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CURRENT STATUS OF SUNFLOWER DISEASES IN MOZAMBIQUE*

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SUMMARY

Although sunflower cultivation has been recently reintroduced in Mozambique, previous work regarding diseases distribution, incidence and severity is not complete. In this work the first systematic survey of the diseases in Mozambique was made. Results showed that the most important pathogens are *Puccinia helianthi* followed by *Alternaria helianthi*, *Alternaria alternata* and *Sclerotium bataticola*.

Key words: Disease, survey, Mozambique, sunflower.

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is one of the most important oil seed crops in the world.

Sunflower has been cultivated in Mozambique from the 1940's for forage purposes. From 1960 it was used as an oil crop in rotation with cotton and other crops, increasing in this way the production of oil-seed crops (Honwana, 1996).

For historical reasons (independence followed by civil war), priorities changed, the crop lost its importance and the cultivated areas was reduced gradually.

In last five years, interest in the crop was renewed, research work, reintroduction and marketing of the crop were re-established.

As in other countries, the main constraints of this crop are diseases.

There is very little information about sunflower diseases in Mozambique. However, results from research work done by INIA (Instituto Nacional de Investigação—Agronómica) from 1978-1980 and Jiminez & Eberlin (1988), showed that the following pathogens are present in Mozambique: *Alternaria sp, Septoria helianthi* Ell

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& Kell, *Sclerotinia sclerotiorum* Lib. de Bary, *Botrytis cinerea* Pers. and *Rizoctonia solani* Kuhn.

Apart from these works, other pathogens have been reported. However, the distribution, diffusion and severity of the pathogens have not been shown (Plumb-Dhindsa and Mondjane, 1984).

Currently, with the aid of a cooperative programme between the Governments of Italy and Mozambique (Projecto girassol), research work is being done with the aim of creating new improved varieties for yield and resistance to diseases.

The aims of the pathological section are:

1. Identification of sunflower diseases, their importance and diffusion.
2. Systematic studies of the biology and epidemiology of pathogens found.
3. Identification of varieties resistant and/or tolerant to different diseases.
4. Device control measures against the pathogens.

MATERIALS AND METHODS

Disease surveys of all sunflower diseases have been done in all regions of Mozambique. The fields observed were as follows. In the south: Umbeluzi (INIA), Changalane, Casa do Gaiato (Boane district), Mafuiane (Namaacha district) all in the province of Maputo. In the center: Beira, Nhamatanda district (province of Sofala). In the north: districts of Namapa, Mecuburi, Ribawe and Malema (province of Nampula) and the district of Cuamba (province of Niassa).

A survey of diseases present was carried out before systematic observations. When diseases could not be identified by symptoms, samples were collected, brought back to the laboratory for culturing, and, in some cases, pathogenicity tests were done. Once the pathogens were identified, a screening of the material present in the field was started. Observations were recorded in pre-printed forms listing every disease to be taken in consideration and disease incidence based on a subjective value scale calculated. For foliar diseases, a scale varying from 0.1-40% was used (Gulya *et al.*, 1990), where 0.1 indicates the presence of the pathogen and 40 indicates completely affected levels. For stem diseases such *as Sclerotium bataticola, S. rolfsii, etc.*, all plants affected were considered, and the mean % of plants observed determined.

In this survey, three observations were made at regular intervals at the experimental sites during growing season, and in other fields observations were made by walking an inverted W path through the field.

Samples with different symptoms brought from the field were placed in petri dishes with wet filter paper, and others were cultivated in artificial medium (PDA and Czapek). For the pathogenecity test, Koch's postulate was observed.

Varieties from Romania, USA and South Africa as well as varieties that had been grown in Mozambique since the beginning were observed for resistance.

The methods described by Rashid (1991) and Person *et al.*, (1986) were used for the identification of sunflower rust physiological races (*P. helianthi*) and the pathotypes of *S. bataticola* Taub., respectively.

RESULTS

The results obtained in the years 1995 and 1996 in Mozambique, at different sites from the south to the north, showed that the major disease of this crop, throughout the country, is the sunflower rust (*P. helianthi* Schw.); however, in the south, apart from *P. helianthi* and *Alternaria helianthi* (Hansf.) Tubaki & Nishihara, very high levels of polyphagous pathogens have been observed such as: *Sclerotium rolfsii* Sacc., *Alternaria sp.* and *Sclerotium bataticola* (Taub.).

Biotic and abiotic diseases of minor importance have been observed either on limited numbers of affected plants or in lower frequency. Boron deficiency has been observed in the north (fouling of the heads) and pathogens such as *Rhizopus sp*, *Phoma* sp and *Erysiphe cichoracearum* D.C. in the south (Figure 1 and Table 1).

