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CONTROL OF *FUSARIUM* WILT OF EGGPLANT (*Solanum melongena* L.*)* USING EXTRACTS OF PLANT ORIGIN

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Abstract

Fusarium oxysporium was isolated and identified as a pathogenic organism causing wilt of eggplant in an experiment conducted at Uyo, Akwa Ibom State. Water and ethanol leaf extracts of Senna alata, Azadirachta indica and Moringa oleifera were evaluated against the wilt causing fungus both in vitro and in vivo. The water and ethanol leaf extracts of plant materials inhibited the mycelial radial growth of the pathogen in culture though to varying degrees and concentration dependent with 50 % concentration recording the highest inhibitory effect. The mean inhibitory effect of the plant extracts against the growth of the fungus in culture was more with ethanol extracts than water extracts with ethanol extracts of A. indica having the highest and significant ($p \leq 0.05$) inhibitory effect (92.05%) followed by ethanol extract of M. oleifera (85.62%) which was not significantly ($p \leq 0.05$) different with ethanol extract of S. alata (85.26%). The water and ethanol extracts of the plant materials had reduced significantly ($p \leq 0.05$) the wilt development and spread in eggplant when compared with the control experiment treated with only water and ethanol respectively indicating the presence of fungitoxic compounds in the extracts of the plant materials. The plant extracts were extracting solvent and concentration dependent with ethanol and 50% concentration recording the lowest disease incidence and severity. At average, ethanol and water extracts of A. indica had the lowest disease incidence of 44. 05 % and 51.29% and severity of 3.07 and 3.34 respectively. This was followed by S. alata ethanol extract (48.54 % and 3.09) and water extracts (54.30% and 3.73) and M. oleifera ethanol extract (50.52% and 3.41) and water extract (56.85% and 3.94) for disease incidence and severity respectively.

KEY WORDS: Fusarium, wilt, plant extract, Solanum melongena.

Introduction : Eggplant (*Solanum melongena*, L.) a native of India is a popular vegetable crop that grows in the tropics and subtropics, often cultivated as annual crop (Schippers, 2002). It is of different varieties grown mainly for its immature edible fruits of different sizes and colours (Lewis, 2005). It contains water (90.6g), energy (135KJ), protein (1.5g), fats (0.1g), carbohydrate (7.2g), fibre (2.0g), calcium (28mg), phosphorus (47mg), iron (1.5g), riboflavin (0.06mg), niacin (0.8mg), and ascorbic acid (8mg) (Grubben & Denton, 2004; Udoh *et al*.,2005). In Nigeria, it is grown for its nutritional and economic values and one of the most profitable crops produced recording an annual yield of 26 – 27 tons of fruit per hectare valued at N675, 000.00 (Maranzu & Wokocha, 2010). Its production is on the increase and the quest for its increase in production is often constrained by edaphic and biotic factors. Pests and diseases constitute major biotic factors militating against increased production of this crop especially during the dry season when it commands higher prices (Maranzu & Wokocha, 2010). Various types of diseases including those caused by fungi, nematodes, bacteria and virus have been associated with losses in yield, income and fruit quality of eggplant (Elmer and McGoven, 2023). Some of these diseases include; late blight which is a highly devastating disease caused by *Phytophthora infestans*, early blight caused by *Alternaria solanisorium*, powdery mildew caused by *Oidium lycopersici*, Fusarium wilt caused by *Fusarium oxysporum*, damping off disease caused by several *Pythium* spp., Verticillium wilt caused by *Verticillium dahlia* and anthracnose caused by *Colletotrichum acutatum* (Attia *et. al* 2022; Serfraz *et .al* 2021; Aumentado *et. al*., 2024; Arora *et.al*. 2021; Tomah *et. al.*, 2023). The use of synthetic fungicides has been found to enhance production and increase fruit yield of the crop. However, their application in plant disease control has been reported to cause environmental pollution and disruption of the ecosystem (Amadioha, 2001, 2004). Application of high doses and continuous application of synthetic pesticides affects beneficial organisms and produces resistant strains of pathogenic organisms (Kumar *et al.*, 2024). The concern over indiscriminate use of these synthetic chemicals on the environment and biodiversity has led to sourcing for alternatives such as botanicals that are effective, ecologically safe and cost effective for the resource poor farmer (Amadioha and Enyiukwu, 2019). Such pesticide alternatives derived from readily available plant materials could be cost effective and sustainable (Hernández-Moreno, *et. al*., 2013; Shenge, 2002). Several extracts of plant origin have been used to control disease-causing organisms in plant both in the field (Kumar *et .al*, 2024); Okereke & Wokocha, 2010), and in storage (Amadioha 2001, 2004, 2012; Markson, *et. al.*, 2014). The evaluation the fungicidal potentials of ethanol and water leaf extracts of *Senna alata* (candle bush), *Moringa oleifera* (drum stick), and *Azadirachta indica* (Neem plant) in the control of eggplant wilt disease in the field is presented in this paper.

