https://dx.doi.org/10.4314/ijs.v26i3.20

EFFECTS OF LEAF BLIGHT CAUSED BY *Colletotrichum* AND *Lasiodiplodia* SPECIES ON THE GROWTH AND YIELD PARAMETERS OF MELONS (*Citrulus* AND *Leganaria* SPECIES)

Ogunsola, J. F.[1, 2*], Ogunsola, K. E.[1] and Ikotun, B.[2]
[1]Department of Biological Sciences, Bells University of Technology, Ota, Ogun State, Nigeria.
[2]Department of Crop Protection and Environmental Biology, University of Ibadan, Ibadan, Oyo State, Nigeria.
[*]Corresponding Author's Email: ogunsolajustinah@gmail.com
(Received: 27th October, 2024; Accepted: 9th December, 2024)

ABSTRACT

Melons (*Citrullus lanatus* (Thumb) Mansf. and *Leganaria siceraria* (Mol.) Standley) are vital vegetable crops in West Africa, valued for their edible nutrient-rich seeds and oil. However, their production is impacted by leaf blight, while the economic yield loss caused by this disease is not well documented. This study examined the effects of three blight-causing pathogens: *Colletotrichum truncatum* (Ct), *Colletotrichum gloeosporioides* (Cg), and *Lasiodiplodia theobromae* (Lt) on the growth and yield traits of melon. Three melon cultivars (Bara, Serewe, and Bojuri) were artificially inoculated with these pathogens in two field trials using a randomized complete block design with four replicates. Data on growth and yield parameters (GYPs) were analyzed using analysis of variance ($p<0.05$). The pathogens significantly affected GYPs depending on the cultivar. In Serewe cultivar, Lt significantly reduced vine length (from 82.9 to 28.2 cm) and the number of leaves (from 74.3 to 39.2). In Bara, the three pathogens reduced the number of leaves and number of vines, while a significant reduction of vine length was caused by Ct (from 98.2±9.9 to 42.4±7.7cm) and Lt (98.2±9.9 to 41.5±13.6cm). However, the GYPs of Bojuri was unaffected by the three blight pathogens. The pathogens also reduced the number of fruits per/plant of Serewe cultivar (from 7.8±2.6 to 3.1±0.6) and weight of fruits/per plant (from 8.0±5.0 to 1.6±0.9 kg) and all the evaluated yield parameters in Bara except weight of fruits/plant which was only reduced by Ct (from 3.1±0.8 to 1.2±0.8 kg). *Lasiodiplodia theobromae* (95.7%) *and Ct (92.9%) caused the highest reduction observed in the weight of seeds/plant of Serewe and Bara, respectively.* This study highlights significant yield losses due to *Colletotrichum* and *Lasiodiplodia* species in Serewe and Bara melon cultivars, emphasizing the need for effective disease management strategies.

Keywords: Blight-causing fungi, Growth parameters, Melon cultivars, Productivity, Seed yield reduction.

INTRODUCTION

Mellon as a vegetable crop belongs to the family of *Cucurbitaceae* which contains about 119 genera worldwide out of which 22 are cultivated in Nigeria (Schippers, 2000). Four of the most cultivated genera are *Cucumis, Citrullus, Cucumeropsis* and *Lagenaria*. Examples of species of this general are *Cucumis melo* L. (true melon), *Citrullus lanatus* Thunb. Matsum and Nakai (Watermelon) and *Citrullus lanatus* (Thumb) Mansf. (Brown-seeded melon), and *Cucumeropsis mannii* Naud. (syn. *C. edulis* (Hooker f.) cogn.) (White-seeded melon). *Leganaria* is a gourd-bearing plant which species include *L. breviflora*, *L. abyssinica*, *L. siceraria*, *L. rufa*, *L. sphaerica* and *L. guineensis* (Morimoto *et al*., 2004). The most common is *L. siceraria* (bottle gourd) which is widely domesticated beyond Africa (Morimoto *et al*., 2004).

Two of the melon species: *C. lanatus* (Thumb) Mansf. and *Leganaria siceraria* (Mol.) Standley are vital indigenous vegetable crops in West Africa. Melon is commonly referred to as “Egusi” in Nigeria. Nigeria is the leading producer of melon seeds, accounting for about 60% of the global annual production of 0.97 million tons (FAOSTAT, 2022). Three of the most prominent Egusi cultivars in Nigeria include Bara, Serewe (*C. lanatus*) and Bojuri (*Lagenaria siceraria*). Among these, Bara has the widest distribution, the most prominent in the Southwest and Northern regions (Denton and Olufolaji, 2000). It is characterized by prominent thick, black or white colour seed edges. "Serewe," on the other hand, lacks these pronounced seed edges and has a thinner seed coat, leading to a higher shelling percentage and a more edible endosperm than Bara (Denton and Olufolaji, 2000). Bojuri is distinct with its broad leaves, larger seeds than the other two, and a lack of prominent seed edges. It often has white or brown patches on its seeds (Ogunsola *et al.,* 2020).

