SURVEY OF DOWNY MILDEW DISEASE OF MAIZE (Peronoscleropora sorghi) FOR APPROPRIATE CONTROL STRATEGIES

FADINA O. O. And ADEOTI B. O.
Department. Of Crop Protection and Environmental Biology,
University of Ibadan, Ibadan Nigeria.

The study sets out to find the various factors militating against the effective control of the downy mildew disease of maize in some local government areas of Oyo and Ogun States (Nigeria). Lack of adequate communication between the farmers and researchers and the unavailability of downy mildew resistant seeds at the appropriate time and at affordable prices are some of the factors militating against the effective control of the downy mildew disease of maize.
The testing of relationships with chi-square between farmers educational levels and incidence of disease shows that there is no relationship between the two i.e. X^2 cal > X^2 tab at 95% significant level.
The chi-square test also indicated that there is still the occurrence of the disease irrespective of whether farmers have access to extension agents or not because X^2 cal = 7.98 while X^2 tab = 5.99 at 95% significant level.
The adoption of an integrated pest management approach, close linkage between the farmers and researchers and the provision of technical advice by extension agents were suggested.

KEY WORDS: Downy mildew; Peronoscleropora sorghi; Acute Incidence; Lesser Incidence.

INTRODUCTION

Resource poor farmers in Nigeria experience many constraints including yield losses caused by pests and diseases.

Downy mildew of maize has been an important disease in Nigeria since 1970 (Kling and Webster, 1970) and yield loss of between 30 – 100% was observed when susceptible varieties were planted and all infected plants do not produce any cob (IITA, 1984). The major areas of wide cultivation of maize in Nigeria coincide with the areas of high pathogen activities. Also, the local methods of farming in these areas encourage the incidence of the disease and where downy mildew resistant variety was planted about three to four infected plants could be found in one hectare of land (Olaniyan and Fajemisin, 1993).

In 1991, the Federal Department of Agriculture appointed a task force to control the spread of the disease and to give advice on the use

of the best control methods. However, the rate of spread of the epidemic is faster than the distribution of information on the available control measures (IITA, 1992).

This study thus examined the pathological and demographic factors militating against the adoption of the available control measures.

MATERIALS AND METHODS

Background Information

Relevant data were collected from farmers in previous downy mildew endemic areas of Oyo and Ogun states. These areas of study were characterized by a high level of humidity, which favors the multiplication of *P. sorghi*. Most of the precipitation occurs between March and October with a decline in July/August. Farming is the major occupation of the inhabitants and crops mostly grown are maize, cassava, yam, coco yam and melon.

Sampling Design

A multistage purposive sampling was done in which four local government areas were chosen and four villages/locations were selected in each local government viz:

- Iddo Local Government: Siba Olosun, Bodegbo, Papa
- Odeda Local Government: Adao, Alabata, Tapa, Olodo
- Akinyele Local Government: Aroro, Igbo-oloyin, Opa, Alaaru
- Ibadan North Local Government: U.I Campus, Agodi GRA, Bodija Community, Igbo-Agala

A total of 200 respondents were interviewed i.e. 50 from each local government area.

Questionnaire Design

Interview was carried out with the use of structured questionnaires scheduled for data collection purposes. The open-ended and close-ended questions were designed to elicit appropriate responses. Data were collected on pathological and demographic variables viz: time of disease occurrence, symptoms of disease, awareness of disease, age of farmer, educational level, attitudes towards the use of downy mildew resistant varieties and other control methods etc.

Data Collection

Two interviews were conducted on each farmers field i.e. in May/June and July/August 1998 to have an on the sport assessments of the crops shortly before teaseling and harvesting. Interviews were personally carried out by one of the researchers and the ADP extension agents covering the areas of study. Most of the interviews comprised of

schedule and unscheduled visits of which if a farmer was absent, another visit was arranged. Since most of the farmers are not literate, questionnaires were interpreted into local dialects by the researcher.

