to luxury N consumption. Due to variability in readings among sites and soil types, critical NO_3-N readings must be established under region-specific growing conditions and cultivars. However, due to the ease of use and low cost of the Cardy NO_3^- meter, region-specific critical readings could be established relatively quickly.

Literature cited

Blackmer, T.M. and J.S. Schepers. 1994. Techniques for monitoring crop nitrogen status in corn. Commun. Soil Sci. Plant Anal. 25:1791–1800.

Coltman, R.R. 1988. Yields of greenhouse tomatoes managed to maintain specific petiole sap nitrate levels. HortScience 23: 148–151.

Delgado, J.A. and R.F. Follett. 1998. Sap test to determine nitrate-nitrogen concentrations in aboveground biomass of winter cover crops. Commun. Soil Sci. Plant Anal. 29:545–559.

Dwyer, L.M., M. Tollenaar, and L. Houwing. 1991. A nondestructive method to monitor leaf greenness in corn. Can. J. Plant Sci. 71:505–509.

Follett, R.H., R.F. Follett, and A.D. Halvorson. 1992. Use of a chlorophyll meter to evaluate the nitrogen status of dryland winter wheat. Commun. Soil Sci. Plant Anal. 23: 687–697.

Geypens, M. and H. Vandendriessche. 1996. Advisory systems for nitrogen fertilizer recommendations. Plant Soil 181:31–38.

Hartz, T.K., R.F. Smith, M. LeStrange, and K.F. Schulbach. 1993. On-farm monitoring of soil and crop nitrogen status by nitrate-selective electrode. Commun. Soil Sci. Plant Anal. 24:2607–2615.

Kubota, A., T.L. Thompson, T.A. Doerge, and R.E. Godin. 1996. A petiole sap nitrate test for cauliflower. HortScience 31: 934–937.

Kubota, A., T.L. Thompson, T.A. Doerge, and R.E. Godin. 1997. A petiole sap nitrate test for broccoli. J. Plant Nutr. 20: 669–682.

Lopez-Cantarero, I., F.A. Lorente, and L. Romero. 1994. Are chlorophylls good indicators of nitrogen and phosphorus levels? J. Plant Nutr. 17:979–990.

Maynard, D.N. and A.V. Barker. 1972. Nitrate content of vegetable crops. HortScience 7:224–226.

Maynard, D.G. and Y.P. Kalra. 1993. Nitrate and exchangeable ammonium nitrogen, p. 25–38. In: Carter, M.R. (ed.). Soil Sampling and Methods of Analysis. Canadian Society of Soil Science, Pinawa, Manitoba.

Neilsen, D., E.J. Hogue, G.H. Neilsen, and P. Parchomchuk. 1995. Using SPAD-502 values to assess the nitrogen status of apple trees. HortScience 30:508–512.

Ontario Ministry of Agriculture, Food, and Rural Affairs. 2000. Vegetable production recommendations. Publ. 363. Queen's Printer for Ontario, Toronto.

Reeves, D.W., P.L. Mask, C.W. Wood, and D.P. Delaney. 1993. Determination of wheat nitrogen status with a hand-held chlorophyll meter: influence of management practices. J. Plant Nutr. 16:781–796.

Rodriguez, I.R. and G.L. Miller. 2000. Using a chlorophyll meter to determine the chlorophyll concentration, nitrogen concentration, and visual quality of St. Augustinegrass. HortScience 35:751–754.

Rosen, C.J., M. Errebhi, and W. Wang. 1996. Testing petiole sap for nitrate and potassium: A comparison of several analytical procedures. HortScience 31:1173–1176.

Sandoval-Villa, M., E.A. Guertal, and C.W. Wood. 2000. Tomato leaf chlorophyll meter readings as affected by variety, nitrogen form, and nighttime nutrient solution strength. J. Plant Nutr. 23:649–661.

Sullivan, D. 1986. Nitrogen management for seeded onions in northern Colorado. Onion World (Jan.):12.

Turner, F.T. and M.F. Jund. 1991. Chlorophyll meter to predict nitrogen topdress requirement for semidwarf rice. Agron. J. 83:926–928.

Warncke, D.D. 1996. Soil and plant tissue testing for nitrogen management in carrots. Commun. Soil Sci. Plant Anal. 27: 597–605.

Westcott, M.P., C.J. Rosen, and J.M. Wraith. 1993. Direct measurement of petiole sap nitrate in potato to determine crop nitrogen status. J. Plant Nutr. 16:515–521.