Melon plays a vital role in income generation for subsistence farmers in Nigeria. It is integral to the farming systems, used in weed suppression, mulching, soil fertility restoration, and erosion control (Achigan-Dako *et al.,* 2008). Its seeds are versatile, used in various culinary applications. They are used as a thickening agent for sauces and soups, a snack ingredient ("robo" in Yoruba, Nigeria), and a fermented condiment ("ogiri" in Yoruba) for seasoning (Denton and Olufolaji, 2000). The fruits of *L. siceraria* (Bojuri) vary in shape and size and, when harvested dry, have several uses in Africa including Nigeria, such as for making utensils, containers and musical instruments. Its seeds are consumed as cake or thickeners of a traditional dish called "egusi soup" in most countries from Western and Central Africa (Enujiugha and Ayodele-Oni, 2003). In addition, the culinary properties from traditional recipes in tropical regions to the resurgence of Bojuri in contemporary European cuisine, agricultural application as a rootstock contributing to improved disease tolerance and yield, and antimicrobial property of *L. siceraria were* recently reported (Brdar-Jokanović *et al.*, 2024).

Despite the diverse uses of melon and significant contribution to the well-being of farmers and their communities, there is a decline in its production, with a significant reduction in both yield and quality (Mohammed, 2011; Ugwuoke *et al.,* 2021). One of the reasons for this is fungal disease infection. Leaf blight greatly hinders melon production in Southwest Nigeria. Leaf blight disease, a significant threat to melon cultivation in Nigeria, is caused by various fungal pathogens including *Didymella bryoniae, Colletotrichum truncatum, Colletotrichum gloeosporioides,* and *Lasiodiplodia theobromae* (Kehinde, 2011; Ogunsola *et al.,* 2020). The disease is both seed and soil borne (Joshi, 2018). This disease manifests as light brown spots with yellow borders on leaf tips, which eventually progress into larger lesions with black fruiting bodies (pycnida). These lesions lead to leaf yellowing and subsequent blight, impacting the overall health and productivity of the plant (Kehinde, 2013). Gummy stem blight and anthracnose was reported as the predominant fungal foliar diseases of Egusi the in Southwestern Nigeria, with a disease incidence index of 82.0 – 100% across *Citrullus lanatus* cultivars (Kehinde, 2011).

The impact of leaf blight disease on melon yield can be substantial, particularly in early-season crops grown under wet conditions. Some studies have indicated potential yield losses exceeding 30% due to this disease (Keinath, 2000). Despite its significance, there is limited information on the economic effect of the disease on the crop. Research on melon has been relatively limited compared to other legumes like cowpea and groundnut. To address this knowledge gap and improve the management of leaf blight disease, this study was conducted to assess the effects of these fungal pathogens on the growth and yield parameters of three popular melon cultivars: Bara, Serewe, and Bojuri.

MATERIAL AND METHODS

Sources of materials

The cultivars: Bara (NG/AO/11/085b), Serewe (NG/AA/SEP/09/148), and Bojuri (NG/TO/AUG/09/003) were obtained from the Genebank of the National Center for Genetic Resources and Biotechnology (NACGRAB), Moor Plantation, Ibadan, Nigeria. The leaf blight-causing pathogens: *C. truncatum, C. gloeosporioides,* and *L. theobromae* were isolated from infected leaf samples collected from a leaf blight survey of the Southwestern Nigeria (Ogunsola *et al.,* 2020).

Isolation of leaf blight causal pathogens

The 5 mm² sections from the boundary of infected tissues of the leaf samples were cut and surface-sterilized with 10% sodium hypochlorite for 1 minute, and rinsed five times in sterile distilled water (SDW). The samples were then plated on potato dextrose agar (PDA) and incubated at 28 ± 2°C for 2-3 days to observe fungal growth. The cultures were further purified, and the pure fungal isolates were examined under a compound microscope and identified using standard procedures (Barnett and Hunter, 2003).

Pathogenicity of the causal pathogens

A pathogenicity test was conducted at the greenhouse of the Nigeria Agricultural Quarantine Service, Moor Plantation, Ibadan. Fourteen-day-old melon seedlings were inoculated with spore suspensions of each fungal isolate. The spore suspensions were prepared by adding 10 mL of SDW to 7-day-old fungal cultures. Tween 80 (0.5 mL/L) was incorporated into the cultures to facilitate spore removal. A hemocytometer was used to determine the spore count. Spore concentration was measured by dispensing 0.1 mL of inoculum onto the hemocytometer. The spores in the four corner squares and the centre square were counted and multiplied by 10^4 to calculate the total spore count. Final spore count and inoculum concentration were determined following the methodology described by Berkane *et al.* (2002). The inoculated plants were monitored for the development of leaf blight symptoms.

