Tomato Resistance Against Root-knot Nematodes

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Root-knot nematodes.

Meloidogyne species

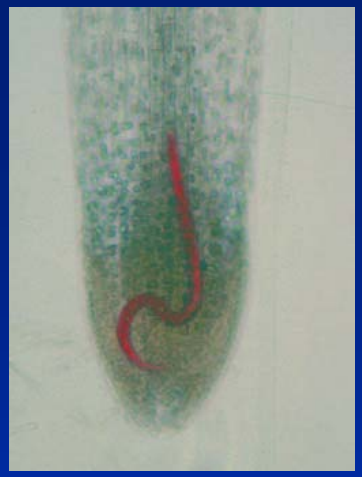
- warm: *M. incognita, M. javanica, M. arenaria*
  - *all three go to tomato*
  - *mostly damage on lighter soil types*
  - *active > 64F, optimum ca. 90F.*
    - *at 65F: 7 wks*

      at 75F: 4 wks

      at 85F: 3wks

Root-knot nematodes:

- *above-ground symptoms: anything that indicates damaged root function (wilting, yellowing, early-dying, stunting), Fusarium, Verticillium.*
- *root-symptoms: galling, rotting.*



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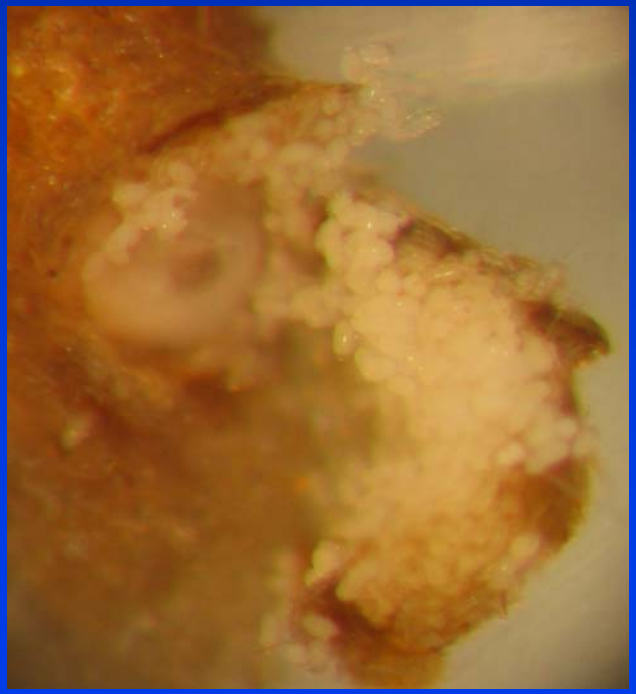
If:

