*Imperial County* Agricultural Briefs

**Features** **From your Farm Advisors**

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# Using Mode of Action Classifications in an Integrated Resistance Management Program – Herbicide Resistance

**Mark A. Trent**

Herbicide resistance is the inborn ability of a plant to survive and reproduce following a treatment with an herbicide that would normally kill the plant. In recent years, there has been widespread occurrence of resistance to selective herbicides and the problem is continuing to worsen.

Frequently, resistance becomes a problem because of high selection pressure applied on a weed population over several years. The repeated use of the same herbicide or several herbicides with the same mode of action is often connected with crop monoculture and reduced cultivation practices. Perhaps the best answer to resistance management is to reduce selection pressure by using a combination of methods. The following techniques are recommended by the Herbicide Resistance Action Committee:

Mixtures or sequences of herbicides with differing modes of action are important, especially to prevent or overcome resistance based on target site differences. To be effective the herbicides used in mixtures or sequences must have similar efficacy against the target weed.

Crop rotations may allow different herbicides or cultivation techniques to be used and may also provide different competitive environments to shift the dominate weed species. Set-aside programs also allow new opportunities to manage populations of resistant weeds.

Cultivation practices may be adjusted if this fits to general agronomic needs. Measures such as stale seedbeds, plowing or stubble burning (where permitted) can be effective in reducing weed populations. In some systems, the grazing off of weeds (including the resistant ones) by sheep or cattle may be possible. In other cropping systems it may be possible to use mechanical methods of weed control.

Economic control levels should be the aim, not higher cosmetic levels which increase selection pressure without providing a financial return to the farmer.

Generally, the best approach to resistance management is an integrated weed management program. This method utilizes all available control methods in an economic and sustainable manner.

For more information on herbicide resistance management and the Classification of Herbicides According to Mode of Action visit the HRAC website at: www.hracglobal.com. Also see http://ucanr.org/freepubs/docs/8012.pdf for resistance management information.

# Cucumber Insecticide Trial Results

## Eric T. Natwick

An insecticide trial to evaluate insecticides for control of sweetpotato whiteflies biotype B and worm pests was established at the UC Desert Research and Extension Center near Holtville, CA on cucumber var. Medalist. The cucumber seed was sown on 6 August 2008 following soil injections of Platinum and Coragen treatments 2 inches below the seedline as four of the treatments. All other insecticides were applied as foliar sprays and all insecticide treatments were compared to an untreated check treatment using a randomized complete design with five replicates. The treatments and application rates and dates are listed in Table 1. Worm pests were counted on ten plants per plot. Whitefly adults were counted on the fifth leaf from the cane terminus of ten plants in each plot, the leaves were extracted and whitefly eggs and nymphs were counted in the laboratory on a 1.65 $cm^2$ leaf disks from each sample leaf. Data were analyzed using ANOVA and mean differences with Least Significant Differences test analysis, *P*=0.05.

There were almost no worm pests on the cucumber plants during the study, likely due to the overwhelming numbers of whitefly adults covering the leaves. There were no significant differences among the treatments for whitefly adults on sampling dates from 19 August to 12 September (Table 2) and none of the insecticide treatments had fewer adults than the untreated control throughout the study. There were no differences among the treatments for whitefly eggs and nymphs throughout the study. The results showed that even neonicotinoid insecticide such as Platinum could not control the overwhelming numbers of whiteflies. It is thought that the untreated control became less attractive whitefly adults soon after seedling emergence as the control plants were smaller than the insecticide treated plants, but none of the plants survived the onslaught of whiteflies to produce fruit. All plants showed symptoms resembling *Cucurbit yellow stunting disorder virus* (CYSDV), transmitted by sweetpotato whitefly. The presence of CYSDV was confirmed at both UC Davis at Davis, CA and USDA ARS at Salinas, CA.

Table 1. Insecticide Treatments, Rates and Application Dates on Cucumber, 2008.

| Treatment | oz/acre | Treatment date |
|---|---|---|
| 1. Control | -------- | -------------------- |
| 2. *SynapseWG f/b Oberon | 2.0<br>8.0 | 27 Aug 29<br>Aug, 15 Sep |
| 3. *SynapseWG f/b Oberon | 3.0<br>8.0 | 27 Aug 29<br>Aug, 15 Sep |
| 4. **Coragen SC | 5.05 | 4 Aug |
| 5. **Coragen SC | 6.74 | 4 Aug |
| 6. **Coregen SC | 7.66 | 4 Aug |
| 7. **Platinum | 11.0 | 4 Aug |

* MSO at 0.25% v/v added to spray mixture. ** Shank injection 2” below seed at planting.

Table 2. Whitefly Adults per Leaf, Holtville, CA 2008.

| Treatment | oz/acre | 19 Aug | 2 Sep | 12 Sep | 22 Sep | 29 Sep | Average |
|---|---|---|---|---|---|---|---|
| Control | ------ | 293.54 | 135.74 | 60.16 | 32.52 c | 30.00 cd | 110.39 bc |
| Synapse/Oberon | 2.0 | 226.38 | 80.60 | 107.16 | 34.52 c | 44.76 bcd | 98.68 c |
| Synapse/Oberon | 3.0 | 263.40 | 79.46 | 73.92 | 26.84 c | 45.96 bcd | 97.92 c |
| Coragen SC | 5.05 | 300.12 | 105.04 | 107.64 | 80.64 b | 80.40 ab | 134.77 ab |
| Coragen SC | 6.74 | 265.70 | 98.74 | 127.96 | 147.20 a | 67.20 abc | 141.36 ab |
| Coregen SC | 7.66 | 263.90 | 96.34 | 97.16 | 98.12 b | 89.24 a | 128.95 abc |
| *Platinum | 11.0 | 307.54 | 227.06 | 184.66 | 73.88 b | 23.88 d | 163.40 a |

Means within columns followed by the same letter are not significantly different, *P*= 0.05.

Table 3. Whitefly Eggs per $cm^2$, Holtville, CA 2008.

| Treatment | oz/acre | 19 Aug | 2Sep | 12 Sep | 22 Sep | 29 Sep | Average |
|---|---|---|---|---|---|---|---|
| Control | ------ | 648.41 | 23.57 | 168.06 | 10.00 | 98.91 | 189.79 |
| Synapse/Oberon | 2.0 | 369.90 | 41.07 | 202.18 | 14.18 | 91.51 | 143.77 |
| Synapse/Oberon | 3.0 | 596.75 | 26.65 | 141.58 | 21.15 | 127.88 | 182.80 |
| Coragen SC | 5.05 | 503.87 | 29.79 | 202.49 | 19.76 | 81.88 | 167.56 |
| Coragen SC | 6.74 | 513.75 | 23.75 | 221.88 | 18.06 | 125.52 | 180.59 |
| Coregen SC | 7.66 | 623.84 | 25.21 | 180.79 | 17.03 | 75.31 | 184.44 |
| Platinum | 11.0 | 547.30 | 45.72 | 267.58 | 21.34 | 46.49 | 185.68 |

There were no differences among the treatments on any sampling date via ANOVA, *P*= 0.05.

