Economic Thresholds and Effectiveness of Spray Applications for Control of Soybean Aphid

Scott Myers
UW-Entomology

Background

2000 – Aphids first found in Wisconsin

2001 – Research conducted to evaluate insecticides and develop an economic threshold

Objectives

Determine the effect of soybean aphid populations on soybean yields.

Develop an economic threshold that will allow soybean producers to make informed decisions when considering control options.

Experiments and Planting Dates

2001 – Rock Co. (planted 9 May)
Arlington, WI (planted 9 May and 11 June)

2002 – Arlington, WI (planted 6 May and 30 May)

Treatments

Six treatments were established to provide different levels of aphid infestation.

- **Unsprayed check treatment**
- **Low rate Warrior – single application**
- **Med rate Warrior – single application**
- **High rate Warrior – single application**
- **Multiple spray – 6 x**

Aphid Sampling

- Aphid counts were taken from each plot
- 20 plants/plot in 2001 and 10 plants/plot in 2002
- Categories used to estimate aphid numbers in 2001
- Actual numbers per plant estimated in 2002

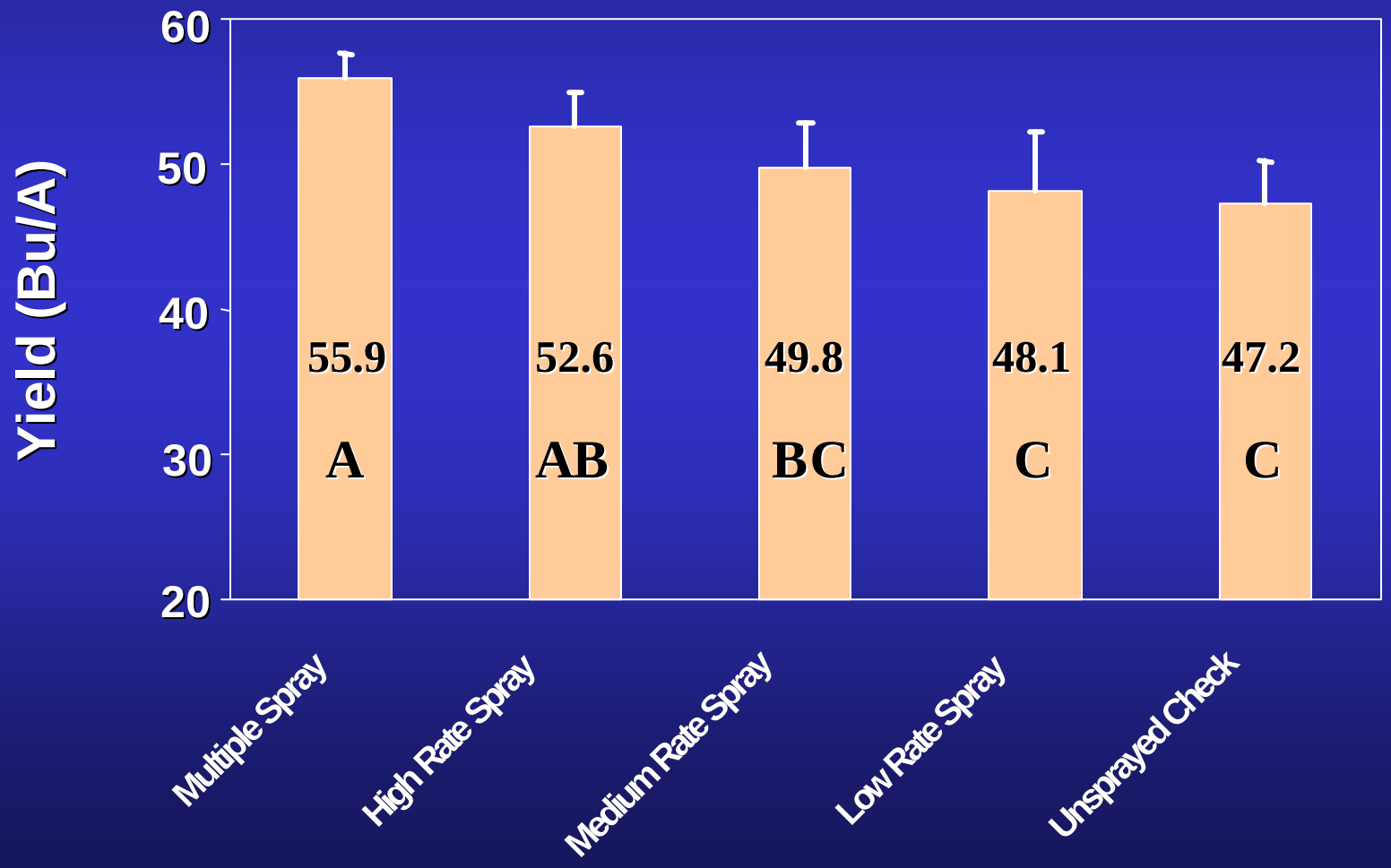
Rating System 1-7 Scale: (2001)

