



ISSN: 2075-6240

Incidence of powdery mildew on Cucurbit plants in Katsina, Nigeria

Abubakar Umar Labo¹, Abrar Ahmad Khan² and Gufran Ahmad^{2*}

¹Department of Biology, Umaru Musa Yar'adua University, P.M.B.2218, Katsina, Nigeria, ²Department of Botany, Aligarh Muslim University, Aligarh, 202002, India

Received: December 31, 2018
Accepted: January 28, 2019
Published: January 30, 2019

*Corresponding Author:
Gufran Ahmad
Email: ahmadgufran811@gmail.com

ABSTRACT

The present study deals with powdery mildews in various cucurbits in Katsina city (Barhim Estate, Kofar Durbi, Kofar Sauri, Kofar Marusa and Low Cost), Nigeria. The finding shows that the areas infested with powdery mildew is one of the important diseases of cucurbits. The *Sphaerotheca fuliginea* was identified to be the causal organism present on all observed cucurbits in the study. Highest frequency of disease was found in Kofar Sauri (79%) followed by Kofar Marusa (68%), Kofar Durbi (66%), Barhim Estate (65%) and the lowest frequency of occurrence of disease was found in Low Cost (55%). The intensity of the disease was moderate to severe in general but it was high in many fields, the area-wise variation was also noticed. On vegetables, the highest frequency of occurrence of powdery mildew disease was observed on *L. cylindrica* (76.4%) followed by *C. moschata* (60%), *C. sativus* (59.3%), *C. vulgaris* (53.9%) and lowest was found on *C. melo* (44.4%). The highest intensity of disease was found on *C. moschata*, followed by *L. cylindrica*, *C. sativus*, *C. vulgaris* and *C. melo*.

KEYWORDS: Cucurbits, frequency, powdery mildew, *S. Fuliginea*, spore, symptoms

INTRODUCTION

Powdery mildew exists between such common, widespread and sometimes crop plants and ornaments that they are born on all crops every year in the growth of plants and crop, possibly due to the disease of another single type of plant. Having crossed the losses. Powder mildews rarely kill their hosts, but use their nutrients, reduce photosynthesis, increase respiration and transpiration, inhibit their growth, and reduce yields, sometimes from 20-40%. Plants which are most affected by powdered mildew mainly have different grains like wheat, barley, because in these crops, chemical control of plant disease is difficult. There are different crops which are under threat from powdery mildew like corky, especially kentalupa [1, 2].

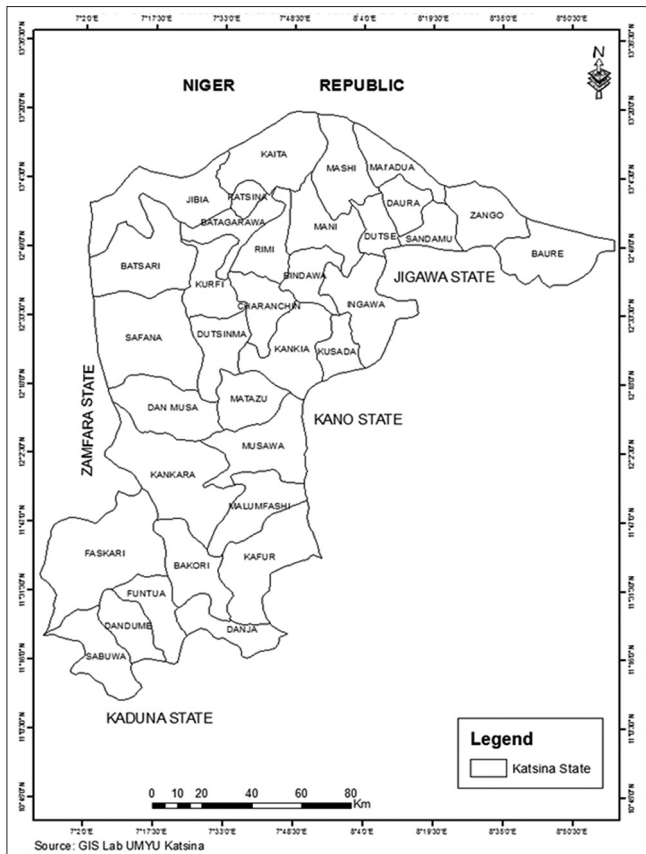
Powdery mildew is a common disease of cucurbits under fields and greenhouse conditions in most areas of the world. Although all cucurbits are susceptible, the symptoms are lower on cucumbers and watermelons because there is resistance in many commercial farms. This disease can be a major production problem. The amount of yield decreases due to any disease during the crop period. As a result of premature abscission of infected leaves, the quality of the market can be reduced because the fruits are burned before sunset or incomplete in the sun. In such fruits, the poor storage capacity (winter squash),

