PREVALENCE OF CERCOSPORA LEAF SPOT INDUCED BY *Cercospora* sp IN MAJOR SESAME GROWING REGIONS OF TARABA STATE, NIGERIA

Supported by tetfund TERTIARY EDUCATION TRUST FUND

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Received: April 25, 2016 **Accepted:** July 26, 2016

Abstract: Among the foliar diseases, Cercospora leaf spot (CLS) caused by *Cercospora* sp. on sesame is the most important causing 22 – 53% losses. Field survey was conducted across major sesame growing areas of Taraba State in 2011 and 2012 cropping seasons.The occurrence of the disease was investigated in 120 farmers' fields in 30 locations. Averagei ncidence (%) of the disease was obtained from four randomly selected quadrants of 1m x 1m per farm; each farm representing a replicate. Simple random sampling technique was employed in the selection of plants. The results on survey revealed that, CLS was low at 8 weeks after sowing and became more prevalent at 12 weeks after sowing. It was also revealed that the disease was seen in all the areas visited. In Takum and part of Donga Local Government which fall within derived savanna ecology, CLS incidence was 86%, while the lowest value of 81% was recorded in Ardo – kola local Government area in northern guinea savanna. The total number of locations surveyed was 10 in Northern Guinea, 10 in Southern Guinea, and 10 in Derived savannas. Derived savanna had significantly (p=0.05) highest mean disease incidence 87.66%. These were followed by Southern Guinea savanna; Northern Guinea savanna incidence (83.67; 82.58%), respectively. The present study provides an indication of incidence of cercospora leaf spot of sesame on which strategies could be derived to ameliorate them in Taraba State, Nigeria.

Keywords: *Cercospora*, incidence, prevalence, sesame, survey

Introduction

Sesame (*Sesamumindicum* L.) is an annual plant that belongs to the Pedaliaceae family (Karifiti and Deckers, 2001). It is considered to be the oldest of the oilseed plants and has been under cultivation in Asia for over 5000 years (Bisht *et al.*, 1998). Sesame or beniseed called 'Ri'idi' in Hausa, 'Igogo' in Igbo and 'Yanmoti' in Yoruba is probably the most ancient oil seed known and used by man. Sesame is the common name used in international professional journals; while it is called 'beniseed'in West Africa and 'simsim' in East Africa. The oldest records from Babylon in Samaria dates back to 2350 B.C. (Bedigian, 2006). The origin of sesame has been a major subject of discussion with the African or the Indian sub - continent as the two suggestions. Bedigian (1981) argues that owing to the wide genetic diversity in Africa it is reasonable to assume that this sub - continent is the primary center of origin. On the other hand, India is generally held as the sub - continent where sesame was first domesticated and then spread to other places in the world such as Africa, the Far East, China and Americas along trade routes (Bedigian, 2004). Today, sesame is widely grown as an oilseed crop in India, China, Korea, Japan, Turkey, Thailand, Vietnam and Cambodia as well as the American and African continents. The sesame is grown all over Nigeria as illustrated by compilation (Alegbejo *et al.*, 2003) of the various names by which the crop is known in at least 25 different languages in the country. The performance of sesame has been reported to be strongly influenced by sowing date (Olowe, 2007). The crop can be grown twice as an early or late crop, or once a year depending on the ecological zone. In the Derived savanna comprising of Benue, Taraba and Nassarawa States, the early crop is sown at the onset of rain (March/April) while the late crop is sown two months before the end of rains (mid July to early August). In the Southern Guinea savanna which includes Niger, southern part of Kaduna states and Northern Guinea savanna comprising of some parts of Adamawa (especially Gombi and Michika), Southern Borno (in areas like Gwoza and Biu), northen part of Kaduna, southern part of Bauchi, Kano, Katsina and Zamfara states, late June is the best planting date. However, in the Sudan savanna comprising of Kebbi, Sokoto, Jigawa states, northern part of Bauchi/Kano/Katsina and Zamfara states, planting is by late June to the first week of July (USAID Markets, 2009).

Cercospora leaf spot of sesame (*Sesamumindicum* L.) induced by *Cercospora sesame* Zimm is a limiting factor for the production of sesame in the tropics (Kolte, 1985; Poswal and Misari, 1994; Adepoju, 1998). In India, it is also reported to be prevalent in all the sesame growing areas such as Karnataka, Maharashtra, Tamil Nadu, Andra Pradesh and Gujarat. The disease causes considerable loss in yield of sesame in India and Venezuela up to about 20% (Naresh and Sangwan, 2010). The disease is endemic in major sesame growing regions of Nigeria. The pathogen infects the leaves, stem, branches, petiole and pods causing severe seed yield loss and deterioration in seed quality. Under severe infections, disease has been reported to cause 22 to 53% loss in seed yield (Enikuomehin *et al.*, 2002).The initial symptoms of the disease, which affects both leaf surfaces of plants as early as 4 weeks after sowing (WAS), starts as small pinhead-sized to circular spots scattered on both the leaf surfaces. These spots later enlarge rapidly to a diameter of 4 - 5 mm. Advanced leaf lesion is characterized by a dark to dark-brown spots with a whitish to straw-coloured or perforated centre (Plate 1). There had not been a prevalent study that would ascertain the status of Cercospora leaf spot on sesame in Taraba State. This paper reports the results of a study to determine incidence and distribution of Cercospora leaf spot in the major sesame growing regions of Taraba State, Nigeria.

