UPDATE ON APHIDS IN CALIFORNIA ALFALFA

2024 CALIFORNIA ALFALFA & FORAGES SYMPOSIUM, DEC. 11, 2024, SPARKS, NV

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Let's
CELEBRATE


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CELEBRATE


HAPPY
Anniversary

SPOTTED ALFALFA APHID

- 70 years in the United States

(1954 in New Mexico)

BLUE ALFALFA APHID

- 50 years in the United States

  (1974 in California)

HAPPY WORKIVERSARY

ONE IS LIKELY TO ENCOUNTER FOUR (4) APHID SPECIES IN ALFALFA DURING THE YEAR

Pea Aphid
Acrythosiphon pisum

Blue Alfalfa Aphid
Acyrthosiphon kondoi

Cowpea Aphid
Aphis craccivora

Spotted Alfalfa Aphid
Therioaphis maculata

PEA APHID

ACYRTHOSIPHON PISUM

- Largest of the aphids commonly encountered in alfalfa
- Green in color, long cornicles
- Readily identified by multiple dark areas which look like bands at end of each antennal segment
- Does not inject toxin into alfalfa as it feeds, damage is usually from high numbers and shortage of soil moisture

PEA APHID
ACYRTHOSIPHON PISUM

- Occasionally a pinkish form of this aphid is encountered

BLUE ALFALFA APHID
ACYRTHOSIPHON KONDOI

- Known as the blue-green lucerne aphid in Australia, where multiple biotypes have been noted that have overcome varietal resistance and also developed resistance to some insecticides
- Slightly smaller than the pea aphid
- Antennae gradually darken from base to end
- Injects toxin when it feeds = Damages Alfalfa!

DAMAGE FROM BLUE APHID FEEDING IN 7 DAYS OF ARRIVAL

BLUE ALFALFA APHID VS. PEA APHID

Blue Alfalfa Aphid

Acyrthosiphon kondoi

Pea Aphid

Acyrthosiphon pisum

COWPEA APHID

APHID CRACCIVORA

- Adults shiny black, nymphs olive green
- Legs are light yellow with dark/black bands
- Much smaller aphid than blue alfalfa aphid or pea aphid
- Injects a toxin into alfalfa as it feeds, can cause death of stems

COWPEA APHID FEEDING SITES AND DAMAGE TO ALFALFA

- Often feed near growing tips, but can be in crowns as well
- Inject a toxin as they feed
- High numbers of aphid can cause stunting and death of alfalfa stems

COWPEA APHID FEEDING DAMAGE IN FOLIAGE

SPOTTED ALFALFA APHID
THERIOAPHIS MACULATA

- Used to be a major problem until alfalfa varieties with partial resistance were developed and released.

- Smallest of the 4 common aphids typically encountered on low desert alfalfa

- Injects a toxin while it feeds on undersides of leaves

- Usually most prevalent on newly emerged, fall planted alfalfa seedings in the low desert, necessitating insecticide applications due to removal of sap and plant dessiction in the low desert. High numbers noted in various southwestern states in 2023-2024.

SINCE 1978 A MAJOR EFFECTIVE

INTEGRATED PEST MANAGEMENT TOOL

FOR BLUE ALFALFA APHIDS (AND BEFORE THAT

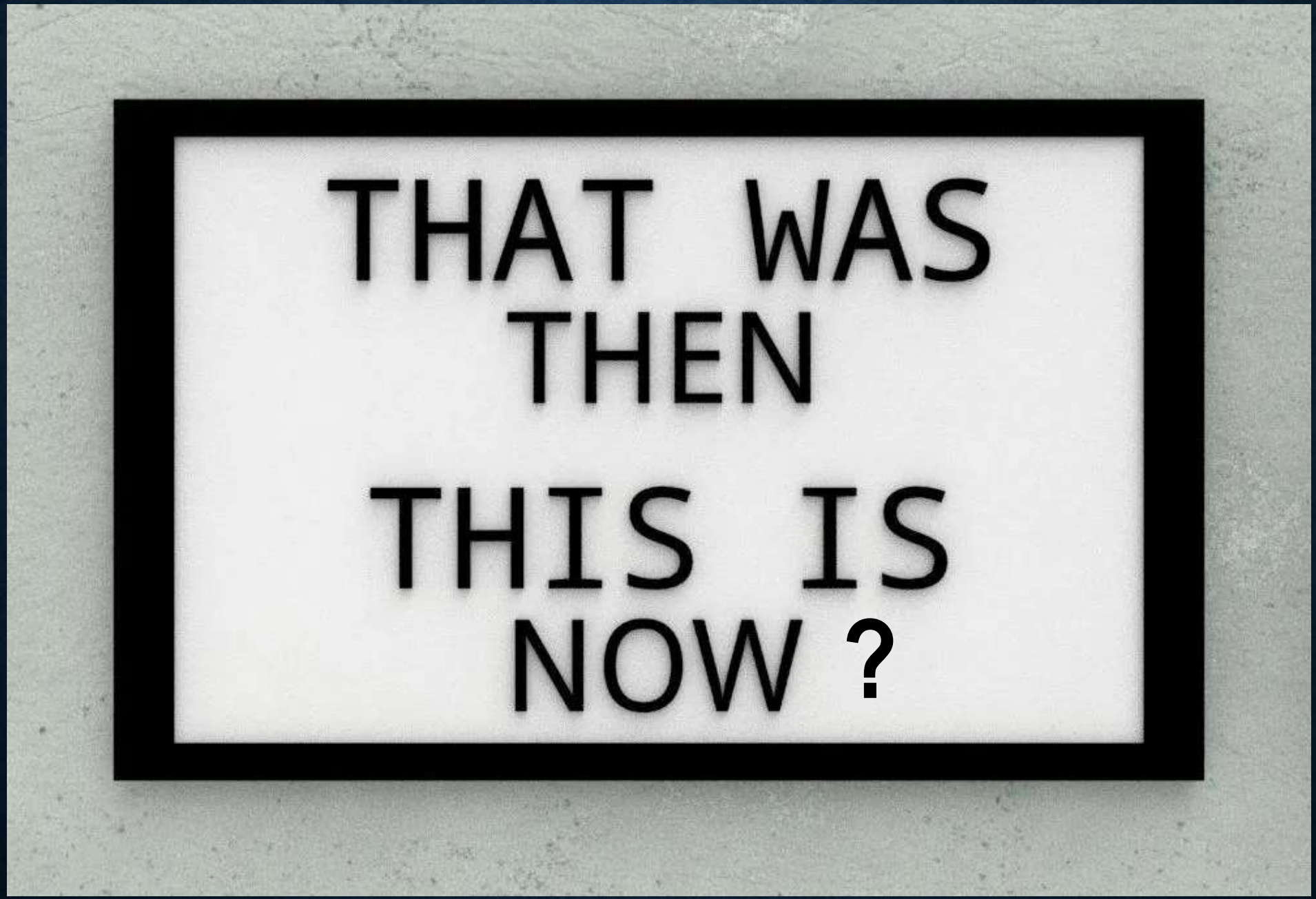
FOR SPOTTED ALFALFA APHID)