Westerveld, S.M., A.W. McKeown, C.D. Scott-Dupree, and M.R. McDonald. 2003a. Chlorophyll and nitrate meters as nitrogen monitoring tools for selected vegetables in Southern Ontario. Acta Hort. (in press).

Westerveld, S.M., M.R. McDonald, C.D. Scott-Dupree, and A.W. McKeown. 2003b. Optimum nitrogen fertilization of summer cabbage in Ontario. Acta Hort. (in press).

Westerveld, S.M., A.W. McKeown, C.D. Scott-Dupree, and M.R. McDonald. 2003c. How well do critical nitrogen concentrations work for cabbage, carrot, and onion crops? HortScience (in press).

Wood, C.W., P.W. Tracy, D.W. Reeves, and K.L. Edmisten. 1992. Determination of cotton nitrogen status with a hand-held chlorophyll meter. J. Plant Nutr. 15: 1435–1448.

Potential Acaricides for Management of Blueberry Bud Mite in Michigan Blueberries

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ADDITIONAL INDEX WORDS. Endosulfan, oil, integrated fruit production, miticide, *Vaccinium corymbosum*

SUMMARY. The goal of this study was to evaluate potential alternatives to endosulfan for control of the blueberry bud mite (*Acalitus vaccinii*), because the availability of this acaricide may be restricted in the future. Laboratory evaluations of potential acaricides showed that endosulfan and a combination of abamectin plus oil provided 97% and 100% control, respectively. Pyridaben and fenpropathrin were less effective, reducing mite survival by 49% and 57%, respectively. Further laboratory evaluation of the abamectin plus oil treatment showed that each component applied alone provided a high level of control of blueberry bud mite. Field trials in Michigan on a mature highbush blueberry (*Vaccinium corymbosum*) planting were conducted to compare control of this pest by postharvest applications of endosulfan, delayed-dormant application of oil, or a combination of both treatments. The oil provided a 40% reduction in mite scores, while endosulfan was more effective (48%) and similar to

Acknowledgement is made to the Michigan Agricultural Experiment Station for support of this research. The authors thank Dave Trinka of Michigan Blueberry Growers Association and Chris Hodgeman for technical assistance. Early drafts of this paper were improved by the comments of Kenneth Sorensen, Sieglinde Snapp, and James Hancock, and we thank two anonymous reviewers for their suggestions. This research was supported in part by a fellowship from the Organization for Economic Cooperation and Development awarded to Dariusz Gajek.

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the combination of endosulfan and oil (52%). A separate field trial using a multifan/nozzle sprayer that applied the pesticide in 233.8 L·ha^{-1} (25 gal/acre) of water suggested that the level of control from one application of endosulfan was not as effective as two applications. Results are discussed in relation to developing future bud mite control programs in blueberry and the need to address gaps in our understanding of the biology of blueberry bud mite. Endosulfan (Thiodan 50 WP), Endosulfan (Thiodan 3 EC), Abamectin (AgriMek 0.15 EC), Fenpropathrin (Danitol 2.4 EC), Pyridaben (Pyramite 60 WP).

The blueberry bud mite is an eriophyid species infesting both highbush blueberry and lowbush blueberry (*Vaccinium angustifolium*) plantings in North America. It was first reported by Fulton (1940) and is typically a pest of blueberry in eastern North America, with greatest activity in areas with mild winter climates. Keifer (1941) described this species and found blueberry bud mites on many species of cultivated and wild blueberry. Infestations of this pest are challenging to manage because of a restricted number of registered chemical control options, difficulty in detecting infested plants, and the challenge of reaching mites within the buds with pesticide (Bailey and Bourne, 1946; Pritts and Hancock, 1992). Endosulfan is the main acaricide used for control of blueberry bud mite, applied as a postharvest treatment. In more northern regions of highbush blueberry production, there may be a small window for application of this acaricide because new buds may be well formed only a few weeks after the harvest of late varieties. Symptoms caused by blueberry bud mite may be similar to those caused by winter injury and this, along with its small size, has contributed to low awareness of this species as a potential pest.

