SUNFLOWER SCREENING TRIALS AT SAMARU, NIGERIA

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SUMMARY

The need to obtain sunflower cultivars adapted to the Nigerian savanna ecologic zone necessitated the introduction of different cultivars from various parts of the world. Screening of the introduced cultivars for adaptation and natural disease infection was carried out in the field. A disease survey was also carried out at various locations in the Nigerian savanna from 1985 to 1987. Fungal pathogens including species of *Alternaria, Cladosporium, Fusarium, Macrophomina, Curvularia, Helminthosporium* and *Cercospora* were isolated from root, stem, leaf and head lesions. Another fungus suspected to be *Coniella* sp. was encountered in 1987. The fungus attacked the leaves from the tip and moved progressively in a V-shape towards the petiole. The infected leaf finally died when the disease reached the petiole. All the materials tested were more or less affected by most of the pathogens. Some cultivars appeared promising in their performance since they yielded as much as 1,000 kg of seed per hectare.

INTRODUCTION

The need for adapted varieties and sources of resistance to diseases, pests, drought, lodging and breakage necessitated the introduction of sunflower germplasm from various parts of the world. Introduced materials must be screened for agronomic performance and disease reactions for several seasons. This is because there are numerous problems inherent in the introduction of new crops to new areas. One of the principal problems will be the unique diseases encountered in the new areas. This is particularly important because diseases are often a major problem in the warm, humid tropics. Information on results from screening of introduced materials will enable the plant breeder to develop new varieties that are well adapted to the local agroclimate, resistant to drought, pests and diseases and with high yields and better nutritional qualities. Disease screening is therefore one of the major tools of plant breeders in selecting desirable plants with better and wider adaptation. Bacteria, fungi and viruses are some of the disease organisms of sunflower that may have to be confronted and controlled for successful production. Thirty-five sunflower diseases were registered in Europe, twenty-two in Australia and sixteen in the United States of America (Acimovic, 1984). In Egypt, more than thirty-five infectious micro-organisms, mostly fungi were registered (Satour, 1984). In Nigeria, Emechebe (1980) reported seven fungi isolated from leaf and stem lesions and one from the root. Fungi are the dominant pathogens of sunflower everywhere. In the traditional areas of sunflower production, a number of diseases were reported important and sources of resistance were identified especially from the wild species which offer a vast reservoir of disease resistance for improving the domesticated types (Putt and Sackston, 1957; Pustovoit, 1966; Hoes et al., 1973; Pustovoit and Gubin, 1974; and Zimmer and Pick, 1974). The objective of this paper was to report the results of preliminary screening trials with a view to obtaining materials with the best plant development and adaptability for use in subsequent improvement programmes. Disease identification was initiated in order to observe any pathogens on time and develop appropriate methods for their control.

MATERIALS AND METHODS

A disease survey of sunflower fields was carried out between 1985 and 1987 at three different locations of northern Nigeria. The locations were Kadawa (11° 39'N; 08° 07'E) which is 480 m above mean sea level with an annual rainfall of 728 mm which falls within 130 days; Jos (09° 25'N; 08° 54'E) which is

1284 m above mean sea level with an annual rainfall of 1412 mm which falls within 180 days and Samaru (11° 11'N; 07° 38'E) which is 686 m above mean sea level with an annual rainfall of 1090 mm which falls within 160 days. Samples of diseased plants were collected and brought to the laboratory for identification of the pathogens. In 1987, nine cultivars obtained from different countries were grown at Samaru in plots of 24.0 m^2 with four replications. The cultivars were randomized in each block. In order to determine the disease incidence, all the plants per plot for each cultivar were examined. By counting the number of diseased and wilted plants as well as the total number of plants per plot, the proportion of diseased plants were obtained. For the foliar diseases, the plants in the center rows of each plot were examined at 60 days after sowing and the percentage leaf area affected was recorded. The diseases considered were broadly divided into leaf spots caused by *Alternaria sp.*, *Helminthosporium sp.*, *Cercospora sp.* and *Curvularia sp.*, and wilt and stem rot caused by *Fusarium sp.* and *Macrophomina sp.* Another disease was encountered at Samaru in 1987 with peculiar symptom of attacking the leaf from the tip and advancing towards the petiole in a more or less V-shape pattern. The leaf tip disease pathogen was suspected to be *Coniella sp.* The proportion of the plants showing the leaf tip disease was noted in each plot. From the records taken, the severity as percent leaf area affected by the leaf spots and the incidence of the stem rot, wilt and leaf tip diseases as percent affected plants were calculated.

