. For example, glyphosate resistant technology provided the opportunity for reduced-cost, non-selective weed control that could be implemented at any time during the growing season, and made way for conservation tillage practices. The rapid adoption of this technology was contributed to the reduced cost in multiple aspects of production. Economics also play a role in land-ownership and access to resources. Land-owners have more flexibility in control strategies and are more likely to make choices that have long-term consequences compared with renters who are making lease-to-lease decisions. Additionally, renters are less likely to rotate crops, and consequently modes of action, because of the uncertainty and inputs involved with rotating crops over several years. There are other obvious factors in deciding which strategy to implement, e.g., what method is cheapest, however, there are long-term benefits that are not always apparent. Individuals making recommendations should prioritize grower's needs, but also ensure these priorities are being constructed from well-understood principles of how resistance issues develop and spread.

Recently, multiple MOA resistant crops that are designed to accommodate current glyphosate efficiency and expand weed control options have become available to corn, cotton, and soybean growers. To demonstrate trade-offs of glyphosate resistance management over time, the USDA created a bioeconomic model for multiple MOA resistant corn and soybeans that simulated different glyphosate-resistance management strategies. This model did not exclude glyphosate, but encouraged use of other modes of action during intermittent years, a strategy that could be implemented with multiple MOA crops. They found that growers will suffer economic losses in year 1. This supports the theory that economics plays a large role in renters' year-to-year decision to use a single MOA. However, their model also showed that in all scenarios any losses suffered in year 1 would be recovered by year 3 with more than $10 per acre annual increase. This was due to a slight diversification in management strategies, dramatically decreasing the likelihood of resistant weeds and ensuring long-term efficacy of herbicide chemistry. This scenario only holds true for multiple MOA resistant corn and soybeans, but sheds light on the cost-savings potential for other cropping systems that rely on a single MOA.

"Ensuring growers have the right information is the first step, but ultimately decisions are made based on a set of priorities that impact some aspect of their livelihoods."

Often, the physiological and biological nature of a plant can increase its likelihood of becoming a weed; on the other hand, it is applicators themselves that play a large role in herbicide resistance with their choices. The practical methods for managing herbicide resistance are present. However, the social aspects, such as scientific miscommunication, should also be factors that professionals consider when determining strategies

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for resistance management. In order to maintain diverse weed control options, growers must communicate their needs and educators must be willing to listen and be flexible in order to sustain long-term efficacy of current crop protection technology.

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Livingston, M., Fernandez-Cornejo, J., Unger, J., Osteen, C., Schimmelpfennig, D., Park, T., & Lambert, D. (2015). *The Economics of Glyphosate Resistance Management in Corn and Soybean Production* (No. ERR-184). USDA-ERS. https://www.ers.usda.gov/publications/pub-details/?pubid=45357

Controlling Herbicide-Resistant Italian Ryegrass

John Roncoroni, UCCE Weed Science Advisor; Caio Brunharo, PhD Student;
Bradley Hanson, UCCE Weed Science Specialist
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Sonoma County has become a 'hot-spot' for herbicide resistant Italian ryegrass (Lolium perenne spp. multiflorum). Like most areas in northern California, almost 100% of the ryegrass in Sonoma is known to be resistant to glyphosate (RoundUp and others). In 2013, I was contacted by a grapegrower with suspected glufosinate (Rely, Lifeline and others) resistance. I contacted Dr. Marie Jasieniuk, Professor Dept. of Plant Sciences at UC Davis, who has been working on resistance for her assistance. Samples of this population and several other populations in Sonoma and Lake Counties were collected as part of a larger project. In greenhouse studies, this population was found to not be resistant; however a population near Cloverdale was found to be resistant to Rely.

