UPDATE ON LOW DESERT ALFALFA INSECT PEST CONTROL

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LOW DESERT ALFALFA PEST INSECT SEASONALITY

Insect	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Weevil												
Blue Alfalfa Aphid												
Pea Aphid												
Cowpea Aphid												
Alfalfa Caterpillar												
Armyworms												
Leafhoppers/ Three Cornered Alfalfa Hoppers												

ALFALFA WEEVILS – LIFE CYCLE
OVER-SUMMERS AS ADULTS – LAY EGGS IN ALFALFA STEMS IN WINTER/LATE FALL

ALFALFA WEEVIL LARVAE

ALFALFA WEEVIL LARVAL DAMAGE

PARKER VALLEY, ARIZONA
PALO VERDE VALLEY, CALIFORNIA

APPROXIMATELY 117,000 ACRES OF ALFALFA IN THE TWO VALLEYS AND MUCH MORE IN OTHER LOW DESERT AREAS

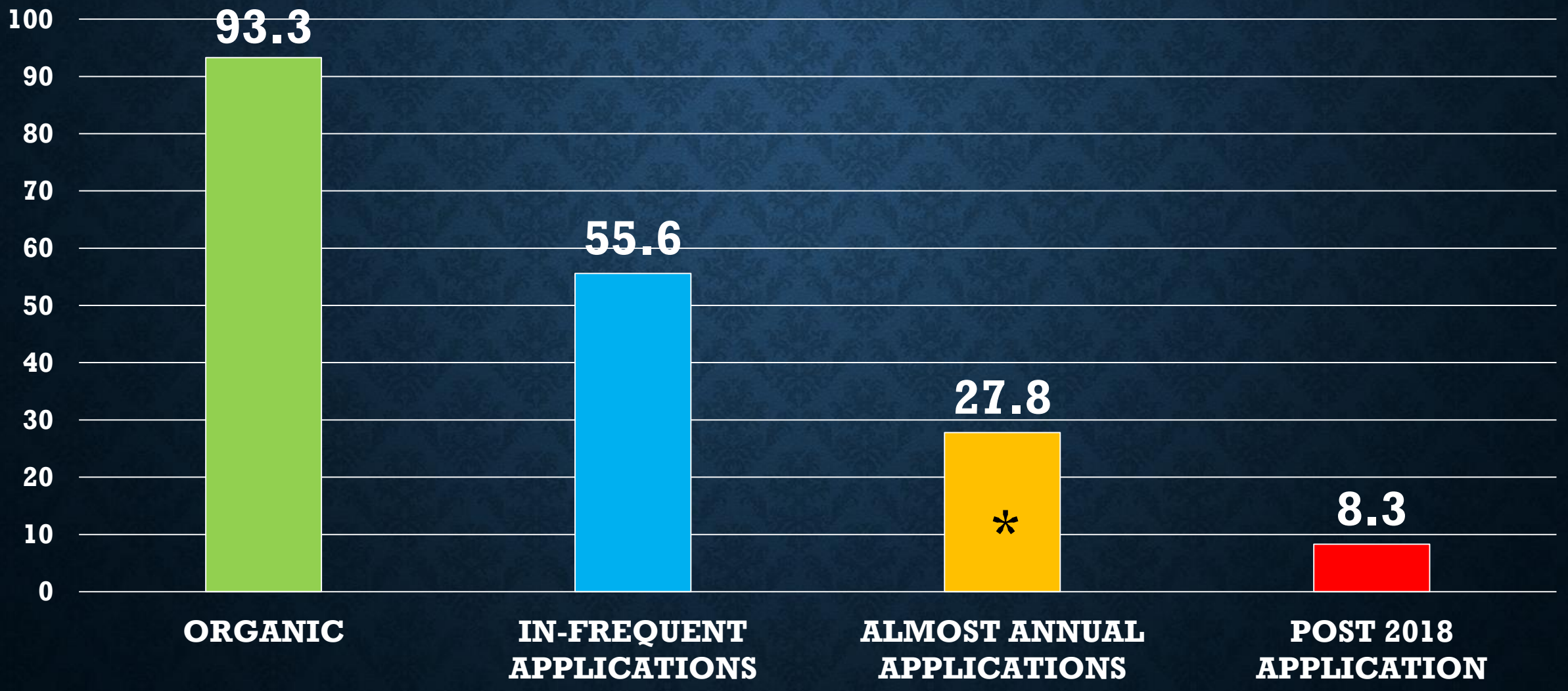
- **Situation at beginning of 2018**:
  - Baythoid XL losing effectiveness
  - Lambda-cyhalothrin (Warrior II, etc.) still considered highly effective and widely used

ONE WEEK AFTER INSECTICIDE APPLICATION

WHAT IS THE SITUATION?

INSECTICIDE RESISTANCE - OR - BAD CHEMICAL?

2018 LABORATORY BIOASSAY COMPARISONS FOR PALO VERDE VALLEY ALFALFA WEEVIL LARVAE CONTROL BY 1.92 OZ./ACRE OF WARRIOR II



2018 FIELD TRIAL DATA – BLYTHE

MEAN PERCENT ALFALFA WEEVIL LARVAE CONTROL AT 4 DAYS AFTER TREATMENT ON FEBRUARY 24 *(3 FOOT STRAIGHT LINE, DEEP SWEEP METHOD)*

2018 FIELD TRIAL DATA – BLYTHE

MEAN PERCENT ALFALFA WEEVIL LARVAE CONTROL AT 4 & 9 DAYS POST FEBRARY 24 TREATMENT *(3 FOOT STRAIGHT LINE, DEEP SWEEP METHOD)*

	4 Days	9 Days
Malathion 8 - 12 oz.	61.6	57.3
Lorsban 4E - 8 oz.	43.3	25.9
Lorsban 4E - 32 oz.	53	56.3
Warrior II 1.92 oz.	64.3	72.5
HM-1508A 2.8 oz.	58.2	73.6
Steward 4 oz.	82.9	95.5
Steward 6 oz.	85.4	96.1

WHY ISN'T FIELD EFFICACY CONTROL DATA THE SAME AS THE LABORATORY BIOSASSY?

- Laboratory bioassay used only large larvae that had survived several days of travel prior to testing (the weak didn't survive?).

- Field testing involved all larval stages, and smaller larvae are often more susceptible to insecticides.

OTHER THINGS NOTED ABOUT 2018 ALFALFA WEEVILS IN LOW DESERT

- A few larvae were still being collected in local insecticide trials into April. This was somewhat surprising as we had had a very warm winter and alfalfa weevils only have one generation per year are reported to have one generation/year.

- Do they have more than 1 generation/year the low desert??

LOW DESERT ALFALFA PEST INSECT SEASONALITY

Insect	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
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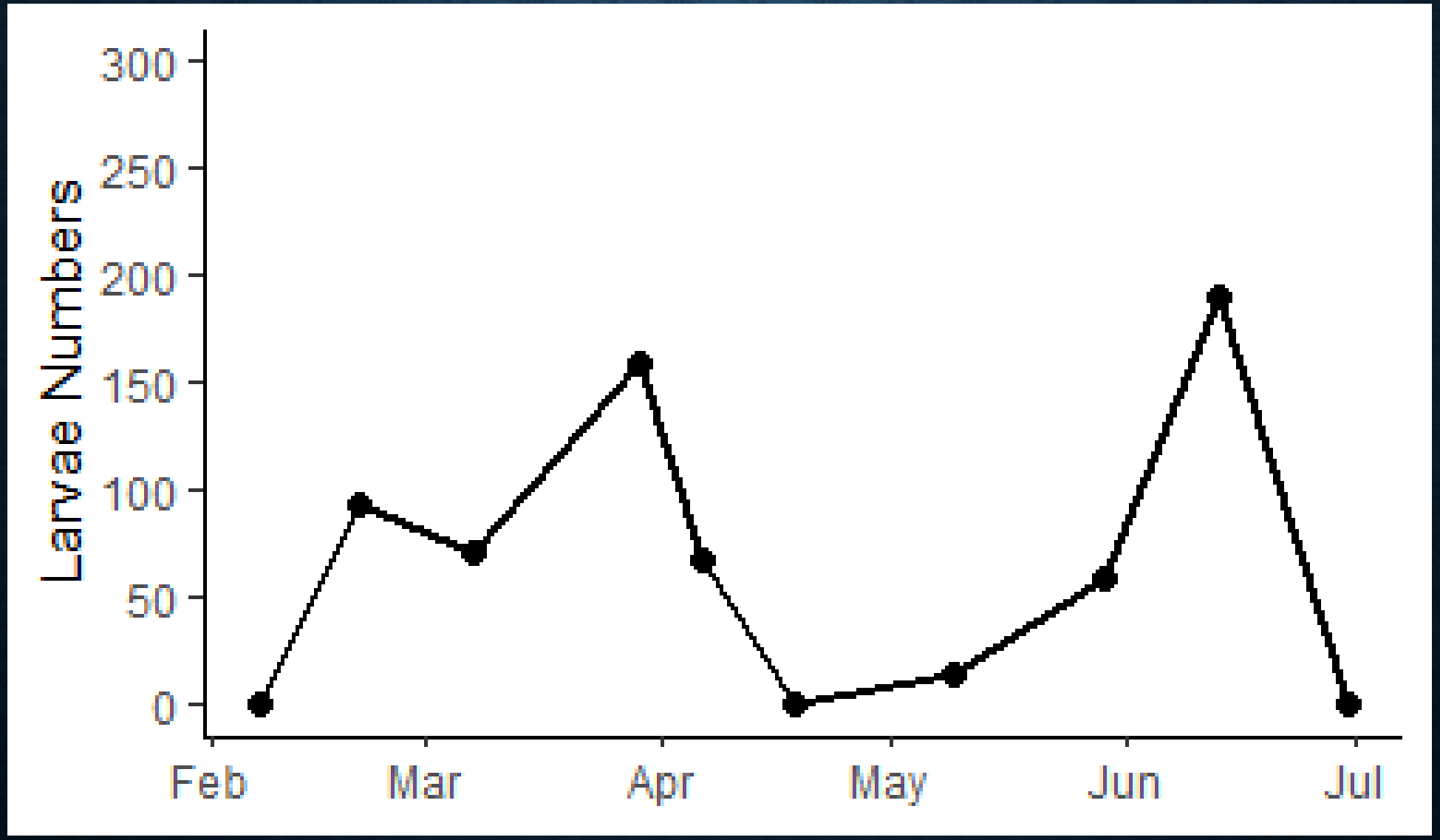
Cowpea Aphid												
Alfalfa Caterpillar												
Armyworms												
Leafhoppers/ Three Cornered Alfalfa Hoppers												

ALFALFA WEEVIL LARVAE COUNTS IN THE SAN JOAQUIN VALLEY, 2018



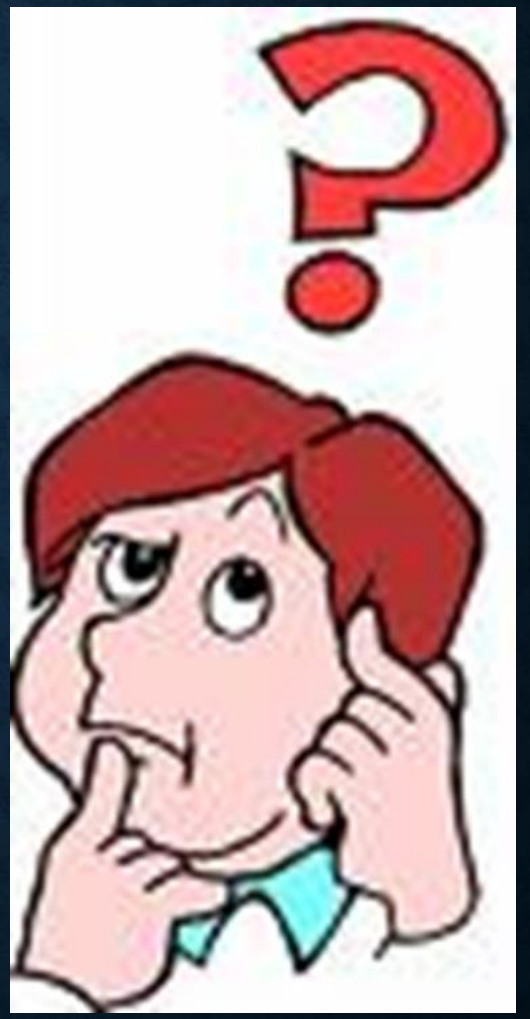
THIS SAME PATTERN *(ALFALFA WEEVIL LARVAL PEAKS IN JUNE & JULY)* **WAS NOTED IN SEVERAL LOW DESERT ALFALFA FIELDS IN 2018.**

- **This had also been noted from alfalfa in several low desert locations prior to 2018.**

AS ALFALFA WEEVILS CAN HAVE MULTIPLE GENERATIONS/YEAR

BASED ON THE DATA,

WHY DON'T WE SEE CONTINUOUS FEEDING PRESSURE IN EACH CUTTING THROUGH THE YEAR VS. JUST CERTAIN TIMES OF YEAR?

