ASPECTS REFERRING TO SUNFLOWER BACTERIAL BLIGHT IN ROMANIA, A DISEASE CAUSED BY PSEUDOMONAS SYRINGAE PV.HELIANTHI

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SUMMARY

In 1981 we could observe that some sunflower crops in Moldavia are heavily affected by leaf blight, petiole necrosis and cracking. Following the investigations, we established that the ethyologic agent implied in these symptoms is Pseudomonas syringae pv.helianthi (Kawamura) Young, Dye et Wilkie.
Further investigations led to the conclusion that this bacterium is seed borne and the rate under glasshouse conditions varies between 13-21% and 14% in the field thus ensuring its spreading both in time and space.
The observations performed in sunflower crops to be bred (varieties, lines, hybrids) at the Research Institute for Cereals and Technical Crops-Fundulea in respect of bacterial blight attack mentioned that out of 294 lines, varieties and hybrids under study, only two lines did not show any bacterial blight attack. The rest showed an attack level of 4 and 31%.
Climatic conditions play an important part in the attack level severity.

INTRODUCTION

In 1934 in Japan, Kawamura (cf.Neergard, 1977) described a sunflower disease which caused brown spots and later became necrotic. The disease was assigned to Pseudomonas helianthi synonim to Pseudomonas syringae pv.helianthi. Later on, the disease was observed in Etyopia, Mexic, India and Canada. In Europe, sunflower bacterial blight has not been observed until 1981, when Stăncescu and Severin described it in Romania with the competition crops, of sunflower hybrids from the Agricultural Station Podul Iloaiei - Moldavia.
Disease symptoms : on young leaves the disease appears as irregular small spots, 1-2 mm, brown colour sorrounded by a lighter halo. In time the spots enlarge and reach 5-10 mm, they are angular, dark brown to black, with exudate on the leaf lower side. When we have a heavy attack the spots cover the limb and it looks like a blight.

The disease manifests on petioles, too, as brown spots and cracks. As a result of pathogenity test, of morphological and cultural characters and of the biochemical tests, too, this sunflower disease in Romania is caused by Pseudomonas syringae pv.helianthi (Stăncescu and Severin, 1983) and it is widely spread in the past years all through the sunflower cropping areas of Romania.

Due to the scarcety of studies developed for this pathogen which causes sunflower bacterial blight, our works aimed at the role of seed in transmitting bacterium as well as the behaviour of hybrids and parental lines which are used for breeding in natural infections with Pseudomonas syringae pv. helianthi.

MATERIAL AND METHODS

Under glasshouse conditions, two experiments were run, with 2 variants each :

Experiment I - variant 1 - seed treated by vacuum infiltration with sterile water (SW)

- variant 2 - seed inoculated by vacuum infiltration with bacterial suspension of Pseudomonas syringae pv.helianthi (titre 10^9 UFC/ml).

Experiment II - variant 1 - seed watered with SW, from seed planting to emergence

- variant 2 - seed treated by watering with inoculum of Pseudomonas syringae pv. helianthi.

Each variant had 6 replications, 600 seeds/variant of LC_2 line.The soil was sterile and the observations in respect of the bacterial blight severity were done on true leaves, 25 days after emergence. Under field conditions an experiment (III) was set up similar to the glasshouse trial; each variant had 6 replications with 600 seeds/variant.

Experiment III - variant 1 - seed treated by vacuum infiltration with SW

- variant 2 - seed treated by vacuum infiltration with bacterial suspension of Pseudomonas syringae pv. helianthi titre 10^9 UFC/ml.

When plants were 40 cm high, that is when the 3^{rd} leaf developed, observations were done in respect of the bacterial blight symptoms frequency. In order to know the behaviour of breeding material to

the pathogen, observations were done in the breeding and competition fields from ICCPT-Fundulea on natural infection with Pseudomonas syringae pv. helianthi; during 1987-1988, 294 lines and 20 hybrids and cvars. were under observation. Influence of lines, hybrids and cvars. genotype on disease level was considered estimating the attack frequency and intensity with 60 plants/variant. Based on these data the attack level was calculated.

RESULTS

The experimental results were statistically interpreted by analysis of mean variance; the assurance coefficient is positive when its value is 2 or higher.

With inoculation by vacuum infiltration with Pseudomonas syringae pv.helianthi suspension transmission rata is 18%, compared with the control which is 2.1% (Table 1). In experiment II, variant 2 (Table 2), the maximum transmission rata is 28%.

Under field conditions (Table 3), in variant with bacteria inoculated seeds, the transmission rata is 14% compared with 6% in the control.