1 = 0 Aphids / Plant
2 = 1-10 Aphids / Plant
3 = 11-25 Aphids / Plant
4 = 26-50 Aphids / Plant
5 = 51-100 Aphids / Plant
6 =101-200 Aphids / Plant
7 = > 200 / Plant

Threshold Study - 2001
Sampling Results: Arlington Late Planting

Treatment	Spray Dates	Rating 7/11 V4-R1	Rating 7/25 R2	Rating 8/1 R5	Rating 8/16 R6
Check	-	1.57 AB	5.53 AB	5.04 A	6.98 A
Low Rate	7/26	1.65 A	6.91 A	3.34 B	6.98 A
Med Rate	7/26	1.59 AB	7.00 A	3.00 B	6.97 A
High Rate	7/26	1.71 A	6.89 A	2.33 BC	4.37 B
Multiple Spray	6/11, 6/28, 7/6, 7/12, 7/16, 7/26, 8/9	1.29 B	5.17 B	1.63 C	2.08 C

Late Planted Threshold Yields (2001)



Threshold Study - 2002
Sampling Results: Arlington Early Planting
Aphids per Plant

Treatment	Spray Dates	Rating 7/11 V4-R1	Rating 7/18 R2	Rating 7/25 R5	Rating 8/7 R6
Check	-	5.6 A	8.0 A	15.1 AB	126.5 A
Low Rate	7/26	20.5 A	40.1 A	30.0 A	108.0 C
Med Rate	7/26	4.2 A	7.9 A	13.4 AB	166.5 A
High Rate	7/26	3.4 A	7.4 A	10.7 AB	138.4 B
Multiple Spray	6/11, 6/28, 7/6, 7/12, 7/16, 7/26, 8/9	1.1 A	0.6 A	0.4 B	2.4 D

Threshold Study - 2002
Sampling Results: Arlington Late Planting
Aphids per Plant

Treatment	Spray Dates	Rating 7/11 V4-R1	Rating 7/25 R2	Rating 8/1 R5	Rating 8/16 R6
Check	-	9.7 AB	22.0 A	349.8 A	193.9 A
Low Rate	7/26	7.9 AB	21.0 AB	327.0 A	146.7 B
Med Rate	7/26	7.8 AB	16.9 BC	227.9 B	151.1 B
High Rate	7/26	25.7 A	15.7 C	177.7 B	95.6 C
Multiple Spray	6/11, 6/28, 7/6, 7/12, 7/16, 7/26, 8/9	2.1 B	0.7 D	0.0 C	0.2 D

Results: 2002
Threshold Study Yields

Treatment	Arlington (Early Plant)	Arlington (Late Plant)
Multiple Spray	72.8 AB	68.4 A
High Rate Spray	68.7 B	67.6 AB
Medium Rate Spray	70.8 AB	68.7 A
Low Rate Spray	72.0 A	67.5 AB
Unsprayed Check	70.9 AB	66.6 B
LSD a=0.05	3.11	1.64

Summary

- Determining when and if to treat will require monitoring the aphid population. Aphid infestations will not always result in yield losses.