Symptoms of infestation range from reddening of bud tissue early in the season to inhibition or prevention of leaf and fruit development (Pritts and Hancock, 1992). Summer generations cause reduced vegetative growth that impacts the following year's crop. In severe infestations plant growth and yield can be reduced (Bailey and Bourne, 1946). Blueberry bud mite infestations have recently been reported in Michigan (Isaacs and Gajek, 2003), prompting this study on potential alternatives to the main registered miticide.

Neunzing and Galletta (1977) sampled blueberry species in Georgia and found that highbush blueberry was the most heavily infested, with an average of 66% bud infestation. No blueberry cultivar has been demonstrated to be fully resistant to the bud mite, though some cultivars have been observed as free of mites in field collections (Neunzing and Galletta, 1977). The lack of known resistant cultivars creates a need for management tools that provide effective control of blueberry bud mite infestations.

Current recommendations for control of blueberry bud mite in the United States rely on pruning infected bushes and postharvest application of the organochlorine insecticide, endosulfan. This pesticide is applied in high water volume [up to 2806.1 L·ha^{-1} (300 gal/acre)] and at high pressure because of the need to deliver pesticides into tight spaces in and around the bud scales where the mites aggregate (Beasley et al., 1983). Recent development of locally-systemic and translaminar insecticides that can spread within plant tissues may reduce the need for these specific sprayer settings (Weintraub and Horowitz 1998; Ngo et al., 1999; Elbert et al., 2001) and provide blueberry growers with a means of targeting bud mites more effectively. In addition, recent legislated re-evaluation of endosulfan by the U.S. Environmental Protection Agency, carried out in response to the Food Quality Protection Act of 1996, has prompted proposals for reduced use in blueberry, increasing the need for alternative controls for blueberry bud mite.

This study was conducted to 1) compare miticide options to control blueberry bud mite under laboratory conditions, 2) compare the field efficacy of fall applications of endosulfan to spring applications of oil, and 3) determine the effectiveness of endosulfan applied to blueberry plantings using a multifan/nozzle type sprayer.

Materials and methods

Laboratory acaricide comparisons. In Expt. 1, four acaricides were tested to determine the most effective chemical control of blueberry bud mite. Fifty 20-cm-long (7.9-inch) shoots with new growth were randomly collected on 23 July 2001 from a mature field of 'Rubel' highbush blueberry in Grand Junction, Mich. containing plants that exhibited damage symptoms. The cut ends of 10 shoots per treatment were transported in water in a cooler to the laboratory where they were treated. Each shoot was treated by immersion for 3 s in 1 L (33.8 fl oz) of a water control or a solution of insecticide that was mixed to be equivalent to application in 935.4 L·ha^{-1} (100 gal/acre) of water. The following insecticides were tested: abamectin (AgriMek 0.15 EC; Syngenta, Greensboro, N.C.) at 1169.2 mL·ha^{-1} (16 fl oz/acre) mixed with horticultural oil (Ultrafine Oil; Sunoco Oil Company, Philadelphia, Pa.) at 0.5% by volume; pyridaben (Pyramite 60 WP; BASF, Mount Olive, N.J.) at 462.34 g·ha^{-1} (6.6 oz/acre); fenpropathrin (Danitol 2.4 EC; Valent, Walnut Creek, Calif.) at 774.61 mL·ha^{-1} (10.6 fl oz/acre); and endosulfan (Thiodan 50 WP; FMC Corp., Philadelphia, Pa.)) at 3.4 kg·ha^{-1} (3 lb/acre). Each shoot was shaken to remove excess liquid and placed upright in a test tube rack inside an illuminated fume hood to dry. Five days after treatment, the lower four buds of the new growth on each shoot were examined for adult mites and the total number of live mites was recorded for 7 to 10 young buds on every shoot. Dead mites were differentiated from living mites by their dry and deformed bodies, darker coloration, and less shiny surface.

To test the efficacy of the combined abamectin plus oil treatment, Expt. 2 was conducted one week after Expt. 1. Highly infested shoots were treated as described above with abamectin mixed with horticultural oil, abamectin, horticultural oil, or water using the same rates and methods as in Expt. 1. The treated branches were assessed 5 d after application of acaricides by counting mites as described above.

