Tobacco Cyst Nematode Management

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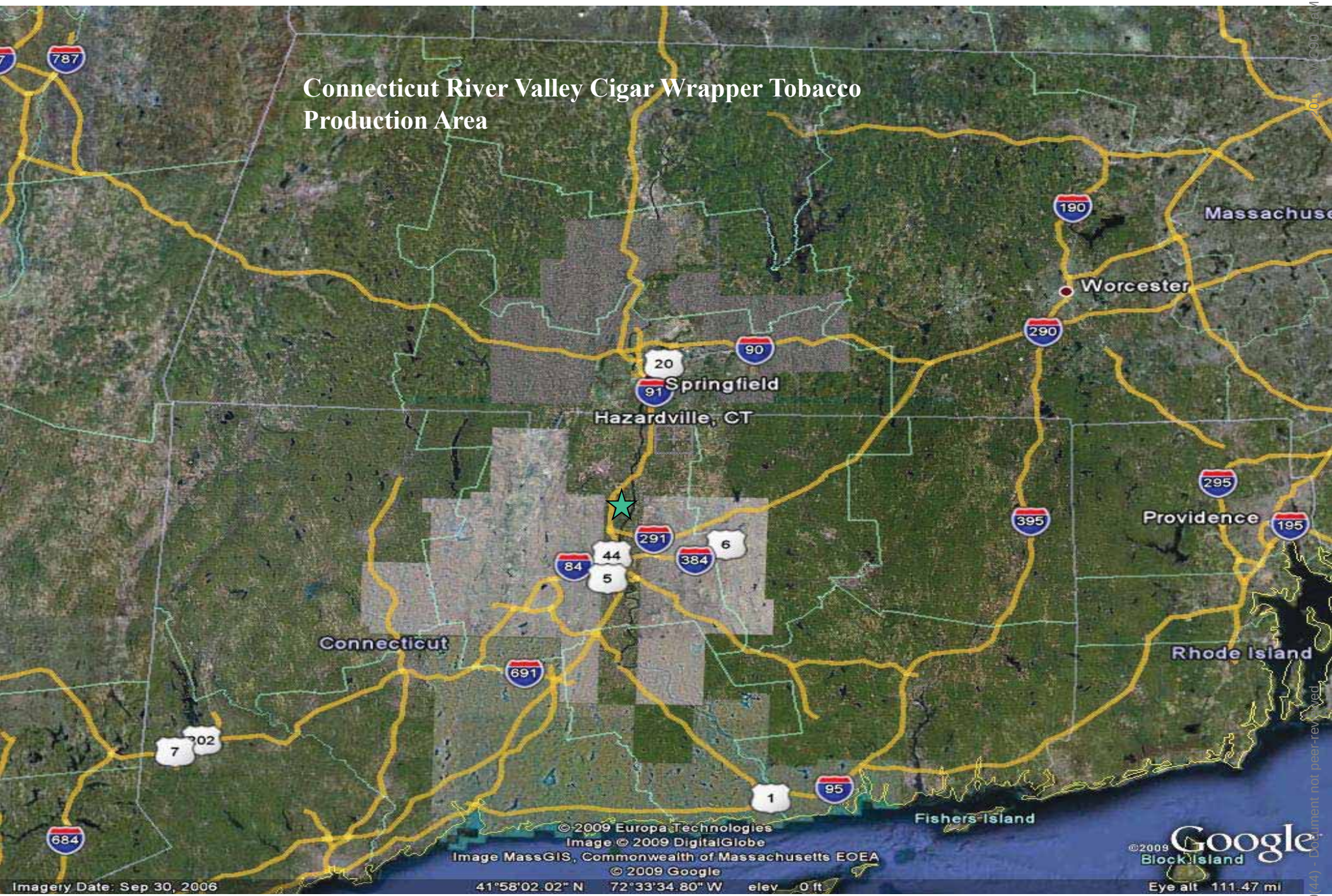