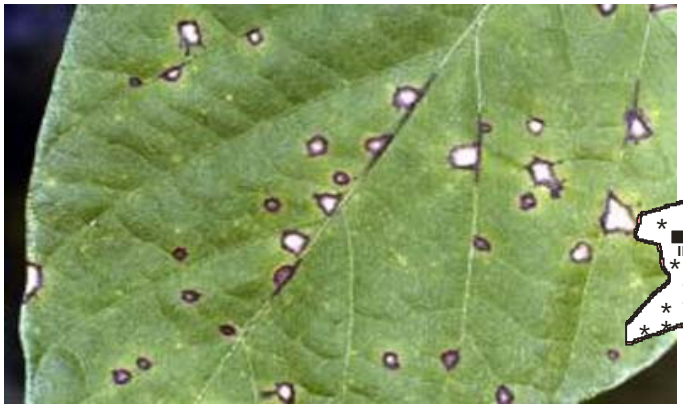
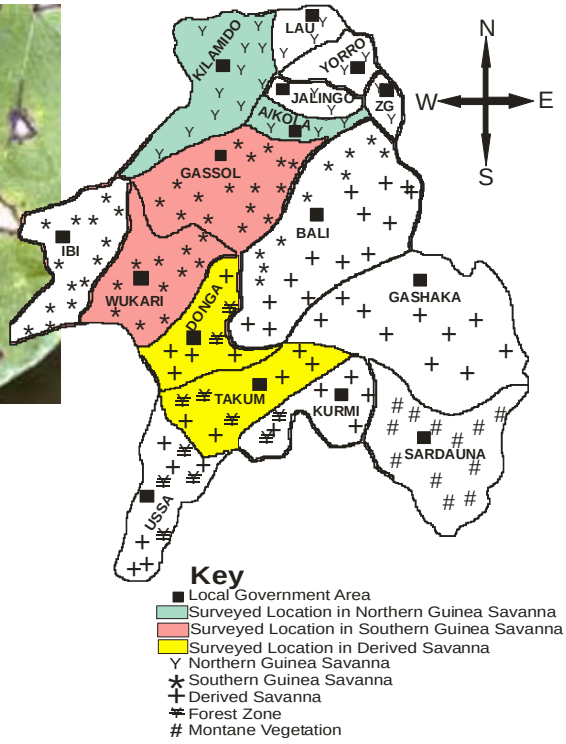


Plate I: Leaf symptom of cercospora leaf spot (*Cercospora* sp.) of sesame

Materials and Methods

Experimental Sites

The experiment was a field survey conducted across six selected Local Government Areas of Taraba state where sesame is grown in large quantity. They included Takum, Donga, Wukari, Gassol, Ardo-Kola and Karim-Lamido Local Government areas. These Local Government areas are incidentally located within various micro agro-ecological zones of Derived Savanna (Takum and Donga), Southern Guinea Savanna (Gassol and Wukari) and Northern Guinea Savanna (Ardo-Kola and Karim-Lamido) which are suitable for sesame cultivation (Fig. 1). Climatic characteristics of these agro - ecological zones are presented in Table 1.



Source: Olanya *et al*. (1993)

Fig. 1: Agro-ecological zones and areas surveyed for prevalence of *Cercospora* leaf spot in major sesame growing areas of Taraba State during 2011 and 2012 rainy seasons

Table 1: Agro-ecological zones suitable for sesame production in Nigeria and their climatic characteristics

Zone	Annual rainfall range (mm)	Annual potential evapotranspiration (mm)	Average duration of humid months	Annual relative humidity (%)	Average temperature (ºC)
Sudan savanna	500–900	1600	4.5	68	33
Northern Guinea Savanna	950–1100	1500	5.5	71	31.5
Southern Guinea Savanna	1100–1400	1375	6.5	77	29
Derived Savanna	>1400	<1375	7.5	89	28

Sources: Olanya *et al*. (1993)

