



Best Nematode Management Practices in Times of Telone Shortage

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Telone

- 1,3-Dichloropropene (1,3-D)
 - #1 fumigant nematicide in high value crops (Telone II, C-35, PicClor60/80)
 - Waste/by product in the synthesis of epoxy resins (mostly for cars)
 - Telone shortages are linked to reduced demand for this product
- Organochlorine, liquid, flammable, colorless, sweet smell
- 1,3-D was first registered as a pesticide in the U.S. in 1954
- Use greatly increased since phase out of methyl bromide



Other fumigants

- ~~Dimethyl Disulfide (Paladin)~~ probably the closest replacement > no longer available
- **Chloropicrin**: mostly fungicide, some nematicidal effect, but nematodes rebound rapidly
 - Added to Telone to improve fungicide and herbicide activity
- **Metam /AITC** (Kpam, Vapam, Dominus): more broad-spectrum activity (nematicide, fungicide, herbicide) > a.i. methyl/allyl isothiocyanates
 - In highly infested fields can be applied as a crop destruct treatment

Non-fumigant nematicide options

- **Nimitz** (fluensulfone)
 - Nematicide only – unknown mode of action (fatty acids?)
 - 3.5-7 pts/acre; 7-day pre plant only
 - Low water solubility, short-medium soil half-life
- **Velum** (fluopyram)
 - Fungicide /nematicide – SDHI mode of action (mitochondria)
 - 6.8 fl oz /acre; pre, at and post plant applications
 - Max 2 apps/year (13.6 fl oz/year, includes Luna fungicide apps)
 - Very low water solubility, very long soil half-life
- Both products are very safe to humans and non target organisms (caution label)

