Wild Rice Notes

University of California
Agriculture and Natural Resources

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In This Issue

Pest Management Strategic Plan Meeting (PMSP)
Tuesday, March 26, 2024

10:00 am - 2:00 pm

UCANR Yuba Office

142A Garden Hwy, Yuba City, CA 95991

Lunch Will Be Provided

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Sign-up here: https://forms.gle/Eyi9v4PdfV4SJBXE6

to RSVP by Monday, March 18, 2024

Wild Rice 2022 Field Trial

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There are few herbicides currently registered for wild rice weed management in which phytotoxicity and efficacy level information are limited. We conducted a field trial study in Shasta County testing six products to provide more herbicide data for wild rice growers and industry members.

Herbicides Tested:

- Clincher CA® (cyhalofop-butyl)*
- Loyant® (florypyrauxifen-benzyl)*
- Granite SC® (penoxsulam)*
- Grandstand CA® (triclopyr)*
- SuperWham® (propanil)*
- Shark H2O® (carfentrazone)

**Note: these products are not currently registered in wild rice in the US.*

Weeds Present (Shasta County):

- watergrass species (*Echinochloa* spp.)
- smallflower umbrella sedge (*Cyperus difformis*)
- water hyssop (*Bacopa* spp.)
- redstem (*Ammania* spp.)
- plantain (*Alisma plantago-aquatica*)
- ricefield bulrush (*Schoenoplectus mucronatus*)
- ducksalad (*Heteranthera limosa*)
- spikerush (*Eleocharis palustris*)
- sprangletop (*Leptochloa* spp.)
- arrowhead (*Sagittaria montevidensis*)

Each herbicide was tested at two different rates except for Shark H2O, which was used as a comparative control since it is an industry-standard. The trial also had an untreated control, and the treated plots were compared to it (for phytotoxicity and weed control). Spraying took place at three different intervals during the wild rice growing season and was evaluated for rice phytotoxicity and weed control efficacy at five different intervals after application.

Phytotoxicity Evaluation

Plots sprayed with Granite SC had 100% stand loss. The next affected plots were those sprayed with Grandstand as they had chlorotic and lodging symptoms till the end of the season, and the number of panicles was also significantly less. Plots applied with Loyant, particularly at a higher rate, had some phytotoxic symptoms (mostly leaf cupping/twisting) that went away with time. It also had some reduced heading rates, though not significantly different from the Shark H2O treatment. Clincher, at its higher rate of application, had similar results to Loyant. At its lower rate, there was no heading reduction. SuperWham treatments had low phytotoxicity from which the plants recovered and demonstrated the best heading overall.

Table 1. *Phytotoxicity evaluations 39 days after herbicide application. Averages of the four treatment replications are reported, with different letters following each mean indicative of differences (using a Tukey test).*

	Treatment	Rate (per Acre)	% Stunting	% Stand Loss	% Leaf Burn	% Leaf Cupping/Twisting	% Chlorosis	% Lodged	% Heading
1	Untreated Control	NA	12.5 a	10.0 ab	0 a	0 a	0 a	0 a	85.0 cd
2	Untreated Control	NA	8.8 a	6.3 ab	0 a	0 a	0 a	0 a	62.5 bcd
3	Clincher CA + COC	15 fl oz	7.5 a	0 a	0 a	0 a	0 a	0 a	92.5 cd
4	Clincher CA + COC	30 fl oz	17.5 a	23.8 b	0 a	0 a	0 a	0 a	70.0 bcd
5	Loyant +MSO fb Loyant +MSO	21 fl oz fb 21 fl oz	7.5 a	0 a	0 a	0 a	0 a	0 a	77.5 bcd
6	Loyant +MSO fb Loyant +MSO	42 fl oz fb 42 fl oz	6.3 a	6.3 a	0 a	0 a	0 a	0 a	52.5 bc
7	Granite SC + COC	2.8 fl oz	0 a	100.0 c	0 a	0 a	0 a	0 a	0 a
8	Granite SC + COC	5.6 fl oz	0 a	100.0 c	0 a	0 a	0 a	0 a	0 a
9	Grandstand CA + COC fb Grandstand CA +COC	16 fl oz fb 16 fl oz	0 a	0 a	0 a	0 a	52.5 b	32.5 ab	38.8 ab
10	Grandstand CA + COC fb Grandstand CA +COC	32 fl oz fb 32 fl oz	0 a	0 a	0 a	0 a	82.5 b	65.0 b	2.5 a
11	SuperWham + COC	96 fl oz	3.8 a	0 a	0 a	0 a	0 a	0 a	98.8 d
12	SuperWham + COC	192 fl oz	2.5 a	0 a	0 a	0 a	0 a	0 a	90.0 cd
13	Shark H2O	7.5 oz	2.5 a	0 a	0 a	0 a	0 a	0 a	95.0 cd

