International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Mycotoxic Potentials of *Azadirachta indica* Adr. Juss. and *Aloe vera* (L.) N. Burman Extracts against Fungi Associated with Rotting *Capsicum Annuum* L. (Chilli Pepper)

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Abstract: ***The mycotoxic potentials of Azadirachta indica Adr. Juss. and Aloe vera (L.) N. Burman extracts was tested against rot of Capsicum annuum L. (Chilli pepper). The fungi were isolated from rotting pepper fruits by placing them aseptically on acidified potato dextrose agar. Pure cultures were obtained by sub culturing onto fresh acidified PDA and later stored at room temperature. Aqueous and methanol extracts of Azadirachta indica and Aloe. vera were obtained using standard measures. The isolated fungi were identified and cultured on acidified potato dextrose agar impregnated aqueous and methanol extracts and the combination of Azadirachta indica and Aloe vera extracts. All plates were incubated at room temperature for 7 days. The plates were observed daily for fungal growth with the measurement of each fungus taken using a meter rule. All experiments were done in duplicates. The data obtained was subjected to analysis using SAS version 9.2. Four fungal pathogens were isolated and these were Aspergillus tamarii, Aspergillus flavus, Penicillium digitatum and Botrytis cinerea. Days, Organisms and Concentrations levels recorded highly significant (p<0.0001) effects with respect to inhibition by all extracts. Highly significant (p<0.0001) interactions were obtained for Days and Organisms, Days and Concentrations and interactions among Days, Organisms and Concentrations. The synergistic effects (aqueous and methanol) of Neem leaf and Aloe leaf inhibited A. tamarii, A. flavus and P. digitatum at combinations of 75% Aloe (A) with 50% Neem (N) (A75+N50). B. cinerea was inhibited by the combination (aqueous) of 25% Aloe and 25% Neem (A25+N25) and the combination (methanol) of 75% Aloe with 75% Neem (A75+N75). This confirm the inhibitory potentials of interaction between the two botanicals. Phytochemical components present in the combinations need to be determined to understand how they interact with the inhibition of these organisms.***

Keywords: Neem, Aloe, synergistic effect, botanicals, fungi

1. Introduction

Pepper is known to originate from South and Central America where it is still under cultivation and are considered the first spice to have been used by human beings (Pickersgill, 1997, FAO, 2009, Wada *et al*., 2015). It is the most used food all over the world and also the most widely grown spice crop. It is among the world's most important vegetable including tomato and onion (Dias *et al.,* 2013)

It is one of the most important spices used in making most Nigerian food. Most peppers grown belongs to *Capsicum annum* but the small, pungent peppers belongs to *Capsicum frutescens*. Production in tropical Africa was estimated at 1 million t, with Nigeria (725, 000 t from 90, 000 ha) and Ghana (270, 000 t from 75, 000 ha) as the largest producers. Most statistics for Africa does not include home farms and garden production (FAO, 2009).

Pepper production in Nigeria has served as a good source of income to local farmers. It also serves as raw materials for our industries, for example, in food production and cosmetic industry. It has improved the standard of living thereby creating employment opportunities to citizens. Pepper production has also contributed to the national income through exports.

Pepper has been used medically for the treatment of different ailments including fevers, colds, indigestion, constipation and pain killing (Dagnoko *et al.,* 2013). It is also used by the security agencies in the preparation of tear gas. The common varieties grown in Nigeria includes Bell peppers, bird peppers, habanero peppers, Cayenne peppers and Nsukka yellow peppers (which are yellow habanero peppers).

However, the plant is known to suffer from biotic and abiotic stresses that in turn leads to the development of different diseases. It is also known to be infected by different pathogens at different stages of its growth, most of which are of fungal origin (Howard *et al.,* 1994; Black *et al.,* 1991; Katoch and Kapoor, 2014; Ademoh *et al.,* 2018).