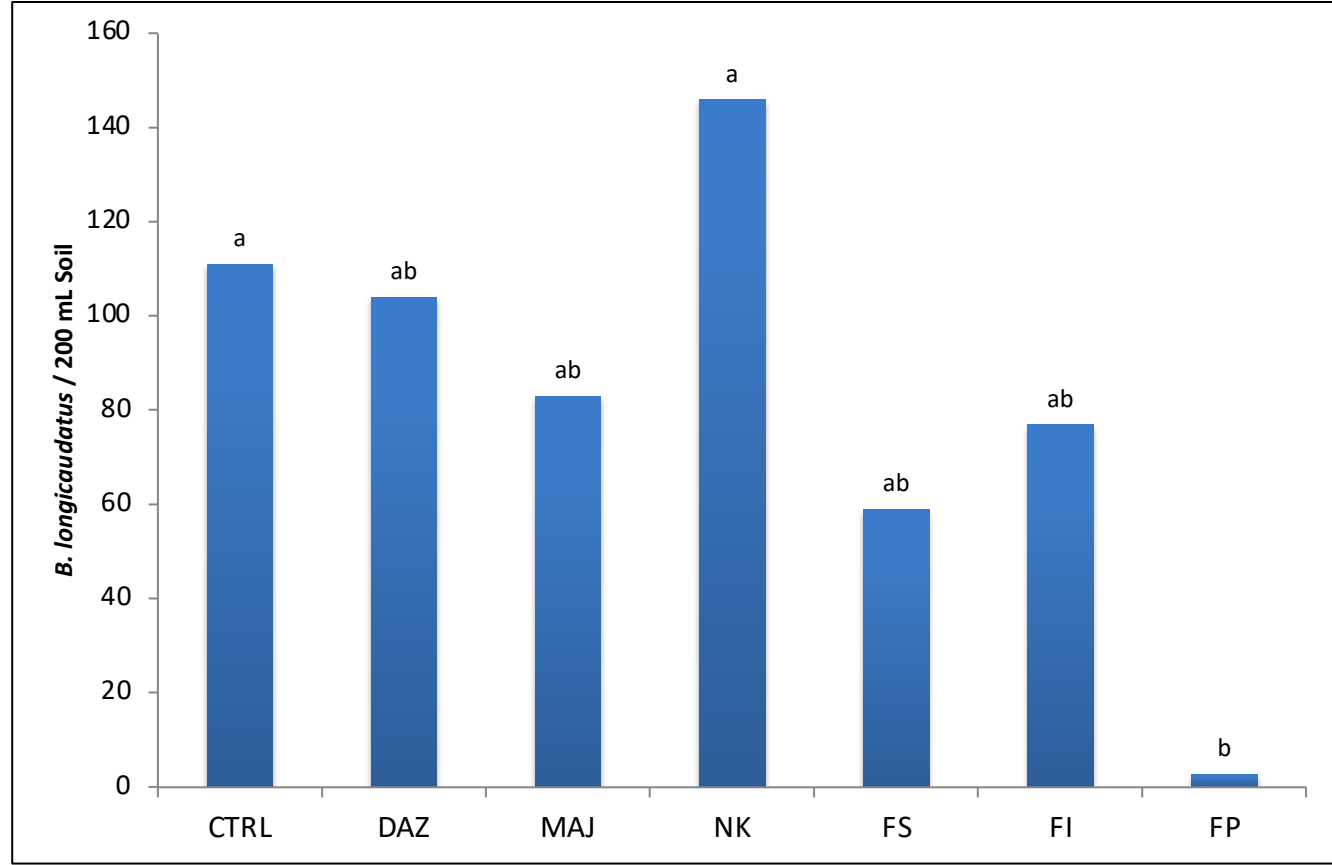
Previous field trial results

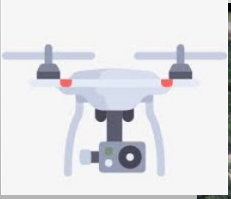
- FSGA trials (2016-20)
 - Small plot trials showed significant reduction of sting nematodes with two applications of **Velum**, and some reduction with one pre-plant application of **Nimitz**
 - Last large plot trials (with Noling) showed good yield response with **Kpam, Nimitz and Velum combinations**
- On farm trials (nine farms, 2018-19) - Velum was applied via drip in mid – late season as a crop rescue treatment
 - Sting nematode populations reduced in four farms by 50-90%
- GCREC trials
 - Kpam (and Velum) performed best in terms of yield

Sting Nematodes, FSGA, 2017-18



- Nematicides (sub-plots):**
- Control (CTRL)
 - Dazitol (DAZ)
 - Majestene (MAJ)
 - NemaKill (NK)
 - Fluensulfone (FS)
 - Fluazaindolizine (FI)
 - Fluopyram (FP)
- 3 apps (for DAZ, MAJ, NK)
1 app (for FS)
2 apps (for FI, FP)