Table 4. Whitefly Nymphs per $cm^2$, Holtville, CA 2008.

| Treatment | oz/acre | 19 Aug | 2Sep | 12 Sep | 22 Sep | 29 Sep | Average |
|---|---|---|---|---|---|---|---|
| Control | ------ | 0.04 | 128.69 | 287.57 | 51.33 | 170.06 | 127.54 |
| Synapse/Oberon | 2.0 | 0.14 | 91.37 | 323.39 | 98.12 | 139.15 | 130.44 |
| Synapse/Oberon | 3.0 | 0.14 | 113.29 | 226.91 | 78.24 | 84.12 | 100.54 |
| Coragen SC | 5.05 | 0.14 | 135.67 | 225.88 | 98.55 | 146.12 | 121.27 |
| Coragen SC | 6.74 | 0.14 | 124.30 | 197.63 | 79.15 | 133.76 | 107.00 |
| Coregen SC | 7.66 | 0.17 | 106.67 | 155.45 | 94.55 | 125.70 | 96.51 |
| Platinum | 11.0 | 0.24 | 71.50 | 239.58 | 98.85 | 134.18 | 108.87 |

There were no differences among the treatments on any sampling date via ANOVA, *P*= 0.05.

# Needle Nematode: An Important Plant Parasitic Nematode of the Imperial Valley

**Donna R. Henderson**

*Longidorus africanus*, Merny 1966, commonly referred to as the needle nematode is an important plant parasitic nematode found in the Imperial Valley of southern California. Needle nematode is preferential to desert climates, having been reported in Sudan, South Africa, Egypt, Portugal, Israel, and Mexico (1,2, 3, 4, 6, 10, 11, 12).

**Damage to Plant Seedlings** Needle nematode is a migratory ectoparasite that parasitizes root tips, inhibiting growth at the root tip that results in symptoms such as stunting, galling (lettuce), and root deformation (forked taproot). Numerous crops may experience these symptoms as well, but the affects are very pronounced on the yield and quality of carrot and lettuce seedlings.

**Host range** Host range studies have revealed that needle nematode is capable of reproducing to varying degrees on a wide range of crops (3, 7, 8, 9). Reproductive hosts include most of the crops grown in the Imperial Valley with the exception of some cruciferous crops (cauliflower, cabbage) (7, 8). The best hosts are sorghum, snap bean, lima bean, and sugar beet. Good hosts include barley, Bermuda grass, corn, wheat, cotton, okra, lettuce, cucumber, tomato, and eggplant. Fairly poor hosts include oat, sunflower, alfalfa, pea, carrot, cantaloupe, squash, zucchini, watermelon, pepper, spinach, spearmint, onion, radish, and broccoli. Non-hosts include cauliflower and cabbage (7, 8). Best host indicates more nematodes reproduced on the plant, good hosts and fairly good hosts indicate somewhat lower reproduction rates, and non-host indicates the nematodes were unable to reproduce on the plant. Although lettuce and carrot are listed as good or fairly good hosts, the nematode can cause significant damage to the seedlings, detrimentally affecting crop yield and quality.

**Environment** Colder soil temperatures (≤ 62 °F) may decrease parasitism rates of needle nematode on lettuce and carrot seedlings (5), indicating that crops planted in the fall with temperatures of ≥ 77 °F may be at greater risk of parasitism. Fallow, moist soil may support needle nematode survival in the soil for up to 3 months at 77 °F (8). Considering the short intercropping cycles in Imperial Valley, longer fallow periods could not be considered. Adult to adult reproduction time is 7 to 9 weeks at 82 °F, egg to adult reproduction time is 4 weeks at 77 °F (8). The relatively short lifecycle indicates that needle nematode can complete more than one lifecycle in a typical cropping season. Although crop rotation studies have not been done with needle nematode, growers should consider incorporating the non-hosts cauliflower and cabbage into their rotation cycle to potentially lower needle nematode populations in the soil (8).

**Damage Threshold** Ploeg (2001) investigated damage thresholds in relation to plant age and needle nematode inoculum levels in carrot and lettuce in the Imperial Valley. The results are presented:

> <u>Lettuce</u> Results of the trials demonstrate that low levels of needle nematode early in the season can cause significant damage to lettuce seedlings. Delaying nematode infection for 10 days greatly increased the estimated minimum yield. Fresh lettuce top weight was significantly decreased at 5 or less needle nematode per 250 g soil. Lettuce root weight was reduced at both inoculation times (at seeding and 30 days post seeding), tolerance levels were < 4 nematodes per 250 g soil.
>
> In summary, methods that protect germinating seedlings in the first 10 days after planting will greatly impact the top weight yield for lettuce. Tolerance levels for needle nematode damage to top weight and root weight are 4 and 5 nematodes per 250 g soil.

*Carrots* Delayed inoculation of needle nematode in carrot seedlings to 15 days significantly increased the estimated minimum yield in comparison to 70% of the untreated control. Surprisingly, just a 5 day delay in inoculation increased the tolerance of the carrots to needle nematode to 5 nematodes per 250 g soil.

*In summary, tolerance levels for carrot and lettuce exposed to needle nematode at seeding were less than 5 nematodes per 250 g soil.*

Currently, there is no information on damage thresholds for other susceptible crops, but the results presented herein should be taken into consideration.

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## Sweet Corn Insect Management

**Eric T. Natwick**

Many insect pests cause serious problems for Low Desert sweet corn production, especially during the fall season. Some pests can be of concern during germination and stand establishment. Wireworms (Limonius spp.) feed on germinating corn seed. Avoid planting into fields with non-decomposed plant residue to reduce wireworm problems. A soil applyed insecticide in the seedline at planting can help prevent wireworm damage. Soil applied insecticides also prevent damage from the lesser corn stalk borer (*Elasmopalpus lignosellus*). The female stalk borer moths deposit their eggs in the soil at the base of emerging corn seedlings. The larvae enter the seedling stalks and are protected from insecticides. The boring within the stalks can weaken or kill the young plants. The desert corn flea beetle (*Chaetocnema ectypa*) and the pale striped flea beetle (*Systena blanda*) both attack seedling corn plants. Damage from both species is caused by adult feeding. Palestriped flea beetles chew numerous small rounded or irregular holes eaten in leaves so that leaves appear to have been peppered with small shot. The larvae of the palestriped flea beetle also feed on germinating seeds and roots of young plants. The desert corn flea beetle feeding does not penetrate the leaf, but the adults scrape away the epidermal layers of leaf tissue along the leaf veins. Flea beetle feeing can be very damaging to young plants and can result in seedling plant death. Foliar sprays or sprinkler chemigation may be needed to prevent serious injury. Armyworms and cutworms can cause serious problems during stand establishment including: armyworm (*Pseudaletia unipuncta*), beet armyworm (*Spodoptera exigua*), western yellowstriped armyworm (*Spodoptera praefica*), variegated cutworm (*Peridroma saucia*), and granulate cutworms (*Agrotis subterranea*). Cutworm hide in the soil or under debris during the day and clip off seedlings at night. Also they can hangout in weedy areas around the field so weeds should be killed and removed prior to planting. Female moths of the various armyworm species deposit egg masses on the seedlings and the neonate larvae feed in mass during their first instar before dispersing down the rows to infest other plants. Armyworm larvae are often hidden in the whorl where they can quickly cause severe injury or death of corn seedlings. Armyworm often is found feeding in the whorls until the tassel emerges and can cause significant damage if not controlled including severing of the tassel reducing pollen production. Insecticides are needed to prevent damage. Other seedling pests include darkling ground beetles (*Blapstinus* spp.) and crickets that can move from other crops, crop residues or weedy areas to clip-off corn seedlings. Clean up weedy area before planting and apply insecticides through the sprinklers if they are used during stand establishment or apply foliar insecticide sprays. Two-spotted spider mites and other spider mites occasionally cause severe damage especially following insecticide treatments that release them from their natural enemies.