Planting, artificial inoculation, and field management

A field experiment was conducted to evaluate the impact of the pathogens on plant growth and yield traits. The study was conducted on the research field of the National Cereals Research Institute (NCRI), Moor Plantation Ibadan, Nigeria on a piece of land with no prior history of melon cultivation. The land was ploughed and harrowed. The experimental design was a Randomized Complete Block Design (RCBD) in a factorial experiment. The field was 40 x 36 m with the total area of 1440 m^2. There were six blocks, each divided into four plots of 14 m x 4 m for inoculated and un-inoculated plants. Seeds were sown at a space of 1.5 m within rows and 2.0 m between rows at 24 plants per plot and 96 per block, making a total of 576 plants. The three melon cultivars were randomly planted on three rows in each plot, and the plants were artificially inoculated.

Fourteen-day-old test plants were artificially inoculated with spore suspension of each of the pathogens. Inoculation was performed by spraying the upper and lower surfaces of the two youngest fully expanded leaves with freshly prepared spore suspension of 2.1×10^6 spores/ml until runoff, using a hand-operated sprayer. There were four treatments, three inoculated plants with the three blight fungi and the negative control (plants sprayed with SDW) from each of the three cultivars. Insect pests were managed by Cypermethrin insecticide at 2 mL/litre, and weeds were manually controlled from three weeks after plant emergence (Kehinde, 2008). The field experiment was conducted in two trials at both early-season cropping (April - June) and late-season planting (August - October) of the year 2019.

Assessment of effects of leaf blight disease on growth parameters of melon cultivars

Plants were visually examined for leaf blight symptom from a week after inoculation (WAI) to confirm disease establishment. The plant growth parameters were assessed by taking a weekly data of the vine length (cm) using a meter rule, number of leaves, and number of vines. The data were taken on both inoculated and uninoculated plants from the third to fifth week after planting (WAP).

Evaluation of effects of leaf blight disease on the yield parameters of melon cultivars

At maturity, fruits were harvested, heaped together per treatment, broken with a club or cutlass, and left to ferment for two weeks before washing with water, and sun-drying. These processed seeds (with seed coats intact) were stored in paper envelopes and refrigerated before data collection. Data were taken on six yield parameters: number of fruits per plant, weight of fresh fruit per plant (kg), weight of seeds per fruit (g), weight of seeds per plant (kg), number of fruits per hectare, and weight of seeds per hectare (kg). Fruits were weighed immediately after harvest. Percentage seed yield reduction was calculated using the formula:

$$\text{Percentage yield reduction} = \frac{WC - WI}{WC} \times \frac{100}{1}$$

Where, WC = Weight of seed per plant for control
WI = Weight of seed per plant for inoculated plants

Data analysis

Growth and yield parameter data were subjected to analysis of variance (ANOVA) using the PROC GLM statement of Statistical Analysis System, version 9.2 (SAS 2008). The mean were separated using Students Newman Keuls at $p < 0.05$.

RESULTS

The seeds of the three melon cultivars germinated at 5 or 6 days after planting. The *C. truncatum, C.*

gloeosporioides and *L. theobromae* infection produced leaf blight symptoms on some of the plants which appeared from the fourth WAI (Figure 1). Symptoms commenced as light brown irregular spots with yellow borders mostly from the tip of the leaves and gradually extended backwards. These lesions later became larger, resulting in dark brown patches on the leaves (blight). The infected leaves eventually died in highly severe cases. The blight symptom was observed on the three melon cultivars while many plants were symptomless.

Figure 1. *Citrullus lanatus* and *Leganaria siceraria* (melon) cultivars. 1, Serewe 2, Bojuri and 3, Bara; A, field-grown plants B, leaf blight symptoms c, fruits and D, seeds

Effects of leaf blight pathogens on growth parameters of melon cultivars

The response of melon's growth parameters to blight fungi inoculum varied significantly ($P < 0.05$) with pathogen and cultivar. The two-way analysis of variance showed that the three blight pathogens significantly reduced the melon's vine length, number of leaves, and number of vines (Table 1). The melon cultivars also varied significantly in their response to the leaf blight disease in which Serewe and Bara showed significant reduction in growth parameters by all or at least one of the three fungi whereas Bojuri did not. In Serewe, only *L. theobromae* significantly reduced melon's vine length (from 82.9±36.8 to 28.2±4.7 cm) and number of leaves (74.3±18.2 to 39.2±8.5) whereas the three fungi did not reduce the number of vines (Table 2). The three blight pathogens significantly reduced leaves and vines number of Bara while only *C. truncatum* and *L. theobromae* reduced its vine length from 98.2±9.9 cm (negative control) to 42.4±7.7 cm and 41.5±13.6 cm, respectively. Meanwhile, none of the three blight fungi significantly reduced the three growth parameters of Bojuri.