The need to introduce safe and ecofriendly control measures for plant diseases, has led researchers turning their attention to the use of different biological control measures including botanicals. Generally, Neem and *Aloe vera* have been severally reported to be a rich source of antimicrobial properties and they are known to produce active secondary metabolites. The numerous beneficial potentials of Neem and A*loe vera* has been severally documented (Hegger, 1996; Daodu, 2000; Olusegun, 2000; Pandey *et al.,* 2016). The efficacy of different concentrations of Neem leaf on different fungal pathogens has also been documented (Simhadri *et al.,* 2017). The mycotoxic properties of *Aloe vera* has as well been documented (Muthomi *et al.,* 2017). However, there is little knowledge on the synergistic effects of extracts of both plants on fungal pathogens. The aim of this study therefore was to examine the synergistic effects of Neem leaf and *Aloe vera* leaf extracts on the fungi isolated

from rotting pepper fruits. The objectives of this experiment are:

a) To isolate and identify the fungi associated with postharvest rotting pepper fruits.
b) To examine the effects of crude extracts of *Azadirachta indica* and *Aloe vera* on the isolated fungi *in vitro*
c) To examine the interactive effects of aqueous and methanol extracts of *Azadirachta indica* and *Aloe vera* on the isolated fungi.
d) To examine the effect of concentration on fungal growth inhibition potential of the plant extracts.

2. Materials and Methods

Collection of pepper fruits, Neem and *Aloe vera* leaves

Rotting fruits of pepper were collected from two selected markets within Ibadan metropolis. Fresh Neem (*Azadirzchta indica*) and *Aloe vera* leaves were collected from the University of Ibadan campus, packed in sterile polythene bags and brought to Plant Pathology laboratory, Department of Botany, University of Ibadan. The leaves were prepared for extraction following standard procedures.

Extraction of the botanicals and preparation of the extract concentrations

Aqueous and methano extraction was carried out in the Department of Botany and the Department of Pharmaceutical Chemistry, University of Ibadan following standard procedures. The stock solution was prepared by dissolving 3 gram of the resulting extract in 10ml of distilled water, for both aqueous and methanol extracts.25%, 50% and 75% of each extract of both botanicals was then obtained from the stock solution.

Inoculation of rotting pepper fruits

Rotting sections of *Capsicum annuum* were sterilized in 1% solution of sodium hypochlorite for 30 seconds and then rinsed in five changes of sterile distilled water. They were cultured on acidified potato dextrose agar (APDA) Petri plates before incubating at 28 ± 2°C for 7 days and were examined daily. The experiment was done in triplicates. All pure cultures after sub culturing were identified and kept on slants.

Pathogenicity test and Bioassay of aqueous and methanol extracts of the plants

Pathogenicity test was carried out following the methods of Lin *et al*. (2002) and Than *et al*. (2008). Agar plate diffusion method was employed in the antifungal assay of the extracts following the method of Dutta, (2001). Concentrations of the extracts used were 25%, 50% and 75%.

Interactive bioassay and Data analysis

The interactive effects of different concentrations (25%, 50% and 75%.) of aqueous and methanol extracts of *Azadirachta indica* (N) and *Aloe vera* (A) were evaluated on each isolated fungus. The data obtained were subjected to ANOVA using Generalized Linear Model of Statistical Analysis Software (SAS).

3. Results

The isolated fungi include *Penicillium digitatum*, *Aspergillus tamarii*, *Aspergillus flavus*, and *Botrytis cinerea*. Table 1 shows the ANOVA Table for the effects of all extracts on growth of the isolated fungi. The F values (P>0.0001) for all available variables as well their interactions were all significant. Table 2 shows the growth inhibition (cm) of *Penicillium digitatum* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation. Significant growth inhibition of the fungus was obtained only by the aqueous extract of *A. indica* at 75% concentration. Table 3 shows growth inhibition (cm) of *Penicillium digitatum* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation. There was no significant growth inhibition of the fungus by methanol extracts of the two plants at all the concentrations compared to control.

Table 4 shows the synergistic effect of *Azadirachta indica* (N) and *Aloe vera* (A) extracts (aqueous and methanol) on *Penicillium digitatum*. Growth inhibition of the fungus by the methanol extracts of the treatment combinations was better than the treatment combinations of the aqueous extracts. However, significant growth inhibition of the fungus by the synergy of the two plant extracts was obtained majorly at A75+N50 and A75+N75 concentrations for both aqueous and methanol extracts.

Table 5 shows the growth inhibition (cm) of *Aspergillus tamarii* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation. Significant growth inhibition of the fungus was obtained only by the aqueous extracts of *A. indica* at 50% and 75% concentrations compared to control.