On farm crop rescue with Velum – 9 fields



Lott Farm March 8 2019



No Velum



On farm crop rescue with Velum – 9 fields

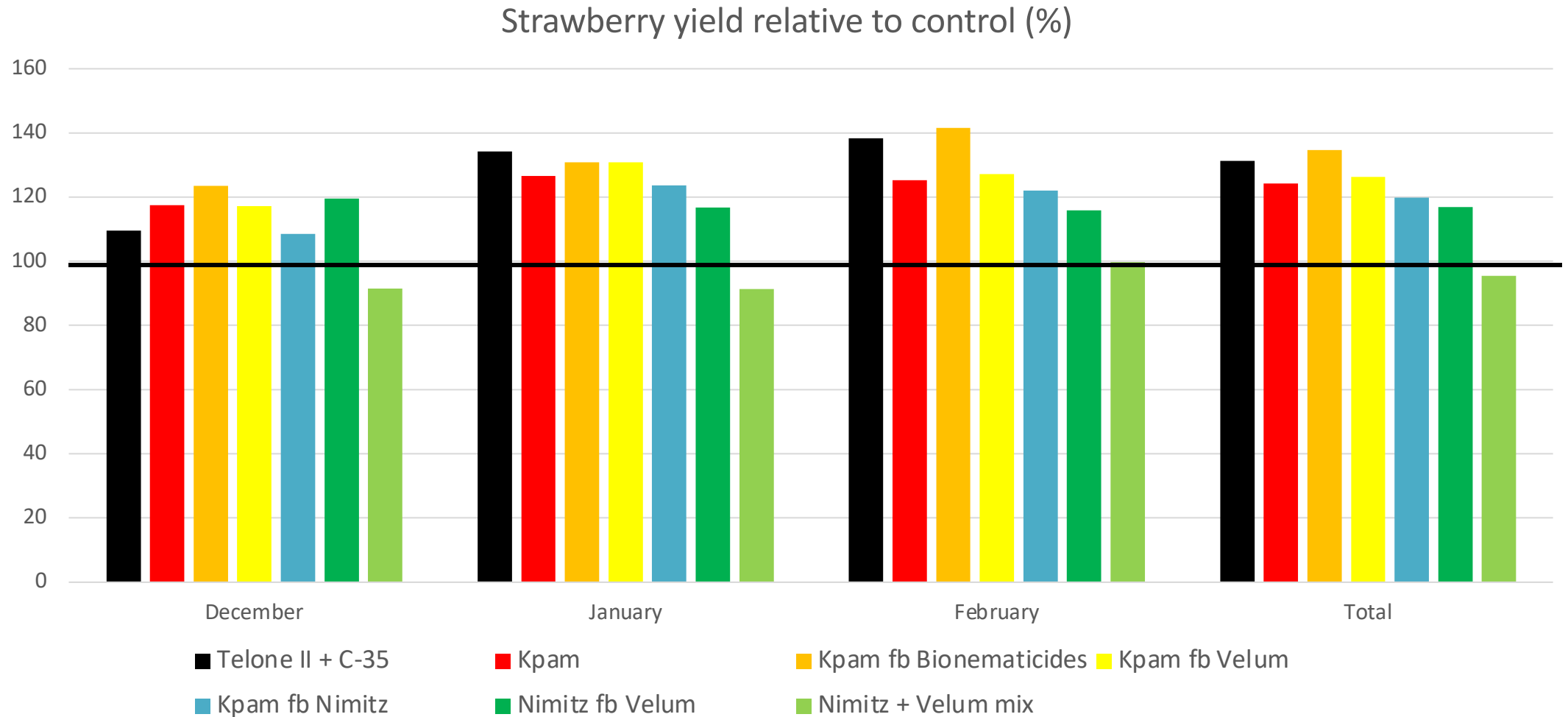
Site	Location	Application Date*	Soil Texture	Organic Matter (%)	Soil pH	<i>Belonolaimus longicaudatus</i> / 200 mL soil				
						Start	4 WAT		End Crop	
							Control	Velum	Control	Velum
FF	Thonotosassa, FL	Dec. 12, 2018 (E)	Sand	0.8	7.6	1	2	1	13	16
LG	Dover, FL	Dec. 12, 2018 (E)	Sand	0.7	7.3	6	12	11	31	8
MG-NW	Dover, FL	Jan. 10, 2019 (M)	Sand	0.6	7.3	0	0	0	0	0
MG-NE	Dover, FL	Jan. 10, 2019 (M)	Sand	0.7	6.9	0	0	0	0	0
MG-SE	Dover, FL	Jan. 10, 2019 (M)	Sand	0.7	6.3	0	0	0	0	0
SK	Durant, FL	Jan. 11, 2019 (M)	Sand	0.8	6.9	2	9	1	2	2
AM	Thonotosassa, FL	Jan. 18, 2019 (M)	Sand	0.8	7.2	89	154	89	94	43
ML	Seffner, FL	Feb. 12, 2019 (L)	Sand	0.6	7.1	3	-	-	26	1
RG	Dover, FL	Feb. 12, 2019 (L)	Sand	1.3	7.0	285	-	-	206	34

