Studii şi Cercetări	Martie 2015	Biologie	24/1	41-44	Universitatea"Vasile Alecsandri" din Bacău

STUDY OF SOIL DISEASES IN SEEDLING STAGE OF VEGETABLE SEED CROPS

Maria Calin, Tina Oana Cristea, Silvica Ambarus, Creola Brezeanu, Petre Marian Brezeanu, Maria Prisecaru, Iuliana Barbu, Diana Barbu

Key words: *behavioural, vegetable category of multiplication, varieties, species, attack, diseases*

INTRODUCTION

Important diseases that have occurred in seedling stage of vegetable include: *Pythium debaryanum* (Hesse), *Rhizoctonia solani (*Kühn), *Fusarium* spp.*, Phytophthora parasitica* (Dast.).

The best practice for minimizing the incidence of disease in organic vegetable crops is planting high quality disease-resistant cultivars (Jeanine Davis, and all., 2007) and other disease management control practices (Baumann, et all. 2002; Baysal, et all. 2008; Budge and Whipps, 2001; Cao, et all. 2010; de Kroon, 2007; Diab, et all. 2003; Dufour, 2012; Klein, et all. 2011; McKellar, and. Nelson, 2003; Shinmura, 2004; Stapelton, 2012; Veeken, et all. 2012).

The multiplication of seed involves a generation system where seed is multiplied and certified in the following categories: Choice field of typical plant, Study field of descendants, Pre-basic seed (PB)**,** Basic seed (BS)**,** and Certified seed (CS) of the first generation C1. All seed-grown plants species are susceptible to one or more of the soil-borne fungi attack, capable to kill the seedlings.

The plants wilt and die suddenly, sometimes before emerging from the soil (preemergence damping-off) and sometimes after emerging from the soil (post emergence damping-off). Symptoms can include root rot, stem lesions, and general seedling wilt.

Soilborne pathogens often survive for long periods on host plant debris, soil organic matter, or as free-living organisms.

Each vegetable crop may be susceptible to several pathogens. Many soil factors including soil type, texture, pH, moisture, temperature, nutrient levels and ecology affect the activity of soilborne pathogens. Soil-borne pathogens such as *Pythium* and *Phytophthora,* often called water molds, can be particularly destructive if the soil is kept too wet for a long period of time. Although temperature is important, different species of these so-called water molds can infect at different temperatures. *Pythium* is the most common water mold pathogen found on diseased vegetable seedlings and is often associated with excessive nutrition or ammonium toxicity. Damping-off caused by the water molds is less likely to occur during warm dry springs such as the spring experienced so far during 2014.

This is even more important, because the number of resistant varieties available to grower increases and the fungicide resistance continues to challenge effective chemical control with permitted fungicide in organic gardening.

MATERIALS AND METHODS

During 2013 – 2014 years, greenhouse experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the behaviour of plants at vegetable seed category in the seedling stage, to the soil-borne diseases attack. We refer at the following species: tomato, long pepper, round pepper, lovage and tomatoes. Depending on the species and variety were used multiplication specific selection schemes with the following categories: Choice field of typical plant (CA), Study field of descendants (CSD), Pre-basic seed (PB)**,** Basic seed (BS)**,** Certified seed of the first generation (C1) as following:

Experiments on round pepper (Creola), long pepper (Ionel) sweet pepper (Dariana Bac) and tomatoes (Unibac) were performed to compare the category: CA, CSD, PB, BS and C1 that presents soil-borne diseases attack.

Experiments on *Levisticum* (Rarau) were performed to compare CA and C1 that presents soil-borne diseases attack.

The lines and cultivars were sown in the greenhouse on February - March, 2013 and 2014. At 3 – 6 days after emergence the young plants were transplanted in cell plastic trays. No preventive chemicals treatments were applied in order to encourage the development of the natural diseases.

Ratings were based on Pathogenically Rating Scale 0-5 (0 is no disease, 5 is terminally infected). The plants were visually evaluated. The following scale was used:

1. No spots and lesions;
2. 1 - 3 spots or lesions present on stem or leaves;
3. 4 - 8 spots present on stem, leaves and bracts,
4. Lesions and spots present on stem, bracts, leaves, flowers and stems;

5. Collapse of plant.

The observations were accomplished every 10 days during a 30 days period after plantation of young vegetable plants in cell plastic trays.

The attack estimation was determined using the following indicators:

- Frequency of attack (F%),
- Intensity of attack (I%),
- Degree of attack (DA%).

The results obtained will be use in plant breeding activity in order to decrease the number of diseases treatments in the organic agriculture practices of vegetable.

RESULTS AND DISCUSSIONS

The behavior of round pepper, long pepper, sweet pepper, lovage and tomatoes varieties at soil pathogens attack in the CA, CSD, PB, BS and C1 at seedling stage, is shown in table 1.

