Rhizoctonia solani and *Meloidogyne incognita* Interaction On Chile Pepper (*Capsicum annuum*)

Ahmed Al-Hammouri, W. C. Lindemann, S. Thomas, S. Sanogo, J. Maruthavanan, and R. Steiner

Introduction

- Root knot nematode (*Meloidogyne incognita*) and *Rhizoctonia solani* are powerful plant parasites that reduce chile yield and can kill chile.
- Results form studies in New Mexico chile fields indicated a wide distribution of root knot nematodes (RKN) in sandy soils. Additionally, *R. solani* was isolated from chile in most fields.
- Hypothesis: RKN and *Rhizoctonia* have a synergistic effect on chile.

Objectives

- To determine reproduction rates of RKN in chile roots of soil that is infected or not infected by *Rhizoctonia*.
- To determine if *Rhizoctonia* infection increases or decreases in the presence of RKN.
- To determine if RKN infection increases severity of infection of chile by *Rhizoctonia*.
- To investigate whether inoculation by both, RKN and *Rhizoctonia* affects chile dry biomass more than either microorganism alone.

Materials and methods

- **Experimental design:** A total of four green house experiments in two sets (1 & 2) and (3 & 4) examined the simultaneous and the sequential interaction between RKN and *Rhizoctonia* on chile, respectively. Each experiment was conducted in a randomized complete block design with 5 replications per treatment.
- **Soil and Chile:** Pasteurized soil (82 to 93 °C) was placed into pots and planted to Nu Mexico-64 chile.
- **Inoculation:** Soil inoculation occurred at 10-12 leaf growth stage with 5000 eggs of RKN and 5 APDA *Rhizoctonia* pellets per plant .
- **Assessment of RKN:** Harvesting of chile roots and separation of tap roots, clipping roots and macerating in sodium hypochlorite solution in rotary stirrer, filtration of root suspension, and counting RKN eggs under microscope.
- **Assessment of *Rhizoctonia*:** Clipping of tap roots under aseptic conditions, placing 4 tap root segments on APDA Petri plate, and counting *Rhizoctonia* colonies after 2 weeks.
- **Plant measurements**: Plant heights, fruit numbers, oven dry weights, and physiological measurements were taken.

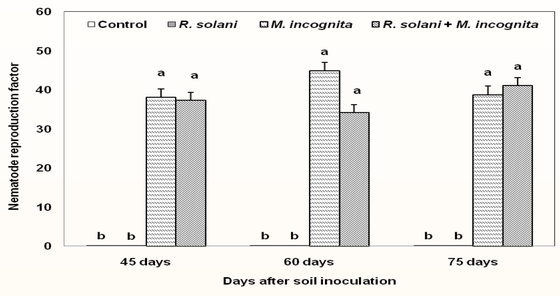

Figure 1. *Meloidogyne incognita* reproduction factor (RF) 45, 60, and 75 days after soil inoculation in experiment 1.

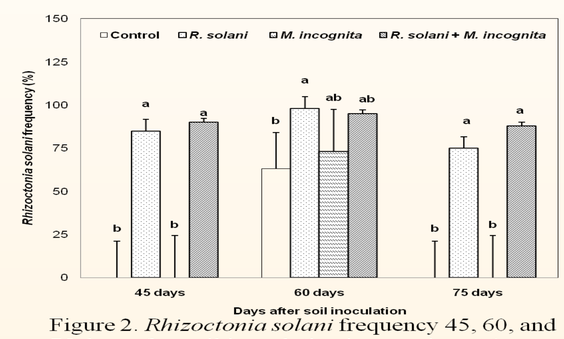

Figure 2. *Rhizoctonia solani* frequency 45, 60, and 75 days after soil inoculation in experiment 1.

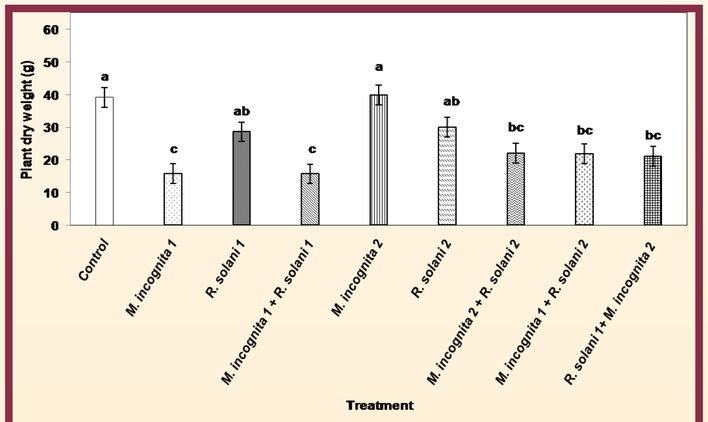

Figure 3. Dry weight of vegetative plant parts (Experiment 3).