Table 6 shows the growth inhibition (cm) of *Aspergillus tamarii* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation. Whereas there was growth inhibition of the fungus by the *A. indica* extracts at 50% concentration, and *Aloe vera* extracts at 50% and 75% concentrations, but this was not significant. Table 7 shows the synergistic effect of *Azadirachta indica* (N) and *Aloe vera* (A) extracts (aqueous and methanol) on *Aspergillus tamarii*. Significant growth inhibition of the fungus by the synergy of the two plants extracts was obtained largely at A25+N25, A25+N50, A25+N75, A75+N50 and A75+N75 for both aqueous and methanol extracts.

Table 8 shows the growth inhibition (cm) of *Aspergillus flavus* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation. Significant growth inhibition of the fungus by extracts of *A. indica* and *Aloe vera* was observed largely at 75% and 25% concentrations respectively compared to control. There was also significant growth inhibition of the fungus by *Aloe vera* extract at 50% concentration compared to control, although not at all days of incubation.

Table 9 shows the growth inhibition (cm) of *Aspergillus flavus* by different concentrations of *Azadirachta indica* and

Aloe vera methanol extracts at different days of incubation. There was no significant growth inhibition of the fungus by extracts of the two plants at all concentrations compared to control. However, there was growth reduction of the fungus by extracts of *Azadirachta indica* at 50% and 75% concentrations up to the 4th day of incubation. Table 10 shows the synergistic effect of *Azadirachta indica* (N) and *Aloe vera* (A) extracts (aqueous and methanol) on *Aspergillus flavus*. Generally, higher significant growth inhibition of the fungus by the synergy of both plants at different concentration combinations was observed with the methanol extracts compared to the aqueous extracts. However, the aqueous and methanol extracts of the two plants at treatment combinations A25+N75 and A75+N50 had the most effect in inhibiting the fungus, compared with the rest of the treatment combinations.

Table 11 shows the growth inhibition (cm) of *Botrytis cinerea* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation. Significant growth inhibition of the fungus by extracts of *A. indica* and *Aloe vera* was observed at 75% and 25% concentrations respectively, compared to control.

Table 12 shows the growth inhibition (cm) of *Botrytis cinerea* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation. Significant growth inhibition of the fungus by extracts of the two plants (compared to control) was observed at the 6th and 7th day after incubation for all the concentrations except 25% *A. indica*. Table 13 shows the synergistic effect of *Azadirachta indica* (N) and *Aloe vera* (A) extracts (aqueous and methanol) on *Botrytis cinerea*. Generally, higher significant growth inhibition of the fungus by the synergy of both plants at different concentration combinations was recorded with the methanol extracts compared to the aqueous extracts. Significant growth inhibition of the fungus by aqueous extracts of the two plants was also observed at A25+N25, A25+N50, A25+N75 and A50+N50 compared to other treatment combinations. Table 14 shows the overall growth inhibition (cm) of the isolated fungi by aqueous and methanol extracts of *Azadirachta indica*. Overall, growth inhibition of all the isolated fungi by aqueous and methanol extracts of A. indica at all concentrations except those of 25% and 50% aqueous extracts was significantly different from control.

Table 15 shows overall growth inhibition (cm) of the isolated fungi by aqueous and methanol extracts of *Aloe vera*. Similar significant results was obtained with aqueous and methanol extracts of the plant at all concentrations (except those of 50% and 75% aqueous extracts) compared to control.

Table 16 shows synergistic effects of *Azadirachta indica* (N) and *Aloe vera* (A) aqueous extracts on growth (cm) of the isolated fungi. Treatment combinations of A25+N25, A25+N50, A25+N75, A75+N50 and A75+N75 gave significantly higher inhibition of all the isolated fungi compared to other aqueous treatment combinations. However, the synergy of methanol extracts of the two plants (Table 17) at A75+N50, and A75+N75 gave the highest growth inhibition of all the isolated fungi compared to other methanol treatment combinations. This was made more evident at days 6 and 7 after inoculation where significant growth reduction was observed (Table 17). Table 18 shows the overall effects of concentration on the growth inhibition potential of the plant extracts (aqueous and methanol). Overall, growth inhibition potential of the two plant extracts (*Aloe vera* {A} and *Azadirachta indica* {N}) was significantly better at A75+N50 compared to other treatment combinations. However, A25+N25 and A25+N50 also had appreciable growth reduction of all the fungi compared to other treatment combinations.

Table 19 shows the overall growth inhibition of the isolated fungi by all extracts at different incubation days**.** Overall, growth inhibition of *A. tamarii* and *P. digitatum* by all extracts of the two plants was significantly better than that of *A. flavus*, which in turn was significantly better than that of *Botrytis cinerea* especially at the latter days after incubation.