The most important pest of sweet corn production is the corn earworm (Helicoverpa zea). The female moths lay their eggs singly on the silks emerging from the ears. The neonate larvae hatching from the eggs quickly follow the silks into the ear where they can render the ear unmarketable due to their feeding and frass. It is necessary to treat with efficacious foliar applications of insecticide every 2 to 3 days from at least the day of silk emergence until the silks turn brown and dry. It is also extremely important to rotate the chemical classes of insecticides used to prevent insecticide resistance.

During the spring of 2009 at the UC Desert Research and Extension Center, near Holtville, CA, an research trial was conducted to evaluate the efficacy of registered and unregistered experimental insecticides against corn earworm. The variety of sweet corn was Bodacious R/M planted on 26 February into plots measuring 50 ft by 2 rows on 40 inch centers in a randomized complete block design with 4 replicates. The insecticide treatments were initiated on 12 May and were to be applied every 3 days, but unintentionally, there was a delay in treatment of 8 days between the first and second treatments allowing some corn earworms to enter the ears; thereafter, insecticides were applied every 3 days. The insecticide treatments and treatment dates are listed in Table 1. Data were analyzed using analysis of variance and mean differences are shown based on least significant differences analysis, *P*=0.05. Percentage data were transformed using the arcsine transformation. Data collection included numbers of corn earworm per ten ears from 11 May through 2 June and percentages of ears damaged per ten ears at harvest on 2 June. There were no differences among the means for corn earworm larvae on 11 May (Table 2), but thereafter, all insecticide treatments had significantly fewer larvae compared to the untreated check.

Insecticide Treatments and Rates for Corn Earworm on Sweet corn, Holtville, CA, 2009.

| Treatment | Oz/acre | Application dates |
|---|---|---|
| 1. Untreated Check | ---------- | --------------------- |
| 2. Rimon 0.83 EC[1] f/b Asana XL[2] | 12.0 f/b 7.0 | 12 May 20, 22, 25 & 28 May |
| 3. Rimon 0.83 EC[1] r/w Asana[2] | 12.0 f/b 7.0 | 12 & 22 May 20, 25, & 28 May |
| 4. NAI-2302 15 EC[3] | 14.0 | 12, 20, 22, 25 & 28 May |
| 5. NAI-2302 15 EC[3] | 21.0 | 12, 20, 22, 25 & 28 May |
| 6. Tourismo[3] | 6.9 | 12, 20, 22, 25 & 28 May |
| 7. Tourismo[3] | 10.3 | 12, 20, 22, 25 & 28 May |
| 8. Coragen 1.67 SC[2] | 5.0 | 12 May |
| 9. Asana XL[2] | 7.0 | 12, 20, 22, 25 & 28 May |
| 10. Radiant[2] | 6.0 | 12, 20, 22, 25 & 28 May |
| 11. Entrust[2] | 2.0 | 12, 20, 22, 25 & 28 May |
| 12. Cobalt[2] | 32.0 | 12, 20, 22, 25 & 28 May |
| 13. Lorsban Advanced[2] | 32.0 | 12, 20, 22, 25 & 28 May |
| 14. Belt[4] | 3.0 | 12, 20, 22, 25 & 28 May |

[1]No surfactant; [2]NIS at 0.25% v/v); [3]MSO at 0.5 % v/v; [4] Dyne-Amic 0.5 % v/v.

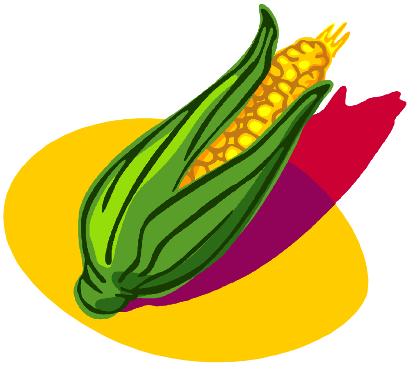

Table 2. Mean numbers of corn earworm per ten sweet corn ears and percentages of corn earworm damaged ears, Holtville, CA, 2009.

| Treatment | Oz/acre | 11 May | 18 May | 26 May | 1 Jun | 2 Jun | Average | % Damage |
|---|---|---|---|---|---|---|---|---|
| Untreated Check | ---------- | 1.75 | 9.00 a | 10.50 a | 8.25 a | 5.50 a | 6.95 a | 58.61 a |
| *Rimon 0.83 EC f/b Asana XL | 12.0 f/b 7.0 | 1.50 | 5.50 bc | 5.25 b | 1.75 cd | 0.50 bcd | 2.90 bcd | 19.55 b |
| *Rimon 0.83 EC r/w Asana | 12.0 f/b 7.0 | 1.00 | 5.50 bc | 3.25 b | 3.25 bcd | 0.75 bcd | 2.75 bcde | 19.55 b |
| *NAI-2302 15EC | 14.0 | 2.50 | 5.50 bc | 5.75 b | 4.00 bc | 1.50 bc | 3.85 b | 27.64 b |
| *NAI-2302 15EC | 21.0 | 1.00 | 4.50 bcde | 4.75 b | 5.25 b | 1.75 b | 3.45 bc | 29.89 b |
| *Tourismo | 6.9 | 1.25 | 7.00 ab | 4.25 b | 1.75 cd | 0.75 bcd | 3.00 bcd | 16.61 b |
| *Tourismo | 10.3 | 1.50 | 4.25 cde | 4.25 b | 1.75 cd | 0.75 bcd | 2.50 cde | 26.57 b |
| *Coragen 1.67SC | 5.0 | 1.25 | 2.75 de | 4.50 b | 2.75 cd | 0.50 bcd | 2.35 cde | 19.55 b |
| Asana XL | 7.0 | 1.00 | 2.00 e | 3.75 b | 1.50 d | 0.25 cd | 1.70 e | 12.91 b |
| Radiant | 6.0 | 1.25 | 6.00 bc | 3.75 b | 1.50 d | 0.25 cd | 2.55 cde | 15.86 b |
| Entrust | 2.0 | 1.50 | 4.00 cde | 4.50 b | 2.50 cd | 0.75 bcd | 2.65 cde | 19.03 b |
| Cobalt | 32.0 | 1.75 | 5.00 bcd | 3.50 b | 1.00 d | 0.00 d | 2.25 de | 14.94 b |
| Lorsban Advanced | 32.0 | 0.50 | 4.75 bcd | 5.00 b | 3.00 bcd | 0.25 cd | 2.70 cde | 22.50 b |
| Belt[4] | 3.0 | 1.25 | 4.00 cde | 4.25 b | 2.50 cd | 0.50 bcd | 2.50 cde | 14.42 b |

* Not registered for use on sweet corn at the time of publication.
Means within columns followed by the same letter are not significantly different; LSD, *P* = 0.05.

