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FABA BEANS ARE NOT A GOOD TRAP CROP FOR THRIPS (THYSANOPTERA: THRIPIDAE) IN SNOW PEAS IN GUATEMALA

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Snow pea (*Pisum sativum* L.; Fabaceae) has been grown as an export crop in Guatemala since the late 1970s (MacVean et al. 1993). From 2001 to 2012, Guatemala's snow pea exports have increased from 40 to 80 million pounds per yr, with about 80% of this volume destined to the U.S. (Guzman 2013). There are about 20,000 snow pea farmers in Guatemala (Hart 2005). Guatemalan snow pea growers are overwhelmingly low-resource Mayan farmers who each produce snow peas on less than 2 acres (0.8 ha), primarily in the western highlands. Guatemalan snow pea growers rely primarily on insecticides to manage arthropod pests, which include leafminers, aphids, caterpillars and thrips (Calderón Villatoro 1993). Intensive insecticide use by Guatemalan snow pea growers has produced unacceptable residues and led to regulatory restrictions on snow peas imported from Guatemala into the United States (Sullivan et al. 1999, 2000; Wingert 2010). Much of the insecticide use on snow pea is directed at thrips, which cause direct damage by feeding on the developing pod. The primary thrips species attacking snow pea in the Guatemalan highlands are *Frankliniella occidentalis* Pergande, *Frankliniella insularis* (Franklin) and *Thrips tabaci* (Lindeman) (Alvarez 1993). Thrips feed on the developing pod, scarring it. Faba bean (*Vicia faba* L.; Fabaceae) has been promoted as a trap crop for thrips in Guatemala, primarily because densities of thrips appear greater on faba bean than snow pea (Sandoval et al. 2004).

Studies were carried out in 2007 in Guatemala to determine if faba bean functions as a trap crop for thrips when intercropped with snow pea. Replicated field studies were carried out comparing whole plant thrips densities on snow pea grown in monoculture, on snow pea intercropped with faba bean, and on faba bean grown in monoculture. The objectives of the study were 1) to determine if there are consistent differences in whole plant counts of thrips on snow pea and faba bean and 2) to determine if thrips densities (total thrips per plant) on snow pea intercropped with faba bean are lower than on snow pea grown in monoculture. This work was part of a broader project funded by the USDA Foreign Agriculture Service to evaluate options for reducing insecticide use on Guatemalan snow peas grown for export to the United States (Smith et al. 2010).

Field trials were carried out in 2007 at the ICTA (Instituto de Ciencias y Tecnología Agrícola) agricultural experiment station in Chimaltenango (N 14° 39' 38" W 90° 49' 10", 1800 m asl). Field trials were carried out during the rainy season (May-Aug) and dry season (Sep-Dec). The cropping systems tested were: 1) snow pea intercropped with faba bean, with insecticide applications initiated at 20% flowering of the snow pea (~ 5 weeks after planting); 2) faba bean monoculture with insecticide applications initiated when snow pea was at 20% flowering; 3) snow pea monoculture with insecticide applications initiated at approximately 20% flowering. Each treatment was replicated 4 times in a randomized block design. The variety of snow pea used was 'Oregon Sugar Pod II'. Crops were fertilized and treated for diseases according to regional practices (Oroxom 2008). Insecticide treatment was adapted from a collaborating snow pea export company and consisted of either dimethoate, endosulfan, or malathion once a wk on a 3 wk rotation until harvest was initiated.

Each replicate plot was 15 × 15 m and included 9 crop rows with a between-row distance of 1.25 m. The distance between plants was 5 cm for snow pea and 25 cm for faba bean, as is typical in export plots in the Guatemalan highlands. In the intercrop treatment, snow pea and faba bean were planted in alternating rows. Whole-plant samples were collected 35, 50, 65, and 80 days after planting. From each replicate plot, three plants were collected (subsamples) for a total of 12 plants per treatment per collection date. Plants were cut at the soil surface, placed in plastic bags and transported to a laboratory at the Universidad Rafael Landívar in Guatemala City.

Plants were washed into a container that drained into a screw-cap with the center replaced with thrips-proof greenhouse screen mesh. The cap was removed after the plant had been thoroughly washed, and then its contents were examined under a microscope. The number of thrips was recorded for each plant, with immature and

adult thrips counted together. The response variable analyzed was whole-plant density of thrips under different treatments. The data were analyzed using analysis of variance, followed by Tukey's means separation when appropriate, with significance declared at $P = 0.05$. Subsamples were averaged for each plot (1 df) and a separate ANOVA was done for each collection date. A separate ANOVA was also made for pooled data from all growing periods. All analyses were carried out using ProStat version 4.01.

