

OCCURRENCE OF SUNFLOWER DISEASES IN BULGARIA, ROMANIA, HUNGARY, AND YUGOSLAVIA

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INTRODUCTION

Bulgaria, Romania, Hungary, and Yugoslavia belong to the group of Danubian and Balkan countries. They are situated between 40° and 50° northern geographic latitude, having mostly continental or moderately continental climates. These neighbouring countries have numerous similarities but also some differences in respect to their sunflower production. Sunflowers are grown mostly in the flatlands of the Pannonian Plain and around the Danube and other smaller rivers, on fertile soils; a smaller portion of sunflower plots is situated in hilly regions, on poorer soils. Thanks to these favourable circumstances it may be said with certainty that these four countries occupy the region of the most intensive sunflower production in Europe.

Besides these similarities, there are also some prominent differences. For example, Bulgaria mostly grows sunflower varieties; in Romania, 60% of sunflower plots are under hybrids and 40% under varieties; in Hungary, domestic varieties were grown until 2—3 years ago but these varieties are now being rapidly replaced by hybrids; Yugoslavia grows hybrids on 100% of sunflower plots. Besides these differences in the structure of assortment, there are also other differences, e.g., in climatic, edaphic, and agrotechnical factors which in turn are reflected on sunflower growing and yields in each four countries.

The previous paragraphs contain merely passing remarks on similarities and differences in sunflower production among these countries. The objective of this paper is to review similarities and differences in the occurrence of pathogens in sunflower. Pathogens fall into the group of major regulators of sunflower seed and oil yields.

METHOD

This report is based on the reports written by the participants in the FAO subnetwork "Sunflower Disease Mapping in Europe" for the last 4—5 years* as well as on personal observations made during the visit in these countries in summer 1980. The data were

collected and processed according to FAO methodologies from 1976 and 1979 (Sackston, 1978; Aćimović, 1979).

RESULTS

Sunflower diseases and their agents will be discussed separately for each of the four countries.

BULGARIA

The following diseases and their agents are distributed in Bulgaria: downy mildew (*Plasmopara helianthi* Novot.), spot (*Septoria helianthi* Ell. et Kell., *Alternaria* sp.), rust (*Puccinia helianthi* Schw.), white and gray rot (*Sclerotinia sclerotiorum* Lib. de By. and *Botrytis cinerea* Pers.) and broomrape (*Orobanche* spp.).

The agents of downy mildew (*Pl. helianthi*), spot (*Septoria helianthi* and *Alternaria* sp.), white and gray rot (*Sc. sclerotiorum* and *Botrytis cinerea*), and rust (*Puccinia helianthi*) are distributed in the north-western, north-eastern, and eastern parts of the country, i.e., in all sunflower-growing regions.

The agent of broomrape, *Orobanche cumana* Wallr., is distributed on a much lower scale, in north-western and north-eastern of the country.

Table 1 shows the importance of these diseases for sunflower production in Bulgaria.

Table 1 shows that in Bulgaria there are only six important diseases which are caused by seven pathogens. Certainly, the list is not complete. It will be extended in the future, after a new cycle of observations and identifications. It is easily noticeable that the list does not include a single agent of wilt. It would be unreasonable to assume that this disease is not

* Annual report on the occurrence of sunflower diseases:

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present in Bulgaria because the pathogens which cause the disease are widely distributed in countries with moderate and warm climates.

Table 1

Sunflower diseases and their agents in Bulgaria; their importance for sunflower production

No.	Disease	Agent	Importance
1	Downy mildew	<i>Plasmopara helianthi</i>	Very important
2	Spot	<i>Septoria helianthi</i>	Very important
3		<i>Alternaria</i> spp.	Medium important
4	Rust	<i>Puccinia helianthi</i>	Very important
5	White rot	<i>Sclerotinia sclerotiorum</i>	Very important
6	Gray rot	<i>Botrytis cinerea</i>	Very important
7	Broomrape	<i>Orobancha cumana</i>	Medium important

