

# **MANAGING ROOT-KNOT NEMATODES IN COTTON: EVALUATING ALTERNATIVE AND REDUCED RISK APPROACHES**

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Cotton root-knot nematode is the most important nematode pest to cotton with losses averaging 33,360 bales/year during the period 1989 through 1998. This pest is a problem primarily in sandy and sandy-loam soils, but can be found in loamy soils.

The emphasis on reducing costs and improving profitability is a driving factor for research focused on finding alternative management approaches to fumigants and other nematicides. In addition, interest by society and regulators in seeking reduced risk approaches to pest management is driving the search for alternative nematode control practices.

Beginning in 1994, experiments have been conducted at Shafter REC to examine the role of crop rotation and the use of resistant Acala variety, NemX, to suppress root-knot nematode populations. The results of these experiments have been reported (1,2) but can be summarized as follows:

- NemX cotton maintained yield potential over three years while Maxxa declined during each year of the trial (Figure 1)
- NemX cotton suppressed the root-knot nematode population while Maxxa maintained the population (Figure 2)
- Traditional crop rotations decrease root-knot nematode populations (Figure 3) but NemX was as effective as alfalfa or black-eye beans
- Using NemX provided significant yield gains for a susceptible vegetable (Henderson bush lima beans)

One of the drawbacks of the 1994-1996 trials was the unavailability of Telone II as a fumigant check. In 1997, another trial was initiated to repeat the experiment with a fumigated check incorporated. The trial is in its third year and consists of 240 plots spanning all combinations from three years of fumigation or no fumigation and three years of Maxxa or NemX. Thus far we have learned:

- Fumigants still protect susceptible cotton (Figure 5)
- Fumigants in 1998 increased yield of both Maxxa and NemX (Figure 6)
- NemX continues to suppress root-knot nematode populations (Figure 7) as indicated by increased yields of susceptible lima beans but control decreases as Telone use decreases

These trials have demonstrated that root-knot nematode is manageable by cultural means, such as crop rotation and host plant resistance. However, care must be taken to prevent root-knot nematode from overcoming the resistance. These studies were conducted in the same field for six consecutive years and probably are providing selection pressure on the population overcome it. *Under normal farming practices, NemX might be used the final year in a three or four-year cotton rotation, followed by a rotation to a non-host or a fumigation prior to vegetables.*

The use of NemX in during a cotton rotation provides an excellent opportunity for California growers to manage their root-knot nematode populations. Cotton acts a filter to prevent the buildup of all other *Meloidogyne* (root-knot nematode) species. NemX will limit the buildup of the population prior to vegetables, thus providing a smaller population for a Telone II to control. If the rotation is to alfalfa or beans, susceptible cotton (non-NemX Acala, Pima, and CA upland) can follow with no nematicide in most situations.

Sampling for nematodes is the only way to base a management decision. In field that is out of cotton, a soil sample is required from every 10-20 acres. For a field currently in cotton, a Fall root-sample will help decide whether to plant NemX or rotate out of cotton. Using the root-sample method, a field can be evaluated by examining the root systems and rating them for nematode damage. Details for both root-evaluation and soil sampling methods can be found in the Cotton IPM Manual (3) and Cotton Production Manual (4).

#### References:

1. Ogallo, J.L., P.B. Goodell, J. Eckert, and P.A. Roberts. 1997. Evaluation of NemX, a new cultivar of cotton with high resistance to *Meloidogyne incognita*. Journal of Nematology: 29 (4): 531-537.
2. Ogallo, J.L., P.B. Goodell, J. Eckert, and P.A. Roberts. 1999. Management of root-knot nematodes with resistant cotton cv. NemX. Crop Science. 39:2:418-421.
3. IPM for Cotton in the Western U.S. UC DANR Publication 3305.
4. Cotton Production Manual. UC DANR Publication 3352.

Figure 1. Cotton yield at Shafter REC with three years (1994-96) of resistant (NemX) or susceptible cotton (Maxxa).

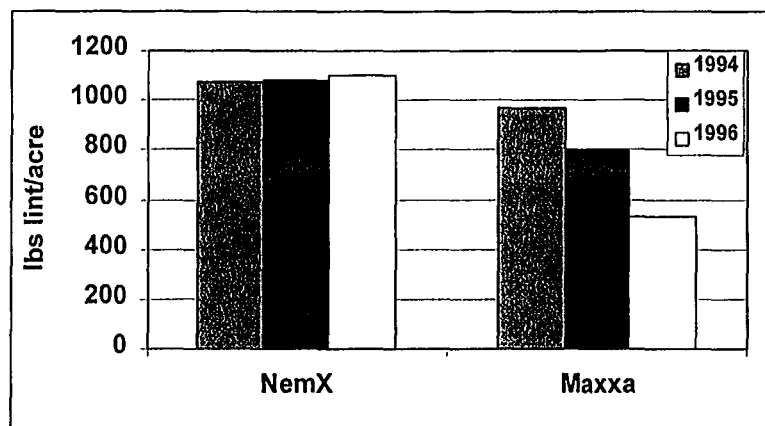


Figure 2. Root-knot nematode population pre-plant densities (Spring) under three years (1994-96) of resistant (NemX) or susceptible cotton (Maxxa).