RESULTS

In 1985 at Kadawa under irrigation, *Alternaria sp.* and *Curvularia sp.* were isolated from leaf lesions. In 1985, at Jos, species of *Alternaria*, *Cladosporium* and *Fusarium* were isolated from infected plants while in 1986 *Fusarium sp.* and *Macrophomina sp.* were isolated. In 1987, at Samaru six fungi were isolated from diseased plants. One of the fungi causes leaf burning starting from the tip and advancing towards the petiole in a V-shaped form covering a large proportion of the leaf area or even the whole leaf and finally killing the leaf as soon as the infection reaches the petiole (Figure 1). The dried leaf either remains on the stem or is dropped by little pressure from wind or other agent like heavy downpours. The fungus causing the disease is suspected to be *Coniella sp.* but confirmation tests have not been completed. The other pathogens isolated at Samaru were species of *Alternaria*, *Helminthosporium*, *Fusarium*, *Cercospora*, and *Macrophomina*. Species of *Alternaria*, *Cercospora* and *Helminthosporium* caused leaf spots while *Fusarium sp.* and *Macrophomina sp.* caused basal stem rot and plant wilt. The stem rot and wilt diseases were found in two cultivars, while the other leaf diseases were found in all the nine cultivars in varying severities (Table 1).

DISCUSSION

In the present study, a collection of sunflower cultivars from different sources was evaluated for reaction to diseases under the Nigerian savanna field conditions. Different fungual pathogens were isolated in different locations within the same year and in different years within the same location. The relative incidence and severity of the diseases gives an indication of the degree of resistance of the varieties from different countries to the prevailing pathogens at the locations of the trials.

The foliage diseases encountered were not antagonistic. They can and do infect the same plant and even the same leaf in which case they compete for surface area. Associations between reactions to the diseases were not computed but it might be possible that cultivars with low leaf spots may have low proportion of wilted plants. Associations between disease reactions and other agronomic traits might equally be possible as reported by Ashri (1971) in safflower genotypes.

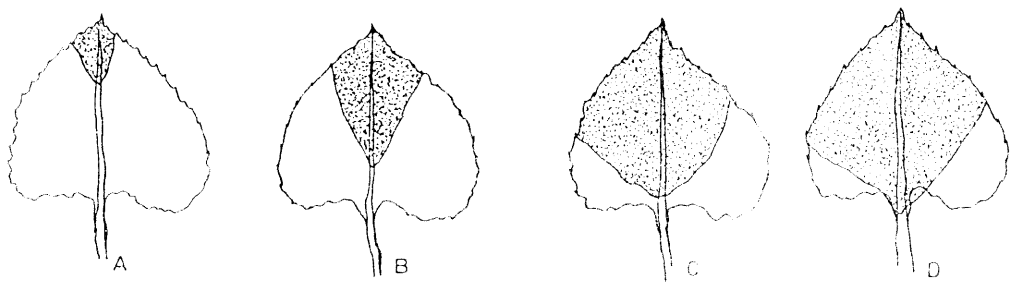

Fig. 1. Stages in the development of the leaf tip disease (A) the leaf tip was just attacked (B), (C) and (D) show the gradual increase in the attack in a characteristic V-shape. The leaf is killed when the attack reaches the petiole. The disease is suspected to be caused by *Coniella sp.*

Table 1: Incidence and severity of three diseases of sunflower cultivars at Samaru.