Field comparison of oil and endosulfan. A field of mature 'Rubel' highbush blueberry, where blueberry bud mite had been detected in samples taken during July 2001, was selected for this trial in Grand Junction, Mich. A randomized complete block design with four replicates was used, and each block contained four treatments that were applied to 30 bushes along a row. Blocks were separated across rows by a guard row and treated sections of rows were separated by two bushes. Within a block, each plot received either 1) an untreated control, 2) endosulfan (Thiodan 50 WP) at 3.4 kg·ha^{-1} applied postharvest on 8 Oct. 2001, 3) horticultural oil at 0.2% by volume applied at bud break on 5 Apr. 2002, or 4) a combination of treatment 2 on 8 Oct. 2001 and treatment 3 on 5 Apr. 2002. Treatments made in the fall were applied in 1870.7 L·ha^{-1} (200 gal/acre) of water, while those made at bud break were made in 654.8 L·ha^{-1} (70 gal/acre) of water, using a Berthoud Arbo 400 airblast sprayer (Berthoud Agricole, Belleville, France). Two weeks after the oil applications five branches containing developing buds with a minimum of five buds per branch were collected randomly from each plot. Mite infestation was scored by examining the apical bud and proceeding downward to inspect additional buds until five buds were examined or more than six mites were observed per sample. The number of live mites detected in each branch sample were counted and placed in one of four categories; 0 = no mites, 1 = one mite, 2 = three to five mites, and 3 = six or more mites. In total, 20 stems were counted from each treatment.

FIELD COMPARISON OF SINGLE OR DOUBLE ENDOSULFAN APPLICATIONS. Two adjacent fields of mature highbush blueberry ('Rubel' and 'Jersey') in Breedsville, Mich. were each divided into four equal plots and each plot received either 1) no treatment; 2) endosulfan (Thiodan 3 EC) at 4.7 L·ha^{-1} (64 oz/acre) on 30 Aug. 2002; 3) endosulfan (Thiodan 3 EC) at 4.7 L·ha^{-1} on 30 Aug. and 10 Sept. 2002; or 4) endosulfan plus a spreader-sticker (Thiodan 3 EC) at 4.7 L·ha^{-1} plus Syl-Tac silicone surfactant (Wilbur-Ellis Co., San Fransisco, Calif.) at 1% by volume 30 Aug. and 10 Sept. 2002. These treatments were applied in 280.6 L·ha^{-1} (30 gal/acre) of water using a Proptec over the row sprayer with fan-assisted spray deposition (Ledebuhr Industries, Bath, Mich.) as described by Hanson et al. (2000). Each treatment plot contained two rows with 50 bushes in each row and a guard row between each treatment. Following the treatments, 20 branches were sampled per plot, and each treatment was examined to detect mite survival. The same procedure was used to collect, examine, and score the branches as described in the field experiment described above.

DATA ANALYSIS. Counts of live mites per shoot in laboratory experiments were analyzed by analysis of variance (ANOVA) followed by means comparison using Statview (Abacus Concepts Inc., Berkeley, Calif.). The score data from field experiments were transformed using reciprocal transformation to obtain normal distribution and account for observations of zeros (Zar, 1999), followed by ANOVA. Data from each experiment were analyzed separately and means were compared using Fisher's protected least significant difference method to identify significant differences.

Results

ACARICIDE EFFICACY. All acaricide treatments tested in the laboratory caused a significant reduction in the number of mites found on the shoots (Tables 1 and 2). In Expt. 1, abamectin plus oil provided 100% control of blueberry bud mite and this was not significantly different from endosulfan, which provided 97% control (Table 1). Pyridaben and fenpropathrin both reduced the number of mites per shoot within 5 d of treatment compared to the control, but these reductions were moderate (50%) compared to the other treatments.

When the components of the abamectin and oil treatment were tested separately, both components showed strong miticidal activity individually. The numbers of live mites in each treatment were not significantly different from the number of mites found in shoots treated with a combination of the two compounds (Table 2). The oil component alone provided 99.4% reduction compared to the water control, whereas the abamectin treatment caused an 87.4% reduction in the mite population.

FIELD COMPARISON OF ENDOSULFAN AND OIL. The average mite score on bushes treated with endosulfan postharvest and a delayed-dormant oil application was significantly lower than that on the untreated bushes (P = 0.032) (Table 3). There was no significant difference among the other treatments, but the endosulfan and endosulfan plus oil treatment reduced the average mite scores by 48% and 52% respectively. A 40% reduction in mite score was recorded when oil was applied alone at the delayed-dormant timing. When buds were examined after the spring

Table 1. Effect of laboratory acaricide applications on abundance of blueberry bud mite on infested highbush blueberry shoots collected in July 2001.

