February 2018

Lassen

Farm Advisor's Update

A Publication for Farmers, Ranchers and Friends of Agriculture • Cooperative Extension •

Winter is certainly shaping up to be quite a bit different than last winter. Snow has been scarce, which brings back memories of the droughts in previous years. As I am writing this newsletter, we are sitting at 17% of snowpack for the northern Sierra, with the central and southern Sierra not looking much better. On the drought monitor this has shifted NE California into the abnormally dry category, but unless we get some much needed snowfall, I anticipate we could shift into the moderate drought rating. I will be crossing my fingers the weather pattern turns around over the next couple of months.

I would like to note for spring weed control that with all of the warm, dry weather we have had, some winter annual weeds I have been seeing are in growth stages which are quite large for this time of year. Many of the rosettes are already past growth stage sizes recommended on herbicide labels. Where appropriate it might be worthwhile using the higher ranges of labeled rate, along with a good surfactant to enable good knockdown.

Upcoming Grower Meeting!

On Thursday, March 1, 2018, there will be a Winter Ag Meeting beginning at 10:30 am held at the Elks Lodge in Susanville. Everyone is welcome, and thanks to our sponsors, American Ag Credit, Helena Chemical Company and The Grow Partners, lunch will be provided. Please RSVP for the meeting to ensure lunch for all attendees. Speakers from UC Cooperative Extension as well as industry representatives will give talks on the following topics:

- Resource Efficient Irrigation of Field Crops
- Utilizing Integrated Pest Management Principles to Effectively Control Problem Weeds
- Integrating Amendments and Cover Crops into Organic Crop Rotations
- Alfalfa Genetics, Pest Management, and the Introduction of Reduced Lignin Alfalfa
- Hay Exports and Trends
- Agronomy 101
- The Need for Humic Acids

You can RSVP by phone at: 530-251-2601 or by email to mgollnick@co.lassen.ca.us or tjgetts@ucanr.edu

(1.5 hours of CE credit have been approved.)

Alfalfa Weevils Pyrethroid Resistance

I want to bring your attention to alfalfa weevil populations which have developed pyrethroid resistance over in Scott Valley. In 2016, pyrethroid insecticides such as Warrior and Baythroid did not appear to give effective control of alfalfa weevils in fields treated multiple times. Steve Orloff and Larry Godfrey conducted bioassays on alfalfa weevils from the treated fields, determining that indeed resistance to the pyrethroid mode of action had developed in Scott Valley.

If you are interested in learning more about this incidence, I encourage you to check out these articles. (As this newsletter is mainly distributed electronically, I have included links below. If you received this newsletter as a hard copy, please feel free to contact me for more information at 530-251-2650.)

First, a blog post from Steve's initial work: Article One.

Second, a blog by Racheal Long detailing the management of alfalfa weevils: Article Two.

Third, details on the work conducted by Steve Orloff looking at the insecticide Steward for control of pyrethroid resistant weevils: Article Three.

Lastly, an article from Rachael Long detailing the results of the insecticide Steward: Article Four.

I would highly encourage all of you to subscribe to the UC Alfalfa and Forage Blog where these original postings were made.

Photo 1: Alfalfa weevil larvae eating the growing point of an alfalfa plant.

Work conducted by Steve Orloff in 2017 indicated that after the alfalfa weevil developed resistance to pyrethroids, few products offered sufficient control. Only treatments containing Steward, or a combination of

Warrior + Lorsban offered greater than 78% weevil control 15 days after treatment in one of his trials. Without pyrethroid insecticides in the mix, there are limited chemical options for alfalfa weevil control!

While I have not heard other reports of alfalfa weevil insecticide resistance in the Intermountain Region, that doesn't mean there isn't a risk of development. Whenever pesticides are used repeatedly there is a risk of resistance developing, whether it is an herbicide, an insecticide, or a fungicide. When pesticide resistance develops, it essentially removes the tools from producer's toolboxes. These tools cannot afford to be lost! New pesticides are not hitting the market as rapidly as in the past, partially due to the rate of discovery, and partially due to the cost for bringing products to registration. It is ever important to help prevent and delay pesticide resistance from developing.

Regardless, there are some basic guidelines to help prevent and delay pesticide resistance from occurring. The main principle of resistance management is to switch up the selection pressure. DO NOT utilize the same management strategy year in and year out to control the same pest. Using the same control method over and over selects for individual pests that can survive the treatment, which is how resistance develops.