- *< 82F!*
- *M. incognita, M. javanica, M. arenaria*


IN GOD WE TRUST
LIBERTY
1989

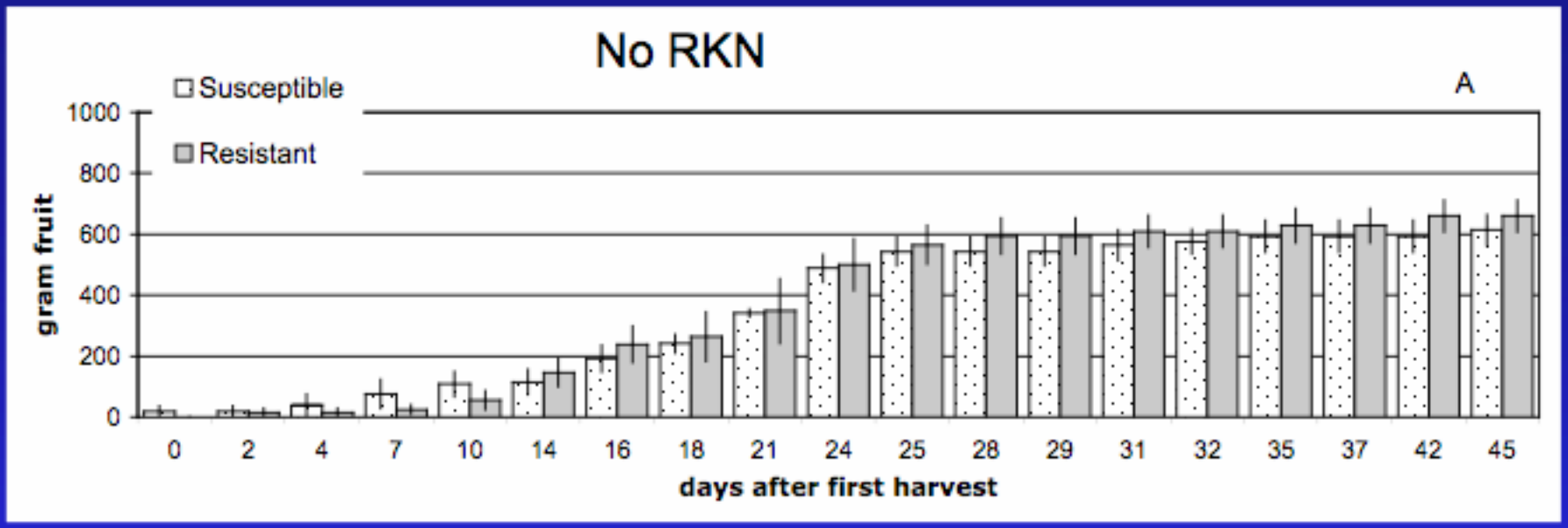


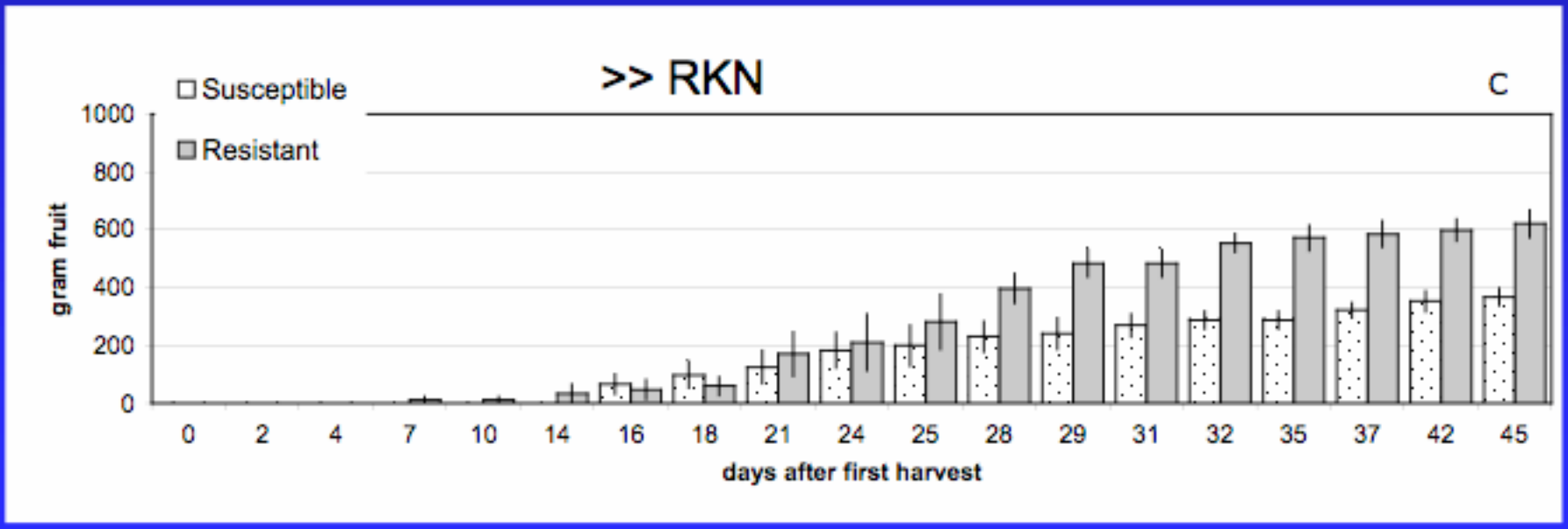
Resistant Tomato varieties:

- *all have the same resistance gene (Mi-gene) coming from a single cross with wild tomato (L. peruvianum) in the early 1940s.*
- *resistance to M. javanica, M. incognita, M. arenaria, some isolates of M. chitwoodi, not against M. hapla*
- *Goal: avoid damage AND reduce nematodes.*

Resistant tomatoes become infected?

- conditions resulted in resistance-breaking (T)
- the nematodes changed
- the plants changed

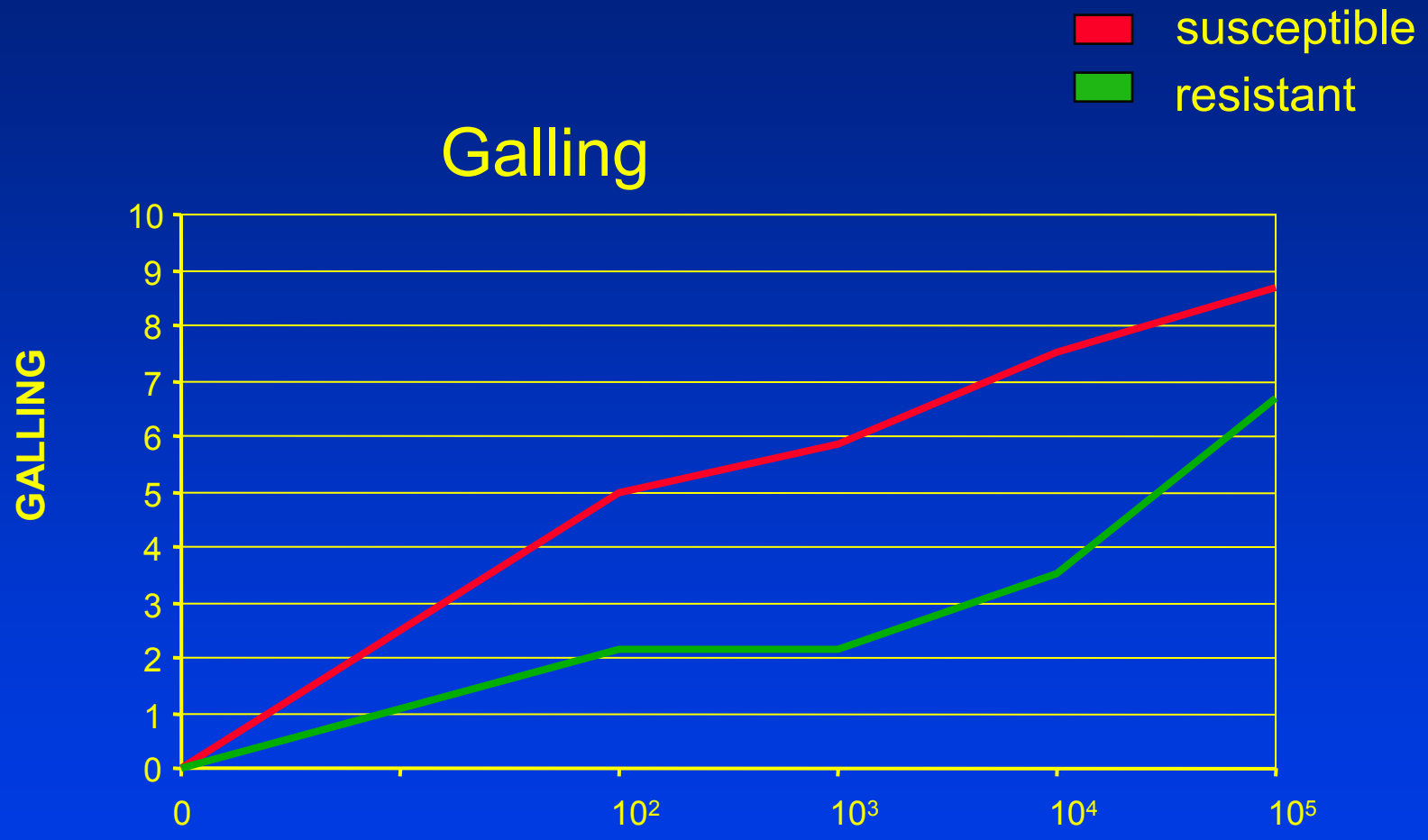

No RKN
A
Susceptible
Resistant
gram fruit
1000
800
600
400
200
0
0 2 4 7 10 14 16 18 21 24 25 28 29 31 32 35 37 42 45
days after first harvest