Measurement of Variables and Analysis of Data

Variables were measured by asking for the factors militating against the adoption of the results of research findings on the control of downy mildew disease. The other variables to be analyzed include season of disease occurrence, disease awareness, symptoms, age of farmers and education level, and the source of planting materials that were being used. Frequencies were used as means of analysis of the variables and the chi-square test was used to test for relationships.

RESULTS

The results are presented in three sections and these are pathological symptoms, demographic data ad the testing of relationships using the chi-square test.

Symptom Observed on Farms

The infected maize plants were chlorotic, leaves have white to yellow streaks from base to tips. Infected leaves were narrow, erect and stiff (Plate 1). On a farmer's field in Alabata, the infected stalks emerged above the healthy ones looking very much like sugar-came plants among maize some white downy growth of spores were seen on the under surface of the infected leaves. Tassels of infected maize plants are well deformed to multiple ear formation and infected plants could not produce any cob (Plate 2).

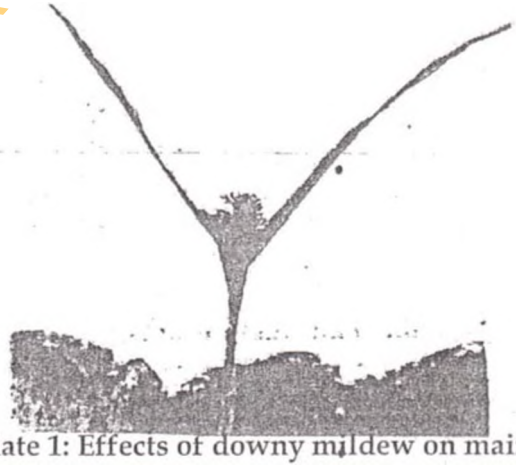

Plate 1: Effects of downy mildew on maize.

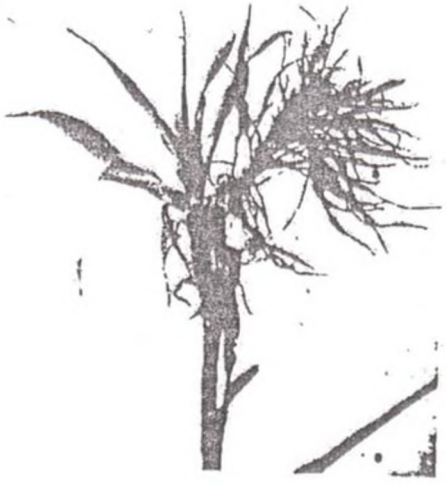

Plate 2: "Crazy top"; multiple ear infection on infected maize plant

Awareness of Disease

The results indicated that all the farmers knew about the disease (Table 1). They often refer to it as "ori-jerry" "sagbadodireke" or "magbadoyegan". These terms describe the symptom of downy mildew in their local dialects. About 3.5% of the farmer claimed to have heard about the disease for over fifteen years.

Table 1: Frequency Distribution of Awareness of Downy Mildew

Year of awareness	Absolute frequency	Relative frequency	Mildew commutative Frequency
1 – 5 years	130	65.0	65.0
6 - 10 years	46	23.0	88.0
11 – 15 years	17	8.5	96.5
16 – 20 years	7	3.5	100.0
21 years	0	0.0	
Total	200	100	

Source: Survey data 1998

Season of Disease Occurrence

As indicated in Table 2, majority of the farmer (93%) claimed that The disease occurs in the rainy season, while the remaining 7% who claimed that the disease is prevalent throughout the year are those farmers who plant maize in Fadama land in the dry season.

Table 2: Frequency Distribution of Season of Disease Occurrence.

Season of occurrence	Absolute frequency	Relative frequency	Commutative frequency
All year round	14	7.0	7.0
Rainy season only	186	93.0	100.0
Total	200	100.0	

Source: Survey data 1998

Source of Planting Materials

As indicated in Table 3, less than 30% of the respondents purchased their seeds from Research Institutes. Most farmers (over 70%) got their planting materials from the open market despite awareness of the existence of downy mildew resistant varieties of maize seeds.

Table 3: Frequency Distribution of Source of Planting Materials.