HAS BEEN THE USAGE OF

HIGHLY RESISTANT (HR) ALFALFA VARIETIES

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


THAT WAS
THEN
THIS IS
NOW ?

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 APHIDS ON ALFALFA

ALFALFA COLOR AND HEIGHTS AS AFFECTED BY BLUE ALFALFA APHID FEEDING.

TALLER, LIGHTER GREEN COLOR ARE PLOTS WITH EFFECTIVE APHID CONTROL.

BLUE ALFALFA APHIDS – MEAN PEAK NUMBER/ SWEEP IN UCCE TRIALS (IMPERIAL & RIVERSIDE COUNTIES)

2021

First international cases of blue alfalfa aphid (*Acyrthosiphon kondoi*) evolving resistance to the insecticides registered and regularly used to control them in Australia (*carbamates, organophosphates, and pyrethroids*).

IN ALFALFA, APHIDS USUALLY HAVE THE MOST DYNAMIC INTERACTIONS AND CHALLENGES FOR CONTROL DECISIONS

- This is due to:
- Multiple aphid species (sometimes can find 2+ at the same time)
- Very short life cycle and rapid reproductive activity (7 days)
- Differences in aphid species and their biotypes in terms of injecting toxins into plants

IN ALFALFA, APHIDS USUALLY HAVE THE MOST DYNAMIC INTERACTIONS AND CHALLENGES FOR CONTROL DECISIONS

- Large differences in effectiveness of biological control(s) if/when they are present
- Differences in insecticide efficacy
- Different growth rates of alfalfa; stem heights when treated
- Potential of differences in aphid strains and insecticide resistance

