

## RESEARCH ON THE BEHAVIOR OF SOYBEAN VARIETIES TO BACTERIAL ATTACK CAUSED BY *Pseudomonas savastanoi* pv. *glycinea*

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### Abstract

Bacterial burning is a widespread disease in soybeans, which occurs most frequently under cold and wet climate. The objective of this research was to estimate the degree of attack of bacterial burn in soybeans. The goal was to have the necessary information in making decisions applying for phytosanitary treatments.

Twenty-five varieties were tested: Columna, Condor, Daciana, Diamant, Eugen, Felix Novisad, Felix PR, Fortezza, Galina, Julija, Merkur, Onix, Perla, PR 20, Procera 12-2, Rubin, Sultana, Sponsor, Tea, Triumf Fundulea, Triumf Novisad, Venera, Victoria and Zora, and observations were made under natural contamination on the 13<sup>th</sup> of July and August 28, 2013.

The research was conducted in the experimental fields without irrigation, in I. C. Bratianu city, county of Tulcea. From this paper it can be concluded that one of the main limiting factors in soybean crop is found in a very large extent of the phytosanitary nature, like the attack of the bacteria *Pseudomonas savastanoi* pv. *glycinea*. The degree of infection varied from one variety to another.

The study was developed during the proces of doctoral studies.

**Key words:** attack, disease, bacterial burning, soybean, cultivars.

### INTRODUCTION

Native to the eastern half of northern China, where it was reported around the eleventh century BC (Shang Dynasty), soybeans were introduced and expanded in culture in Romania, much later, since 1911 (Dencescu and Popa, 1973).

Widely cultivated soybean is susceptible to diseases, the most common being the bacterial ones (Kennedy and Tachibana, 1973; Jagtap and Dey, 2012).

In 1908, Smith named „*Bacterium savastanoi*” the bacterium which causes knots on several plants belonging to the family *Oleaceae*. This species was later transferred to the genus *Pseudomonas* as “*Pseudomonas savastanoi*” by Stevens.

In 1978, Young et al. proposed a new nomenclature and classification for plant-pathogenic bacteria and introduced the concept of pathovar, and all fluorescent oxidasenegative *Pseudomonas* species (except *Pseudomonas viridiflava*) were considered to

be members of a single species, *Pseudomonas syringae*, which had a number of pathovars.

Thus, *Pseudomonas savastanoi* became *Pseudomonas syringae* pv. *savastanoi*.

*Pseudomonas savastanoi* pv. *glycinea* (Janse, 1982; Gardan et al., 1992) synonymous *Pseudomonas syringae* pv. *savastanoi* (Coerper, 1919) Young, Dye et Wilkie (1978) is a biotic factor, which plays a limiting role soybeans under favorable conditions, the attack decreasing the production.

*Pseudomonas savastanoi* pv. *glycinea* (Janse, 1982) is a *Proteobacteria*, class: *Gamma Proteobacteria*, order: *Pseudomonadales*, family: *Pseudomonadaceae*, a Gram-negative, rod-shaped, aerobic and motile possessing several polar flagella (Garrity et al., 2005).

Under certain environmental conditions, serious economic losses can occur.

The research was conducted in the experimental fields without irrigation, in I. C. Brătianu city, county of Tulcea.

The results of this paper are part of doctoral thesis.

The objective of this research was to estimate the degree of attack of bacterial burning in soybeans.

## MATERIALS AND METHODS

Twenty-five cultivars were tested: Columna, Condor, Daciana, Diamant, Dukatt, Eugen, Felix Novisad, Felix PR, Fortezza, Galina, Julija, Merkur, Onix, Perla, PR 20, Procera 12-2, Rubin, Sultana, Sponsor, Tea, Triumf Fundulea, Triumf Novisad, Venera, Victoria and Zora.

Visual observation is the fastest method to identify a disease based on signs and symptoms shown by infected soybean plants. This method involves a high degree of subjectivity, depending largely on the diagnosing person's level of knowledge.

Scouting for *Pseudomonas savastanoi* pv. *glycinea* attack has a particular importance in soybean to establishing the need for chemical treatments during the vegetation season.

The attack value is represented by frequency (F%), intensity (I%) and attack degree (AD%).

Frequency is the percentage of plant attacked out of 100 examined soybean plants.

Intensity indicates the degree to which the soybean plant is attacked under examination. Intensity was noted directly in percentage.

The attack degree present severity of bacterial burning in the crop and was calculated using the frequency (disease incidence) and intensity (severity).

Attack degree was calculated using the formula:

$$A.D. = \frac{F\% \times I\%}{100}$$

The experimental block surface was placed in three repetitions.

Observations were made under natural contamination on the 13<sup>th</sup> of July, at growth stage R1 and August 28, 2013, at growth stage R4 (Fehr et al., 1971).

## RESULTS AND DISCUSSIONS

Diseased plants manifested only lesions on the leaves. The lesions of bacterial burning usually begin as small, angular and yellow.

Lesions progress in color from yellow to light brown and eventually to a dark reddish brown. Older lesions have a dark center surrounded by a water-soaked margin and a yellow halo.

