Rice Notes
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In This Issue

Whitney Brim-DeForest
UCCE Farm Advisor
Sutter, Yuba, Sacramento and Placer Counties

Weedy Rice: 2018 season wrap-up and looking ahead for 2019

Whitney Brim-DeForest, UCCE Rice Advisor
Luis Espino, UCCE Rice Advisor
Timothy Blank, CA Crop Improvement Association

In 2018, we did not see a large increase in the number of weedy rice samples and sites over the 2017 season. Acreage remains around 10,000 acres. Out of 25 submissions, 5 were positively identified as weedy rice, at 4 general locations (some locations contained multiple fields). We are encouraged by the number of submissions we continue to receive, which is a great indicator of the fact that lots of people are continuing to be on the lookout for weedy rice in their fields. The only way we can get rid of it is if we know that it is in a field.

We did find one new type in 2018, which we are calling "Type 6" (Figures 1 and 2). It has some of the same characteristics as the other weedy rice types, including red pericarp (bran), lighter leaf color, and taller height. There are a couple of distinct characteristics that differentiate this type from the others (black hull color and red awns). Type 6 differs from Type 4 in that the panicles of Type 4 do not have complete panicle exsertion. All of the identifying characteristics for all of the types are summarized in Table 1.

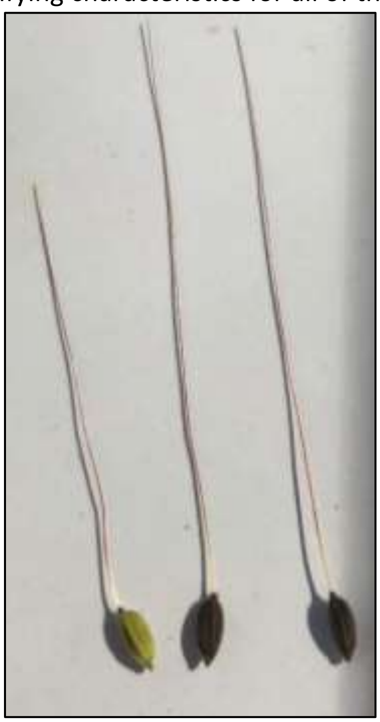


Figure 1. Seed from weedy rice Type 6 at maturity. Note the black hull color, and the long reddish awns.

Figure 2. Immature panicle of weedy rice Type 6 in the field. The long reddish awns are clearly visible before maturity.

Table 1. Traits of the six weedy rice biotypes identified as of 2018, compared to Calrose medium-grain cultivar, M-206. Biotypes were characterized by dormancy (low or high), shattering (low or high), pericarp color (red or brown), hull color (straw, gold, or black), awns (presence/absence), grain type (short, medium, or long), and panicle exsertion (full or partial). Table modified from Brim-DeForest et al. 2019.

	Seed Dormancy	Shattering	Pericarp Color	Hull Color	Awns	Grain Type	Panicle Exsertion
Weedy Rice Biotype 1	High	High	Red	Straw	Absent	Short	Full
Weedy Rice Biotype 2	Low	High	Red	Gold	Absent	Long	Full
Weedy Rice Biotype 3	High	High	Red	Straw	Present	Medium	Full
Weedy Rice Biotype 4	High	High	Red	Black	Present	Medium	Partial
Weedy Rice Biotype 5	Low	High	Red	Straw	Absent	Medium/Long	Full
Weedy Rice Biotype 6	*Unknown*	*Unknown*	Red	Black	Present	Medium	Full
Calrose Cultivar M-206	*Low*	*Low*	*Brown*	*Straw*	*Absent*	*Medium*	*Full*

We also conducted a competition study this past year, which gave us preliminary data on yield loss. Some of the key findings so far are:

- Impacts on yield are the same between Types 1-5 (we did not yet have Type 6 to test)
- Significant yield reductions start with as few as 8 weedy rice plants per square meter (approximately 1 plant per square foot)
- At 1 plant per square foot, reductions in grain weight per M-206 plant were more than 40%
- At 4 plants per square foot, reductions in grain weight per M-206 plant were more than 70%

For the majority of fields infested with weedy rice, weedy rice densities are around 1 or fewer plants per square foot, but we do have at least two infested fields that are at or above 4 plants per square foot.