In spring of 2015, I was contacted by another grower after a sethoxydim (Poast) treatment failed to control a population of ryegrass that was known to be resistant to glyphosate. I contacted Dr. Brad Hanson, UCCE Weed Specialist, to alert him to the possible resistance. Plants were collected and grown to maturity in greenhouses at UC Davis to collect seed. A subsequent fluazifop (Fusilade) application was made in the vineyard; this treatment also failed. Dr. Hanson's PhD graduate student, Caio Brunharo, carried out greenhouse experiments to characterize the response of the suspected-resistant population of Italian ryegrass, compared to a previously characterized, susceptible population. Plants were treated with, fluazifop, glufosinate, glyphosate, sethoxydim, paraquat (Gramoxone), clethodim (Clethodim and Select), rimsulfuron (Matrix), and pyroxsulam (not registered in grapes) at various rates for the construction of dose-response curves. A field experiment was also carried out in the affected vineyard to assess the efficacy of sethoxydim (Poast Plus at 2.25 pints/A + COC at 1%) paraquat (Gramoxone SL 2.0 at 4 pints/A + NIS at 0.25%), glufosinate (Rely 280 at 56 fl. oz./A + AMS at 1% + NIS at 0.25%), rimsulfuron (Matrix SG at 4 oz./A + NIS

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at 0.25%) and fluazifop (Fusilade DX at 12 fl. oz./A + NIS at 0.25%). Based on the greenhouse experiment, the Sonoma population was highly susceptible to clethodim, glufosinate, paraquat, pyroxsulam and rimsulfuron, and had moderate susceptibility to sethoxydim. On the other hand, the quantity of glyphosate and fluazifop necessary to reduce the growth of the Sonoma population by 50% was 126 and 31 times larger, respectively, compared to the susceptible. Validating the results obtained in greenhouse, poor control of the Sonoma population with fluazifop and moderate control with sethoxydim was observed in the field. Conversely, glufosinate, paraquat and rimsulfuron provided excellent (91 to 97%) control of the Sonoma population. These field and greenhouse experiments confirmed glyphosate and fluazifop resistance in the Sonoma

Table 1. Efficacy of pre- and post-emergent herbicides on herbicide-resistant Italian ryegrass in vineyards in Sonoma County, CA.

			Ryegrass control		
			February 16	April 14	June 2
	Treated January 28		19 DAT	77 DAT	126 DAT
			Burndown[1]	Control[2]	Control[2]
1	Roundup	2 qt	4	5	4.8
2	Chateau	12 oz	7.8	7.3	8.9
3	Mission	2.85 oz	7.3	9.6	9.9
4	Matrix	4 oz	7	10	10
	Prowl H2O	4 qts			
5	Matrix	4 oz	6	9.8	10
	Alion	3.5 fl oz			
6	Chateau	6 oz	4.8	4.3	5.8
	Prowl H2O	4 qts			
7	Chateau	6 oz	8.3	8.5	9.8
	Alion	3.5 fl oz			
8	Mission	2.14 oz	6	9.5	10
	Prowl H2O	4 qts			
9	Mission	2.14 oz	6	10	10
	Alion	3.5 fl oz			
10	Control		0	4	5.8
	All treatments made with 2 qt Roundup PowerMax = 0.5% ProAMS except Control				

[1]Burndown rated on 0-10 scale- 0= no phytotoxicity; 10=dead

[2]Control rated on 1-10 scale- 1= no control; 10=complete control

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vineyard site but indicated that the population was susceptible to glufosinate, paraquat and rimsulfuron.

I conducted a trial in the same field to determine what combinations of herbicides could be used to not only control Italian ryegrass, but also other common weeds, with a combination of preemergence and postemergence herbicides with glyphosate. These herbicides were: flumioxazin (Chateau), flazasulfuron (Mission), rimsulfuron (Matrix), indaziflam (Alion), and pendimethalin (Prowl H_20). A complicating factor for successful control is that Italian ryegrass germinates early in fall with the first rains. This is usually much earlier than most growers in the north coast make their herbicide applications. All treatments (see table 1) controlled ryegrass except Treatment 1 (RoundUp PowerMax 2 qts. /acre) and Treatment 6 (Chateau 6 oz. plus Prowl H_2O 4qts. plus Roundup PowerMax 2 qts. /acres) even though the herbicides in Treatment 6 provided excellent control when mixed with other herbicides. Matrix and Mission, both sulfonylurea herbicides, are slow acting materials which resulted in lower burndown rating 19 days after application, but produced excellent control when mixed with long-lasting herbicides Alion or Prowl H_2O.