Table 1. The attack degree of soil-borne diseases in tomato seedling

Category of multi-plication	**Attack**			**Coments**
	F%	**I %**	**DA%**	
1	2	3	4	5
Round pepper - Creola				
CA	1,7	100	1,7	*Susceptible plants after emergence*
CSD	1,3	100	1,3	*Susceptible plants after emergence*
PB	0,7	100	0,7	Tolerant plants at soil pathogen attack
B	0,3	100	0,3	Tolerant plants at soil pathogen attack
C1	0,3	100	0,3	Tolerant plants at soil pathogen attack
Long pepper - Ionel				
CA	0,3	100	0,3	Tolerant plants at soil pathogen attack
CSD	0,3	100	0,3	Tolerant plants at soil pathogen attack
PB	0,1	100	0,1	Tolerant plants at soil pathogen attack
B	0,1	100	0,1	Tolerant plants at soil pathogen attack
C1	0	100	0	
Sweet pepper - Dariana Bac				
CA	3,3	100	3,3	*Susceptible plants after emergence*
CSD	3,3	100	3,3	*Susceptible plants after emergence*
PB	2,1	100	2,1	*Susceptible plants after emergence*
B	2,4	100	2,4	*Susceptible plants after emergence*
C1	2,1	100	2,1	*Susceptible plants after emergence*
Levisticum - Rarau				
CA	0,3	100	0,3	Tolerant plants at soil pathogen attack
C1	0,3	100	0,3	Tolerant plants at soil pathogen attack
Tomatoes				
1	2	3	4	5
CA	1,2	100	1,2	*Susceptible plants after emergence*
CSD	1,0	100	1,0	*Susceptible plants after emergence*
PB	0,5	100	0,5	Tolerant plants at soil pathogen attack
B	0,7	100	0,7	Tolerant plants at soil pathogen attack
C1	1,0	100	1,0	Tolerant plants at soil pathogen attack

F% - frequency; I% - intensity; DA% - degree of attack (%);
CA - choice field of typical plant; CSD - study field of descendants; PB - pre-basic seed; BS - basic seed; C1 - certified seed of the first generation.

As shown in the previous table, the lowest degree of soil pathogen attack was observed in PB, B and C1 round pepper (0,3 - 0,7%). The plants of CA and CSD category after emergence were susceptible at soil pathogen attack (1,3 - 1,7%).

The percentage of healthy plant was 98,3 - 99,7% (fig. 1).

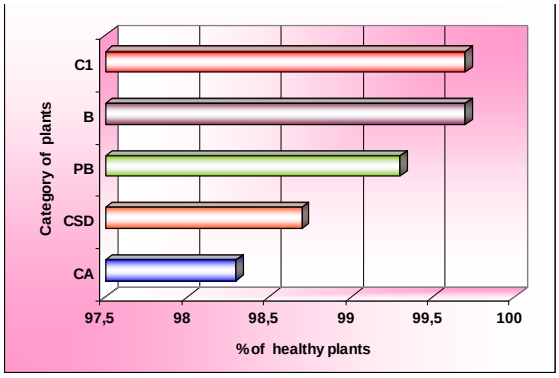

Fig. 1. % healthy plants of round pepper

After transplanting in cell plastic trays, the temperature varied between 8^{O}C (during the night) to 35°C during the day.

Long pepper - Ionel was tolerant to soil pathogens attack (tab. 1, fig. 2).

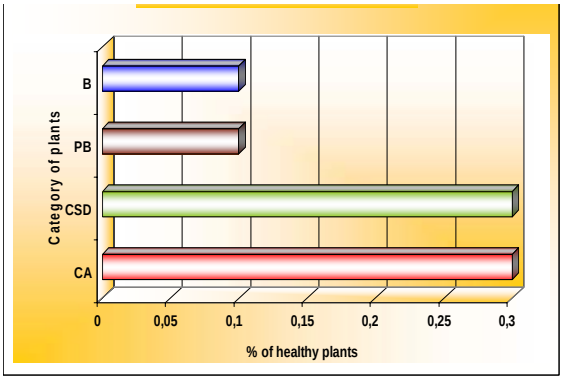

Fig. 2. % healthy plants of long pepper

Data presented (CA - 0.3% CSD - 0.3%, PB - 0.1%, B - 0.1% C1 - 0) shows a better resistance to the

soil pathogens compared with sweet pepper Dariana Bac. The temperature regime during and after plant emergence were similar with sweet pepper.

Sweet pepper showed a light susceptibility to soil pathogens attack after emergence: CA - 3.3% CSD - 3.3%, PB - 2.1% BS - 2.4% C1 - 2.1%. % of health plants is shoved in fig. 3.