All seed production fields were included into either the Certified Seed program or the Rice Seed Quality Assurance (QA) program, both administered by the California Crop Improvement Association. Of the 332 fields inspected in the Certified Seed program, one field was rejected as it contained several Type 1 weedy rice plants; this rejected field was in its first year of production of Certified class seed. Of the 33 fields inspected in the QA program, none were rejected. In 2019, rice producers may only use seed that has been enrolled in the seed certification or QA programs.

Looking forward: 2019 and beyond

We have a large research project starting this year at the UC Davis campus. The field was seeded in 2018 with weedy rice, to establish a population in the field. We will be evaluating three treatments: 1) conventional flooded rice; 2) a stale seedbed method (where the field is flushed before planting, to allow weeds to emerge, then sprayed with glyphosate); and 3) a rice-sorghum-rice rotation (which allow for the use of other herbicide modes of action). From the field experiment, we hope to be able to get yield loss data, timing on flowering, and emergence timing, to better plan our herbicide applications, if using a stale seedbed.

Work on sensing weedy rice with a camera (for mapping purposes) will continue this summer, with collaboration from the Informatics and GIS (IGIS) Center at UC. We are excited to be collaborating with Sean Hogan, who we did some preliminary work with last summer.

We urge growers and PCA's to continue to submit suspected samples for testing. The UCCE Farm Advisors will continue to collect samples, so please give us a call if you suspect you might have weedy rice. Again, we encourage folks to not remove suspected plants from the field, to limit the spread of the seeds.

References:

Brim-DeForest, W.B., Espino, L., Blank, T., De Leon, T. (2019). Weedy Rice in California: what makes a pest a pest? In Proceedings of the 2019 California Plant and Soil Conference. Fresno, CA. 5-6 February 2019.

Summary of 2018 University of California Rice Variety Trials

Luis Espino, UCCE Rice Advisor

Every year, the University of California Cooperative Extension, in cooperation with the Rice Experiment Station (RES), conducts rice variety trials in several locations of the Sacramento Valley. Three broad variety categories are included in the trials:

Preliminary breeding lines: those that have been selected by RES breeders to be evaluated on a statewide basis because of promising characteristics observed at the RES. They are tested in two- replication trials.

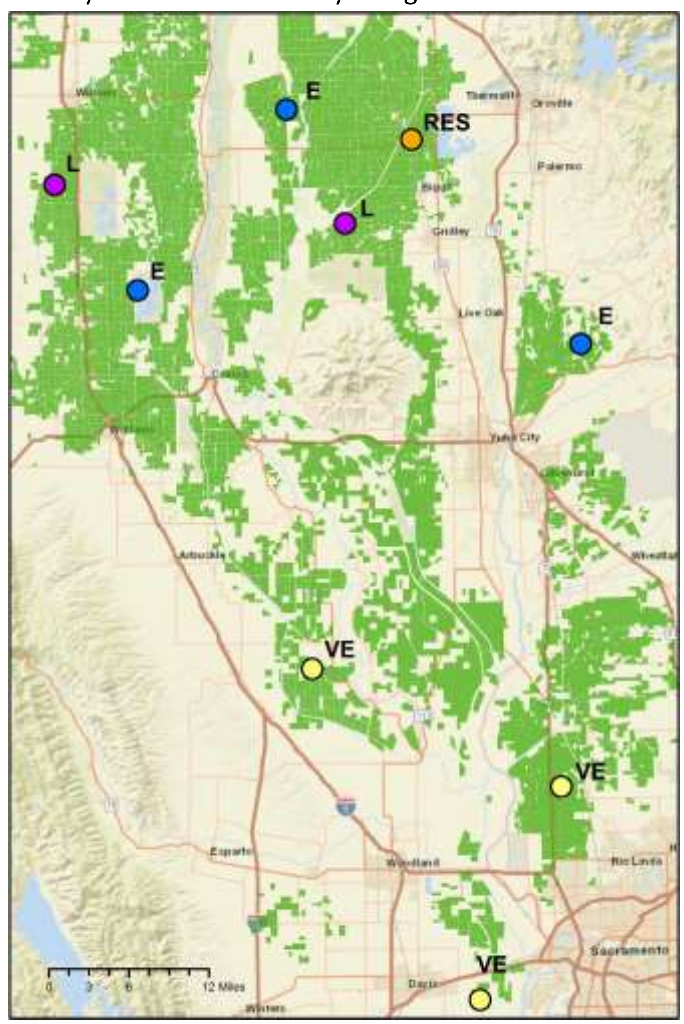
Advanced breeding lines: these lines are more promising; typically they have been tested first as preliminary. They are tested in four-replication trials. The best of the best may undergo seed increase and be considered for release as new rice varieties after several years of testing.