FSGA 2019-20 large plot fumigation (J. Noling)

#	Treatment	Method	Rate
1	Telone C35	Shank	30 gpta
2	Telone II + Telone C35	Deep shank + Shank	12 gpta + 30 gpta
3	Telone II + Telone C35 + Kpam	Deep shank + shank + drip	12 gpta + 30 gpta + 62 gpta
4	PicClor80	Shank	320 lb/ta
5	Telone II + PicClor80	Deep shank + Shank	12 gpta + 320 lb/ta
6	Telone II + PicClor80 + Kpam	Deep shank + Shank + drip	12 gpta + 320 lb/ta + 62 gpta
7	Kpam	Drip	62 gpta
8	Kpam fb Bio-nematicides*	Drip + drip	62 gpta
9	Kpam fb Velum	Drip + drip	62 gpta + 6.5 oz/a
10	Kpam fb Nimitz	Drip + drip	62 gpta + 5 pts/ta
11	Nimitz fb Velum (no fume program)	Drip + drip	5 pts/ta + 6.5 oz/a
12	Nimitz + Velum mix (no fume program)	Drip + drip	5 pts/ta + 6.5 oz/a
13	Nimitz + Nimitz fb Bio-nematicides* (no fume prog.)	Deep drip + drip + drip	5 pts/ta + 5 pts/ta + *
14	Untreated control		
15	Telone II + Nimitz	Deep shank + drip	12 gpta + 5 pts/ta
16	Kpam + Nimitz	Deep drip / Drip	62 gpta + 5pts/ta

Bionematicides:

2019-20 large plot fumigation trial (J. Noling)



Cover crops as nematode management tool



- Cover Crop is a non-host
- Cover Crop is used as a "Trap Crop"
- Cover Crop has toxic root exudates (marigold) or breakdown products (sunn hemp, sorghum, mustard)
- Activity in the Soil Food Web is increased

In Summary

Best current recommendations if no Telone

- 1) Metam (Kpam or similar) at bedding,
- 2) Nimitz 7 days pre-plant,
- 3) Velum 1-2 applications post plant
- 4) (Metam crop destruct)

Thank you to GCREC nematology staff and FSGA for funding



GCREC 2018-19

Treatment, Rate (per acre), Timing	Plant Vigor (NDVI value) ^z	Fruit Yield (kg/plot)	<i>Belonolaimus longicaudatus</i> per 200 mL Soil
Untreated Control	0.61 ^y	13.3 ab	71
Nimitz, 7 pt, 7 days before planting	0.61	9.9 b	42
Velum, 6.8 fl oz, at plant	0.55	13.3 ab	67
Velum, 6.8 fl oz, 20 days after planting	0.48	12.0 ab	50
Salibro, 61.4 fl oz, at plant	0.56	11.1 b	33
Salibro, 30.7 fl oz, at plant and 20 days after planting	0.54	11.7 b	50
Salibro, 30.7 fl oz, at plant followed by Salibro 15.4 fl oz, 20 and 40 days after planting	0.67	14.8 ab	50
Kpam, 62.5 gal, 21 days before planting	0.61	23.7 a	11