the resultant soluble solids with the bad taste (watermelon), bad rind color (pumpkin), besides, powdery mildew infections specifically prefer the plants for other diseases. Sphaerotheca Fuliginand is the most common form of the ancient seepieri rim. Due to the powder fungal disease on fungus recorded cucurbits.

E. cichoracearum was considered to be the primary contingent organism around the world before 1958. Today *S. Fuliginia* is more commonly found [3]. Powder crystalline disease is caused by many different species of fungi. This is one of the easiest diseases to spot, because its symptoms are quite specific. The infected plants show white powder spots on the leaves and stems. The lower leaves or young leaves are most affected, but mildew can be seen on any upper part of the plant. As the disease progresses, the spots become larger and a large number of asexual spores are formed, and with high humidity and moderate temperature [4, 3], the mold increases well in the environment.

The cucurbits belong to family *Cucurbitaceae*. They are commonly grown in Nigeria which include *Luffa cylindrica*, *Cucumis sativus*, *Cucumis melo*, *Citrullus vulgaris* and *Cucurbita moschata*. Powdery mildew disease is very common on these cucurbits. In Nigeria, no work has been done so far on powdery mildew diseases, more especially in Northern Nigeria. However, the powdery mildew diseases are very common wherever

Copyright: © 2019 The authors. This article is open access and licensed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted, use, distribution and reproduction in any medium, or format for any purpose, even commercially provided the work is properly cited. Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.



Administration map of Katsina state

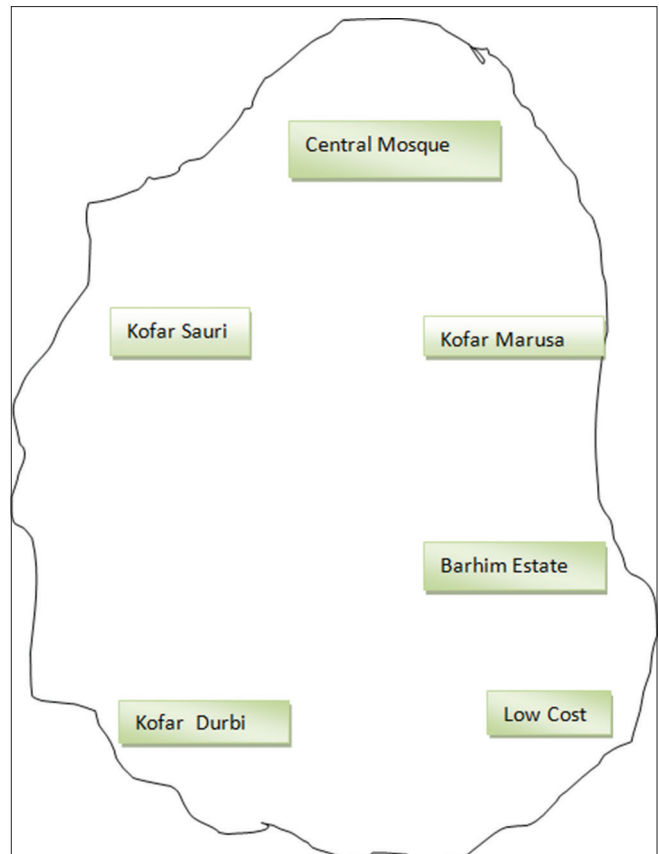


Figure 1: Showing the occurrence of powdery mildew in different localities of Katsina city

cucurbitaceous crops are grown. For first time an aim was made to observe the incidence and intensity of disease and identify the species of powdery mildew on cucurbitaceous crops

MATERIALS AND METHODS

The following materials were used for present proposed study. The materials were as hand globs, needles, brush, white polythene bags, knife/blade, cover slip, binocular, light microscope, distilled water, KOH solution, cotton blue and ocular micrometer.