There were no statistical differences between thrips counts on snow pea intercropped with faba bean and snow pea grown in monoculture on any sample date in either the rainy or dry season (Table 1). Thrips counts were significantly higher on faba bean than on both snow pea treatments at 65 and 80 days after planting in the rainy season, and at 80 days after planting in the dry season. Average thrips counts (4 sampled dates combined) were not statistically different for the 2 snow pea treatments in either the rainy or dry season. Average thrips counts on faba bean were significantly higher than both snow pea treatments in the rainy season, but not the dry season.

The data indicate that by 65 days after planting in the rainy season and 80 days after planting in the dry season, thrips counts are significantly higher on faba bean than on snow pea. However the proximity of faba bean to snow pea in the intercrop treatment did not affect thrips counts compared to snow pea grown in monoculture. These data indicate that faba bean does not reduce densities of thrips on adjacent snow pea, and so does not function as a trap crop. Nor is there any indication from these data that faba bean functions as a source of thrips on snow pea, because thrips densities were not greater on snow pea planted adjacent to faba bean.

Species composition of thrips on faba vs. snowpea helps greatly to explain the results above. Thrips species were primarily *T. tabaci* (65%) and *F. occidentalis* (33%) on snow pea (total $n = 264$), and primarily *F. occidentalis* (51%) on faba bean, with many unidentified immatures and low numbers of other species including *F. insularis* and *F. gossypiana* (total $n = 150$). The fact that *T. tabaci* was not found on faba bean but is the main species attacking snow pea poses real limits on the use of faba bean as a trap crop. However, our spe-

TABLE 1. AVERAGE WHOLE PLANT THRIPS COUNTS (± SEM) ON SNOW PEA INTERCROPPED WITH FABA BEAN, ON FABA BEAN IN MONOCULTURE, AND ON SNOW PEA IN MONOCULTURE.

		Thrips counts	
Days after planting	Cropping System	Rainy season	Dry season
35	Snow pea intercrop	18.8 ± 10.8	9.4 ± 6.0
	Faba bean monoculture	37.5 ± 13.5	21.9 ± 18.0
	Snow pea monoculture	18.8 ± 12.0	9.4 ± 6.0
		$F_{2,6} = 0.81$; $P = 0.485$	$F_{2,6} = 0.33$; $P = 0.729$
50	Snow pea intercrop	15.6 ± 15.6	3.1 ± 3.1
	Faba bean monoculture	12.5 ± 7.2	15.6 ± 15.6
	Snow pea monoculture	18.8 ± 14.9	18.8 ± 8.0
		$F_{2,6} = 0.052$; $P = 0.949$	$F_{2,6} = 0.797$; $P = 0.493$
65	Snow pea intercrop	21.9 ± 6.0 a	9.4 ± 9.4
	Faba bean monoculture	212.5 ± 63.1 b	43.8 ± 27.2
	Snow pea monoculture	6.3 ± 4.0 a	15.6 ± 6.0
		$F_{2,6} = 10.50$; $P < 0.01$	$F_{2,6} = 1.18$; $P = 0.368$
80	Snow pea intercrop	18.8 ± 8.0 a	12.5 ± 5.1 a
	Faba bean monoculture	325 ± 113.5 b	31.3 ± 3.6 b
	Snow pea monoculture	18.8 ± 14.9 a	3.1 ± 3.1 a
		$F_{2,6} = 7.55$; $P < 0.05$	$F_{2,6} = 14.53$; $P < 0.01$
Pooled data for all samples	Snow pea intercrop	18.8 ± 4.8 a	8.6 ± 3.0 a
	Faba bean monoculture	146.9 ± 44.2 b	28.1 ± 8.6 b
	Snow pea monoculture	15.6 ± 5.7 a	11.7 ± 3.1 ab
		$F_{2,42} = 8.3$; $P < 0.01$	$F_{2,42} = 3.5$; $P = 0.039$

Densities with the same letter are not statistically different ($P > 0.05$) determined by Tukey's multiple comparison test.

Whole-plant counts are the average of 4 replicates (blocks), with 3 plants sampled and combined in each replicate plot. Block effects were not significant in ANOVA ($P > 0.5$).

cies composition data are based on rainy-season samples only.

