

Field evaluation of hybrid sensitivity to *Diaporthe helianthi* : relationship between symptoms and yield losses

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Abstract : *Diaporthe helianthi* is still a major disease for sunflower in France. The promotion of hybrids of less sensitivity is an important aim to maintain large cropping areas. Such promotion needs a successful experimentation to be able to evaluate new hybrids on the basis of symptoms notations. Especially correlation between symptoms and nuisibility has to be checked well. A criss-cross design with well-known hybrids was used to study relationships between symptoms and nuisibility. It has been shown that symptom dynamics could be very quick and different among hybrids. Consequences on time of observations for a proper evaluation are discussed.

Key-words : *Helianthus annuus*; *Diaporthe helianthi*; hybrid evaluation; symptoms; grain yield nuisibility

Introduction :

Diaporthe helianthi has become the major disease for sunflower in France. The promotion of hybrids of less sensitivity is an important objective to maintain large cropping areas. As proposed by Bertrand et Tourvieille (1987), several evaluation methods were tested to try to classify sunflower hybrids. On the field scale, hybrids are usually evaluated on the basis of symptom notations on a 3 or 5 step scale in multilocal field experiments with or without reinforced contaminations. Nevertheless there is a large variability among sites and experimentators according to the way observations were checked. Observations are often done too early or too late with consequences on the correlation between symptoms and nuisibility which can be a source of mistakes in hybrid characterization. There is a need for a precise description of symptom dynamics and their relationships with nuisibility. A criss-cross design with well-known hybrids was used to study relationships between symptoms and nuisibility and to identify some of the mistakes which should be avoided for hybrid classification on *Diaporthe helianthi* sensitivity.

Materials and methods :

Six hybrids were used in this study. They were classified for their sensitivity to *Diaporthe helianthi* as follows. Agrisol (Semence Coop de Pau) is a nearly resistant hybrid, Santiago (Hilleshog NK) is very little sensitive, Albena (Rustica Prograin Génétique) is little sensitive, DK3790 (RAGT) and Viki (Maisadour) are sensitive and Challenger (Mycogene) is highly sensitive. In 1994, Those hybrids were compared in a criss-cross design with 4 replications in the CETIOM field research station of En Crambade near Toulouse (South West of France). The aim was to get highly attacked and well-protected plants in two neighbouring plots to have estimations of the productivity nuisibility which should be as precise as possible for each hybrid. The ascospore contamination was reinforced by an application of contaminated straw and 4 small irrigations between the end of May and the end of June to keep enough wetness. Treated

plots received fungicides 3 times from May 20 (growth stage B10) to June 22. The first two treatments were done with PUNCH C at 0.8 liter per hectare, and the last one with CORVET flow at 2.5 liters per hectare. The plant density was 70 plants per square meter. The flowering stage was reached from June 28 to July. Symptoms were checked 4 times every 10 days from July 11 to August 8. A 5 step scale was used : step 1, healthy plant; step 2, plant with non-encircled symptoms; step 3, plant with encircled symptoms; step 4, plant with totally brown stem, step 5, plant with broken stem. Observations were made on 40 plants per plots on 2 neighbouring rows. Results were expressed as a percentage of plants for each level of the scale. The rate of plants with nuisible symptoms corresponded to steps 3 to 5. The heads were harvested by hand. Grain yields and oil contents were determined for each elementary plot.

Results and discussion :

Treatments were very efficient, and the protected half of each plot only had a low level of nuisible symptoms from 0% for Agrisol (the less sensitive cultivar) to 5.6% for Challenger, the more sensitive hybrid, at the final notation, on August 8. On the other hand, non protected plots were strongly attacked with 6.9% of plants presenting nuisible symptoms and 78.8% for Agrisol and Challenger respectively.

The average nuisibility for each hybrid on the grain yield was between 0.29 ton for Agrisol, the lowest, and 1.51 tons for Challenger, the highest. For the oil content, there was a decrease of 1.7% for Agrisol and 6.7% for Challenger.

Figure n° 1 shows symptom dynamics for each hybrid. Significant rates of attacked plants were only reached at the end of July. The hybrid classification is roughly good compared to what is known for each one. Nevertheless there is a hybrid x date of observation interaction. In July, Santiago always was less attacked than Albena, which seemed to be less attacked at the final observation. This observation suggests that symptom dynamics could be different among hybrids with consequences on the hybrid qualification. When observations were checked early, then Santiago looked better than Albena, but if the notation was late, then we could get the opposite conclusion.

Table n°1 shows regression coefficients between symptoms and yield nuisibility at different dates, taking into account different scale steps. Nuisibility is not significantly correlated with early symptoms : the percentage of plants presenting leaf symptoms on July 11 was not correlated with nuisibility. At the same date, the class 2 (non-encircled symptoms) has to be taken into account to have a significant correlation.