# EFFICACY VARIOUS INSECTICIDES ON CABBAGE FOR WORM AND WHITEFLY CONTROL IN 2008

**Eric T. Natwick**

The objective of the study was to evaluate the efficacy of several insecticides on cabbage under desert growing conditions against sweetpotato whitefly biotype B (SWF) and worm pests including: beet armyworm (BAW), cabbage looper (CL) and diamondback moth larvae (DBM). Cabbage (var. HEAD START) was direct seeded on 17 Sep 2008 at the University of California Desert Research and Extension Center, Holtville, CA into double row beds on 40 inch centers. Stand establishment was achieved using overhead sprinkler irrigation, with furrow irrigation used thereafter. Plots were 4-beds wide by 50 ft long and bordered by two untreated beds. Four replications of each treatment were arranged in a randomized complete block design. Formulations, rates and application dates for each compound are provided in Table 1. The applications were made with a Lee Spider Spray Trac operated at 35 psi delivering 61 gpa. A broadcast application was delivered through 3 TJ-60 11003VS nozzles per bed. Admire Pro was injected 2 inches below seed in 52.2 gpa on 10 September as a standard whitefly control treatment that was followed with foliar spray treatments with Radiant a standard for worm pest control. Evaluation of BAW, CL and DBM efficacy was based on numbers of live larvae per ten plants. Whitefly efficacy evaluations were based on the numbers of adults on a single basal leaf from ten plants per plot. Whitefly eggs and nymphs were counted on 1.65 $cm^2$ leaf disks from ten basal leaves per plot using a binocular microscope in the laboratory. Harvest data for worm damaged heads, market quality heads, kg of market heads were collected from 1-row per plot of 13.1 ft (0.001 acre) on 7 Jan 2009, and percentages of market quality heads were calculated. Data sets were analyzed using a 2-way ANOVA and means separated by a protected LSD ($P = 0.05$).

The BAW pressure was low, but there were differences ($P = 0.05$) among the treatments for BAW larvae for the sampling dates of 18 November and 1 December as well as for the seasonal average; all insecticide treatments had BAW means that were significantly lower than the untreated check (UTC) but there were no differences among the insecticide treatments (Table 2). The CL pressure was greater than that for BAW. There were differences among the treatments for CL seasonal averages; all insecticide treatments had CL means that were significantly lower than the UTC except the lowest rate of Brigadier on 20 October (Table 3). All of the insecticide treatments had significantly lower means for CL compared to the UTC on sampling dates from 11 November through 8 December and for the season averages. The highest rate of Brigadier had the lowest CL seasonal average among the insecticide treatments. The DBM larval pressure was also low and there were no differences among the treatments until 8 December when all insecticide treatments had means that were significantly lower that the mean for the UTC and all insecticide treatments had season averages that were lower than the UTC (Table 4).

All of the insecticide treatments had SWF adult means that were lower ($P = 0.05$) than the UTC on 20 October and for the season averages (Table 5). Only the Discipline plus Orthene 97 treatment did not have a mean lower than the UTC on 28

October and only the highest rate of Brigadier and the Admire Pro treatment had significantly fewer SWF adults than the UTC on 11 November. There were on differences among the treatments for SWF eggs on any of the sampling dates (Table 6). There were no differences among the treatments for SWF nymphs on any of the sampling dates except 11 November when only the two highest rates of Brigadier, the two treatments that included Discipline and Admire Pro had nymphal means lower than the UTC (Table 7).

All insecticide treatments had means for worm damage that were lower ($P = 0.05$) than the UTC and all insecticide treatments had means for market quality heads, percentages of market quality heads and kg of market quality heads that were significantly greater than the UTC (Table 8).

Table 1. Treatment Rates and Application Dates on Cabbage 2008.

| Treatment | Oz/acre | Treatment date |
|---|---|---|
| 1. Untreated Check | -------- | -------------------- |
| 2. Brigadier | 3.84 | 10 & 30 Oct, 13 Nov |
| 3. Brigadier | 6.08 | 10 & 30 Oct, 13 Nov |
| 4. Brigadier | 12.16 | 10 & 30 Oct, 13 Nov |
| 5. Mustang Max 2SC + Provado | 4.0 + 3.8 | 10 & 30 Oct, 13 Nov |
| 6. Mustang Max 2SC + Provado | 4.0 + 3.6 | 10 & 30 Oct, 13 Nov |
| 7. Warrior T | 3.84 | 10 & 30 Oct, 13 Nov |
| 8. Discipline + Dibrom | 6.4 + 8.0 | 10 & 30 Oct, 13 Nov |
| 9. Discipline + Orthene 97 | 6.4 + 16.0 | 10 & 30 Oct, 13 Nov |
| 10. *AdmirePro f/b<br>Radiant + NIS | 10.5<br>5.0 | 10 Sep<br>10 & 30 Oct, 13 Nov |

*Preplant injected 2” below seed.
NIS @ 0.25% v/v (37.9 ml/4 gal) added to each spray mixture.

**Table 2. Beet Armyworm per Ten Cabbage Plants at Holtville, CA, 2008.**

| Treatment | Oz/acre | 7 Oct | 14 Oct | 20 Oct | 28 Oct | 11 Nov | 18 Nov | 1 Dec | 8 Dec | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check** | **--------** | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 1.25 a | 1.50 a | 0.25 | 0.44 a |
| **F6550 2SC** | **3.84** | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 b | 0.25 | 0.06 b |
| **F6550 2SC** | **6.08** | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 b | 0.25 b | 0.25 | 0.09 b |
| **F6550 2SC** | **12.16** | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 b | 0.00 b | 0.00 | 0.09 b |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 b | 0.00 | 0.03 b |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 b | 0.50 b | 0.00 | 0.13 b |
| **Warrior T** | **3.84** | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 b | 0.25 b | 0.00 | 0.09 b |
| **Discipline + Dibrom** | **6.4 + 8.0** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 b | 0.00 | 0.00 b |
| **Discipline + Orthene 97** | **6.4 + 16.0** | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 b | 0.00 b | 0.00 | 0.09 b |
| **AdmirePro f/b Radiant** | **10.5<br>5.0** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 b | 0.00 | 0.00 b |
| **LSD; *P* = 0.05** | | **NS** | **NS** | **NS** | **NS** | **NS** | **0.61** | **0.74** | **NS** | **0.17** |

**Means within columns followed by the same letter are not significantly different LSD; *P* = 0.05**
**NS indicates no significant differences among means via ANOVA; *P* = 0.05**