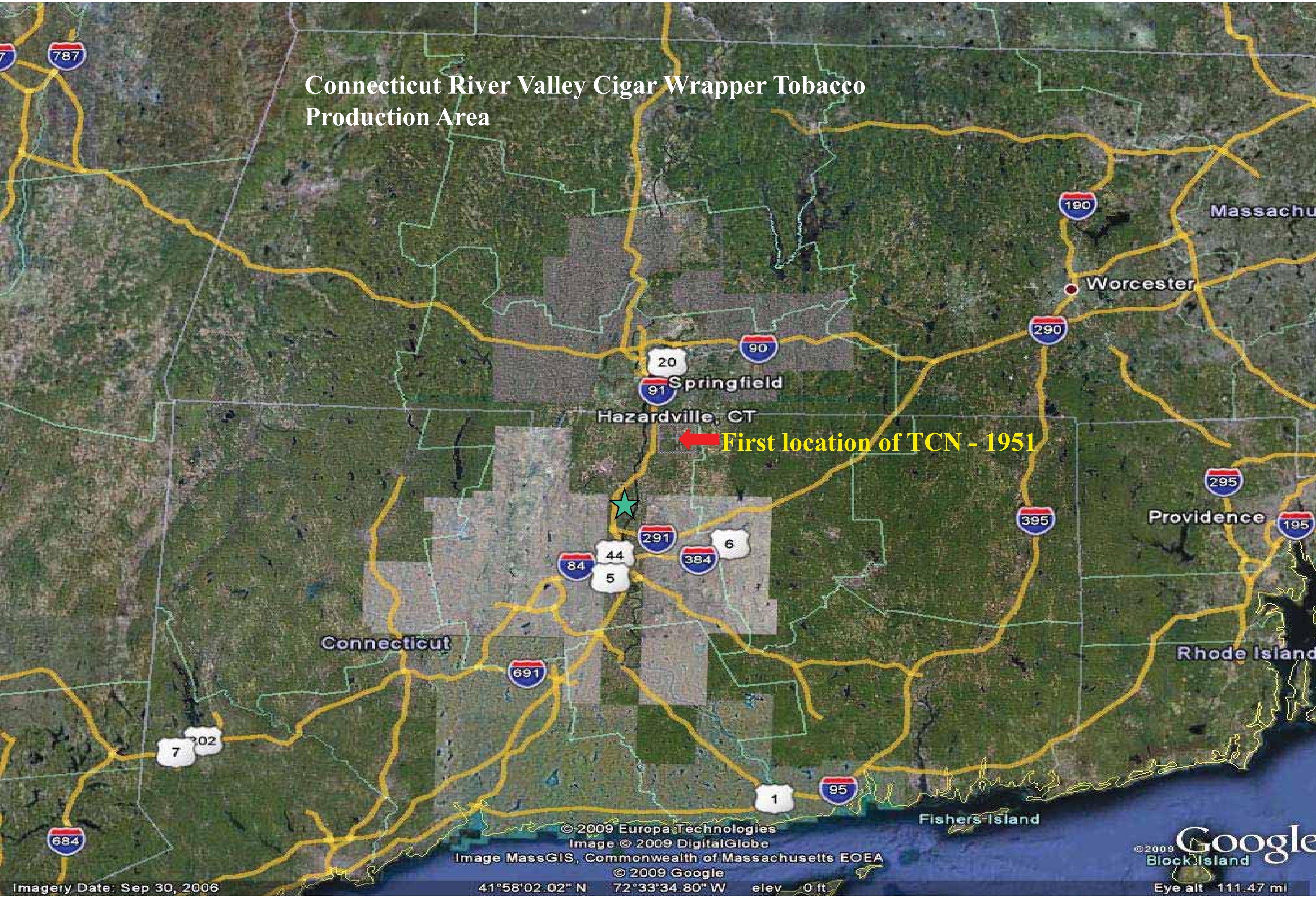
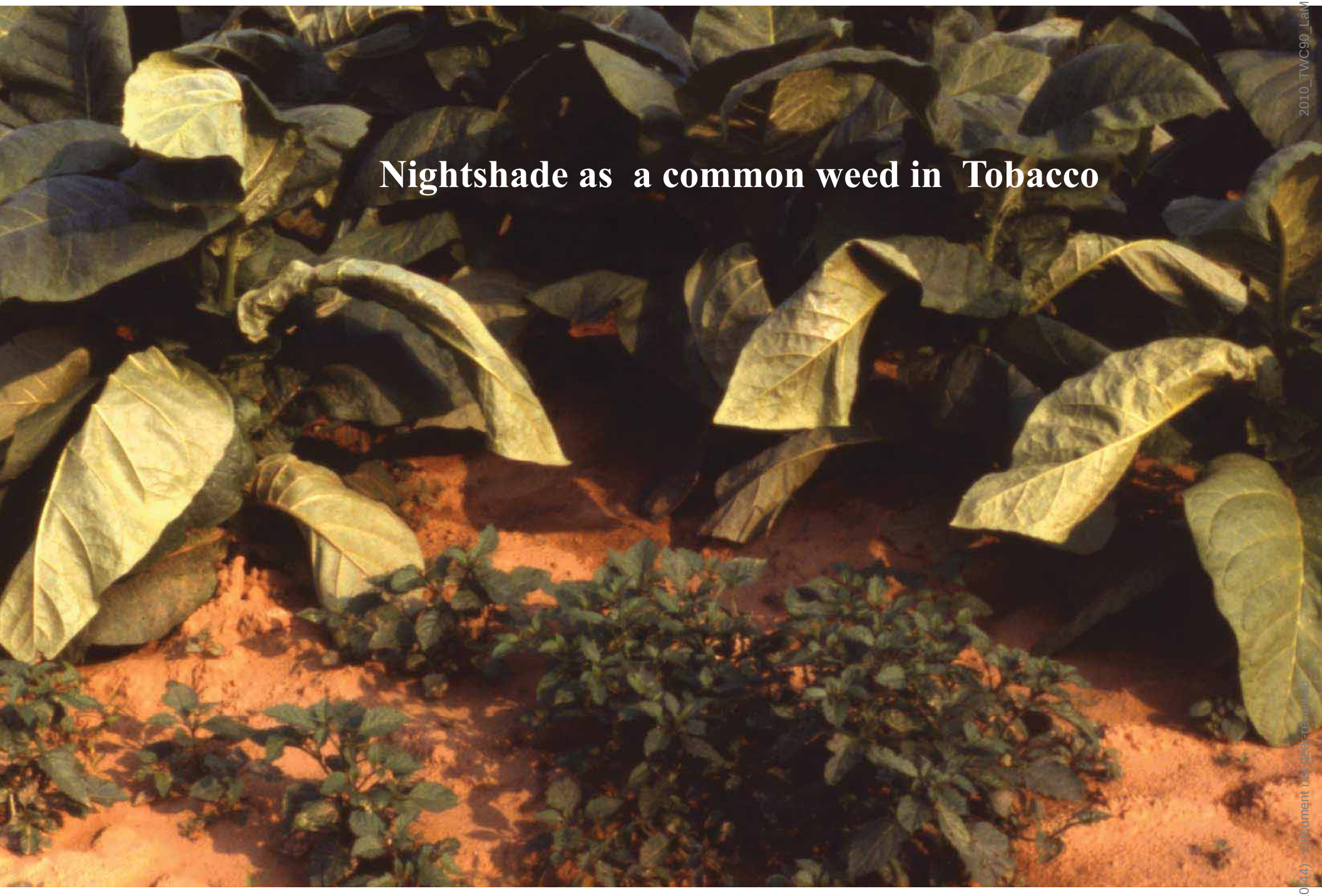
Connecticut Shade Tobacco