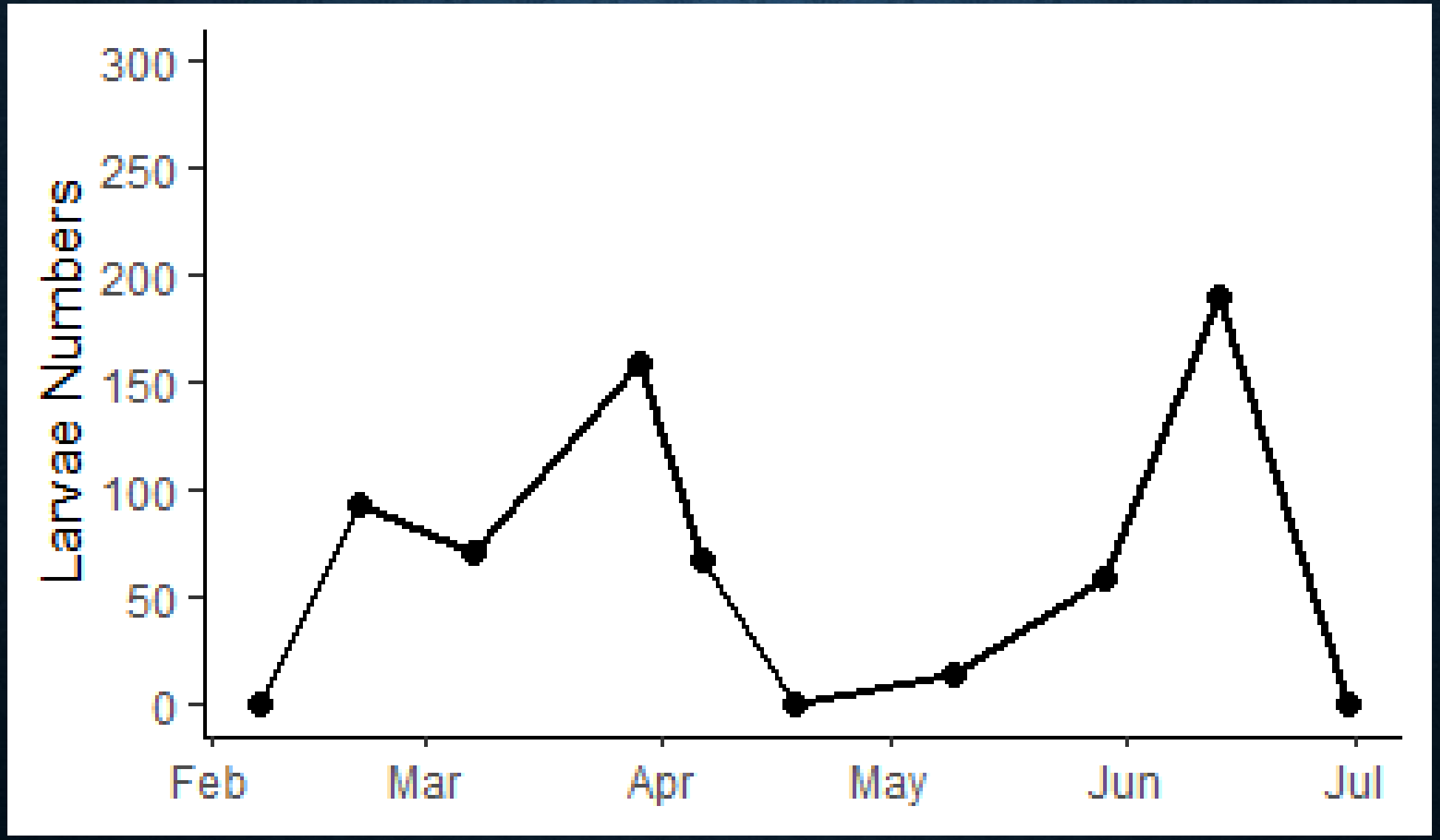


THERE ARE TWO (2) KEY BIOLOGICAL ASPECTS THAT GOVERN ALFALFA WEEVILS OVIPOSITION

- 1) It takes about 60 days after females alfalfa weevils become adults for ovaries to mature and be functional. Newly emerged adult female alfalfa weevils (March) would not have functional ovaries until May.

- 2) Summer solstice stops oviposition

ALFALFA WEEVIL LARVAL COUNTS IN THE SAN JOAQUIN VALLEY, 2018



2018 – THE WINTER AND SPRING OF APHIDS!

BLUE ALFALFA APHID

PEA APHID

2018 – THE WINTER AND SPRING OF APHIDS, APHIDS AND MORE APHIDS!

DO YOU RECOGNIZE THIS APHID?

(NOTE THE ANTENNAE THAT GRADUALLY DARKEN FROM BASE TO TIP, DARK TIPS OF CORNICLES, AND LIGHT GREEN 'STRIPES' BETWEEN BODY SEGMENTS)

IDENTIFICATION ASPECTS OF ACYRTHOSIPHON SPP. APHIDS OCCURRING IN NORTH & SOUTH AMERICAN ALFALFA

Character	**Pea aphid** *A. pisum*	**Blue Alfalfa Aphid** *A. kondoi*	**Green Trefoil Aphid** *A. Loti*
Distribution	Asia, Africa, Central America, Caribbean, Europe, North America, South America, Oceana,	Asia, South Africa, Europe (Russia), North America, South American, Oceana	Europe, and South America (Argentina)
Ave. Body Length	**4.1 mm**	**3.0-3.5 mm**	**1.7-2.9 mm**
Antennae ***Coloration***	End of each segment is black (appears banded)	Base lighter colored, gradual darkening towards tip	Base lighter colored, gradual darkening towards tip
Antennal length relative to body	**Length = 6.4 mm** ***(longer than body)***	**Length = 1.1x of body** ***(slightly longer than body)***	**0.9-1.0x length of body** ***(not longer than body length)***
Cornicles	Tip = Blackish	Tip = Black/Dark Usually >1.7x size of cauda.	Tip = Black Usually <1.7x size of cauda.

IDENTIFICATION ASPECTS OF ACYRTHOSIPHON SPP. APHIDS OCCURRING IN NORTH/SOUTH AMERICAN ALFALFA

Character	**Pea aphid** *A. pisum*	**Blue Alfalfa Aphid** *A. kondoi*	**Green Trefoil Aphid** *A. loti*
Distribution	Asia, Africa, Europe, North America, South America, Oceana, Central America, Caribbean	Asia, South Africa, Europe (Russia), North America, South American, Oceana	Europe, and South America (Argentina)
Average Body Length	4.1 mm	3.0-3.5 mm	1.7-2.9 mm
Antennae	End of each segment is black (appears banded) Length = 6.4 mm (longer than body)	End is dark, base is lighter colored. **Terminal = 1.6-2.7x longer than cauda**	End is black, base is lighter colored. 0.9-1.0x length of body. **Terminal = 1.1-1.6x longer than cauda**
Cornicles	Tip = Blackish	Tip = Black/Dark Usually >1.7x size of cauda.	Tip = Black Usually <1.7x size of cauda.

BLUE ALFALFA APHID
TIME LINE OF IMPORTANT EVENTS

- 1974 – Blue alfalfa aphid, a native of Asia, found in U.S. for first time (Kern Co., California)

- 1975 - California alfalfa reported damaged by blue alfalfa aphid feeding partially due to toxin it injects while feeding

BLUE ALFALFA APHID
TIME LINE OF IMPORTANT EVENTS

- 1977? – CUF 101, a variety developed for resistance to blue alfalfa aphid, released to alfalfa growers.

- *CUF 101 had 60% of plants that survived blue alfalfa aphid infestation in greenhouse studies. This is considered to be High Resistance in alfalfa variety ratings (HR = 51+% of plants that have resistance)*

BLUE ALFALFA APHID
TIME LINE OF IMPORTANT EVENTS

- 1991 - First report of a new blue alfalfa biotype in US, noted as BAOK90 (Oklahoma).

- 1998 – Three to seven (3-7) phenotypes identified in Australia. Clones differed in life history traits that included survival, fecundity, growth rates and percentage of winged aphids.

BLUE ALFALFA APHID
TIME LINE OF IMPORTANT EVENTS

- 2001 – Variation in growth rates of various BAA aphids (Australia)

- 2009 – South Australia – Blue alfalfa aphids collected from certain locations had much greater virulence on all previously resistant alfalfa varieties, producing high rates of plant mortality.

BLUE ALFALFA APHID
TIME LINE OF IMPORTANT EVENTS

- 2012 – South Australia – Confirmation of the 2009 discovery that a new, highly virulent blue alfalfa aphid exists in south Australia. Expansion of range noted.
  (Humphries et al., 2012)

- 2013 and subsequent years – Severe and damaging outbreaks of blue alfalfa aphid in California.

SINCE 1978 A MAJOR EFFECTIVE INTEGRATED PEST MANAGEMENT TOOL FOR BLUE ALFALFA APHIDS HAS BEEN THE USAGE OF HIGHLY RESISTANT ALFALFA VARIETIES

- This is usually in conjunction with beneficial insects and insecticides as needed

- CUF-101

ARE WE EXPERIENCING A NEW BLUE ALFALFA APHID BIOTYPE IN CALIFORNIA?

- Timing of recent outbreaks since 2013 fits chronologically with the new blue alfalfa aphid biotype noted in Australia.

- At this time, it is unproven if a new biotype exists in California.

ARE WE EXPERIENCING A NEW BLUE ALFALFA APHID BIOTYPE IN CALIFORNIA?

- Research is needed to determine if the recent and current outbreaks of blue alfalfa aphid are the same biotype as those historically encountered.

- If different, how does this fit with currently available alfalfa varieties? New varieties with resistance may need to be developed for a new biotype.

ALFALFA VARIETY RESISTANCE LEVELS

Resistance Level		% Resistant Plants	% Susceptible Plants
S	Susceptible	0-5	95-100
LS	Low Resistance	6-14	84-96
MR	Moderate Resistance	15-30	70-85
R	Resistance	31-50	50-69
HR	High Resistance	51+	0-49

2019 FIELD WITH MULTIPLE INFESTATION AREAS

DAMAGE FROM APHID FEEDING, 2019

MIS-SHAPEN STEMS, YELLOWED/DESICATED LEAVES, CAST APHID SKINS, AND BLACK MOLD ON LEAVES ASSOCIATED WITH ‘HONEYDEW’

WHY ARE THESE APHID DAMAGE AREAS SOMEWHAT CIRCULAR IN SHAPE?