References

'A population of Italian ryegrass from Sonoma County California exhibits resistance to fluazifop and glyphosate.' Brunharo, C., J. Roncoroni, B. Hanson. Abstract submitted to California Weed Science Society, 2017.

Controlling Sharppoint Fluvellin

John Roncoroni, UCCE Weed Science Farm Advisor
University of California Cooperative Extension

Sharppoint fluvellin (*Kickxia eglantine* (L.) Dumort.) has gone from what many growers considered a minor nuisance in the northern Napa and eastern Sonoma Counties, to a weed that has spread throughout many area of the state. In some areas the infestation of this annual weed has become so thick that the 'skeleton' the plant leaves when it dies in the winter catches so many fallen grape leaves that its keeps much of the herbicides from hitting the soil. This may keep the preemergence herbicide from being incorporated in to the soil and will shield small weeds from postemergence herbicide making the application ineffective.

We are just beginning to understand fluvellin biology as it relates to its growth in vineyards in northern California. Germination can occur throughout the year, except for the coldest part of winter. Germination that occurs in mid to late summer and throughout the fall is the most important because this comes at a time when little or no weed control operations are done in the vineyard. Vineyards that are routinely cultivated in the vine row will not have a large fluvellin problem. It is the vineyards that are 'no-till' under vine that may see large infestations of fluvellin.

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Results (Table 1): Fluvellin is not a 'good competitor', meaning that is less of a problem when weed control is not as effective against other weeds. Long-lasting herbicides are important for fluvellin control because of its extended, late germination period. In this trial started on December 15, 2015 in Sonoma County, we used power backpack blowers to remove the fallen grape leaves and some of the fluvellin skeleton from all plots. All plots were then treated with 2 quarts / acre of Roundup PowerMax + 0.5% ProAMS. Results indicate that a postemergence treatment with glyphosate after leaf drop in late fall or early winter combined with a treatment in late winter (but before bud break) made up of a combination of glyphosate plus a burn-down herbicide plus a long lasting preemergence herbicide provides the best control of fluvellin. Herbicide combinations that included flazasulfuron (Mission) at 2.15 oz/acre and rimsulfuron (Matrix) at 4oz/acre provided the best control at 239 days after treatment rating. Flumioxazin (Chateau) at 10oz/acre provided good control but those combinations with 6 oz/acre were not successful.

Table 1. Efficacy of tank-mixes of a pre- and post-emergent herbicide on fluvellin control in vineyards in Sonoma County, CA.

	Treatment	Rate/Acre	Fluvellin Control[2]			Control-New Germination[2]
			June 30	Aug 4	Sept 22	Nov 29
	Treated Jan 28		(155 DAT)	190 DAT	239 DAT	307 DAT
1	ROUNDUP P Max	1qt	5.5	5	5.5	7.4
	CHATEAU	10 oz				
2	ALION	5 fl oz	7	5.9	6.6	9.3
	CHATEAU	6 oz				
3	ALION	5 fl oz	9.3	7.4	7.6	7.8
	MATRIX	2 oz				
4	ALION	5 fl oz	9.6	9.6	9	9.7
	MISSION	2.14 oz				
5	TRELLIS SC	23 fl oz	8	6	5.8	7.9
	CHATEAU	6 oz				
6	TRELLIS SC	23 fl oz	9.9	8.8	7.8	7.1
	MATRIX	4 oz				
7	TRELLIS SC	23 fl oz	10	9.6	9.4	9.1
	MISSION	2.14 oz				
8	CHATEAU	10 oz	9.3	8.1	7.8	7.6
	PROWL H2O	6 qt				
9	PROWL H2O	6 qt	9.6	8.5	7.5	7.6
	MATRIX	4 oz				
10	CHATEAU	10 oz	9.7	8.8	8.4	7.3
	MATRIX	4 oz				
	All treatments made with 1 qt Roundup PowerMax and 0.5% v/v ProAMS Dec 15, 2015 All fallen leaves blown from plots and 2qt Roundup PM applied					