Tobacco Cyst Nematode
Globodera tabacum tabacum



G. tabacum host status:

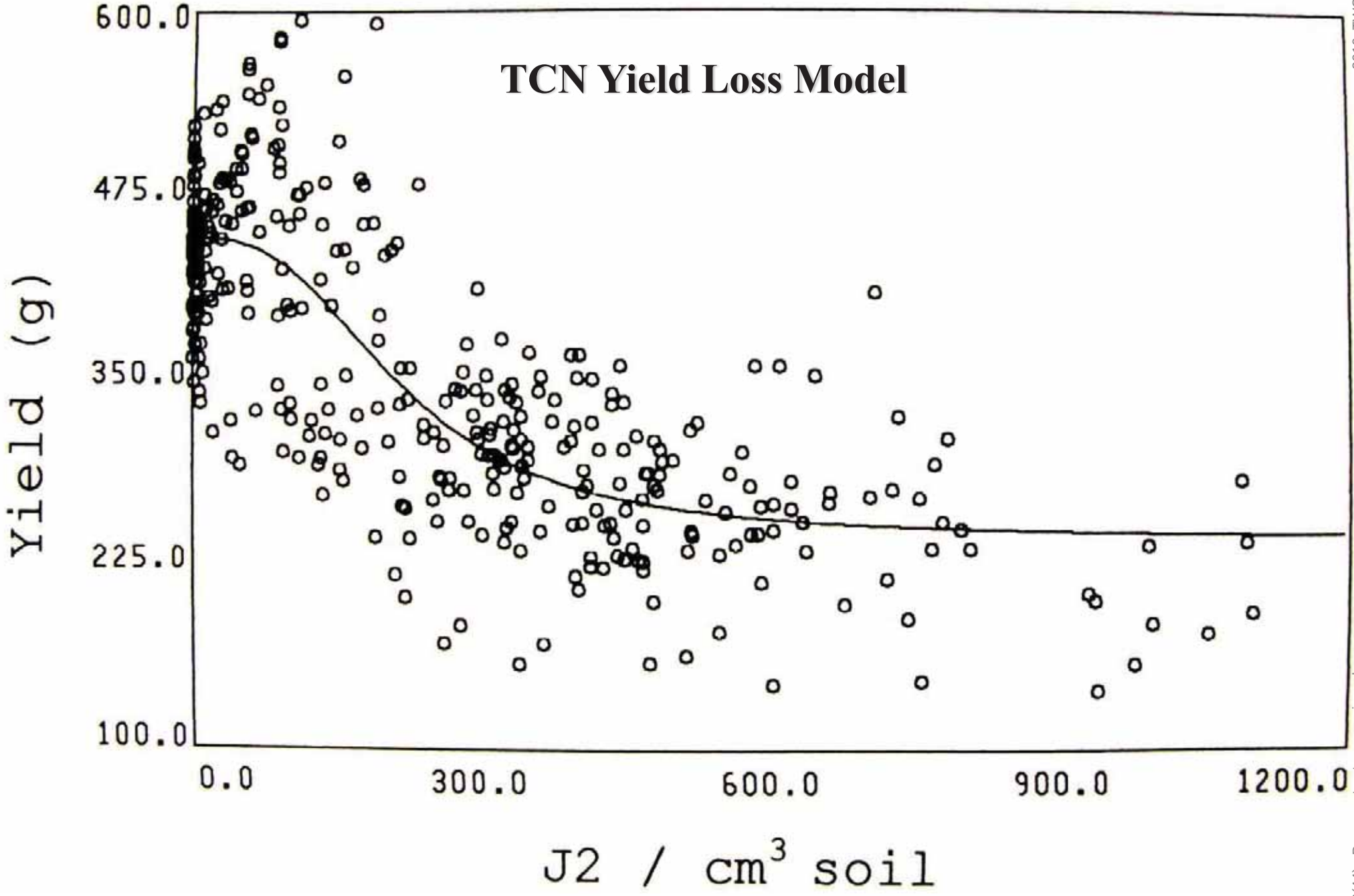
Tobacco vs. Eastern Black Nightshade

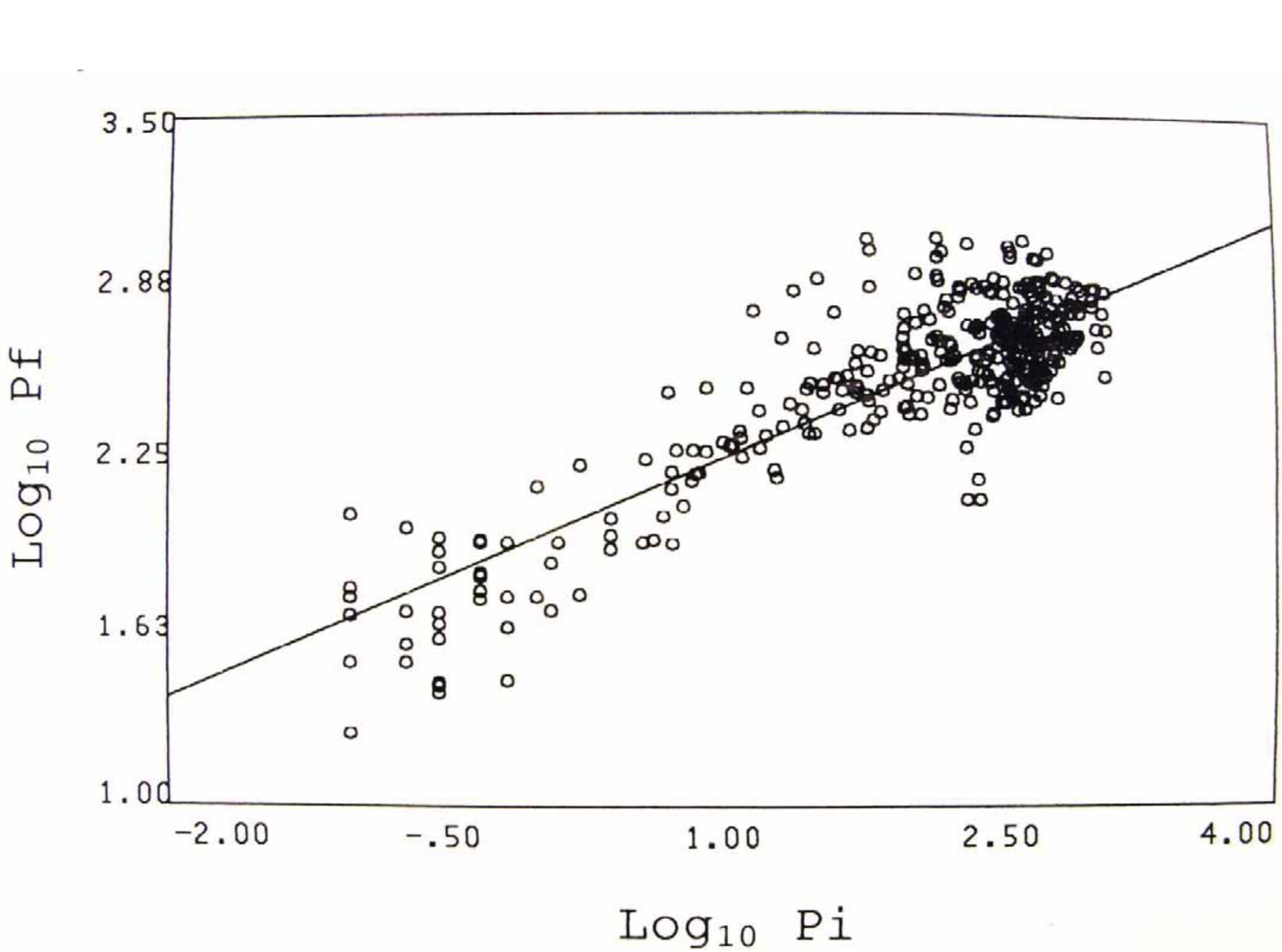
Plant	Hatch	Pf/Pi	Gen time
Tobacco	138	3.23	6 wks
Nightshade	638	5.02	5 wks