Beleaf INSECTICIDE

Transform WG INSECTICIDE

CARBINE INSECTICIDE

Sefina Inscalis Insecticide

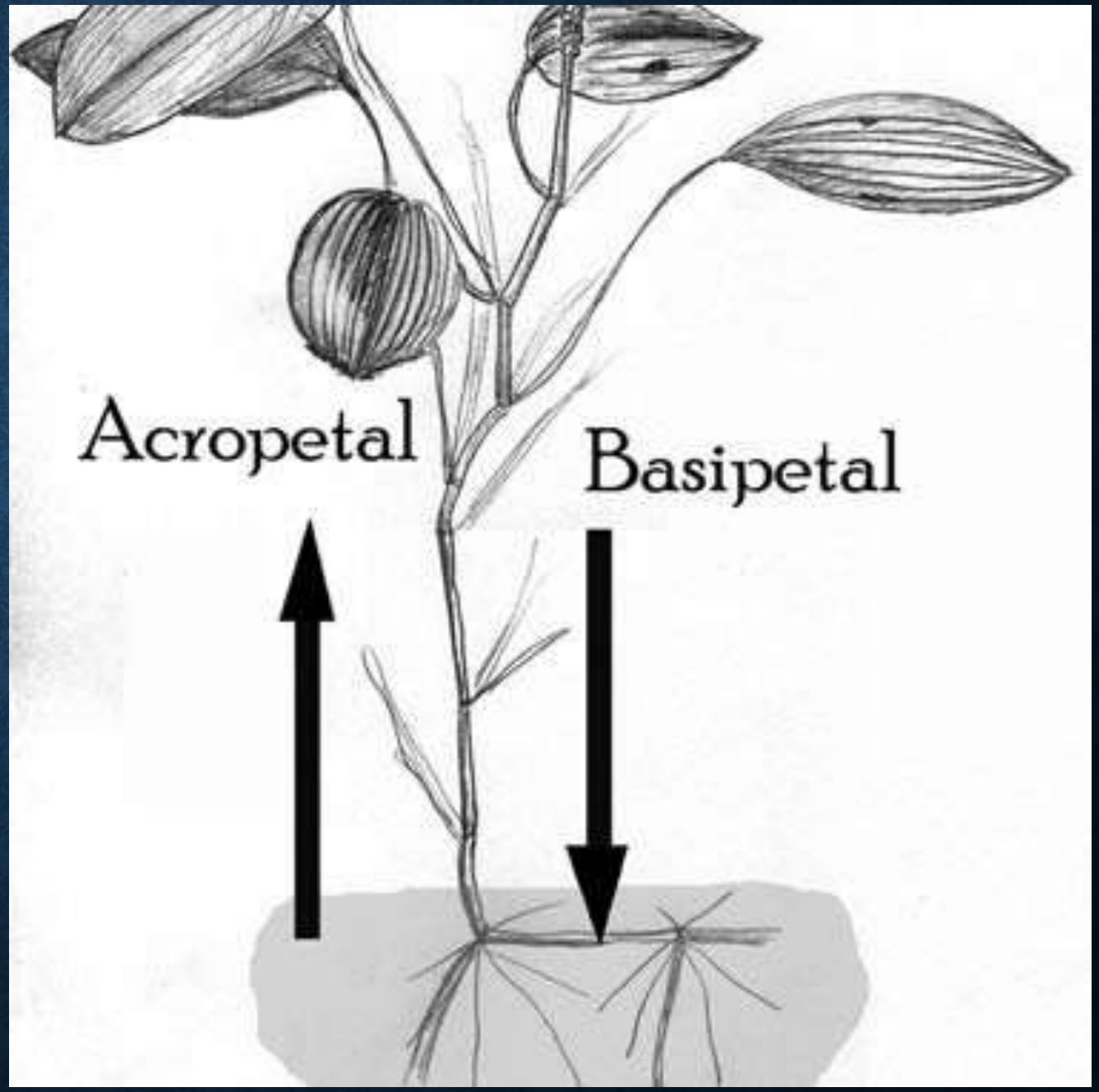
SIVANTO prime

MANY OF THE SYSTEMIC INSECTICIDES USED IN ALFALFA TODAY ARE NOT FULLY SYSTEMIC, BUT ARE ACROPETALLY SYSTEMIC

THIS MEANS THAT THEY ONLY PROTECT THE INTERCEPTED FOLIAGE WHEN SPRAYED, AND THE NEW GROWTH AFTER THAT.

FOLIAGE UNDERNEATH THE DIRECT CONTACT AREA WILL NOT BE PROTECTED AND APHIDS WILL CONTINUE TO FEED.

BETTER INSECT CONTROL USUALLY NOTED AT 10 DAYS THAN AT 3 DAYS POST TREATMENT



SYSTEMIC APHID PRODUCTS FOR ALFALFA

FLONICAMID = ACTIVE INGREDIENT – ACROPETALLY SYSTEMIC

BELEAF® 50 SG INSECTICIDE

CARBINE® 50WG INSECTICIDE

- Beleaf 50 SG supplemental label issued March 2023; Carbine 50WG issued Sept. 20, 2024. Both expire June 30, 2025, in California.
- No more than 2 applications/year of 2.8 oz./acre (5.6 oz/year total), 7 days between applications
- Minimum of 20 gpa by ground, 20 by air
- 14 Day PHI *(previously 60/62 days)*

SYSTEMIC APHID PRODUCTS FOR ALFALFA

DIMETHOATE IS FULLY SYSTEMIC

Highly effective against some aphids in alfalfa (spotted alfalfa aphid, cowpea aphid) but not pea aphid and blue alfalfa aphid

California requires blood tests for applicators if used more than 5 days in a 30 day period *(organophosphate)*

Tough on beneficials such as ladybeetles

MEAN NUMBER OF COWPEA APHIDS, SPOTTED ALFALFA APHIDS, AND WESTERN FLOWER THRIPS LARVAE PER 46 ROW INCHES OF SEEDLING ALFALFA AT 3 DAYS POST NOV. 14 TREATMENT, RIPLEY, CA, 2019

	Cowpea aphids	Spotted Alfalfa Aphids	Western Flower Thrips Larvae
Beleaf® SG 2.1 oz.	61.5	115.3	33.3
Beleaf® SG 2.8 oz.	49	110	44.3
Damadim® Progress 16 oz.	4.3	4.3	5.25
*PQZ 2.4 oz.	65.8	102.5	50
*Sefina Inscalis 3.0 oz.	72.5	104	39
*Sefina Inscalis 6.0 oz.	62.5	89.3	36.5
Sivanto Prime 7.0 oz.	19	19	45
*Transform® WG 1.0 oz.	14.5	12.8	27
*Transform® WG 2.0 oz.	12.3	17.3	28
Warrior II 1.92 oz.	15.3	60.5	28
Untreated	49	218	32.7

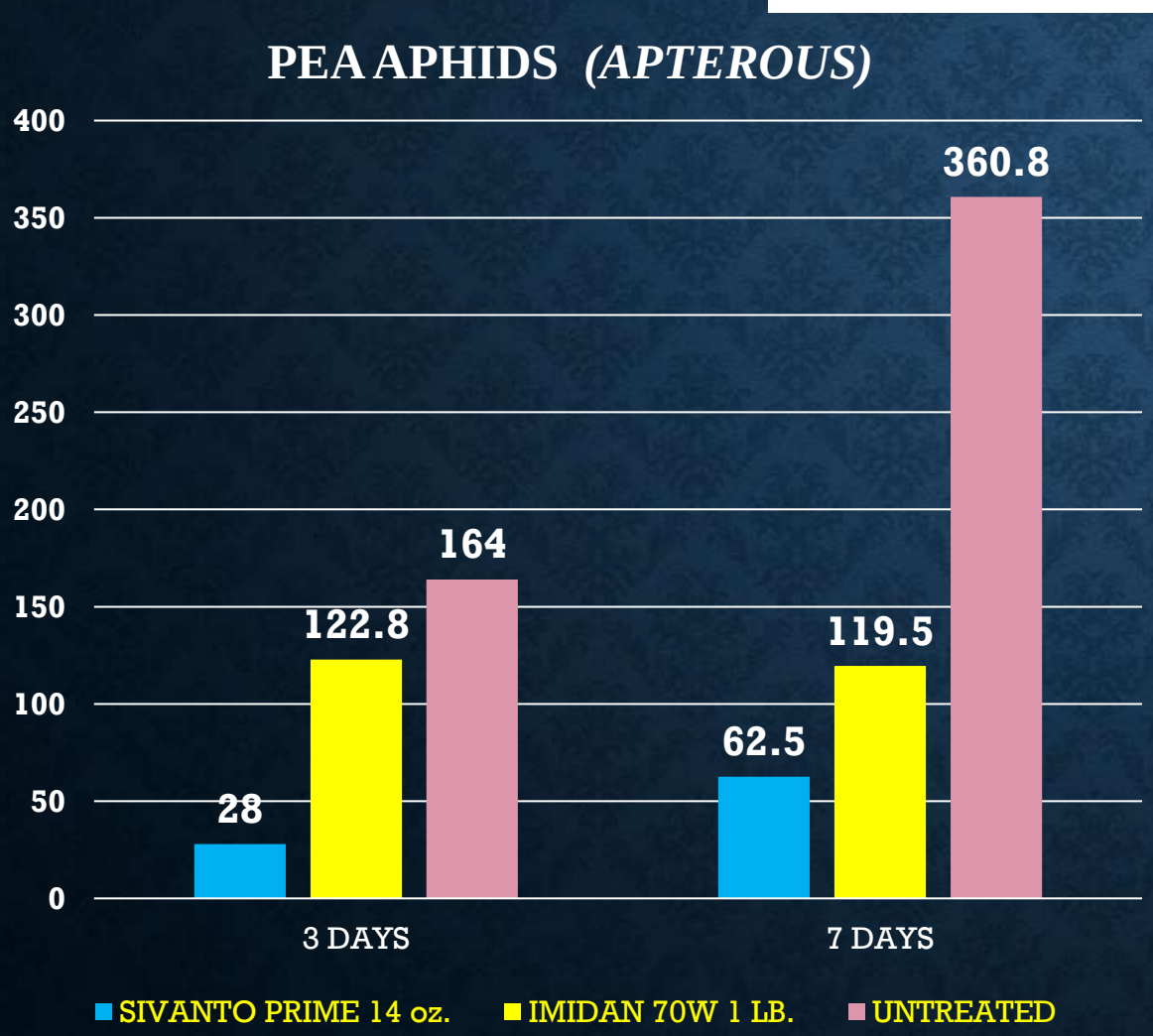
*Active ingredient in insecticide not registered for usage on California alfalfa hay at time of application