Table 20 shows the overall comparisons of fungal inhibitions by the aqueous and methanol extracts. Generally, growth inhibitions by methanol extracts of the plants was significantly better than that of the aqueous extracts.

4. Discussion

The increase in growth inhibition of *Penicillium digitatum* with increase in concentration of aqueous Neem extract corroborated the work Suleiman (2011). The results obtained with the extracts of *Aloe vera* against the fungus also agrees with the reports of Rosca-Casian *et al.* (2007). Results obtained with the methanol and aqueous extracts of *Aloe vera* against *Aspergillus flavus* is similar to the reports of Babaei *et al*. (2013).

The significant F value (P>0.0001) for concentration means that growth inhibition of the fungi depends on the concentration of the extract, the effect of which varies from one fungus to the other. The significant F value (P>0.0001) for day also means that growth inhibition of the fungi differed significantly from one incubation day to the other. The significant F value (P>0.0001) for organism means that growth inhibition of all the isolated fungi differed significantly from each other. The highly significant F value (P>0.0001) for interaction between day and concentration means that growth inhibition of the fungi by any particular concentration of the plant extract differed significantly from one incubation period to the other. This underscores the significant impact of exposure period on the effectiveness of the extracts in inhibiting growth of the pathogens. The significant F value (P>0.0001) for interaction between day and organism means that growth inhibition of any particular fungus by the extracts differed significantly from one day of incubation to the other. The significant F value (P>0.0001) for interaction among day, organism and concentration means that growth inhibition of any particular fungus by a specific concentration of the plant extract differed significantly from one incubation period to the other.

The growth inhibition of *Aspergillus tamarii*, *Aspergillus flavus* and *Penicillium digitatum* by the combination of extracts of aqueous Neem leaf and Aloe leaf shows the higher mycotoxic impact of their synergy on the isolated

fungi compared to their individual impacts, especially the combinations of A75+N50, A25+N25, A75+N50 and A75+N75). Sharmita (2015), in an experiment to evaluate the possibility of a new pharmaceutical, also recorded a positive synergy between Neem leaf and *Aloe vera* leaf against *E. coli* with antibiotics.

5. Conclusion

Extracts of *Azadirachta indica* and *Aloe vera* possess promising mycotoxic potentials against fungi associated with rotting pepper, especially *A. flavus*, A. *tamarii*, *P. digitatum* and *B. cinerea*. Growth inhibition of these fungi is significantly boosted by the combination of both extracts, especially at A75+N50.

Further work, however, needs to be carried out to ascertain the effectiveness of these findings in the field.

Table 1: ANOVA table of the effects of all extracts on growth of the fungi isolated

Source	Df	SS	MS	F value	P > F
C	17	435.74	25.63	138.43	0.0001**
D	6	2104.25	350.71	1894.12	0.0001**
S	1	4850.44	4850.44	26196.4	0.0001**
O	3	1626.95	542.32	2928.96	0.0001**
D*C	102	142.09	1.39	7.52	0.0001**
C*S	17	398.46	23.44	126.59	0.0001**
O*C	51	332.54	6.52	35.22	0.0001**
D*S	6	899.61	149.93	809.77	0.0001**
D*O	18	382.80	21.27	114.86	0.0001**
O*S	3	1984.04	661.35	3571.82	0.0001**
D*C*S	102	147.15	1.44	7.79	0.0001**
D*O*C	306	208.04	0.68	3.67	0.0001**
O*C*S	51	285.18	5.59	30.20	0.0001**
D*O*S	18	463.88	25.77	139.18	0.0001**

C = Concentration
D = Days
S = Solvents
O = Organisms
**= Highly significant

Table 2: Growth inhibition (cm) of *Penicillium digitatum* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation

	Treatment	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.33^{b}	1.98^{d}	2.55^{e}	2.53^{efgh}	2.83^{efg}	3.08^{fgh}	3.45^{fgh}
	50%	1.30^{b}	2.10^{cd}	2.88^{d}	3.60^{c}	4.25^{c}	4.83^{c}	5.13^{c}
	75%	1.28^{bc}	1.55^{f}	1.60^{i}	1.63^{jk}	1.65^{klm}	1.63^{klmn}	1.58^{nop}
Aloe vera	25%	1.15^{de}	2.60^{b}	2.85^{d}	2.83^{def}	2.88^{ef}	2.90^{gh}	4.30^{de}
	50%	1.20^{cd}	2.28^{c}	2.45^{ef}	3.23^{cd}	3.75^{cd}	3.85^{de}	3.93^{efg}
	75%	1.33^{b}	2.00^{d}	2.20^{fg}	2.65^{efg}	3.33^{de}	3.85^{de}	4.13^{ef}
	Control	1.20^{cd}	1.45^{f}	1.65^{i}	2.20^{ghi}	2.30^{fghij}	2.45^{hij}	2.60^{jkl}