Survey of Cercospora leaf spot disease of sesame

The field survey consisted of six local government areas (LGAs) and five wards per local government selected by purposeful sampling technique during preliminary visits, by taking into consideration settlements that had sesame production as one of their major activities.The surveys were carried out in a Randomized complete Block Design (RCBD) consisting of the six local governments selected as treatments, while four fields randomly scouted per ward served as replicates according to Zarafi and Emechebe (2005) and Malgwi *et al*. (2011). A total of 120 fields consisting of 6 LGAs x 5 wards x 4 fields were surveyed. The plants were examined at two weeks intervals and at 8, 10 and 12 weeks after sowing (WAS). Assessment of incidence was done in four random quadrants (1m x 1m) per field according to Eman (2011). The total number of plants and number infected in a quadrant were counted and the percentage disease incidence was calculated. The mean of these quadrants was accepted as the disease incidence for a farm/field.

$$disease\,incidence = \frac{total\,number\,of\ diseased\ plants}{total\,number\,of\ plants\,sampled} x\,100$$

Statistical analysis

The data obtained from disease incidence was subjected to analysis of variance (ANOVA) for RCBD using the generalized linear model (GLM) procedure of SAS Version 9 (SAS, 2005).

Results and Discussion

Cercospora leaf spot (CLS) incidence in different surveyed locations at 8, 10 and 12 weeks after sowing (WAS)

Results obtained from the 2011 and 2012 surveys of major sesame growing regions of Taraba revealed a gradual increase in the incidence (Tables 2 - 4) of Cercospora Leaf Spot disease with time. The combined results of the incidences of CLS at 8, 10 and 12 WAS across various locations and major sesame growing Local Government Areas (LGA) of Taraba State indicated that the CLS disease increased from 8-12 WAS. The combined mean results at 8, 10 and 12 WAS in Tables 2, 3 and 4 showed that the disease was significantly higher at Takum (62; 79; 87%) and Donga (66; 85; 88%) local government areas respectively in 2011 and 2012.

Table 2: Incidence (%) of *Cercospora* leaf spot in surveyed farms' fields at 8 weeks after sowing for 2011 and 2012 rainy seasons

Treatment	Incidence (%) of *Cercospora* leaf spot at 8 weeks after sowing		
	2011	2012	Mean
Takum	57.17[b]	67.07[a]	62.12[b]
Donga	64.42[a]	67.45[a]	65.94[a]
Wukari	53.58[c]	64.45[b]	59.02[d]
Gassol	54.00[c]	59.76[d]	56.88[e]
Ardo-kola	52.58[c]	58.51[e]	55.55[e]
Karim-Lamido	58.70[b]	62.66[c]	60.68[c]
Mean	56.74	63.32	60.03
SE(±)	1.61	0.82	0.93

Means in the same column followed by the same superscript(s) are not significantly different (0.05) using LSD.

The survey revealed that CLS was prevalent in all the areas visited with varying incidences from locality to locality. The survey results also revealed a gradual increase in the incidence of CLS disease with time. The variation in the disease incidence amongst locations across the sesame growing areas surveyed could be attributed to interaction interplay of the effects of weather, crop type, cropping patterns and other cultural practices adopted by different farmers. Olanya *et al.* (1993) reported that variation of Sorghum downy mildew on maize among fields was related to cropping practices and management inputs such as crop variety, fertilizer type and amount, and other cultural practices such as rotation, harrowing and deep ploughing.

Table 3: Incidence (%) of *Cercospora* leaf spot in surveyed farms' fields at 10 weeks after sowing for 2011 and 2012 rainy seasons

Treatment	Incidence (%) of *Cercospora* leaf spot at 10 weeks after sowing		
	2011	2012	Mean
Takum	70.07[bc]	87.61[b]	78.84[b]
Donga	80.88[a]	89.78[a]	85.33[a]
Wukari	64.97[d]	85.08[c]	75.02[c]
Gassol	72.00[b]	85.58[c]	78.79[b]
Ardo-kola	61.57[e]	83.55[d]	72.56[d]
Karim-Lamido	68.18[c]	83.82[d]	76.00[c]
Mean	69.61	85.90	77.76
SE(±)	1.83	0.72	0.88

Means in the same column followed by the same superscript(s) are not significantly different (0.05) using LSD.

Table 4: Incidence (%) of *Cercospora* leaf spot in surveyed farms' fields at 12 weeks after sowing for 2011 and 2012 rainy seasons

Treatment	Incidence (%) of Cercospora leaf spot at 12 weeks after sowing		
	2011	2012	Mean
Takum	86.65[a]	88.16[b]	87.41[a]
Donga	85.84[a]	89.95[a]	87.90[a]
Wukari	83.61[b]	86.73[c]	85.17[b]
Gassol	79.00[c]	86.50[c]	82.75[cd]
Ardo-kola	79.21[c]	84.36[d]	81.79[d]
Karim-Lamido	82.67[b]	84.05[d]	83.36[c]
Mean	82.83	86.63	84.73
SE(±)	1.47	0.57	0.90

Means in the same column followed by the same superscript(s) are not significantly different (0.05) using LSD.

