

## Spread and Manifestations of Pear Rust (*Gymnosporangium sabine*) on Different Pear Cultivars

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### Abstract

The paper presents an investigation aimed at identifying the zones with regular incidence of pear rust. Such zones are appropriate for testing of cultivar susceptibility to the pathogen and fungicidal efficacy. The investigation data indicate that the disease is common on the monitored pear trees grown in the skirts of the north slopes of mountain Vitosha. Further away from the mountain, in Sofia Valley, the rate of pear rust attack is lower or the infection is missing.

**Key words:** pear rust, *Gymnosporangium sabinae*, *Rostellia cancellata*

### Резюме

Статията представя изследване, насочено към установяването на зони, където болестта крушова ръжда се явява често. Такива зони са подходящи за изпитване на сортовата устойчивост, а така също и на фунгицидната ефикасност срещу патогена. Данните от изследването показват, че в подножието на северните склонове на Витоша болестта се явява масово по наблюдаваните дървета. В по-отдалечени от планината райони на Софийското поле нападението отслабва или няма инфекция.

### Introduction

The pear is a fruit species for whose growth there are appropriate conditions in Bulgaria. Pear gardens can provide yields whose quality and quantity are sufficient for the needs of the domestic market and for export (Iliev *et al.*, Kitanov, 1986). The data for harvested land, however, indicate that the pear gives way not only to the apple but also to the rest of basic seed and stone fruit species. One of the reasons is the spread of diseases which cause pear trees to wither or perish (Aldwinckle, 1997; Borovinova, 2003). Thus the pear has become unattractive to owners of large orchards.

In the small non-market farms and orchards, however, the pear trees are not rare. Traditionally various cultivars are grown. The variety provides fresh fruits from the middle of the summer till the beginning of the winter. A part of the yield is intended for processing - drying, cooking of compote, distilling alcohol, etc. These possibilities are undoubtedly an advantage, which can be utilized mostly by small scale farmers.

In the period between August 2014 and August 2015, a research was done to establish zones with pear trees suffering from pear rust (Fig. 1). The investigation was part of a bigger research



**Fig. 1.** Symptoms of pear rust on leaf lamina

project on economically important diseases on fruit species in Bulgaria. It was aimed at testing the cultivar resistance and to the fungicidal efficacy against pathogens.

### Materials and methods

An investigation was carried out in the regions on the territory of Sofia, Capital municipality and in Kostinbrod municipality (Table 1).

Small orchards, country house gardens and plots among residential and public buildings with planted pear trees were visited. Subject of the supervision were trees which had not been treated with fungicides.

The spread of the disease was traced out on the leaves of the common and standard Bulgarian cultivar Popska (synonyms Pastornice, Curé,

**Table 1.** Spread and manifestations of pear rust in some parts of Sofia' field.

Municipality / district / quarter	Location latitude, longitude	Cultivar	Rate of attack
Capital / Pancharevo	42°35'32.71" N; 23°24'48.38" E	Popska	1
		summer pear	3
Capital / Vitosha, close to Vrana residency	42°37'59.57" N; 23°26'19.83" E	Popska	2014 - 3
			2015 - 3
Vitosha Dragalevtsi quarter	42°37'22.07" N; 23°19'07.71" E	Popska	6
		Passe Crassane	6
Vitosha Boyana quarter	42°38'50.66" N; 23°15'53.09" E	Popska	2
Vitosha Boyana quarter	42°39'29.05" N; 23°16'02.26" E	Passe Crassane	5
Studentski University of forestry	42°39'08.83 N; 23°21'32.65" E	unknown small fruit variety	1
Slatina Institut of microbiology	42°40'33.05" N; 23°22'06.66" E	unknown summer cultivar	1
Slatina, close to Romanian embassy	42°41'13.32" N; 23°21'10.60" E	Popska, summer unknown	0
Ovcha kupel New Bulgarian university	42°40'09.14" N; 23°15'34.25" E	Popska	1 - 2
Novi Iskar Kurilo quarter	42°49'43.01" N; 23°21'14.30" E	Passe Crassane	0
		unknown summer	0
Municipality Kostinbrod Distict № 1	42°49'06.87" N; 23°13'57.85" E	Popska	0
District № 2	42°48'11.98" N; 23°11'03.02" E	unknown wild small fruit variety	1*

**Fig. 2.** Pear cultivar Popska (synonyms: Pastornice, Curé, Pastorenbirne, Belle de Berry, Bon - papa)

Pastorenbirne, Belle de Berry, Bon - papa) (Fig. 2) as well as cultivar Passe Crassane (synonym Edel Crassane) and some pear trees with unspecified cultivar affiliation.

When the disease is present the rate of attack on the leaves of the trees is determined on a scale (0 - 5) proposed by Lazarov *et al.* (1979) and Yoncheva *et al.* (1979) as follows: 0 - healthy leaves; 1 - single small spots; 2 - up to 5% of leaves with spots; 3 - up to 10% of leaves with spots; 4 - up to 25% of leaves with spots; 5 - up to 50% with spots. For the specifying of the present research to the scale was added rate 6 - above 50% of leaves are spotted.

