INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

INCIDENCE AND SEVERITY OF BACTERIA BLIGHT AND LEAF STREAK DISEASE IN SOME COMMON AGRO PLANTS IN MAKURDI

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ABSTRACT
Studies were carried to quantify bacterial leaf streak and blight diseases on some common agro plants in their different locations in Makurdi from June to October 2008. Disease plants based on symptoms and disease index (DI) determined. Disease severity on the crops was done by using a disease score scale of 0-4. Diseased plant leaves were collected for culture, Isolation and identification of the causal organisms. Randomized Complete Block Design (RCBD) with four replicates. The results showed that, the highest percentage incidence of blight was (33.67%) on *Ipomea batatas* (L.) Lam at Wadata while the lowest was (9.18%) on *Abelmoschus esculentus* (L.) Moench at Wadata. The highest severity score (2.0) was recorded on *Vigna unguiculata* and *Ipomea batatas*. The highest percentage incidence of streak recorded was (25.81%) on *Zea mays* at North bank while the lowest was (10.97%) on *Oryza sativa* at North bank. The highest severity score was (2.0) recorded on *Oryza sativa, Saccharum officinarum, Zea mays* and *Sorghum bicolor*. It was observed that significant difference ($P \leq 0.05$) existed in the distribution of blight and streak on crops in the studied areas. Isolates show that the causal organisms of the studied plants diseases were *Pseudomonas syringae* and *Xanthomonas translucens*. It was concluded that blight and streak exist on crops and sites in Makurdi to varying degrees. It is recommended that measures of controlling/ preventing blight and streak disease be put in place.

KEYWORDS: Incidence; Severity; Bacterial blight and leaf streak; crop plants

INTRODUCTION

Bacterial leaf streak disease is caused by *Xanthomonas translucens* (Jones *et al.,* 1917). Different names have been proposed depending on the host plant (Vauterin *et al.,* 1995; Bragard *et al.,* 1997). It was first identified on barley (*Hordeum Vulgare* L.) (Jones *et al.,* 1917). Bacterial leaf streak disease has a wide geographical distribution (Duveiller *et al.,* 1997) in Africa it has been found in Kenya, Ethiopia (Burton 1931), also in Libya and in Madagascar (Bragard *et al.,* 1995). Bacterial leaf streak is a major disease of wheat and also affects legumes. Its effect on legumes is called Black Chaff. It occurs in different weather conditions. It is seed borne and may attack a complete nursery so severely that nothing can be harvested (Burton, 1931). Moisture aids the pathogen's release from the seed and enhances leaf colonization and invasion of leaf tissue. Control of bacterial leaf streak disease is mainly achieved by not sowing infected seed hence it is seed borne. However, other methods of control like rotations, use of resistant varieties and applications of balanced levels of nitrogen can be employed. Bacteria leaf streak is less damaging than blight. It was first identified as a distinct disease in 1957 when the pathogen was described in China (Fang *et al.,* 1957). It was earlier confused with blight. Bacterial blight disease is caused by *Psedomonas syringae* (Heather *et al.,* 1993) the pathogen is relatively weak and has a very wide host range. It was first identified on lilac and requires moisture for infection. Different plants vary in their susceptibility to infection with newly expanded leaves and flowers most severely damaged. Bacterial blight disease results in great economic losses which vary between years, losses occur from death of plant, partial loss of leaves, which is detrimental to ornamental and vegetable plants and pods potting. Control of bacterial blight disease is mainly by not sowing infected seed hence it is seed borne but other methods may be used though, the methods have limitations. These include use of bactericides that contains metallic copper the effectiveness of this however; vary depending on the type of the plant and overtime. A survey has shown that resistance to copper and streptomycin is widespread in commercial and ornamental nurseries in the pacific Northwest in 1982/83 25% of the bacterial collected were copper- resistant, 7% were streptomycin-resistant and 68% were sensitive to both copper and streptomycin and only 46% were sensitive to both. Chemical and cultural control can also be employed. The study is relevant due to the fact that high economic losses result from bacterial blight and streak diseases. These diseases have studied in various parts of the world and the methods of control have been put in place; In Madagascar leaf streak diseases was studied by (Bragard *et al.,* 1995) while (Heather *et al., 1993*) of the Oregon State University studied Bacterial Blight Disease in 1993 but such record of study is absent in Benue State hence the relevance of study. The objectives of the study is to determine the incidence and severity of bacterial blight and leaf streak disease and to compare the incidence and severity of bacterial blight and leaf diseases in some agro plants in Makurdi. The study is limited to Makurdi metropolis which is the capital of Benue State Nigeria. The study is also limited to the Botany and Zoology Laboratories of Benue State University and some selected Agro plants.