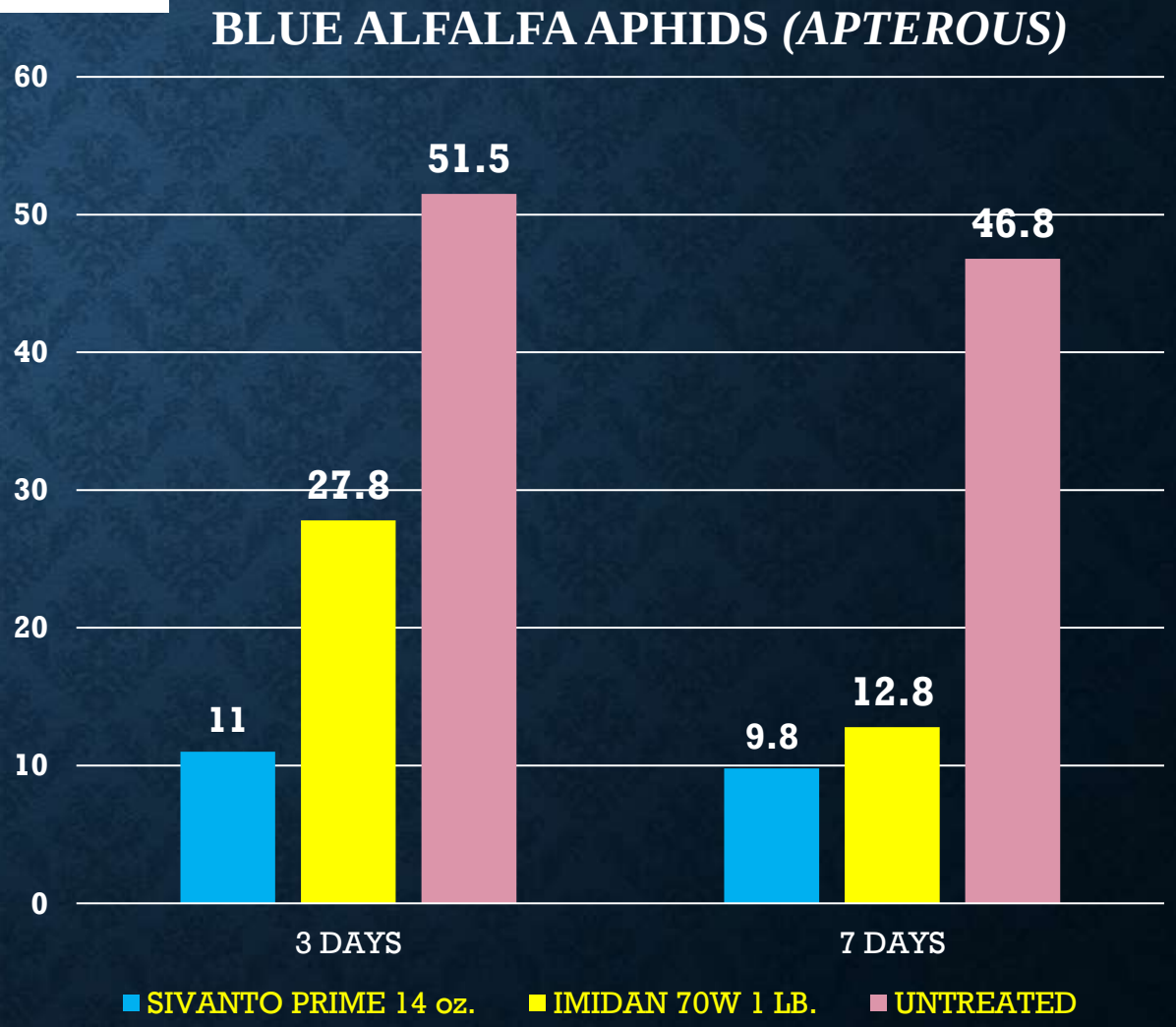
SYSTEMIC APHID PRODUCTS FOR ALFALFA

- Older chemistry (active ingredient is known as Phosmet, and organophosphate)
- Need chemical apron when mixing
- A minimum of a NIOSH-approved particulate filtering facepiece respirator with any N , R, or P filter…etc.
- Has 5 day reentry period, 14 day PHI