**Table 3. Cabbage Looper per Ten Cabbage Plants at Holtville, CA, 2008.**

| **Treatment** | **Oz/acre** | **7 Oct** | **14 Oct** | **20 Oct** | **28 Oct** | **11 Nov** | **18 Nov** | **1 Dec** | **8 Dec** | **Average** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check** | **--------** | 0.00 | 0.50 | 0.75 a | 1.00 | 1.25 a | 2.75 a | 1.50 a | 1.00 a | 1.09 a |
| **F6550 2SC** | **3.84** | 1.25 | 0.00 | 0.50 ab | 0.50 | 0.00 b | 0.00 b | 0.25 b | 0.00 c | 0.31 b |
| **F6550 2SC** | **6.08** | 1.25 | 0.00 | 0.00 b | 0.25 | 0.00 b | 0.00 b | 0.00 b | 0.00 c | 0.19 bcd |
| **F6550 2SC** | **12.16** | 0.00 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.00 b | 0.00 b | 0.00 c | 0.00 d |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | 0.25 | 0.50 | 1.00 a | 0.25 | 0.00 b | 0.00 b | 0.00 b | 0.25 bc | 0.28 bc |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | 0.50 | 0.00 | 0.00 b | 0.25 | 0.00 b | 0.00 b | 0.00 b | 0.00 c | 0.09 bcd |
| **Warrior T** | **3.84** | 0.50 | 0.00 | 0.00 b | 0.50 | 0.25 b | 0.00 b | 0.25 b | 0.50 b | 0.25 bc |
| **Discipline + Dibrom** | **6.4 + 8.0** | 0.25 | 0.25 | 0.00 b | 0.50 | 0.00 b | 0.00 b | 0.25 b | 0.00 c | 0.16 bcd |
| **Discipline + Orthene 97** | **6.4 + 16.0** | 0.25 | 0.00 | 0.00 b | 0.25 | 0.00 b | 0.00 b | 0.00 b | 0.00 c | 0.06 cd |
| **AdmirePro f/b Radiant** | **10.5<br>5.0** | 0.75 | 0.00 | 0.00 b | 0.75 | 0.25 b | 0.00 b | 0.00 b | 0.00 c | 0.22 bcd |
| **LSD; *P* = 0.05** |  | **NS** | **NS** | **0.51** | **NS** | **0.39** | **0.23** | **0.45** | **0.34** | **0.22** |

**Means within columns followed by the same letter are not significantly different LSD; *P* = 0.05**
**NS indicates no significant differences among means via ANOVA; *P* = 0.05**

**Table 4. Dimondback Moth Larvae per Ten Cabbage Plants at Holtville, CA, 2008.**

| Treatment | Oz/acre | 7 Oct | 14 Oct | 20 Oct | 28 Oct | 11 Nov | 18 Nov | 1 Dec | 8 Dec | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check** | **--------** | 1.50 | 0.00 | 0.25 | 1.00 | 0.25 | 0.50 a | 0.50 | 0.50 a | 0.56 a |
| **F6550 2SC** | **3.84** | 0.00 | 0.25 | 0.25 | 0.25 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.09 b |
| **F6550 2SC** | **6.08** | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.06 b |
| **F6550 2SC** | **12.16** | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.09 b |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | 1.00 | 0.00 | 0.00 | 0.25 | 0.25 | 0.00 b | 0.00 | 0.00 b | 0.19 b |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | 1.25 | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 b | 0.00 | 0.00 b | 0.19 b |
| **Warrior T** | **3.84** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.00 b |
| **Discipline + Dibrom** | **6.4 + 8.0** | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.03 b |
| **Discipline + Orthene 97** | **6.4 + 16.0** | 0.50 | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.09 b |
| **AdmirePro f/b Radiant** | **10.5<br>5.0** | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 b | 0.00 | 0.00 b | 0.09 b |
| **LSD; *P* = 0.05** |  | **NS** | **NS** | **NS** | **NS** | **NS** | **0.26** | **NS** | **0.26** | **0.24** |

**Means within columns followed by the same letter are not significantly different LSD; *P* = 0.05**
**NS indicates no significant differences among means via ANOVA; *P* = 0.05**

**Table 5. Whitefly Adults per Cabbage Leaf at Holtville, CA, 2008.**

| Treatment | Oz/acre | 14 Oct | 20 Oct | 28 Oct | 11 Nov | Average |
|---|---|---|---|---|---|---|
| **Check** | **--------** | 26.82 | 45.98 a | 31.28 a | 19.55 a | 27.82 a |
| **F6550 2SC** | **3.84** | 28.12 | 16.38 cd | 14.20 cd | 19.90 a | 17.43 bc |
| **F6550 2SC** | **6.08** | 26.88 | 16.78 bcd | 13.80 cd | 20.75 a | 18.03 bc |
| **F6550 2SC** | **12.16** | 21.43 | 19.20 bcd | 14.50 cd | 12.68 bc | 15.55 c |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | 19.13 | 21.63 bc | 20.80 bc | 16.40 ab | 18.08 bc |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | 23.80 | 25.45 bc | 12.83 d | 16.58 ab | 17.97 bc |
| **Warrior T** | **3.84** | 35.13 | 28.18 b | 15.58 cd | 16.53 ab | 21.17 b |
| **Discipline + Dibrom** | **6.4 + 8.0** | 37.05 | 24.93 bc | 17.20 cd | 15.98 ab | 21.33 b |
| **Discipline + Orthene 97** | **6.4 + 16.0** | 23.20 | 8.43 d | 25.80 ab | 19.63 a | 17.55 bc |
| **AdmirePro f/b Radiant** | **10.5 5.0** | 22.55 | 20.95 bc | 14.70 cd | 8.93 c | 15.64 c |
| **LSD; *P* = 0.05** | | **NS** | **11.78** | **7.28** | **6.62** | **5.18** |

**Means within columns followed by the same letter are not significantly different LSD; *P* = 0.05**
**NS indicates no significant differences among means via ANOVA; *P* = 0.05**

**Table 6. Whitefly Eggs per 16.5 $cm^2$ of Cabbage Leaf at Holtville, CA, 2008.**

| Treatment | Oz/acre | 14 Oct | 20 Oct | 28 Oct | 11 Nov | Average |
|---|---|---|---|---|---|---|
| **Check** | **--------** | **584.50** | **300.75** | **168.25** | **27.25** | **270.19** |
| **F6550 2SC** | **3.84** | **651.75** | **390.25** | **195.00** | **32.75** | **317.44** |
| **F6550 2SC** | **6.08** | **547.00** | **317.50** | **132.25** | **9.00** | **251.44** |
| **F6550 2SC** | **12.16** | **634.00** | **217.25** | **106.75** | **11.00** | **242.25** |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | **533.00** | **329.50** | **168.25** | **19.00** | **262.44** |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | **713.50** | **256.25** | **167.75** | **21.50** | **289.75** |
| **Warrior T** | **3.84** | **591.25** | **363.75** | **148.75** | **24.25** | **282.00** |
| **Discipline + Dibrom** | **6.4 + 8.0** | **685.75** | **302.25** | **147.50** | **26.25** | **290.44** |
| **Discipline + Orthene 97** | **6.4 + 16.0** | **529.25** | **258.50** | **168.00** | **19.25** | **243.75** |
| **AdmirePro f/b Radiant** | **10.5 5.0** | **422.75** | **225.00** | **189.00** | **13.50** | **212.56** |

**There were no significant differences among means via ANOVA; *P* = 0.05**

**Table 7. Whitefly nymphs per 16.5 cm$^2$ of Cabbage Leaf at Holtville, CA, 2008.**

| Treatment | Oz/acre | 14 Oct | 20 Oct | 28 Oct | 11 Nov | Average |
|---|---|---|---|---|---|---|
| **Check** | **--------** | 240.00 | 457.00 | 236.50 | 149.00 a | 270.63 |
| **F6550 2SC** | **3.84** | 326.75 | 381.25 | 299.50 | 105.50 abcd | 278.25 |
| **F6550 2SC** | **6.08** | 210.75 | 466.00 | 349.25 | 91.00 bcde | 279.25 |
| **F6550 2SC** | **12.16** | 296.00 | 297.50 | 239.75 | 62.50 de | 223.94 |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | 186.75 | 308.75 | 286.50 | 93.25 abcde | 218.81 |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | 214.25 | 385.00 | 148.00 | 130.50 ab | 219.44 |
| **Warrior T** | **3.84** | 408.75 | 250.25 | 239.00 | 122.00 abc | 255.00 |
| **Discipline + Dibrom** | **6.4 + 8.0** | 306.50 | 360.00 | 273.00 | 81.00 bcde | 255.13 |
| **Discipline + Orthene 97** | **6.4 + 16.0** | 319.25 | 362.50 | 232.50 | 72.25 cde | 246.63 |
| **AdmirePro f/b Radiant** | **10.5 5.0** | 180.75 | 341.50 | 148.00 | 44.75 e | 178.75 |
| **LSD; *P* = 0.05** | | **NS** | **NS** | **NS** | **57.91** | **NS** |

