

PEAS - 2001

Pea Aphid and Pea Seed Weevil Control in Dry Field Peas: Effects on Yield and Yield Components from Insecticide Application Timings

John W. Burns and David E. Bragg

ABSTRACT

Pea aphid (PA), *Acyrtosiphum pisum* (Harris) and pea seed weevil (PW) (*Bruchus pisorum* (L.) are widespread insect pests of dry green peas (*Pisum sativum* L) in the Pacific Northwest (PNW). In addition, Pea leaf weevil (PLW), *Sitona lineata* (L.) is a prevalent pest in some years causing considerable damage to seedling peas. This study was conducted to document the impact of PA and PW on pea yield, yield components, and observe differences between insecticide timing. Insecticides tested were: Dimethoate (*dimethoate*) 0.5# ai/ac, Capture (*bifenthrin*) 0.04# ai/ac, Imidan (*Imidan*) 1.9# ai/ac in combination with Dimethoate 0.33# ai/ac, Warrior (*Lambda-cyhalothrin*) 0.03# ai/ac and two formulations of Baythroid (*cyfluthrin*) both at 0.03# ai/ac. All treatments were compared to an untreated check (UTC) for early and late insecticide applications. Field trials were established in Farmington, WA in 2001 with a commercial variety of pea, Columbian (dry, smooth, green cotyledon). PA populations were counted every seven days after aphid appearance in each of the plots. PW counts were made 40 days after harvest by counting infested seeds taken from a random hand harvest sample of 50 pods per plot. Crop year 2001 was characterized by extremely low aphid infestations throughout the growing season. This was vividly shown when peak aphid counts did not exceed 33 PA per square foot in any of the 2001 plots in contrast to over 3225 PA per square foot in a similar trial conducted in 2000. In the absence of economic threshold levels of PA pounds per acre pea yield were not measured since influence from PA was determined to be non-existent. 100-seed weight was not influenced by any insecticide treatment and treatments were not significantly different from the untreated check. The most significant finding in this study was high levels of PW damage. Pea Weevil damage was severe in all treatments ranging from 42% to over 79% with essentially no significant difference between any treatment. It is speculated that early insecticide treatments were timed too late to control heavy infestations of PW that were already in the plots living among residue on the soil surface. There were extremely high levels of pea leaf weevil (PLW) during seedling establishment. Plots were not treated with an insecticide to control pea leaf weevil based on the assumption that pea seedlings outgrow the harmful effects of PLW feeding. In contrast, 2000 plots had similar levels of PLW and all plots were treated with a cover spray of Sevin (*Carbaryl*) 1.0# ai/ac to prevent seedling damage. The possibility exists that a cover spray for PLW control might also provide initial knockdown of PW infestations in pea fields allowing subsequent treatments at the bloom stage to provide economic control. The most conclusive results from this study emphasized the importance of field scouting to determine PA threshold levels. Until PA populations reach threshold levels, there is no economic benefit to treat with insecticides as a preventive measure. In addition, further studies are needed to maximize early treatments for PW control. This study suggests that the occurrence of PLW might be an indicator of potential PW infestations.

J.W. Burns, Extension Agronomist, P.O. Box 646420, WSU, Dept of Crop and Soil Sciences, Pullman, WA 99164-6420;
D.E. Bragg, Area Extension Agent-Entomologist, WSU, Garfield County, Pomeroy, WA, 98843

Since 1996 the USA Dry Pea and Lentil Commissions (WA, ID) have supported research to find alternative insecticides to *Dimethoate*, the industry standard insecticide for aphid control. This focus stemmed from provisions of the EPA Food Quality Protection Act (FQPA) that placed organophosphate insecticides such as *Dimethoate* and possibly *Imidan* on review lists that could eliminate usage based on environmental hazards. Loss of the use of *Dimethoate* or a combination with *Imidan* would limit the ability to control aphids and more importantly, pea weevil (PW) in dry green peas that would result in significant yield and quality reductions.

Many newer classes of synthetic Pyrethroid insecticides have been developed that represent 'soft'

chemistry (*Warrior*, *Capture*, *Baythroid*). On-farm research trials have shown aphid control equal to or better than *Dimethoate* using newer classes of insecticides (Burns and Bragg, 1999,2000). PA population development studies in green peas, *Pisum sativum*, have shown economic threshold varies from season to season (Maiteki & Lamb, 1985). This variation is also observed in lentils. Despite the fact that PA infestations occur annually, estimates of economic injury levels and timing of insecticide applications vary among producers.

The objective of this study was to determine the efficacy of newer classes of insecticides compared to *Dimethoate* for PA control and *Dimethoate* plus *Imidan* for PW control at two different stages of growth.