Incidence of cercospora leaf spot in different cropping patterns and ecological zones

Out of 120 fields in 30 locations surveyed, 29 % of the fields were mixed sorghum + sesame – sesame (mixed cropped as early planting and sole cropped sesame as late planting), 25 % of the surveyed fields were sole cropped aspure stand and twice in a year (sesame - sesame), 15 % fields were sown with pure stand of sesame once in a year, 12.5 % fields cropped mixed sorghum + sesame once a year, 10 % sowed mixed maize + sesame once a year and 8 % fields sowed mixed maize + sesame – sesame (Table 5). Sesame cropped as pure stand twice per anuum had significantly (p = 0.05) the highest mean disease incidence (83.39 %). This was followed by maize + sesame - sesame; sorghum + sesame – sesame; sole sesame once per anuum incidence (74.99; 72.12; 70.21 %). Sorghum + sesame and maize + sesame once per anuum, had the lowest mean disease incidence (68.08; 68.06 %). Agrios (1997) reported that continuous monoculture in large acreages and close spacing increases the possibility and incidence of disease epidemic. It was further observed that 32 (91.14 %) out of 35 fields sown to mixed crop of sorghum + sesame – sesame left crop debris on the soil after harvest. This was followed by sesame – sesame (90.00 %), maize + sesame – sesame (90.00 %), sorghum + sesame once a year (86.67 %), pure stand sesame once a year (83.33 %) and maize + sesame (83.33 %). This corroborated the works of Chaube and Singh (2001) who reported that continuous and wide spread annual cultivation of any crop over the season and years will build up inoculum level to such an extent that the epidemic will become common phenomena. The infected debris left in the field serves as a major source of infection, thus causing the disease to be endemic in the areas. Beckman and Payne (1982) reported that Cercospora pathogen is a polycyclic, facultative pathogen which over winters in infected crop debris, and this is widely believed to be the primary source of inoculum.

Table 5: *Cercospora* leaf spot incidence at 12 weeks after sowing in different cropping pattern

Cropping pattern	Disease incidence (%)	Surveyed fields by cropping pattern	Fields with debris left on soil
Sesame – sesame (pure stand and twice a year)	83.39[a]	30(25.00)	27(90.00)
Cropped sesame (pure stand and once a year)	70.21[cd]	18(15.00)	15(83.33)
Sorghum + sesame – sesame	72.12[c]	35(29.17)	32(91.14)
Maize + sesame – sesame	74.99[b]	10(8.33)	8(90.00)
Sorghum + sesame	68.08[d]	15(12.50)	13(86.67)
Maize + sesame	68.06[d]	12(10.00)	10(83.33)
SE(±)	3.27		

Means in the same column followed by the same superscript(s) are not significantly different (0.05) using Duncan's Multiple Range Test; % = Percentages

Table 6: *Cercospora* leaf spot incidence at 12 weeks after sowing in three agro- ecological zones of Taraba State

Zone	Disease incidence (%)	Number of locations
Northern Guinea savanna	82.58[bc]	10
Southern Guinea savanna	83.67[b]	10
Derived savanna	87.66[a]	10
SE(±)	1.99	

Means in the same column followed by the same superscript(s) are not significantly different

The total number of locations surveyed was10 in Northern Guinea, 10 in Southern Guinea, and 10 in Derived savannas (Table 6). Derived savanna had significantly (P = 0.05) highest mean disease incidence (87.66 %). These

were followed by Southern Guinea savanna; Northern Guinea savanna incidence (83.67; 82.58 %). According to Zarafi and Emechebe (2005), environmental conditions such as high rainfall, greater number of humid months and lower temperatures are conducive for disease development and are, therefore related to the high levels of disease incidence recorded in Derived savanna. The variation of disease incidence observed among the zones was also reported for sorghum downy mildew (*Peronosclerosporasorghi*) on maize (Olanya *et al*. 1993; Fajemisin 1980). The variation was attributed to the variation in the environmental conditions such as rainfall, number of humid months and temperatures in those zones. Zarafi and Emechebe (2005) also reported significantly more severe yam anthracnose in areas of higher rainfall.

Conclusion

The occurrence of Cercospora Leaf Spot disease in the major sesame growing zones in Taraba State, under various cropping patterns suggests that the disease is a serious threat to sesame production. Therefore, strategies should be evolved to ameliorate the disease.

Acknowledgement

The authors is very grateful to Mrs. Maryam Bako, Bunkaya Bilkoya, Adeka Gani, Dantsoho M. Sule and Philip Magaji for their assistance during the surveys.

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