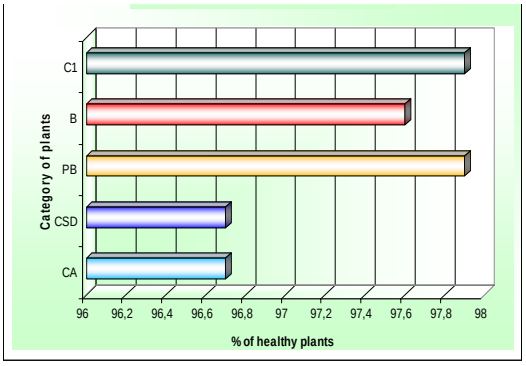

Fig. 3. % healthy plants of sweet pepper

After transplanting in cell plastic trays the pathogen attack stopped.

Lovage Rarau presented a low attack of soil pathogens, behaving as a rustic species, resistant to low temperatures and soil pathogens attack. In both categories of multiplication the attack did not exceed 0.3% (tab. 1).

The tomatoes due to low temperatures during emergence (8-20^{O}C) had an uneven emergence, being infected with soil pathogens (tab. 1, fig. 4). There is the difference between the attack at category of multiplication: CA - 1,2%, CSD - 1,0%, PB - 0,5%, B - 0,7%, C1 - 1,0%.

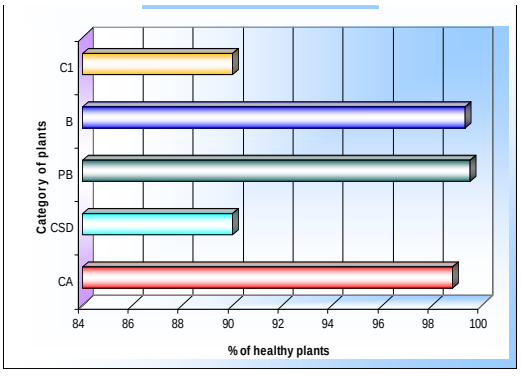

Fig. 4. % healthy plants of tomatoes

CONCLUSIONS

The degree of soil pathogen attack in PB, B and C1 round pepper was between 0,3 - 0,7%. The plants of CA and CSD category after emergence were susceptible to soil pathogen attack (1,3 - 1,7%).

The percentage of healthy plants was 98,3 - 99,7%.

Long pepper - Ionel was tolerant to soil pathogens attack (CA - 0.3% CSD - 0.3%, PB - 0.1%, B - 0.1% C1 - 0)

Sweet pepper showed a light susceptibility to soil pathogens attack after emergence: CA - 3.3% CSD - 3.3%, PB - 2.1% BS - 2.4% C1 - 2.1%. After transplanting in cell plastic trays the pathogen attack stopped.

Lovage - Rarau presented a low attack of soil pathogens, behaving as a rustic species, resistant to low temperatures and soil pathogens attack. In both categories of multiplication the attack did not exceed 0.3%.

The tomatoes due to low temperatures during emergence (8-20^{O}C) had an uneven emergence, being infected with soil pathogens. There is the difference between the attack at category of multiplication: CA - 1,2%, CSD - 1,0%, PB - 0,5%, B - 0,7%, C1 - 1,0%.

ABSTRACT

During 2013 - 2014, greenhouse experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the vegetable categories of multiplication at the soil-borne diseases attack in seedling stage. Experiments on round pepper (Creola), long pepper (Ionel) sweet pepper (Dariana Bac) and tomatoes (Unibac) were performed to compare the category: CA, CSD, PB, BS and C1 that presents soil-borne diseases attack.

Experiments on *Levisticum* (Rarau) were performed to compare CA and C1 that presents soil-borne diseases attack.

The attack on B and C1 generations at round pepper was between 0,3 - 0,7%. The plants of CA and CSD category after emergence were susceptible at soil pathogen attack (1,3 - 1,7%). The percentage of healthy plants was 98,3 - 99,7%.

Long pepper - Ionel was tolerant to soil pathogens attack (CA - 0.3% CSD - 0.3%, PB - 0.1%, B - 0.1% C1 - 0).

Sweet pepper showed a light susceptibility to soil pathogens attack after emergence: CA - 3.3% CSD - 3.3%, PB - 2.1% BS - 2.4% C1 - 2.1%. After transplanting in cell plastic trays the pathogen attack stopped.

Lovage - Rarau presented a low attack of soil pathogens, behaving as a rustic species, resistant to low temperatures and soil pathogens attack. In both categories of multiplication the attack did not exceed 0.3%.

The tomatoes due to low temperatures during emergence (8-20^{O}C) had an uneven emergence, being infected with soil pathogens. There are differences between the attack depending on the category of multiplication: CA - 1,2%, CSD - 1,0%, PB - 0,5%, B - 0,7%, C1 - 1,0%.

