

### **Notes from the Desk of Joe Nunez**

We did quite a few research trials in 2016 trying to find solutions of various issues for the vegetable growers in California, particularly for the growers in Kern County. None of this work is any good unless of course I tell folks about it. I have made some presentations at various meetings so far but to make sure you are aware of this work I collected just some of the information we collected from these trials and have them listed here in this newsletter. I hope to send another newsletter sent out in the beginning of the new year of some more work we did. By the way, when I say we I mean myself and my excellent assistants that I have. I couldn't do this work without the help of Sophie Marin and my long-time assistant Jed DuBose. They both worked hard for me this year.

I will be hosting the 38<sup>th</sup> International Carrot Conference in March 19<sup>th</sup>-22<sup>nd</sup> here in Bakersfield. We are expecting folks from far and wide to be attending this conference. Topics to be covered by experts from around the world will include plant diseases, nematodes, breeding, crop production and other topics. You can find more information at our website [www.ucanr.edu/carrots](http://www.ucanr.edu/carrots). If you are a local grower or a local farm manager you can contact me for special rate to attend the conference.

As a final note, rumor is that I will be retiring soon. The answer I give to that rumor is yes and no. Yes I plan to retire from the University in the end of June 2017 but no, I plan to stay around as an emeritus advisor for a while. I feel that this program that you and I have built together is too important to let it sit idle until this position is replaced. The potato variety trial and the carrot variety trials that I am involved in are too large and important to the local vegetable community to stop. Also there are some issues in the processing tomato industry that I would like to continue working on. At least until this position is replaced. The good news is that I just received word that they will open the position for recruitment in winter of 2018. So after June 2017 I hope to just oversee some of these projects until the new person comes on board. In the meantime I still have a potato trial to do, carrot conference to organize, carrot trials...

### **Tomato Nematode Trials**

Each year since 2008 I have been evaluating various products for nematode control. Back in 2008 there were no true nematicide chemicals to evaluate other than fumigants. Since then there are three actual nematicides with two of these actually on the market now. Nimitz by ADAMA is registered on fruiting vegetables and more crops will be added to the label in the near future. Velum by Bayer Crop Science has registration on a very limited number of crops but that list of registered crops likely will be increasing in the coming years. The third product is still under development and I'm not sure when it will be marketed or which crops will be listed first on the label. But it is exciting to finally see some real movement by major manufactures on the development of true nematicides. All three of these products are true nematicides and not fumigants. By true nematicides I mean that they only effect nematodes and apparently have no activity on any other pest.

I began my screening of nematicides in 2008 by mainly screening biologicals because that was the only type of non-fumigant nematicides being developed. I still continue to look at biological nematicides because they have an important role to play in today's agriculture. The organic acreage is very large especially in California. Although I tend to believe that soils under organic farming systems tend to be healthier than conventional soils these soils still develop soil pest problems. Nematodes can be a problem in organic farmed fields and occasionally require remediation treatments. And of course any effective biological nematicide can be used in conventional fields as well. Therefore I try to screen any new biological nematicide that I become aware of as well as any conventional chemical nematicide.

Table 1 lists the results of the biological nematicide trial on processing tomatoes. These materials were applied onto the top of the beds with a watering can and watered into the roots zones with a sprinkler irrigation immediately afterwards. As is common with the biological trials we didn't see any significant differences, *statistically* speaking. But some of these products appeared to reduce the amount of galling we saw on the roots, *numerically* speaking. The EMUNE Plus and OXVA seemed to have some activity on the root knot nematodes. We hope to be able to look at those two products again in 2017. Neither of these products are currently registered and are still in the development stage.

Table 2 lists the results of the chemical nematicide trial we did on processing tomatoes. These treatments were applied thru a buried drip system and replicated 5 times. As expected Velum and Nimitz performed very well in regards to reducing nematode injury in comparison to the non-treated control. The Nimitz was applied at 5 pints per acre calculated as a 24 inch band or a full 60 inch bed. The developmental product, treatment #5 DP, did not perform as well as it normally does or expected.

Table 1. Average Root Knot Nematode Injury Rating for Tomato Biological Nematicide Trial

Treatment	Average Nematode Rating *
1. Control	8.1
2. Nematode Control 1 gal/A	6.8
3. Majestene @ 1.5 gal/A	8.3
4. EMUNE @ 2 gal/A	8.4
5. EMUNE Plus @ 2 gal/A	6.0
6. OXVA @ 0.5 gal/A	6.3
7. OXVA @ 1 gal/A	5.7
Probability=	0.3068
%CV=	28.27
LSD P=0.05	Not Significant

*Planted on 4/20/16 with Halley BOS 3155*

*1st application on 4/21/16, 2nd on 5/19/16 and 3rd on 6/15/16*

*Harvested on 8/1/16*

*\*Nematode rating scale: 1=no nematode galling, 10=100% of roots galled.*

Table 2. . Average Root Knot Nematode Injury Rating for Tomato Conventional Nematicide Trial