SYSTEMIC APHID PRODUCTS FOR ALFALFA

Imidan® 70-W
Agricultural Insecticide





SYSTEMIC APHID PRODUCTS FOR ALFALFA

- Acropetally systemic
- Slower acting than Sivanto or Transform
- Best results realized when treating before alfalfa exceeds 9 inches of growth

SYSTEMIC APHID PRODUCTS FOR ALFALFA

- Acropetally systemic

SIVANTO® prime

- Works faster in warmer temperatures
- Limited to 28 oz./acre for a 12 month period (Most effective product for *Empoasca* spp. leafhoppers in the low desert)
- Pest control advisors in low desert are commenting that efficacy seems to be slipping a bit.

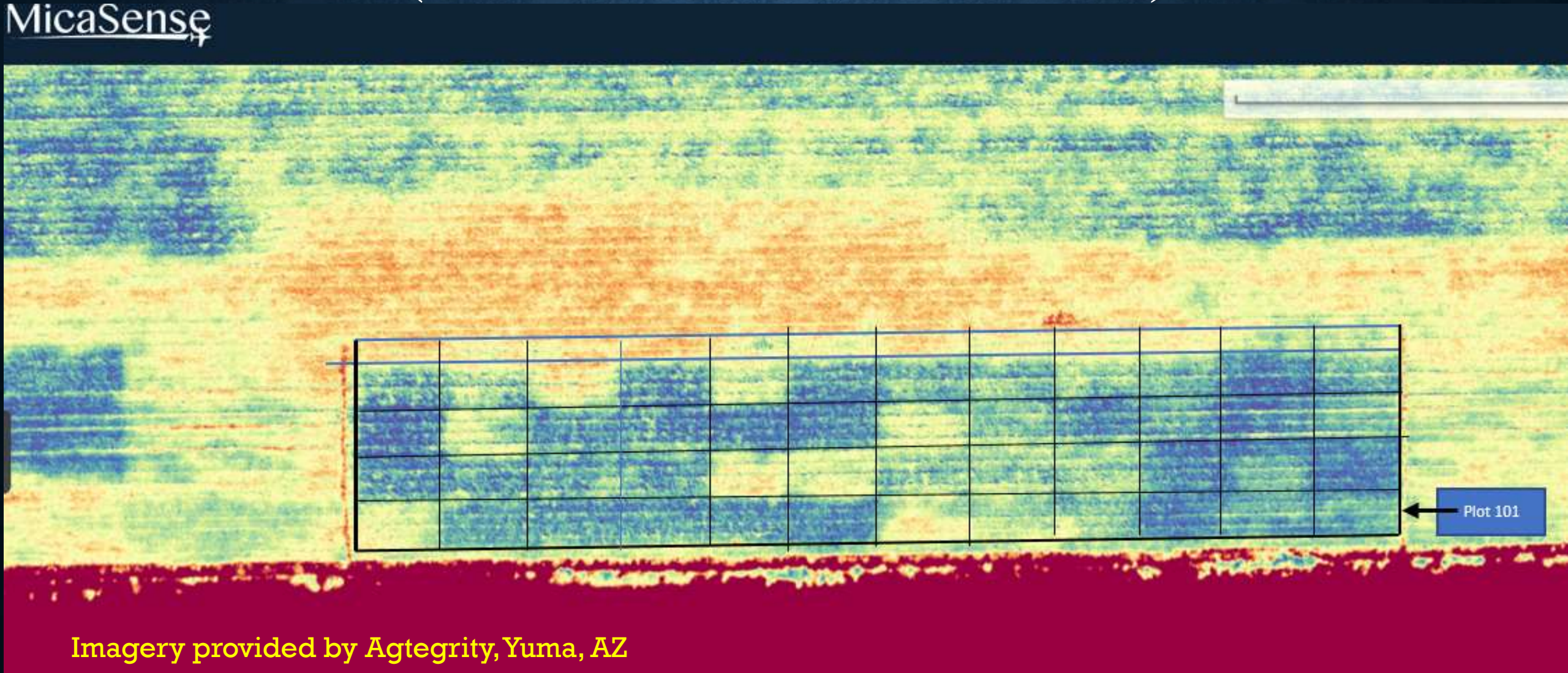
SYSTEMIC APHID PRODUCTS FOR ALFALFA

NOT REGISTERED FOR USAGE IN CALIFORNIA ON ALFALA HAY

DRONE IMAGERY OF PLOTS AT 23 DAYS POST MARCH 29, 2021, TREATMENT SHOWING DIFFERENCES IN STRESS OF ALFALFA.

DARK BLUE = LESS STRESS/BETTER BLUE ALFALFA APHID CONTROL

(LADYBEETLES PRESENT IN THIS STUDY)