BLUE ALFALFA APHID BIOLOGY

PEA APHIDS AND BLUE ALFALFA APHIDS

- Don't oversummer here, must fly into the area each winter from another location

- Winged aphids land on alfalfa and start reproducing

- These non-winged aphids stay on this plant and/or move (walk) to adjacent plants and continue reproducing. This produces circular areas of infested plants

- Aphids don't develop wings and fly away until they are stressed (plant nutrition, over-crowding)

WHAT ARE THE MAJOR BENEFICIAL INSECTS OF APHIDS IN ALFALFA?

- **Lady Beetles (2 species)**
- **Parasitic wasps (primarily *Aphidius ervi* for blue alfalfa aphids and pea aphids)**

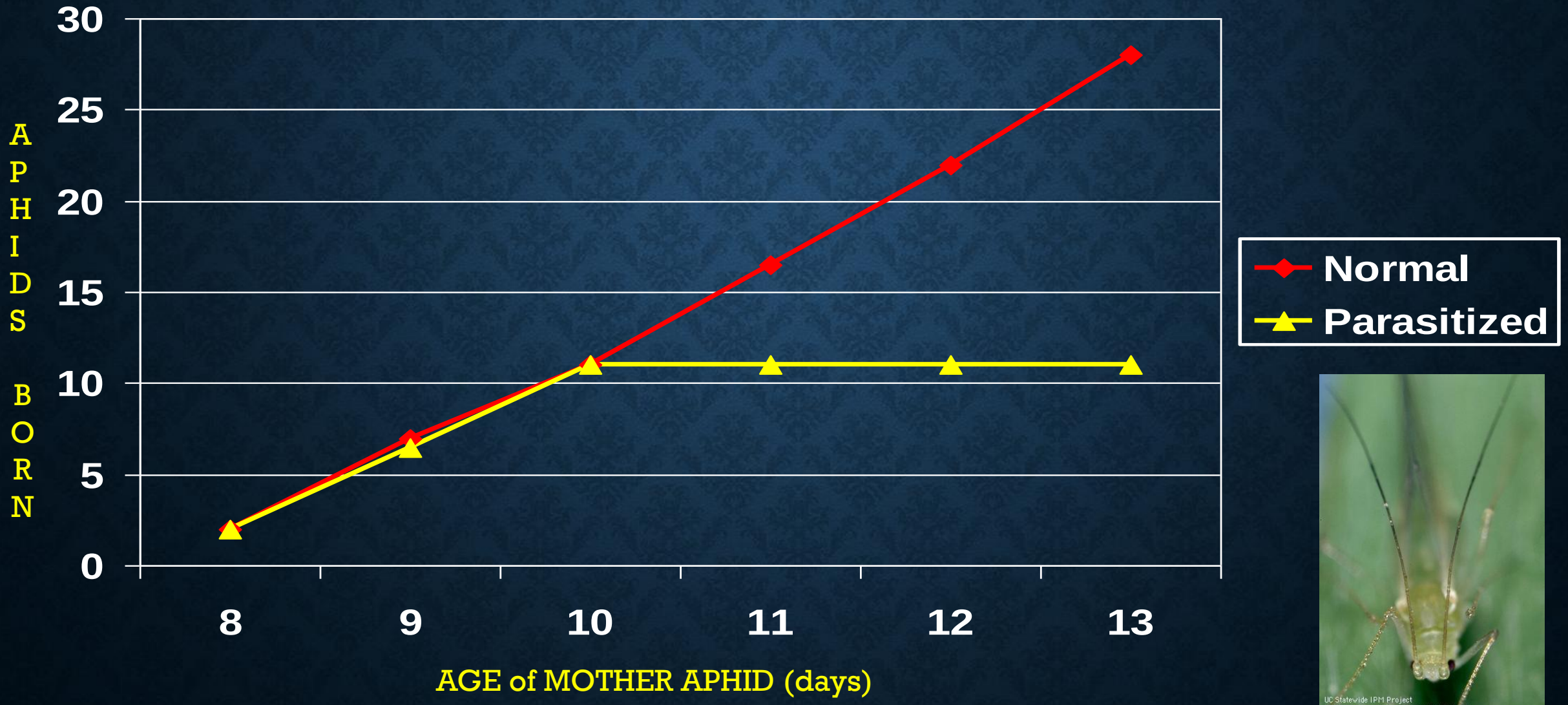
CONVERGENT LADYBEETLE

SEVEN SPOTTED LADY BEETLE

- Feeds on alfalfa weevil larvae as well as aphids
- Much larger in size than the convergent lady beetle, or other lady beetles encountered in local alfalfa. Larger = eat more aphids!

BLUE ALFALFA APHID REPRODUCTION

NUMBER OF APHIDS PRODUCED PER DAY (NEBRASKA, EARLY 1980S)



WHY AREN'T WE SEEING BIOLOGICAL CONTROL OF BLUE ALFALFA APHIDS? THERE ARE PLENTY OF PARASITIZED COWPEA APHIDS

APHID PARASITES ARE FAIRLY SPECIALIZED

- Parasitic wasps that attack and kill cowpea aphid and spotted alfalfa aphids do not attack and kill pea and/or blue alfalfa aphids

- The wasps that attack pea and blue alfalfa aphids need aphid hosts to survive in area, but hosts aren't here in the summer

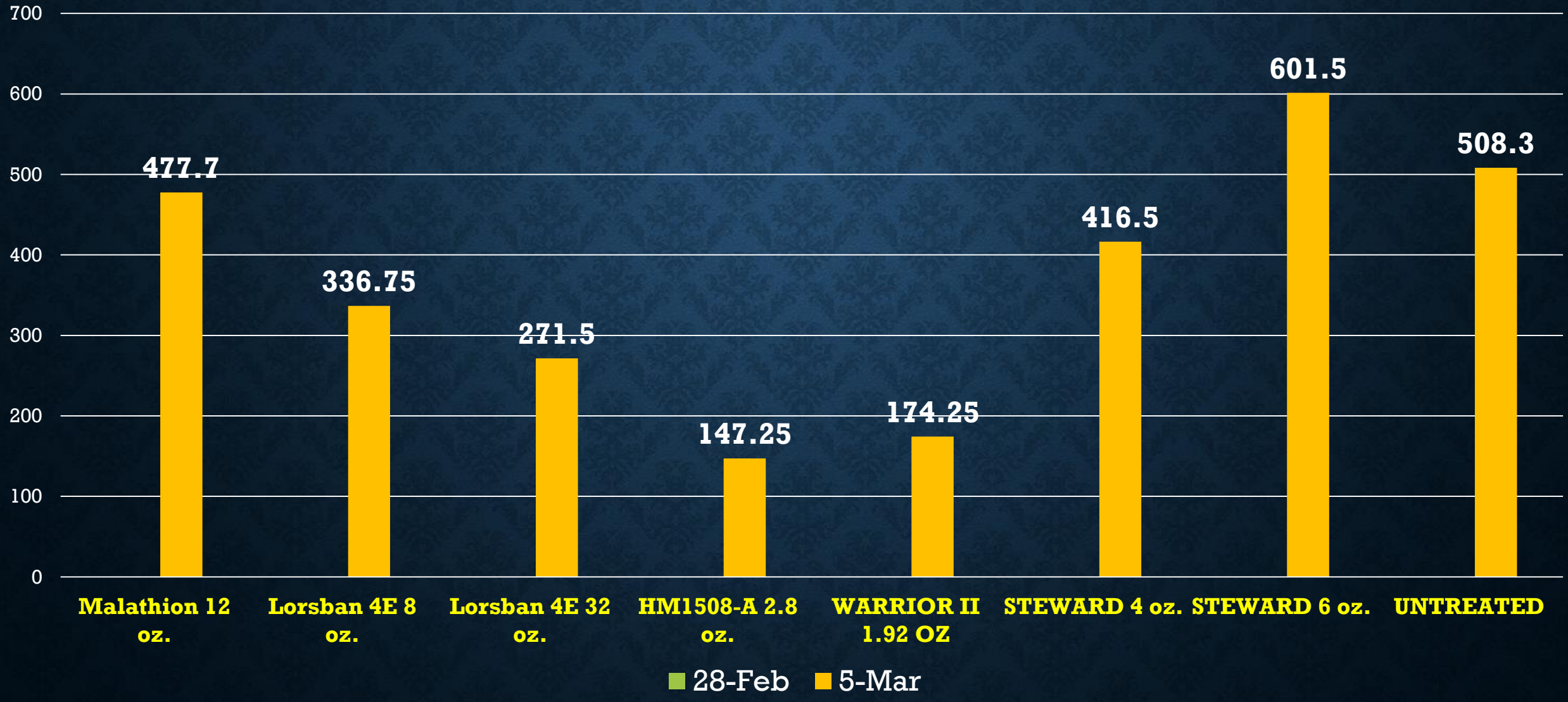
- Wasps that attack blue and pea aphids must be re-introduced to area. This happens when multiple pea and/or blue alfalfa aphids that have been parasitized (but not yet killed) fly into the area and wasps begin reproducing.

- Wasps can be killed via insecticide applications (pyrethroids), and/or when parasitized aphids are eaten by lady beetles.

IN 2018 – APHIDS WERE NOT CONTROLLED BY RESISTANT VARIETIES AND BENEFICIAL INSECTS

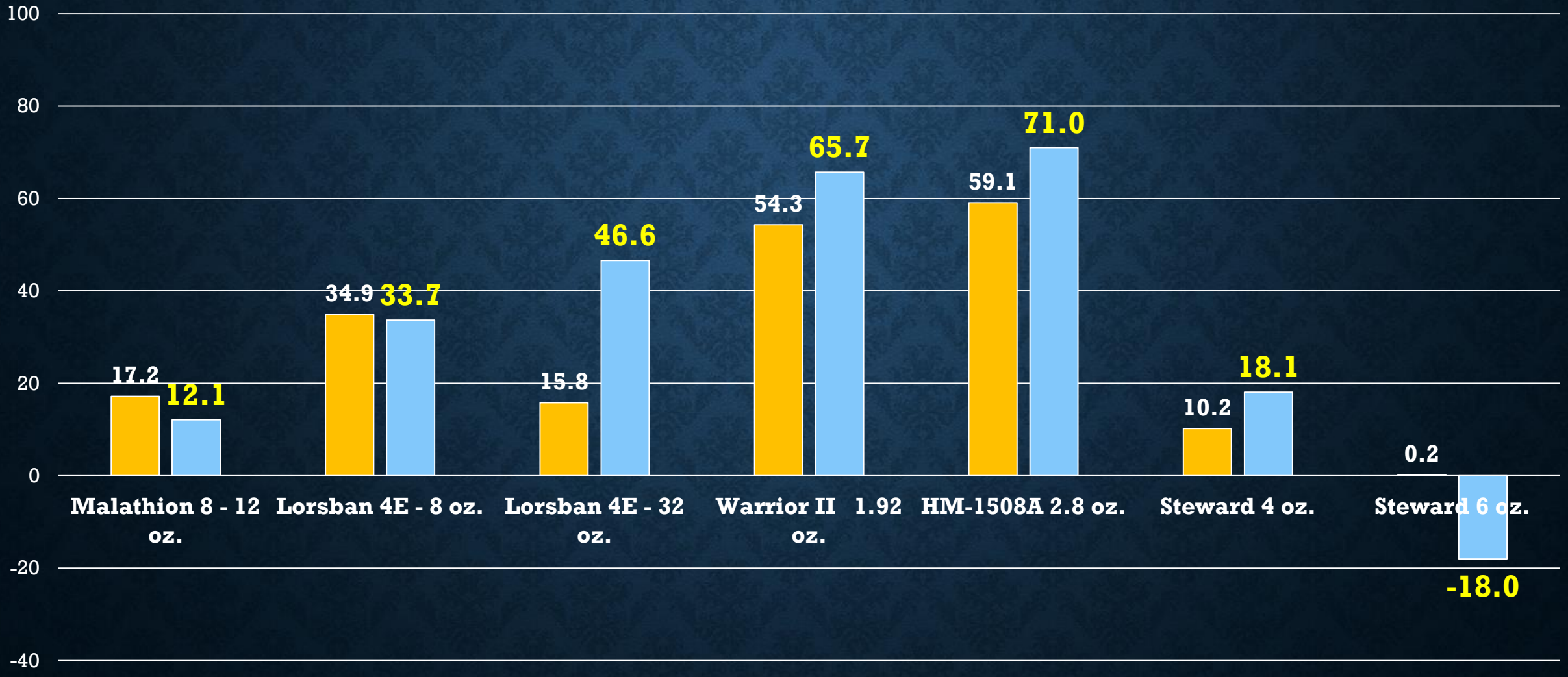
- Insecticides were our only viable option!