Table 1. Effects of leaf blight causing fungi on the growth parameters of melon cultivars 5 weeks after planting.

Cultivar	Pathogen	Vine length (cm)	No. of leaves	No. of vines
Serewe	*Colletotrichum truncatum*	48.5±12.1ab	77.5±22.3a	10.5±3.3a
	C. gloeosporioides	85.6±8.6a	73.5±7.8a	33.9±18.8a
	Lasiodiplodia theobromae	28.2±4.7b	39.2±8.5b	5.1±1.4a
	Negative Control	82.9±36.8a	74.3±18.2a	20.4±15.5a
Bojuri	*C. truncatum*	38.4±12.5a	47.3±18.8a	6.2±3.4a
	C. gloeosporioides	58.3±32.6a	46.6±28.8a	12.5±4.3a
	Lasiodiplodia theobromae	33.8±5.5a	31.6±5.4a	3.7±0.7a
	Negative Control	58.6±27.1a	55.6±18.7a	12.9±10.5a
Bara	*C. truncatum*	42.4±7.7b	79.2±14.9b	8.1±1.3b
	C. gloeosporioides	79.6±16.9a	62.1±10.5b	6.8±1.2b
	Lasiodiplodia theobromae	41.5±13.6b	56.2±25.6b	7.1±3.4b
	Negative Control	98.2±9.9a	106.2±10.3a	13.1±2.7a

Negative control, un-inoculated plants
Mean values (means of two trials and four reps) with the same letters along each column for each cultivar are not significantly different according to Student Newman Keuls ($P<0.05$)

Effects of leaf blight causal organisms on the yield parameters of melon cultivars

The three blight pathogens also produced varied effects on the yield parameters of melons depending on the pathogen and cultivar. The ANOVA showed that the effects of pathogens varied significantly ($P < 0.05$) in their yield parameter except for number of fruits per hectare (Table 2). Similar trend to the growth parameter was observed in the yield parameters for Bojuri cultivar in which the pathogens significantly reduced yield traits in Serewe and Bara whereas that of Bojuri was not significantly reduced (Table 3) The blight-causing fungi significantly and similarly reduced the number of fruits per plant of Serewe from 7.8±2.6 (negative control) to 3.1±0.6 (by *C. gloeosporioides),* 3.3±0.5 (*L. theobromae*) and 3.6±1.3 (*C. truncatum*). These fungi also reduced the weight of fruits per plant from 8.0±5.0 to 1.6±0.6 (*C. truncatum),* 2.1±0.1 (*C. gloeosporioides),* and 2.7±0.8 (*L. theobromae*) of this cultivar but did not cause any significant reduction in other four yield parameters evaluated. For Bara, all the pathogens reduced the yield parameters evaluated except weight of fruits per plant which was only reduced by *C. truncatum* from 3.1±1.1 to 1.2±0.8 kg.

The blight producing fungi caused percentage seed yield reduction of between 0 and 95.7 in the three melon cultivars (Table 5). The highest seed yield reduction (95.7%) was observed in weight of seeds per plant of Serewe infected by *L. theobromae*, followed by 92.9% reduction in weight of seeds per plant in Bara by the three blight pathogens. Reduction of weight of seeds per fruit of Bara infected by *C. truncatum* (57.1%), *C. gloeosporioides* (42.9%), and *L. theobromae* (53.6%) was also observed. Similarly, *C. truncatum*, *C. gloeosporioides*, and *L. theobromae* reduced the weight of seeds per plant and weight of seeds per hectare by 43.5 and 21.0%, 60.9 and 17.3%, and 95.7 and 31.3% respectively. Although Bojuri showed 71.4% reduction in the weight of seeds per plant by each of the *C. gloeosporioides* and *L. theobromae,* however, analysis showed that the yield and growth reduction of this cultivar by the pathogens were not significant. The results also showed that both *C. gloeosporioides* and *C. truncatum* did not cause any reduction (0%) in the weight of seeds per fruits in Serewe and weight of seeds per hectare of Bara.