Commercial varieties: varieties released by the RES and planted in commercial fields.

The entries and varieties included in the trials can be grouped in three maturity groups:

- Very early maturity group (<80 days to 50% heading) (Table1).
- Early maturity group (81-90 days to 50% heading) (Table 2).
- Intermediate/Late maturity group (>90 days to 50% heading) (Table3).

The trials are conducted at the RES and in grower fields. On-farm trials are planted in the most appropriate location for the maturity group of the entries, taking into consideration weather but also the field variety of the location to avoid early or late harvesting. Entries in each test were generally restricted to a single maturity group to avoid too early or too late maturation relative to the field variety of the test location.



Location of the UCCE and RES variety trials (VE=very early, E=early, L=intermediate/late, RES=Rice Experiment Station)

Each entry is grown in 200 ft^2 plots. Cooperating growers manage the trials as part of the field. Plots are harvested using a research plot combine, and yields are converted to lbs/acre at 14% moisture. The complete report (2018 Agronomy Progress Report) is published on the UC Rice On-line website (http://rice.ucanr.edu/).

Table 1. Grain Yield (lb/acre @ 14% moisture) Summary of Very Early Rice Varieties by Location and Year (2014-2018)

Location	Year	M104	M105	M206	Calmochi 101	S102	L206
Biggs (RES)	2014	8150	7680	9200	6540	7640	8580
	2015	8580	8150	9350	7940	9520	8910
	2016		10380	10250	7490	8960	10100
	2017	8790	9270	9680	8140	9260	9850
	2018	7670	8600	9090	6390	7890	9770
Location Mean		8298	8816	9514	7300	8654	9442
Sutter	2014	9510	10380	9710	7780	8770	9440
	2015	9520	10350	9900	7990	9190	9820
	2016		11630	11110	9420	10720	9260
	2017	9030	9380	9240	7250	8770	8580
	2018	9390	9540	9250	7110	9260	9330
Location Mean		9363	10256	9842	7910	9342	9286
Yolo	2014	9610	10150	9770	7580	8980	8760
	2015	8150	7210	7490	5560	6940	7740
	2016		10420	10980	9290	9530	10090
	2017	9670	8550	8890	7790	8360	9250
	2018	9780	10010	10090	8500	9490	9890
Location Mean		9303	9268	9444	7744	8660	9146
South Yolo	2017	8240	8590	7530	8570	8610	6860
	2018	8830	8210	7640	8020	8330	7260
Location Mean		8535	8400	7585	8295	8470	7060
Loc/Years Mean		8874	9185	9096	7812	8782	8734

Table 2. Grain Yield (lb/acre @ 14% moisture) Summary of Early Rice Varieties by Location and Year (2014-2018)

Location	Year	Calhikari 201	S102	M105	M205	M206	M209	L207
Biggs (RES)	2014	6220	7320	8570	9140	9240	9670	
	2015	8580	10050	8610	8720	9620	9490	10550
	2016	7310	9020	10380	10690	10780	10950	11220
	2017	9210	10460	10300	10640	9770	10490	11070
	2018	8510	8220	9360	9280	9050	10640	10120
Location Mean		7966	9014	9444	9694	9692	10248	10740
Butte	2014	8310	8570	9070	9140	9610	9140	
	2015	7180	8810	9350	7780	9370	8580	9130
	2016	8080	9480	10060	9640	10400	10220	10960
	2017	7810	8180	8910	9670	9330	9350	9750
	2018	6720	7980	8350	8540	8270	7990	9420
Location Mean		7620	8604	9148	8954	9396	9056	9815
Colusa	2014	7740	8080	9100	9370	9280	9600	
	2015	8940	9200	10500	10050	9850	10490	11160
	2016	8590	9050	10390	9730	9960	9600	10600
	2017	7610	6920	7390	8040	7530	7850	9410
	2018	7290	8010	8470	8540	8960	9120	10000
Location Mean		8034	8252	9170	9146	9116	9332	10293
Yuba	2014	7290	7420	8590	9120	8950	8800	
	2015	8490	8740	9970	9650	9940	10240	10480
	2016	7310	8300	9110	8430	9090	8760	8470
	2017	6380	8170	8370	8020	8770	9060	9600
	2018	6210	8170	9450	7090	9350	8400	9340
Location Mean		7136	8160	9098	8462	9220	9052	9473
Loc/Years Mean		7689	8508	9215	9064	9356	9422	10080