Weed Control Evaluation

The major weed species present were ducksalad, water hyssop, and spikerush while the other weeds (sprangletop, bulrush, plantain, grass, and redstem) had less pressure. Smallflower, arrowhead, and grasses (early season only) had very low population coverage, so control may not be accurately reflected.

Table 2. *Evaluations of weed control (compared to untreated controls: treatment 1 and 2) at 39 days after herbicide application. Averages of the four treatment replications are reported, with different letters following each mean indicative of differences (using a Tukey test). The untreated controls are reported as % cover of each species per plot, and treatments 3-13 are reported as % control (compared to the untreated controls).*

	Treatment	Rate (per Acre)	Grass	Smallflower	Bulrush	Redstem	Ducksalad	Hyssop	Plantain	Sprangletop	Spikerush	Arrowhead
1	Untreated Control	NA	5.0 a	0 a	6.3 a	0	0	0	0.01	3.8 a	5.0 a	0
2	Untreated Control	NA	6.3 a	0 a	12.0 a	0	0	0	0.01	5.0 a	16.3 ab	0
3	Clincher CA + COC	15 fl oz	75.0 b	100.0 b	33.3 ab	NA	NA	NA	50.0 ab	100.0 b	60.7 abcd	NA
4	Clincher CA + COC	30 fl oz	100.0 b	75.0 b	0 a	NA	NA	NA	25.0 ab	100.0 b	33.6 abc	NA
5	Loyant +MSO fb Loyant +MSO	21 fl oz fb 21 fl oz	100.0 b	100.0 b	75.0 bc	NA	NA	NA	75.0 ab	100.0 b	92.9 cd	NA
6	Loyant +MSO fb Loyant +MSO	42 fl oz fb 42 fl oz	100.0 b	100.0 b	100.0 c	NA	NA	NA	100.0 b	100.0 b	67.9 bcd	NA
7	Granite SC + COC	2.8 fl oz	100.0 b	100.0 b	100.0 c	NA	NA	NA	100.0 b	100.0 b	100.0 d	NA
8	Granite SC + COC	5.6 fl oz	100.0 b	100.0 b	100.0 c	NA	NA	NA	100.0 b	100.0 b	100.0 d	NA
9	Grandstand CA + COC fb Grandstand CA +COC	16 fl oz fb 16 fl oz	100.0 b	100.0 b	91.7 c	NA	NA	NA	100.0 b	100.0 b	100.0 d	NA
10	Grandstand CA + COC fb Grandstand CA +COC	32 fl oz fb 32 fl oz	100.0 b	75.0 b	100.0 c	NA	NA	NA	100.0 b	100.0 b	100.0 d	NA
11	SuperWham + COC	96 fl oz	75.0 b	75.0 b	25.0 bc	NA	NA	NA	100.0 b	100.0 b	100.0 d	NA
12	SuperWham + COC	192 fl oz	100.0 b	75.0 b	16.7 a	NA	NA	NA	75.0 ab	100.0 b	100.0 d	NA
13	Shark H2O	7.5 oz	100.0 b	100.0 b	14.6 a	NA	NA	NA	75.0 ab	100.0 b	85.0 cd	NA

Yields Evaluation

The Shark H2O treatment had the highest yield though SuperWham and the lower rates of Clincher and Loyant were not too far off with slightly lower yields, not significantly different from Shark H2O. By comparison, the Granite SC treatment and the Grandstand treatment were poor yielding.