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Materials and Method: Location of Site: The Green house and laboratory experiments were carried out at University of Uyo, Uyo, Akwa Ibom state, Nigeria. Uyo lies within the humid tropical rainforest zone of Southern Nigeria and located within latitude $5^0 03^{'}$ N, longitude $07^0 56^{'}$ E and an altitude of 38 m above sea level. The area has an annual rainfall of 2,500 mm and monthly sunshine of 3.14 hours and mean annual temperature of 28^0C and annual relative humidity of 79 % and evaporation rate of 2.6 cm^2 (Uniuyo, 2008). The rainfall pattern of Uyo is bimodal. Rain usually starts in March and ends in November with a short period of relative moisture stress in August, traditionally referred to as "August break". The temperature is generally high in the months of February through April (Udoh *et. al*., 2005).

Source of Materials: Egg plant seeds were obtained from University of Uyo Teaching and Research Farm. The leaves of the test plats; *Senna alata, Azadirachta indica* and *Moringa oleifera* were obtained from the University community.

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Isolation of Pathogenic Organism: Culture Medium: The culture medium used was Potato Dextrose Agar (PDA). The medium was prepared by adding 39 g of PDA in one litre of distilled water in 1000 ml conical flask and then sterilized in an autoclave at 121ºC for 15 minutes. The medium was allowed to cool (40^{o} C) and dispensed (25ml) in sterile Petri dishes and allowed to solidify before use (Amadioha and Enyiukwu 2019).

Isolation: Collected eggplant leaves with typical wilt symptom were thoroughly washed under running tap water, surface sterilized in 0.01 % sodium hypochlorite solution for 10 minutes and rinsed with changes of sterile distilled water and then cut into 5 mm pieces. The pieces were plated out on potato dextrose agar (PDA) culture medium and incubated at 37ºC for seven days. Pure cultures were obtained by sub-culturing three times on fresh PDA medium. Pure cultures of the isolates were maintained in McCartney bottles in an incubator until required.

Pathogenicity Test and Identification of Pathogen: This experiment was conducted in the green house with eggplant seeds planted in a pot and the pathogenicity test was conducted on the seedlings four weeks after planting in line with the Koch's postulates as describe by Altinok and Can (2010). Spore suspension ($1x10^5$ spores/100 ml of distilled water) of the isolates were prepared and used to spray-inoculate the seedlings to run off. A control experiment was set up by inoculating some seedling with sterile distilled water or ethanol only without spores. The isolates that caused the disease symptom were re-isolated and compared with the original culture. Those that caused wilt disease and resemble the original cultures were regarded as pathogens and identified by observation under a compound binocular microscope for their growth and sporulation and identified using fungal atlas by Barnet and Hunter (1999).

Preparation of Plant Extracts and Application: The plant materials (Table 1) were thoroughly washed in running tap water and rinsed with distilled water, air-dried in the laboratory and pounded in a mortar with pestle to form paste. Water and ethanol leaf extracts of the test plant materials were obtained by infusing separately 10g, 20g, 30g, 40g, and 50g paste of each test plant in 100 ml of sterile distilled water or ethanol in 250 ml conical flask and thoroughly stirred using sterile glass rod and left for 24hours to allow for extraction of the active ingredients before it was filtered into 500 ml flask using four-fold cheesecloth as described by Okereke and Wokocha (2006). These preparations represented 10 %, 20 %, 30 %, 40 % and 50 % concentrations of water or ethanol leaf extract of respective test plants. Application of plant extracts commenced two weeks after transplanting (2WAT) in the screen ouse with hand atomizer and was done fourth nightly until the experiment was concluded.