Treatment	Mites/sample [no. (SE)][z]
Untreated	1.63 (0.49) a[y]
Pyridaben	0.83 (0.21) b
Fenpropathrin	0.70 (0.14) b
Endosulfan	0.05 (0.02) c
Abamectin plus horticultural oil	0.00 (0.00) c

[z]Values are the average number of mites per four shoots.
[y]Means separated by different letters are significantly different at P = 0.05.

Table 2. Effect of laboratory treatments with abamectin and oil on abundance of blueberry bud mite on infested highbush blueberry shoots collected in July 2001.

Treatment	Mites/sample [no. (SE)][z]
Untreated	5.22 (0.99) a[y]
Abamectin	0.67 (0.05) b
Horticultural oil	0.03 (0.03) b
Abamectin plus horticultural oil	0.02 (0.02) b

[z]Values are the average number of mites per four new shoots.
[y]Means separated by different letters are significantly different at P = 0.05.

Table 3. Effect of post-harvest applications of endosulfan and delayed-dormant applications of oil on blueberry bud mite, when applied alone or in combination to commercial highbush blueberry plants in Grand Junction, Mich.

Treatment (timing)	Avg mite score (0–3)[z]	SE	Buds without mites (%)
Untreated	1.25	0.37	40
Endosulfan (postharvest)	0.65	0.28	55
Horticultural oil (delayed-dormant)	0.75	0.19	75
Endosulfan (postharvest) and horticultural oil (delayed-dormant)	0.60	0.41	70

[z]Score 0 = no mites, 1 = one mite, 2 = three to five mites, and 3 = more than five mites.

application, the oil application and the combination treatment resulted in a high proportion of mite-free buds (75% and 70%, respectively) compared to the untreated control (40%).

Field comparison of endosulfan once or twice plus Syltac . Comparisons made in the fields of 'Rubel' and 'Jersey' indicated a reduction in bud mite abundance from the untreated (2.15 average mite score) in response to a single application of endosulfan (1.3 average mite score), endosulfan applied twice (0.30 average mite score), and endosulfan applied twice plus a silicone surfactant (0.45 average mite score). The two treatments that received endosulfan applications twice postharvest had 90% and 85% mite-free buds.

Discussion

Our laboratory and field experiments demonstrate that endosulfan is a highly effective acaricide for the control of blueberry bud mite under commercial production conditions in Michigan, and addition of a spreader-sticker was not found to increase bud mite control by this product. Endosulfan is currently used in integrated fruit production programs elsewhere, including Polish blackcurrants (*Ribes nigrum*), where it is used against the black currant bud mite (*Cecidophyopsis ribis*), providing direct control and also protection of predatory mites (Gajek and Niemczyk, 2002). Endosulfan is also relatively safe for pollinators once the residue is dry (Johansen and Mayer, 1990), and can play an important role in integrated blueberry pest management programs.

This study also demonstrated that there are effective alternative miticides for control of blueberry bud mite, such as abamectin that showed excellent control against the target pest. Horticultural oils have been used against tetranychid mite pests in apple (*Malus* ×*domestica*) (Agnello et al., 1994), performing with high efficacy at low rates of application, and the oil tested in this study showed excellent activity against blueberry bud mite. The relatively low cost of oils and safety to humans and biocontrol agents provide compelling reasons for their recommendation within integrated blueberry production systems. Pyridaben and fenpropathrin have no penetrative properties and performed relatively poorly against this pest that is most abundant in the tight spaces of blueberry buds.

Since endosulfan has high mammalian toxicity, application is restricted to after harvest for control of blueberry bud mite. In southern states of the U.S., two applications are recommended (Sorensen, 1994). The slower annual phenology of blueberry in more temperate climates may reduce the duration of the appropriate plant development stage for application, so alternative timings for control may be needed. For example, applications could be made at bud break when overwintering mites will be more exposed than when bud scales are tightly wrapped together. Alternatively, the period of mite migration may be a more effective time for acaricide applications. The timing of this movement from old buds to new growth is not well understood, however, and is an area that should be investigated to help optimize opportunities for control of blueberry bud mite.