APHIDS *(PEA & BLUE ALFALFA)*/5 SWEEPS AT 9 DAYS POST TREATMENT *(FEBRUARY 24, 2018, BLYTHE, CA)*



2018 EARLY SEASON FIELD TRIAL DATA – BLYTHE

% PEA APHID + BLUE ALFALFA APHID CONTROL AT 4 AND 9 DAYS POST FEB. 24 TREATMENT *(3 FOOT STRAIGHT LINE SWEEP METHOD)*



2018 EARLY SEASON FIELD TRIAL DATA – BLYTHE

% PEA APHID CONTROL AT 4 AND 9 DAYS AFTER FEB. 24 TREATMENT *(3 FOOT STRAIGHT LINE DEEP SWEEP METHOD)*

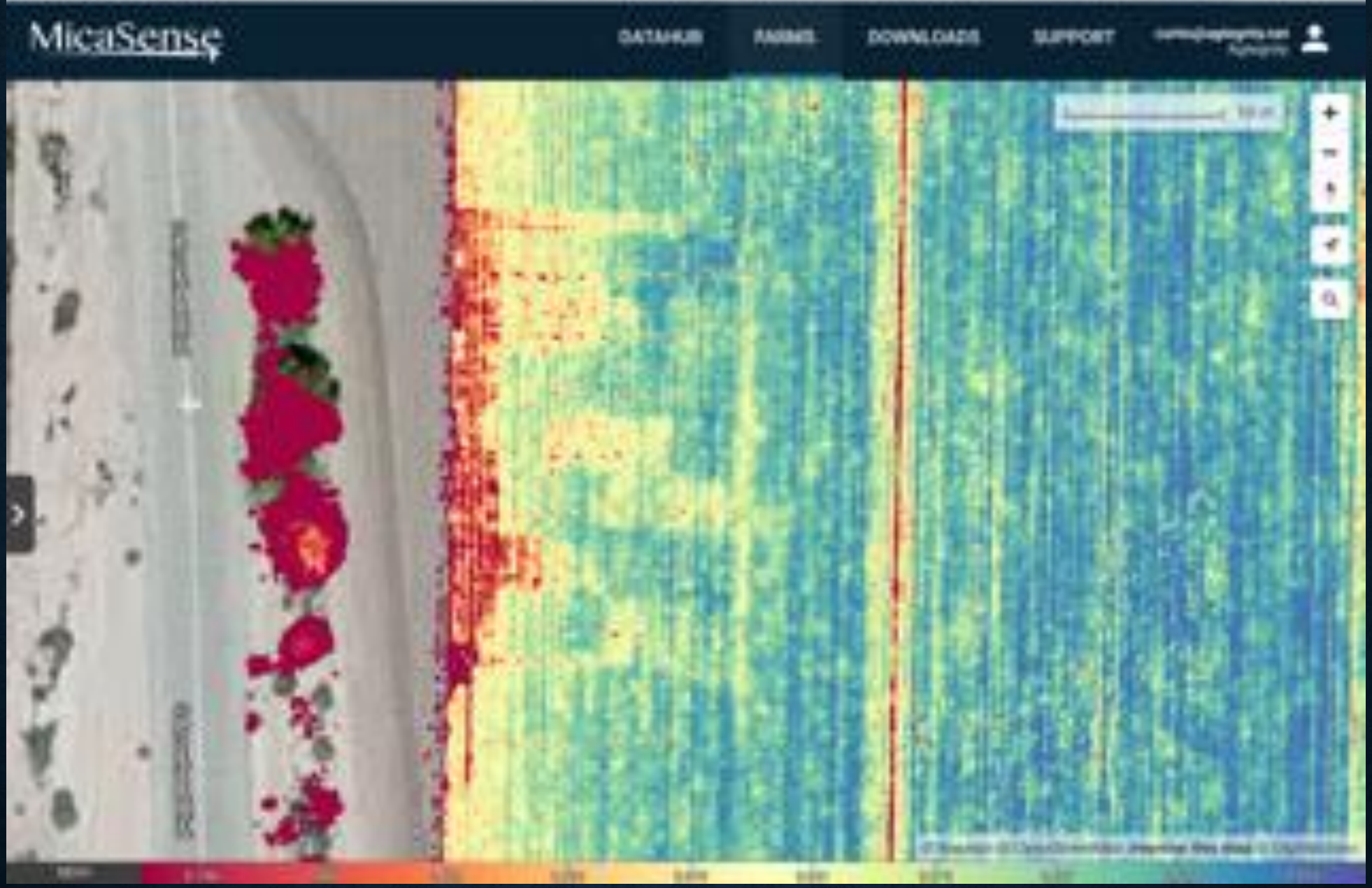
Treatment	4 DAT	9 DAT
Malathion 8 - 12 oz.	21.7	11.2
Lorsban 4E - 8 oz.	79.4	68.2
Lorsban 4E - 32 oz.	70.2	80.4
Warrior II 1.92 oz.	64.9	59.4
HM-1508A 2.8 oz.	61.8	64.4
Steward 4 oz.	-5.6	5.9
Steward 6 oz.	-13.9	-60.7

2018 EARLY SEASON FIELD TRIAL DATA – BLYTHE

% BLUE ALFALFA APHID CONTROL AT 4 AND 9 DAYS AFTER FEB. 24 TREATMENT *(3 FOOT STRAIGHT LINE DEEP SWEEP METHOD)*

	4 days	9 days
Malathion 8 - 12 oz.	14.2	22.8
Lorsban 4E - 8 oz.	5.4	18.8
Lorsban 4E - 32 oz.	-20.3	31.9
Warrior II 1.92 oz.	47.3	73.7
HM-1508A 2.8 oz.	57.3	78.8
Steward 4 oz.	20.3	35.5
Steward 6 oz.	9.6	23.1

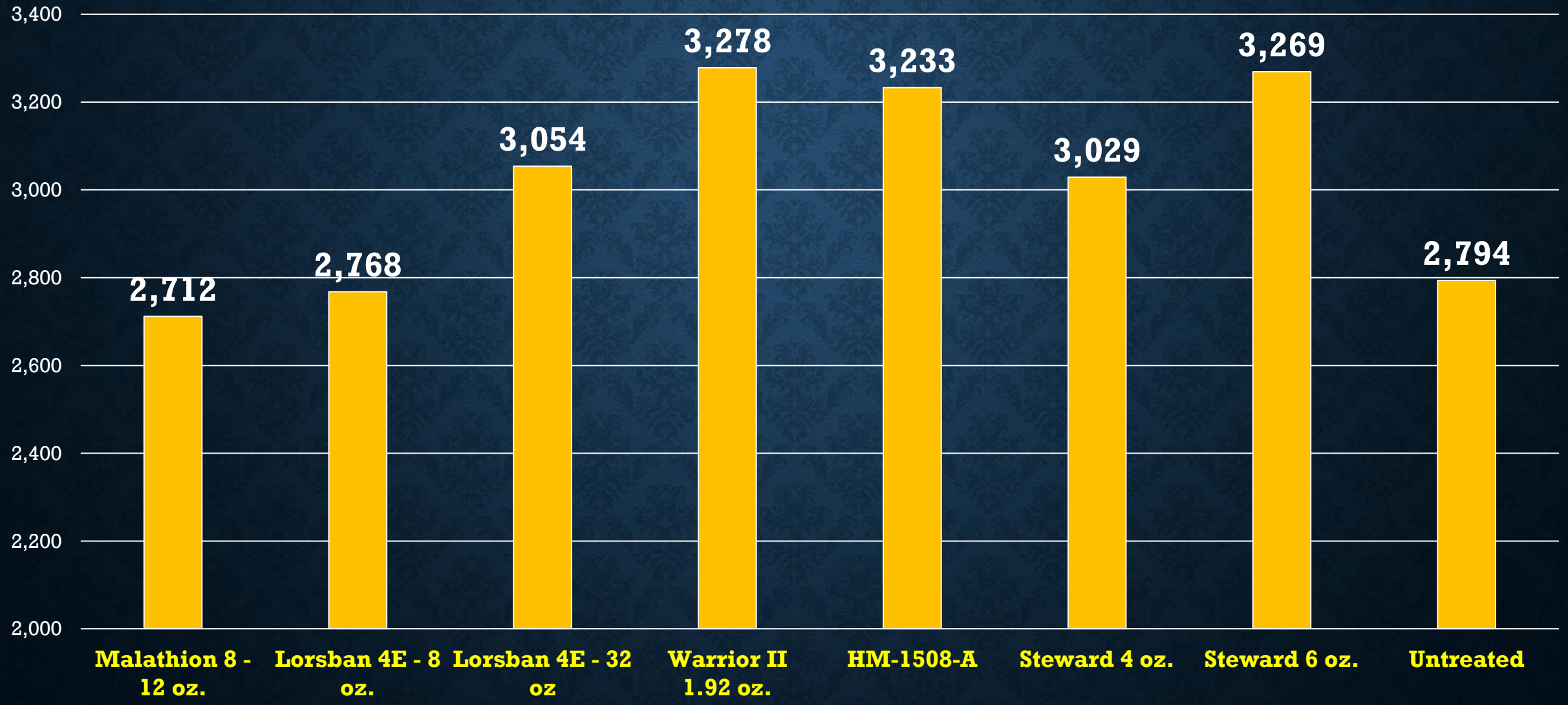
ALFALFA FIELD INSECTICIDE TRIAL AT HARVEST – BLYTHE, 2018



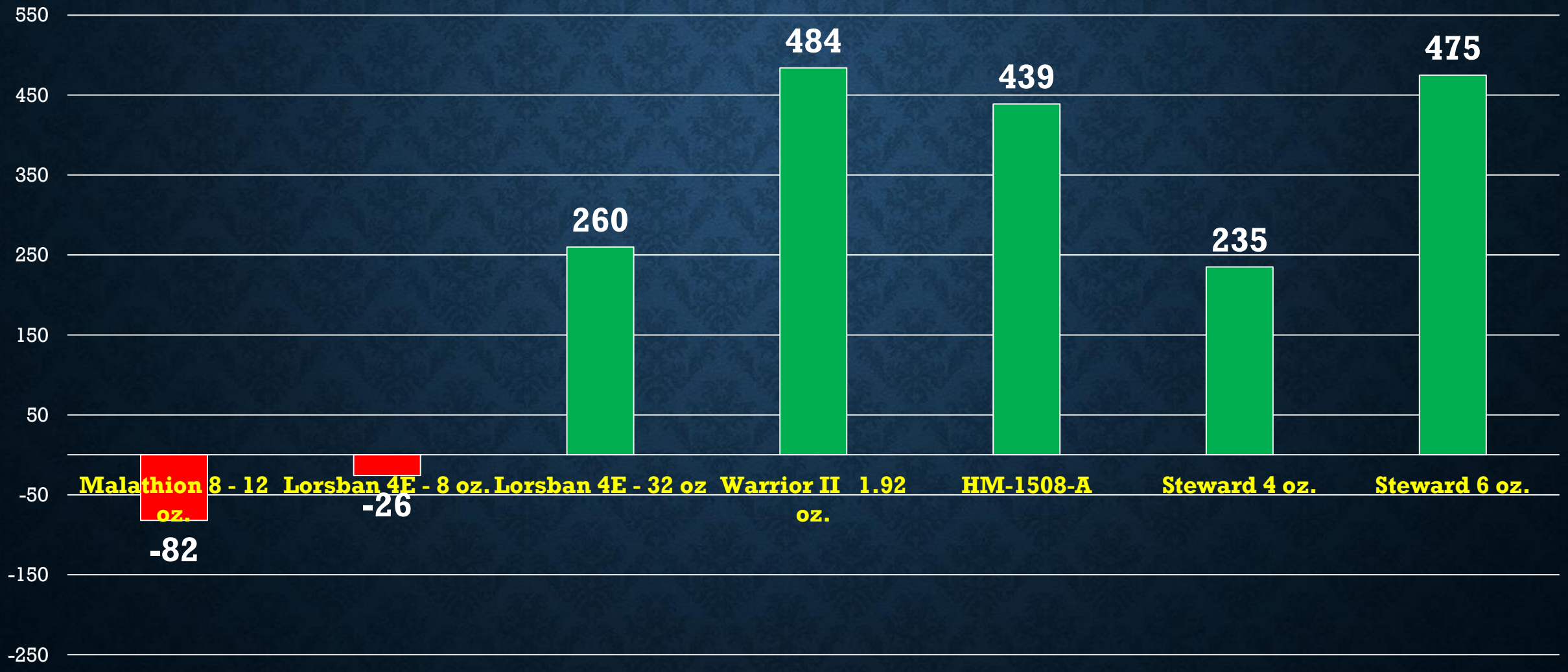
Preliminary Image supplied by: Curtis Pate, Agtegrity