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Effect of Plant Extract on Mycelial Radial Growth of Pathogen in Culture *(In vitro* Experiment) : Method of Amadioha and Obi (2012) was used to evaluate the antifungal effects of the test plants against fungal growth *in vitro.* This involved creating a four equal sector on each Petri dish by drawing two perpendicular lines at the bottom of the plate with the point of intersection as the centre of plate. This was done before dispensing the PDA medium (25 ml) into each of the plates. Water and ethanol leaf extract of the plant materials (0.1ml) was each separately introduced into each Petri dishes containing the culture medium (PDA) and evenly spread to form thin film on the solidified medium. A disc (4 mm diameter) of the pure culture of the pathogen was placed on the PDA extract medium at the centre of the Petri dish. Control experiments contained PDA culture medium and sterile distilled water (0.1ml) without plant extract. The inoculated plates were incubated at room temperature (27ºC) and radial growth measured with metre rule after the growth in the control experiment had reached the edge of the plate. Fungi toxicity was determined as percentage of fungal colony inhibited according to Amadioha (2003, 2004) and Wokocha and Okereke (2006).

$$Fungal\ growth\ inhibition\ (\%) = \frac{DC - DT}{DC} X$$

Where DC = Average diameter of colony in control experiment

DT= Average diameter of fungal colony with extract treatment

The extract was also rated for their inhibitory effect using the scale below;

0 % inhibition - Not effective

0-25% " - Slightly effective

26-50% " - Effective

51-75% " - Moderately effective

76% -100% " - Highly effective

Effect of Plant Extract on Incidence and Severity of Wilt Disease on Eggplant *(In vivo* Experiment): The effect of the water and ethanol leaf extracts of the plant materials on disease incidence and severity on eggplant in the green house was conducted by spraying the seedlings at 2WAP with respective extracts before spray inoculating the spore suspension of the pathogen (10 $x10^5$ spores/100ml distilled water) two days after. The disease incidence and severity were collected 10 weeks after application of extracts of the plant materials. The disease incidence was estimated by counting the number of plants infected within the infected plants and expressing the figure as a percentage of the total number of plants inoculated.

Disease incidence and severity were assessed according to Amadioha (2004).

$$\text{Disease incidence (\%)} = \frac{\text{Number of plants infected}}{\text{Total number of plants assessed}} \times \frac{100}{1}$$

Disease severity was recorded on a 0-5 scale (Amadioha and Kenkwo, 2019)

0 = No visible disease symptoms

1 = 1 – 20 % of leaves infected

2 = 21 - 40% of leaves infected

3 = 41 - 60% of leaves infected

4 = 61 -80% of leaves infected

5 = 81 - 100% of the leaves infected

Data Collection: The following growth parameters were collected from five (5) sample plants at 2 weeks intervals

i. Plant height (cm): Measured from the base of the plant to the apex of the terminal leaf bud using measuring tape.

ii. Number of leaves: This was obtained by counting the number of leaves per sampled plant.

iii. Plant girth (cm): Measured by the use of venire caliper.

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Data Analysis: The experiment was conducted in a Randomized Complete Block Design (RCBD) with three replicates. Data collected were subjected to the Analysis of Variance (ANOVA) and means were separated using least significance difference (LSD) at 5 % probability level. **Results: Pathogenic Organism:** Pathogenicity test showed *Fusarium oxysporium* (Plate 1) as the major organism causing wilt of eggplant. *F. oxysporum* recorded the highest disease incidence and frequency of occurrence, indicating its dominance in the fungal population associated with wilt of eggplant in the field. Eggplants inoculated with the pathogen showed Fusarium wilt symptom which often began with dropping of leaf petioles. Sometimes a single branch may wilt before the rest of the plant. This wilting often started with the lower leaves quickly progressing up to the plant until the whole plant collapses. The entire plant may be killed before it reaches maturity (Plate 2).