REFERENCES

1. BAUMANN D.T., BASTIAANS L., and KROPFF M.J., 2002 - Intercropping system optimization for yield, quality, and weed suppression combining mechanistic and descriptive models. Agronomy Journal 94: 734–742. (https://www.agronomy.org/publications/aj/abstracts/94/4/734) (verified 20 June, 2012);
2. BAYSAL F., BENITEZ M.S., KLEINHENZ M.D., MILLER S.A., and MCSPADDEN GARDENER B., 2008 - Field management effects on damping-off and early season vigor of crops in a transitional organic cropping system. Phytopathology 98: 562–570. (http://dx.doi.org/10.1094/PHYTO-98-5-0562) (verified 20 June, 2012);
3. BUDGE S. P., and WHIPPS J.M., 2001 - Potential for integrated control of *Sclerotinia sclerotiorum* in glasshouse lettuce using *Coniothyrium minitans* and reduced fungicide application. Phytopathology 91: 221–227. (http://dx.doi.org/10.1094/PHYTO.2001.91.2.221) (verified 20 June, 2012);
4. CAO C., PARK S., and McSPADDEN GARDENER B.B., 2010 - Biopesticide controls of plant diseases: Resources and products for organic farmers in Ohio [Online]. Available at: http://ohioline.osu.edu/sag-fact/pdf/0018.pdf (verified 20 June, 2012);
5. KROON H., 2007 - How do roots interact? Science 318: 1562–1563. (Available online at http://dx.doi.org/10.1126/science.1150726) (verified 20 June, 2012);
6. DIAB H., HU S., and BENSON D.M., 2003 - Suppression of *Rhizoctonia solani* on impatiens by enhanced microbial activity in composted swine waste amended potting mixes. Phytopathology 93: 1115–1123. (Available online at: http://dx.doi.org/10.1094/PHYTO.2003.93.9.1115) (verified 20 June, 2012);
7. DUFOUR R., ATTRA Biorationals: Ecological Pest Management Database [Online]. Available at: http://attra.ncat.org/attra-pub/ biorationals/ (verified 20 June, 2012);
8. JEANINE DAVIS, GARDNER R., DUFFIE LAURA, 2007 - Opportunities with Tomatoes and Organics. Mountain Horticultural Crop Research and Extension Centre;
9. KLEIN E., KATAN J. and GAMLIEL A., 2011 - Soil suppressiveness to Fusarium disease following organic amendments and solarization. Plant Disease. 95: 1116–1123. (Available online at: http://dx.doi.org/10.1094/PDIS-01-11-0065) (verified 20 June, 2012);
10. McKELLAR M.E. and NELSON E.B., 2003 - Compost induced suppression of *Pythium* damping-off is mediated by fatty-acid metabolizing seed-colonizing microbial communities. Applied and Environmental Microbiology 69: 452–460. (Available online at: http://dx.doi.org/10.1128/AEM .69.1.452-460.2003 (verified 20 June, 2012);
11. SHINMURA A., 2004 - Principle and effect of soil sterilization method by reducing redox potential of soil. Pytopathological Society of Japan Soilborne Disease Workshop Report, 22: 2–12;
12. STAPELTON J.J., 2012 - Passive solar disinfestation of soil, pests and structural materials [Online]. Agriculture and Natural Resources, University of California. The Regents of the University of California. Available at: http://ucanr.org/sites/ Solarization/ (verified 1 Aug 2012);
13. VEEKEN A.H.M., BLOK W.J., CURCI F., COENEN G.C.M., TEMORSHUIZEN A.J., and HAMELERS H.V.M., 2005 - Improving quality of composted biowaste to enhance disease suppressiveness of compost-amended, peat based potting mixes. Soil Biology and Biochemistry 37: 2131–2140. (Available online at http://dx.doi.org/10.1016/j.soilbio.2005.03.018) (verified 20 June, 2012).

AUTHORS' ADDRESS

CALIN MARIA, CRISTEA TINA OANA, AMBARUS SILVICA, BREZEANU CREOLA, BREZEANU PETRE MARIAN - Vegetable Research and Development Station Bacau, Calea Barladului, No. 220, Bacau, Romania, e-mail: sclbac@legumebac.ro;

PRISECARU MARIA - „Vasile Alecsandri", University of Bacau, Faculty of Science, Department of Biology, Marasesti Street, no. 157, Bacau, Romania, e-mail: prisecaru_maria@yahoo.com;

BARBU IULIANA, BARBU DIANA - Farmacia Naturii, Strada George Bacovia 32, Bacău, Romania, e-mail: iuliabarbu@farmacianaturii.ro.