2018 FIELD TRIAL DATA – BLYTHE

ALFALFA HAY YIELDS (LBS./ACRE)

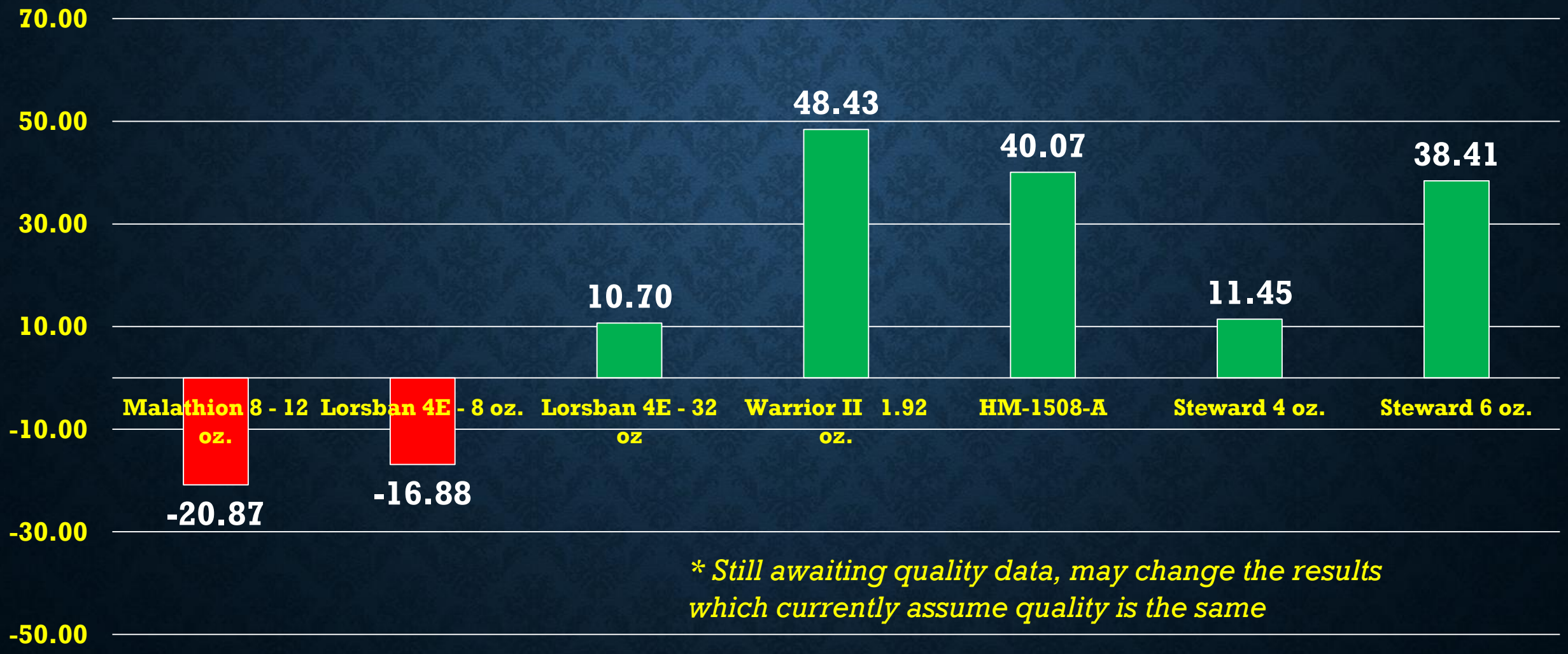


2018 FIELD TRIAL DATA – BLYTHE
ALFALFA HAY YIELDS VS. CHECK (LBS./ACRE)



2018 FIELD TRIAL DATA – BLYTHE

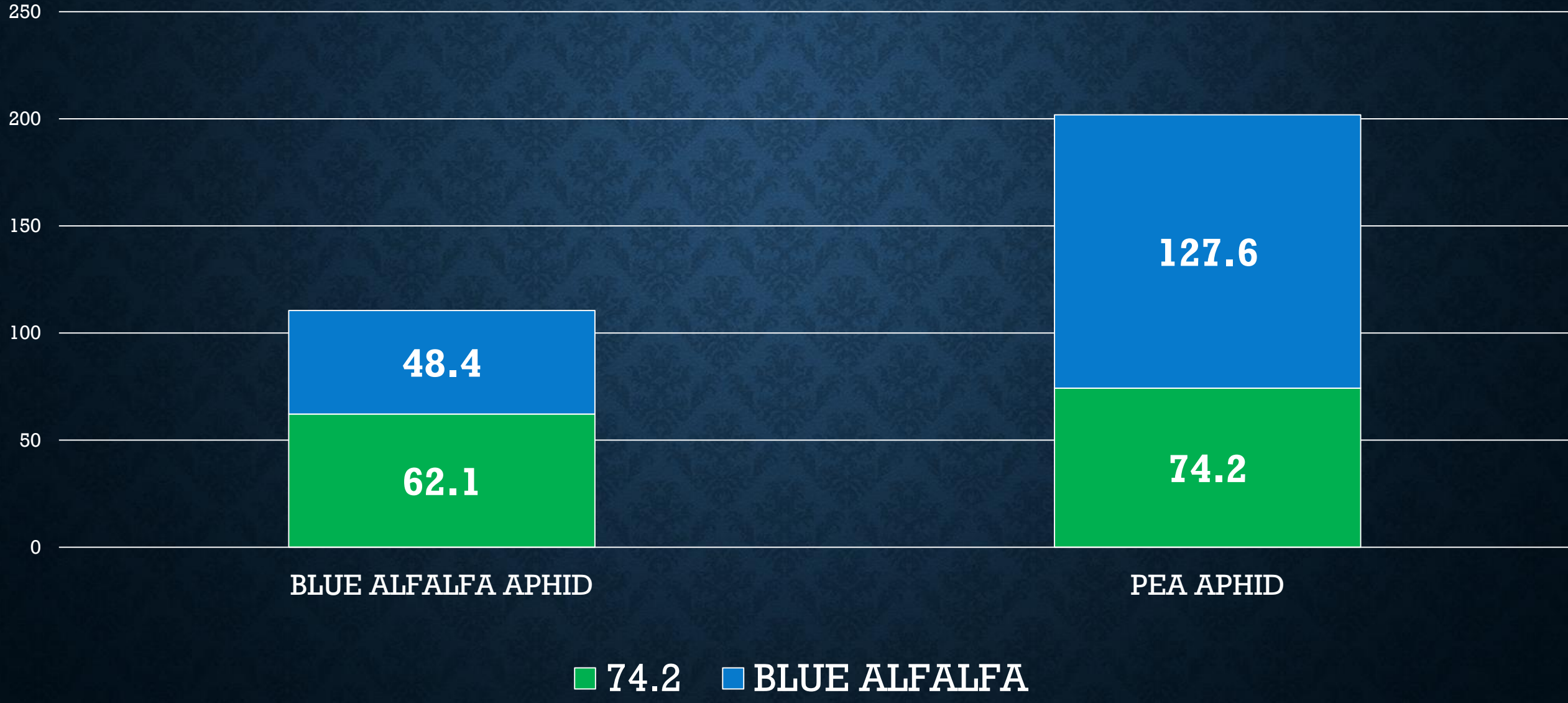
CALCULATED NET $ VALUE VS. CHECK ($/ACRE AT $265/TON*))



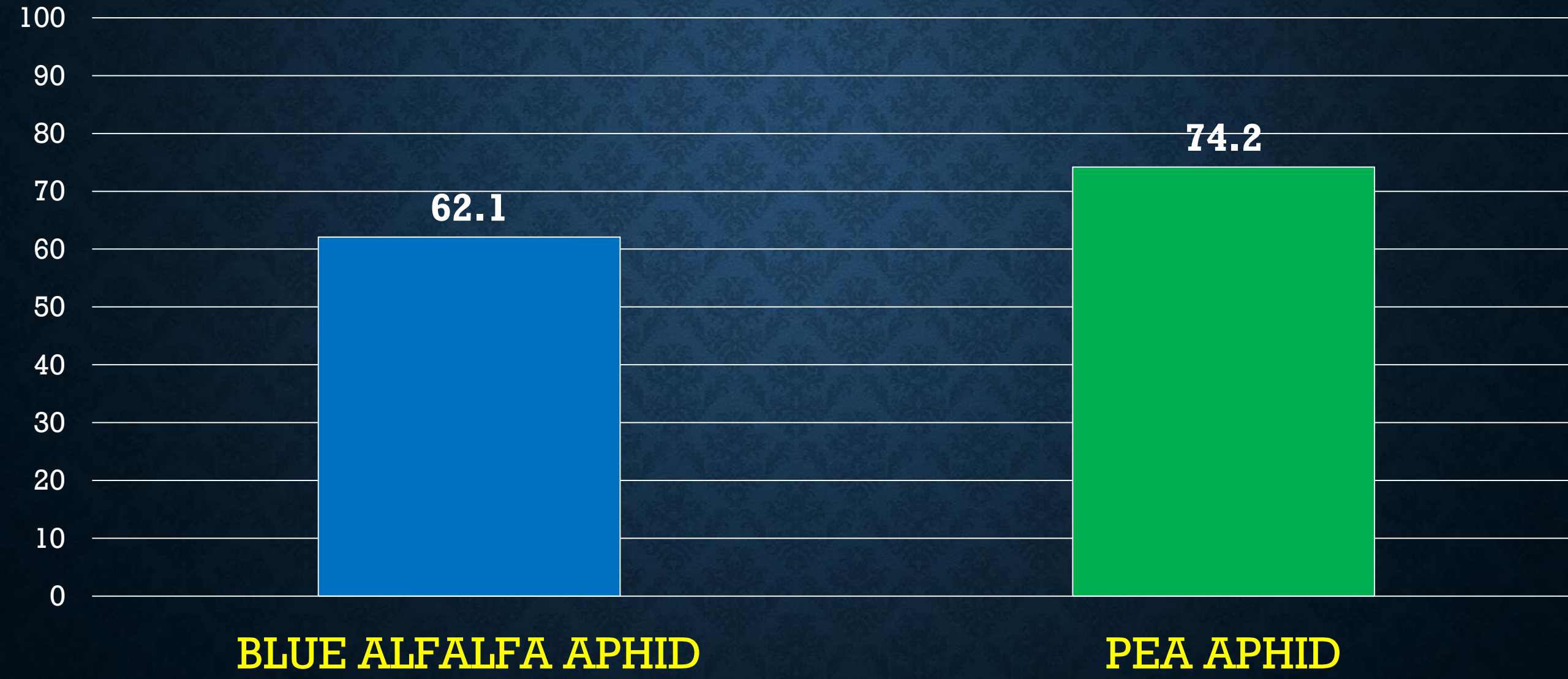
** Still awaiting quality data, may change the results which currently assume quality is the same*