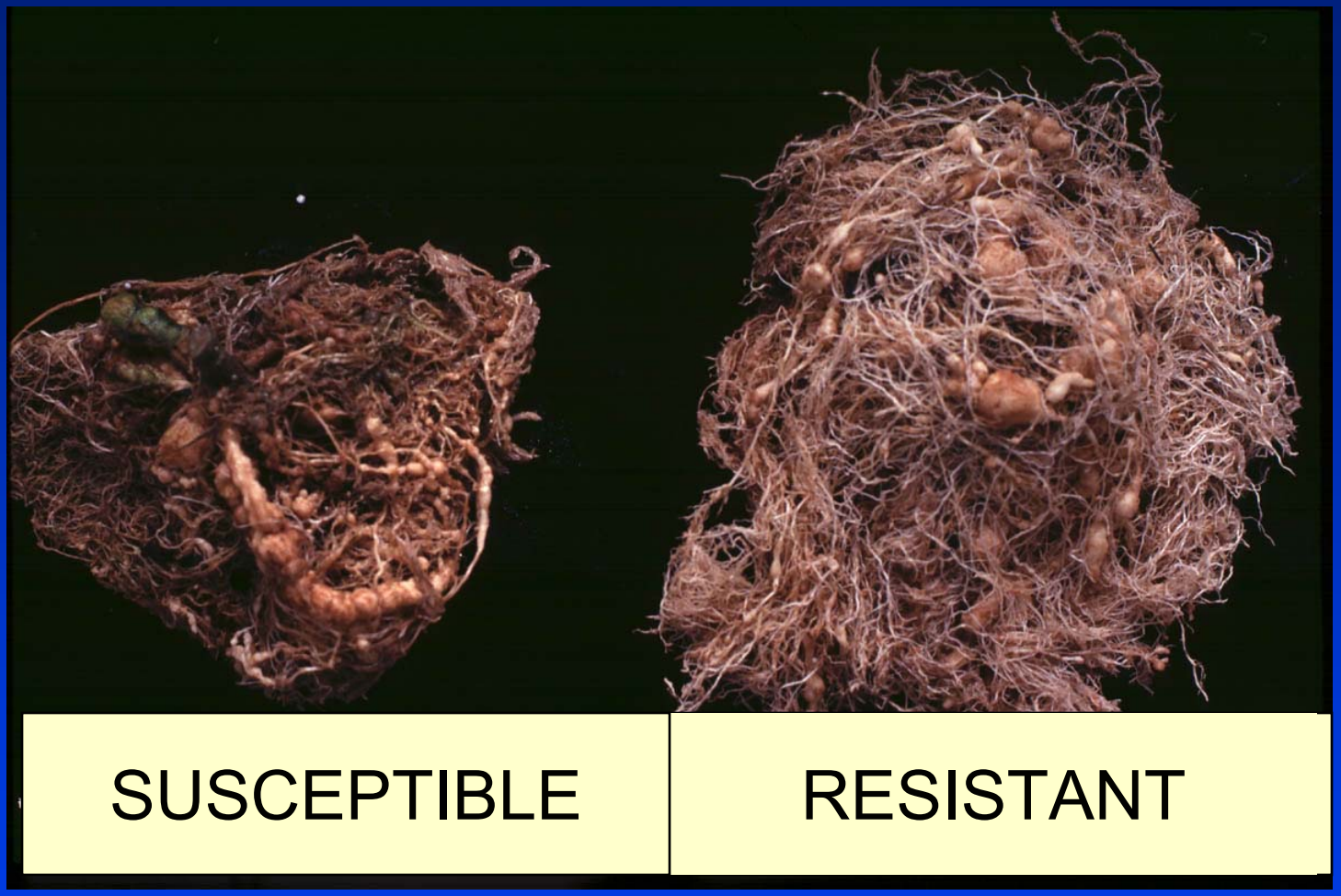

>> RKN
C
Susceptible
Resistant
gram fruit
1000
800
600
400
200
0
0 2 4 7 10 14 16 18 21 24 25 28 29 31 32 35 37 42 45
days after first harvest

Conclusion:

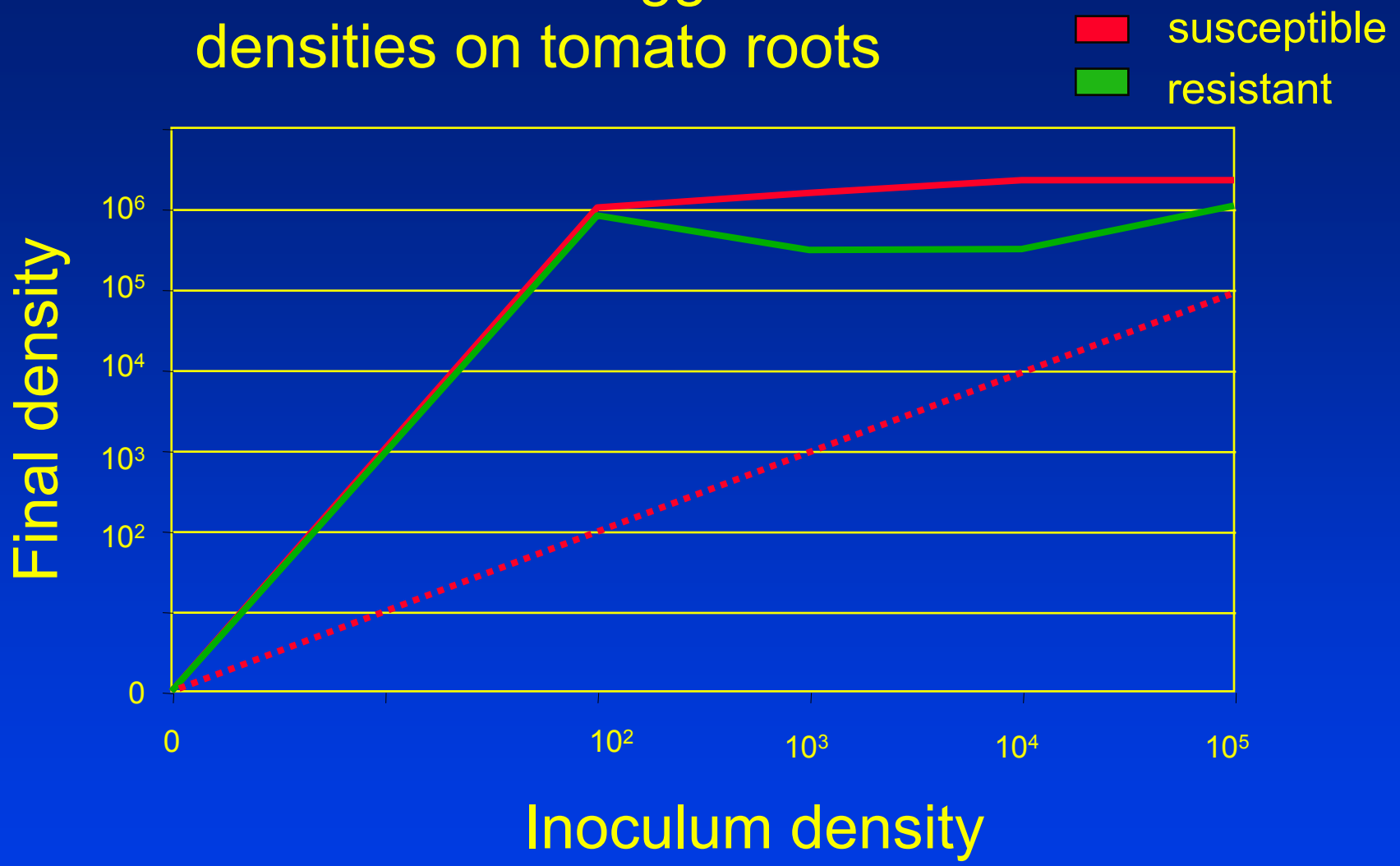
Total fruit weight is not affected by grafting in absence of nematodes. As nematode pressure increases, yields decrease. Plants on resistant rootstocks however maintain higher yields. This is mainly due to a longer harvest period.

