International Journal of Innovative Agriculture & Biology Research 9(4):10-18, Oct.-Dec., 2021

© SEAHI PUBLICATIONS, 2021 **www.seahipaj.org** **ISSN: 2354- 2934**

Studies Of Common Diseases Of Balanite *(Balanite aegyptiaca L.)* Trees In Usmanu Danfodiyo University, Sokoto, Nigeria

Nasiru A. M*[1] & [2]Muhammad A. S

***[1]Department of Forestry & Environment, Usmanu Danfodiyo University, Sokoto Nigeria**
[2]Department of Crop Science, Usmanu Danfodiyo University, Sokoto Nigeria
Email: amnafad597@gmail.com **Phone: +234(0)8034566086**

ABSTRACT
Number of diseases was reported to attack *Balanite aegyptiaca* causing loss in yield and quality of the tree parts. Purposive sampling procedure was used to identify different locations in Usmanu Danfodiyo University, Sokoto. Diseased leaf samples were collected with the objective of identifying incidence, severity and the disease and organisms responsible for the disease. The result of *Fusarium* Leaf spots shows that, incidence in area between Alh. Shehu Ladan close to Area 1.E recorded the highest disease incidence (65.49%), followed by the area between Abdu Gusau Road to Ihenacho road (50.27%), the severity was significantly higher in the area between Prof. S. Galadanci road to Abdu Gusau road which was recorded (39.82%), followed by the area between Ihenacho road to Sultan lbrahim Dasuki road (38.9%). Almost similarly results were obtained from Mucor Leaf spots, *Aureo basidium* leaf rusts and Aspergillus leaf rust. The research revealed that, leaf spot and leaf rust are the available symptoms of the disease of *Balanites aegyptiaca* in Usmanu Danfodiyo University Sokoto. Therefore, all the possible management practice should be put in place so as to enhance the productivity of the tree.
Keywords: - *Balanites aegyptiaca*, Incidence, Severity, Fungi, Pathogens and Diseases

INTRODUCTION

The normal physiological functions of plants are disturbed when they affected by pathogenic living organisms or by some environmental factors. Initially plants react to the disease causing agents, particularly in the site of infection. Later, the reaction becomes more widespread and histological changes takes place, such changes are expressed as different types of symptoms of the disease which can be visualized macroscopically. As a result of the disease, plant growth in reduced, deformed or even the plant dies (Singh, 2007). Historical perspectives show that the attention of man to plant disease and the science of plant pathology were drawn first only in the European countries (Singh, 2007). Greek philosopher Theophrastus (about 28 BC) recorded some plant disease about 2400 years ago.

Balanites aegyptiaca (L) Del. are species of tree, classified either as a member of the *Zygophyllaceae* or the *Balanitaceae.* It is deep rooted arid zone tree that has a very wide natural range. The wide range of habitat in which this species is occurring suggests high pattern of variation among and within locations. This tree is native to much of African and part of the Middle-East (Prashant *et al.,* 2011). *Balanties aegyptiaca* is a perennial tropical plant used in food preparations and herbal medicine, especially in African and some developing countries (Nadro *et al.*, 2014). It is also called desert date (English), *Aduwa* (Hausa, Nigeria), *Tanni* (Fulfulde, Nigeria) and *Heglig* (Arabic) (Nadro *et al.,* 2014). The plant is commonly found wild in Borno and Adamawa states of Nigeria. *B. aegyptiaca* attains a height of about 6-10 meters (21-33ft) in height with a generally narrow form and is highly resistant to stresses such as

sandstorms and heat waves, and grows with minimal available moisture. The tree has thick, tough glossy leaves, spiny branches, and a double root system and produces date-like fruits. The plant grow extensively even when neglected (Shweta, 2014). The branches are thorny, the tree produced several form of inflorescences bearing yellow-green bisexual flowers which exclude nectar. The larvae of the cabbage tree emperor moth *bunaeaalcinoe* causes defoliation of the tree. The dark green compound leaves are made up of two leaflets which are variable in size and shapes (Prashant *et al.,* 2011).