**Means within columns followed by the same letter are not significantly different LSD; *P* = 0.05**
**NS indicates no significant differences among means via ANOVA; *P* = 0.05**

**Table 8. Means for Worm Damage, Market Quality Heads, Total Heads, Kg of Market Heads and Percentages of Market Heads of Cabbage per 0.001 acre at Holtville, CA, 2008.**

| Treatment | Oz/acre | Worm Damage | Market Heads | Total Heads | Percentage Market | Kg Market |
|---|---|---|---|---|---|---|
| **Check** | **--------** | **14.50 a** | **10.75 c** | **25.25** | **41.99 d** | **9.88 c** |
| **F6550 2SC** | **3.84** | **2.75 c** | **19.75 ab** | **22.50** | **87.88 a** | **24.05 ab** |
| **F6550 2SC** | **6.08** | **8.25 b** | **19.75 ab** | **28.00** | **70.98 c** | **20.35 b** |
| **F6550 2SC** | **12.16** | **5.00 bc** | **21.75 ab** | **26.75** | **81.82 ab** | **25.14 ab** |
| **F2700-04-1 + Provado** | **4.0 + 3.8** | **4.00 c** | **18.25 b** | **22.25** | **82.38 ab** | **20.97 ab** |
| **F2700-04-1 + Provado** | **4.0 + 3.6** | **5.75 bc** | **20.00 ab** | **25.75** | **78.93 abc** | **22.20 ab** |
| **Warrior T** | **3.84** | **5.50 bc** | **20.75 ab** | **26.25** | **81.09 ab** | **22.22 ab** |
| **Discipline + Dibrom** | **6.4 + 8.0** | **4.00 c** | **24.00 a** | **28.00** | **85.78 ab** | **24.36 ab** |
| **Discipline + Orthene 97** | **6.4 + 16.0** | **4.50 bc** | **19.00 b** | **23.50** | **80.67 abc** | **20.47 ab** |
| **AdmirePro f/b Radiant** | **10.5 5.0** | **6.50 bc** | **19.75 ab** | **26.25** | **75.87 bc** | **25.84 a** |
| **LSD = 0.05** | | **3.77** | **4.35** | **NS** | **10.06** | **5.41** |

**Means followed by the same letter are not significantly different LSD; *P* = 0.05**

# INSECTICIDE EFFICACY FOR WORM AND WHITEFLY IN BROCCOLI, 2008.

**Eric T. Natwick**

The objective of the study was to evaluate the efficacy of several insecticides on broccoli under desert growing conditions against sweetpotato whitefly biotype B (SWF) and worm pests including: beet armyworm (BAW), broccoli looper (CL) and diamondback moth larvae (DBM). Broccoli (var. CORONADO CROWN) was direct seeded on 17 Sep 2008 at the University of California Desert Research and Extension Center, Holtville, CA into double row beds on 40 inch centers. Stand establishment was achieved using overhead sprinkler irrigation, with furrow irrigation used thereafter. Plots were 4-beds wide by 50 ft long and bordered by two untreated beds. Five replications of each treatment were arranged in a randomized complete block design. Formulations, rates and application dates for each compound are provided in Table 1. The foliar applications were made with a Lee Spider Spray Trac operated at 35 psi delivering 61 gpa. A broadcast application was delivered through 3 TJ-60 11003VS nozzles per bed. Admire Pro was injected 2 inches below seed in 52.2 gpa on 10 September as a standard whitefly control in two treatment that were followed with Synapse foliar spray treatments for worm pest control. Evaluation of BAW, CL and DBM efficacy was based on numbers of live larvae per ten plants. Whitefly efficacy evaluations were based on the numbers of adults on a single basal leaf from tem plants per plot. Whitefly eggs and nymphs were counted on 1.65 cm2 leaf disks from ten basal leaves per plot using a binocular microscope in the laboratory. Plant height in cm and worm damage ratings of 1 to 5 (1 = no worm chewing damage to leaves or heads, 2 = a few chewing holes in leaves, 3 = several leaves per plant with worm chewing damage but little or no damage to heads, 4 = many leaves with chewing damage and little damage to heads, and 5 = severe chewing damage to many leaves and some chewing damage to heads) were measured on 19 November. Harvest data for total numbers of broccoli heads, worm damaged heads, whitefly damage as white discoloration of broccoli stalks below the florets of harvested heads, market quality heads, kg of market heads were collected from 1-row per plot of 13.1 ft (0.001 acre) on 5 Jan 2009, and percentages of market quality heads were calculated. Data sets were analyzed using a 2-way ANOVA and means separated by a protected LSD (P = 0.05).

The worm pest pressure was very low so the data worm pests (BAW, CL and DBM) were pooled as numbers of worms per ten plants. There were differences ($P = 0.05$) among the treatments for mean numbers of worms for the sampling dates of 16 October through 19 November as well as for the seasonal average. All insecticide treatments had worm pest means that were significantly lower than the untreated check (UTC) with the exceptions of Synapse 24WG plus a non-ionic surfactant (NIS) on 16 October and Coragen plus methylated seed oil (MSO) on 20 October (Table 2).

All of the insecticide treatments except Coragen had SWF adult means that were lower ($P = 0.05$) than the UTC on sampling dates from 8 October through 11 November and for the season averages; Coragen means were not different than the UTC means on 8 and 16 October but were different thereafter (Table 3). All of the insecticide treatments had significantly fewer SWF eggs compared to the UTC on sampling dates from 16 October through 11 November and for the season averages (Table 4). All of the insecticide treatments had means for SWF nymphs that were lower ($P = 0.05$) than the UTC on sampling dates from 8 October through 11 November with the following exceptions; Coragen means were not different than the UTC means on 16 October, both Voliam Flexi and Voliam Xpress were not different from the UTC on 20 October and Voliam Xpress was not different from the UTC on 11 November (Table 5).

All insecticide treatments had means for plant height greater (*P* = 0.05) than the UTC on 19 November except Voliam Flexi and Voliam Xpress (Table 6). The means for worm damage for each insecticide treatment was not different from the mean for the UTC. All insecticide treatments had means for white stalk caused from whitefly feeding that were lower than the UTC. Each of the insecticide treatments had means for market quality heads, percentages of market quality heads and kg of market quality heads that were significantly greater than the means for the UTC.