A clearer understanding of the biology and ecology of blueberry bud mite is essential for the development of optimal control programs for this pest. Baker and Neunzig (1970) indicate that bud mite is often a greater problem in dryer summers following mild winters, such as those experienced in Michigan during the five years prior to this study. The variability of occurrence of this pest from year to year may be explained by overwintering conditions (Sorensen, 1994), but the long-term importance of blueberry bud mite remains to be evaluated. However, the broad geographic range of this mite within Michigan found in a recent survey (Isaacs and Gajek, 2003) and the degree of damage associated with its presence indicates that this pest requires active monitoring within an integrated pest management program. During these experiments, a potential for biological control was identified; tydeid predatory mites were found in spring samples, with both tydeid and phytoseiid mites present during summer samples (D. Gajek and R. Isaacs, unpublished). Future research efforts should identify biological controls that can be used to maintain populations of blueberry bud mite below economic thresholds. A management program is needed to provide a standard method for sampling, decision-making, and effective chemical control that retains the activity of biological control agents.

Literature cited

Agnello, A., W. Reissig, and T. Harris. 1994. Management of summer populations of european red mite (Acari: Tetranychidae) on apple with horticultural oil. J. Econ. Entomol. 87: 148–161.

Bailey, J. and A. Bourne. 1946. The control of the blueberry bud mite. J. Econ. Entomol. 39:89.

Baker, J. and H. Neunzig. 1970. Biology of the blueberry bud mite. J. Econ. Entomol. 63: 74–79.

Beasley, E., R. Rohrbach, C. Mainland, and J. Meyer. 1983. Saturation spraying of blueberries with partial spray recovery. Trans. Amer. Soc. Agr. Eng. 26:732–736.

Elbert, A, A. Buchholz, U. Ebbinghouse-Kintscher, C. Erdelen, R, Nauen, and H. Schnorbach. 2001. The biological profile of thiacloprid – A new chloronicotinyl insecticide. Pflanzenschutz-Nachrichten-Bayer. 54:185–208.

Fulton, B. 1940. The blueberry bud mite, a new pest. J. Econ. Entomol. 33:699.

Gajek, D. and E. Niemczyk. 2002. Efficacy of chemical and non-chemical treatments against blackcurrant gall mite (*Cecidophyopsis ribis* Westw.) and their influence on populations of twospotted spider mite (*Tetranychus urticae* Koch), predatory mites (*Phytoseiidae*) and aphids (*Aphididae*). J.Fruit Ornamental Plant Res. 9(1-4):93–102.

Hanson, E., J. Hancock, D. Ramsdell, A. Schilder, G. VanEe, and R. Ledebuhr. 2000. Sprayer type and pruning affect the incidence of blueberry fruit rots. HortScience 35:235–238.

Isaacs, R. and D. Gajek. 2003. Abundance of blueberry bud mite (*Acalitus vaccinii*) in Michigan blueberries, and variation in infestation among common highbush blueberry varieties. Bul. Intl. Org. Biol. Integrated Control Noxious Animals Plants W. Palaearctic Reg. Sec. 26(2):127–132.

Johansen, C.A. and D.F. Mayer 1990. Pollinator protection—A bee and pesticide handbook. Wicwas Press, Cheshire, Conn.

Keifer, H. H. 1941. Eriophyid studies XI. Bul. Calif. Dept. Agr. 30:192–216.

Neunzing, H. and G. Galletta. 1977. Abundance of blueberry bud mite (Acarina–Eriophyidae) on various species of blueberry. J. Ga. Entomol. Soc. 12:182–184.

Ngo, N., S. Moore, S. Lawson, S. White, and P. Dugger. 1999. Ovicidal research with emamectin benzoate against tobacco budworm eggs, p. 1090–1091. In: D. Richter (ed.). Proceedings Beltwide Cotton Conferences. Natl. Cotton Council Amer., Memphis, Tenn.

Pritts, M.P. and J. F. Hancock. 1992. Highbush blueberry production guide. N.E. Reg. Agr. Eng. Serv.-55, Ithaca, N.Y.

Sorensen, K.A. 1994. Blueberry bud mite and its control. 21 Sept. 2003. <http://www.ces.ncsu.edu/depts/ent/notes/Fruits/fruitb4.html>.

Weintraub, P.G. and A.R. Horowitz. 1998. Effects of translaminar versus conventional insecticides on *Liriomyza huidobrensis* (Diptera: Agromyzidae) and *Diglyphus isaea* (Hymenoptera: Eulophidae) populations in celery. J. Econ. Entomol. 91: 1180–1185.

Zar, J. H. 1999. Biostatistical analysis. Prentice-Hall, Upper Saddle River, N.J.