In Nigeria, Balanite fruits are commonly consumed by both rural and urban dweller especially during the dry season. This fruits has high nutritional values (food, medicine and fodder) as compared to cultivated fruits. However, a number of disease were reported to attack *Balanite aegyptiaca* causing loss in yield and quality of the tree parts which range from the loss of chlorophyll form the tissues of leaves (yellowing), necrosis of the die-bark tissue (Canker), lesion on the fruits which are some of the disease affecting *Balanite aegyptiaca* in Usmanu Danfodiyo University, Sokoto (Main Campus). Despite the vast values of *Balanite aegyptiaca* in terms of it medicinal uses, nutritional and economical importance, there is lack of information of the diseases affecting tree with respect to the pathogens that are responsible to the disease. The study is therefore aimed to determine the incidence and severity of the disease affecting *Balanite aegyptiaca* and to identify the pathogens that are responsible for the disease.

Balanite aegyptiaca is one of the most common trees, but neglected wild plant species of the dry land of Africa. Therefore, this study was carried out to put insight and awareness of this plant species for more emphasis on its importance and to determine the disease incidence and severity of the plant and the organisms responsible for the disease and possible disease management practice in order to reduce the activities of these organisms.

MATERIALS AND METHODS

Study area

The study was conducted in five locations within usmanu Danfodiyo University permanent site located in Dundaye village under Wamako local government area of Sokoto state Nigeria. Sokoto state is located in the Sudan savannah zone in the extreme north western part of Nigeria between latitude 11-6^{0}N and 13.9^{0}N and Longitude 3.7^{0}E and 6.9^{0}E (Mamman *et al.,* 2000). Sokoto state share common border with Niger republic to the north, Kebbi state to the south west, Zamfara state to the south. Sokoto state has two main seasons, dry season which last from October to June and raining season from June/July to September. The humidity in January is less than 20% in northern areas and between 20-4-% in the southern areas. The mean annual rainfall is 750mmhg and potential evapo-transpiration rate has been reported to be 162cm. the annual mean temperature is 34.9^{0}c with highest temperature recorded in april (41^{0}C) and the minimum temperature occurring in January (13^{0}C) (Hassan *et al.,* 2005). This temperature fall are caused by severe harmattan and to low humidity. Sokoto is located in the sudan savannah zone, where grass cover is more or less interspeare by short and shrubs. The soil is predominantly ferruginous tropical type. Texturally sandy and pH of the soil ranges between 6 and 7. Some common tree species found includes *Balanites aegyptiaca, Vetex domiana, Adansonia digitata, Acacia nilotica, Perkia biglobosa, Eucaplyptus camaldulensis, Azadirachta indica* (Bello., 2002).

Sampling Procedure and Sampling Collections

Prior to the commencement of the research, a reconnaissance survey of the selected locations was done. These locations were:

1. Location I: this area lies along the road between Prof. S. Galadnci road to Abdu Gusau road
2. Location II: this area lies between Abdu Gusau road to Ihenacho road
3. Location III: this area lies between Iheanacho road to Sultan Ibrahim Dasuki road
4. Location IV: this area lies between Sultan Ibrahim Dasukiroad to Alh. Shehu ladan close
5. Location V: this area lies between Alh. Shehu Ladan close to Area I.E

Cluster sampling technique was employed and ten trees were randomly selected in each location for the study, the selected trees were critically examined for presence of disease.

The specimen of the disease level was collected using scissor and placed into the sterile polythene bag and the samples were taken to the mycology laboratory of biological science, Usmanu Danfodiyo University Main campus, Sokoto for analysis.

Laboratory Procedures for the Identification of Pathogens

Sterilization of glassware: the petri dishes were wrapped with the foil paper and were place into the hot air oven for sterilization

Media preparation: the media was prepared in the conical flask according to manufacturer instructions i.e. 39g of PDA was dissolved in 1000ml of distilled water; 1g of streptomycin was added to inhibit the growth of bacteria, the conical flask was then closed with cotton wool and was wrapped with foil paper. The mixture was heated using thermo-plate and dissolved completely and aws autoclaved at 121^{o}c for 15 minutes. It was allowed to cool. After which it was poured into the petri dish aseptically.