Management of Multiple-Resistant Italian Ryegrass in Perennial Crops in California

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Italian ryegrass (*Lolium perenne* L. spp. *multiflorum* (Lam.) Husnot) causes yield losses in a variety of cropping systems around the world (Figure 1). This species is highly competitive with annual crops but may also compete with perennial crops particularly during the establishment years when they are most vulnerable to direct competition. In orchards and vineyards, Italian ryegrass infestation can also interfere with cultural practices during the bearing years.

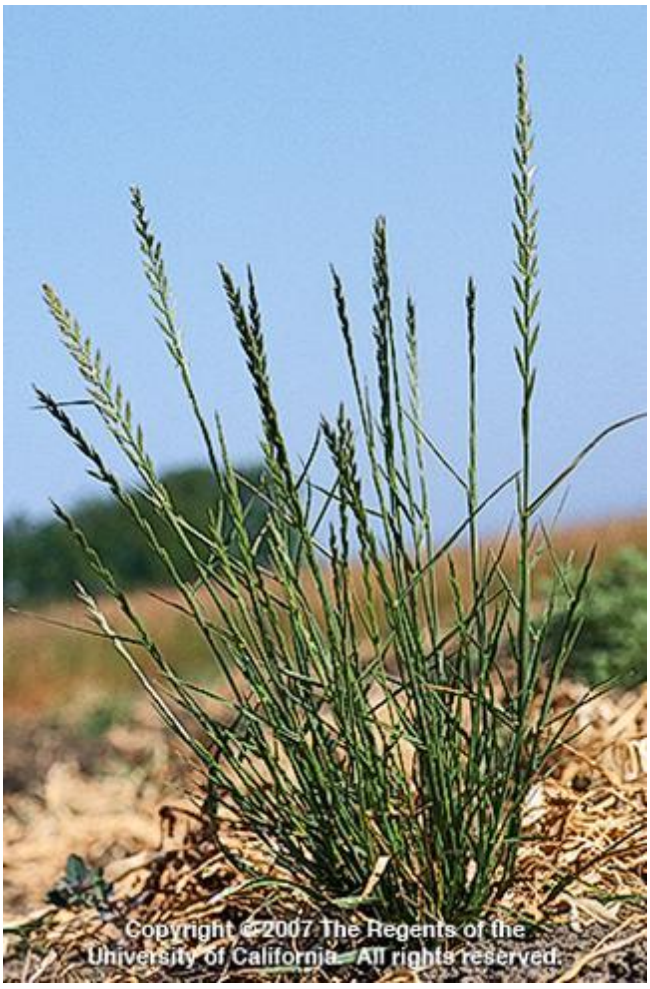

Figure 1. Mature plant of Italian ryegrass

Repeated herbicide use has selected Italian ryegrass populations resistant to a variety of herbicide mode of actions across the world. Glyphosate-resistant Italian ryegrass populations were first reported in California in 2008, and the evolution and spread of these populations in the state made alternative postemergence herbicides an important management strategy against this troublesome species.

Recently, poor control of Italian ryegrass with Gramoxone 2.0 SL was reported in a prune orchard near Hamilton City, California. Greenhouse dose-response experiments and field trials were carried out to evaluate Italian ryegrass response to several postemergence and preemergence herbicides.