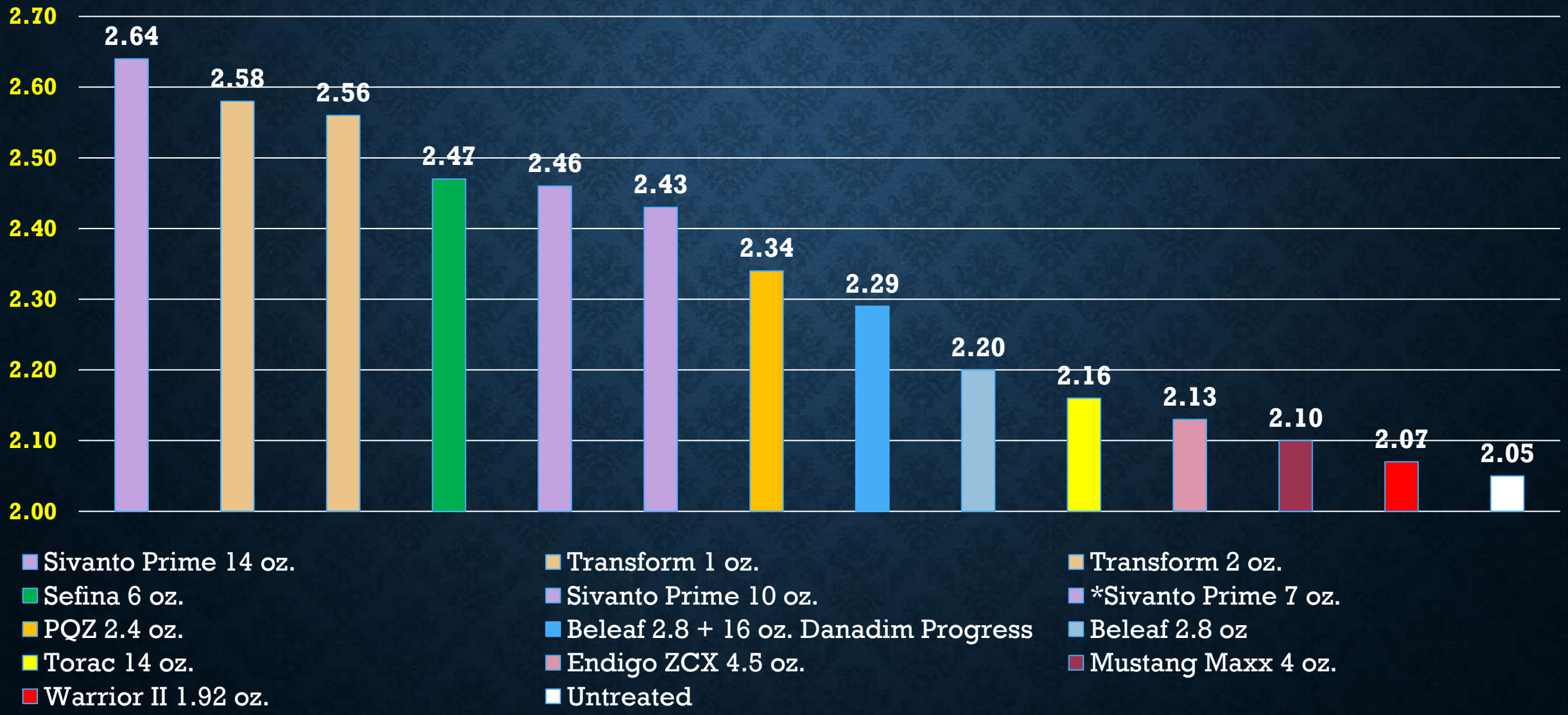
Imagery provided by Agtegrity, Yuma, AZ

MEAN NUMBER OF SEVEN SPOTTED LADYBEETLES/ 5 SWEEPS ON APRIL 5 (7 DAYS POST TREATMENT)

	BELEAF 2.8 oz.	BELEAF 2.8 + DANADIM PROGRESS 16 OZ.	ENDIGO ZCX 4.5 oz.	MUSTANG MAXX 4 oz.	PQZ 2.4 oz.	SEFINA 6 oz.	SIVANTO PRIME 10 oz	SIVANTO PRIME 14 OZ.	TRANSFORM 1 oz.	TRANSFORM WG 2 oz.	TORAC 14 oz.	WARRIOR II 1.92 oz	UNTREATED
Upper	24.8	1	3.5	4.7	17.8	14.5	26.3	31.7	29.5	22.8	4.3	4.8	18.3
Lower	23.8	1	3	4.7	17	11.3	24.5	28.7	29	21.5	3.3	3.3	15.8

ALFALFA YIELDS

MEAN YIELD *(TONS/ACRE)* OF NEWLY ESTABLISHED ALFALFA AS AFFECTED BY INTERACTIONS OF BLUE ALFALFA APHIDS, INSECTICIDES & LADYBEETLES, FOLLOWING APPLICATION ON MARCH 29 *(12.25" TALL)* & APRIL 27 HARVEST



TAKE HOME POINTS

- INSECTICIDES WHICH CONTROLLED BLUE ALFALFA APHIDS BUT DID NOT DETER SEVEN SPOTTED LADY BEETLES RESULTED IN TALLEST ALFALFA/HIGHEST YIELDS *(INTERACTIONS OF INSECTICIDE x EFFICACY x LADYBIRD BEETLE FEEDING WHICH ALSO REDUCED REMAINING APHID NUMBERS)*

- HIGHER RATES OF SIVANTO PRIME AND TRANSFORM WG PROVIDED CONTROL FOR A LONGER TIME PERIOD THAN LOWER PRODUCT RATES AND RESULTED IN INCREASED ALFALFA GROWTH LATER IN THE EXPERIMENT

TAKE HOME POINTS

- ALFALFA DID NOT JUST GROW TALLER FROM APHID CONTROL BUT ALSO RESULTED IN THICKER STEMS. DATA INDICATED THAT LOWER INTERNODES ALSO CONTINUED TO LENGTHEN WITH LESS INSECT FEEEDING PRESSURE.

- DATA HELPS EXPLAIN WHY GROWERS WERE COMPLAINING THAT ALFALFA WAS TESTING LOWER IN QUALITY THAN IN PREVIOUS YEARS (~GOOD INSECT CONTROL!)

WHAT IS EFFECT ON APHIDS AND RESULTING ALFLAFA GROWTH WHEN APHID INFESTED ALFALFA IS TREATED AT DIFFERENT HEIGHTS?