The injuries on the leaf lamina were determined by means of HP Scanjet 4850 desktop scanner. Canon Powershot SX20 IS and Panasonic DMC TZ1 digital cameras were used. The background was a white sheet of paper. Measuring the area of digital image was done by Adobe Photoshop. In our

case the software product was used to list the pixels on which the image was located (Kostadinov and Moteva, 2014).

## Results and discussion

The disease was found in five Sofia districts: Vitosha, Pancharevo, Studentski, Slatina, Ovcha kupel" and in Kostinbrod municipality (Table 1). The trees in Dragalevtsi and Boyana were the most severely affected, where almost all leaves

manifested symptoms characteristic of the disease. Besides, some of the leaves manifested two and more spots on the lamina.

In Slatina and Ovcha kupel, symptoms were rarely observed or were almost missing. Only one spot was recorded in Kostinbrod municipality. No symptoms were observed on the trees in district Novi Iskar.

The damage recorded at the end of September 2014 on the leaves of Popska tree grown in location

**Table 2.** Manifestation of pear rust on the leaves of different pear cultivars grown in different locations

Number of samples	Gauged leaf area cm <sup>2</sup>	Part of the injury cm <sup>2</sup>	Number spots on the leaves	Average area of one spot cm <sup>2</sup>
<b>Cultivar Popska (30.09.2014) location: avenue „Tsarigradsko shose” (close to Vrana residency)</b>				
14	42,63	1.38	20	0.9
Ratio 3.24%				
<b>Cultivar Popska (04.08.2015) location: avenue „Tsarigradsko shose” (close to Vrana residency)</b>				
9	22.60	0.06	18	0.39
Ratio 2.65%				
<b>Cultivar Popska (06.08.2015) Location: district Vitosha, quarter Dragalevtsi</b>				
7	31.10	0.78	19	0.303
Ratio 2.51%				
<b>Cultivar Passe Crassane (06.08.2015) Location: district Vitosha, quarter Dragalevtsi</b>				
9	40.29	3.09	53	0.53
Ratio 7.62%				
<b>Cultivar Passe Crassane (?) (06.08.2015) Location: district Vitosha, quarter Boyana</b>				
10	34.83	1.32	23	0.537
Ratio 3.85%				
<b>Unknown summer pear (06.08.2015 г.) Location: district Vitosha, quarter Dragalevtsi</b>				
10	17.45	0.74	14	0.495
Ratio 4.24%				
<b>Uunknown small fruit pear (06.08.2015) Location: district Studentski, University of forestry</b>				
3	5.05	0.08	3	0.074
Ratio 1.58%				
<b>Unknown summer pear (04.08.2015) Location: district Slatina, Institute of microbiology</b>				
9	19.84	0.64	9	0.614
Ratio 3.23%				
<b>Unknown summer pear (04.08.2015) Location: district Pancharevo</b>				
10	31.41	0.67	13	0.519
Ratio 2.13%				

42°37'59.57" N; 23°26'19.83" E (close to Vrana residency - Table 2) was more severe than the damage observed in the beginning of August 2015. This is probably due to the longer period for development of the lesions. At the same time (4 - 6 August) there was not significant difference from the tree grown in Dragalevtsi. This may be a result of similar levels of resistance to the pathogen.

The most severe manifestation was recorded on the leaves of cultivar Passe Crasane grown in Dragalevtsi and on the tree resembling the mentioned cultivar grown in Boyana.

The comparison between the injuries on the leaves of summer pears shows the highest level in Dragalevtsi quarter. However, further investigations have to be implemented for clarifying the cultivar affiliation of every one pear tree.

The small fruit pear trees observed in Sofia (Studentski) and Kostinbrod municipality seem to be resistant to *Gymnosporangium sabinae* Dickson (syn. *G. fiscum*), *Basidiomycetes* (*Rostellia cancellata* Rebentish, *Uredinales*.)

Generally the results outline the districts near by mountain Vitosha as suitable for investigations for resistance of cultivars to pear rust. There is a constant infectious background due to the presence of *Juniperus* species which are natural host plants of *G. sabine* (Aldwinckle, 1997; Borovinova, 2003; Shishkova, 1960; Tsanova *et al.*, 1979)<sup>1</sup>.

The instructions for fungicide control against pear rust (*G. sabine*) are the same with those recommended against apple scab *Venturia inaequalis* Cooke (Winter) (anamorph *Spylocea pomi* Fr. et Fr., syn. *Fusicladium dendriticum* Wallr. (Fuckel) and pear scab *V. pirina* Bret. (syn. *Endostigma pirina* Sydow, *Ascomycetes*) (anamorph *Fusicladium pirinum* Libert (Fucke) (Aldwinckle, 1997; Borovinova, 2003). However, the suitability of such treatment is questionable because systemic fungicides permitted in Bulgaria for control of *V. inaequalis* have not been tested for efficacy against *G. sabine*.

## Conclusion

In the Sofia Valley pear rust is spread in districts of municipalities of the Capital and the town of Kostinbrod. The level of attack by the pathogen is higher in locations near the northern slopes of the mountain Vitosha than the level recorded in other locations not so close to the mountain. This

is due to the presence of *Juniperus* species which are the main natural host plants of the *G. sabine*. These circumstances may facilitate the research to determine the resistance of pear cultivars and the efficacy of different fungicides against *G. sabine*.

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<sup>1</sup>See also Administration of Park Vitosha  
<http://park-vitosha.org>