TECHNOLOGICAL FACTORS IN THE INTEGRATED CONTROL OF SUNFLOWER DISEASES

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SUMMARY

There are presented the results got for three years in Romania in respect of the influence of some technological elements regarding the attack of Phomopsis helianthi, Sclerotinia sclerotiorum, Alternaria spp., Sclerotium bataticola. It could thus be established that the proper time for planting and density strongly influence both Phomopsis helianthi and Alternaria spp. attack. Seed treatment ensured plant protection during the first vegetation phases and it also maintained a proper density.
It is established a pattern of integrated control which includes both technological and chemical elements.

INTRODUCTION

Sunflower cropped areas cover an area surpassing half a million hectares in our country, being the main source of vegetal oil. Seed yield is much diminished due to a rather great number of pathogens with a high polyphagous level. Beside a series of specific pathogens (Plasmopara helianthi - downy mildew, Puccinia helianthi - rust, Phomopsis helianthi - brown spot and sunflower stalks lodging) we can also meet a series of pathogens with a high polyphagous level: Sclerotinia sclerotiorum - white rot, Botrytis cinerea - grey mold, Macrophomina phaseolina - charcoal rot and Orobanche spp. - broom rape.
The share of the elements of integrated control in assuring sunflower protection against the main pathogens attack depends directly upon the pathogens biology, upon the relationship parasite-host plant being influenced by the ecological conditions too, in a certain cropping area (Iliescu and Ioniţă, 1988).

MATERIAL AND METHODS

The data presented in the paper are a synthesis of the experiments carried out during 1988-1991 in Romania.

A polyfactorial trial was set up in three experimental plots bearing in mind the influence of some technological elements (hybrid, seed treatment, fertilization, density, treatment in vegetation) on the crop phytosanitary stage.
The experiments were organized in latin rectangle, 6 rows per variant. The plot size was 8 x 4.2 m. The climatic conditions are within the normal limits registered during the past 25 years in Romania, in some places favourable to the occurrence and development of criptogamic diseases (Hasanan et Andrews, 1989), as well.

RESULTS AND DISCUSSIONS

In the frame of the agrotechnical measures, location is an important factor with special impact in the existence of diseases caused by the pathogens which overwinter in soil (Sclerotinia sclerotiorum, Plasmopara helianthi, Macrophomina phaseolina) as sclerotia, oospores or resistence mycelium.
Crop rotation also influence the occurrence of soilborne pathogens (Iliescu et al., 1991). The data from table 2 demonstrate that in case of Sclerotinia sclerotiorum the attack frequency decreases from 23.3% in case of monocrop to 6.3% in case of crop rotation : wheat-maize-maize followed up by sunflower. It can also be observed that when within crop rotation soya is present too, as a precrop, the attack frequency increases to 46.3%.
In case of Plasmopara helianthi the attack frequency decreases from 73.4% with monocrop, to 11.2% in a crop rotation with the pre-crop wheat followed up by maize, for two years.
Crop rotation also influences in terms of frequency the attack of Orobanche spp. too (Table 2).
Following a 4 years rotation, most of the pathogens presented in Table 2, show a low attack frequency.
The best results are obtained after minimum 5 years with Sclerotinia sclerotiorum (F=7.3%) with Plasmopara helianthi (F= 3.1%)and with Orobanche spp. (F=3.6%)
Crop fertilization act upon the attack frequency of different pathogens in the crop. In Table 3 it can be seen an increase of the attack frequency of pathogens in the crop. It can be observed an increase of the attack frequency of most of pathogens in case of increasing fertilizer rates and mostly when using an unbalanced ratio of nitrogen-phosphorus and potassium with nitrogen excess (Table 3).

Planting time represents another important element within the agrotechnical measures.

From Table 4, it comes out that for an earlier planting - an increase of attack frequency of Plasmopara helianthi from 6.7% to 11.2% of Sclerotinia sclerotiorum from 2.8% to 3.7% and of Phoma macdonaldi from 18.3% to 25.9%.

Another important link of integrated control is represented by chemical control (Lamarque et al., 1985). Treatments are applied both on seeds to control downy mildew and rot during the first phenological stages and during vegetation. They represent the main measure to prevent and control the attack of Sclerotinia sclerotiorum, Botrytis cinerea, Phomopsis helianthi and Alternaria spp.

The phenological stage for treatment application differs function of the pathogen. Thus, for Phomopsis helianthi and Septoria helianthi one treatment is applied in the stage of 8-10 leaf pairs, using a systemic chemical followed by the second application, pre-flowering, with a mixture between a systemic and a contact product. For the other pathogens as ; Sclerotinia sclerotiorum, Botrytis cinerea and Alternaria spp., the first treatment is applied at the occurrence of the first ligulate flowers - with a mixture of chemicals of systemic and contact activity as well, followed by a second treatment 10-15 days later, after the end of flowering for which it is quite sufficient a product of contact activity.