One way to switch up the selection pressure is by altering the pesticide Mode of Action (MoA) utilized. Mode of action is defined as how the pesticide works physiologically within the pest. It is not enough to switch up what pesticide you are using, if the pesticide you rotate to has the same MoA. If the pesticide has the same MoA then you are not significantly switching the selection pressure to control the pest. To change the selection pressure chemically, it is important to utilize a pesticide with a different MoA. Finding out what mode of action the pesticide you are using is easy, just take a look at the jug. On each pesticide label there should be a "group number" listed (see Photo 2). Different group numbers indicate different pesticide MoAs. Switching the pesticide MoA utilized is a major step to help prevent and delay pesticide resistance from developing.

However, only using more pesticides to deal with resistance, is only using part of the toolbox at your disposal. Utilizing a multi-faceted approach and managing your pests with an integrated approach will further switch up the selection pressure. This can be done by utilizing mechanical control methods, cultural control methods, or biological control methods. One of the best ways to switch up the selection pressure is almost as old as agriculture itself, crop rotation. Crop rotation allows you to utilize various mechanical techniques to control plants and vertebrate pests, while creating an environment where the new crops may not support the same host specific insects and pathogens. Likewise, it allows you to utilize other chemistries which may not be labeled in the initial crop to further switch the selection pressure.


POISON
KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS BEFORE OPENING OR USING
Dow AgroSciences
Lorsban™ 500 EC
Insecticide
ACTIVE CONSTITUENT: 500 g/L CHLORPYRIFOS (an anticholinesterase compound)
SOLVENT: 495 g/L LIQUID HYDROCARBON
GROUP 1B INSECTICIDE
For the control of certain insect pests of fruit, vegetables, field crops, pasture and other situations as specified in the Directions For Use.
THIS PRODUCT IS TOO HAZARDOUS FOR USE BY HOUSEHOLDERS.
HOUSEHOLDERS MUST NOT USE THIS PRODUCT AROUND THE HOME.
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Photo 2: Lorsban label. Group 1B indicates the mode of action. Lorsban is an organophosphate insecticide.

At the very least, I wanted to bring the development of pyrethroid resistant alfalfa weevils in Scott Valley to light. If pesticide resistance develops in one location, it certainly can develop in other locations (including in your field!) If you have routinely treated your fields with the same pesticides year in and year out, consider switching it up, so you don't lose the tools you currently have!

Armyworms!

(Article originally posted on the UC Alfalfa and Forage blog)
Tom Getts, Rachael Long , and Dan Putnam

This fall there were serious outbreaks of armyworms in the Intermountain Region of California. Many pastures and hayfields were overtaken by this pest, especially in Siskiyou, Shasta, Modoc, and Lassen counties. While armyworms are only occasionally a problem in the Intermountain Region, when the numbers are high, the amount of damage can be devastating. Certain fields were wiped out this fall with many growers losing their third cutting, or fall grazing ground, to armyworms. Injury can be dramatic, where entire fields can be eaten down to the ground seemingly overnight.

Armyworms are not a pest that plagues the Intermountain Region each year. The climate is not conducive to their lifecycle, as freezing temperatures will kill most worms. As such, adult armyworm moths need to migrate in from warmer lower elevations to lay eggs and establish populations, which is why the pest rears its ugly head later in the growing season. There are multiple species of armyworms which can be problematic: true armyworm (*mythimna unipuncta*), western yellow

True armyworm larvae(mythimna unipuncta) found in an alfalfa grass mix underneath the windrow after cutting.

striped armyworm (*spodoptera praefica*), beet armyworm (*spodoptera exigua*), and the fall armyworm (*spodoptera frugiperda*). While other species do exist, these are typically the most prevalent in the Intermountain Region.

Multiple generations of armyworms can occur in a single growing season. Fall damage in the Intermountain Region is typically from one of the later armyworm generations as the population size builds. Eggs deposited hatch within a few days, and larvae mature in 2-3 weeks. The worms can grow quite large, typically up to 1-1.5 inches. During maturation, extensive feeding occurs, but most of the foliage consumed is in the last couple of days before they pupate. Armyworms can consume an estimated 80 percent of the total plant matter within the last 4 days of feeding. This is why crops seem to be eaten "overnight" as the worms march through the fields trying to quell their insatiable appetite. On grasses, armyworms typically eat the leaf, only leaving the spindly midvein behind. Fields can even appear to be dead if the worm population is high enough.