Effect of water leaf extract on mycelia radial growth of *Fusarium oxysporium* in culture: The fungitoxicity of different concentrations of water leaf extract (Table 1) indicated that the biopesticidal potential increased with extract concentration such that the higher the extract concentration, the higher the mycelial radial growth inhibition with 50% concentration recording the highest mycelial radial growth inhibition. There were no significant ($p \leq 0.05$) differences on the effect of the plant materials on the mycelial radial growth inhibition of the pathogen in culture at 50% concentration. At 30% concentration, *A. indica* had a significant effect on percentage mycelial radial growth inhibition of *F. oxysporium* (80.60%) compared to *M. oleifera* and *S. alata* with 68.50% and 67.92% inhibition respectively. The highest mean percentage mycelial radial growth inhibition of 78.89% was recorded with *A. indica* followed by *M. oleifera* (70.25%) and *S. alata* (69.98 %) and this was significant ($p \leq 0.05$) (Table 2).

Effect of ethanol leaf extract concentration on the mycelia radial growth of *Fusarium oxysporium* in culture: The effect of ethanol leaf extract concentration of *S. alata, M. oleifera* and *A. indica* on growth of *F. oxysporim in vitro* is shown in Table 2. The fungitoxic potentials of ethanol extracts of the test plant materials increased with extract concentration and inhibited the mycelial radial growth of the pathogen to varying degrees with 50% extract concentration recording the highest mycelial radial growth inhabitation of 95.24%, 85.61% and 85.26% for *A. indica, M. oleifera* and *S. alata* respectively. The effect of the mean extract concentrations of the plant materials showed that *A. indica* had the highest (90.05%) and significant ($p \leq 0.05$) inhibitory effect of the mycelial radial growth of the pathogen compared with *M. oleifera* (85.61%) and *S. alata* (85.26%) that had no significant ($p \leq 0.05$) difference.

Effect of water and ethanol leaf extract on the mycelia radial growth of *Fusarium oxysporium* in Culture: The inhibition of the mycelial radial growth of the wilt causing fungus in culture by both water and ethanol leaf extracts of the test plant materials were to varying degrees and concentration dependent, increasing with increase in concentration with 50 % concentration recording the highest inhibitory effect (Table 3). The ethanol extracts of the plant materials had significant ($p \leq 0.05$) mycelial radial growth inhibition of the pathogen at 50% when compared with the water extracts. Ethanol extract of *A. indica* recorded the highest inhibitory effect of the pathogen (95.24%) followed by ethanol extract of *S. alata* (93.83%) and *M. oleifera* (92.63%) at 50% concentration. The average inhibitory effects of the concentration of the plant materials on mycelial radial growth of the fungus was more with ethanol extracts than water extracts with ethanol extracts of *A. indica* having the highest and significant ($p \leq 0.05$) inhibitory effect (92.05%) followed by *M. oleifera* (85.62%) which was not significantly ($p \leq 0.05$) different with ethanol extract of *S. alata* (85.26%).

Effect of water and ethanol plant extracts on disease incidence and severity by *Fusarium oxysporium* in eggplant: The effect of water and ethanol leaf extracts of the test plants on disease development and spread in eggplant by the pathogenic organism is shown in Table 4. Both the water and ethanol extracts of the plant materials reduced significantly ($p \leq 0.05$) the wilt development and spread in eggplant when compared with the control experiment treated with only water and ethanol respectively indicating the presence of fungitoxic compounds in the extracts of the plant materials. The plant extracts were concentration dependent with 50% concentration recording the lowest disease incidence and severity. Plant materials extracted with ethanol were relatively more effective than water extracts in reducing the disease development and spread in eggplant. At average, ethanol and water extracts of *A. indica* had the lowest disease incidence of 44. 05 % and 51.29% and severity of 3.07 and 3.34 respectively. This was followed by *S. alata* ethanol extract (48.54 % and 3.09) and water extracts (54.30% and 3.73) and *M. oleifera* ethanol extract (50.52% and 3.41) and water extract (56.85% and 3.94) for disease incidence and severity respectively.