We plan to continue sampling the 2 crops in the highlands of Guatemala to determine whether this pattern of species composition and host use persists.

Summary

Snow peas intercropped with faba beans in the Guatemalan highlands did not show a reduction in thrips densities compared to snow peas in monoculture, and faba bean does not appear to function as a trap crop. Thrips species composition differed markedly on each host, which may largely explain the results. *Thrips tabaci* was predominant on snow peas, while *Frankliniella occidentalis* was the main species on faba beans.

Key Words: export crop, *Frankliniella occidentalis, Frankliniella insularis, Thrips tabaci,* host preference

Resumen

El cultivo de arveja china en asocio con haba en el altiplano de Guatemala no produjo reducción significativa de trips comparado con arveja china en monocultivo. No hubo evidencia que el haba funcione como cultivo trampa. La composición de especies de trips mostró diferencias marcadas entre hospederos, lo cual ayuda a explicar los resultados. La especie predominante en arveja china fue *Thrips tabaci* mientras que la especie principal en haba fue *Frankliniella occidentalis*.

Palabras Clave: cultivo de exportación, *Frankliniella occidentalis, Frankliniella insularis, Thrips tabaci*, preferencia de hospedero

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References Cited

Alvarez, G. 1993. Evaluación de insecticidas químicos para el control de trips en arveja china, pp. 77-88 *In* D. Dardón and V. Salguero [eds.], Manejo integrado de plagas en arveja china, Fase II: 1992-1993. Proyecto MIP-ICTA-CATIE-ARF. Guatemala.

Calderón Villatoro, F. E. 1993. Guía práctica para el control de plagas y enfermedades en el cultivo de arveja china. Instituto de Ciencia y Tecnología Agrícola, Guatemala.

Guzman, V. 2013. Comparativo de exportaciones de arveja china, 2001-2012. Comité de Arveja de AGEXPORT/2013, Asociacion Gremial de Exportadores, Guatemala.

Hart, M. 2005. Economic development, food safety and sustainable export market access: the case of snow peas from Guatemala. http://www.commercialdiplomacy.org/case_study/snow_pea.htm

MacVean, C. M., Pérez, R., and Morales, H. 1993. Impact of non-traditional horticultural export crops on pests, beneficial organisms and soils in the highlands of Guatemala (Impacto de cultivos hortícolas no-tradicionales de exportación sobre plagas, organismos benéficos y suelos en el altiplano de Guatemala). Rev. Univ. Valle de Guatemala 3: 14-22. Guatemala. PDF available at www.uvg.edu.gt

Oroxom, R. 2008. Efecto de la combinación de control químico y franjas de maíz adyacentes a la arveja china sobre la densidad poblacional y el porcentaje de parasitismo de la mosca minadora (*Liriomyza huidobrensis* Blanchard), en Chimaltenango, Guatemala. Undergraduate thesis, Universidad Rafael Landivar, Guatemala. PDF available at www.url.edu.gt/PortalURL/Biblioteca/Contenido.aspx?o=2346&s=49

Sandoval, J. L., Sanchez, G., Calderon, L., and Cid, M. D. 2004. Pre-inspection manual in snow and sweet pea. ICTA/IPM CRSP publ., Guatemala.

Smith, H. A., Capinera, J. L., and MacVean,, C. M. 2010. Reducing pesticide use on Guatemalan snow peas exported to the United States. Final Report to the United States Department of Agriculture Foreign Agricultural Service (USDA FAS Agreement No. 58-3148-5-147. http://gcrec.ifas.ufl.edu/HSmith/Reports for web page/FAS Project Agreement 58-3148-5-147 Snow Pea Final Report.pdf

Sullivan, G. H., Sánchez, G. E., Weller, S. C., and Edwards, C. R. 1999. Sustainable development in Central America's non-traditional export crops sector through adoption of integrated pest management practices: Guatemalan case study, pp. 123-126 *In* Sustainable Development International, Launch edn. ICG Publishing, London, UK.

Sullivan, G. H., Weller, S. C., Edwards, C. R., Lamport, P. P., and Sánchez, G. E. 2000. Integrated crop management strategies in snow pea: A model for achieving sustainable NTAE production in Central America, pp. 107-110 *In* Sustainable Development International, 3rd ed. ICG Publishing, London, UK.

Wingert, S. 2010. Feed the Future Initiative, achieving food security in Guatemala: opportunities and challenges. Prepared by Wingert Consulting and Abt Associates for the USAID Guatemala Trade Competitiveness Assistance Program. 116 pp.