Fumigated Plot: Low TCN Density

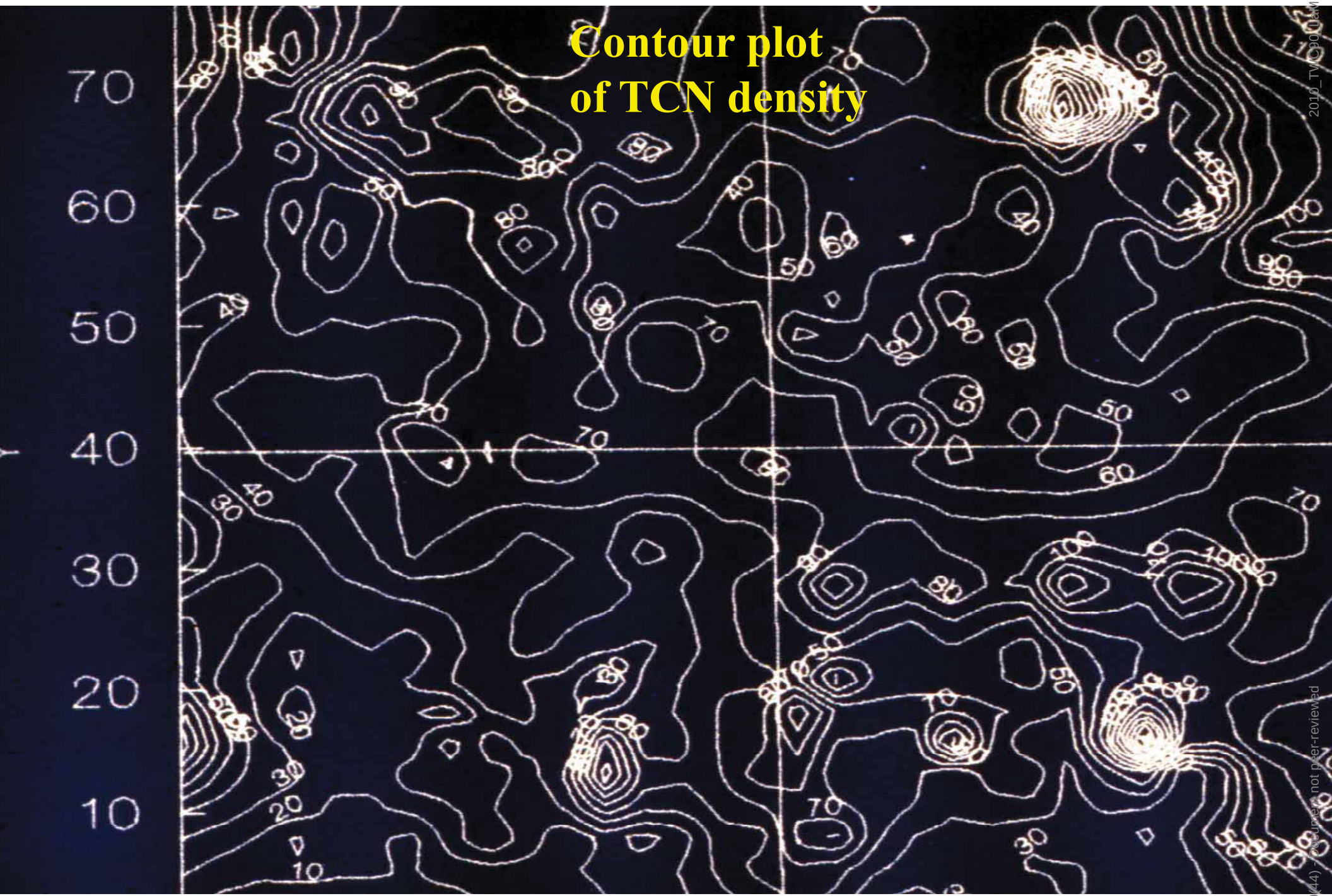
Tobacco cyst nematode damage: reduced growth and poor color.