OTHER PEA APHID AND BLUE ALFALFA APHID CONTROL EXPERIMENTATION

PEA APHIDS AND BLUE ALFALFA APHIDS/SWEEP AT 5 DAYS POST TREATMENT ON MAY 28, 2018

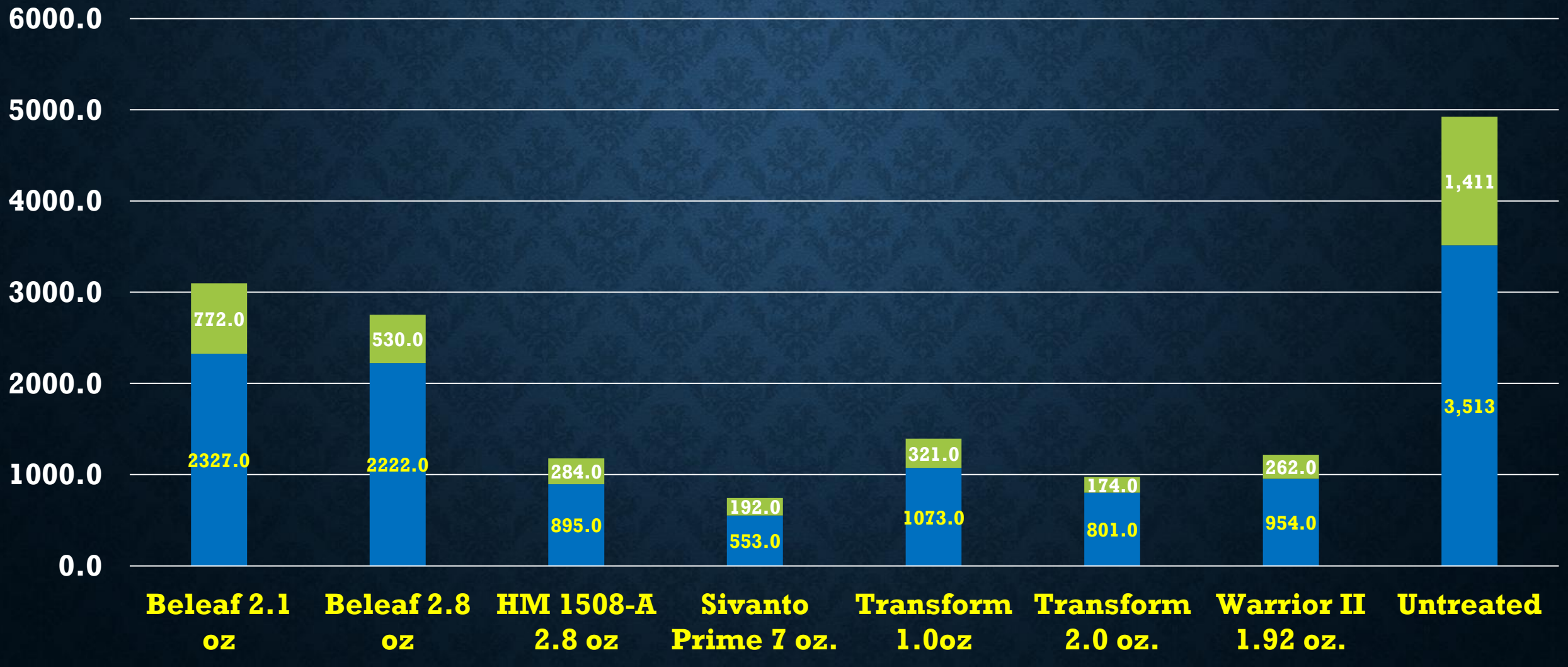


PERCENT CONTROL OF PEA APHIDS AND BLUE ALFALFA APHIDS AT 5 DAYS AFTER TREATMENT ON MAY 28, 2018 WITH 16 OZ./ACRE OF DIMETHOATE 400 + 7 OZ SIVANTO PRIME



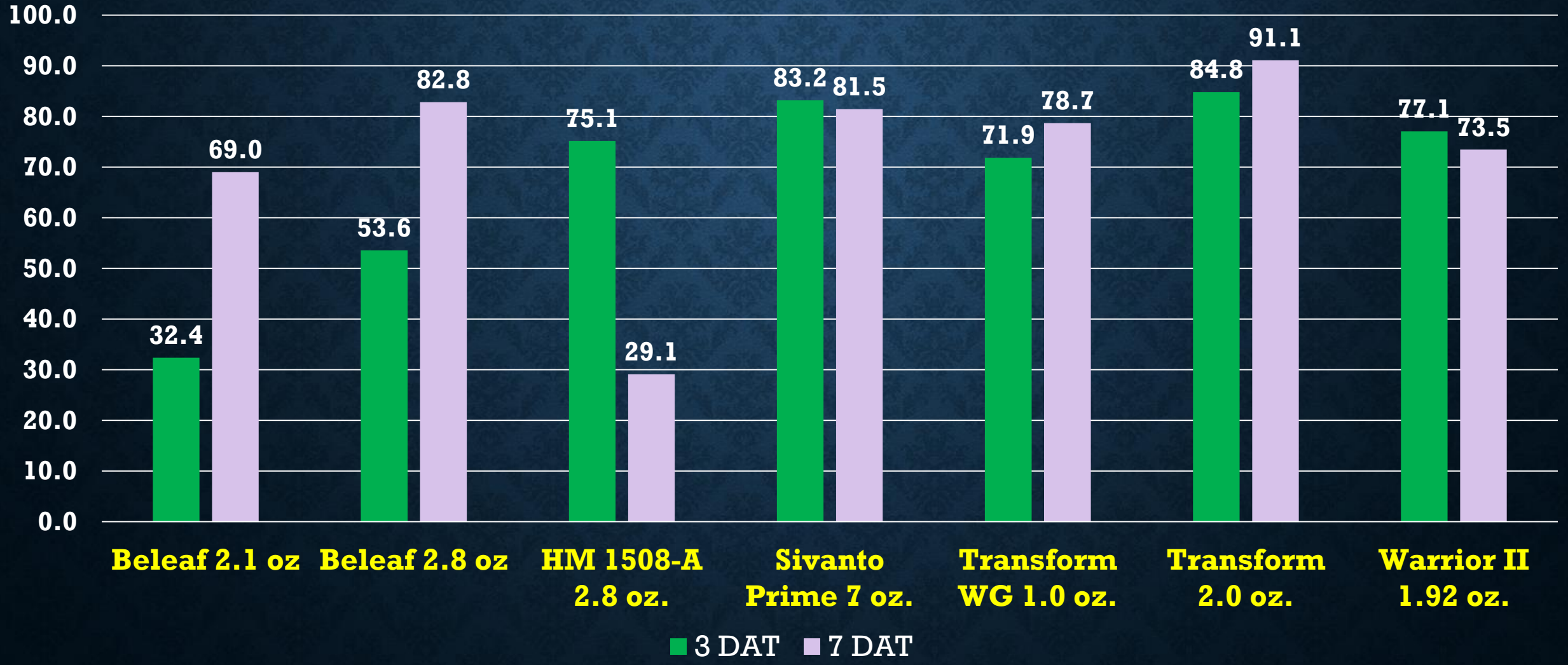

117,793 Aphids
gave their lives for the
following spring 2018 study.

NUMBER OF BLUE ALFALFA APHIDS AND PEA APHIDS/10 SWEEPS AT THREE (3) DAYS POST LATE SPRING SEASON APPLICATION ON MARCH 26, 2018 BLYTHE, CA



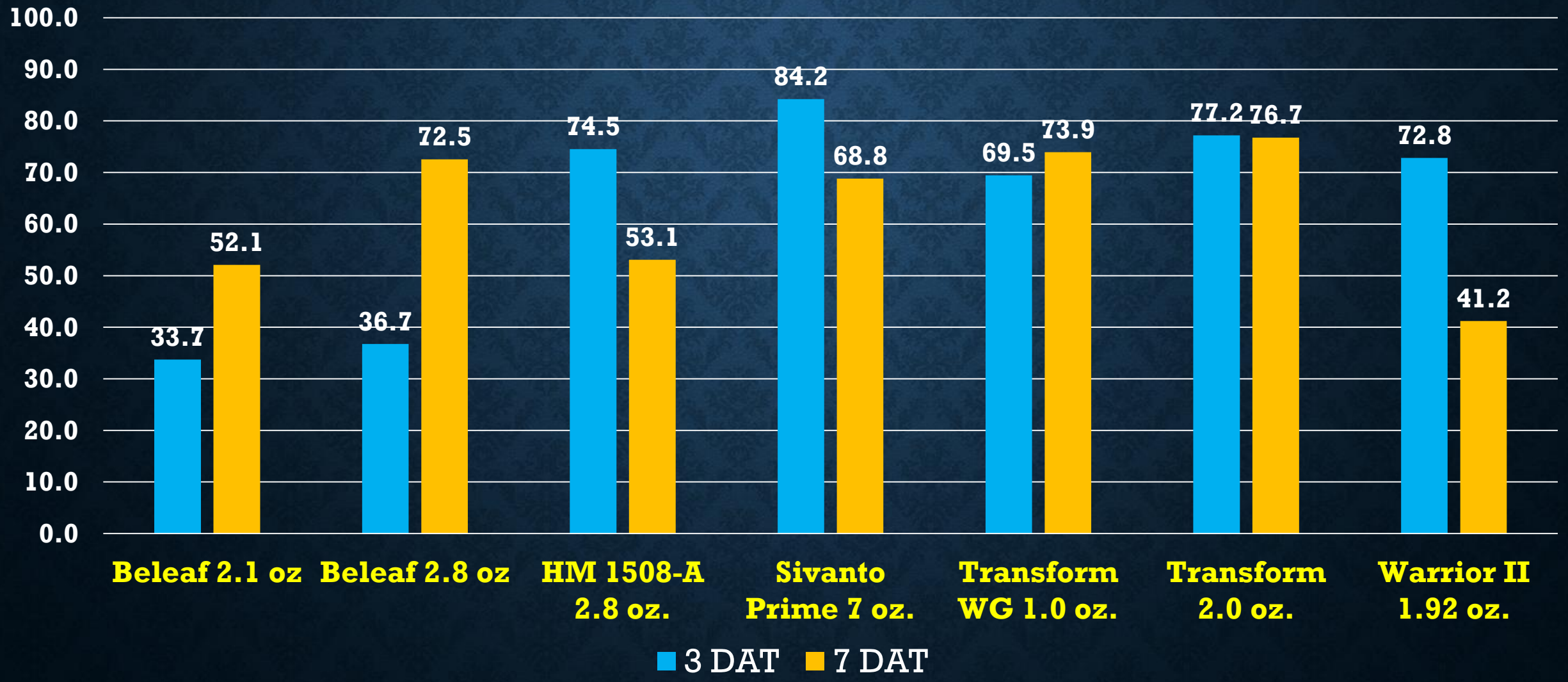
PERCENT PEA APHID CONTROL AFTER LATE SPRING SEASON APPLICATION

(MARCH 26, 2018 BLYTHE, CA)



PERCENT CONTROL OF BLUE ALFALFA APHIDS AT 3 AND 7 DAYS AFTER LATE SEASON APPLICATION

(MARCH 26, 2018 BLYTHE, CA)