Survey

A detailed survey was conducted for powdery mildews on cucurbits in and around Katsina from September to November, 2015. Five cucurbits growing areas were selected in Katsina, which included Kofar Sauri, Kofar Durbi, Barhim Estate, Kofar Marusa and Low Cost.

(Figure 1 & 2) to observe the presence of the powdery mildew and to identify the species infecting cucurbits. The sporadic method was followed for the sampling of cucurbits in the survey.

Pathogen: *Sphaerotheca fuliginea*

Five samples from each cucurbits as *Cucumis sativus* (cucumber), *Luffacylindrica* (sponge gourd), *Cucurbitamoschata*



Figure 2: Showing infection of powdery mildew disease on *Cucurbita moschata*

(pumpkins), *Citrullusvulgaris* (water melon) and *Cucumis melo* (gurji) were collected in polythene bags separately and brought to the laboratory for detailed study under light micro scope. Samples of each cucurbit were collected at random from each available field/plot in Katsina. Cucurbits grown in kitchen gardens, farm yards, orchards or climbing on roof – tops or huts or other dwelling units were also included for sampling. Aerial parts of the plants (leaves, twigs, stem portions) were collected.

Laboratory Examination

Infected leaves were selected for examination. Clean slide was used for microscopic examination. The spores from leaf were transferred on slide with the help of brush. A drop of water was put on the middle of slide. Very small cotton blue was used with the help of needle. Then cover slip was placed and observed under microscope. The species of powdery was identified on the basis of shape and size of spores. For conidial dimensions many slides prepared from each sample were measured with the help of ocular micrometer. L/B index was determined by dividing length of a conidium with its breadth. Mean values and standard deviation were calculated.

Incidence of Disease

Incidence of disease (percent occurrence) on each cucurbit crop in an area was calculated as follows:

$$\text{Disease incidence (\%)} = \frac{\text{Number of fields of cucurbit with infection}}{\text{Total fields of cucurbit surveyed}} \times 100$$

Intensity of Disease

Severity (intensity) of the disease on crops and in different areas of Katsina was rated on 0 – 3 scale as follows:

- Grades: 0 = No infection (-) = No visible disease symptoms
 1 = Mild infection (+) = Pustules few, small in size and scattered
 2 = Moderate (++) = Pustules many, large in size tending to lesce, and
 3 = Severe infection (+++) = Large pustules covering almost the entire leaf areas.

Average of the ratings from different fields of Katsina was assigned as severity grades to each cucurbit in the areas.

RESULTS

The incidence of the powdery mildews diseases in terms of frequency of occurrence on different cucurbit crops for each locality of Katsina city are given in table 1. The frequency of

occurrence of the disease was high in field of Kofar Sauri (79.3%) followed by Kofar Marusa (68.4%), Kofar Durbi (66.6%), Barhim Estate (65.7%) and lowest in Low Cost (55.8%). The average frequency of occurrence of powdery mildew disease in Katsina was 58.8% (Table 1). The frequency of occurrence of powdery mildew disease on *C. moschata* (Figure 2) was found highest in Barhim Estate (66.6%) and Kofar Sauri (66.6%) followed by Kofar Durbi (60%), Low Cost (57%) and lowest found in Kofar Marusa (50%). The frequency of disease on *L. cylindrica* (Figure 3) was found highest in Kofar Sauri and Kofar Marusa that was (100%) and lowest found in Low Cost (50%). On *C. sativus* (Figure 4) frequency was highest in Barhim Estate and lowest recorded in Low Cost (62.5%). Similarly the frequency of disease on *C. vulgaris* (Figure 5) and *C. melo* (Figure 6) was highest in Kofar Sauri locality while the lowest was recorded (50%) and (44.4%) for *C. vulgaris* in Kofar Marusa and *C. melo* in Low Cost respectively.