The best correlation was obtained for the final observation. Nevertheless, Figures n°2 and 3 suggest that between July 29 and August 8, the symptom evolution went very fast and that probably the best correlation would be checked a few days before the final notation. Later on, the correlation would continue to decrease with a fast progression of symptoms, with many hybrids close to 80 or 100% of plants in classes 3+4+5.

This study underlines the strong importance of the final notation date to get a good evaluation of hybrid sensitivity to *Diaporthe helianthi*. Especially the results focussed on the fact that observations have to be made early enough. Our experience in this station shows that the proper date is, in this area, during the first decade of August for early sowing until the end of March or beginning of April. Nevertheless, this study was carried out for one year, in one site. For a given site, it remains difficult to predict what will be the proper date for an efficient observation. This will depend on the management of the contamination, the climate and the sowing date. As recently shown by Delos et al (1995), the sowing date can interact strongly with hybrid classification.

References :

BERTRAND et TOURVIELLE 1987 Phomopsis tournesol : tests de sélection . Informations Techniques CETIOM 98: 12-18.

DELOS, MOINARD, JACQUIN 1995 Evolution du phomopsis du tournesol en France, Etude et surveillance du phomopsis : des pièges au modèle, Mise en oeuvre de la lutte chimique. PHYTOMA juin 1995 p25.

	% of plants with symptoms		
	linear regression		parabolic regression
	class 2+3+4+5	class 3+4+5	class 3+4+5
11 July	0.516 HS		
21 July	0.476 HS	0.405 S	0.460 S
29 July		0.548 HS	0.590 HS
8 August		0.755 HS	0.804 HS

Table n°1 : Regression coefficients (R2) between symptoms and grain yield nuisibility (n=24) for different dates, regressions, taking into account different symptoms classes.

FIGURE 1 : HAUTE GARONNE 1994
symptoms dynamics for different hybrids
NUISIBLE SYMPTOMS (steps 3+4+5).

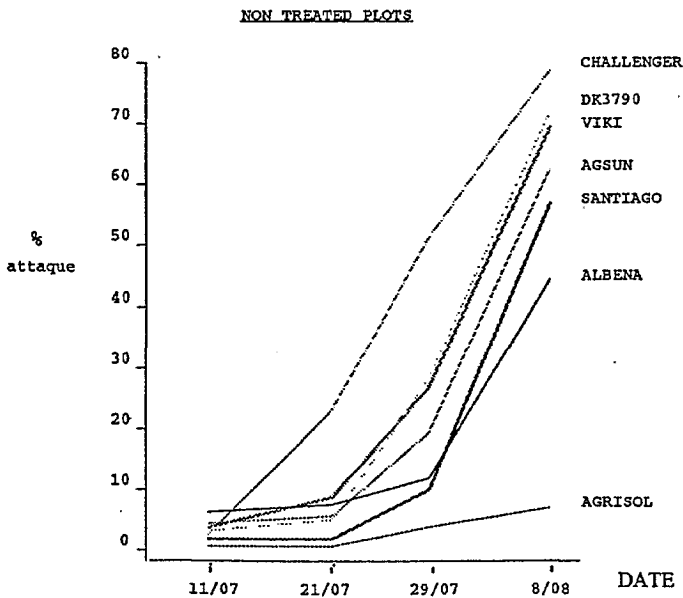


Figure n°2 : Relationship between symptoms and grain yield nuisibility the 29 th of July

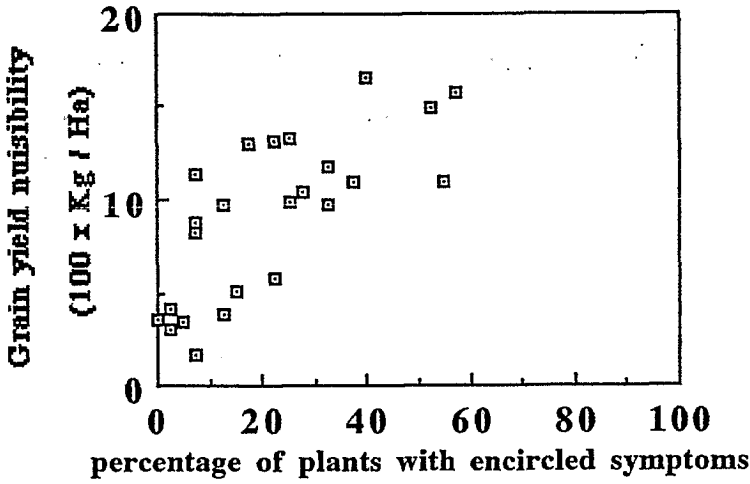


Figure n°3 : Relationship between symptoms and grain yield nuisibility the 8 th of August