<u>Treatment</u>	<u>Nematode Root Rating*</u>
1. Control	4.8 A
2. Velum 6.5 fl oz/A pre and 21 DAP post	1.8 B
3. Nimitiz 5 pints/A as a 24 inch band	2.2 B
4. Nimitiz 5 pts/A as a full 60 inch bed	1.7 B
<u>5. DP pre at 30.7 fl oz/A &amp; 1 post at 15.4 fl oz/A</u>	<u>3.0 AB</u>
Probability	0.0238
% Coefficient of Variation	52.16%
LSD P=0.05	1.910

*pre-plant applications made on 4/20/16*

*2nd application of Velum and DP on 5/30/16*

*Planted on 4/27/16 with Halley BOS 3155*

*\*Nematode rating scale: 1=no nematode galling, 10=100% of roots galled.*

### **Cavity Spot of Carrots**

In 2015 we conducted a fungicide trial to look at different treatments for the control of cavity spot (table 3). We looked at the standard cavity spot fungicides along with some others normally not used in cavity spot control along with some biologicals and an experimental. We did not get much cavity spot at our cavity spot nursery but the control did develop the most cavity spot incidence. But by using contrast comparison analysis we showed some significant differences. Ridomil Gold and Ridomil Gold with Quadris worked very well in reducing cavity spot. Ranman also did a significant job in reducing cavity spot. Presidio in combination with the experimental material V-10208 did well also. The new biological Teagro seemed to suppress the amount of cavity spot but it was not significant.

In 2016 we went back to the cavity spot nursery to evaluate 40 carrot varieties for tolerance to cavity spot. This time we saw much more cavity spot but some of this may have been lesions from soft rot (*Erwinia carotovora*) which we had plenty of in the plot. Each variety was replicated 4 times but we did lose some plots due to soft rot. However the rankings of the varieties seem to follow as we expected with the purple varieties more tolerant and Atomic Red being a highly susceptible variety.

Table 3. 2015 Cavity Spot Trial

<u>Treatment</u>	<u>Rate</u>	<u>Percent Cavity Spot</u>
1. Control		7.5
2. Ridomil Gold	8 fl oz/A	3.3
3. Ridomil Gold & Quadris	9 fl oz/A	2.8
4. Teagro	5.2 oz/A	4.3
5. Reason	8.2 fl oz/A	5.5
6. Ranman	24 fl oz/A	2.5

7.	Presidio	0.125lb/A	6.5
8.	V-10208	8 oz/A	3.8
9.	Presidio & V-10208		2.8
10.	Serenade Soil	2 qt/A	7.3
11.	Fungi-Phite	2 qt/A	5.3
12.	Fungi-Phite & Ridomil Gold		5.5
Probability			0.4136
%CV			72.74
LSD			Not Significant

#### Contrast Comparisons

Control vs All Treatments,	Prob=0.102
Control vs Ridomil Gold,	Prob=0.09
Control vs Ridomil & Quadris,	Prob=0.059
Control vs Ranman,	Prob=0.048
Control vs Presidio & V-10208	Prob=0.059

(application dates: 2/26/15, 2/26/15, 3/23/15)

Table 4. 2016 Screening of carrot varieties for susceptibility to cavity spot.

<u>Variety</u>	<u>Percent Cavity Spot</u>	<u>Variety</u>	<u>Percent Cavity Spot</u>
28. CR 1640	12.5	32. Top Cut	51.6
30. Purple Elite	16.6	1. KXPC 222	51.9
13. Red 42	22.3	24. PSI 603	55.1
31. Purple Snax	24.3	38. Purple Haze	55.3
2. KXPC 104	25.0	7. PS 1441	55.4
8. Triton	27.6	3. KXPC 162	55.6
5. Copperhead	29.9	6. Olympus	55.7
19. Sun 255	32.0	10. Legend	56.9
15. Yellow Bunch	33.4	27. Slender Cut	58.0
20. Crispy Cut	35.1	34. Candy Snax	60.6
23. KXPC 107	35.3	16. Navajo	62.8
40. B2226B-V104073-2	36.9	14. Snowman	64.9
29. Imperial Cuts	39.5	11. Zeus	65.5
22. Poseidon	39.9	18. Rebec	67.0
4. CR 1706	42.6	12. Maverick	72.2
33. Upper Cut	46.0	37. Envy	72.6
21. Creampak	46.5	26. TriplePlay	74.1
39. B5367B- 365-1	47.6	17. Slim Cut	78.1
25. HoneySnax	48.4	9. CR 2289	83.5
36. Cello Bunch	51.1	35. Atomic Red	90.6

## Powdery Scab of Potatoes

Powdery scab of potatoes is a serious issue for some growers in Kern County. It can be confused with common scab of potatoes but powdery scab is more serious. The lesions are deeper and larger than common scab. Common scab can be managed by adjusting the soil pH while powdery scab is more challenging to control. So in 2015 and 2016 we conducted trials to find ways to manage powdery scab of potatoes.

