

Performance evaluation of different sunflower lines and hybrids (*Helianthus annuus*) against *Verticillium dahliae*

Paola S. Verón¹, Antonio Ivancovich²

¹Escuela de Ciencias Agrarias, Naturales y Ambientales de la Universidad Nacional del Noroeste de la Provincia de Buenos Aires (UNNOBA), Monteagudo 2772, B2700KIZ Pergamino, Argentina, e-mail: paola_veron@hotmail.com; ²Sección de Fitopatología, INTA – EEA Pergamino, CC31, B2700WAA Pergamino, Argentina, e-mail: ivancovich@pergamino.inta.gov.ar.

ABSTRACT

- *Verticillium* wilt is one of the most important diseases affecting the sunflower crop in Argentina. It is caused by *Verticillium dahliae*, a fungus parasite of systemic distribution in sunflower plant that is found in roots, stems, leaves and inflorescence. The greatest losses occur due to stalk breakage; however, yield losses also occur due to drying of plants.
- The aim of this study was to evaluate the performance of different sunflower lines and hybrids from the breeding program of INTA – EEA Pergamino against *Verticillium dahliae*.
- The evaluation was carried out during the 2009/2010 season on 125 lines and 35 hybrid of sunflower crop on an infected place within INTA Pergamino, established over 10 years ago with the incorporation of sunflower stubble infected with this disease. The parameters evaluated were: 1 - incidence of the pathogen (two measurements in a vegetative state, 47 and 60 days after sowing and two reproductive state, 75 and 90 days after sowing), and 2 - percentage of the plant height affected (one measure at vegetative state, 60 days and another measure at reproductive state, 90 days after sowing). It was used only one repetition of line and hybrid; therefore the data were processed by multivariate analysis using principal components and cluster analysis.
- The campaign was launched with great predisposition for the disease development, however, 8 of the 35 hybrids and 35 of the 125 lines showed no visible symptoms of the disease. Among the susceptible hybrid and lines, it was found an increasing incidence of the disease with the plant aging, being on average 6.1, 17.7, 28.6 and 42.3% in successive observations. The disease was more aggressive in reproductive status. In terms of percentage of the plant height affected similar behavior was observed, recorded 19.8 and 61.4% at vegetative and reproductive status respectively.
- In conclusion, no differences between hybrids and lines were found, possibly due to optimal weather conditions for the development of the disease, only a handful of them had shown a very good behavior. However, among those that were susceptible, it was noted higher incidence and percentage of the plant height affected in reproductive status.

Key words: Argentina – Natural inoculation – *Verticillium* wilt.

INTRODUCTION

The sunflower crop is the second most important oily crop after the soy in Argentina. It is mainly grown in Buenos Aires, Chaco and La Pampa provinces (FAUBA, 2002). Its production can be influenced by diseases caused by fungal pathogens, bacteria or viruses. About twenty microorganisms affecting this oily crop are known in our country, but only a few of them can produce losses in the production (Fernández-Pérez, 1997). In this regard, *Verticillium* wilt is a potentially destructive disease for this crop. It is caused by the *Verticillium dahliae* fungus. This disease is manifested by a leaf wilt occasioned by the tamponed of the conduction tissues going from the root. Initially, it is seen in the lower leaves and then in the higher ones, then it can be observed chlorotic and necrotic areas between the ribs (Zimmer & Hoes, 1978). It affects the crop performance by reducing the grains weight and their oil content (Bertero de Romano *et al.*, 1994; Pereyra *et al.*, 1999). *Verticillium* wilt is a disease with great economic impact, so the collection of cultivars with good behavior against this disease is the primary goal in breeding programs in Argentina. (González *et al.*, 2003).

For this reason, an experience was carried out in order to evaluate the performance of different sunflower lines and hybrids from the breeding program of INTA – EEA Pergamino against *Verticillium dahliae*.

MATERIALS AND METHODS

It was analyzed the behavior of lines and hybrid of sunflowers from the breeding program of INTA – EEA Pergamino against *Verticillium dahliae*. The evaluation was carried out during the 2009/2010 season on 125 lines and 35 hybrid of sunflower crop on an infected place within INTA Pergamino, established over 10 years ago with the incorporation of sunflower stubble infected with this disease.