Among the cucurbits, the highest frequency of occurrence was found *L. cylindrica* in Kofar Sauri and Kofar Marusa that was (100%) and lowest was recorded on *C. melo* from Low Cost (Table 1).

On the basis of shape and size of spores the species of powdery mildew was identified as *Sphaerotheca fuliginea* on the entire included cucurbit crops from all the localities of Katsina (Table 2). In the conidial dimensions of the powdery mildew, the length of the spores was largest (Figure 7) in Barhim Estate



Figure 3: Showing infection of powdery mildew disease on *Luffa cylindrica*

Table 1: Frequency of occurrence of powdery mildew on cucurbit crops in Katsina

Cucurbits	Localities																	
	Barhim estate			Kofar Durbi			Kofar sauri			Kofar Marusa			Low cost			Total		
	Sam	Inf	Freq	Sam	Inf	Freq	Sam	Inf	Freq	Sam	Inf	Freq	Sam	Inf	Freq	Sam	Inf	Freq
<i>C. moschata</i>	15	10	66.6	5	3	60.0	6	4	66.6	8	4	50	7	4	57.0	41	15	60.0
<i>L. cylindrical</i>	7	4	57.4	8	6	75.0	4	4	100	7	7	100	6	3	50.0	32	24	76.4
<i>C. sativus</i>	8	7	87.5	5	4	80.0	3	2	66.6	-	-	-	8	5	62.5	22	18	59.3
<i>C. vulgaris</i>	-	-	-	7	4	57.4	8	7	87.5	4	4	50	4	3	75.0	23	16	53.9
<i>C. melo</i>	8	4	50.0	8	5	62.5	8	6	75.5	-	-	-	9	4	44.4	33	19	44.4
Total	38	25	65.7	33	22	66.6	9	23	79.3	19	13	68.4	34	19	55.8	151	92	58.8

Sam-Sample, Inf-Infected, Freq-Frequency



Figure 4: Showing infection of powdery mildew on *Cucumis sativus*



Figure 6: Showing infection of powdery mildew disease on *Cucumis melo*



Figure 5: Showing the powdery mildew infection on *Citrullus vulgaris*



Figure 7: Showing the conidia of *Sphaerotheca fuliginea* with fibrosin bodies

(26.46cm) as well as the breadth (24.57cm) followed by Kofar Durbi, length (23.52cm) and breadth (19.74cm); Low Cost, length (22.70cm) and breadth (18.62cm) and smallest in Kofar Sauri, length (17.03cm) and breadth (12.39cm). The L/B index of spores was found highest in Kofar Sauri (1.37) followed by Low Cost (1.21), Kofar Marusa (1.17), Kofar Durbi (1.14) and lowest in Barhim Estate (1.07) (Table 2).

The data presented in table 3 shows that severity of disease of powdery mildew was highest on *C. moschata* in Kofar Durbi (+++), on *L. cylindrical* Barhim Estate and Low Cost, on *C. sativus* in Kofar Sauri, on *C. vulgaris* and *C. melo* on Kofar Marusa. The highest severity of disease of *S. fuliginea* was observed in Kofar Marusa (11) and lowest was found in Low Cost (8). On cucurbits, the highest severity of disease was found on *C. moschata* (11) followed by *L. cylindrical* (10), *C. sativus* (10), *C. vulgaris* (9) and *C. melo* (9) (Table 3). Overall frequency of disease on severity grade was 49%.