Table 1. Treatment Rates and Application Dates on Broccoli 2008.

| Treatment | Oz/acre | Treatment date |
|---|---|---|
| 1. Untreated Control | -------- | -------------------- |
| 2. Coragen + MSO | 5.0 | 10 & 30 Oct, 13 Nov |
| 3. Voliam Flexi + NIS | 6.0 | 10 & 30 Oct, 13 Nov |
| 4. Voliam Xpress + NIS | 7.0 | 10 & 30 Oct, 13 Nov |
| 5. *AdmirePro f/b<br>Synapse 24 WG + MSO | 10.5 2.0 | 10 Sep<br>10 & 30 Oct, 13 Nov |
| 6. *AdmirePro f/b<br>Synapse 24 WG + NIS | 10.5 2.0 | 10 Sep<br>10 & 30 Oct, 13 Nov |

*Preplant injected 2” below seed.
NIS or MSO @ 0.25% v/v added to spray mixtures as indicated in the table.

Table 2. Worms per ten plant in Broccoli 2008.

| Treatment | Oz/acre | 8 Oct | 16 Oct | 20 Oct | 29 Oct | 6 Nov | 11 Nov | 19 Nov | 1 Dec | 9 Dec | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Check | -------- | 1.20 | 1.20 a | 1.60 a | 3.60 a | 2.60 a | 0.80 a | 1.80 a | 0.20 | 0.20 | 1.47 a |
| Coragen + MSO | 5.0 | 1.20 | 0.00 b | 1.00 ab | 1.00 b | 0.20 b | 0.00 b | 0.00 b | 0.00 | 0.00 | 0.38 b |
| Voliam Flexi + NIS | 6.0 | 0.40 | 0.00 b | 0.40 bc | 1.40 b | 0.40 b | 0.00 b | 0.00 b | 0.00 | 0.00 | 0.29 b |
| Voliam Xpress + NIS | 7.0 | 1.20 | 0.00 b | 0.40 bc | 0.60 b | 0.00 b | 0.00 b | 0.00 b | 0.00 | 0.00 | 0.24 b |
| AdmirePro f/b Synapse 24WG + MSO | 10.5<br>2.0 | 1.80 | 0.00 b | 0.20 bc | 1.00 b | 0.00 b | 0.00 b | 0.00 b | 0.00 | 0.00 | 0.33 b |
| AdmirePro f/b Synapse 24WG + NIS | 10.5<br>2.0 | 1.20 | 0.60 ab | 0.00 c | 1.20 b | 0.00 b | 0.00 b | 0.20 b | 0.00 | 0.00 | 0.36 b |

Means within columns followed by the same letter are not significantly different, ANOVA; LSD (*P*<0.05).

Table 3. SWF adults per leaf in Broccoli 2008.

| Treatment | Oz/acre | 8 Oct | 16 Oct | 20 Oct | 29 Oct | 6 Nov | 11 Nov | Average |
|---|---|---|---|---|---|---|---|---|
| Check | -------- | 66.70 a | 32.66 a | 25.62 a | 33.02 a | 36.18 a | 28.84 a | 37.17 a |
| Coragen + MSO | 5.0 | 69.82 a | 23.32 ab | 17.16 b | 21.60 b | 19.46 b | 13.92 c | 27.55 b |
| Voliam Flexi + NIS | 6.0 | 45.62 b | 19.26 bc | 16.58 b | 17.58 b | 12.46 b | 14.66 c | 21.03 cd |
| Voliam Xpress + NIS | 7.0 | 47.64 b | 9.86 c | 13.52 b | 23.80 b | 17.32 b | 21.70 b | 22.31 c |
| AdmirePro f/b Synapse 24WG + MSO | 10.5<br>2.0 | 43.26 b | 10.00 c | 12.68 b | 9.34 c | 15.20 b | 11.88 c | 17.06 de |
| AdmirePro f/b Synapse 24WG + NIS | 10.5<br>2.0 | 24.64 c | 18.50 bc | 12.74 b | 9.16 c | 15.66 b | 11.38 c | 15.35 e |

Means within columns followed by the same letter are not significantly different, ANOVA; LSD (*P*<0.05).

Table 4. SWF eggs per $cm^2$ in Broccoli 2008.

| Treatment | Oz/acre | 16 Oct | 20 Oct | 29 Oct | 6 Nov | 11 Nov | Average |
|---|---|---|---|---|---|---|---|
| Check | -------- | 658.00 a | 250.80 a | 88.60 | 96.00 a | 105.00 a | 239.68 a |
| Coragen + MSO | 5.0 | 498.20 b | 99.40 bc | 75.00 | 49.40 b | 37.20 b | 151.84 b |
| Voliam Flexi + NIS | 6.0 | 359.40 c | 266.60 a | 61.40 | 47.80 b | 56.40 b | 158.32 b |
| Voliam Xpress + NIS | 7.0 | 415.80 bc | 163.00 b | 93.60 | 54.60 b | 58.80 b | 157.16 b |
| AdmirePro f/b Synapse 24WG + MSO | 10.5<br>2.0 | 165.00 d | 88.20 bc | 44.20 | 30.00 b | 51.60 b | 75.80 c |
| AdmirePro f/b Synapse 24WG + NIS | 10.5<br>2.0 | 206.00 d | 38.80 c | 53.00 | 28.20 b | 51.80 b | 75.56 c |

Means within columns followed by the same letter are not significantly different, ANOVA; LSD (*P*<0.05).

Table 5. SWF nymphs per $cm^2$ in Broccoli 2008.

| Treatment | Oz/acre | 16 Oct | 20 Oct | 29 Oct | 6 Nov | 11 Nov | Avg |
|---|---|---|---|---|---|---|---|
| Check | -------- | 463.20 a | 590.60 a | 625.00 a | 529.40 a | 426.60 a | 526.96 a |
| Coragen + MSO | 5.0 | 347.80 ab | 374.00 bc | 376.40 bc | 322.00 b | 301.00 bc | 344.24 b |
| Voliam Flexi + NIS | 6.0 | 230.00 bc | 551.60 ab | 359.00 bc | 322.80 b | 303.60 bc | 353.40 b |
| Voliam Xpress + NIS | 7.0 | 255.00 bc | 492.20 ab | 446.00 b | 338.00 b | 338.40 ab | 373.92 b |
| AdmirePro f/b Synapse 24WG + MSO | 10.5<br>2.0 | 121.00 d | 271.20 cd | 249.60 cd | 170.40 c | 194.00 cd | 201.24 c |
| AdmirePro f/b Synapse 24WG + NIS | 10.5<br>2.0 | 151.40 cd | 157.00 d | 159.80 d | 136.40 c | 156.00 d | 152.12 c |

Means within columns followed by the same letter are not significantly different, ANOVA; LSD (*P*<0.05).