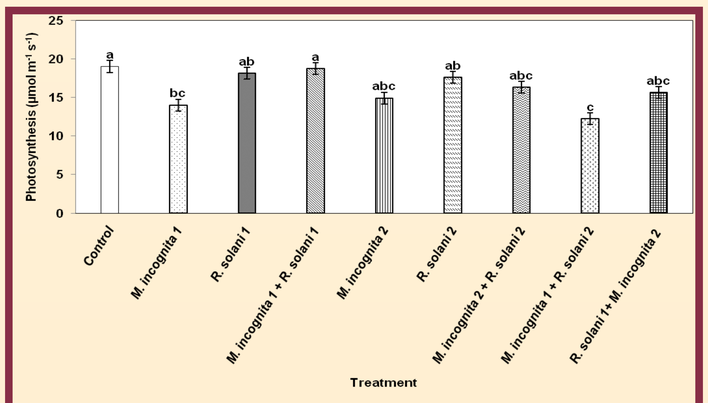

Figure 4. Photosynthesis rates of chile plants (Experiment 4)

Results

- Most comparisons of RKN egg counts and RF were not significant (Fig 1. & Table 1.).
- RKN & *Rhizoctonia* interaction had little or no significant effect on *R. solani* frequency (Fig 2. & Table 2.).
- RKN & *Rhizoctonia* interaction had a minor effect on plant dry weights (Fig 3.).
- The interaction between RKN and *Rhizoctonia* had little or no effect on photosynthesis (Fig. 4).
- The interaction between RKN and *Rhizoctonia* had no significant effect on plant heights and fruit numbers (*data not shown*).
- Higher frequencies of *Rhizoctonia* colonies were observed when the fungus preceded RKN in the sequential inoculation (Table 2).

Table 1. *Meloidogyne incognita* reproduction factor (RF) and egg counts in the sequential experiments.

Treatment	*Meloidogyne incognita*			
	Reproduction factor (RF)		Egg counts/ g dry root [1]	
	Experiment 1	Experiment 2	Experiment 1	Experiment 2
Control	0.1 c	0.3 c	0.10 b	0.94 c
***M. incognita* 1**	267.7 a	348.6 bc	2.35 a	3.85 ab
***R. solani* 1**	0.0 c	0.1 c	0.00 b	0.50 c
***M. incognita* 1+ *R. solani* 1**	194.2 ab	470.7 ab	2.03 a	4.76 a
***M. incognita* 2**	291.1a	796.3 a	1.74 a	1.74 bc
***R. solani* 2**	0.0 c	0.0 c	0.15 b	0.68 c
***M. incognita* 2 + *R. solani* 2**	97.6 bc	633.3 ab	2.00 a	1.97 bc
***M. incognita* 1 + *R. solani* 2**	158.8 ab	578.1 ab	1.99 a	2.44 bc
***R. solani* 1+ *M. incognita* 2**	184.5 ab	354.0 bc	1.75 a	3.38 ab

[1] data presented are log transformations of M. incognita egg count that were then divided by dry root weight of the plant

Table 2. Frequency of recovery of *Rhizoctonia solani* from stem and tap root segments of chile in the sequential experiments.

Treatments	*Rhizoctonia solani* frequency %			
	Experiment 1		Experiment 2	
	Roots	Stems	Roots	Stems
Control	73 NS	88 NS	65 a	80 ab
***M. incognita* 1**	63 NS	45 NS	98 a	45 bc
***R. solani* 1**	75 NS	67 NS	90 a	25 c
***M. incognita* 1 + *R. solani* 1**	80 NS	80 NS	90 a	100 a
***M. incognita* 2**	33 NS	20 NS	60 a	83 ab
***R. solani* 2**	100 NS	60 NS	60 a	20 c
***M. incognita* 2 + *R. solani* 2**	100 NS	100 NS	70 a	75 ab
***M. incognita* 1 + *R. solani* 2**	40 NS	40 NS	0 b	0 c
***R. solani* 1+ *M. incognita* 2**	80 NS	100 NS	78 a	100 a

Conclusion

- The interaction between RKN and *Rhizoctonia* had little or no effect on most measurements**.**
- There was no synergistic effect between RKN and *Rhizoctonia* on chile.

Acknowledgment

To New Mexico Chile Association.