ROMANIA

There were only seven important diseases in 1976 and eight in 1977, 1978, and 1979. Those were: downy mildew (*Plasmopara helianthi* Novot.), spot (*Septoria helianthi* Ell. et Kell. and *Alternaria* spp.), rust (*Puccinia helianthi* Schw.), white and gray rot (*Sclerotinia sclerotiorum* Lib. de By and *Botrytis cinerea* Pers.), black stem rot (*Phoma oleracea* var. *helianthi tuberosi* Sacc.), wilt (*Sclerotium bataticola* Taub. and *Verticillium dahliae* Kleb.), and two species of broomrape (*Orobancha* spp.) — *O. cumana* Wallr. and *O. ramosa* L.

Plasmopara helianthi was distributed in all sunflower growing regions in the north, south, east, and west of the country.

There were two pathogens causing spot: *Septoria helianthi* and *Alternaria* spp. The pathogens were distributed in southern and western parts of the country.

Puccinia helianthi was observed in southern, southeastern, and western parts of Romania.

The agents of white and gray rot (*S. sclerotiorum* and *Botrytis cinerea*) were distributed in all sunflower-growing regions.

Phoma oleracea var. *helianthi-tuberosi* was observed in eastern, southern and western parts of the country.

The agents of wilt (*Sclerotium bataticola* and *Verticillium dahliae*) were distributed in eastern, north-eastern, and western regions of the country. The first pathogen occurred on large scale, the second one on small scale, in the form of sporadic oases of infected plants.

The floriferous parasite *Orobancha* spp. is distributed in eastern and south-eastern parts of the country.

The importance of these diseases and their agents for sunflower production in this country is shown in Table 2.

Table 2

Sunflower diseases and disease agents in Romania; their importance for sunflower production

No	Disease	Agent	Importance
1	Downy mildew	<i>Plasmopara helianthi</i>	Medium important
2	Spot	<i>Septoria helianthi</i>	Less important
3		<i>Alternaria</i> spp.	Medium important
4	Rust	<i>Puccinia helianthi</i>	Less important
5	White rot	<i>Sclerotinia sclerotiorum</i>	Very important
6	Gray rot	<i>Botrytis cinerea</i>	Very important
7	Blank stem rot	<i>Phoma oleracea</i> var. <i>helianthi-tuberosi</i>	Medium important
8	Wilt	<i>Sclerotium bataticola</i>	Medium important
9		<i>Verticillium dahliae</i>	Less important
10	Broomrape	<i>Orobancha</i> spp.	Very important

The data given in Table 2 show that there occurred eight sunflower diseases, caused by 10 pathogens: three of them were less important, four were medium important, and three very important for sunflower production. Sunflower production is by no means endangered only by those pathogens which are classified as very important. In the future, the less important pathogens may become quite dangerous if there occur conditions favourable for their development.

HUNGARY

In Hungary, there occurred the following sunflower diseases and pathogens: downy mildew (*Plasmopara helianthi* Novot.) spot (*Septoria helianthi* Ell. et Kell., *Alternaria helianthi* (Hansf.) Tub. et Nish., *Alternaria zinniae* Pape, and *Alternaria* spp.), rust (*Puccinia helianthi* Schw.), powdery mildew (*Erysiphe cichoracearum* D.C.), white and gray rot (*Sclerotinia sclerotiorum* Lib. de By., *Botrytis cinerea* Pers.), bacterial rot [*Bacterium carotovorum* (Joh.) Holand.], wilt (*Sclerotium bataticola* Taub., *Verticillium albo-atrum* R. et B.), and broomrape (*Orobancha cumana* Wallr.).

The majority of the pathogens is distributed in all sunflower-growing regions of Hungary.

The importance of these diseases for sunflower production and their agents are listed in Table 3.

The data in Table 3 show that 13 pathogens caused nine sunflower diseases in Hungary. Of the 13 pathogens, eight were less important, two medium important, and three very important for sunflower production.