Inoculation: little portion of the sample was taken aseptically with inoculation needle and was incubated at the centre of the media

Sub-culturing: fungal mycelium of the isolated organism was sub-cultured on fresh PDA in order to obtain pure culture. The cultural characteristics were noted and detailed microscopic characteristics (morphological) were observed. The fungi were identified using identification manual (identification of food borne fungi) by Robert A Samson and Ellen S. van Reenen-Hoekstra. The data collected were incidence and severity of the leaf disease, mycelia growth for two weeks after inoculation

Assessment of Incidence and Severity Disease of *Balanite aegyptiaca*

Disease incidence is the number of plants units infected, expressed as a percentage of the total number of units assessed as follows:

$$\text{Disease incidence (I)} = \frac{\text{Number of infected plants unit}}{\text{Total number(healthy and infected) of units assessed}} \times 100$$

While disease severity scores were obtained using 1-5 scale adapted from Zelalem, *et al*, (2012), ghosh, *et al*, (2010) and tarr, (1981) where;

1. No symptoms on leaves
2. 1-25% number of leaves diseased
3. 26-50% number of leaves diseased
4. 51-75% number of leaves diseased
5. 76% or more number of leaves diseased

$$\text{Disease Severity (S)} = \frac{\text{Sum of all leaves disease rating}}{\text{total number of leaves examined X maximum rating}} \times 100$$

Data Analysis

The data was subjected to analysis of variance (ANOVA) procedures using SPSS software, version 21. Descriptive analysis was employed to analyze the data by determining frequency and percentages.

RESULTS

Disease Incidence and Severity of Balanites aegyptiaca

The Incidence and Severity of Fusarium leaf spots of Balanites aegyptiaca presented in table 1, with significant difference among the treatment. The result shows that, the area between Alh. Shehu Ladan close to Area 1.E recorded the highest disease incidence (65.49%), followed by the area between Abdu Gusau road to Ihenacho road (50.27%), followed by the area between Ihenacho road to Sultan Ibrahim Dasuki road and Prof. S. Galadanci road to Abdu Gusau road which were statistically similar (30.95%) and (27.29%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh. Shehu Ladan Close (5.55%). The severity was significantly higher in the area between Prof. S. Galadanci road to Abdu Gusau road which was recorded (39.82%), followed by the area between Ihenacho road to Sultan lbrahim Dasuki road (38.9%), followed by the area between Abdu Gusau road to Ihenacho road and Alh. Shehu Ladan close to Area 1.E, which was also statistically similar (28.89%) and (26.51%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh, Shehu Ladan close with (12.96%).

Table 1: Incidence and Severity of Fusarium Leaf spots of *Balanite aegyptiaca*

Location	Incidence (%)	Severity (%)
Prof. S. Galadanci road - Abdu Gusau road	27.29±4.99[b]	39.82±4.32[a]
Abdu Gusau road - Ihenacho road	50.27-23.71[ab]	28.89+3.00[ab]
Ihenacho road -Sultan Ibrahim Dasuki road	30.95+18.19[b]	38.96+5.70[ab]
Sultan TbrahimDasuki road- Alh. Shehu Ladan close	5.55+9.62[c]	12.96+22.45[c]
Alh. Shehu Ladan close - Area 1.E	65.49+3.58[a]	26.51+13.52[b]
Standard error	6.31	3.49
Significant Difference	*	*

Means followed by the same letter(s) do not differ significantly according to Duncan Multiple Range Test (DMRT) at 5% level of significance.

The Incidence and Severity of Mucor leaf spots of *Balanite aegyptiaca* are presented in table 2, with significant difference among the treatments. The result shows that, the area between Alh. Shehu Ladan close to Area 1.E recorded the highest disease incidence (50.11%), followed by the area between Ihenacho road to Sultan Ibrahim Dasuki road (44.40%o), followed by the area between Abdu Gusa road to Ihenacho road and Prof. S. Galadanci road to Abdu Gusau road which were statistically similar (32.10%) and (30.55%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh. Shehu Ladan close (7.22%). The severity was significantly higher in the area between Ihenacho road to Sultan Ibrahim Dasuki road which was recorded as(43.33%6), followed by the area between Prof. S. Galadanci road to Abdu Gusau road(37.18%6), followed by the area between Alh. Shehu Ladan close to Area 1.E and Abdu Gusau road Ihenacho road which were also statistically similar as (31.31%) and (26.56%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh. Shehu Ladan close (11.06%).