- Considering a spray application cost of $15 per acre and a soybean value of $5 / bushel then any yield loss resulting from aphid infestation that exceeds 3 bushels per acre would warrant an insecticide application.

Threshold Recommendations

- **Results from 2001 indicate that if the majority of the plants are infested with 200+ aphids at the beginning of the population peak (late July) a spray treatment is worthwhile.**

- **Based on categorical data.**

Threshold and Plant Stage

Aphid populations vary across the growing season will have a differential impact on soybean plant growth and resulting yields.

Early infestations most damage potential.

Threshold and Plant Stage (2)

Early infestations do not always result in yield losses.

Numbers in the “hundreds per plant” won’t affect yields if they only occur late in the season. V5-V6 growth stage

Soybean Aphids / Plant and Yields (K Study)

Treatment	Jul 24 R2	Jul 31 R3	Aug 7 R4	Aug 16 R5	Yield Bu/A
Unsprayed	228	1510	1645	853	41.2
Sprayed	0.8	72	0.1	0.2	48.4

Yield loss = 7.2 Bu/A

2002 “Best Guess” Threshold

R2 Stage – 200+ Aphids/plant

R3 Stage – 1000+ Aphids/plant

R4 Stage – 1500+ Aphids/plant*

R5 Stage – Too late!!

***Optimal Timing R2-R3 Stage (Late July)**

6-8 Bushel Yield Loss

Soybean Aphid Control with Foliar Sprays
UW Arlington Ag Research Station – 2002

Treatment	Rate	Stage	Applicat. Date	# aphids 8/9	# aphids 8/12	Yield Bu/A
Check	-	R4	-	115.1 bc	90.3 bcd	65.5 abc
Asana 0.66EC	8 fl.oz/A	R4	8/5	89.9 cde	64.4 d	66.8 a
Lorsban 4E	0.5 ai/A	R4	8/5	2.9 l	1.3 f	62.6 bc
Furadan 4F	0.25 ai/A	V3	6/28	114.0 bc	92.9 bc	63.9 abc
Furadan 4F	0.25 ai/A	R4	8/5	8.9 jkl	12.9 ef	64.9 abc
Warrior 1EC	3.2 fl.oz/A	R4	8/5	36.9 ghijk	6.9 ef	65.5 abc
Penncap-M	0.50 ai/A	R4	8/5	7.4 kl	0.9 f	62.3 bc
Dimethoate	0.50 ai/A	R4	8/5	17.7 hijlk	10.45 ef	66.9 a

4 Days Post Application
(30 July 2001)

1 = 0 Aphids / Plant
2 = 1-10 Aphids / Plant
3 = 11-25 Aphids / Plant
4 = 26-50 Aphids / Plant
5 = 51-100 Aphids / Plant
6 =101-200 Aphids / Plant
7 = > 200 / Plant

PRODUCT	LBS AI/A	RATING
WARRIOR T	0.025	1.53 D
DIMETHOATE	0.500	5.31 A
CRUISER 5FS	25 GA/100KG	5.45 A
UNTREATED	----------	6.05 A

14 Days Post Application

(9 August 2001)

1 = 0 Aphids / Trifoliate
2 = 1-10 Aphids / Trifoliate
3 = 11-25 Aphids / Trifoliate
4 = 26-50 Aphids / Trifoliate
5 = 51-100 Aphids / Trifoliate
6 =101-200 Aphids / Trifoliate

PRODUCT	LBS AIA	TRIFOL 1	TRIFOL 2
DIMETHOATE	0.500	5.60 A	5.78 A
UNTREATED	--------	5.33 A	5.78 A
CRUISER 5FS	25 GA	4.55 AB	4.20 B
WARRIOR T	0.025	2.70 CD	5.43 A

Conclusions

Overall low numbers of aphids in 2002.

Spray efficacy difficult to evaluate.

Timing of applications still crucial in control efforts.

What to expect in 2003?

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