Table 2. Effects of leaf blight causing fungi on the yield parameters of melon's cultivars

Cultivar	Pathogen	No. fruits /plant	Wt fruits /plant (kg)	Wt seeds /fruit (g)	Wt seeds /plant (kg)	No fruits /hectare	Wt seeds /hectare (Kg)
Serewe	*Colletotrichum truncatum*	3.6±1.3b	1.6±0.6b	70.0±0ab	1.3±1.0a	19000±5484a	591.9±97.4a
	C. gloeosporioides	3.1±0.6b	2.1±0.1b	105.0±5.8a	0.9±0.6a	11256±6745a	620.0±124.1a
	Lasiodiplodia theobromae	3.3±0.5b	2.7±0.8b	65.0±5.8b	0.1±0a	16250±2598a	515.0±242.5a
	Negative Control	7.8±2.6a	8.0±5.0a	95.0±36.9ab	2.3±1.4a	20438±2909a	749.4±118.9a
Bojuri	*Colletotrichum truncatum*	3.1±1.4a	1.1±0.9a	110.0±11.5a	1.1±0.9a	14625±7938a	951.9±241.8a
	C. gloeosporioides	2.8±1.4a	1.8±0.3a	100.0±11.5a	0.2±0a	14000±6928a	877.5±470.5a
	Lasiodiplodia theobromae	2.4±0.6a	1.7±0.5a	85.0±28.9a	0.2±0a	11750±2887a	823.8±59.2a
	Negative Control	3.0±1.4a	2.1±0.2a	112.5±35.9a	0.7±0.4a	14894±7167a	916.3±433.3a
Bara	*Colletotrichum truncatum*	2.6±1.1b	1.2±0.8b	65.0±0.1b	0.1±0b	15250±2598b	416.3±24.5b
	C. gloeosporioides	3.7±0.4b	2.6±0.2ab	80.0±11.5b	0.1±0b	18500±1732b	653.1±163.8b
	Lasiodiplodia theobromae	3.4±0.2b	2.5±0.2ab	60.0±0.1b	0.1±0b	17000±866b	709.4±243.2b
	Negative Control	5.8±1.1a	3.1±0.8a	140.0±45.5a	1.4±0.4a	23000±3048a	1243.1±129.7a

[a]No. fruits, number of fruits; Wt seed, weight of seeds; Wt fruit, weight of fruits

Mean values with the same letters within each column along each cultivar are not different by SNK ($P<0.05$)

Table 3. Percentage seed yield reduction of melon cultivars by leaf blight causing fungi

Cultivar	Pathogen	Weight of seeds /fruit	Weight of seeds /plant	Weight of seeds /hectare
Serewe	*Colletotrichum truncatum*	26.3	43.5	21.0
	C. gloeosporioides	0.0	60.9	17.3
	Lasiodiplodia theobromae	31.6	95.7	31.3
Bojuri	*Colletotrichum truncatum*	2.2	0.0	0.0
	C. gloeosporioides	11.1	71.4	4.2
	Lasiodiplodia theobromae	24.4	71.4	10.1
Bara	*Colletotrichum truncatum*	57.1	92.9	0.0
	C. gloeosporioides	42.9	92.9	47.5
	Lasiodiplodia theobromae	53.6	92.9	42.9

DISCUSSION

The Leaf blight, which is prominent among cucurbits, produces severe disease symptoms on melon cultivars in Nigeria (Ogunsola *et al*., 2024). In this study, the effect of three leaf blight disease pathogens on the growth and yield of three melon cultivars were evaluated in two field trials.*Colletotrichum truncatum, C. gloeosporioides,* and *L. theobromae* caused a significant growth reduction in the Bara and Serewe cultivars. The results indicated higher susceptibility of Bara to the three blight causing fungi followed by Serewe and despite the development of blight symptoms by the pathogens on all the three cultivars, the infection did not result in any significant yield reduction in Bojuri.

Although, the ability of the three fungi to produce leaf blight disease has been reported (Kehinde, 2011; Ogunsola *et al.,* 2020), there is a limited information on their capacity to reduce the yield and productivity of melon cultivars. This study thus provided evidence of significant yield loss of *Citrullus lanatus* cultivars by leaf blight. Their effect however varied with pathogen and cultivar. Yield loss by these pathogens have been earlier reported on other crops. A significant reduction in seed germination, seed quality, and yield of soybeans by *C. truncatum* was observed in the warm and humid subtropical regions (Manandhar and Hartmans, 1999). Severe yield losses in melons from anthracnose caused by *C. truncatum* have been documented in Thailand and India (Manandhar and Hartman, 1999).

Lasiodiplodia theobromae is known to infect a wide variety of hosts, causing diseases like blight, dieback, root rot, and post-harvest decay across different plants in tropical and subtropical regions (Urbez-Torres *et al.,* 2008). In Southeast Nigeria, it was identified as a significant field pathogen Southwestern Nigeria (Bankole, 1998). The fungus has been documented causing leaf blight on orchids (*Catasetum fimbriatum*) in Brazil (Lopes *et al.,* 2009) and rice (*Oryza sativa*) in Nigeria (Claudius-Cole, 2018). It has also been found in stored melon seeds within Nigeria's humid forest and Northern Guinea savanna zones (Bankole *et al.,* 2006). Similarly, various *Colletotrichum* species are known to affect aerial parts of plants, causing blights and rots post-harvest (Saxena *et al.,* 2016). Although *Colletotrichum* species are commonly associated with anthracnose, they can also induce other conditions such as blight, leaf spot, dieback, and rot of flowers, fruits, and roots (Bruce *et al.,* 2013). For example, *C. truncatum* causes anthracnose and pod blight in soybean (Jagtap *et al.,* 2014), and *C. dematium* has been reported to induce leaf blight in *Azadirachta indica* (Bhanumathi and Rai, 2007). Additionally, five *Colletotrichum* species, including *C. gloeosporioides,* have been linked to brown blight on tea leaves (*Camellia sinensis*) in China (Yuhe *et al.,* 2020). This study highlights the ability of both *Colletotrichum* and *Lasiodiplodia* species to not only produce leaf blight symptoms but also cause a significant reduction in melon yield.