Table 2: lncidence and Severity of Mucor Leaf spots of *Balanite aegypiaca*

Location	Incidence (%)	Severity (%)
Prof. S. Galadanci road - Abdu Gusau road	30.55±3.03[b]	37.18±11.85[ab]
Abdu Gusau road - Ihenacho road	32.10±11.27[ab]	26.56±8.94[b]
Ihenacho road -Sultan Ibrahim Dasuki road	44.40±16.82[ab]	43.33±333[a]
Sultan Ibrahim Dasuki road - Alh. Shehu Ladan close	7.22±12.50[c]	11.06±19.20[c]
Alh. Shehu Ladan close - Area 1.E	50.11±13.92[a]	31.3±14.60[ab]
Standard error	4.79	3.80
Significant Difference	*	*

Means followed by the same letter(s) do not differ significantly according to Duncan Multiple Range Test (DMRT) at 5% level of significance

The incidence and Severity of *Aureo basidium* leaf rust of *Balanite aegyptiaca* is presented in table 3, with significant difference among the treatments. The result shows that, the area between Alh. Shehu Ladan close to Area 1.E recorded the highest disease incidence (62.226), followed by the area between Abdu Gusau road to Ihenacho road (42.246), followed by the area between Prof. S. Galadanci road to Abdu Gusau road and Ihenacho road to Sultan Ibrahim Dasuki road which were statistically similar (36.246) and (26.19%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh. Shehu Ladan close (1.49%). The severity was significantly higher in the area between Ihenacho road to Sultan Ibrahim Dasuki road which was recorded as (49.34%), followed by the area between Prof. S. Galadanci road to Abdu Gusau road (36.08%), followed by the area between Abdu Gusau road to Ihenacho road and Alh. Shehu Ladan close to Area 1.E, with (30.75%) and (27.53%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh. Shehu Ladan close (3.76%).

Table 3: Incidence and Severity of *Aureo basidium* leaf rusts of *Balanite aegyptiaca*

Location	Incidence (%)	Severity (%)
Prof. S. Galadanci road - Abdu Gusau road	36.2±44.73[b]	36.0±84.01[ab]
Abdu Gusau road - Ihenacho road	42.24±21.42[ab]	30.75±4.01[b]
Ihenacho road - Sultan Ibrahim Dasuki road	26.19±13.44$_b$	49.34±1.65[a]
Sultan Ibrahim Dasuki road Alh. Shehu Ladan close	1.49±2.58[c]	3.76±6.51[c]
Alh. Shehu Ladan close - Area 1.E	62.22±2.66[a]	27.53±3.15[b]
Standard error	5.90	4.07
Significance difference	*	*

Means followed by the same letter(s) do not differ significantly according to Duncan Multiple Range Test (DMRT) at 5% level 'of significance.

The Incidence and Severity of Aspergillus leaf rust of *Balanite aegyptiaca* is presented in table 4, with significant difference among the treatments. The result shows that, the area between Alh. Shehu Ladan close to Area 1.E recorded the highest disease incidence (59.42 6), followed by the area between Ihenacho road to Sultan Ibrahim Dasuki road (43.51%), followed by the area between Abdu Gusau road to Ihenacho road and Prof. S.Galadanci road which were statistically similar (35.72%) and (29.15 %) respectively, the least disease severity was recorded in the area between Sultan brahim Dasuki to Alh. Shehu Ladan close (2.40%). The severity was significantly higher in the area between Ihenacho road to Sultan Ibrahim Dasuki road which was recorded (39.73%), followed by the area between Prof. S. Galadanci road to Abdu Gusau road (35.24%), followed by the area between Abdu Gusau road to Ihenacho road and Alh. Shehu Ladan close to Area 1.E, with (25.326) and (23.19%) respectively, the least disease severity was recorded in the area between Sultan Ibrahim Dasuki to Alh. Shehu Ladan close with (8.00%).