Data was collected at the following ages:

Vegetative

- At 47 days after sowing, incidence was evaluated.
- At 60 days after sowing, incidence and percentage of the plant height affected were evaluated.

Reproductive

- At 75 days after sowing, incidence was evaluated.
- At 90 days after sowing, incidence and percentage of the plant height affected were evaluated.

RESULTS

Figure 1 shows the principal component analysis, and Table 1, the correlations with the original variables.

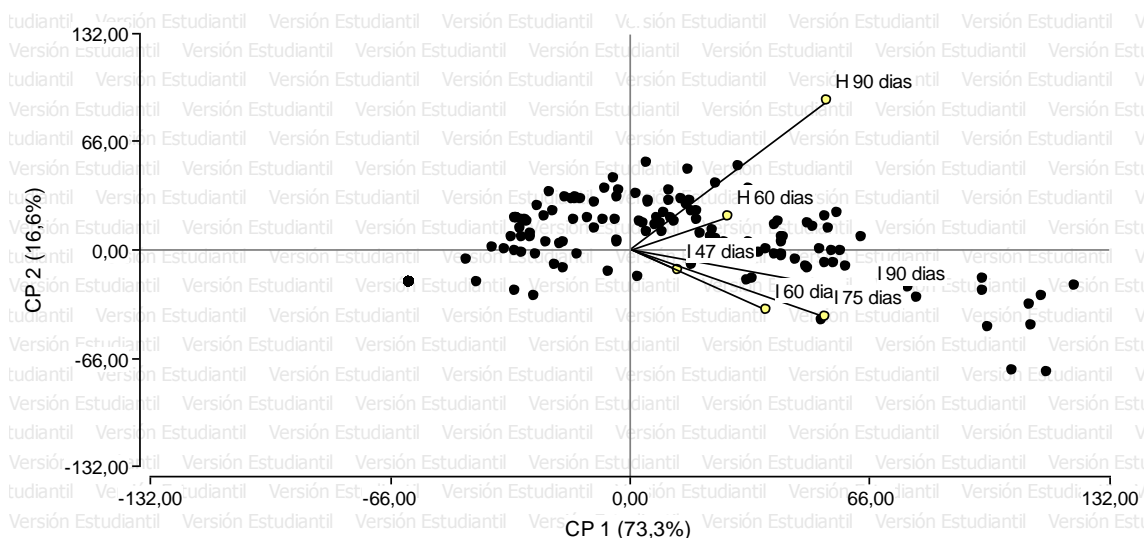


Figure 1. Principal component analysis.

Table 1. Correlations with the original variables

Variables	CP 1	CP 2
Incidence at 47 days AS	0,66	-0,28
Incidence at 60 days AS	0,83	-0,39
Incidence at 75 days AS	0,92	-0,34
Incidence at 90 days AS	0,95	-0,18
Height affected at 60 days AS	0,71	0,25
Height affected at 90 days AS	0,78	0,62

CP: Principal component; AS: After sowing.