PERCENT APHID CONTROL BY PYRETHROID INSECTICIDES BETWEEN LATE FEBRUARY AND EARLY APRIL IN LOW DESERT DUE TO TEMPERATURE

Late February - Early March (through *9 days post treatment)*	**Late March**	Very Late March – Early April
Ave. High = 69 F Ave. Low = 39.1 F	Ave. High = 80.0 F Ave. Low = 52.3 F	Ave. High = 92 F Ave. Low = 59 F
~75% Aphid Control	~73% Aphid Control	~48% Aphid Control

LOW DESERT ALFALFA PEST INSECT SEASONALITY

Insect	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Weevil												
Blue Alfalfa Aphid												
Pea Aphid												
Cowpea Aphid												
Alfalfa Caterpillar												
Armyworms												
Leafhoppers/ Three Cornered Alfalfa Hoppers												

CATERPILLARS IN LOW DESERT ALFALFA

OUTBREAKS USUALLY FOLLOW VERY HOT, DRY SUMMER CONDITIONS WHICH KILL *TRICHOGRAMMA SEMIFUMATUM* WASPS, WHICH PARASITIZE ALFALFA CATERPILLAR EGGS

ALFALFA CATERPILLARS

ARMYWORMS

SEVERAL SPECIES FOUND IN LOW DESERT ALFALFA

- Beet armyworm
- Yellow-Striped Armyworm
- Western Yellow-Striped Armyworm

ARMYWORMS

SEVERAL SPECIES FOUND IN LOW DESERT ALFALFA

- Beet armyworm
- Yellow-Striped Armyworm
- Western Yellow-Striped Armyworm

- Egg masses covered with scales

BEET ARMYWORM

YELLOW STRIPED ARMYWORM

WESTERN YELLOW STRIPED ARMYWORM

ALFALFA WITH ARMYWORM FEEDING DAMAGE

SUMMER 2018 – EFFECICACY OF VARIOUS INSECTICIDES UNDER HIGH TEMPERATURE CONDITIONS

- Inscticide classes used were those currently recommended by UC-IPM Alfalfa Pest Management Guidelines. Actual insecticides and rates evaluated were

- *Bacillus thuringiensis* DiPel DF @ 8 oz./acre
- Indoxacarb Steward EC @ 8 oz./acre
- Methoxyfenozide Zylo @ 8 oz./acre

- Chlorantraniliprole Coragen 3.5 oz./acre

Mean number of alfalfa butterfly caterpillars (number/10 sweeps) following insecticide application on July 6, 2018, Blythe, California.

		Sample Date			
Insecticide and Rate/Acre		July 9	July 13	July 16	July 20
Coragen®	3.5 oz.	0.25a	0.00a	0.00a	0.00a
DiPel® DF	8 oz.	0.25a	0.00a	0.00a	0.00a
DiPel® DF + Steward*	8 oz. 3.2 oz.	0.75a	0.00a	0.25a	0.00a
Steward® EC	8 oz.	0.25a	0.50a	0.00a	0.00a
Zylo™	8 oz.	1.75a	0.00a	0.00a	0.25ab
Untreated	-----	90.25 b	46.75 b	5.00 b	0.75 b
	P value	*<0.0001*	*<0.0001*	*<0.0001*	*0.02*

Mean total beet armyworm caterpillars (number/10 sweeps) following insecticide application on July 6, 2018, Blythe, California.

Insecticide and Rate/Acre		Sample Date July 9	July 13	July 16	July 20
Coragen®	3.5 oz.	0.50a	0.00a	0.25a	0.50a
DiPel® DF	8 oz.	6.50 bc	7.75 b	3.00 b	2.00a
DiPel® DF + Steward®	8 oz. 3.2 oz.	1.50ab	1.00a	1.25ab	2.75a
Steward® EC	8 oz.	0.50a	1.50a	0.75a	1.50a
Zylo™	8 oz.	0.25a	0.00a	0.75a	4.25a
Untreated	-----	9.00 c	4.75ab	1.75ab	4.50a
	P value	*<0.001*	*0.002*	*0.004*	*0.19*

Means in columns followed by the same letter are not statistically different at the 0.05 level of probability (Tukey's HSD test, JMP Pro 13).

Mean number of yellow-striped armyworm caterpillars (number/10 sweeps) following insecticide application on July 6, 2018, Blythe, California.

Insecticide and Rate/Acre		Sample Date July 9	July 13	July 16	July 20
Coragen®	3.5 oz.	0.25a	0.25a	3.00a	3.75ab
DiPel® DF	8 oz.	3.50a	17.00a	9.25ab	13.75 bc
DiPel® DF + Steward*	8 oz. 3.2 oz.	0.00a	1.00a	2.25a	9.25abc
Steward® EC	8 oz.	0.00a	0.00a	1.50a	3.25a
Zylo™	8 oz.	0.50a	1.00a	4.00a	11.00abc
Untreated	-----	1.25a	10.00a	13.75 b	14.50 c
	P value	*0.46*	*0.06*	*0.0014*	*0.26*

Means in columns followed by the same letter are not statistically different at the 0.05 level of probability (Tukey's HSD test, JMP Pro 13).

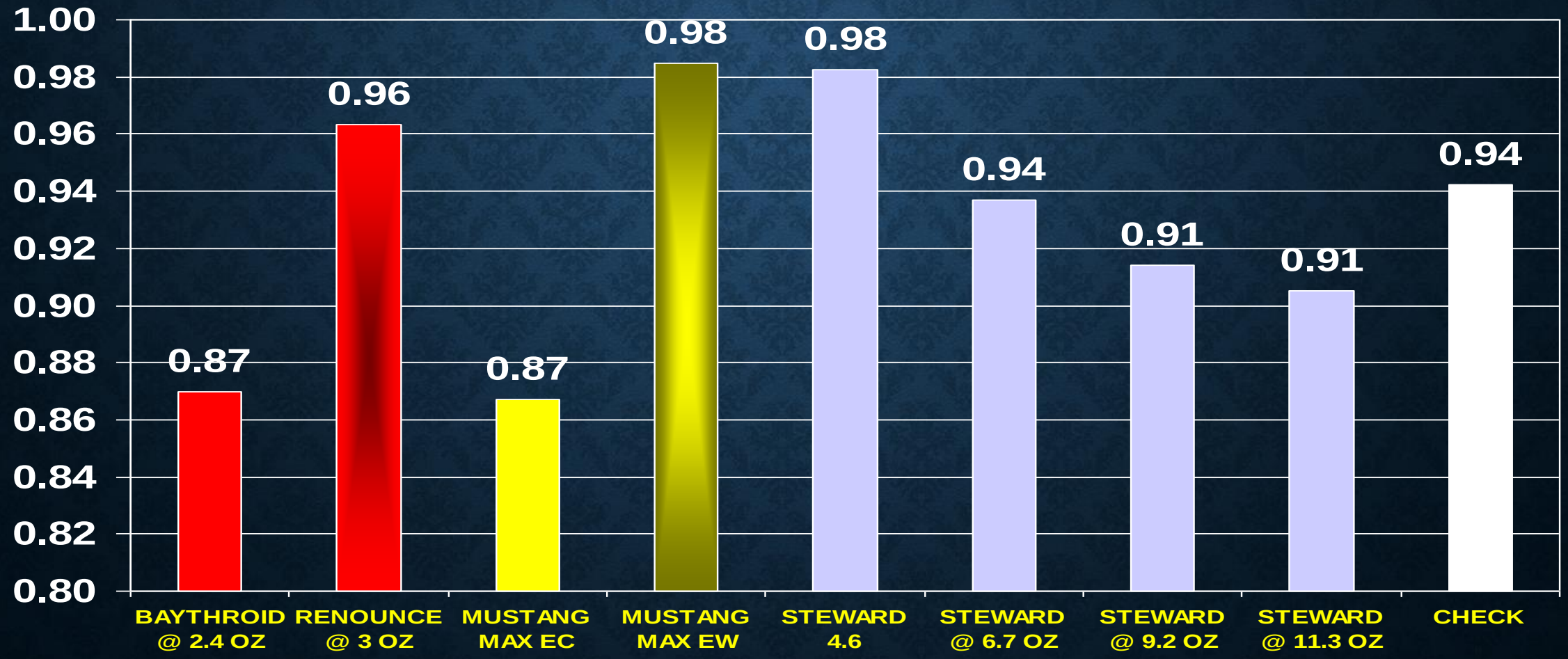
Mean yields and quality of alfalfa at harvest on July 20 following insecticide application for alfalfa butterfly caterpillars on July 6, 2018, Blythe, California.

Insecticide and Rate/Acre		Tons/acre	RFV	NE/Lact	% Crude (90% dm)
Coragen®	3.5 oz.	1.71a	155.3a	0.666a	15.9ab
DiPel® DF	8 oz.	1.74a	148.9a	0.653a	15.1 b
DiPel® DF + Steward®	8 oz. 3.2 oz.	1.64a	147.9a	0.650a	15.9ab
Steward® EC	8 oz.	1.71a	151.5a	0.657a	**17.0a**
Zylo™	8 oz.	1.61a	159.3a	0.673a	15.6ab
Untreated	-----	1.62a	148.5a	0.657a	15.4 b
	P value	*0.94*	*0.57*	*0.52*	*0.02*

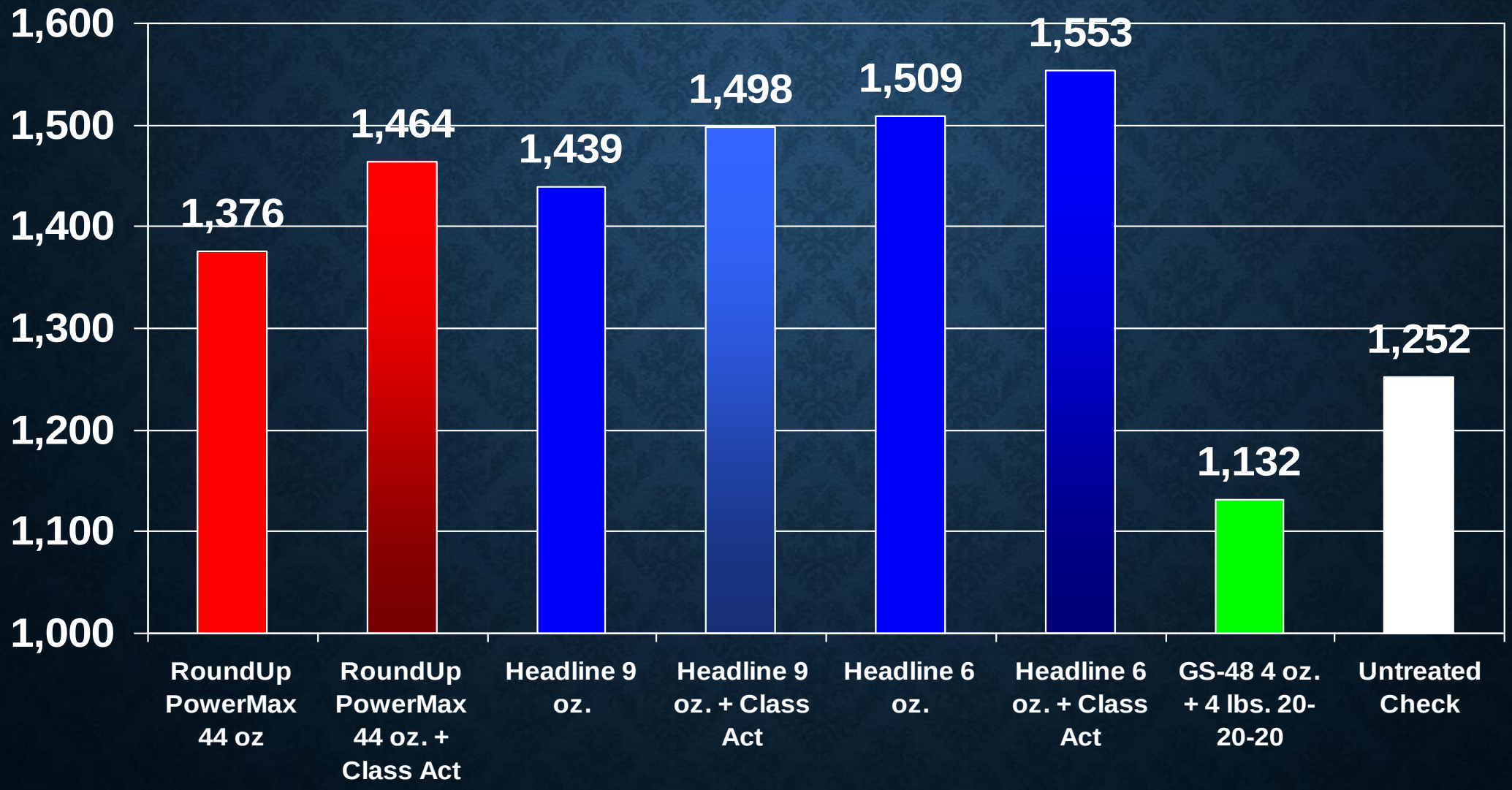
Means in columns followed by the same letter are not statistically different at the 0.05 level of probability (Tukey's HSD test, JMP Pro 13).