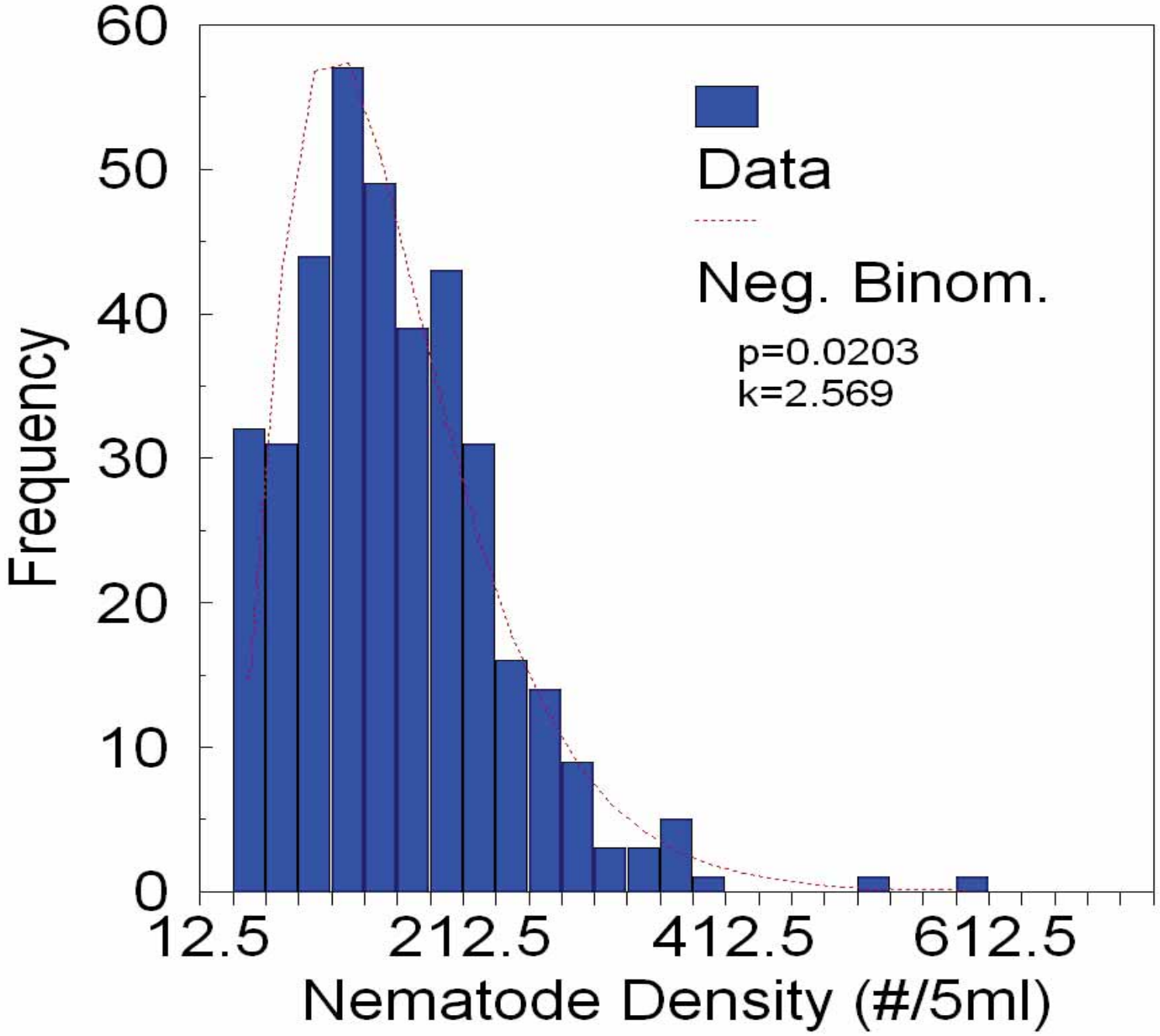
Non-Fumigated Plot: High TCN Density

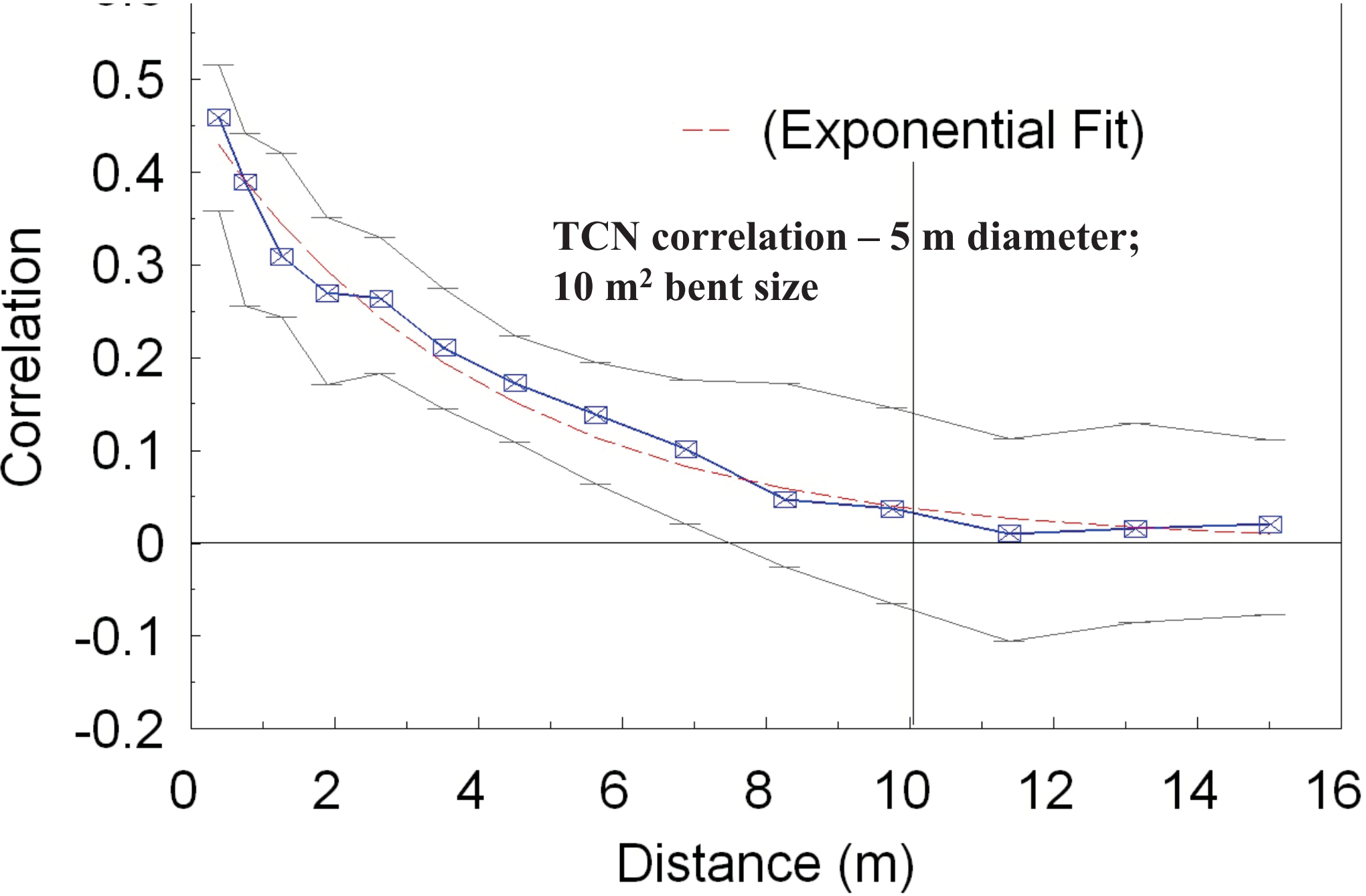




Contour plot of TCN density







TCN Sampling – 4 samples per bent, 40 bents per acre

Fusarium Wilt

TCN – Fusarium wilt

	Incidence %		Rating 0-4	
Trt	2 wk	0 wk	2 wk	0 wk
TCN	70	10	1.9	0.2
None	0	10	0.0	0.1

TCN – Fusarium wilt

Oxamyl

kg ai/ha	Incidence %	Severity
0.0	48	1.4
2.2	23	0.7
6.7	8	0.2

TCN – Fusarium wilt

Oxamyl	3 wk AT	
kg ai/ha	J2	J3 - Adult
0.0	103	76
2.2	14	4
6.7	0	0

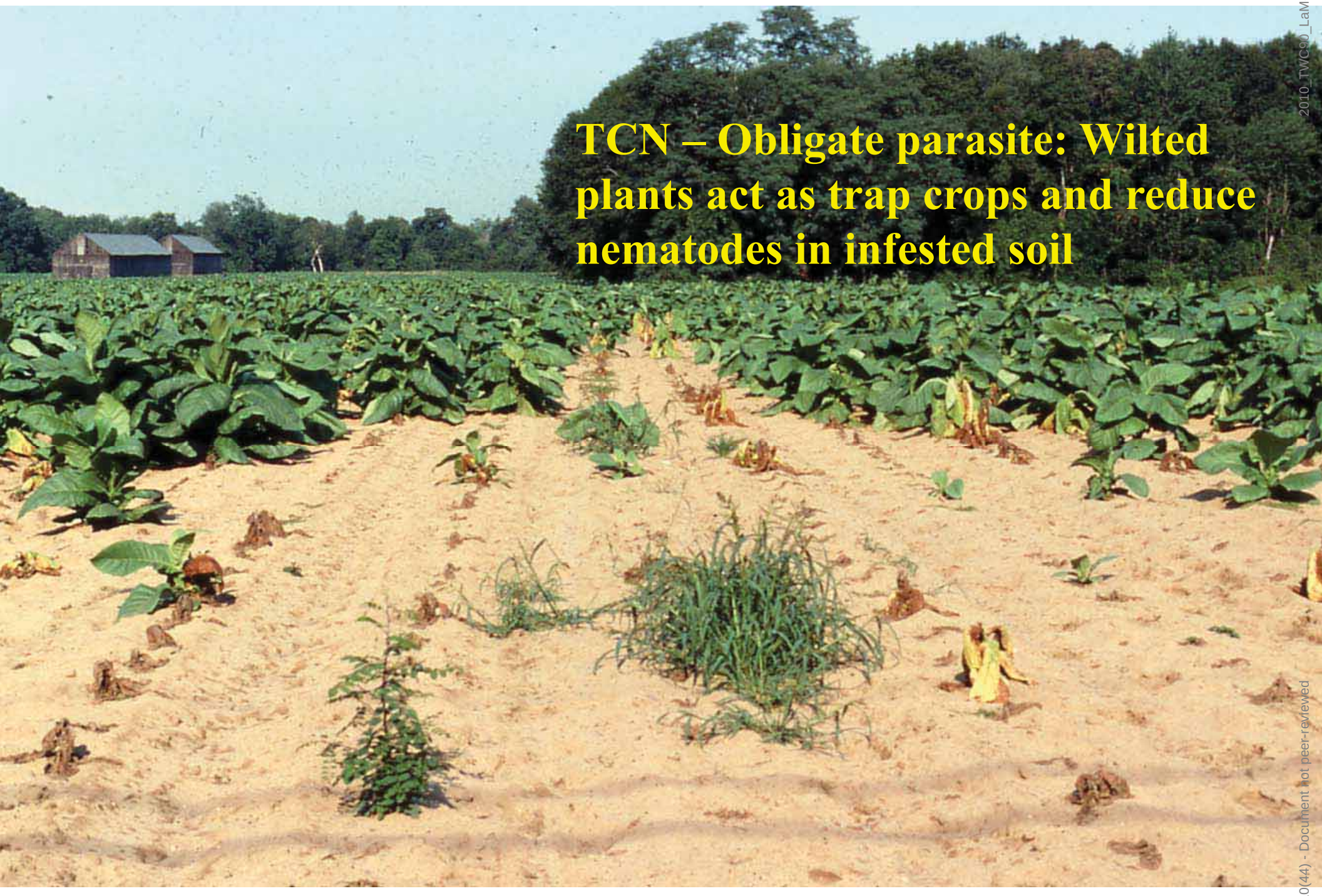
Spread of Fusarium Wilt

Rapid spread throughout the Valley

Infected stalks applied to new fields

Soil carried on equipment

Between farms - seed / plant transfer



TCN wilt resistant cultivars (1991) controlled Fusarium wilt: allowed damaging populations to build up over time

Cyst nematodes now cause direct losses in broadleaf

Cyst Nematode Management

Chemical control:

Fumigation: Vorlex, Vapam, Telone

Non-Fum: Vydate (3 gpa), Nemacur

Cyst Nematode Management

Chemical control:

Fumigation: Vorlex, Vapam, Telone

Non-Fum: Vydate (3 gpa), Nemacur

Fumigation is costly and threatened by regulation

Cyst Nematode Management

Rotation

Trap cropping

Crop residue destruction at harvest

Plant resistance (long-term)

Cyst Nematode Management

Rotation crops –limited to 20 – 30% control due to lack of hatching factor.