The cvars. and hybrids under study behaved differently towards the bacterial attack (Table 4) most of them showing low attack values most of the 294 parental lines showed a satisfactory resistance against Pseudomonas syringae pv.helianthi attack, almost all of them being around 4.1-15%.

DISCUSSIONS

Generally, in literature it is demonstrated that seedborne transmission rata of phytopathogenic bacteria with cropping plants is around 1-15%. Thus, for Pseudomonas syringae pv. phaseolicola and Xanthomonas campestris pv.phaseolicola it is 10% (Taylor,1970 -cf. Neergard,1977); with Erwinia stewarti in maize, it is 2% (Pepper -cf.Neergard, 1977) and with Clavibacter nebraskense it is 1% (Schuster et al., 1973 - cf.Neergard,1977). Brinkerhoff and Hunter (cf.Neergard, 1977) obtained a transmission rata of 24% with Xanthomonas campestris pv. malvacearum inoculated on cotton seed.

Our experiments with Pseudomonas syringae pv.helianthi, artificial inoculation showed a transmission rata up to 28% under glasshouse conditions and up to 20% in the field.

It is obvious, that the bacterium is seedborne and therefore it assures its survival, and also the seed assures bacterium sprea-

Table 1 - Frequency of bacterial blight symptoms on sunflower leaves from inoculated seeds, grown on sterile ground, in glasshouse

Variant	Replication						Mean	Mean deviation ±	Assurance coefficient
	1	2	3	4	5	6			
Control-sterile water inoculated	0.6o	1.5o	0.4o	1.1o	0.3o	2.1o	1	0.62	
*Sample-*Pseudomonas syringae* pv.*helianthi* inoculated	18.oo	8.oo	17.2o	8.8o	11.oo	15.oo	13.oo	4.o8	2.91

* - inoculation by vacuum infiltration method

Table 2 - Frequency of bacterial blight symptoms on sunflower leaves from seeds watered with *Pseudomonas syringae* pv.*helianthi* suspension

Variant	Replication						Mean	Mean deviation ±	Assurance coefficient
	1	2	3	4	5	6			
Control-seeds watered from planting with water	1.8o	2.4o	3.6o	1.4o	0.7o	2.1o	1.7o	0.76	
Sample-water from planting with *Pseudomonas syringae* pv. *helianthi* suspension	21.oo	13.oo	19.oo	25.oo	28.oo	22.oo	21.16	6.86	2.17

Table 3 - Frequency of bacterial blight symptoms on sunflower leaves from inoculated seeds, in the field

Variant	Replication						Mean	Mean deviation ±	Assurance coefficient
	1	2	3	4	5	6			
Control-sterile water	9.oo	13.oo	3.oo	4.oo	2.9o	4.1o	6.oo	3.65	
*Sample-*Pseudomonas syringae* pv. *helianthi*	15.3o	12.7o	9.8o	2o.2o	16.3o	9.7o	14.oo	3.57	1.56

* - Inoculation by vacuum infiltration method

Table 4 - Behaviour of 20 sunflower hybrids and cvars. toward *Pseudomonas syringae* pv. *helianthi* attack

No.	Hybrid or cvar.	Frequency F%	Intensity I %	A.L. $\frac{F \times I}{100}$
1.	Fundulea 52	18,o	22,2	4
2.	Fundulea 53	38,o	39,o	15
3.	Fundulea 82	45,6	43,8	2o
4.	Fundulea 80	37,o	4o,5	15
5.	Fundulea 90	69,o	36,2	25
6.	Fundulea 206	31,o	12.9	4
7.	Fundulea 59	37,o	1o,8	4
8.	Fundulea 3o1	69,5	21,5	15
9.	Fundulea 3o5	4o,2	9,9	4
1o.	Fundulea 3o8	25,4	15,7	4
11.	Felix	33,o	45.4	15
12.	Super	27,o	14.8	4
13.	Select	21,o	19,o	4
14.	HS-55	69.2	43,35	3o
15.	HS-7o	4o.5	49,3	2o
16.	HS-866	51,4	48,6	25
17.	HS-173	16,2	24,6	4
18.	HS-175	33,o	45,4	15
19.	HS-167	62,9	39.7	25
2o.	Record	69.5	64.7	45

ding both in time and space.

It could be concluded that out of the 294 parental lines, two were quite resistant (A.L.=0.076%) and 93 lines were moderate resistant (up to 4%) so that this genetic material can be successfully used for breeding.

REFERENCES

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