In view of getting an efficient control the forecasting of various pathogens attack has to be done, treatment application being performed at warning in case of exceeding the economic damage threshold. Beside the "phenological" forescasting there is also an "ecological" forecasting. That is done after studying the pathogen biology, the relationships parasite-host plant by correlating them with the wether conditions existing in different cropping areas (Jinga et al., 1986).

CONCLUSIONS

1. The importance of agrotechnical measures depends upon the way of pathogen transmitting and spreading.
2. The relationship parasite-host plant which is at the basis of getting diseased, is influenced by genotype, fertilization, planting time, plant density as well as other technological elements.
3. Chemical seed treatment greatly influences the pathogens attack frequency which are soil and seed borne.

Table 1 - Share of some technological links in assuring sunflower protection against the main pathogens attack

Integrated control elements	Sclerotinia sclerotiorum	Botrytis cinerea	Plasmopara helianthi	Phomopsis helianthi	Macrophomina phaseolina	Alternaria sp.	Orobanche sp.	Puccinia helianthi
Technological methods								
-site (location)	+++	-	+++	-	+++	-	+++	-
-crop rotation	+++	+	+++	+	+++	-	++	-
-fertilization	+	-	-	+	++	+	-	+
-planting time	-	-	++	+++	+	-	-	+
Genetical resistance	+	-	+++	+++	+	+	+++	+++
Chemical methods								
-seed treatment	+	+	+++	-	+	-	-	-
-treatment in vegetation	++	++	-	+++	+	++	-	+
Forecasting attack occurrence-Predicting of treatments	++	++	-	+++		+	-	-

Table 2 - Influence of crop rotation in maintaining sunflower crop phytosanitary status

Crop rotation	Years	Attack frequency (%) Sclerotinia sclerotiorum	Rhizoctonia bataticola	Plasmopara helianthi	Phomopsis helianthi	Orobanche spp.
Sunflower	1	23.3	89.4	73.4	21.4	26.4
Maize-sunflower	2	21.3	98.4	51.4	13.5	25.5
Soya-sunflower	2	46.3	95.3	46.4	12.3	2o.5
Wheat-maize-maize-sunflower	4	6.3	96.6	11.2	lo.4	7.3
Maize-soya-wheat-sunflower	4	36.2	81.4	lo.3	11.o	6.1
Maize-soya-wheat-maize-wheat-sunflower	6	7.3	87.5	3.1	lo.7	3.6
Maize-soya-wheat-soya-wheat-sunflower	6	39.4	83.4	2.1	13.6	2.5
Peas-wheat-maize-peas-wheat-maize-sunflower	7	5.1	73.1	o.1	lo.7	1.2

4. Timing of application in vegetation and type of fungicide depend on both the pathogen biology and the conditions of natural contamination.

Table 3 - Influence of planting time on some pathogens attack frequency

Planting time	Attack frequency (%)			
	Phomopsis helianthi	Alternaria spp.	Sclerotinia sclerotiorum	Phoma macdonaldi
April, 5	11.2	10.7	3.7	25.9
April,15	6.7	11.1	2.8	18.3
April,25	4.1	18.5	2.9	19.5
LD 5%	1.43	1.05	0.41	0.67

Table 4 - Influence of fertilization on some pathogens attack frequency

Fertilization level	Attack frequency (%)			
	Alternaria spp.	Sclerotinia sclerotiorum	Phomopsis helianthi	Phoma macdonaldi
N_o P_o K_o	14.5	7.9	10.9	24.1
N_{60} P_{60} K_o	17.7	10.3	12.3	15.2
N_{90} P_{60} K_{60}	18.8	12.2	15.1	29.2
N_{120} P_{60} K_{60}	20.0	15.0	17.1	30.1
LD 5%	1.65	0.99	1.9	2.5

REFERENCES

HASANAN MAARANI, CH. ANDREWS, 1989. Corelation of some climatological factors with plant and seed caracteristics of sunflower (Helianthus annuus L.). Vol.4 N°2, p.53-92.

ILIESCU H., IONITA ALINA, 1988. Nouvelles orientations dans la lutte intégrée contre les principales maladies cryptogamiques affectant les cultures oléagineuses. Atti Congresso su Stato Attualla e Prospective della Colture Oleaginose Erbacee in Italia. p.667-674.

ILIESCU H., IONITA ALINA, JINGA V., IORDACHE EMILIA, CSEP N.,SINEA E. Lupta integrată - metodă modernă de prevenire şi combatere a bolilor florii-soarelui,1991, Al VIII-lea simpozion Combaterea integrată a bolilor şi dăunătorilor şi Protecţia Ecosistemelor, Constanţa, p.72-78.

JINGA V.,ILIESCU H., RAFAILA C.,CIUREA ALEXANDRA,IONITA ALINA,CSEP N., 1986. Cercetări privind prognoza apariţiei atacului de pătare brună şi frîngerea tulpinilor (Diaporthe-Phomopsis) de floarea-soarelui.Anale ICPP, vol.XX, p.57-69.