Table 4 Incidence and Severity of *Aspergillus* leaf rust of *Balanite aegyptiaca*

Location	Incidence (%)	Severity (%)
Prof. S. Galadanci road-Abdu Gusau road	29.15±6.40[b]	35.24±1.80[ab]
Abdu Gusau road -Ihenacho road	35.72±10.40[b]	25.32±6.21[b]
Ihenacho road -Sultan Ibrahim Dasuki road	43.51±19.72[ab]	39.73±10.55[a]
Sultan Ibrahim Dasuki road - Alh. Shehu Ladan close	2.40±4.15[c]	8.00±13.86[c]
Alh. Shehu Ladan close - Area 1.EB	59.42±4.46[a]	23.19±2.21[b]
Standard error	5.53	3.46
Significance difference	*	*

Means followed by the same letter(s) do not differ significantly according to Duncan Multiple Range Test (DMRT) at 5% level of significance.

Morphological Features of Fungi Responsible for the Disease of ***Balanite aegyptiaca***
***Aureo basidium* species**

Aureo basidium isolate had colony on PDA at 24 C attaining a diameter of 4cm in 7days, Smooth covered with a slimy mass of spores, yellow, cream, pink, brown or black.

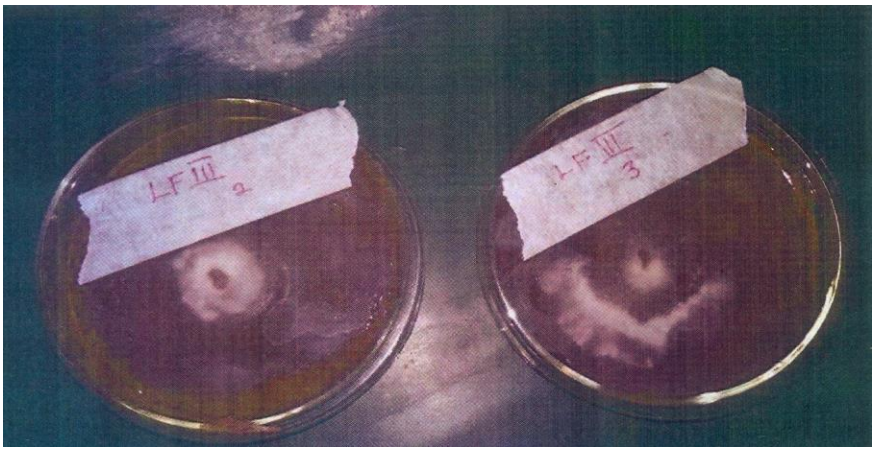

Plate 1: An Isolate of *Aureo basidium* species

Mucor species

Mucor specie is characterized with hyphae white or coloured, varying from a few millimeters to some centimeters in height. Sporangiophores often branched, always sending in a many-spores sporangium without an apophysis. Sporangia varying in size, columellae well-developed, spores are variable in shape, smooth-walled or slightly ornamented.

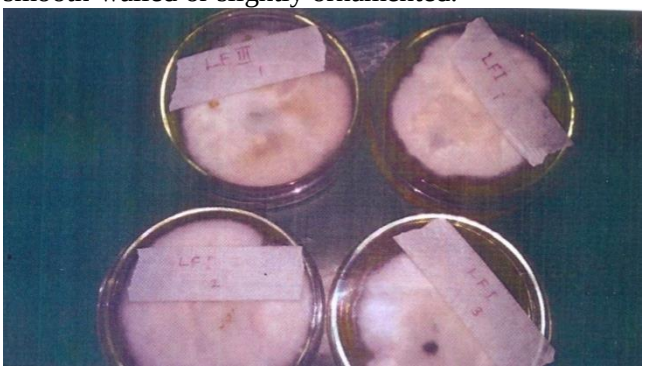

Plate 2: An isolate of Mucor species

Fusarium species

Fusarium specie colony usually grow fast, it is white to cream colour or bright coloured in yellow, brownish, pink, reddish, violet or lilac shapes with cotton like growth, whitish floccose overgrowth of aerial mycelium.