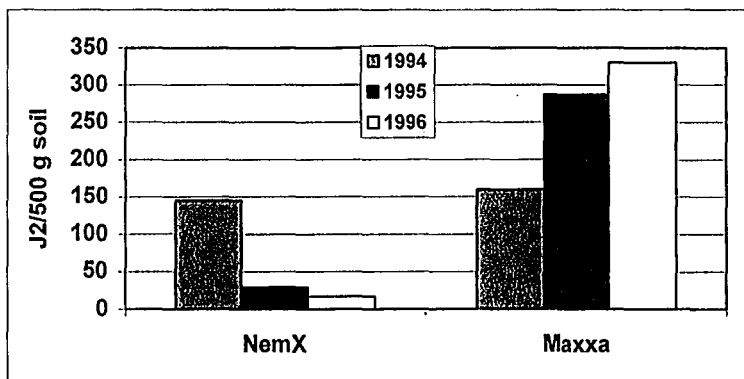


Figure 3. Pre-plant densities of root-knot nematode (January 1996) following one year rotations of different crops.

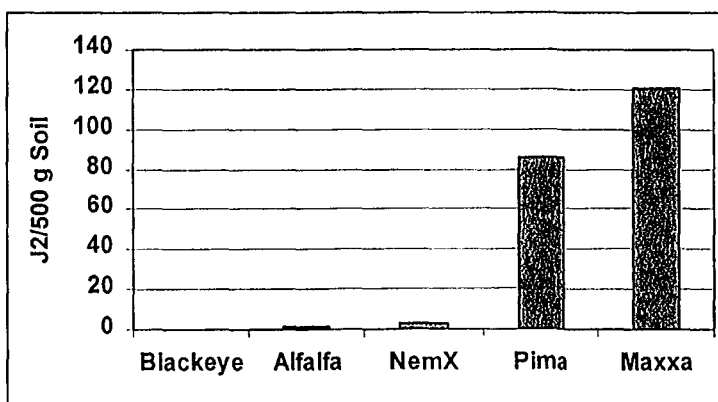


Figure 4. Yield of lima beans (whole plant green weight) following NemX ( R) or Maxxa ( S) cotton in 1995 (1) or 1996 (2).

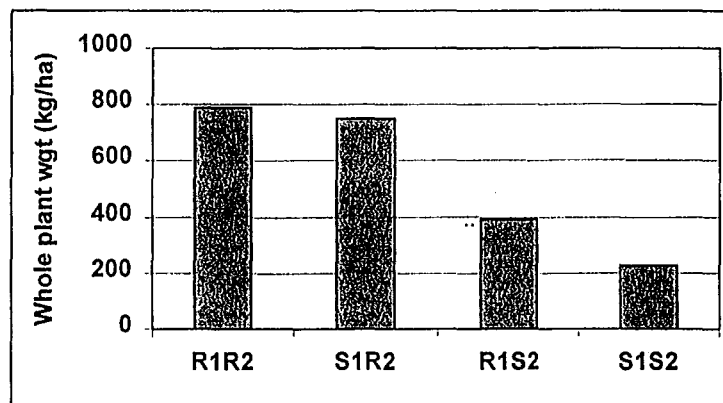


Figure 5. Lint yield in 1997 for resistant (NemX) or susceptible (Maxxa) cotton with or without nematicides.

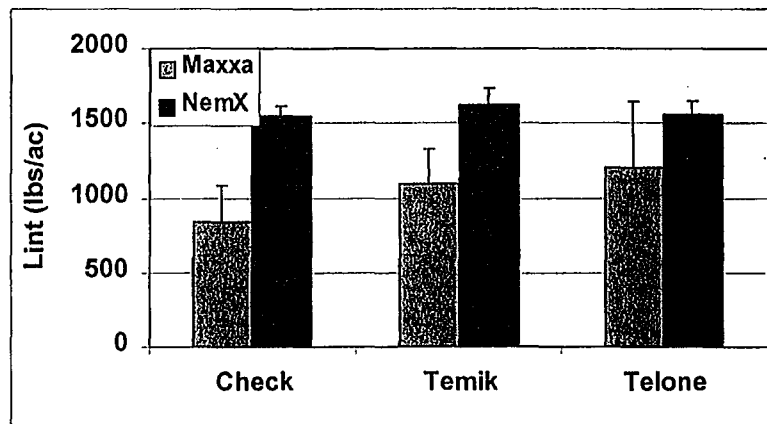


Figure 6. Lint yield in 1998 for resistant (NemX) or susceptible (Maxxa) cotton with or without fumigant.