Table 1: Biotic and abiotic diseases identified in Mozambique according to their importance

1995			1996		
Major		Minor	Major		Minor
North	South		North	South	@
P.helianthi	*P.helianthi*	*S.rolfsii*	*P.helianthi*	*P.helianthi*	*S.rolfsii*
	Alternaria sp	*Ryzopus sp*		*A. helianthi*	*Ryzopus sp*
	S. bataticola	*Phoma sp*		*S.bataticola*	*Phoma sp*
		E. cichoracearum		*Alternaria sp*	*E. cichoracearum*
		Boron deficiency			*S. sclerotiorum*
					Boron deficiency

The chlorate sensitivity tests schowed no difference between the northern and southern isolates in growth pattern. They showed a feathery growth pattern described by Pearson (1996). However, when submitted to different temperatures, the northern isolates were able to tolerate higher temperatures, up to 40°C (Figures 2 and 3).

In relation to the variety behaviour towards the pathogens, South African varieties showed to be more susceptible to *A. helianthi* with the highest score of 40%, whereas the Mozambican varieties showed to be very susceptible to rust (*P. helianthi*). The USA varieties showed to be less susceptible to both pathogens ranging between 0.1-15% (Table 2).

All varieties were very susceptible to *S. bataticola*.

Studying the physiological races of *P. helianthi*, race 4 was found (Vicente and Zazzerini, in press).