Angular lesions may enlarge and merge, producing large, irregular dead areas in the leaf. With wind and rain these large dead areas drop out or tear away, giving the leaf a ragged appearance (Figure 1).



Figure 1. Ragged appearance of foliage resulting from bacterial burning

### Scouting in growth stage R1.

The data presented in Table 1 show the results on the behaviour of some soybeans cultivars to the pathogen *Pseudomonas savastanoi* pv. *glycinea* under natural contamination.

It is noteworthy that there was no attack of *Pseudomonas savastanoi* pv. *glycinea* in Sponsor cultivar during years 2013.

The cultivars Dukatt, Eugen, Julija, Perla and Procera 12-2 showed no symptoms of bacterial burning at first scouting.

At the same scouting stage cultivars Onix and PR 20 showed the lowest attack degree (0.01%) *Pseudomonas savastanoi* pv. *glycinea*.

Low values of the attack degree presented the cultivars Triumf Novisad (0.15%), Sultana (0.25%), Condor and Diamant (0.5%).

Table 1. Scouting the attack of bacterial burn on tested soybean cultivars investigated (I. C. Brătianu city, county of Tulcea, 2013)

Cultivars	Scoring growth stage					
	R1			R4		
	F <sup>1</sup> (%)	I <sup>2</sup> (%)	AD <sup>3</sup> (%)	F (%)	I (%)	AD (%)
Columna	10	10	1	70	15	10.5
Condor	10	5	0.5	10	5	0.5
Daciana	33.3	15	5.02	95	20	19
Diamant	10	5	0.5	80	30	24
Dukatt	0	0	0	30	2	0.6
Eugen	0	0	0	95	35	33.25
Felix Novisad	30	20	6	30	25	7.5
Felix PR	21.6	20	4.3	95	35	33.25
Fortezza	31.6	10	3.16	80	5	4
Galina	80	45	36	90	65	58.5
Julija	0	0	0	80	5	4
Merkur	10	10	1	85	24	20.4
Onix	1	1	0.01	65	3	1.95
Perla	0	0	0	100	40	40
PR 20	1	1	0.01	10	1	0.1
Procera 12-2	0	0	0	5	5	0.25
Rubin	20	10	2	85	10	8.5
Sultana	5	5	0.25	95	30	28.5
Sponsor	0	0	0	0	0	0
Tea	33.3	9	3.0	95	15	14.25
Triumf Fundulea	13.3	25	3.32	35	35	12.25
Triumf Novisad	3	5	0.15	15	5	0.75
Venera	15	10	1.5	45	30	13.5
Victoria	20	5	1.0	40	5	2
Zora	45	5	2.25	100	35	35

<sup>1</sup>F (%) = Frequency; <sup>2</sup>I (%) = Intensity; <sup>3</sup>AD (%) = Attack degree.

Galina cultivar showed at first scouting the highest attack degree of bacterial burning (36%).

#### Scouting at growth stage R4.

In the second scouting stage frequent plants attacked by bacterial burning ranged from 0% (Sponsor cultivar) to 100% (Perla and Zora cultivars), and the intensity of the attack ranged from 0% (Sponsor cultivar) to 65% (Galina cultivar).

Like in the case of first scouting, Galina cultivar showed the highest attack degree of bacterial burning (58.5%) at this growth stage also.

Perla and Eugen cultivars had a spectacular evolution to *Pseudomonas savastanoi* pv. *glycinea* attack from the first scouting to the second one. Thus, if the first scouting no attack was recorded, it reached 33.25% for Eugen cultivar and 40% for Perla cultivar in the growth stage R4.

Very low values of the attack degree of bacterial burning in both two scouting had PR 20 (0.1%), Procera 12-2 (0.25%), Condor (0.5%), Dukatt (0.6%) and Triumf Novisad (0.75%) cultivars.

In our opinion, a good behavior against *Pseudomonas savastanoi* pv. *glycinea* attack manifested Victoria (2%), Fortezza and Julija cultivars with 4% attack degree.

If Galina cultivar was very sensitive to *Pseudomonas savastanoi* pv. *glycinea*, it can be said that Eugen (33.25% attack degree), Felix PR (with the same percentage of attack) and Sultana (28.5%) cultivars cultivars were sensitive.

Mention that in the case of Galina, Dukatt, Fortezza and Venera cultivars symptoms of bacterial burning occurred on the lower leaves of the plant floor. The other cultivars had symptoms on the leaves of the upper floor.

## CONCLUSIONS

Bacterial burning in soybeans was limited to leaves.

Sponsor cultivar showed that was not susceptible to *Pseudomonas savastanoi* pv. *glycinea* during years 2013.

Galina cultivar showed the highest attack degree of bacterial burning during years 2013. Very low values of the attack degree of bacterial burning were registered for PR 20 (0.1%), Procera 12-2 (0.25%), Condor (0.5%), Dukatt (0.6%) and Triumf Novisad (0.75%) cultivars.

Galina, Dukatt, Fortezza and Venera cultivars symptoms of bacterial burning occurred on the lower leaves of the plant floor while the other cultivars had symptoms on the leaves of the upper floor.

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