Effects on root symptoms and nematode populations:



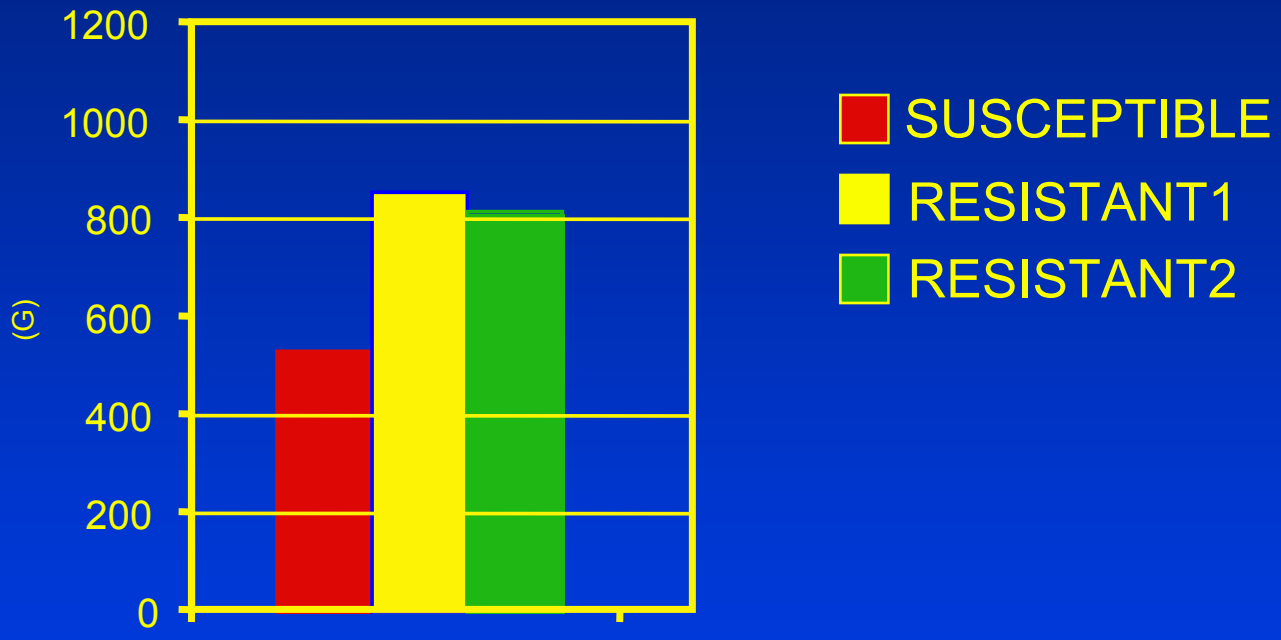

SUSCEPTIBLE
RESISTANT

Initial and final egg densities on tomato roots



Effects on fruit yields

TOTAL FRUIT WEIGHT PER PLANT; (50K M. INCOGNITA EGGS INOCULUM)