While these insects can be devastating in certain years, their populations are typically cyclical. There are many natural enemies of the larvae from spiders and lacewings, to parasitoids such as the caterpillar parasite wasp *(hyposoter exiguae).* Viral diseases can also affect armyworms under certain conditions associated with moisture, turning the caterpillar bodies limp. Most years in the Intermountain Region these natural predators help keep populations in check, unfortunately, this wasn't one of those years with large outbreaks spanning the region. Possibly the wet spring produced an abundance of weedy vegetation that the armyworms built up on, faster than the natural enemies could keep them in check. When the weeds dried down, the worms (adults and larvae) moved into nearby crops.

Monitoring is the name of the game when dealing with insect pests, including armyworms. Monitor early and often. Typically, these worms do not like light and actively feed at night or on cloudy days, which can be good times to look for them. Be sure to look in the soil, under leaf litter and dirt clods where they often hide during the day. While there is no economic threshold for pasture and grasses in California, other states recommend treatment after worm populations exceed a certain population (2-4 larvae/square foot for any species of armyworm present). This type of monitoring requires getting down on your knees and really looking for the worms on the foliage of the plant, but also around the base of the crown and on or just under the soil surface! Threshold levels will vary depending on the stage of the stand; stubble or younger stands will have a much lower threshold or tolerance to armyworms, so be sure to watch for crop damage.

In California, economic thresholds for armyworm infestations in alfalfa have been set using a sweep net for monitoring. Below is a link to a UC IPM page which has a great video detailing armyworm and alfalfa caterpillar monitoring with details regarding detection of parasitized worms! It is important to determine if worms have been parasitized during monitoring, so money isn't wasted on an unnecessary treatment. Sweeps with counts greater than 15 non-parasitized armyworms in alfalfa justifies a treatment. http://ipm.ucanr.edu/PMG/r1900711.html

Treatment options vary by crop, and organic treatments are limited. In alfalfa and grass hay fields, one cultural method which can reduce damage is cutting the field

True armyworm adult and pupa (mythimna unipuncta). Specimens collected from an irrigated meadow a few weeks after extensive feeding from the worms occurred.

early. Often you will find armyworms under the windrows hiding from the light, but in general cutting will diminish their populations. However, cutting early isn't always the right option, and sometimes treatment with insecticides is justified.

XenTari® or Agree WG® (*bacillus thuringiensis* BT) are labeled for organic production but are only effective on the 1st to 2nd instars of the armyworm larvae. BT products typically do not harm beneficial insects. Applications can be made to the younger armyworm instars without impacting beneficial insect populations, which can be a concern with many conventional insecticides. Both crop group 17 (grass forage, fodder, hay, range/pasture, excluding cereals) and 18 (non-grass animal feeds, forage fodder straw and hay) are on the XenTari label and Agree labels.

In conventional production, Intrepid 2f® *(methoxyfenozide)* and Coragen® *(chlorrantraniliprole)* are effective armyworm products. Both products are also labeled for grass and non-grass forage crops (both crop groups 17 and 18). Steward EC® *(indoxacarb)* is an effective insecticide choice for alfalfa, but is not labeled for grass and other forage crops. While smaller worms are more susceptible to insecticide control, applications of these conventional products to armyworms in their early instars could be counterproductive, as they can negatively impact beneficial insect populations before they have time to do their work. Deciding when to treat is a balancing act between the number of armyworms in the field, not treating too early before beneficial insects can control the population, and not treating too late before the worms grow too large and cause significant crop damage.

This year make sure to monitor early and often so the pest doesn't "appear" and eat your fields overnight.

New Gramoxone Regulations and a Contact Herbicide Weed Control Trial in Mixed Alfalfa Orchardgrass Hay Production

Recently, I attended the California Weed Science Society conference, and I learned new regulation is coming down the line from the EPA for the use and packaging of Gramoxone *(paraquat)*. As there have been multiple poisonings, injuries, and suicides surrounding Gramoxone, steps to make the use of the product safer are underway. In the coming years, Gramoxone will not be sold in conventional 2.5 gallon jugs with screwcap lids. Instead, new "closed-system packaging" will be utilized to "prevent transfer or removal of the pesticide except directly into proper application equipment." This is an example of regulators utilizing engineering-type controls to ensure pesticide workers and handlers remain safe. However, at the conference when talking to manufacturers, exactly how the product will be packaged in order to meet the standards is still being developed. As the packaging is still being developed, talking with closed mixing system manufacturers, it is unclear how the closed mixing system will actually operate. Stay posted, and as I know more I will forward the information on to you. Here is a link to the current EPA web page on Gramoxone *(paraquat)*.

As this new regulation is coming down the pipeline, I wanted to bring to light a couple of products which have similar burn down characteristics to Gramoxone, but have CAUTION listed as the single word, opposed to DANGER/POISON.