MATERIALS and METHODS

Field plots were established 6 May 2001 near Farmington, WA on the Bernt and Roger Lehn farm to evaluate efficacy of foliar insecticides to control PA and PW in 'Columbian' dry pea. Columbian pea is the predominant dry green pea raised in the PNW. Plots were established in a RCBD with four replicates having 6 x 15 ft. plots. Seeding was done with a double-disc drill at 170# of seed per acre on 6-inch centers. Heavy infestations of pea leaf weevil, PLW, (*Sitona lineata* (L.)) were observed however an insecticide treatment was not applied for control. Pea seedlings recovered from the PLW infestations and developed uniform stand densities. Six foliar insecticide treatments, early and late, and an untreated check (UTC) were established. Early foliar treatments were applied at approximately 10% bloom (25 June, 2001) and late treatments were applied at pod-set (7 July 2001). A CO₂-powered backpack sprayer at 20-gpa/20 psi was used to apply foliar treatments. All foliar spray mixes were buffered to pH 5.0.

Pea aphid population development was monitored every seven days and rated by average counts of Pea Aphid (PA) /ft² sample per replicate for Pre-Count (PrCt), 12, 19, 26 and 31 Days After Treatment (DAT).

Average aphids per plot were counted using a one-square foot clipboard that was placed at random on the ground between rows in each plot. Aphids were knocked by hand off plants with four sequential 'beatings' per plot. The 'beating' technique does not cause any plant damage and aphids readily fall from plants. The technique is also enhanced with the 'clipboard' being painted bright yellow and 9-equal grids drawn on the board to allow counting aphids per grid-area. The yellow color provides excellent contrast to the light-green colored aphids.

Plots were hand-harvested at random from each replicate to by selecting 50 pods to obtain 100-seed weight and percent (%) pea weevil infestation. Since PA numbers were minimal, plots were not harvested for pea seed yield based on the assumption that yield differences would be strictly a function of plot variability with no insecticide treatment influence. Counts of pea weevil (PW) per 100-pea sample were made 6 October 2001 after approximately 95% of weevils had emerged. Quiescent weevils were extracted from peas beneath operculum windows to obtain total weevil counts. 100-seed weight is expressed in grams from random samples taken from each replicate.

RESULTS

APHIDS: Aphid pressure in crop year 2001 was essentially non-existent and resulted in essentially no significant differences among treatments measured (Table 1). During a period of potential aphid build-up

weather patterns shifted to hot, dry conditions which accelerated physiologic maturity of the peas and reduced any further potential development of PA.

100-SEED WEIGHT: 100-seed weight trends showed essentially no significant differences among treatments (Table 2). The lack of significant differences in 100-seed weight can also be attributed to lack of economic threshold PA numbers throughout the 2001 growing season (Table 1).

% PEA WEEVIL: Pea weevil damage was severe with negligible differences among treatments. The combination of Dimethoate and Imidan treated early had significantly greater control of PW than all

Baythroid and single Dimethoate applications. The combination was also had significantly less PW than a late application of Warrior. This early combination effect on PW is probably a result of Imidan that is the industry standard for PW control. Even though no controls were economically acceptable, the results reflect that PW control is enhanced by insecticide treatments applied at the onset of weevil infestation rather than waiting for aphid populations to reach threshold levels.

Table 1: Average number of PA per square foot in Columbian pea counted at 5 different dates after treatment with insecticides at two stages of growth (early, late). Counting dates are referred to as Days After Treatment (DAT) for each observation. (Farmington, WA, 2001)

	EARLY TMT	LATE TMT					
PEAS - FARMINGTON - 2001	DAT	DAT	DAT	DAT	DAT	DAT	
	0	12	19	26	31	36	
COLUMBIAN PEAS	25-Jun-01	7-Jul	14-Jul	21-Jul	26-Jul	31-Jul	TOTAL
	Aphids per Sq Ft						
Dimethoate - 1 pt (Early)	0	0	0	3.5	3.25	0	6.75
Dimethoate- 2/3 pt + Imidan (Early)	0	0	0	3.25	7	0	10.25
Capture 2E (Early)	0	0	0.25	0	0	0	0.25
Warrior (Early)	0	0	0	1.75	2.5	0	4.25
Baythroid 20WP (Early)	0	0	1.25	21.75	33.75	0	56.75
Baythroid 2 (Early)	0	0	0.25	18.5	7.75	0	26.5
Dimethoate - 1 pt (Late)	0	0	0	0	1.75	0	1.75
Dimethoate- 2/3 pt + Imidan (Late)	0	0	0.25	0	0.5	0	0.75
Capture 2E (Late)	0	0	0	1.25	3.5	0	4.75
Warrior (Late)	0	0	0	0.25	4.5	0	4.75
Baythroid 20WP (Late)	0	0	1.5	0.75	15.5	0	17.75
Baythroid 2 (Late)	0	0	1.5	17	14.25	0	32.75
UTC	0	0	8.25	16	11	0	35.25
LSD (P=0.05)	NA	NA	2.24	17.8	15.9	NA	21.7