Cultivar	Leaf spots *Alternaria sp.* *Cercospora sp.* and *Helminthosporium sp.* % leaf area affected	Wilt/stem rot *Macrophomina sp.* and *Fusarium sp.* % affected plants	Leaf tip disease % affected plants	Seed yield t/ha
Cakinskij 268	50	-	30	1.140
Cernoanka 66	40	-	30	1.018
Funtua	40	20	35	0.996
Isaanka	40	-	15	1.345
Peredovik	30	26	46	0.966
Record	30	-	39	1.098
Saturn	30	-	40	1.002
Smena	30	-	37	1.086
VNIINK 8883	40	-	24	0.919

According to Emechebe (1980), seven fungi were isolated from leaf and stem lesions of sunflower grown in the savanna and semi-arid areas of Nigeria, while one fungus was isolated from the root. The fungi isolated from the leaves and stem lesions were species of *Alternaria, Helminthosporium, Fusarium, Curvularia, Cladosporium, Chaetomium* and *Nigrospora* while from the root, *Macrophomina phaseolina* (Tassi) Gold was isolated. From our results, *Alternaria sp.* which was encountered in all the locations, was also reported in different European countries including Bulgaria, France, Hungary, Italy, Poland, Portugal, Romania, Spain, Turkey and Yugoslavia. The pathogen was, however, only important in Romania and Yugoslavia (Achimovic, 1984).

Helminthosporium sp. which was isolated at Samaru was reported only in Turkey among the European countries and it was less important. *Fusarium sp.* which was observed at Jos and Samaru was reported in Italy, Portugal, Romania and Yugoslavia. Species of *Alternaria, Curvularia, Helminthosporium, Fusarium,* and *Macrophomina,* observed in Nigeria were also reported in Egypt (Satour, 1984), while in Pakistan, Mirza and Beg (1983) reported *Macrophomina phaseoli* and *Alternaria helianthi* among others. Out of the sixteen pathogens of sunflower registered in the United States (Acimovic, 1984) only three were encountered in Nigeria at the time of the survey being reported.

It should be noted that most of the pathogens found in Europe, the United States and Australia are not found in Nigeria at present. However, some unique pathogens have been isolated among which were species of *Cladosporium, Curvularia, Cercospora* and the suspected *Coniella.* The leaf tip disease which might be a new disease in sunflower is under investigation. The leaf tip disease though observed for the first time at Samaru appeared in relatively moderate frequency. If it becomes widespread and severe, it might result in significant yield reductions. The fungus causing the disease is suspected to be *coniella sp.* which in Samaru attacks kenaf (*Hibiscus cannabinus*). Even though the mean yields obtained in all the cultivars reported was approximately one tonne per hectare, the yields were relatively lower than what was reported previously at Samaru. The decrease in yield was particularly pronounced in the cultivars Smena, Funtua and VNIIMK 8883 which according to Ado and Tanimu (1986) yielded 2.6, 1.8 and 1.6 tonnes per hectare respectively.

CONCLUSIONS

From the preliminary observation on diseases of sunflower in northern Nigeria, it is evident that the type and severity of the diseases may vary from one year to another and from one location or field to another, depending on presence of the pathogen, weather, soil conditions and relative resistance or susceptibility of the varieties. Detection of diseases must continue and control measures must be adopted in order to prevent any outbreak. From the organisms isolated it was clear that the host-pathogen relationships in Nigeria were quite different from those prevailing in the areas where sunflower is grown in large scale. Wide extension of sunflower growing might be followed by the appearance of various diseases which are presently not known to attack the crop. The leaf-tip disease observed at Samaru may be a potential threat to sunflower production. The cause of the disease is being determined and a search for resistance should be initiated.

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