Typical rotation crops include grains, weedy fallow, and recently, soybean. Weedy fallow – danger of nightshade.

Cyst Nematode Management

Rotation

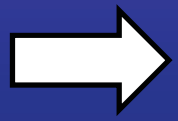
Trap cropping

Crop residue destruction at harvest

Plant resistance (long-term)

Trap Cropping

	Pf/Pi	
Wk AT	Susceptible	Resistant
4	0.38	0.44
5	0.52	0.48
6	0.49	0.38
8	1.14	0.35



Cyst Nematode Management

Rotation

Trap cropping

Crop residue destruction at harvest

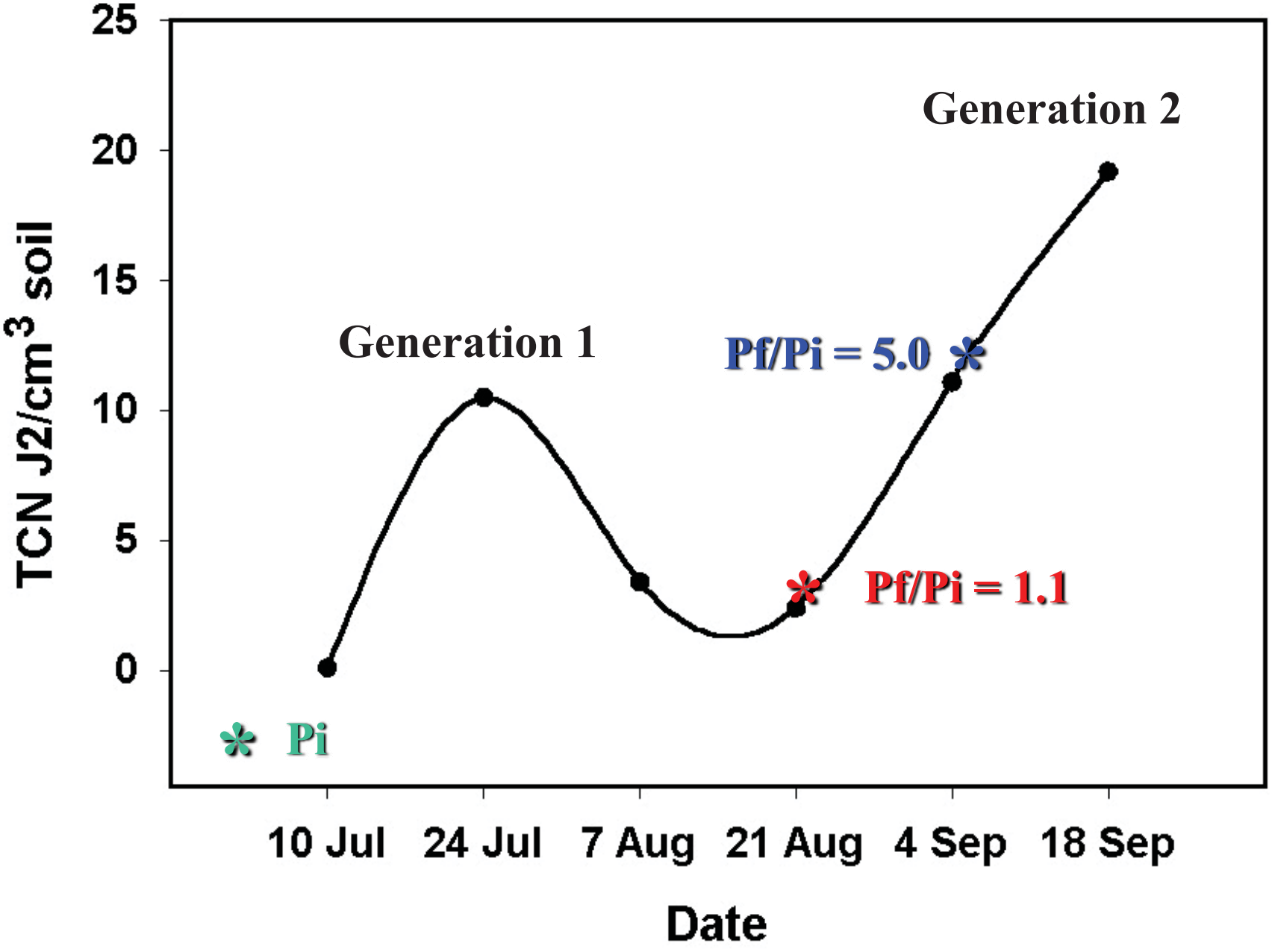
Plant resistance (long-term)

Bdlf Tillage: timing on TCN

Treatment	Pf/Pi	Pi	Pf
Till immediately	1.03	4.4	4.6
3 wks after cutting	5.42	6.3	24.4
6 wks after cutting	5.89	8.3	24.8

Bdlf Tillage and nematicide effects on TCN

Nematicide	Tillage	Pf/Pi
None	Cutting	2.21
None	5 wks	6.78
Nemacur	Cutting	0.59
Nemacur	5 wks	1.32



Cyst Nematode Management

Rotation

Trap cropping

Crop residue destruction at harvest

Plant resistance (long-term)

TCN Resistance Breeding

Source of resistance VA-81 and Clemson PD-4.

Resistance segregated as a single, dominant effect gene.