Source of planting materials	Absolute frequency	Relative frequency	Commutative frequency
Open market	152	76.0	76.0
NCRI	32	16.0	92.0
OYSADEP	10	5.0	79.0
NSS	3	1.5	98.5
IITA	3	1.5	100.0
Total	200.0	100.0	

Source: Survey data 1998
NCRI: National cereals research Institute
OYSADEP: Oyo State Agricultural Development Project
NSS: National Seed Service
IITA: International Institute of /Tropical Agriculture

Farmers' Educational Levels

The frequency distribution of the level of education of respondents is indicated in Table 4. About 17% have no formal education while only 15% have complete secondary education.

Table 4: Frequency Distribution of Farmers Educational Level.

Educational level	Absolute frequency	Relative frequency	Commutative frequency
No formal education	34	17.0	17.0
Pry school uncompleted	26	13.0	30.0
Pry school completed	54	27.0	57.0
Sec. School uncompleted	30	15.0	72.0
Sec. School completed	36	18.0	90.0
Above sec. School	17	8.5	98.15
Adult education class	3	1.5	100.0
Total	200	100.0	

Source: Survey data 1998

Closeness of Respondents to Extension Agents

Table 5 indicates the frequency of distribution of visits by extension agents to the farmers. This indicates that most of the interviewed farmers have no access to extension agents who are supposed to teach them innovations in crop production and protection.

Table 5: Frequency Distribution of visits by Extension Agents

Type of contact	Absolute frequency	Relative frequency	Commutative frequency
Direct contact	65	32.5	32.5
Contact farmers	93	46.5	19.0
No contact	42	21.0	100.0
Total	200	100.0	

Source: Survey data 1998

Testing of Hypothesis

The relationship between farmer's educational level and occurrence of disease was tested using chi-square while

$$X^2 \text{ cal} = \frac{E\,(0 - E)^2}{E}$$

Result indicated that X^2 calculated = 229.7 while X^2 tab (0.05) = 129.56 at 95% significant level. This was an indication that the educational level of farmers has no significant relationship with the incidence of downy mildew. (Table 6)

The relationship between farmers contact with extension agents and the occurrence of downy mildew was also tested. In Table 7, calculated (79.8) was higher than the X^2 (0.05) tabulated value (5.99) showing the occurrence of the disease irrespective of whether farmers have access to extension agents or not.

Table 6: Chi-square test for Relationship between Education Level and Disease Incidence

Educational level	* Acute incidence		* Lesser Incidence	
	Observed	Expected	Observed	Expected
No formal education	30	17.5	4	16.7
Incomplete Pry Educ.	62	40.8	18	39.2
	10	43.9	76	42.1
Total	102		98	

Source: Survey data, 1998
* Acute Incidence: High occurrence of downy mildew
* Lesser Incidence: Lower occurrence of downy mildew

Table 7: Chi-square test for Relationship between farmers contact with extension agents and disease incidence

Type of contact	* Acute Incidence		* Lesser Incidence	
	Observed	Expected	.49 Observed	Expected
Extension agents	4.51	33.2	61.49	31.9
Contact farmers	57.51	47.4	36.49	45.6
No contact	41.51	21.4	1.49	20.6
Total	102		98	

Source: Survey data, 1998
* Acute Incidence: High occurrence of downy mildew
* Lesser Incidence: Lower occurrence of downy mildew

DISCUSSION AND CONCLUSION

Most of the respondents' farmers were able to describe the symptoms of downy mildew as they often refer to it as "sagbadodireke" or "jerry" or "magbadoyagan". Carwell *et al.*, (1995) stated that a good knowledge of symptom expression of downy mildew is important for farmers in order to achieve a better control. Agboola (1979) reported that Ogun and Oyo State of Nigeria have annual rainfall between 1,016 mm and 1,542 mm with a bimodal pattern and this explains why 93% of the farmers experienced sufficient moisture for the survival and multiplication of the pathogen (Bonde, 1982). Kling also reported high incidence of downy mildew in the humid forest belt of Nigeria in 1991. The respondent farmers who experienced the disease throughout the

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