MATERIALS & METHODS

Description of the study area

This research work was done in Makurdi metropolis which lies on a latitude of 07° 45′ and longitude 08° 36′. The town has Guinea Savannah vegetation which comprises of giant grasses, oil palm, and locust bean trees among others. The mean annual rainfall in Makurdi ranges between 150-180mm while the mean temperature ranges between 27°C and 28°C. The town experiences wet and dry seasons the former starts from April to October while the latter is from October to April. The climate is tropical. Benue State is found within the lower Benue trough and Makurdi lies in the valley. The majority of Benue people are: Farmers, Businessmen/women and Civil Servants in that order. The town has a very low level industrialization. It has basically two industries: The Nigerian Bottling Company and Benue Brewery.

Sample collection

Five (5) agro plants were selected for the blight survey and also five for the streak survey, *I. batatas, A. esculentus, L. esculentum, V. unguiculata* and *A. hybridus* were sampled for blight while *O. sativa, S. officinarum, Z. mays, M. sapientum* and *S. bicolor* were sampled for *streak.* A chosen portion of the field was selected based on the existence of disease symptoms then four replicates of the diseased crops were chosen at random and the number of diseased leaves on each plant was manually counted and recorded as R_1, R_2, R_3, and R_4 respectively. Diseased leaves from each crop were counted and percentage distribution determined as below:

Number of diseased plant leaves * 100/ Total plant leaves sampled. The above sampling was done between the month of September and October 2008. Three parts of Makurdi town namely Akpehe, Wadata and North bank were chosen for the survey of both blight and streak. The collected samples were brought to the Benue State University Biological Sciences Laboratory for analysis.

Experimental design

The experimental design used was complete Randomized Block Design (CRBD) with four replicates.

Preparation of medium for culture

The medium used for culture were prepared according to the instructions of the manufacturers. All glass waves were sterilized in the autoclave before culturing was done. After preparation the medium were sterilized in an autoclave at a temperature of 121°C for 15 minutes. The medium was allowed to cool then used.

Diagnostic techniques

The method used in isolating the bacteria from the diseased leaves was carried as recommended by (Donald, 2008).

- Small infected areas or margins of large ones were cut out and placed in 10% chlorox for different durations.
- Sterile forceps were used to rinse tissue sections in distilled water and bottled on sterile filter paper.
- The tissue pieces were placed in test tubes of sterile water and macerated.
- Serial dilutions were made by transferring 1ml of bacterial suspension from one test tube to the next (each test tube contained 9mls of distilled water).
- 0.5mls of each dilution was placed in separate Petri dishes and melted but cooled agar was added and stirred gently and left to solidify. The Petri dishes were sealed with PCV tapes to avoid contamination.
- Single colonies appeared on all the plates after two days.
- Single colonies were sub-cultured after three days and the properties of the bacteria were compared to those gotten by Buttner *et al.,* 2006.

Method of identification

This was done to determine whether the bacteria were gram positive or negative. Jensen's method as cited in Gaffa and Azoro (2005) was used. It involves the following:

- A smear of the bacteria culture was made on a clean slide and allowed to dry on the bench.
- After drying it was mixed by gently passing the lower part of the slide over flame several times.
- On completion of fixing, Gram's crystal violet solution was poured on the mixed film and allowed on it for one minute.
- The crystal violet was washed off in tap water for about two seconds.
- A solution of Gram's iodine was poured on the film and left on it for one minute.
- Therefore the iodine was drained off and the smear was washed with tap water.
- Immediately, a decolouriser, the alcohol was poured on the film one drop after the other with tilting until the colour stopped coming out of the stain.
- Thereafter, the Gram's counter stain solution of safranin O was poured on the film and left on it for about thirty seconds.
- The film was then washed in tap water and allowed to dry.
- It was then observed under the oil immersion lens where the bacteria appeared red hence they are gram negative.