Common scab is caused by the bacterium *Streptomyces scabies* while powdery scab is caused by fungus-like microbe called *Spongospora subterranea*. Some researchers have found that zinc applications as ZnSO<sub>4</sub> can reduce powdery scab infections. We wanted to test this treatment to see if it would work in Kern County. In these trials ZnSO<sub>4</sub> was applied in-furrow at planting with the rates calculated as an 8 inch band application. The seed furrow was opened up, ZnSO<sub>4</sub> applied and then potato seed pieces placed in the open furrow. Afterwards the open furrows were closed to form a normal potato bed. All the other treatments were applied the same way. The other treatments were Omega and Serenade Soil. Serenade Soil is a biological product and Omega is a registered fungicide for the control of powdery scab of potato.

The results of these two trials were interesting and similar. In both years the lower rate of ZnSO<sub>4</sub> performed the best, whether alone or in combination with Omega. Omega was not as effective as the fertilizer ZnSO<sub>4</sub> but it was helpful. In both years the control plots had the highest amounts of powdery scab but there were not differences in treatment means unless contrast comparisons were used in data analysis.

In plain English this means that ZnSO<sub>4</sub> at a 15 lb/A rate seems to help with this disease. As a potato grower, if you have powdery scab issues you may want to look at applying ZnSO<sub>4</sub> at a 15 lb/A rate on a small portion of your field to see how it performs for you. Omega is also worth looking at in portion of a field. It's worth noting that Omega is a conventional pesticide while ZnSO<sub>4</sub> is registered as organic and can be purchased with OMRI certification.

Table 5. Analysis of Variance and Contrast Comparisons of 2015 Powdery Scab Trial.

Treatment	% Tubers with Powdery Scab
1. Control	38.5
2. ZnSO <sub>4</sub> @ 15 lbs/A	16.5
3. ZnSO <sub>4</sub> @ 30 lbs/A	21.2
4. Omega 500 @ 1.5 pt/A	29.3
5. Omega 500 @ 3.0 pt/A	30.8
6. Serenade Soil @ 6 qt/A and ZnSO <sub>4</sub> @ 15 lbs/A	24.8
7. Omega 500 @ 1.5 pt/A & ZnSO <sub>4</sub> @ 15 lb/A	27.6
8. ZnSO <sub>4</sub> & Serenade Soil & Actinovate @ 12 oz/A	21.0
Probability	0.62
% CV	52.33
LSD p=0.05	Not Significant

### Contrast Comparisons

Control verses All Other Treatments	Prob.= 0.119 Sum of Squares = 520.467
Control verses 2. ZnSO4 @ 15 lbs/A	Prob. = 0.068 Sum of Squares = 734.827
Control verses 3. ZnSO4 @ 30 lbs/A	Prob. = 0.145 Sum of Squares = 448.935
Control verses 6. Serenade Soil @ 6 qt/A and ZnSO4 @ 15 lbs/A	Prob. = 0.24 Sum of Squares = 282.907
Control verses all ZnSO4 treatments	Prob. = 0.081 Sum of Squares = 666.600

Table 6. Analysis of Variance and Contrast Comparisons of 2016 Powdery Scab Trial.

<u>Treatment</u>	<u>Percent Tubers with Powdery Scab</u>
1. Control	51.4
2. ZnSO4 @ 15 lbs/A	39.9
3. ZnSO4 @ 30 lbs/A	44.5
4. Omega 500 @ 1.5 pt/A	43.8
5. Omega 500 @ 3.0 pt/A	36.0
6. Serenade Soil @ 6 qt/A and ZnSO4 @ 15 lbs/A	52.7
7. Omega 500 @ 1.5 pt/A & ZnSO4 @ 15 lb/A	35.9
8. Omega 500 @ 3.0 pt/A & ZnSO4 @ 30 lb/A	38.5
Probability=	0.6866
%CV	36.88
LSD P=0.05	Not Significant

### Contrast Comparisons

Control vs all Treatments

Sum of Squares = 336.630

Probability = 0.258

Control vs all treatments with ZnSO4 and Omega (except with Serenade)

Sum of Squares = 465.667

Probability = 0.186

Control vs ZnSo4 at 15 & 30 lbs/A

Sum of Squares = 226.935

Probability = Not Significant

Control vs Omega at 1.5 & 3.0 pt/A

Sum of Squares = 354.202

Probability = 0.247

Control vs ZnSO<sub>4</sub> & Omega combined at low and high rates

Sum of Squares = 538.654

Probability = 0.156

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