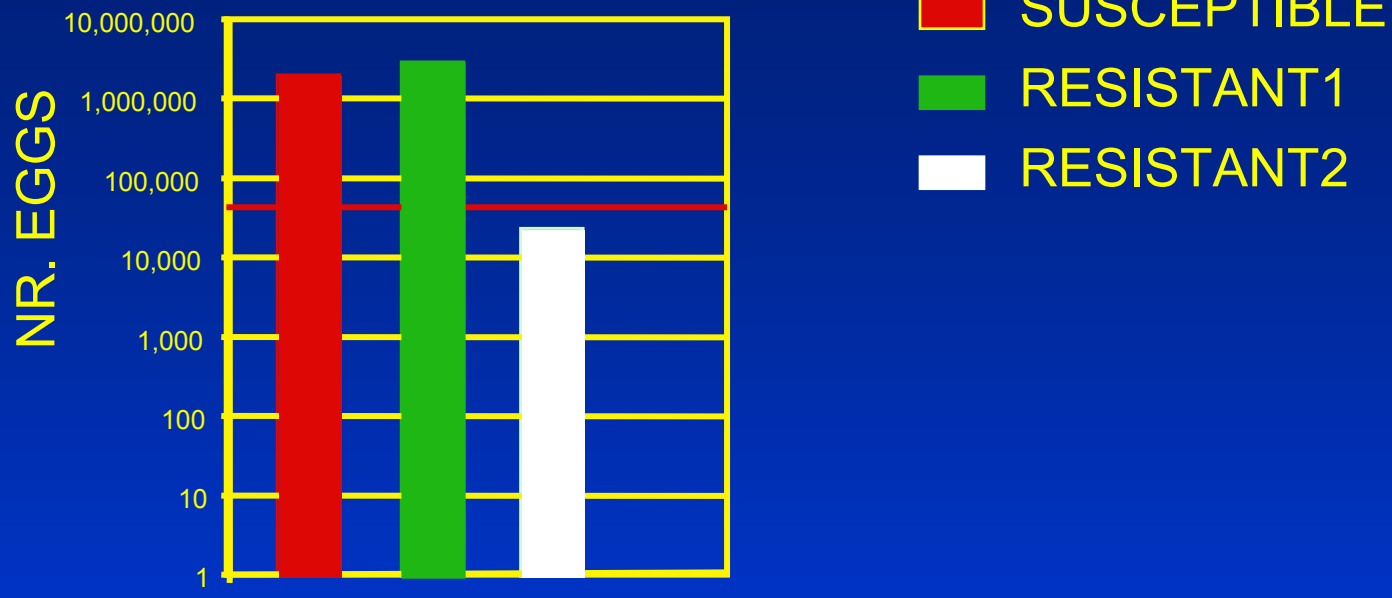
Effects on root symptoms and nematode populations:

SUSCEPTIBLE

RESISTANT1

RESISTANT2

END NEMATODE COUNTS (EGGS) PER ROOT SYSTEM



The nematodes changed:

- happened with other nematode- crop combinations
- nematodes can change under influence of selection pressure (narrow rotations with same resistance genes) or spontaneous.
- Can happen gradually or suddenly
- Resistance breaking populations reported from CA, Greece, Spain, France, Morocco.
- Can only be identified biologically

Questions:

- (make sure nematode identification is correct)
- do resistance-breaking populations break resistance on “all” *Mi* tomato varieties?
- how big is the problem, is it increasing?
- is there any link with cropping history?

Solutions:

- lessen frequency of resistance genes in rotation
- reduce initial population levels
- introduce other resistance genes in tomato