Discussion: *Fusarium oxysporum* was identified as the causal agent of eggplant wilt, a devastating disease that significantly impacts eggplant production worldwide (Kumar *et al*., 2024). This pathogen infects eggplant producing toxins that disrupt the plant's vascular system and cause wilt symptoms (Elmer & McGovern, 2023; Kumar *et. al*., 2023; 2025) that starts with the lower leaves quickly progressing up to the plant until the whole plant collapses, making it a significant constraint in eggplant production worldwide (Ji *et. al.,* 2022). Water and ethanol leaf extracts of *S. alata* , *A. indica* and *M. oleifera* inhibited the growth of the test fungus both *in vitro* and *in vivo* indicating that their extracts contain fungitoxic potential against eggplant wilt, which is in agreement with earlier reports of several researchers on different pathogenic organisms (Okigbo *et. al*, 2009). Also, the presence of phytochemicals which are anti-microbial, could be responsible for the antifungal properties of the plant extracts (Iwu, 2003). The efficacy of the extracts differed with plant material, solvent of extraction and concentration. Both ethanol and water extracts of the test plants were highly effective against the mycelia radial growth of the pathogen in culture corroborating the findings of Siva *et. al*. (2008) and Iwu (2003) on antifungal study of plant extracts. The mycelial radial growth inhibition of *F. oxysporum* in culture by water and ethanol leaf extracts of the test plant materials was to varying degrees and concentration dependent, increasing with increase in concentration with 50 % concentration recording the highest inhibitory effect. Ethanol extracts at 50% concentration had significantly ($p \leq 0.05$) higher mycelial radial growth inhibition than water extracts, with ethanol extracts of *A. indica* having the highest and significant ($p \leq 0.05$) inhibitory effect (92.05%) followed by *M. oleifera* (85.62%) which was not significantly ($p \leq 0.05$) different with ethanol extract of *S. alata* (85.26%). The disease incidence and severity in eggplant by the pathogen were significantly ($p \leq 0.05$) reduced by water and ethanol leaf extracts of the test plants when compared with the control experiment indicating the presence of fungitoxic compounds in the extracts of the plant materials. The extracts were concentration dependent with 50% concentration recording the lowest disease incidence and severity and ethanol extracts were relatively more effective than water extracts in reducing the disease development and spread in eggplant. Ethanol extracts of *A. indica* had the lowest disease incidence and severity followed by *S. alata* and *M. oleifera* when compared to water extracts. The higher fungitoxicity of ethanol extracts than aqueous extracts in reducing mycelia radial growth of the pathogen in culture and disease development and spread in eggplant by the pathogen may be due to differences in solvent of extraction with ethanol extracting more active compounds in test plants than water as extracting solvent

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(Amadioha, 2004; Amadioha and Kenkwo, 2019). It may also be due to differences in susceptibility of the pathogenic organism to different concentrations of the plant extracts which agrees with the findings of some workers (Onifade, 2002; Amadioha, 2001; Amadioha and Enyukwu, 2019). The presence of bioactive ingredients had been reported to produce resistance to plants against bacteria and fungi which may explain the antifungal activity of extracts of test plants that suppressed the growth of the pathogen both in culture and eggplant. Neem contain a wide range of bioactive compounds including Azadirachtin which is the main antifungal and antifeedant and other biotic compounds, Nimbin, Salanin, Flavonoids, Tannins and Polyphenols acting as antioxidant (Akter *et.al.*, 2021). The significant reduction in disease incidence and severity by *A. indica* (Neem) extract in this study could be due to these bioactive compounds that reinforced cell wall structure, which contributed to stem thickening and prevention of stem shrinkage and xylem blockage due to Fusarium infection (Sangoyomi *et.al.*, 2009). Fusarium causes early senescence and abscission and the Azadirachta leaf extract may have suppressed the fungus, reducing toxin accumulation in plant tissues thereby promoting leaf retention and new shoot growth by minimizing pathogen stress (Sangoyomi *et.al.*, 2009). Agbenin and Marley (2006) investigation on the effect of *A. indica* (Neem) aqueous extracts on Fusarium wilt disease revealed that the percentage of disease incidence was reduced to the level of 25.5% - 27.8% after 6 weeks of infection and that crude extracts of neem (*A. indica)* at concentrations ranging from 5% to 30% of the material in 100ml Potato Dextrose Agar inhibited mycelia growth of *Fusarium oxysporium* at various levels . *Senna alata* is rich in bioactive phytochemicals including anthraquinones, flavonoids, terpenoids, phenols, saponins and tannings (Pamulaparthi *et. al.*, 2024) which have antimicrobial, anti-inflammatory, antioxidant properties and growth promoting properties, making *S. alata* extract a promising biocontrol and biostimulant agent (Chavez *et. al.,* 2025) against a variety of bacteria and fungi (Ashfaq & Yousaf, 2022). Tannins and Flavonoid, some of the active ingredients in the plant extract have been reported to boost resistance to fungi infection and reduces leaf drop (Alshehri *et. al.*, 2022). Also, *S. alata* extract treatment have been reported to relieve pathogen induced stress in plant vascular system and improve water and nutrient transport which helps to restore vertical growth (Okigbo and Mmeka, 2006). *Moringa oleifera* extracts contain compounds that can inhibit the growth of microorganisms (Riyadi *et al*.,2022), stimulate plant defense mechanisms (Ali *et al.,* 2022), and protect plants from oxidative stress caused by pathogens (Albalawi, *et al.,* 2022). Moringa leaf extract enhances photosynthesis and nutrient up take thereby boosting plant vigour even under biotic stress. It has been explored for its potential as a biopesticide since its extracts contain insecticidal, fungicidal, and bactericidal properties, making it a promising alternative to synthetic pesticides (Ishaq *et al.*, 2023; Ali, 2025). Its extract have been found to be effective against various insect pests (Alao *et al*., 2025; Osman & Elsobki, 2019; Ngegba *et al*., 2022), inhibit fungal growth and reducing the severity of fungal diseases caused by *Fusarium, Rhizoctonia*, and *Sclerotium*, (Alam & El-Nuby, 2022; Ishaq *et al.*, 2023; Alao *et al.*, 2025). The findings of this study has shown that both ethanol and water extracts of *S. alata, M. oleifera* and *A. indica* inhibited the mycelial radial growth of *F. oxysporium in vitro* and reducing the disease incidence and severity in eggplant indicating the presence of antifungal properties in their extracts that could be exploited as an alternative or complimentary to synthetic chemicals in control of fungal pathogens of eggplant. The use of the extract of these plants in controlling eggplant diseases could offer several advantages, including being environmentally friendly (Khairy *et al.*, 2021; Siva *et al.*, 2008).), cost-effective (Akhtar *et al*., 2024), and multipurpose (Islam *et al.*, 2021; 2023). making them a sustainable option for eggplant disease control by resource poor farmers and increase food production in Nigeria.