Microscopic examination

A slide was prepared from the pure culture of bacteria and stained with neutral red. It was first viewed under the x40 objective then the oil immersion lens and single bacteria cells were then snapped using the digital camera.

RESULTS

Table 1 showed the incidence of blight on some agro plants among sites in Makurdi. This Table one showed that *Ipomea. batatas* recorded a percentage incidence of (17.06%) in Akpehe, (33.67%) in Wadata and 26.96% in North bank. *A. esculentus* recorded (27.30%) at Akpehe, (9.18%) at Wadata and (19.61%) at North bank. *L. esculentum* recorded (10.24%) at Akpehe, (9.69%) at Wadata and (12.75%) at North bank. *V. unguiculata* recorded (27.30%) at Akpehe, (31.63%) at Wadata and 27.94% at North bank. *A. hybridus* recorded 18.09% at Akpehe (15.82%) at Wadata and (12.75%) at North bank. The highest percentage incidence of blight on *I. batatas* (33.67%) was recorded at Wadata while the least percentage incidence of blight on *I. batatas* (17.06%) was recorded at Akpehe. The highest percentage incidence of blight on *A. esculentus* (27.30%) was recorded at Akpehe while the least percentage incidence of blight on *A. esculentus* (9.18%) was recorded at Wadata. The highest significant incidence on blight on *V. unguiculata* (31.63%) was recorded at Wadata while the least significant incidence of blight on *V. unguiculata* (27.30%) was recorded at Akpehe. The highest percentage incidence of blight on *A. hybridus* (18.09%) was recorded at Akpehe

while the least percentage incidence (15.82%) was recorded at Wadata.

TABLE 1: % incidence of blight on crops in Makurdi

Crop Type	Sites		
	Akpehe	Wadata	North bank
I. batatas	17.06	33.67	26.96
A. esculentus	27.30	9.18	19.61
L. esculentum	10.24	9.69	12.75
V. unguiculata	27.30	31.63	27.95
A. hybridus	18.09	15.82	12.75
LSD 5%	2.50	3.00	3.25

Table 2 showed the percentage severity of Blight on crops in Makurdi. *I. batatas* recorded a percentage severity score of (1.0), (2.0) and (2.0) at Akpehe, Wadata and North bank respectively. *A. esculentus* recorded (2.0), (1.0) and (1.0) at Akpehe, Wadata and North bank respectively. *L. esculentum* and *A. hybridus* recorded a severity score of (1.0) on all the sites while *V. unguiculata* recorded a severity score of (2.0) on all the sites. The highest severity score was (2.0) which were recorded on *I. batatas* at Wadata and North bank, *A. esculentus* at Akpehe and *V. unguiculata* on all the sites. Statistically, there was no significant difference P≤0.05 of the distribution of blight at North bank but significant difference existed in the distribution of blight at North bank.

TABLE 2: % severity of blight on crop in Makurdi

	Severity Score		
Crop type	Akpehe	WADATA	North Bank
I. batatas	1.0	2.0	2.0
A. esculentus	2.0	1.0	1.0
L. esculentum	1.0	1.0	1.0
V. unguiculata	2.0	2.0	2.0
A. hybridus	1.0	1.0	1.0

Adapted from modified Emechebe and Shoyinka (1985). 0-4 scale
0-4 infection present
1.0 (-25) rarely present
2.0 (26-50) moderately present
3.0 (51-75) highly present
4.0 (76-100) severely present