Our greenhouse studies confirm that the Italian ryegrass population from Hamilton City is resistant to Gramoxone 2.0 SL, Envoy Plus and Roundup PowerMAX, whereas Rely 280, Matrix and Poast controlled both a known-susceptible and resistant Italian ryegrass population (Table 1). It seems that Fluazifop DX and Simplicity CA exhibited lower efficacy on the resistant population, though our results were not conclusive with the statistical procedure adopted (note: Simplicity CA, which is not registered in perennial

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crops, was included in the study for comparison purposes). Our criteria were that whenever the resistance index (RI) was larger than two and the comparison between biotypes was statistically different (P <0.05), the population was considered as resistant to that particular herbicide. Matrix is an exception, however, because when applied POST, this herbicide controlled both biotypes at well below its recommended preemergence field rate.

Table 1. Dose-response experiments with a multiple-resistant and a susceptible population of Italian ryegrass.

	GR_{50} (±SE)[2]			
Herbicides[1]	Resistant	Susceptible	RI (±SE)[3]	P-value
Envoy Plus	416 (82)	40 (11)	10 (3)	<0.01
Fluazifop DX	309 (1099)	25 (10)	12 (45)	>0.05
Rely 280	188 (17)	158 (12)	1 (0.1)	>0.05
Roundup PowerMAX	1647 (124)	170 (9)	10 (1)	<0.001
Gramoxone 2.0 SL	1089 (57)	57 (9)	19 (3)	<0.001
Simplicity CA[4]	12 (8)	1 (1.5)	20 (52)	>0.05
Matrix	29 (3)	17 (3)	2 (0.3)	>0.05
Poast	4 (2)	1 (1)	3 (2)	>0.05

[1]Ammonium sulfate at 1% was added to all treatments. Non-ionic surfactant at 0.25% was added to Envoy Plus, Fusilade DX, Roundup PowerMAX, Gramoxone 2.0 SL, Simplicity CA and Matrix. Crop oil concentrate was added at 1% to Poast.
[2]Herbicide rate (in g a.i. ha^{-1} or g e.a. ha^{-1}) to reduce plant biomass by 50% (GR_{50}) compared to a nontreated control; SE: standard error.
[3]Resistance index (ratio between GR_{50} of resistant and susceptible biotypes).
[4]Simplicity CA is not registered for use in perennial crops and was included for comparison purposes only.

The field experiment with postemergence herbicides corroborates with data from the greenhouse studies, since glyphosate and paraquat did not adequately control the herbicide-resistant population from Hamilton City. On the other hand, most of the treatments containing Rely 280 were effective on the glyphosate-paraquat resistant population (Figure 2).

Treatments with PRE herbicides provided high weed control levels based on visual assessments up to 150 DAT (Table 2). Tankmixes containing Alion and Chateau, as well as solo treatments of Alion (3.5 fl oz/A or 5 fl oz/A), Chateau (12 oz/A), Surflan AS (4 qt/A), GoalTender (3 pt/A) and Prowl H2O (4 qt/A) alone also provided weed control >90%. Conversely, Matrix alone (4 oz/A) and Broadworks + Prowl H2O (6 fl oz/A + 2

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qt/A) did not control Italian ryegrass more than 80% by 150 DAT. Matrix, however, may be an option when an herbicide with a short residual activity is practical, since it did control Italian ryegrass well up to 60 DAT (data not shown). Broadworks is an herbicide with primary broadleaf activity, and the relatively modest control when combined with Surflan AS and Prowl H2O was due to the relatively low rates used.