Table 3. *Yields (lbs/A) adjusted to 14% moisture. Averages of the four treatment replications are reported, with different letters following each mean indicative of differences (using a Tukey test).*

	Treatment	Rate (per Acre)	Yield (lbs/A)
1	Untreated Control	NA	2370 bc
2	Untreated Control	NA	2353 bc
3	Clincher CA + COC	15 fl oz	2567 bc
4	Clincher CA + COC	30 fl oz	1805 abc
5	Loyant +MSO fb Loyant +MSO	21 fl oz fb 21 fl oz	2676 bc
6	Loyant +MSO fb Loyant +MSO	42 fl oz fb 42 fl oz	1637 abc
7	Granite SC + COC	2.8 fl oz	460 ab
8	Granite SC + COC	5.6 fl oz	NA
9	Grandstand CA + COC fb Grandstand CA +COC	16 fl oz fb 16 fl oz	1883 abc
10	Grandstand CA + COC fb Grandstand CA +COC	32 fl oz fb 32 fl oz	669 a
11	SuperWham + COC	96 fl oz	2305 bc
12	SuperWham + COC	192 fl oz	2611 bc
13	Shark H2O	7.5 oz	2982 c

In Summary

Rates and timing for each herbicide will be important to determine, which is why repetition of this study would be beneficial to obtain more information (rates, phytotoxicity, weed control) in wild rice fields. Further

testing is also necessary as there was a lack of good grass and sprangletop control data. It should be noted that it is likely that weed control would be similar to conventional rice systems weed control, as these products are currently registered in rice in California. It would also be ideal to conduct a greenhouse test on spikerush to establish SuperWham efficacy since its population is not well established in the Sacramento Valley rice systems.

Some key takeaways from this study are:

- SuperWham and Clincher are currently the most promising as the plots were high-yielding and they had low phytotoxicity on wild rice.
- Grandstand may need to be tested at lower rates since it had good sedge and broadleaf control but significant phytotoxicity with the tested rates.
- Loyant had good sedge and broadleaf control but caused some phytotoxicity at the higher rate of application.
- Granite SC is likely not a good candidate for continued testing as it caused severe stand reduction.

We also conducted two trials in 2023. All of the data will be combined to send to the chemical companies to evaluate if further testing is needed.

Blackbirds in Wild Rice: A Brief Overview of Some Management Studies

Consuelo B. Baez Vega, UCCE Jr. Specialist

Whitney Brim-DeForest, CE Rice and Wild Rice Advisor

Background

Figure 1: red-winged blackbird perched on a shrub.

Wild rice (*Zizania palustris*) is a grain commodity native to North America with an increasing commercial value. One of the problems that has plagued wild rice production since the inception of its commercial cultivation has been bird damage (Marcum & Gorenzel, 1994).

Blackbirds (family Icteridae), specifically red-winged, are considered to be the most damaging vertebrate pest in wild rice due to their feeding and natural habits within fields. They can consume 6-8 seeds per minute (Avery & Cummings, 2003). Losses have been estimated at $121-$309 per hectare. Blackbirds will consume wild rice during three seed stages: milk, dough, and mature as well as causing seed loss through their movement into easily-shattered matured wild rice stands. Other contributing pest factors are their population size and prolonged presence (Marcum & Gorenzel, 1994; Avery et al, 2000). As such, several studies have been conducted to test for potential methods of managing blackbirds as well as surveys to note grower practices and observed efficacy.

Grower Survey

A survey sent to California wild rice growers conducted by Marcum and Gorenzel (1994) collected information on blackbirds where it was found that 72% of those surveyed reported 1-10% yield loss. Two growers reported 26-50% yield loss. 97% of the growers were doing some form of management for blackbirds, which would last on average 3.5 months. Practices used were shotguns, propane cannons, other forms of sound deterrents (e.g. shellcrackers, bird bombs, etc.), and patrols, (walking or with vehicles). The majority rated shotguns and air shooting, typically a large caliber rifle, as good control. Growers in the Northeastern area also deemed patrols favorable at 52% compared to their counterparts in the Sacramento Valley at 18%. Aircraft hazing was also considered quite effective though it was not widely used. Practices that were seen as ineffective were propane cannons, visual deterrents (kites, balloons, etc.), noisemakers, and Sevanna repellent (cayenne pepper and garlic-based).

Most growers identified blackbird presence around July with continued appearances throughout August and September, with August being the most damaging for most of the growers. This coincided with the most active, intense month of control (August). They also identified the red-winged blackbird as the most damaging. Other species were observed such as the yellow-headed blackbird and the European starling.