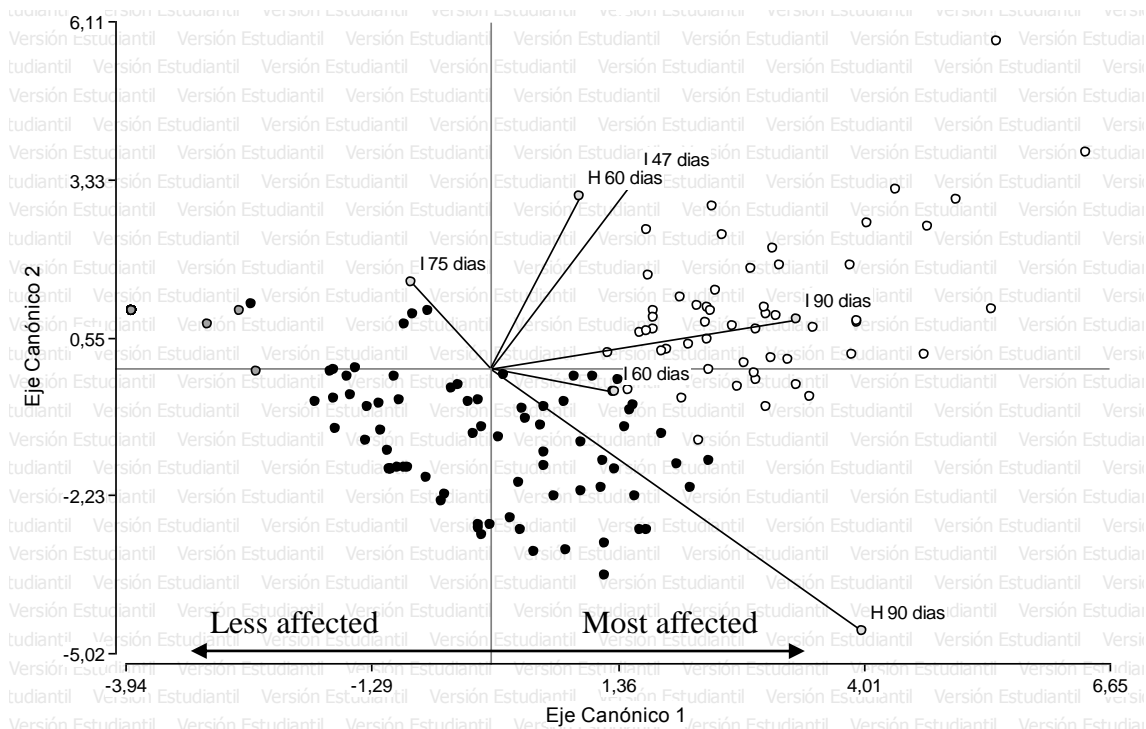


Figure 2. Discriminant analysis.

DISCUSSION

The campaign was launched with great predisposition for the disease development, however, 8 of the 35 hybrids and 35 of the 125 lines showed no visible symptoms of the disease. Among the susceptible hybrid and lines, it was found an increasing incidence of the disease with the plant aging, being on average 6.1, 17.7, 28.6 and 42.3% in successive observations. The disease was more aggressive in reproductive status. In terms of percentage of the plant height affected similar behavior was observed, recorded 19.8 and 61.4% at vegetative and reproductive status respectively.

CONCLUSION

In conclusion, no differences between hybrids and lines were found, possibly due to optimal weather conditions for the development of the disease, only a handful of them had shown a very good behavior. However, among those that were susceptible, it was noted higher incidence and percentage of the plant height affected in reproductive status.

REFERENCES

- Bertero de Romano, A.; A. Vazquez; S. Piubello y C. Sala. 1994. Quantifying the relationship between *Verticillium* wilt and yield loss of sunflower (*Helianthus annuus* L.), and feasibility of utilizing the hypodermic inoculation technique as a selection method. *Helia*. 17(20):49-50.
- FAUBA - Facultad de Agronomía, UBA. 2002. Informe de Coyuntura: Aceite de Girasol. Disponible en http://www.agro.uba.ar/apuntes/no_1/coyuntura.htm. Consultado 10 de diciembre de 2011.

- Fernández Pérez, J. 1997. Verticilosis “hoja abigarrada”: grave problema para el cultivo de girasol en la pampa”. 39-40.
- González, J.; N. Mancuso; P. Ludueña y A. Ivancovich. 2003. Evaluación del comportamiento de líneas de girasol frente a *Verticillium dahliae*. Revista de tecnología agropecuaria. 8(23):9-10.
- Pereyra V.; F. Quiroz; M.E. Agüero y A. Escande. 1999. Relación del rendimiento del girasol con la intensidad de síntomas provocadas por *Verticillium dahliae*. p. 35. En: Proc. X jornadas fitosanitarias Argentinas, Jujuy.
- Zimmer, D.E. y J.A. Hoes. 1978. Diseases. En: J.F. Carter (ed.), Sunflower Science and Technology. Am. Soc. Agron., Madison, WI, USA.