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IDENTIFICATION OF SUNFLOWER RUST (*Puccinia helianthi*) PHYSIOLOGICAL RACES IN MOZAMBIQUE*

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SUMMARY

Isolates of *Puccinia helianthi* Schw. collected during 1996-1997 were assessed for virulence on a set of Canadian and USA differential lines. All isolates were identified as race 4. In this work, as the sexual phase of the fungus was not found, inoculum introduction was hypothesized. Preliminary observations on field crops suggested that the South African varieties are less susceptible to *P. helianthi* than the domestic material.

Key words: Physiological races, *Puccinia helianthi*, sunflower, Mozambique.

INTRODUCTION

Sunflower has been grown as an oil crop in Mozambique since 1960 (Honwana, 1996). From then on production areas increased considerably, followed by a sharp decrease due to political reasons (independence followed by civil war).

Sunflower rust caused by *Puccinia helianthi* Schw. is a common and widespread disease wherever this crop is grown.

The disease was first reported in Mozambique in 1958 (De Carvalho & Mendes, 1958). However, the distribution, incidence and severity were not shown.

Twenty-years passed to see sunflower research started again. At the same time *P. helianthi* was observed. Recent disease surveys in Mozambique have shown that rust caused by *Puccinia helianthi* is the most important disease due to its presence throughout the country (Vicente and Zazzerini, in press).

According to Sackston (1962), *P. helianthi* is composed of races differing in pathogenic characters. Four races (1,2,3 and 4) were identified in North America

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using Canadian differential lines, and a new isolate of sunflower rust designated number five (Bushland isolate) which was virulent on all resistant sunflower genotypes, was reported by Rashid (1991).

Because of its importance, and *P. helianthi* being an autoecious rust, in which a high frequency of sexual recombinatios and formation of new races is expected (Rashid, 1991) much research is focused on rust. The first attempt to identify the physiological races in order to develop resistant cultivars has been made.

MATERIALS AND METHODS

Races identification

During 1996-1997 three different isolates of *P. helianthi* were collected from most of the surveyed fields in southern Mozambique: Mafuiane, Boane and Umbeluzi (Maputo province).

Urediospores from each isolate were inoculated separately on the Mozambican susceptible cultivar Peredovik branco. The inoculated seedlings were incubated at 100% relative humidity for 24h in darkness, then submitted to 16h photoperiod (15000 Lux) with day/night temperatures of 24/18°C, and maintained until the urediospore collection.

In order to multiply the inoculum, spores of a single pustule of each isolate were collected with the aid of a cotton bud and inoculated on the same susceptible cultivar. The multiplied inoculum was used for race identification on differential lines.

Three Canadian sunflower rust differential cultivars, CM 90RR (R1 resistance gene), Cross 29-3 (R2 resistance gene), and S 37-388 (universal susceptible), and five inbred lines, HA-R1, HA-R2, HA-R3, HA-R4, and HA-R5, were used to evaluate the infection type of all the isolates for race identification. Two-week old seedlings were spray inoculated with a urediospore suspension in water, incubated and maintained as described above. Assessment of host differential reactions was made 12 days after inoculation, based on infection types 0-4, whereby: 0 = immune with no sign of infection; = flecking or hypersensitivity reaction, 1 = very small uredia 0.1-0.2mm in diameter, 2 = small uredia 0.3-0.4 mm in diameter, 3 = medium sized uredia 0.5-0.6 mm in diameter, and 4 = large uredia > 0.6 mm in diameter (Rashid, 1991).

Disease incidence and severity

Commercial hybrids on experimental and farmers' fields were observed in the south of Mozambique (Maputo province).

In farmers' fields, observations were made on the plants encountered on the path while walking an inverted W. At experimental sites (randomized block design with four replications) observations were made on every plant in the plot.

Disease severity was estimated visually using a subjective scale proposed by Gulya *et al.*, (1990).

RESULTS AND DISCUSSION

Assessment of virulence

In all isolates collected from fields in the south of Mozambique, race 4 was identified. Isolates of this race showed an additional virulence on the differentials; HA-R5 was designated as sub-race 4-2 (Table 1).

Table 1: Rust race identification and additional virulence of the Southern Mozambique isolates

Differential line	N° isolates		
Canadian differential lines	1	2	3
CM 90 RR	S	S	S
29-3	S	S	S
S 37-388	S	S	S
USA differential lines			
HA-R1	R	R	R
HA-R2	R	R	R
HA-R3	R	R	R
HA-R4	R	R	R
HA-R5	S	S	S

R= Resistant, infection types 0-2
S= Susceptible, infection types 3-4

In Mozambique, all isolates did not show genotype diversity compared with isolates from other countries, where many races are found. As this crop has been recently reintroduced in the country, it could mean that rust populations might have come from recent introductions.

The sexual phase of the fungus was observed neither on the cultivated sunflower nor on the Mozambican wild sunflower *Helianthus argophyllus*. Therefore, in order to better understand the epidemics of this pathogen and the role that wild sunflower could have as a source of new pathotypes, further studies need to be undertaken.

Incidence and severity

Systematic observations in 1997 showed that rust infections were lower than the previous year. The highest level of infection was observed in some fields close to maturity.

Disease severity varied from traces to 40% (Table 2). The South African hybrids that showed only traces of the disease could be considered slightly resistant, but

these results are from one-year observations only. Therefore, further observations are necessary for a more conclusive evaluation.

Table 2: Varieties behaviour towards sunflower rust (*P. helianthi*)

Variety	*P. helianthi*	Variety	*P. helianthi*
SW-2302**	0.1	SO 289*	1
PAN 7252*	-	2W 2303*	0.1
PH 66472HO	-	PAN 735*	0.1
Emil**	5	PAN 7392*	0.1
Davil**	15	PAN 7411*	0.1
Oscar	20	PHI 650*	-
Rekord	20	P. Branco***	40
Black Rekord	0.1	P. Negro***	40
Sunbred**	20	Olidil**	15
Franz Rover*	0.1	2W2302*	-

Origin of the materials:
* Republic of South Africa
** USA (Pioneer a worldwide company)
*** Mozambican selection from the Russian variety Peredovik
Disease severity is based on a percentage of the leaf area infected (0.1-40%) Gulya *et al.* (1990)

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IDENTIFICACIÓN DE RAZAS FISIOLOGICAS DE ROYA EN GIRASOL (*Puccinia helianthi*) EN MOZAMBIQUE

RESUMEN

Se han evaluado por su virulencia aislados de *Puccinia helianthi* Schw., recogidos durante 1996.-1997., en una serie de lineas diferenciales canadienses y estadounidenses. Todos los aislados fueron identificados como Raza-4. Puesto que no se determinó la fase sexual del hongo, se llegó a proponer la hipótesis de la introducción de un inóculo. Estudios preliminares de cultivos en el campo hicieron pensar que las variedades sudafricanas sean menos susceptibles a *P. helianthi*.

IDENTIFICATION DES RACES PHYSIOLOGIQUES DE ROUILLE (*Puccinia helianthi*) CHEZ LE TOURNESOL AU MOZAMBIQUE

RÉSUMÉ

Des isolats de *Puccinia helianthi* Schw., collectés durant 1996.-1997., ont été évalués pour leur virulence sur un échantillon de lignées différentielles en provenance du Canada et des USA. Tous les isolats identifiés appartenaient à la race 4. Dans cette étude, étant donné que la phase sexuée du champignon n'a pu être retrouvée, on formule l'hypothèse d'introduction de l'inoculum. Des observations préliminaires sur des cultures au champ suggèrent que les variétés sud Africaines sont moins sensibles à *P. helianthi*.