The inability of the three leaf blight pathogens to reduce the growth and yield parameters of Bojuri cultivar might be attributed to the genetic potential of the melon species to tolerate blight disease and the possibility of the presence of antifungal secondary metabolites that confer resistance to plant disease. For instance, phytochemical screening of the plant has revealed the presence of flavonoids, cucurbitacins, saponins and polyphenolics which have been reported to enhance antimicrobial property (Deshpande *et al.,* 2008). Similarly, *L. siceraria* was reported to be resistant to some soil-borne diseases and thus used as rootstock for watermelon in grafting (Lee, 1994).

The delayed onset of blight symptoms on the three melon cultivars, which was typically observed from 4 to 5 weeks after planting, might have also contributed to this broad-leaf cultivar to develop some tolerance to these pathogens over time as suggested by Odubanwo *et al.* (2013). The variation in the impact of these pathogens on the yield traits of the *Egusi* melon cultivars also suggests differences in the aggressiveness or virulence of the blight-causing pathogens as well as the genetic variation and defense mechanisms of the cultivars. The significant effects of pathogen in all the parameters except number of fruits per hectare implies variation in the growth and yield reduction capacity among the three pathogens. The *C. truncatum* and *L. theobromae* produced growth and yield reduction in more parameters than *C. gloeosporioides*.

These findings provided a yield reduction of 92.9 and 95.7% by leaf blight disease on Serewe and Bara which are the most prominent cultivars in Nigeria (Obani and Ikotun, 2023). This information will be useful in developing effective management measures for the control of the disease. The fungicidal properties of botanicals like *Phyllanthus amarus* Schum & Thonn*, Passiflora foetida* Linn., and *Costus afer* Ker-Gawl have been recognized as effective and eco-friendly biopesticides for managing leaf blight in melon, which can contribute to higher yield and productivity. Unlike synthetic fungicides, these natural treatments are considered safe, affordable, and efficient, significantly curbing disease spread without harming humans or the environment (Ogunsola and Ogunsola, 2023). Further research on the plants to harness their antifungal potential will enhance melon's productivity. Additionally, the Bojuri cultivar is recommended for areas prone to leaf blight infection, based on cultivar preference. The study revealed that different cultivars exhibit varied responses to pathogen effects on growth and yield, with Bojuri showing no impact from the disease, while Bara and Serewe experienced more considerable reductions. Specifically, Bara had the most significant decrease, followed by Serewe.

CONCLUSION

This study shows the ability of leaf blight pathogens: *C. truncatum, C. gloeosporioides,* and *L. theobromae* to significantly reduce growth and yield parameters of Serewe and Bara melon cultivars. The three fungi only produced blight symptom on Bojuri but did not impair its growth and yield parameters. Yield reduction was more pronounced in Bara, followed by Serewe and *L. theobromae and C. truncatum* produced more yield loss than *C. gloeosporioides.* The high reduction in the weight of seeds per plant in Serewe caused by *L. theobromae* and in Bara by the three pathogens indicate a high yield loss caused by leaf blight. These results underscore a significant yield loss by blight causing fungi on Serewe and Bara cultivars of *Citrullus lanatus* necessitating the need for an effective blight disease management measure. Further study is required on environment-friendly leaf blight management strategies for melon.

ACKNOWLEDGEMENTS

We are grateful to the Head of the Nigeria Agricultural Quarantine Service (NAQS) and National Cereal Research Institute, Moor Plantation, Ibadan Nigeria, for extending diagnostics facilities and experimental field for this study. We also thank Dr Adewale S. Kazeem of NAQS and Dr. Oluwole Oguntade of Germplasm Health Unit, IITA, Ibadan Nigeria, for their assistance in disease diagnosis.

FUNDING

The authors claimed they did not receive any financial support for this work.

CONFLICT OF INTEREST

The authors declare lack of any form of conflict of interest.

HUMAN AND ANIMAL RIGHTS

This article lacks any human or animal rights.