Further research needs to be conducted on blackbirds as noted by growers' uncertainty about blackbird movement patterns. Species identification was deemed important as tri-colored birds were observed in fields (they are a protected species). There is also potential for conducting studies on management practices not used by growers at the time of the study. These included trapping, poisons, nest destruction, frightening agents, and barriers. Biosonics and the use of lure crops are also unexplored avenues.

Figure 2: tri-colored blackbird, noted by the orange-red and white on the upper part of the wings.

Repellent Studies

Avery et al (2000) conducted a field study in northern California, eastern Shasta County, on a blackbird repellent trademarked Flight Control (a.i. anthraquinone) as it was observed in a laboratory setting to make birds avoid the treated rice after consumption that led to sickness symptoms. This was also seen in field studies in Louisiana. The most common blackbird spotted was the red-winged blackbird. Results found no significant differences between treated and untreated plot yields, with similar results for bird activity, demonstrating that it did not work well in managing blackbirds.

Some reasons provided for the inefficiency were blackbirds increased use of the test plots due to a lack of alternative wild rice stands, low repellent exposure within blackbirds due to quicker seed consumption, and poor repellent seed coverage. Flock variation was also a potential factor. Birds not previously present in the field could have eaten the treated wild rice, not having developed an avoidant behavior. There was also residue variability, which could have led to blackbirds eating seeds with lower residue. The researchers noted that harvested wild rice samples were contaminated with anthraquinone residues, which was likely due to unclean equipment.

Methiocarb, intended as an insecticide, has been used in the past to protect food crops from birds, but it is not registered as a bird-repellent anymore.

Caffeine has prospects as a bird repellent as noted by a behavioral trial study. This was corroborated by a Florida study that coated rice seeds with caffeine. There was a 76% reduction in rice seed consumption from the blackbirds when given the highest caffeine treatment rate.

Sevin (a.i. carbaryl) is a broad-spectrum insecticide intended to be used on ripening rice. It causes insect reductions, which blackbirds would have used as food sources. This is likely the reason that there is an apparent bird activity reduction. A study in Louisiana observed an activity reduction but yields remained similar to control plots. This may be due to Sevin's short persistence time.

Methyl anthranilate is a chemical irritant (primary repellent), signifying that it is a fast-acting chemical as it is naturally aversive to the pest. Study results have been unfavorable. The few studies that have tested methyl anthranilate against bird damage noted no significant effects from the applications (aerial or seed-treatment studies).

Summary

From a research standpoint, there are many unexplored avenues for bird control studies. Some control tools that have not been tested are biosonics, lure crops, nest destruction, and others. There is also a need to reassess the chemicals used and collect more data on efficacy and efficiency when combined with other management strategies. In California, there are not many chemical management options against blackbird predation. Growers are currently limited to one active ingredient: methyl anthranilate (e.g. Apex Bird Repellent). It would be of interest to test chemical products from other states and gather data for California wild rice growers.

Current Tools Available for Blackbird Control

- Current practices that have been used since early wild rice production. For example:
    - Walking/vehicle patrols
    - Shotguns and other similar tools
    - Aircraft hazing

- Apex Bird Repellent (a.i. methyl anthranilate)

References

Avery, M., L., Whisson, D., A., & Marcum, D., B. (2000). Responses of blackbirds to mature wild rice treated with flight control bird repellent. *Proceedings of the Vertebrate Pest Conference*, 19. https://escholarship.org/uc/item/1t93q5j1

Avery. M., L., & Cummings, J., L. (2003). Chemical repellents for reducing crop damage by blackbirds. *USDA National Wildlife Research Center - Staff Publications*, 199. https://digitalcommons.unl.edu/icwdm_usdanwrc/199/

Databases. (2024). cdpr.ca.gov. Retrieved January 29, 2024, from https://www.cdpr.ca.gov/database_menu.htm

Marcum, D., B., & Gorenzel, W., P. (1994). Grower practices for blackbird control in wild rice in California. *Proceedings of the Vertebrate Pest Conference*, 16. https://escholarship.org/uc/item/5j01x300

Visit Our New Wild Rice Website!

Website Domain Link: https://wildrice.sf.ucdavis.edu/

Figure 3: New wild rice site home page appearance.