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Table 1: Plant materials used

Botanical Name	Common Name	Part used
Senna alata	Candle bush	Leaves
Azadirachta indica	Neem Plant	Leaves
Moringa oleifera	Drum stick	Leaves

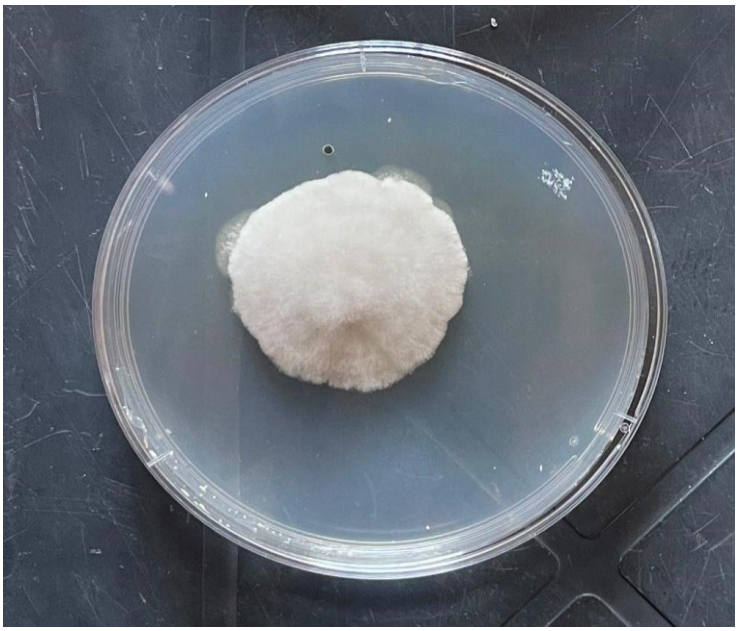

Plate 1: Pure culture of *Fusarium oxysporium.*

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Plate 2: Fusariun wilt. Eggplants inoculated with *Fusarium oxysporium*

Table 1: Effects of Water Extracts on Mycelia Radial Growth of *Fusarium oxysporium* in Culture

	Mycelia Radial growth inhibition (%) and extract concentration (%)					
Plant Extracts	**10**	**20**	**30**	**40**	**50**	**Mean**
Senna alata	55.25	67.58	67.92	72.58	86.58	69.98
Moringa oleifera	60.65	65.48	68.50	74.33	82.30	70.25
Azadirachta indica	69.05	75.98	80.60	84.22	84.59	78.89

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LSD ($p \leq 0.05$)	11.57	6.21	9.82	4.39	6.94	7.79

Data are means of three replicates in two separate experiments

Table 2: Effect of ethanol extract concentration on mycelial radial growth of *Fusarium oxysporium* in culture.