Table 3. Grain Yield (lb/acre @ 14% moisture) Summary of Intermediate/Late Rice Varieties by Location and Year (2014-2018)

Location	Year	M205	M402	M209	L206
Biggs (RES)	2014	10550	10040	11270	10340
	2015	9880	8450	9880	9520
	2016	9460	9370	9900	10490
	2017	10590	8880	10350	10520
	2018	9530		9760	9540
Location Mean		10002	9185	10232	10082
Glenn	2014	8910	8910	8610	8870
	2015	9420	8710	9700	9910
	2016	8490	9850	8520	9290
	2017	8500	7280	8200	7560
	2018	9840		9990	9260
Location Mean		9032	8688	9004	8978
Butte	2016	9110	6900	9010	9530
	2017	8550	6280	8480	8980
	2018	9200		9580	9530
Location Mean		8953	6590	9023	9347
Loc/Years Mean		9329	8154	9420	9469

Tillage for weed management in a good water year

Whitney Brim-DeForest, UCCE Rice Advisor

It is looking to be a pretty good water year in California. As of the writing of this article, in the Sacramento Valley, we are running very close to the average precipitation expected for this time of year (over 90%), and our snowpack in the Sierra Nevada is considerably over the average (140% of normal). Most growers have drained their winter-flooded fields, and will be starting ground preparation in the next couple of months. The water table is high; the soil moisture content is high, and will likely remain so for weeks, even if the rain tapers off in March. So how does all of this effect weed management and tillage operations?

Weed seeds need proper temperature (warmer is usually better, up to a point), and moisture, to germinate. The weed seeds that we see germinate in a given season are those in the top few inches of soil. The weed seeds buried deeper in the soil profile will not germinate, and they will remain buried and dormant, unless brought close to the soil surface through tillage.

So in a year like this one, how should we best prepare to minimize weed control issues during the season?

First, tillage operations should occur as close to planting as is possible. The longer a field is left tilled and not planted, the greater the opportunity for weed seed germination, either due to a rain event, or to moisture in the heavily-saturated soil in a year like this. Once the weeds are germinated ahead of the rice, controlling them with in-season herbicide applications can be nearly impossible, especially if the weeds got a big head-start on the rice. This is because our herbicide applications are timed to be applied at certain rice leaf stages, and are not based on weed growth stages.

Second, unless necessary, tillage should be shallow, to disturb as little of the soil as possible. As long as weeds are not going to seed at the end of the season, the top few inches of soil should eventually be depleted of weed seeds, and over time, populations of germinating weeds in the field should go down. Deep tillage will bring up weed seeds from deeper in the soil profile, negating the effects of the depletion of those top few inches of soil. Soil deeper in the profile is also likely full of moisture, enabling those once-dormant weed seeds to germinate quickly.

So, to reiterate, to maximize weed control efforts in a good rain year like this one, till as close to planting as possible, and till shallowly. Looking forward to a good year!

Change in UCCE Rice Advisor County Assignment

Starting February 2019, UCCE Advisor Luis Espino covers Butte and Glenn counties. Advisors Whitney Brim-DeForest and Michelle Leinfelder-Miles will continue to cover their current county assignments (Brim-DeForest covers Sutter, Yuba, Sacramento and Placer counties; and Leinfelder-Miles covers Delta counties). The Advisor position covering Colusa and Yolo counties is vacant, but we hope it will be filled in the future.