INSECTICIDE TREATMENT/RATE EFFECT ON ALFALFA HAY YIELD (TONS/ACRE) FALL 2003, BLYTHE, CA

(VERY FEW INSECTS – VERY LIGHT PRESSURE)



ALFALFA HAY YIELDS *(LBS./ACRE)* FOLLOWING APPLICATIONS FOR ALFALFA RUST CONTROL, RISING CITY, NE, FALL 2013



LOW DESERT ALFALFA PEST INSECT SEASONALITY

Insect	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Weevil												
Blue Alfalfa Aphid												
Pea Aphid												
Cowpea Aphid												
Alfalfa Caterpillar												
Armyworms												
Leafhoppers/ Three Cornered Alfalfa Hoppers												

COWPEA APHIDS

- Usually feed near growing tips
- Inject a toxin as they feed
- High numbers of aphid can cause stunting and death of alfalfa stems

EMPOASCA LEAFHOPPERS

- Feeding injury causes a condition known as “Hopperburn”, severe cases where much of field is injured have “hopper yellows”
- This can result in stunted growth and reduced yields, not only for the damaged cutting, but 1-2 subsequent cuttings as well

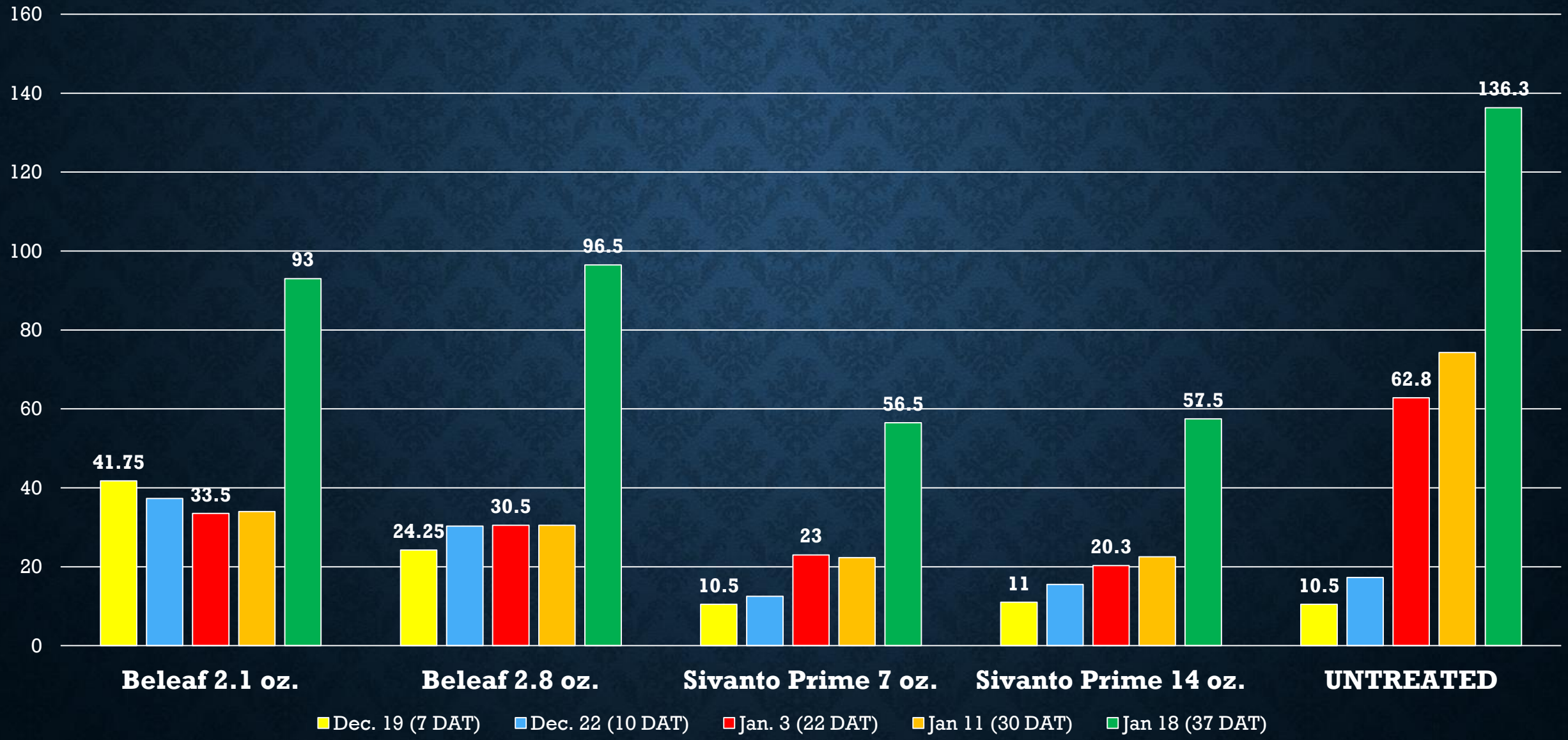
LATE FALL/WINTER INSECT CONTROL:

PRODUCTS EFFICACY IN COOL TEMPERATURES

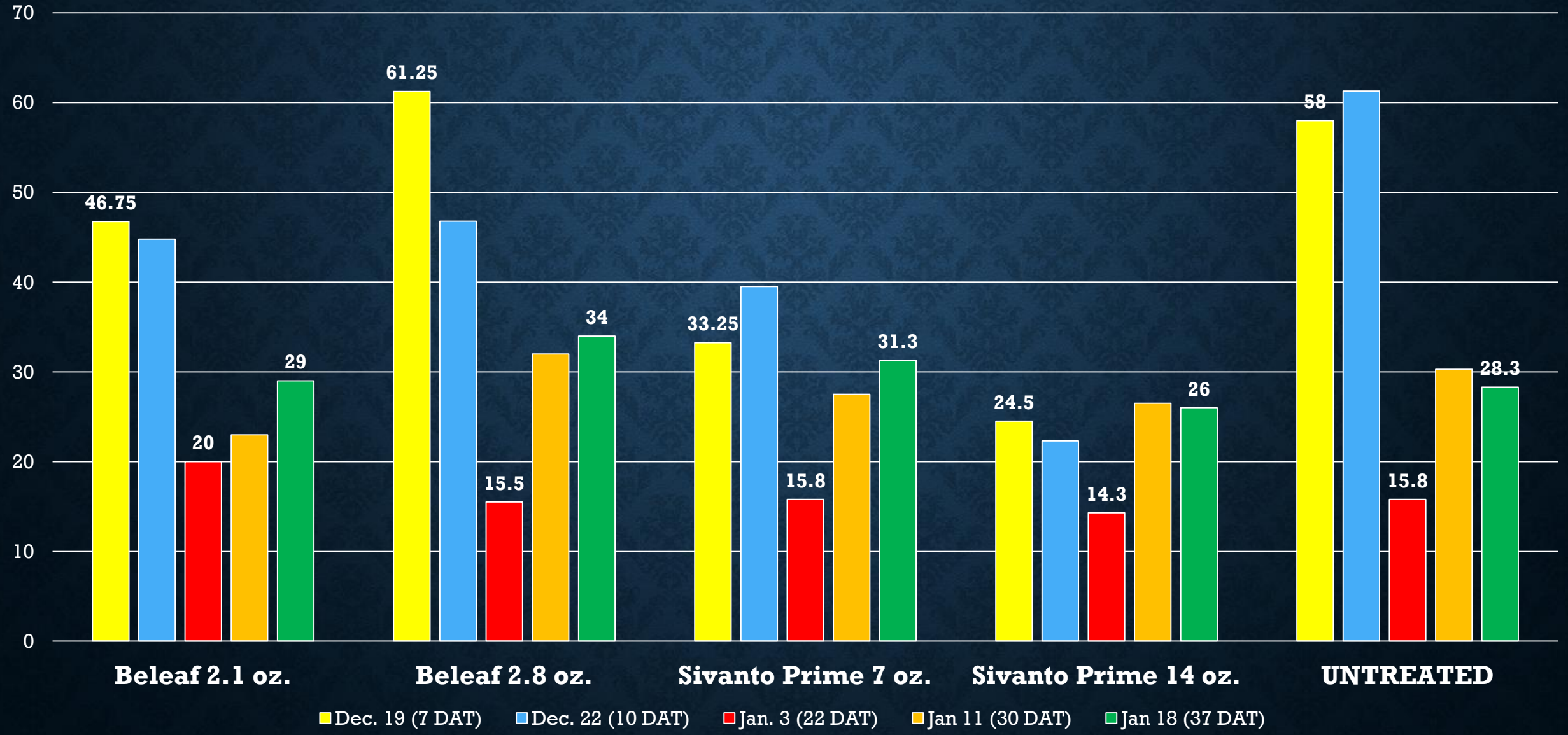
- Two Rates of Beleaf (2.1 and 2.8 oz./acre) 62 DAY PRE-HARVEST INTERVAL!

- Sivanto Prime (7 and 14 oz./acre) 2 applications/year

COWPEA APHIDS/10 SWEEPS FOLLOWING INSECTICIDE APPICATION ON DEC. 12, 2018



EMPOASCA LEAFHOPPERS/10 SWEEPS AFTER INSECTICIDE APPLICATION ON DEC. 12, 2018



WESTERN FLOWER THRIPS/10 SWEEPS AFTER INSECTICIDE APPLICATION ON DEC. 12, 2018

400
350
300
250
200
150
100
50
0

110.75
46
202.5
131.75
63.5
207.5
216.25
107.8
143.5
190.75
132.3
163.5
356.75
129.8
146.5

Beleaf 2.1 oz. **Beleaf 2.8 oz.** **Sivanto Prime 7 oz.** **Sivanto Prime 14 oz.** **UNTREATED**

Dec. 19 (7 DAT) Dec. 22 (10 DAT) Jan. 3 (22 DAT) Jan 11 (30 DAT) Jan 18 (37 DAT)

LOW DESERT ALFALFA PEST INSECT SEASONALITY

Insect	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Weevil												
Blue Alfalfa Aphid												
Pea Aphid												
Cowpea Aphid												
Alfalfa Caterpillar												
Armyworms												
Leafhoppers/ Three Cornered Alfalfa Hoppers												

CLOSING THOUGHTS

- Alfalfa grows all year round and can have insect pests at every cutting. The possibility of new pests continues.

- Current insect controls on the whole are somewhat losing effectiveness, perhaps due to multiple exposures to the same class of chemistries/lack of effective alternatives

- Insecticide rotation will need to be utilized to keep current chemistries viable as long as possible. Newer chemistries are probably going to be more expensive due to increased costs for registrations.

QUESTIONS?