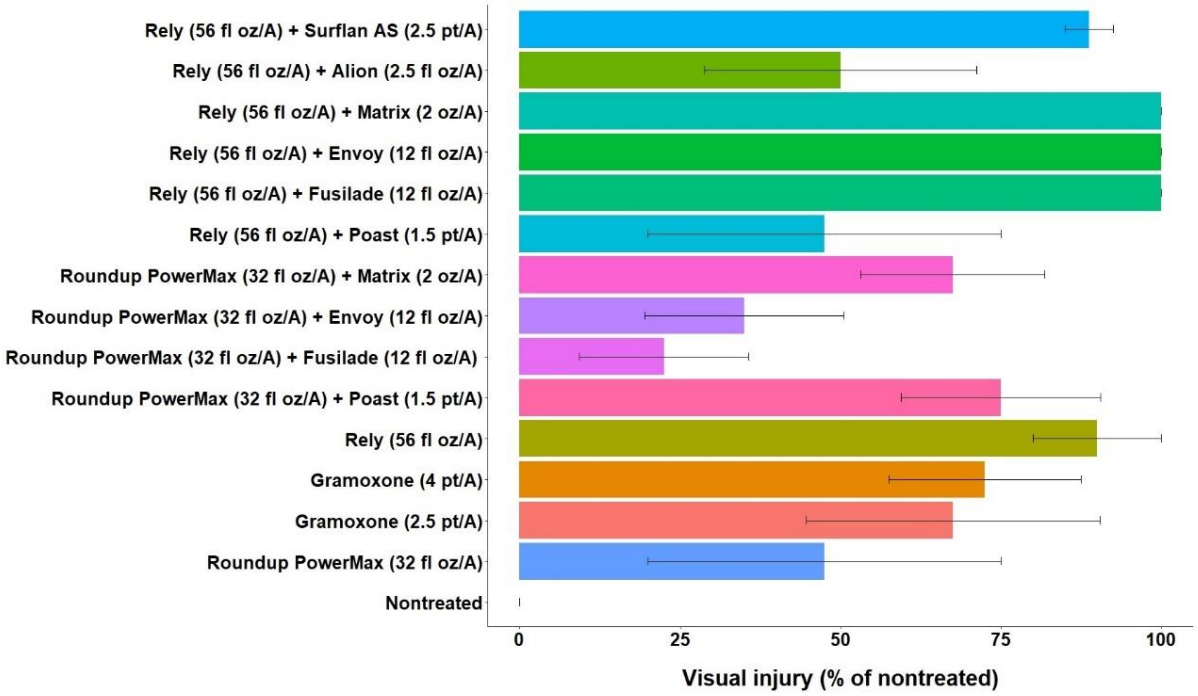

Figure 2. Postemergence herbicide efficacy in a multiple-resistant population of Italian ryegrass in Hamilton City, CA.

Even though several postemergence herbicides controlled Italian ryegrass in our research, it should be noted that ryegrass populations resistant to Rely 280 and Poast have been reported elsewhere in the state, and overreliance on these herbicides will increase the chances of selection of further cases of resistance. A chemical weed management program in areas infested with Italian ryegrass should include a preemergence herbicide with long residual sprayed in the winter (Alion, Chateau, Surflan, GoalTender or Prowl H2O are possible options) tankmixed with an effective postemergence herbicide. In areas where herbicide-resistant weeds are known to be present, alternative herbicide chemistries should be adopted (rather than increasing the herbicide rate sprayed) in both the winter and spring application. In some cases, a short residual grass herbicide included with the post-harvest burndown application may help reduce recruitment of early-germinating Italian ryegrass plants which will reduce weed pressure and densities to be managed later in the season.

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Table 2. Multiple-resistant Italian ryegrass visual injury 150 DAT after herbicide treatment in a prune orchard in Hamilton City, CA in 2014/2015.