- WINTER 2022 TRIAL

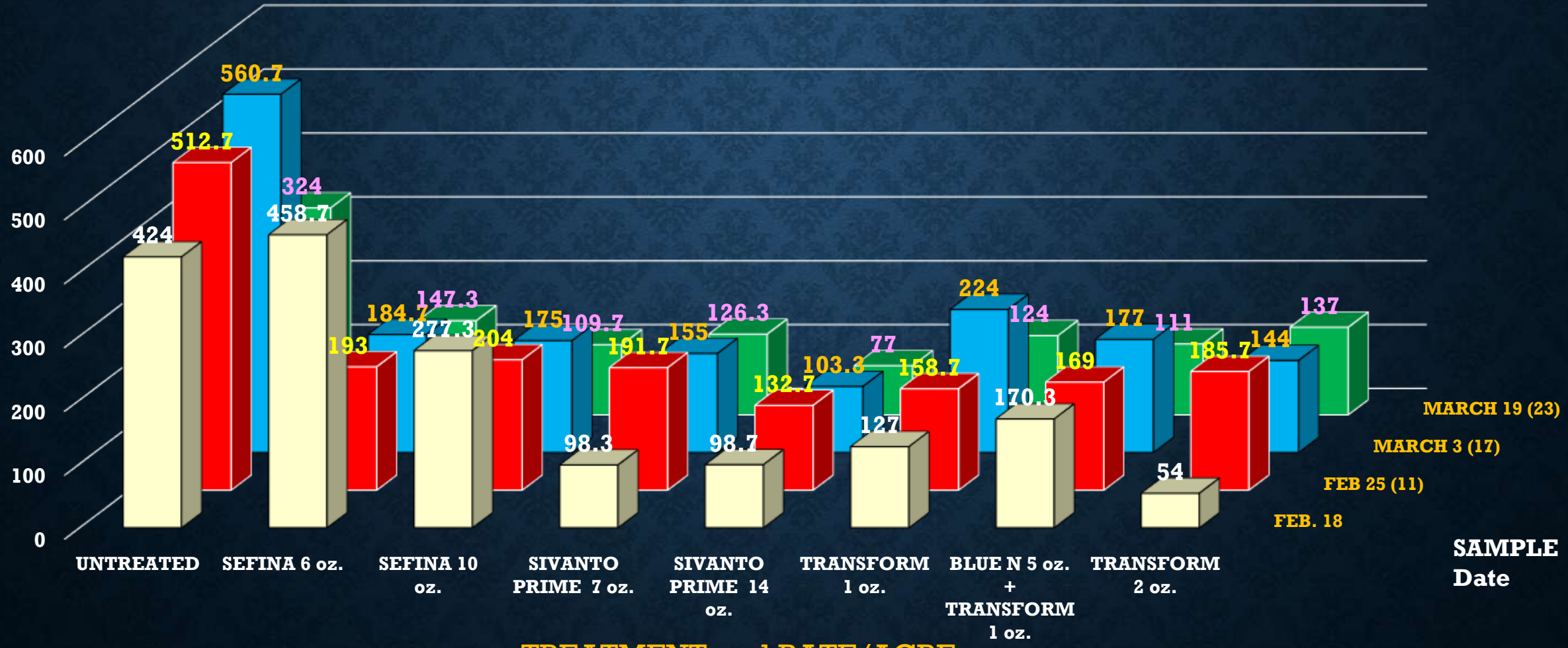
- *ESTABLISHED ALFALFA INFESTED WITH COWPEA APHIDS AND BLUE ALFALFA APHIDS TREATED AT 4 DIFFERENT HEIGHTS*
  - 3.55” (9.0 cm) (Stubble treatment)
  - 5.75” (14.6 cm)
  - 9.0” (22.9 cm)
  - 12.0 “ (30.5 cm)

ALFALFA STUBBLE/ REGROWTH ON FEBRUARY 14

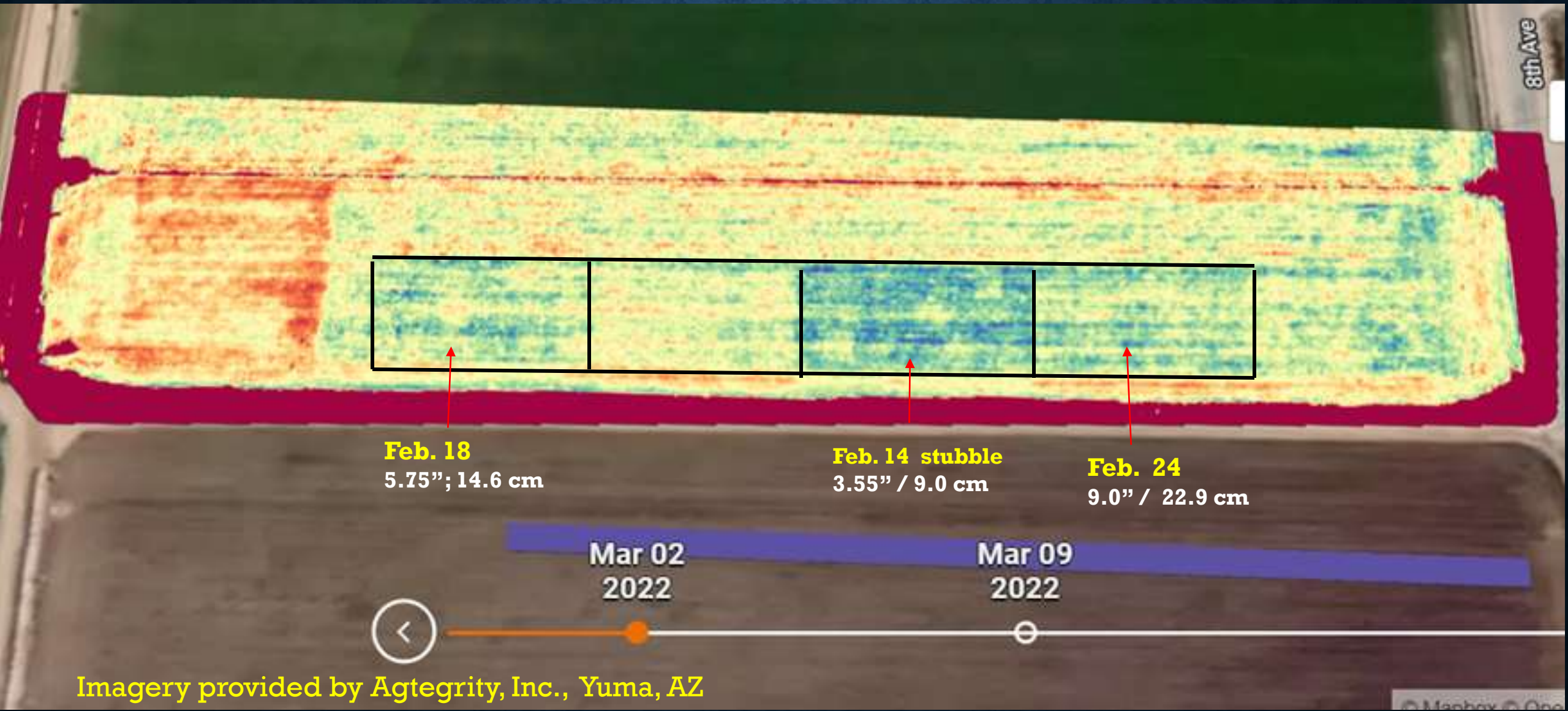
(AVERAGE 3.55 INCHES)

