

2016 Progress report for CFCAB supported Kern County projects

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***Abstract:** Several trials were conducted in 2016 with several still in progress at the time of writing this report. The nematode trial in this year's trials had mixed results. The same treatments used on tomatoes showed more conclusive results. Results showed no nematode efficacy for any of the biologicals tested. Most treatments had no effect and a few actually had a negative effect on plant stand and plant vigor. A cavity spot trial showed that Ridomil Gold, Ridomil Gold with Quadris and Ranman were the top performing fungicides. A cavity spot variety screening trial demonstrated there is differences in tolerance among the major commercially used varieties but no real resistance. A herbicide that shown some promising results by other researchers does not perform well in the growing conditions in California.*

Evaluation of Alternative Nematicides for the Control of Root-Knot Nematodes

The use of fumigants have come under tighter restrictions and regulations in California and elsewhere for several reasons including human safety, VOC emissions (which leads to smog formation), and as an ozone depleter. Although there is much debate on maintaining the use of fumigants in agriculture, alternative methods of nematode management must be investigated. There are viable alternative pesticides for most other soil borne pests but nematodes essentially need to be controlled with the use of fumigants. Fumigants such as 1,3-dichloropropene and metam sodium are routinely used in carrot production in California for nematode control. Carrot production is responsible for the majority of 1,3-dichloropropene and metam sodium use in California. The carrot industry of California urgently needs alternative methods of nematode control if restrictions on the use of fumigants continue to increase.

In cooperation with Drs. Ole Becker and Antoon Ploeg, UCCE Nematology Specialists at UC Riverside, we have been evaluating new non-fumigant nematicides at the UCCE Shafter Research Farm. A spring trial is conducted at the root knot nematode (RKN) infested nursery located at the Shafter Research Farm. That data is included in the CFCAB nematode report by Becker, Ploeg and Nunez 2016.

We did not get uniform enough nematode injury to make solid conclusions in the biological and conventional nematicide trials. However we did conduct these exact same treatments on tomatoes at the same time. In the conventional *tomato* trial we did see significant differences while in the biological *tomato* trial we had similar results with the carrot biological trial (table 1 and 2). So while the carrot trials may not have revealed the efficacy of these new nematicides, the tomato trials showed that these new products are very effective. The biological nematicide continued to show some promise but are inconsistent in their performance.

Table 1. 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 band	2.2 B
4. Nimitiz 5 pts/A as a full 60inch bed	1.7 B
5. DP pre at 30.7 fl oz/A & 1 post at 15.4 fl oz/A	3.0 AB
Probability	0.0238
% Coefficient of Variation	52.16%
LSD P=0.05	1.910

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

<u>Treatment</u>	<u>Average Nematode Rating *</u>
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

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

Treatment	Rate	Percent Cavity Spot
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 Presido & 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.

Variety	Percent Cavity Spot	Variety	Percent Cavity Spot
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

Herbicide Trial

In late 2015 we conducted an herbicide trial with Zidua (pyoxasulone) after learning of some work being done in New York and Canada. Trials conducted there had shown that it could not be used as a pre-plant herbicide on mineral soils but could in muck soils. The following is the treatments applied:

1. Non-Treated Control
2. linuron at 0.5 lb ai/A at planting and 1 lb ai/A at 4 leaf stage
3. Linuron 0.5 lb ai/A pre-plant and Zidua WG @ 1.5 oz/A post-plant at 4 leaf stage
4. Zidua WG @ 1 oz/ A post-plant at 4 leaf stage
5. Zidua WG @ 1.5 oz/A post-plant at 4 leaf stage
6. Zidua WG 2 oz/A post-plant at 4 leaf stage
7. Zidua WG @ 2 oz/A + Select Max @ 13 fl oz + COC tank mix post-plant 4 leaf stage

planted 11/9/15

Linuron pre-plants applied 11/10/15

Pyoxasulone is only a pre-emergent herbicide that prevents weeds from germinating. It does not have any contact efficacy. In this trial we saw no benefit to using pyoxasulone under the growing methods employed in California. Linuron, as the standard check, was far better than all other treatments. Treatment 3 utilized linuron as a pre-plant and pyoxasulone as a post-plant application. But linuron alone performed just as well and without any phytotoxicity. Phytotoxicity was an issue on all pyoxasulone applications.

Variety Trials

A variety trial is planted each year in Kern County for a field day to be held in January. Entries in this trial includes short cuts, cellos, colored varieties and a section of material for Dr. Phil Simon for his screening of new crosses. Over 75 carrot varieties were on display at the field day.

In 2016 heavy rains called for a postponement of the field day by a week. Attendance suffered somewhat because it was too late for out of town participants to change their plans.

For 2017 the Kern County variety trial will be part of the 38th International Carrot Conference. The field day will be held in March 2017 and will include more diverse types of carrots to reflect what is grown worldwide. Over 145 varieties have been planted with selections in cello, short cuts, colored, nantes and processing types.

We also assist Dr. Phil Simon with the USDA Winter Carrot Nursery at the Desert Research and Extension Center (DREC) in Imperial Valley. Besides hands on help during harvest we help manage the plot and take responsibility for its finances.

We also collaborate with several researchers from throughout the US on the Organic Agriculture Research and Extension Initiative (OREI) to help develop new and improved carrots for the organic industry. This effort is led by Dr. Simon. Each year we plant 36 carrot varieties in a conventional and organic field to measure any differences in quality characteristics.

38th International Carrot Conference

I am hosting the next International Carrot Conference at the request of the North American carrot industry. I have enlisted the help of several local carrot industry representatives. We have been working on getting conference organized since the summer of 2016. The conference itself will be held in March 19th to 22nd 2017. It will include two days of oral and poster presentations and a field day.