AUTHORS' CONTRIBUTIONS

Conceptualization was by [JFO, KEO and IB]. The methodology was contributed by [JFO and KEO]. Formal analysis investigation, and interpretation of data were by [JFO and KEO]. Writing original draft preparation was contributed by [JFO]. Writing review and editing were contributed by [KEO]. Funding and resources were contributed by [KEO]. Final review and approval of the manuscript for publication was by [JFO, KEO and IB].

DECLARATION

This manuscript is only submitted to the Ife Journal of Science and is not under review elsewhere or being considered for publication by any other journal.

REFERENCES

Achigan-Dako, G.E., Vodouhe SR, Sangare, A. 2008. Characterization morphologique des cultivars locaux de *Lagenaria siceraria* (Cucurbitaceae) collectes au Benin et au Togo. *Belgium Journal of Botany*, 14: 21–38

Bankole, S.A. 1998. Postharvest fungal deterioration of melon seeds and its control. PhD Thesis, Department of Crop Protection and Environmental Biology, University of Ibadan, Nigeria. 219 pp.

Bankole, S.A., Ogunsanwo, B.M., Osho, A., Adewuyi, G.O. 2006. Fungal contamination and aflatoxin B1 of 'egusi' melon seeds in Nigeria, *Food Control*, 17(10): 814-818. doi: 10.1016/j.foodcont.2005.05.008

Barnett, H.L., and Hunter, B.B. 2003. Illustrated Genera of Imperfect Fungi. American Phytopathological Society Press, St. Paul, Minnesota, USA. 218 pp.

Berkane, A., Cruenca-Estrella, M., Gomez-Lopez, A., Petrikkou, E and Mellado, E. 2002. Comparative evaluation of two different methods of inoculum preparation for antifungal susceptibility testing of filamentous fungi. *Journal of Antimicrobial Chemotherapy,* 50(5): 719-722

Bhanumathi, A. and Rai, R.V. 2007. Leaf blight of *Azadirachta indica* and its management. *African Journal of Agricultural Research,* 2(5): 38-543.

Brdar-Jokanović, M., Ljevnaić-Mašić, B., López, M.D. *et al.* 2024. A comprehensive review on *Lagenaria siceraria*: botanical, medicinal, and agricultural frontiers. *Nutrire* 49: 24. doi: 10.1186/s41110-024-00266-7

Bruce, C.D.F., Fatima, C.D. and Michereff, S.J. 2013. Biology of *Colletotrichum* spp. And epidemiology of the anthracnose in tropical fruit trees. *Revista Caatinga,* 26: 130-138.

Claudius-Cole A.O. 2018. *Lasiodiplodia theobromae* in the Root Rot Disease Complex of Rice. *Journal of Rice Research* 6(4): 1-5. doi: 10.4172/2375-4338.1000197

Denton, L. and Olufolaji, A.O. 2000. Nigeria's most important vegetable crops. In: Agronomy in Nigeria, M.O. Akoroda (editor). University of Ibadan, pp 85-93.

Deshpande, J.R., Choudhari, A.A., Mishra, M.R., Meghre, V.S., Wadodkar, S.G. and Dorle, A.K. 2008. Beneficial Effects of Lagenaria siceraria (Mol.) Standley fruit epicarp in animal models. *Indian Journal of Experimental Biology*, 46: 234-242

Enujiugha, V.N., and Ayodele-Oni, O. 2003. Evaluation of nutrient and some anti-nutrients in lesser-known, under-utilised oilseeds. *International Journal of Food Science and Technology* 38: 525-528

FAOSTAT 2022. "Food and Agriculture Organization of the United Nations, Statistical database", Rome: Crops and livestock products. Accessed 22 October, 2024. https://www.fao.org/faostat/en/#data/QCL

Jagtap, D.P., Gavale, D.S. and Utpal, D. 2014. Control of C*olletotrichum truncatum* causing anthracnose /pod blight of soybean by aqueous leaf extracts and biocontrol agents. *Legume Research*, 37(3): 329–334. doi:10.5958/j.0976-0571.37.3.050

Joshi R. (2018). A review on Collectotrichum spp. Virulence mechanism against host plant Defensive factors. Journal of Medical Plants Studies 6(6): 64-67 doi: 10.22271/plants.218.v6.i6b.02

Kehinde, I. A. 2008. Identification and control of field and storage fungal pathogens of Egusi melon: *Citrullus lanatus* (Thumb) Mansf. in Southwestern Nigeria. PhD. Thesis. Dept. of Crop Protection and Environmental Biology, University of Ibadan. 211 pp.