	Mycelia radial growth inhibition (%) and extract concentration (%)					
Plant Extracts	**10**	**20**	**30**	**40**	**50**	**Mean**
Senna alata	80.65	81.33	81.48	89.00	93.83	85.26
Moringa oleifera	75.75	82.23	85.15	92.30	92.63	85.61
Azadirachta indica	80.53	98.39	90.95	95.14	95.24	92.05
LSD ($p \leq 0.05$)	8.33	5.27	7.30	4.61	2.13	5.53

Data are means of three replicates in two separate experiments

Table 3: Effect of water and ethanol extract concentration on mycelial radial growth of *Fusarium oxysporium* in culture.

	Mycelia radial growth inhibition (%) and extract concentration (%)					
Plant Extracts	**10**	**20**	**30**	**40**	**50**	**Mean**

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Senna alata						
Ethanol	80.65	81.33	81.48	89.00	93.83	85.26
Water	55.25	67.58	67.92	72.58	86.58	69.98
Moringa oleifera						
Ethanol	75.75	82.23	85.15	92.30	92.63	85.61
Water	60.65	65.48	68.50	74.33	82.30	70.25
Azadirachta indica						
Ethanol	80.53	98.39	90.95	95.14	95.24	92.05
Water	69.05	75.98	80.60	84.22	84.59	78.89
LSD ($p \leq 0.05$)	9.95	5.74	8.56	4.50	4.54	6.66

Data are means of three replicates in two separate experiments

Table 4: Effect of water and ethanol extract concentration on *Fusarium* wilt incidence and severity in eggplant.

Plant Extracts	**Extract concentration (%) and Disease Incidence (IN) (%) and Severity** (SE)										**Mean**	
	10		**20**		**30**		**40**		**50**			
	IN	**SE**	**IN**	**SE**	**IN**	**SE**	**IN**	**SE**	**IN**	**SE**	**IN**	**SE**

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Senna alata						
Ethanol	56.63 3.30	51.85 3.45	51.14 3.18	43.35 3.25	39.63 2.24	48.54 3.09
Water	61.25 4.12	57.58 3.51	53.92 3.89	52.18 3.87	46.58 3.26	54.30 3.73
Control:						
Ethanol alone	92.58 5.00	91.30 5.00	91.15 5.00	90.41 5.00	89.25 5.00	90.94 5.00
Water alone	100 5.00	100 5.00	100 5.00	100 5.00	100 5.00	100 5.00
Moringa						
oleifera Ethanol						
Water	57.25 3.71	53.23 3.65	52.18 3.14	49.30 3.34	40.63 3.21	50.52 3.41
Control:	62.65 4.12	60.48 4.52	58.50 3.71	54.33 3.76	48.30 3.57	56.85 3.94
Ethanol alone						
Water alone	92.58 5.00	91.30 5.00	91.15 5.00	90.41 5.00	89.25 5.00	90.94 5.00
	100 5.00	100 5.00	100 5.00	100 5.00	100 5.00	100 5.00
Azadirachta indica						
Ethanol						
Water						
Control:						
Ethanol alone	50.53 3.24	48.39 3.20	45.95 3.24	40.14 3.12	35.24 2.56	44.05 3.07
Water alone	59.05 3.12	55.98 3.05	50.60 3.65	46.22 3.65	44.59 3.24	51.29 3.34
	92.58 5.00	91.30 5.00	91.15 5.00	90.41 5.00	89.25 5.00	90.94 5.00
	100 5.00	100 5.00	100 5.00	100 5.00	100 5.00	100 5.00
LSD ($p \leq 0.05$)	8.75	4.54	7.58	4.56	3.54 5.34	6.66

Data are means of three replicates in two separate experiments