

The GEDUNEM project : Varietal and technical innovations for the sustainable and integrated management of root-knot nematodes in protected vegetable cropping systems

Context

- 50% reduction in the use of pesticides by 2018 (*Plan Ecophyto 2018, the "Grenelle de l'Environnement"*)
- A survey carried out by INRA PACA (*Phytoma Novembre 2010, EPPO Bulletin Avril 2012*) : more than 40% of horticultural farms in the SE of France are infested by root-knot nematodes (*Meloidogyne* species)
- Increased interest of plant breeders to create new varieties and rootstocks resistant to nematodes
- Emergence of adapted nematodes populations, called "virulent", leading to resistance breakdown
- Urgent need to increase the durability of the genetic resources (scarcity of resistance genes available)



Damage caused by root-knot nematodes (*Meloidogyne* spp.) on eggplant, salad and a melon root

Objectives

- Combine *R*-plants and cropping techniques to decrease the pressure of inoculum and reduce the selection pressure of *R*-genes on the pathogens
- Validate, in field agronomic conditions (natural nematodes populations), previous results obtained in laboratory
- Develop and validate strategies for *R*-genes management
- Define predictors of *R*-durability
- Study the effect of innovative strategies on the ecological diversity of plant-parasitic and non parasitic nematodes (soil health approach, environmental impact)
- Assess cropping systems from agronomical point of view
- Explore the viability of the cropping systems and acceptance of innovative strategies by producers, and coordinate horticultural professionals (socio-economic impact)

4 systems studied with growers in Mediterranean region, 2 systems studied in parallel at INRA Alenya



Exemple of systems on a 4-years field experiment

2012				2013				2014				2015																				
A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
salad	Sorghum	Me1 Me3	salad	Me1	Me3	salad	salad	melon	Me1 Me3	salad	salad	Me1	Me3	salad	salad	Me1	Me3	salad	salad	Me1	Me3	salad	salad	Me1	Me3	salad	salad	Me1	Me3	salad	salad	
Susceptible crop	Green manure as control	Peppers as « trap crops »	Susceptible crop	Resistant crop (tomato or pepper)	Resistant crop (tomato or pepper)	Susceptible crop as control	Bad host plants (onion, rugula, german turnip, corn salad)	Susceptible crop	Green manure as control	Peppers as « trap crops »	Susceptible crop	Green manure as control	Peppers as « trap crops »	Susceptible crop	Susceptible crop	Resistant crop (tomato or pepper)	Resistant crop (tomato or pepper)	Susceptible crop	Susceptible crop	Resistant crop (tomato or pepper)	Resistant crop (tomato or pepper)	Susceptible crop	Susceptible crop	Resistant crop (tomato or pepper)	Resistant crop (tomato or pepper)	Susceptible crop	Susceptible crop					

Our final goal: Promoting the durability of crop resistance against nematodes in making people sensitive to 'the directions for use' of the *R*-cultivars and rootstocks, and experimenting new farming systems for the sustainable management of nematodes

Diversity of partners : nematologists, geneticists, ecologists, agronomists from experimental station and on technical systems, technicians, ingeniors and advisors of technical institutes (CTIFL, APREL and GRAB) and of chambers of agriculture, and growers' development structures

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