Shark *(carfentrazone)* is a product that was registered in alfalfa production a few years ago. It is a PPO inhibitor, and is good at controlling small emerged broadleaf weeds. It can be used preplanting, before the alfalfa breaks dormancy, and between cuttings. Sharpen *(saflufenacil)* is another product which was also registered for alfalfa production in recent years. It is a PPO inhibitor like Shark, and can be effective as a treatment during the dormant season for small winter annual weeds. Shark and Sharpen are "contact" type herbicides like Gramoxone, and could potentially be used in its place. However, both Shark and Sharpen have limited activity on grass species, unlike Gramoxone.

Both products will burn back active growth of alfalfa plants they are applied to, especially Sharpen where the initial injury can be severe. Alfalfa plants have been shown to grow out of the injury incurred, as long as applications are not made too late. Each have shown a fairly wide spectrum of broadleaf weed control from research which has been conducted by my colleagues. Here are some links to various presentations and papers which highlight results from research trials: One Canevari Update, Two Orloff Intermountain Trial, Three Orloff and Canevari, and Four Hembree Field Day.

Over the past two years, I worked with Steve Orloff conducting trials evaluating both Sharpen and Shark in mixed alfalfa grass stands within the Intermountain Region. Data from the trials conducted during the first

Picture of trial one week after treatment. Higher rates of Sharpen caused significant burnback of alfalfa.

year can be found on page four in the research report posted last year on the UCCE website (http://celassen.ucanr.edu/files/256962.pdf). A complete summary of the work done this year will be posted next month. On the next page are some summary tables from the information collected in the trials this past year.

A trial was initiated on March 11, 2017, in a mixed alfalfa orchardgrass field outside of Standish in the Honey Lake Valley. At the time of application, alfalfa had one inch of growth and orchardgrass was more variable with 1- 5 inches of growth. Major weeds in the plots included 1-2 inch Jim Hill mustard, 1-2 inch annual polonium and 1-2 inch cheatgrass. Minor weeds included flixweed, prickly lettuce, and red stem filaree.

Crop injury and weed control was assessed for both alfalfa and orchardgrass 1, 2, 4, and 8 weeks after application. Table 1 shows alfalfa injury and Table 2 shows orchardgrass injury. Weed control results for major weed species are displayed in Table 3.

Cheatgrass and annual polonium were the weeds of highest concentration within the plots. Neither Sharpen or Shark offered good control of the cheatgrass, and only treatments containing Dimetric gave at least 85 percent control of the winter annual grass. Sharpen alone gave 92 to 98 percent control of all broadleaf weed species, where Shark gave substantially less control of annual polonium and Jim Hill mustard. In other trials from previous years and other locations, Shark has shown better weed control than in this trial. Neither product is currently registered in California for mixed alfalfa/grass stands, but both are registered in alfalfa alone. These treatments were made as part of an experiment, to develop data to potentially support a label change.

From visual evaluations, all products that contained Shark or Sharpen appeared to cause some orchardgrass injury. The injury symptoms noted were spotting on the leaves of the orchardgrass initially, with some chlorosis developing later. After eight weeks almost, no injury was apparent in the treated orchardgrass plants compared to the untreated plants.

For both Sharpen and Shark, the 2 oz. rate caused more injury than the 1 oz. rate in alfalfa. Overall, Sharpen appeared to burn the alfalfa back more than Shark. While alfalfa injury was severe two weeks after treatment, it began to subside four weeks after treatment, and was barely noticeable on alfalfa plants eight weeks out. Injury to the orchardgrass was less severe than injury/burn back of the alfalfa.

Both Shark and Sharpen are contract herbicides like Gramoxone *(paraquat)*. With all contact herbicides it is very important to treat weeds at small growth stages, use the proper tank mix additives, and ensure good coverage of the spray. While neither product is perfect, I wanted to let you know there are other options for contact herbicides for alfalfa which do not have the high toxicity of Gramoxone. These products could come in handy for fields with winter annual broadleaf weeds, but do not have a lot of activity on grasses.

Four weeks after treatment, checkerboard pattern in the field from treatment is no longer apparent. Most injury has subsided.

Russian Knapweed Biocontrol Release

Russian Knapweed is a B list noxious weed within California, and Lassen, Modoc, Sierra and Plumas counties all have established populations. Unlike other invasive knapweeds found on the noxious weed list, Russian knapweed is a creeping perennial plant with an extensive root system. It can be problematic in various agronomic settings, from irrigated alfalfa and pasture, to rangelands. One of the long-term strategies to control invasive weeds is to bring organisms which feed on the invasive plant from the plant's native range overseas. The organisms which are introduced are referred to as biological control species or "biocontrol" species. Certain biocontrol species have been established on Russian knapweed in other states, such as Montana and Colorado, where Russian knapweed populations are extensive.