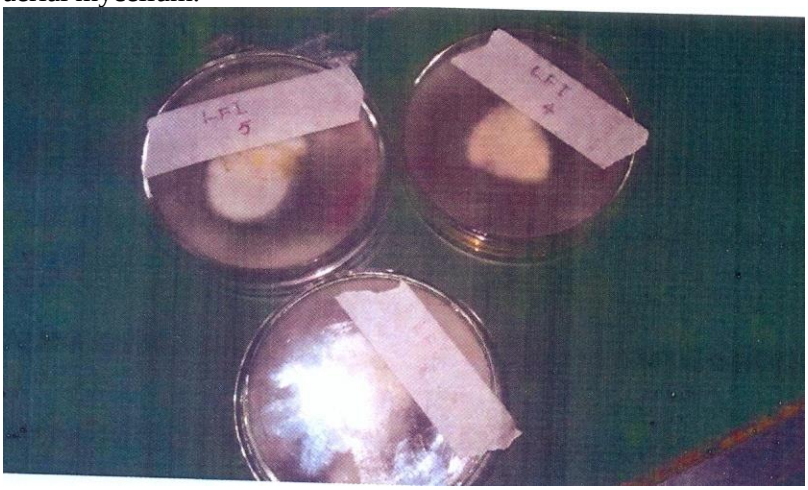

Plate 3: An isolate of *Fusarium* species

Plate 3: An isolate of *Aspergillus* species

Aspergillus species colonized on PDA at 25C attaining a diameter of 3-4cm within 4 days and consist of a dense felt of dark green conidiophores intermixed with aerial hyphae bearing conidiophores.

DISCUSSION

Incidence and Severity of Fungal Diseases of *B. aegyptiaca* at the end of the research, fungal pathogens responsible for the diseases of *Balanites aegyptiaca* were identified in the study area and the common symptoms of disease in the area is leaf spot and leaf rust. Fusarium Leaf spot of *Balanites aegyptiaca* are round blemishes found on the leaves of species of tree plants, most caused by parasitic ung and bacteria, Anon (2015). A typical spot is zonal, meaning it has a definite edge and often has a darker border. When lots of spots are presents, they can grow together and becomes blight or blotches. Mucor leaf spots of *Balanites aegyptiaca* are usually round or free-form any shape, fungal leaf spot on tree will discolor and in extreme cases, kill leaves. Anon (2015), this goes in-line with the findings of Nix (2007), that leaf spot is caused by insect, bacteria and fungi, over a long period of time, the spot enlarges to become blotches or blight around the veins which causes necrosis and premature leave drop, fungi leaf spots affects leaves. by spores which are dispersed by air current or splashing of rain. Leaf spots were observed on *Balanites aegyptiaca* along stream or Fadama sites. This agrees with the findings Emad *et al.,* (2012), that leaf spots may moisture, such as dew, fog, or rain to be established. Symptoms of fungal may include black edged lesion, brown spots with tallow halos or just light and black areas on the foliage. This agrees with the findings of Emad *et al.,* (2012), leaf spots may appear on the edge of a leaf where it appears brownish, yellow and the tissue dries and breaks off. The leaves become quite papery and delicates when the fungal disease attacks leaf edges.

Aureo basidium leaf rust of *Balanites aegyptiaca* are plant disease caused by pathogenic fungi, the rust usually affects the health and vigorously growing plant, the infection is limited to the plant parts such as leaves, petioles, tender shoots, stem fruit etc. Infection may cause deformities such as growth retardation, witches brooms. Stem canker, hypertrophy of the affected tissues or formation of gall. This agrees with the findings of (Mark *et al,*. 2006), that leaf rust formed yellow or orange leaf spots form on the leaf, Powdery yellow-orange spores are produced on the underside of the leaf of *Balanites aegyptiaca*. The leaf rusts turn as the disease progresses, causing premature defoliation. *Aspergillus* leaf rusts is most obvious on leaves where rusty-brown powdery pustules develop on the undersides of small yellow leaf spots, this also agrees with the findings of Peter (201l), *Aspergillus* leaf rust first appears as many small (1-2mm) angular, pale- bright yellow lesions (spots) on the upper surface of infected leaves. These rusts are usually limited in size and shape by the finest vein lets and are often grouped in small irregular clusters of 3 or more spots. With age, thee spots may often turn a golden yellow.