GCREC 2018-19

Treatment, Rate (per acre), Timing	Plant Vigor (NDVI value) ^z	Fruit Yield (kg/plot)	<i>Belonolaimus longicaudatus</i> per 200 mL Soil
Untreated Control	0.70 ^y	15.9	13
Nimitz, 7 pt, 7 days before planting	0.72	15.8	12
Velum, 6.8 fl oz, at plant	0.70	15.2	10
Nimitz, 3.5 pt, 7 days before planting followed by Velum, 3.4 fl oz, 20 days after planting	0.70	16.2	16
Nimitz, 3.5 pt and Velum, 3.4 fl oz, 7 days before planting	0.66	14.5	22
Nimitz, 7 pt, 7 days before planting followed by Majestene, 2 gal, 20 days after planting	0.71	18.9	16
Velum, 3.4 fl oz and Majestene, 2 gal, at plant and 40 days after planting	0.75	17.0	6
Nimitz, 3.5 pt, 7 days before planting followed by Velum, 3.4 fl oz, 20 days after planting followed by Majestene, 2 gal, 40 days after planting	0.68	15.6	21
Dazitol, 5.35 gal, 5 days before planting followed by Majestene, 2 gal and MeloCon, 4 lb, 20 and 40 days after planting	0.73	15.5	10

GCREC 2019-20

Treatment ^X	Rate/A	Application time ^Y	Plant Vigor (NDVI value)					Total Yield (kg)	Mid-season nematode count / 200 mL soil		End-season nematode count / 200 mL soil	
			35 DAP	63 DAP	91 DAP	119 DAP	147 DAP		Sting	Stunt	Sting	Stunt
Nimitz	7 pt	8 DBP	0.23 ab	0.40 b	0.57 ab	0.55 ab	0.33	8.32 b	3	1	2	2
Velum	6.8 oz	2 DBP	0.27 ab	0.46 ab	0.71 a	0.65 ab	0.41	11.21 ab	2	1	0	0
Nimitz fb Velum	3.5 pt fb 3.4 oz	7 DBP fb 22 DAP	0.21 b	0.39 b	0.63 ab	0.59 ab	0.34	8.45 b	1	2	0	1
Nimitz + Velum	3.5 pt + 3.4 oz	7 DBP	0.24 ab	0.39 b	0.58 ab	0.55 ab	0.34	8.21 b	2	1	1	0
Nimitz fb Majestene	7 pt fb 2 gal	8 DBP fb 21 DAP	0.23 ab	0.38 b	0.64 ab	0.63 ab	0.33	9.45 b	2	1	1	0
Nimitz fb Velum fb Majestene	3.5 pt fb 3.4 oz fb 2 gal	7 DBP fb 22 DAP fb 41 DAP	0.24 ab	0.43 ab	0.68 ab	0.67 ab	0.38	11.89 ab	1	0	0	2
K-pam	62.5 gal	20 DBP	0.30 a	0.56 a	0.74 a	0.69 a	0.40	15.97 a	3	0	2	0
UTC	-	-	0.22 b	0.34 b	0.50 b	0.45 b	0.29	6.52 b	5	1	1	1
<i>P</i> -value			0.0173	<.0001	0.0005	0.0293	0.3586	0.0013	0.0885	0.6239	0.0685	0.6107

^XMeans within each column sharing the same letter do not differ significantly (*P* value > 0.05) according to Tukey Kramer Test

General Summary-Issues to Resolve



Nonfumigant Weed Control was unacceptable for Nutsedge with the Controls & NON Fumigants



Canopy Convergence Significantly Delayed Season Long, Particularly Early with the Controls & NON Fumigants



the Net Value of Plant Losses due to disease was greater (up to \$8000 / a) with the Controls & NON Fumigants



Yields were depressed up to 22% in the Controls & NonFumigants due to increased plant mortality and overall smaller plant sizes.

PROGRAM COSTS - Fumigants vs NonFumigants

1	Telone C35	816.00		816.00
2	Telone C35+Deep Telone II	816.00	196.40	1012.40
4	Pic Clor 80	822.00		822.00
5	Pic Clor 80+Deep Telone II	822.00	196.40	1018.40
7	Kpam alone	346.81		346.81
8	Kpam +Majestene, +Dazitol, + NemaKill	346.81	728.30	1075.11
9	Kpam+ Velum 6.5 fl oz/acre	346.81	60.94	407.75
12	Nimtz + Goal +Chateau + Velum + Ridomil	281.25	147.72	428.97
14	Untreated Control	-	-	-