Treatment[a]	Rate	Visual injury[b]
		%
Nontreated control	-	0±0 c
Alion 200 SC	3.5 fl oz/A	96±3 ab
Alion 200 SC	5 fl oz/A	98±1 a
Alion + Chateau	3.5 fl oz/A + 6 oz/A	100±0 a
Alion 200 SC + GoalTender	3.5 fl oz/A + 3 pt/A	100±0 a
Alion 200 SC + Matrix	3.5 fl oz/A + 2 oz/A	98±1 a
Matrix	4 oz/A	68±7 b
Chateau	12 oz/A	97±2 ab
Chateau + Prowl H2O	6 oz/A + 4 qt/A	98±1 a
Chateau + Surflan AS	6 oz/A + 2 qt/A	98±1 a
Surflan AS	4 qt/A	90±3 ab
GoalTender	3 pt/A	98±1 a
Prowl H2O	4 qt/A	91±3 ab
Broadworks + Prowl H2O	6 fl oz/A + 2 qt/A	76±7 b
Broadworks + Surflan AS	6 fl oz/A + 2 qt/A	86±4 ab
Alion 500 SC	1.4 fl oz/A	98±1 a
Alion 500 SC + Matrix	1.4 fl oz/A + 2 oz/A	97±2 ab

[a]*Rely 280 at 82 fl oz/A, Roundup PowerMAX at 32 fl oz/A, ammonium sulfate at 1% and non-ionic surfactant at 0.25% were added to all treatments.*
[b]*Means followed by same letter within a column are not statistically different.*

CWSS Awards 8 Student Scholarships in 2017

Scott Oneto, UCCE Farm Advisor
University of California Cooperative Extension

Each year, the California Weed Science Society offers three unique opportunities to support undergraduate and graduate students with an interest in weed or invasive plant management. These include scholarships, internships and undergraduate research awards. To be eligible for any of these awards the student must be pursuing a degree at an accredited 2-year college or 4-year university in California and demonstrate a strong interest in weed or invasive plant management.

This year, the society has awarded 8 scholarships in the amount of $1,000 each. The students include:

HannahJoy Pheasant: A Masters student at U.C. Davis, HannahJoy is studying International Agricultural Development. Her goal is to develop innovative technology for the agricultural sector to increase economic opportunities and reduce backbreaking labor. Her thesis project is working to develop automated weed control systems that achieve significant reductions in need for hand weeding and herbicides while maintaining a practical and cost-effective weed control system.

Adalia Cajias: An undergraduate student at CSU Chico, Adalia is majoring in Crop Science & Horticulture. She is passionate about sustainable agriculture production and weed control.

Emily Bick: A PhD student at U.C. Davis, Emily is in the Entomology Graduate Group where she is examining the use of spatio-temporal models to predict population dynamics of an invasive aquatic weed.

James 'Sunny' Brucker: An undergraduate student at Cal Poly State University, San Luis Obispo, James is majoring in Agricultural and Environmental Plant Science with a concentration in Fruit and Crop Science. James is currently working on getting his PCA and CCA licenses and is confident that weed control and management practices will play a major role in his career.

Alex Ceseski: A PhD student at U.C. Davis in the Horticulture and Agronomy Graduate Group with an emphasis on Weed Science. Alex is studying rice systems in California and is specifically looking at mapping the extent and spread of ALS-inhibitor resistance and cross-resistance throughout the California rice-growing region, and hopes to be able to elucidate the precise genetic and/or metabolic mechanisms of that resistance in select smallflower umbrella sedge populations. Alex is also continuing to work on using alternative rice seeding strategies to enhance weed control.

May Yang: An undergraduate student at CSU Fresno, May is majoring in Plant Science with an emphasis in Plant Health. May has a strong interest in weed science in agricultural systems and would like to further pursue her education as a graduate student studying weed resistance.

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Diane Onofre: An undergraduate student at CSU Fresno, Diane is majoring in Plant Science with an emphasis in Plant Health. Diane is currently working with her professors examining the germination conditions of Sprangletop. In addition, she is also working on a project looking at glyphosate resistant Fleabane.

Katie McCauley: A PhD student at U.C. Davis in the Horticulture and Agronomy Graduate Group with an emphasis on Weed Science. Katie's research focuses on understanding herbicide resistance in sprangletop, an important weed in California. Her research includes determining the mode of resistance and what physiological and biochemical changes can cause the resistance. In addition, she is conducting research to find new tools to manage herbicide resistant weeds in California rice cropping systems.

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The California Weed Science Society
http://www.cwss.org