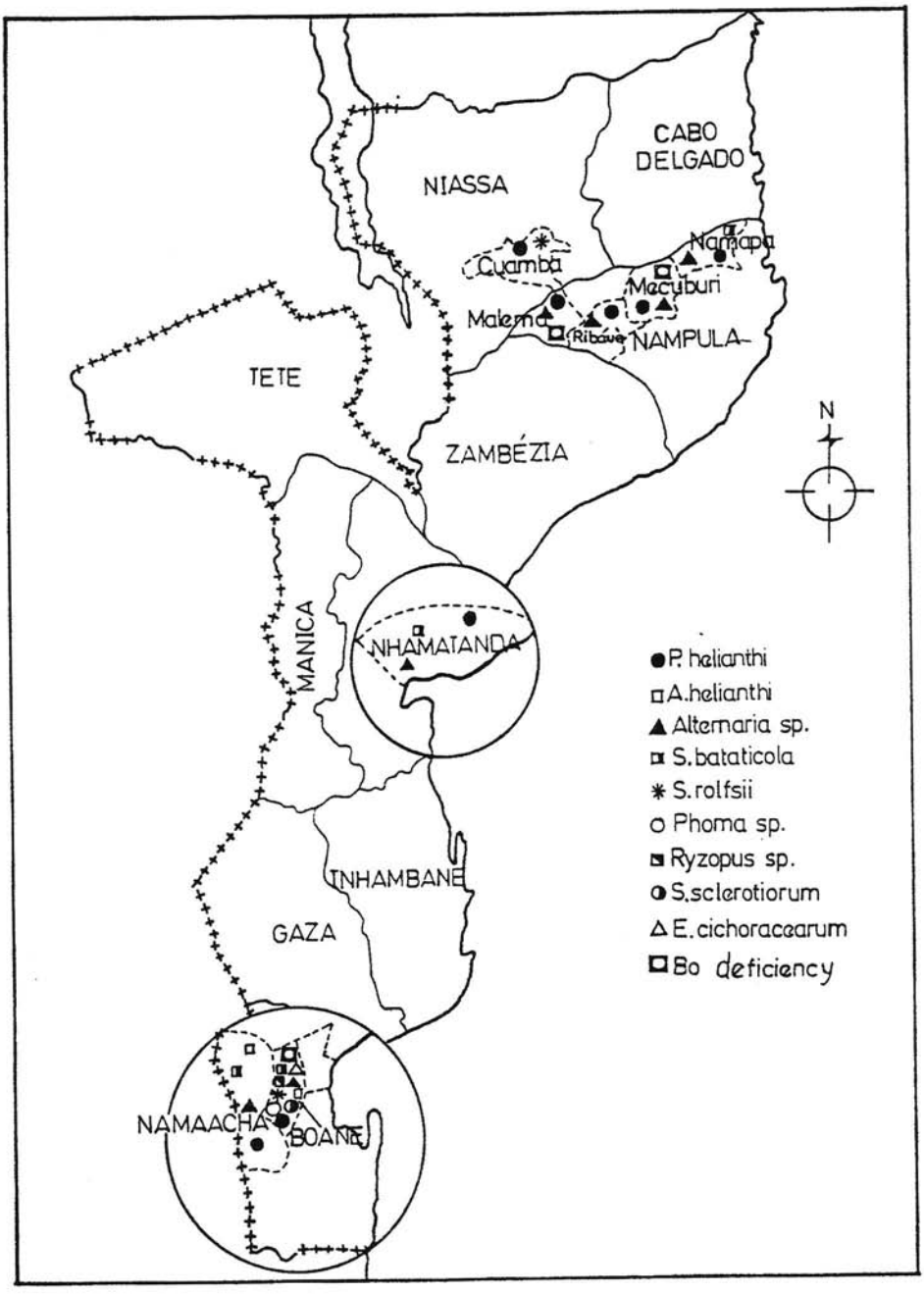

Figure 1. Geographical distribution of diseases identified in Mozambique

Table 2: Varietal behaviour with different phytophatogens

Variety	*A. alternata*	*A. helianthi*	*S. rolfsii*	*S. bataticola*	*P. helianthi*
SW-2302**	2	5	-	80	0.1
PAN 7252*	2	25	-	80	-
PH66472HO	2	25	-	80	-
Emil**	2	5	3	20	5
Olidil**	-	2	1	30	15
Davil**	15	5	-	75	15
Oscar	2	-	-	75	20
Rekord	-	2	-	80	20
Blak Rekord	-	-	-	95	0.1
Sunbred**	40	0.1	-	80	20
Franz Rover*	-	-	-	75	0.1
P. Negro***	-	-	-	75	40
P. Branco***	-	-	-	80	40
SO289*	-	40	-	80	1
2W2302*	-	15	-	95	-
2W2303*	-	18	-	78	0.1
Pan 735*	-	40	-	75	0.1
Pan7392*	-	25	-	63	0.1
Pan7411*	-	25	-	55	0.1
PHI650*	-	15	-	82	-

Origin of the material
* Republic of South Africa
** A USA company with a worldwide distribution
*** Mozambican selection from the Russian variety Peredovik
Disease incidence reported as percentages of plants per field (1-100%); disease severity is based on the percentage of leaf area infected (0.1-40%) (Gulya *et al.*, 1990).

DISCUSSION

The identification and distribution of sunflower diseases are of utmost importance, because they allow the development of the methods to control these diseases, thus increasing the quantity and improving the quality of sunflower products.

Sunflower diseases have been recorded by De Carvalho and Mendes, (1958) and Plumb-Dhinsha and Mondjane, (1984), but the disease incidence, distribution and epidemiology were not shown.

In this work, a phytophatological picture of the current status, although incomplete, of the biotic and abiotic diseases of this crop in Mozambique has been established.

Presently, the diseases classified as of major and minor importance according to their incidence and damages caused have determined the situation. This definition cannot be taken absolutely, for the phytopathological situation may vary from

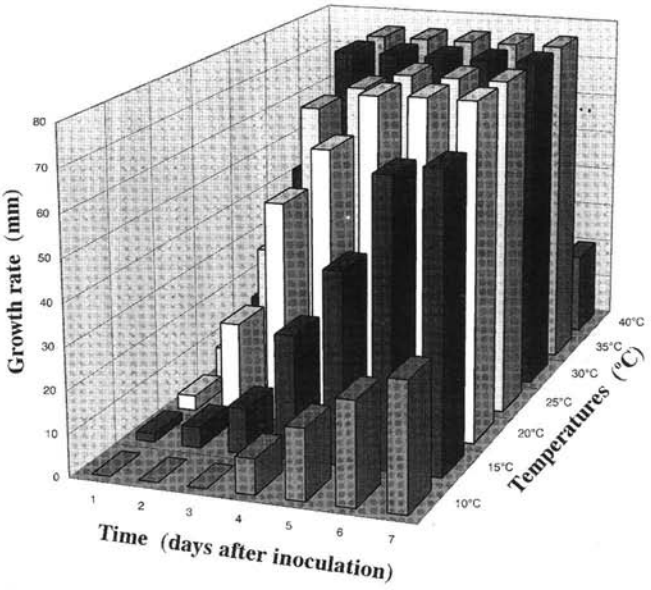

Figure 2. Southern isolates of S. bataticola behavior towards different temperatures