Table 2. Average values for 100-seed weight and percent PW in Columbian peas after treatment with insecticides at two stages (early, late) of growth. (Farmington, WA, 2001)

COLUMBIAN PEAS	100 Seed Wt ⁽¹⁾	Pea Weevil
	(grams)	(percent)
Dimethoate - 1 pt (Early)	20.2 ab	70.0% b
Dimethoate- 2/3 pt + Imidan (Early)	20.3 a	42.0% a
Capture 2E (Early)	18.0 ab	64.8% ab
Warrior (Early)	19.3 ab	62.0% ab
Baythroid 20WP (Early)	19.2 ab	69.3% b
Baythroid 2 (Early)	18.3 ab	79.3% b
Dimethoate - 1 pt (Late)	19.0 ab	76.3% b
Dimethoate- 2/3 pt + Imidan (Late)	18.5 ab	62.0% ab
Capture 2E (Late)	19.3 ab	59.0% ab
Warrior (Late)	18.9 ab	66.3% b
Baythroid 20WP (Late)	17.9 b	70.0% b
Baythroid 2 (Late)	18.0 b	68.5% b
UTC	18.7 b	63.3% ab

⁽¹⁾ Numbers followed by the same letter in a column are not significantly different. (P= 0.05)

DISCUSSION

Aphid population development and 100-seed weight impacts did not follow patterns similar to previous studies conducted from 1999-2000. Unseasonable weather patterns did not favor aphid population development resulting in essentially no aphid pressure on peas during 2001. As a result there were limited to no significant differences in aphid counts or 100-seed weight from any treatment. Virus disease vectoring by PA was not present in this trial but is a critical component of PA management. Relatively small numbers of aphids can result in significant yield losses when vectoring viruses.

In contrast to previous years these results indicate that it is critical to scout and evaluate pea fields for the presence of aphids. More importantly it is critical that an economic threshold-level of aphid populations should be established before spraying with an insecticide.

The high percentage of PW infestation in all treatments is more difficult to explain. The combination of Dimethoate and Imidan exhibited a predictable trend by having lower PW percentages than other treatments. This is expected due to the proven efficacy of Imidan for control of PW. It is speculated that early insecticide treatments were timed too late to control heavy infestations of PW that were already in the plots living around residue on the soil surface. Early treatment dates were selected based on a commercial practice of timing insecticide applications to control both PA and PW with a single application to avoid additional costs irrespective of threshold numbers in the field. There were extremely high levels

of pea leaf weevil (PLW) during seedling establishment. Plots were not treated with an insecticide to control PLW based on the assumption that pea seedlings will outgrow the harmful effects of PLW feeding. The possibility exists that a cover spray for PLW control might also provide initial knockdown of PW infestations in pea fields allowing treatments at the bloom stage of growth to provide sufficient control. Results of the 2001 trials and coupled with similar trials conducted in 1999 and 2000 show that control measures for PW are more difficult to estimate compared to PA. A major reason for this is due to PW being highly mobile on both the soil and plant surfaces compared to PA that are basically restricted to the plant surfaces. Reduced acres of peas planted in the Palouse region may also aggravate the severity of PW infestations since there are fewer fields that PW can infest especially in years with high overwintering PW populations. In addition, a single female PW has the capacity to lay over 400 eggs during her life cycle that can result in significant damage with low numbers of adult PW. Further study is needed to evaluate the relationship of high levels of PLW and the relationship to potential high populations of PW in the same year. In addition, evaluation of insecticide treatments well in advance of flowering in pea might be able to provide better estimates of insecticide timing to control PW. The most conclusive results from this study depict the importance of field scouting to determine economic insect threshold levels prior to an insecticide application

ACKNOWLEDGMENTS

We thank Bernt and Roger Lehn for providing the land and field preparation for this trial. In addition, we thank Ron Johnson for his continued support of this research study. The research was supported by funds or in-kind funding from the USA Dry Pea and Lentil Commission, Spokane Seed Co., (Colfax), BNP Lentil (Farmington), Wilbur-Ellis (Colfax), Bayer Corp, FMC Corp.

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