B2 Broadleaf Tobacco

- F1 male-sterile hybrid
- Initial crosses for TCN-R made in 1987
- BC2 selected to inbred, backcrossed and inbred, crossed to MS bdlf
- 27 generations of field and greenhouse selection with 8 cycles ea of selection for wilt-resistance, TCN & TMV-R
- Field evaluation over 4 yrs

Resistance Breeding

Lines	TMV	Fwilt	TCN	BMold
C9	R	R	S	S
B2	R	R	R	MR

B2 is a male-sterile F1 hybrid uniform seed stable over time

TCN Resistance

Treatment	Effect on nematodes
Susceptible	increase of $\geq$ 2x
Fallow	20 percent decrease
Resistant B2	60 – 70 % decline
Fumigation	70 - 80 % decline
Fum + Susc	maintains popns

Broadleaf Breeding 2006-08

Line	lb/acre	% wrapper	%M & D
C9	2003	53 *	28 *
B-2	2105	55 **	29 **

* = good quality wrapper

The Connecticut Agricultural Experiment Station, New Haven

TCN Tracker – A Decision-based Cyst Nematode Management Aid For Connecticut Wrapper Tobacco Types

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TCN Tracker

User-friendly point and click Access database. Uses TCN density to predict impacts of field use on nematodes and yield.

Microsoft Access: uses population dynamics models, yield loss models.

TCN Tracker - Broadleaf
Connecticut Agricultural Experiment Station Valley Laboratory
Broadleaf Tobacco Cyst Nematode Management Decision Model

Title:

Date:

Initial Tobacco Cyst Nematode Population: 0.0 J2/cm^3

Year One Field Use

- Fallow
- Resistant
- Susceptible (Till Immediately
- Fumigation
- Trap Crop
- Susceptible (Till Later)

Population After Year 1: 0.0 J2/cm^3

Yield Loss Year 1: 0.00 %

Year Two Field Use

- Fallow
- Resistant
- Susceptible (Till Immediately
- Fumigation
- Trap Crop
- Susceptible (Till Later)

Population After Year 2: 0.0 J2/cm^3

Yield Loss Year 2: 0.00 %

Year Three Field Use

- Fallow
- Resistant
- Susceptible (Till Immediately
- Fumigation
- Trap Crop
- Susceptible (Till Later)

Population After Year 3: 0.0 J2/cm^3

Yield Loss Year 3: 0.00 %

Year Four Field Use

- Fallow
- Resistant
- Susceptible (Till Immediately
- Fumigation
- Trap Crop
- Susceptible (Till Later)

Population After Year 4: 0.0 J2/cm^3

Yield Loss Year 4: 0.00 %

Year Five Field Use

- Fallow
- Resistant
- Susceptible (Till Immediately
- Fumigation
- Trap Crop
- Susceptible (Till Later)

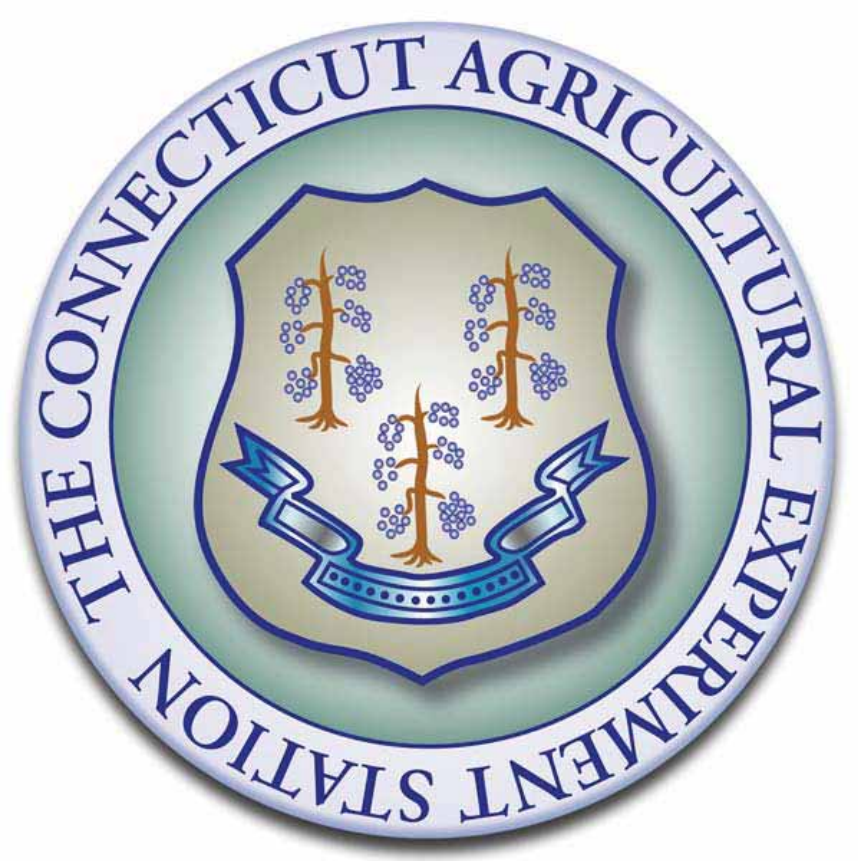
Population After Year 5: 0.0 J2/cm^3

Yield Loss Year 5: 0.00 %

TCN Control - shade

Fall '06 start at: 100 J2/cm^3 soil

Treatment	Fall '07	Fall '08
Fallow	80	64
Resistant cv -	40	16
Fumigation	(20)	(22)
+susceptible -	108	110



The Connecticut Agricultural Experiment Station Valley Laboratory

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Bdlf Blue Mold Resistance -2007

Lines	Lesions/plant
B2	0.2 a
B6	0.8 b
B3	1.6 bc
C9	2.1 c

Bdlf Blue Mold Resistance -2009

Lines	Disease rating
NC2000	1.7 a
NC2002	2.0 a
B2	3.0 ab
KT206	3.3 ab
C9	3.5 b
KT200	4.7 b

Bdlf Blue Mold Resistance -2009

Rating	Disease
1	No lesions
2	Single lesions few plants
3	Single lesions most plants
4	Multiple lesions few plants
5	Multiple lesions most plants