Table 6. Broccoli plant height, Worm damage rating, Percentages of market heads, and Numbers of White stalks, Market heads, Total heads, and Kg of market heads per 0.001 acre, 2008.

| Treatment | Oz/acre | Plant height | Worm Damage | White Stalk | Market Heads | Total Heads | Percent Market | Kg Market |
|---|---|---|---|---|---|---|---|---|
| Check | -------- | 37.01 c | 2.20 | 11.00 a | 6.40 b | 18.80 | 36.01 c | 1.57 c |
| Coragen + MSO | 5.0 | 40.06 bc | 1.40 | 1.40 b | 15.40 a | 18.20 | 84.64 ab | 4.05 b |
| Voliam Flexi + NIS | 6.0 | 36.17 c | 1.60 | 4.20 b | 15.80 a | 22.20 | 70.58 b | 4.31 b |
| Voliam Xpress + NIS | 7.0 | 37.85 c | 1.60 | 3.00 b | 16.60 a | 21.20 | 80.37 ab | 3.90 b |
| AdmirePro f/b Synapse 24WG + MSO | 10.5<br>2.0 | 46.81 a | 1.20 | 1.40 b | 17.20 a | 19.40 | 88.22 a | 6.97 a |
| AdmirePro f/b Synapse 24WG + NIS | 10.5<br>2.0 | 44.46 ab | 1.40 | 2.40 b | 19.60 a | 23.00 | 84.97 a | 6.56 a |

Means within columns followed by the same letter are not significantly different, ANOVA; LSD (*P*<0.05).

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# THE 20th ANNUAL FALL DESERT CROPS WORKSHOP

## December 1, 2009
## Brawley Event Center
## 1562 Main Street Brawley, CA

New Venue for the Annual Fall Desert Crops Workshop

Mark your calendars for the upcoming **20th Annual Fall Desert Crops Workshops**. This year's meeting will be take place at the Brawley Event Center located at 1562 Main Street in Brawley on December 1st. A great line up of speakers have been scheduled including representatives for your local UC Cooperative Extension, UA Yuma Extension, USDA-ARS scientists, as well as Extension specialists from the University of California and Arizona. Continuing education credits for California and Arizona as well as CCA credits will be available. So come out and join us for this educational opportunity. Lunch will be provided courtesy of the Western Farm Press. Please RSVP for lunch by October 28th by mail using the Registration Form at the end of the agenda or by email to atietz@ucdavis.edu.

## Agenda

7:30 **Registration**

7:45 **Welcome from Western Farm Press** – Cary Blake, Associate Editor, Western Farm Press, Gilbert, AZ;

7:50 **Update on E. coli and other human pathogens concerning Leafy Vegetable producers** – Mark Trent, Vegetable Crops Advisor, UC Cooperative Extension Imperial County, UC Desert and Extension Center, Holtville;

8:10 **Vegetable insect management -** Eric Natwick, Entomology Farm Advisor, UC Desert and Extension Center, Holtville;

8:30 **Using RF ID and GPS Technology for Lettuce Carton Trace Back** – Kurt Nolte – UA Area Extension Agent and Director, Yuma County, Ariz.;

8:50 **Importance of Nematode Sampling** – Donna Henderson, UC Cooperative Extension Imperial County, UC Desert and Extension Center, Holtville;

9:10 **Nitrogen Management for Vegetable Crops** – Charles Sanchez, Soil Scientist, UA Yuma Agricultural Center Director, Yuma County, Ariz.;

9:30 **Lettuce Irrigation Management** – Khaled Bali, Irrigation/Water Management Advisor, UC Cooperative Extension Imperial County, UC Desert and Extension Center, Holtville;

9:50 **Break**

10:05 **The Legend of El Dorado, Biochar, Carbon Sequestration, and How All This Affects Soil-Applied Pesticides** - Milton McGiffen Jr., UC Cooperative Extension Specialist, Plant Physiologist, Riverside, Calif.;

10:25 **Nematode Management** – Antoon Ploeg, Nematology Specialist, UC Riverside;

10:45 **Melon Virus Disease Management** – Maria Rojas, Plant Pathologist, UC Davis;

11:05 **Expanded Host Range of *Cucurbit yellow stunting disorder virus*: Implications for Management** – William Wintermantel, Plant Pathologist, USDA ARS, Salinas, CA;

11:25 **Breeding Melons for Resistance Powdery Mildew and Cucurbit Yellow Stunting Disorder** – James McCreight, USDA ARS, Salinas, CA;

11:45 **Pesticide Industry Updates** – To be announced

12:10 **Lunch** - provided at no charge for those who RSVP by Oct. 28 – courtesy of Western Farm Press and commercial suppliers.

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REGISTRATION FORM
20th Annual Fall Desert Crops Workshop
December 1, 2009

Name ____________________________________________

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Please e-mail atietz@ucdavis.edu , fax to 760-352-0846, or return this form to:
Workshop, 1050 Holton Rd. Holtville, CA

EXTENSION WORK IN AGRICULTURE & HOME ECONOMICS, U S DEPARTMENT OF AGRICULTURE & UNIVERSITY OF CALIFORNIA CO-OPERATING

# CIMIS REPORT AND UC DROUGHT MANAGEMENT PUBLICATIONS

**Khaled Bali and Steve Burch***

California Irrigation Management Information System (CIMIS) is a statewide network operated by California Department of Water Resources. Estimates of the daily reference evapotranspiration ($ET_o$) for the period of October 1 to December 31 for three locations in the Imperial County are presented in Table 1. ET of a particular crop can be estimated by multiplying $ET_o$ by crop coefficients. For more information about ET and crop coefficients, contact the UC Imperial County Cooperative Extension Office (352-9474) or the IID, Irrigation Management Unit (339-9082). Please feel free to call us if you need additional weather information, or check the latest weather data on the worldwide web (visit http://tmdl.ucdavis.edu and click on the CIMIS link).

Table 1. Estimates of daily Evapotranspiration ($ET_o$) in inches per day

| Station | October | | November | | December | |
|---|---|---|---|---|---|---|
| | 1-15 | 16-31 | 1-15 | 15-30 | 1-15 | 16-31 |
| Calipatria | 0.23 | 0.19 | 0.14 | 0.10 | 0.07 | 0.07 |
| El Centro (Seeley) | 0.23 | 0.17 | 0.13 | 0.09 | 0.06 | 0.06 |
| Holtville (Meloland) | 0.23 | 0.18 | 0.13 | 0.10 | 0.06 | 0.06 |

* Irrigation Management Unit, Imperial Irrigation District.

**Link to UC Drought Management Publications**

http://ucmanagedrought.ucdavis.edu/

**TO OUR UNIVERSITY OF CALIFORNIA EXTENSION CLIENT**:

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Optional Questionnaire: Your UC Cooperative Extension Farm Advisors are actively involved in conducting applied research and educational programs aimed at addressing the need of the agricultural community. By completing the optional questionnaire you will provide information that will assist us in serving you better. We welcome the opportunity to serve Imperial County agriculture and look forward to your response.

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**Please check √ the appropriate boxes and review your address for corrections, then fold (this page and next), stamp, and return this page to our office by December 1, 2009.**

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__ Cotton
__ Desert Feedlot
__ Exotic Weeds
__ Grower
__ Labor Manager
__ Lettuce
__ Melons
__ Onions
__ PCA
__ Personnel Management
__ Pest-O-Gram
__ Rye Grass
__ Seed Company
__ Sudan Grass
__ Sugar Beets
__ Today's Families
__ Tomato
__ Water/Irrigation
__ Wheat

VOLUNTARY SELF IDENTIFICATION STATEMENT

__ Male __ Female __ Handicapped (specify) ____________
__ Caucasian __ African American __ Hispanic __ American Indian __ Asian __ Other

In furtherance of Federal, State, and Local Civil Rights Laws, this department extends its services and outreach to all. To better identify the recipients of our programs, please complete the above questions. Your response is voluntary and will be kept in strict confidence.

Khaled M. Bali
Acting County Director

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**University of California**
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