DISCUSSION

The study was conducted in some localities of Katsina city to assess the frequency of occurrence and intensity of the disease

Table 2: Conidial dimensions of powdery mildews on cucurbits collected from different localities of Katsina

Locality	Pathogen	Conidial dimension		
		length (um)	Breath (um)	L/B index
Barhim estate	<i>S. fuliginea</i>	26.46±1.35	24.57±23.37	1.07
Kofar Durbi	<i>S. fuliginea</i>	23.52±4.20	20.58±4.10	1.14
Kofar Sauri	<i>S. fuliginea</i>	17.03±2.67	12.39±0.29	1.37
Kofar Marusa	<i>S. fuliginea</i>	23.10±2.14	19.74±2.53	1.17
Low cost	<i>S. fuliginea</i>	22.70±1.74	18.62±2.62	1.21
Average	-	22.56±17.1	22.9±8.56	1.19

L/B index: length and breadth index Values are mean of 25 conidia; ± standard deviation

caused by powdery mildew on cucurbit crops. The incidence in general was moderate to severe. Almost all cucurbits plants grown in the localities were found to be infected with powdery mildew disease in Katsina. *S. fuliginea* was identified to be responsible for powdery mildew disease on all cultivated cucurbits. However, severity of disease varied among the localities. Highest disease intensity was found on *C. moschata* and *L. cylindrical*. The frequency of occurrence was found to

Table 3: Severity of powdery mildew disease on cucurbits in different localities of Katsina

Locality	Vegetables					Total
	<i>C.moschata</i>	<i>L. cylindrical</i>	<i>C. sativus</i>	<i>C. vulgaris</i>	<i>C. melo</i>	
Barhim estate	++	+++	++	++	+	10
Kofar Durbi	+++	+	++	++	++	10
Kofar Sauri	++	++	+++	+	++	10
Kofar Marusa	++	+++	+++	+++		11
Low cost	++	+++	+	+		8
Total	11	10	10	9	9	49

Grade: + =mild; ++ =moderate; +++ =severe; - =No infection

be very high on *L.cylindrica* in Kofar Sauri and Kofar Marusa. Among localities, highest frequency of disease was found in Kofar Sauri and lowest was in Low Cost area.

S. fuliginea infects a large number of cucurbits all over the world in various agro climatic condition [5, 6, 7,8]. The *S. fuliginea* has already been reported on cucurbits in Libya and North African countries [9]. The present record of occurrence of *S.fuliginea* on cucurbits in Katsina (Northern Nigeria) is obvious as its climate is also similar to Libya and other sub Sahara countries. *S. fuliginea* may be a major pathogen causing powdery mildew of cucurbits in this relatively unexplored region: this, however, needs further detailed investigation.

CONCLUSION

This is the first report of *S. fuliginea* on cucurbits in Katsina state. The rate at which powdery mildews affect cucurbitaceae family members in present day has been an issue of a great concern to the farmers. The present observation demonstrated that the localities have sufficient infestation of powdery mildew

disease. The occurrence of *S. fuliginea* in the localities is of great importance. The high infestation ensures high damage to the crops.

REFERENCES

1. Jhooty, J.S. Pathological specialization in *S. fuliginea* causing powdery mildew of cucurbits. *Indian Phytopath.* 1967,38: 302-305
2. Khan, M.W. Studies on powdery mildew resistance in cucurbits. 1972, Report PL-480 Project, Aligarh Muslim University, Aligarh.
3. Khan, M.W. The identity of powdery mildew of cucurbits – a critical appraisal. *Acta. Bot. Indica.* 1983,11: 97-126
4. Dave, G.S., Khosla, H.K. and Nema, K.G. Identity of powdery mildews of cucurbits-*IJKVV Res. J.* 1971, 5: 133.
5. Ballantyne, B.J. Powdery mildew of cucurbitaceae: Identity distribution, host range and sources of resistance. *Proc. Linn. Soc. New South Wales.* 1975,99:100-120.
6. Khan, M.W. Powdery mildew of cucurbits- a three pathogen disease. *Int. J. Trop. Plant. Dis.* 1977, 107-123.
7. Sharma, A.K. Powdery mildew of some cucurbits from Jammu. *Indian Phytopath.* 1978,31: 85-86.
8. Ullasa, B.A. and Amin, K.S. Simultaneous occurrence of powdery mildews on *Cucurbita maxima* Dust and *Abelmoschus esculantus* (L.) Moench. from Karnataka, India. *Curr. Sci.* 1981,50: 238.
9. El-Ammari, S.S. and Khan, M.W. Leveillula taurica powdery mildew on greenhouse cucumber in Lihya. *Plant Disease* 1983,67: 5-53 - 555