Table 3

Sunflower diseases and disease agents in Hungary; importance for sunflower production

No.	Disease	Agent	Importance
1	Downy mildew	<i>Plasmopara helianthi</i>	Very important
2	Spot	<i>Septoria helianthi</i>	Less important
3		<i>Alternaria helianthi</i>	Very important
4		<i>Alternaria zinniae</i>	Less important
5		<i>Alternaria</i> spp.	Less important
6	Rust	<i>Puccinia helianthi</i>	Less important
7	Powdery mildew	<i>Erysiphe cichoracearum</i>	Less important
8	White rot	<i>Sclerotinia sclerotiorum</i>	Very important
9	Gray rot	<i>Botrytis cinerea</i>	Medium important
10	Bacterial rot	<i>Bacterium carotovorum</i>	Less important
11	Wilt	<i>Sclerotium bataticola</i>	Medium important
12		<i>Verticillium dahliae</i>	Less important
13	Broomrape	<i>Orobanche cumana</i>	Less important

YUGOSLAVIA

In Yugoslavia, there occurred the following diseases and their agents: downy mildew (*Plasmopara helianthi* Novot.), spot (*Septoria helianthi* Ell. et Kell., *Alternaria helianthi* (Hansf.) Tub. et Nish., *Alternaria alternata* (Fr.) Keiss., and *Alternaria* spp.), rust (*Puccinia helianthi* Schw.), powdery mildew (*Erysiphe cichoracearum* D.C.), black stem spot (rot) (*Phoma oleracea* var. *helianthi-tuberosi* Sacc.), brownish-pink stem spot (rot) (*Stemphylium* sp.), white rot (*Sclerotinia sclerotiorum* Lib. de By.), gray rot (*Botrytis cinerea* Pers.), dry rot (*Rhizopus* spp.), bacterial rot [*Bacterium carotovorum* (Johnes) Holand.], wilt (*Sclerotium bataticola* Taub., *Verticillium alboatrum* R. et B., *Verticillium dahliae* Kleb., and *Fusarium* spp.) broomrape (*Orobanche cumana* Wallr), and dodder (*Cuscuta* spp.).

Certainly, this list is by no means final. Determination of 2—3 new pathogens which cause wilt and spot is already under way. When new pathogens are determined, their importance for sunflower production will be estimated.

The above-mentioned pathogens are distributed mostly in the Vojvodina Province, in the north-east of Yugoslavia, where sunflowers are grown most intensively and on the largest area.

The majority of these pathogens can be found in all sunflower-growing regions of the country. Exceptions are *Verticillium dahliae* and *Phoma oleracea* var. *helianthi-tuberosi*,

which are distributed in Vojvodina and eastern Croatia, *Verticillium alboatrum*, found only in Vojvodina, and *Orobanche cumana*, distributed in Vojvodina and Macedonia, i.e., northeastern and southern parts of the country.

The importance of these diseases for sunflower production and their agents are shown in Table 4.

Table 4

Sunflower diseases and disease agents in Yugoslavia; their importance for sunflower production

No.	Disease	Agent	Importance
1	Downy mildew	<i>Plasmopara helianthi</i>	Less important
2	Spot	<i>Septoria helianthi</i>	Less important
3		<i>Alternaria helianthi</i>	Very important
4		<i>Alternaria alternata</i>	Less important
5		<i>Alternaria</i> spp.	Less important
6	Rust	<i>Puccinia helianthi</i>	Less important
7	Powdery mildew	<i>Erysiphe cichoracearum</i>	Less important
8	Black stem rot	<i>Phoma oleracea</i> var. <i>helianthi-tuberosi</i>	Medium important
9	Brownish-pink stem rot	<i>Stemphylium</i> sp.	Less important
10	White rot	<i>Sclerotinia sclerotiorum</i>	Very important
11	Gray rot	<i>Botrytis cinerea</i>	Medium important
12	Dry rot	<i>Rhizopus</i> spp.	Less important
13	Bacterial rot	<i>Bacterium carotovorum</i>	Less important
14	Wilt	<i>Sclerotium bataticola</i>	Very important
15		<i>Verticillium alboatrum</i>	Less important
16		<i>Verticillium dahliae</i>	Less important
17		<i>Fusarium</i> spp.	Less important
18	Broomrape	<i>Orobanche cumana</i>	Less important
	Dodder	<i>Cuscuta</i> spp.	Less important

The data in Table 4 show that 19 pathogens have been determined so far in Yugoslavia. They are not of equal importance — 14 of them are less important, two are medium important, and three are very important for sunflower production in Yugoslavia. However, a disease and its agent cannot be considered separately from the whole picture.