Table 3 showed the percentage incidence of streak on crop in Makurdi. *O. sativa* recorded a percentage incidence of (25.00%) in Akpehe, (23.08%) in Wadata and (10.97%) in North bank. *M. sapientum* recorded a percentage incidence (17.26%) in Akpehe, (13.05%) in Wadata and (16.13%) in North bank. *S. officianarum* recorded a percentage of (16.60%) in Akpehe, (21.58%) in Wadata and (25.81%) in North bank. *S. bicolor* recorded a percentage incidence of (22.02%) in Akpehe, (21.22%) in Wadata and (21.94%) in North bank. The highest percentage incidence of streak on *O. sativa* (25.00%) was at Akpehe while the least (10.97%) was recorded at North bank. The highest percentage incidence of streak on *M. sapientum* (17.26%) was recorded at Akpehe while the lowest (13.05%) was recorded at Wadata. The highest incidence of streak recorded on *S. officianarum* (25.16%) was at North bank while the lowest (16.60%) was at Akpehe. The highest incidence of streak (25.81%) recorded on *Z. mays* was at North bank while the least (19.05%) was at Akpehe. The highest incidence of streak on *S. bicolor* (22.02%) was at Akpehe while the lowest (21.22%) was recorded at Wadata.

TABLE 3: % incidence of streak on crops in Makurdi

	Site		
Crop type	Akpehe	Wadata	North Bank
O. sativa	25.00	23.08	10.97
M. sapientum	17.26	13.05	16.13
S. officinarum	16.60	21.58	25.16
Z. mays	19.05	21.08	25.81
S. bicolor	22.02	21.22	21.94
LSD 5%	2.32	2.65	4.16

Table 4 showed the percentage severity of streak on crops in Makurdi. *O. sativa* recorded a percentage severity of (2.0) at Akpehe while (1.0) was observed at Wadata and North bank. *M. sapientum* recorded a severity score of (1.0) on all the sites. *S. officinarum, Z. mays* and *S. bicolor* also recorded a severity score of (1.0) at Akpehe and Wadata and (2.0) at North bank. Statistically, there was no significant difference of $P \leq 0.05$ of the distribution of streak at Akpehe and Wadata, however, significant difference $P \leq 0.05$ was observed in the distribution of streak at North bank.

TABLE 4: % severity of streak on crops in Makurdi

Crop Type	Severity Score Akpehe	Wadata	North Bank
O. sativa	2.0	1.0	1.0
M. sapientum	1.0	1.0	1.0
S. officinarum	1.0	1.0	2.0
Z. mays	1.0	1.0	2.0
S. bicolor	1.0	1.0	2.0

Adapted from modified Emechebe and Shoyinka (1985). 0-4 scale
0-4 - infection present
1.0 - rarely present
2.0 - moderately present
3.0 - highly present
4.0 - severely present

DISCUSSION & CONCLUSION

Bacterial blight and streak diseases existed on all sample sites and crops however; the crops sampled had different susceptibilities to both blight and streak resulting to varying severity and percentage incidence rates on the crops and sites. Similar observations were made by (Heather *et al.,* 1993) and (Bragard *et al.,* 1995). Bacterial blight and streak diseases occurred on all crops and sites sampled. Some field obviously had low yield depending on the severity of the diseases. Vegetable crops that had high incidence of the diseases were grossly affected. This agrees with the results got by (Duveiller and Maraite 1995 and Yeshwant *et al.,* 2005). Blight and streak diseases if not properly checked will go a long way to greatly reduce food availability in Makurdi and Benue State at large and also reduce income from farm produce as most farmers interacted with associated all symptoms of blight and streak with environmental and not pathogenic factors. El Attari *et al.,* (1996) and Buttner *et al.* (2006) all stated that streak and blight result to great economic losses. The pathogens isolated from diseased plant leaves exhibited characteristics that tailed with those stated by Tom (2006) and Buttner *et al.,* (2006). Bacterial blight and streak diseases were found to exist in Makurdi with varying severity rates on crops and sites.

RECOMMENDATIONS

In view of the result of this survey, the following recommendations are made: The Ministry of Agriculture and other related establishments should heighten awareness of the etiology, epidemiology and prevention/ control of blight and streak among farmers in Makurdi. Method of certifying seeds before planting should be taught and made accessible to all farmers as this will provide a good control measures for bacterial blight and streak is by not sowing infected seeds. Further research should be done on these diseases to give rise to resistant varieties, effective chemical control and documented quantitative evidence on the diseases in the study area among other things.

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