As the leaf spots age, they turn golden yellow and then brown as the affected tissue within the spot dies. Mild, moist condition favours the development of rust diseases. This agrees with the findings of Mark *et al.* (2006), that rusts are spread by windblown spores from infected plants to healthy plants. Spores are also spread by splashing of water, they need wet leaf Surface to germinate and cause infection. Rusts

disease are commonly in late summer and early rainfall, since free water on leaf surface is usually necessary for infection.

The microscopic features of Mucor is characterized by hyphae white or coloured, varying from a few millimeters to some centimeters in height. sporangiophores often branched always ending in a many-spores sporangium without an apophysis. Sporangia Varyile size, columellae well-developed, spores are variable in shape, smooth-walled or slightly ornamented this agrees with the findings of David *et al.*, (2007), Colonies are floccose. *Mucor*ranging in colour from white cream, pale, grayish to brown. Sporangiophores are hyaline and mostly sympodially branched with long branches erect and shorter branches becoming Circinate (recurved). Sporangia are spherical, varying from 20-80 um in diameters, with small sporangia often having a persistent sporangial wall, Columellae are spherical to ellipsoidal and are up to 50um in diameter, Sporangiospores are hyaline, Smooth-walled.

Aureobasidium isolate had Colony on PDA at 24°C attaining a diameter of 4cm in 7days, Smooth covered with a slimy mass of spores, yellow, cream, pink, brown or black. This correlates with the findings of David *et al.,* (2007) that colonies are fast growing, Smooth, soon covered with slimy masses of conidia, cream or pink to brown or black, hyphae hyaline and septate, frequently becoming dark brown with age and forming chains of one- to two-celled, thick-walled, darkly pigmented arthroconidia. These arthroconidia actually represent the Scytalidium anamorph of Aureobasidium and are only of secondary importance in recognizing members of this genus. Conidia are produced synchronously in dense groups from indistinct scars or from short denticles on undifferentiated, hyaline to sub-hyaline hyphae. Conidia are hyaline, smooth-walled, single-celled, ellipsoidal but of very variable shape and size (8-12 x 4-6 um), often with an indistinct hilum.

Fsariumm specie colony usually grow fast, it is white to cream colour or bright coloured an yellow., brownish, pink, reddish, violet or lilac shapes with cotton like growth. Whitish foccose overgrowth of aerial mycelium, this correlates with the findings of David *et al.,* 2007) that Fusarium are usually fast growing, pale or bright coloured (depending on the Species) with or without a cottony aerial mycelium. The colour of the thallus varies from whitish to yellow, pink, red or purple shades. Species of Fusarium typically produce both macro- and microconidia from slender phialides. Macroconidia are hyaline, tw0- to several celled, fusiform to sickle-shaped, mostly with an elongated apical cell and pedicellate basal cell.

Aspergillus specie colonized on PDA at 25 C attaining a diameter of 3-4cm within 4 days and consist of a dense felt of dark green conidiophores intermixed with aerial hyphae bearing conidiophores. This goes in-line with the findings of Rodrigues, *et al.,* (2007). That Aspergillus Macro-morphological features includes conidial and mycelialcolour, colony diameter, colony reverse colour, production of exudates and soluble pigments Dresence of sclerotia and cleistothecia. Micro morphology characterization is mainly dependent on seriation, shape and size of vesicle, conidia and stipe morphology, presence of Hulle cells, and morphology of cleistothecia and ascospores. However, all these morphological features have to be determined under standardized laboratory conditions by trained mycologists, in order to obtain an accurate identification.

CONCLUSION

Generally, the impact of fungal disease of *Balanites aegyptiaca* is a worldwide probe affecting *Batanite aegyptiaca* in general which greatly affect the annual productivity of the fruits and some valuable parts of the tree. Due to absence of regular surveillance, Occurrences of fungal disease are not notice until considerable damage may have taken place. The research revealed that, leaf spot and leaf rust are the available symptoms of the disease of *Balanites aegyptiaca* in Usmanu Danfodiyo University Sokoto (Main campus). Therefore, all the possible management practice should be put in place so as to enhance the productivity of the tree.

REFERENCES

Anonymous, (2015). ""Common fungal leaf spot disease and disorders to forest trees" Retrieved from http://plant science.psu.edu. on 05th November, 2015, at 04:12pm.