The California Department of Food and Agriculture (CDFA) has released two Russian knapweed biocontrol species within the state: a gall midge *(jaapiella ivannikovi)* and recently a gall wasp *(aulacidea acroptilonica)*. Both insects form galls (growths) on the stems of Russian knapweed plants reducing plant vigor and, in high populations, the ability of Russian knapweed to produce as many seeds. Talking with a biologist for CDFA, populations of the gall midge failed to establish after multiple releases in the state. However, recent releases of the gall wasp have shown initial promise for establishment.

Standish Alfalfa Percent Injury				
Treatment	One Week	Two Weeks	Four Weeks	Eight Weeks
Control	0	0	0	0
Dimetric .67lb + NIS	25	26	8	9
Sharpen 1oz + MSO	66	59	21	8
Sharpen 2oz + MSO	84	81	39	14
Shark 1oz + MSO	55	56	18	5
Shark 2 oz +MSO	78	66	30	10
Dimetric .67 lb + Sharpen .67oz	39	26	8	0
2,4-DB 1qt + Dimetric .67lb	26	28	14	3
Shark 2oz + Dimetric .67lb	58	59	14	6

Table 1: Alfalfa injury at Standish site, 1, 2, 4, 8 weeks after treatment. Darker shades of red highlight more injury where darker shades of green highlight less injury.

Standish Orchardgrass Percent Injury				
Treatment	One Week	Two Weeks	Four Weeks	Eight Weeks
Control	0	0	0	0
Dimetric .67lb + NIS	0	15	19	9
Sharpen 1oz + MSO	29	23	21	10
Sharpen 2oz + MSO	36	36	35	10
Shark 1oz + MSO	23	18	26	10
Shark 2 oz +MSO	25	24	25	11
Dimetric .67 lb + Sharpen .67oz	28	21	19	5
2,4-DB 1qt + Dimetric .67lb	0	11	14	6
Shark 2oz + Dimetric .67lb	18	23	25	4

Table 2: Orchardgrass injury at Standish site, 1, 2, 4, 8 weeks after treatment. Darker shades of red highlight more injury where darker shades of green highlight less injury.

Standish Weed Control Four Weeks After Treatment				
	Cheatgrass	Annual Polemonium	Jim Hill Mustard	Prickly Lettuce
Control	0	0	0	0
Dimetric .67lb + NIS	85	95	96	97
Sharpen 1oz + MSO	0	94	94	92
Sharpen 2oz + MSO	18	97	98	92
Shark 1oz + MSO	18	69	78	82
Shark 2 oz +MSO	3	66	73	89
Dimetric .67 lb + Sharpen .67oz	88	96	96	96
2,4-DB 1qt + Dimetric .67lb	86	95	96	98
Shark 2oz + Dimetric .67lb	86	97	97	97

Table 3: Weed control for select weeds at the Standish site four weeks after treatment. Darker shades of red highlight more control where darker shades of green highlight less control.

Adult gall wasps were released in the spring of 2017 at multiple Russian knapweed infestations in Lassen and Siskiyou counties. In the fall of 2017, release sites were visited to assess if the wasps had laid eggs on the stems of the knapweed plants, and if any galls were formed. Not at all sites, but at multiple sites in both counties, galls were found on the stems of some Russian knapweed plants! Next year's sites will be monitored to determine if the gall wasp population has become established. Hopefully, the insects survive the winter and continue feeding on the Russian knapweed patches well into the future.

Successful biocontrol programs can reduce invasive weed populations as a long-term solution. However, they are often only part of the solution, and should not be depended upon as the only source of control. If you are the infamous owner of a patch of Russian knapweed, I encourage you to get out and control it during the growing season this year. It is a noxious weed for a reason, and if noxious weeds grow on your property, they are yours, and legally need to be controlled.

Galls on stem of Russian knapweed plant.

2017 Weed and Agriculture Research Report

This years research report will be posted by the middle of March on the Lassen County Cooperative Extension Web Page. Topics in the report will include detailed updates on research trials conducted in the past year. Highlighted projects are: Roundup Ready Alfalfa: Avoiding Injury While Maximizing Weed Control, Weed Control in Mixed Alfalfa Orchardgrass Stands, LESA Irrigation Trial, Medusahead Control with Pre-Emergent Herbicide Applications, and Scotch Thistle Control with Aminocyclopyrachlor.

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