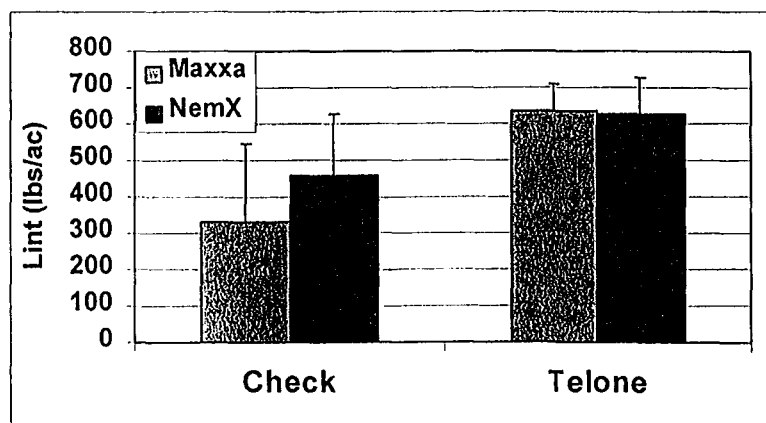


Figure 7. Green weight yield of Henderson lima bean following 1 or 2 years with or without fumigation and growing resistant (NemX) or susceptible cotton (Maxxa). See Table 1 for treatment code. Zero indicates 3 years of Telone, 3 indicates no Telone since 1996.

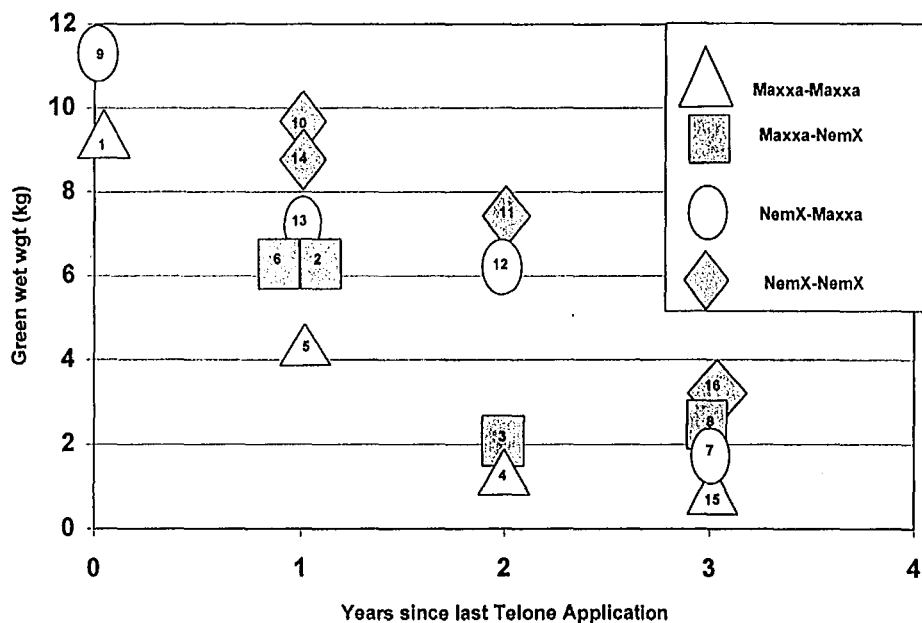


Table 1. Summary of treatments at nematode management trial, Shafter REC, 1997-1999.

Treatment No.	Year		
	1997	1998	1999
1	Telone, Maxxa	Telone, Maxxa	Telone
2	Telone, Maxxa	Telone, NemX	
3	Telone, Maxxa	NemX	
4	Telone, Maxxa	Maxxa	
5	Maxxa	Telone, Maxxa	
6	Maxxa	Telone, NemX	
7	Maxxa	Maxxa	
8	Maxxa	NemX	
9	Telone, NemX	Telone, Maxxa	Telone
10	Telone, NemX	Telone, NemX	
11	Telone, NemX	NemX	
12	Telone, NemX	Maxxa	
13	NemX	Telone, Maxxa	
14	NemX	Telone, NemX	
15	NemX	Maxxa	
16	NemX	NemX	