Sunflower plants are under a combined attack of all pathogens present, which cause the destruction of plant parts, roots, stems, leaves, heads, or even the whole plant. Attacks by the pathogens vary from plot to plot in the

same year as well as from year to year. The variations depend on several factors. Along the same line, sunflower yields vary in dependence of the intensity of disease attacks. It is our experience that weak attacks reduce seed yields by 20—30%, medium attacks by 30—40%, and strong attacks by 40—50%. As the years of weak attacks are becoming scarce and the year of medium and strong attacks are more and more frequent, sunflower yields grow less stable and lower (Aćimović, 1974).

The importance of certain diseases varies with the changes in climatic factors and the assortment, as may be seen from the following example. Until four years ago, Soviet varieties VNIIMK 8931 and Peredovik had been grown in Yugoslavia. Important diseases had been downy mildew and broomrape. These varieties were then replaced by single hybrids, and spot, wilt, and white rot became dominant diseases. This example shows that every change in sunflower production solves some problems but at the same time emphasizes others which then come to their full expression.

CONCLUSIONS

The above data on sunflower diseases and disease agents in Bulgaria, Romania, Hungary and Yugoslavia show clearly that the problems have not been studied sufficiently as yet.

The numbers of diseases and pathogens vary: seven in Bulgaria, 10 in Romania, 13 in Hungary, and 19 in Yugoslavia. The significance of pathogens for sunflower production in these countries varies also.

The problem of sunflower diseases should be studied still more intensively. Importance of each pathogen should be defined and a solution, aimed at an improvement in sunflower production, found. If correct solutions are not found and offered, the production will suffer more and more serious damages, the yields will be reduced, which inevitably leads to decreases in the hectareage under sunflowers.

It is also visible that the four countries have some problems in common. These problems should be solved through joint research programmes. Some differences most certainly do not originate from different problems but rather from the same or similar problems which have been studied more extensively in some countries and less so in the others. When talking about the levels of knowledge of certain patho-

gens, we must respect specific characters of sunflower production in each of the four countries.

LITERATURE

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L'APPARITION DES MALADIES DU TOURNESOL EN BULGARIE, ROUMANIE, HONGRIE ET YOUGOSLAVIE

Résumé

Le nombre des maladies et pathogènes du tournesol dans les quatre pays danubiens et balkaniques varie de 7 en Bulgarie à 19 en Yougoslavie. Leur conséquences sur le rendement du tournesol varient aussi d'un pays à l'autre. Malgré les problèmes graves soulevés par ces maladies, les pathogènes respectifs n'ont pas été suffisamment étudiés, afin de trouver la solution adéquate pour limiter leur attaque.

Il est évident que les quatre pays ont quelques problèmes communs à cet égard, qui doivent être solutionnés par l'intermédiaire des programmes communs de recherche.

LA APARICIÓN DE ALGUNAS ENFERMEDADES DEL GIRASOL EN BULGARIA, RUMANIA, HUNGRIA E YUGOSLAVIA

Resúmen

El número de las enfermedades y de los patógenos del girasol en los cuatro países danubianos y balcánicos varia desde 7 en Bulgaria hasta 19 en Yugoslavia. Las consecuencias de las mismas sobre la producción del girasol varia, asimismo, de un país al otro. A pesar de todos los problemas graves que surgen de estas enfermedades, los patógenos respectivos no han sido estudiados suficientemente para hallar la solución correspondiente a la limitación de su ataque.

Queda evidente que los cuatro países cuentan con unos problemas comunes en este respecto, los cuales se deben solucionar por medio de los programas comunes de investigación.