Kehinde, I. A. 2011. Response of melon cultivars to natural infection by diseases in Southwestern Nigeria. *International Journal of Biology,* 3(4): 47-55

Kehinde, I.A. 2013. Characteristic symptoms of melon diseases caused by fungi in Southwestern Nigeria. *African Journal of Agricultural Research,* 8(46): 5791-5801

Keinath, A.P. 2000. Effect of protectant fungicide application schedules on gummy stem blight epidemics and marketable yield of *Plant Disease* 84. (3): 254–260

Lee J.M., 1994. Cultivation of grafted vegetables I. Current status, grafting methods and benefits. *Journal of Horticultural Science*, 29: 235–239

Lopes, U.P., Zambolim, L. and Pereira, O.L. 2009. First report of *Lasiodiplodia theobromae* causing leaf blight on the orchid *Catasetum fimbriatum* in Brazil. *Australasian Plant Disease Notes,* 4: 64-65

Manandhar, J.B. and Hartman, G.L. 1999. Anthracnose. In: Hartman, G.L. Sinclair, J.B. and Rupe, J. C (editors) *Compendium of Soybean Diseases.* 4th edition. St. Paul, APS Press, USA, pp. 13-14.

Mohammed, B.T. 2011. Socio-economic analysis of melon production in Ifelodun Local Government Area, Kwara State, *Nigeria. Journal of Development and Agricultural Economic*, 3(8): 362-367

Morimoto, Y., Gikungu, M., and Maundu, P. 2004. Pollinators and biological diversity: the case of the bottle gourd (Lagenaria siceraria) in Kenya, Notes on Lagenaria and Cucurbita (Cucurbitaceae)" by Herwig Teppner 252pp.

Nnadi, N.E. and Carter, D.A. 2021. Climate change and the emergence of fungal pathogens. *PLoS Pathog*, 17(4): e1009503. doi: 10.1371/journal.ppat.1009503

Obani, F. T. and Ikotun, B. 2023. Various Egusi Melon Seeds existing in Southwestern Nigerian Markets. Sustainable Agriculture, Nature Conservation and Climate Change Response. Proceedings of the First Faculty of Agriculture International Conference, Nnamdi Azikiwe University, Awka, Nigeria. pp 310-312. https://journals.unizik.edu.ng/faic/article/view/1945/1582

Odubanwo, B.O., Popoola, A. R., Ojo, D. K. and Ganiyu, S.A. 2013. Yield performance of soybean accessions on field naturally infected with bacterial pustules (*Xanthomonas axonopodis* pv. glycine) *African Crop Science Conference proceedings,* 11: 309-315

Ogunsola, J.F., Ikotun, B., Ogunsola, K.E. 2020. Incidence of leaf blight disease of Egusi melon in South-West Nigeria. *African Crop Sciences Journal,* 28(2): 255–265. doi: 10.4314/acsj.v28i2.10

Ogunsola J. F. and Ogunsola K. E. 2023. Antifungal activity of *Phyllanthus amarus Passiflora foetida* and *Costus afer* against Colletotrichum species causing leaf blight on *Citrullus lanatus* (Egusi melon). *Journal of Plant Diseases and Protection.* 130(2): 301-313. doi: 10.1007/s41348-022-00690-9

Ogunsola, J.F., Ogunsola, K.E. Ikotun, B. Salihu, S., Kazeem, S.A. and Adesanmi, O.B. (2024). Potential of *Trichoderma, Pseudomonas*, and *Bacillus* species as biocontrol agents against leaf blight of *Citrullus lanatus* (Egusi melon). *Indian Phytopathology*. doi: 10.1007/s42360-024-00755-9

Saxena, A., Raghuwanshi, R., Gupta V. K. and Singh, H.B. 2016. Chilli Anthracnose: The epidemiology and management. *Frontiers in Microbiology*, 7: 1527-1535. doi: 10.3389/fmicb.201 6.01527

Schippers, R. R. 2000. *African Indigenous Vegetables. Cal An Overview of the Cultivated Species.* Natural Resources Institute/ACP-EU Technical Centre for Agricultural and Rural Cooperation, Chatham, UK. 214 p.

Statistical Analysis System (SAS), 2008. SAS User's Guide Version 9.2, Cary, NC, SAS Institute Incorporated

Ugwuoke C.U., Asogwa, A.A., Okwo, C.R., Onu, F.M., Eze, G.E. and Onah, F.C. 2021. Effects of planting distance and seed rate on the growth and yield of Egusi melon (*Citrullus colocynthis*). *Legume Research-An International Journal*, 44(3): 328-333. doi: 10.18805/LR-566

Urbez-Torres, J.R., Leavitt, J.C., Guerrero, J.G. and Gubler, W.D. 2008. Identification and pathogenicity of *Lasiodiplodia theobromae* and *Diplodia seriata,* the causal agents of Canker. *Disease of Grape vines in Mexico*, 92(4): 519-529

Yuhe, W., Lvjia Z., Liang, Z., Huarong, T., and Yingjuan C. 2020. A New Colletotrichum species associated with brown blight disease on *Camellia sinensis*. *Plant Disease*, 105(5): 1474-1481. doi: 10.1094/PDIS-09-20-1912-RE