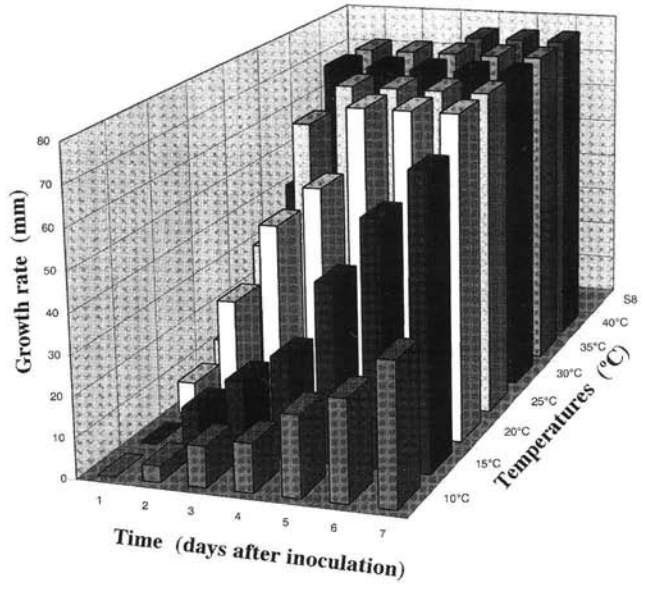

Figure 3. Northern isolates of S. bataticola behavior towards different temperatures

year to year, with changes in the environment, introduction of new agronomic practices, as well as the variety factors.

Therefore, there is a need for continuos surveys so that the farmers and researchers can be updated with the phytopathological problems of the crop.

Once the rust physiological races and/or pathotypes of the most important pathogens of each region are identified, systematic epidemiological studies could be started to avoid cultivation of susceptible varieties. Also, the growing of the crop could be started in least favourable conditions for pathogen development prevail and timely control programs would be enabled.

Regarding control measures, the most important one to be taken is the individualisation of genetic material to resistant and/or tolerant. Therefore, observations were made on the genetic material of "Projecto girassol". Most of the resistant materials observed are still segregating (unpublished data). Thus, it would be difficult to predict if the same germplasm can maintain the resistance until they become varieties. Further investigation needs to be done mainly on the variety resistance.

Finally, to avoid the introduction of new pathogens in the country, it would be advisable for the quarantine authorities to observe strictly imports and testing regulations for the most important sunflower pathogens, mainly seed-borne diseases.

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REFERENCES

De Carvalho, T. and Mendes, O., 1958. Doenças de plantas em Mozambique. Direcção de Agricultura e Florestas. Tip. Minerva Central, Lourenço Marques.

Gulya, T., Venette, R., Venette, J. R. and Lamey, H.A., 1990. Sunflower rust. NDSU Extension Service, PP-998, 4 pp.

Honwana, C., 1996. Sunflower cultivation in Mozambique: History and perspectives. Proceedings of the 14th International Sunflower Conference, Beijing/Shenyang, China, 12-20 June, 419-423.

Jiminez, H. and Eberlin, R., 1988. Girassol. Seminário Sobre Investigação Agrária. Instituto Nacional de Investigação Agronómica. Mozambique.

Pearson, C. A. S., Leislie, J. F. and Schwenk, F. W., 1986. Variable clorate resistance in *Macrophomina phaseolina* from corn, soyabean and soil. Phytopathology. 76: 646-649

Plumb-Dindsa, P. and Mondjane, A. M., 1984. Index of plant disease in associated organisms of Mozambique. Tropical Pest Management. 30(4): 407-429.

Rashid, K. Y., 1991. Incidence and virulence of *Puccinia helianthi* on sunflower in Western Canada during 1988-1990. Can. J. of Plant Pathol.13: 356-360.

ESTADO ACTUAL DE LAS ENFERMEDADES EN MOZAMBIQUE

RESUMEN

Aunque el cultivo de girasol ha sido reintroducido recientemente en Mozambique, el trabajo preliminar en relación a la distribución de enfermedades, incidencia y severidad no es completo. En este trabajo se ha llevado a cabo la primera prospección de enfermedades en Mozambique. Los resultados mostraron que los patógenos mas importantes son *Puccinia helianthi* seguido por *Alternaria helianthi*, *Alternaria alternata* y *Sclerotium bataticola*.

ETAT ACTUEL DES MALADIES DU TOURNESOL AU MOZAMBIQUE

RÉSUMÉ

La culture du tournesol a été récemment réintroduite au Mozambique. Les travaux antérieurs concernant la répartition des maladies, leur incidence et les dégâts occasionnés ne sont pas achevés. Dans cette étude on a réalisé le premier recensement systématique des maladies au Mozambique. Les résultats montrent que les pathogènes les plus importants sont *Puccinia helianthi* suivi d'*Alternaria helianthi*, *Alternaria alternata* et *Sclerotium bataticola*.