Bello A.G. (2002). Evaluation of *Perkiabiglobosa* (Jacq) Agroforestry system in the Sudan Savannah Zone of Nigeria. A. Ph.D Thiess submitted to the post graduate school Usmanu Danfodiyo University Sokoto, Nigeria (Unpublished) pp. 142.

David E, Stephen D, Helen A, Rosemary H, and Robyn B. (2007).Descriptions of Medical Fungi.2nd Edition.School of Molecular & Biomedical Science University of Adelaide. South Adelaide. Retrieved from www.mycology.adelaide.edu.au on 14th September, 2015, at 11:25am

Emad M. Abdullahi, Anis Ben Hsouna, and Khalif S. Al-khalifa.Antimicrobial, Antioxidant and Phytochemical Investigation of *Balanites aegyptiaca*, edible fruit from Sudan.African journal of Biotechnology vol. 11(52). Ppl1535, 28 june 2012

Ghosh, P.P., D. Mandal, L. Laba and MK. Dasgupta (2009).Dynamics and Severity Model in Managing Fungal Diseases. The journal of Plant Protection Science 1(1): 55-59 Retrieved from www.aappbckv.org/jourmal

Hassan, W.A and B. Omotola, (2005). Care and good performance of calves under the Peri urban Cattle Production system in Sokoto, Nigeria Proc, of 10h Animal conf, Anim, Sci. Ass. Of Nigeria (ASAN) Sept. 12.15, 2005.Univ. of Ado Ekiti Nigeria Pp 14.

Mamman, A.B, Oyebenji, J.O. and S.W. Peter (2000). Nigeria: A people united, A fetor Assured (Survey of state). Vol 2.Gabumo publishing Co. Ltd, Calabar, Nigeria

Mark A. Marshalis and Natalia P. Goldberg. Leaf and Stem rust diseases of forest trees. Extension Agronomist.Extesion plant Pathology (2006).

Nadro M. S, and Samson F. P: October (2014). Journal of Applied Pharmaceutical Science Vol. 4 (10), pp. 058-061, by Department of Biochemistry, Modibbo Adama University of Technology, PMB 2076, Yola. Adamawa state. Nigeria.

Nix, S. (2007): Ten common tree Diseases of hardwoods. Retrieved from http//forestry about.com/od/forest disease/p/discomedia.htm.

Peter A. (2011): Managing Rust of Almond, Magarey Plant Pathology: Published by Almond Board of Australia. Berri, South Australia 5343.

Prashant Kumar Dubay, Mahesh Yogi, AkhilBharadwaj, M.L. Soni, Ajeet Singh and Anupam K (2011).Academic Journal of plant sciences 4 (1), 12-18, 2011.

Rodrigues P, C. Soares, Z. Kozakiewicz, R.R.M. Paterson, N. Lima, and Venancio A: (2007). Identification and characterization of *Aspergillus parasiticus* and flavus. IBB-Institute for Biotechnology and Bioengineering, Centre for Biological Engineering, Universidadedo Minho, Campus de Gualtar, 4710-057 Braga, Portugal 2CIMO-Escola Superior Agraria de Bragança, Campus de Santa Apolonia, 5301-855 Bragança, Portugal

Shweta S., Rani W. Chavan, G. Tapadiya , G. and Khadabadi S.S (2014) An Important of Ethnomedicinal Plant *Balanite aegyptiaca* Del. Journal of American Ethnomedicine. 2014, Vol. 1, No. 3, 122-128.

Singh D.V.(2007) Ex-Head and Emeritus Seientist Division of Plant Pathology'" Indian Agricultural Research lnstitute.E.G-www.thefreedictionary.com/disease. New Delhi-110012.Introductory to Plant Pathology (9th-07-2007).

Tarr, S.AJ (1981).The Principle of Plant Pathology. Macmillan, London 632p

Zelalem, B., Temam, H. and T. Taye, (2012).Distribution, Incidence, Severity and Effects of the rust (*Puccinia abrupt* var. Partheniicola) on *Parthenium sterophorus* L. In Western Hararghe Zone, African Journal of plant Science 6(13), pp. 337-345.