HOW LONG DID INITIAL TREATMENTS LAST?

MEAN NUMBER OF COWPEA APHIDS/10 SWEEPS OF ESTABLISHED ALFALFA FOLLOWING APPLICATION TO ALFALFA STUBBLE ON FEB. 14, 2022, BLYTHE, CA

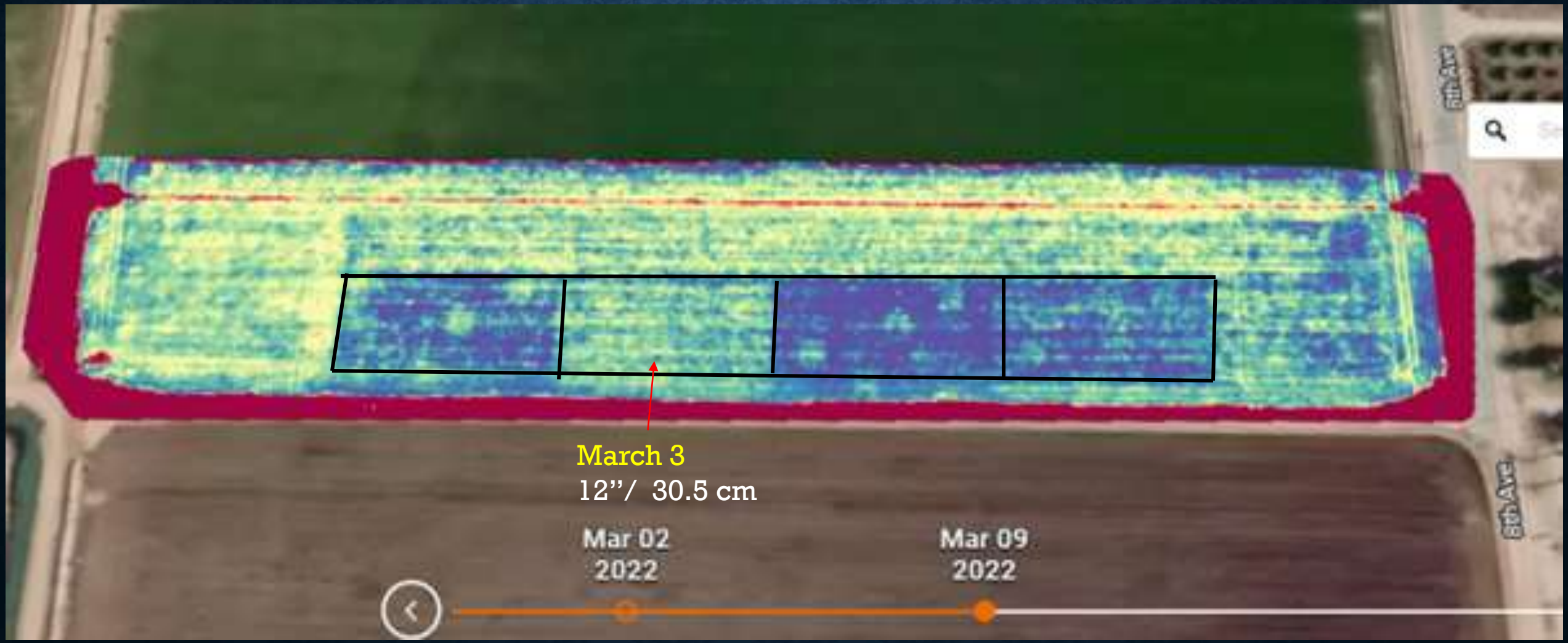


NDRE IMAGE OF ALFALFA ON MARCH 2, 2022



Imagery provided by Agtegrity, Inc., Yuma, AZ

NDRE IMAGE OF ALFALFA ON MARCH 9, 2022



Imagery provided by Agtegrity, Inc., Yuma, AZ

APHID POPULATIONS IN ALFALFA THE PAST 2 SEASONS

- Affected by rains and snows in the California the past 2 years!

- Much reduced numbers of **Blue Alfalfa Aphids**, and later arrival in the Palo Verde Valley

APHID POPULATIONS IN ALFALFA THE PAST 2 SEASONS IN THE PALO VERDE VALLEY

- High numbers of Pea Aphids in March-April 2023, aphids still being found in June

- Early arrival of "Pea Aphids" in 2024 during cooler temperatures. Antennal bands do not quite fit for pea aphids however. Regular pea aphids in Feb.-April

- Is this early arrival a *different* aphid species or biotype?

QUESTIONS?