Means with different letters in a column are significantly different ($p \leq 0.05$)

Table 3: Growth inhibition (cm) of *Penicillium digitatum* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.00^{g}	1.00^{j}	0.98^{k}	1.03^{lm}	1.03^{n}	1.15^{mn}	1.47^{nop}
	50%	1.03^{g}	1.00^{j}	1.00^{k}	1.00^{m}	1.00^{n}	1.00^{n}	1.00^{p}
	75%	1.00^{g}	1.00^{j}	0.98^{k}	1.00^{m}	1.00^{n}	1.00^{n}	1.00^{p}
Aloe vera	25%	1.00^{g}	1.00^{j}	1.13^{k}	1.25^{klm}	1.35^{lmn}	1.43^{lmn}	1.58^{nop}
	50%	1.03^{g}	1.00^{j}	1.00^{k}	1.00^{m}	1.00^{n}	1.00^{n}	1.00^{p}
	75%	1.00^{g}	1.00^{j}	1.00^{k}	1.00^{m}	1.03^{n}	1.00^{n}	1.00^{p}
	Control	1.00^{g}	0.98^{j}	0.98^{k}	1.00^{m}	1.03^{n}	1.00^{n}	1.08^{p}

Means with same letters in each column are not significantly different ($p \leq 0.05$)

Table 4: Synergistic effect of *Azadirachta indica* and *Aloe vera* extracts (aqueous and methanol) on *Penicillium digitatum*

Solvent	Level of interaction	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aqueous	A25+N25	1.13^{def}	1.25^{ghi}	2.55^{e}	2.55^{efgh}	2.78^{efgh}	2.83^{ghi}	3.38^{ghi}
	A25+N50	1.08^{efg}	2.23^{c}	2.43^{ef}	2.38^{fgh}	2.43^{fghi}	2.50^{hij}	2.88^{hij}
	A25+N75	1.10^{efg}	1.53^{f}	2.48^{ef}	1.83^{ij}	2.23^{hijk}	3.43^{efg}	4.10^{ef}
	A50+N25	1.33^{b}	2.90^{a}	3.30^{c}	3.50^{c}	3.83^{cd}	4.25^{d}	4.93^{cd}
	A50+N50	1.15^{de}	2.50^{b}	2.90^{d}	2.98^{de}	3.08^{e}	3.58^{ef}	3.93^{efg}
	A50+N75	1.75^{a}	2.95^{a}	4.15^{a}	6.05^{a}	6.10^{a}	7.25^{a}	7.53^{a}
	A75+N25	1.05^{fg}	2.58^{b}	3.70^{b}	4.90^{b}	5.30^{b}	5.75^{b}	5.90^{b}
	A75+N50	1.13^{def}	1.78^{e}	2.05^{gh}	2.10^{hi}	2.20^{hijk}	2.15^{jk}	2.20^{j-n}
	A75+N75	1.10^{efg}	1.98^{d}	2.13^{g}	2.30^{gh}	2.28^{ghij}	2.25^{ijk}	2.35^{jklm}
Methanol	A25+N25	1.13^{def}	1.13^{hij}	1.25^{jk}	1.50^{jkl}	1.88^{ijkl}	2.18^{jk}	2.48^{jklm}
	A25+N50	1.00^{g}	1.05^{ij}	1.10^{k}	1.25^{klm}	1.53^{lmn}	1.70^{klm}	1.90^{l-o}
	A25+N75	1.00^{g}	1.03^{j}	1.10^{k}	1.23^{klm}	1.50^{lmn}	1.78^{kl}	2.05^{k-o}
	A50+N25	1.03^{g}	1.05^{ij}	1.18^{k}	1.58^{jk}	1.78^{jkl}	2.50^{hij}	2.73^{ijk}
	A50+N50	1.03^{g}	1.00^{j}	1.10^{k}	1.25^{klm}	1.43^{lmn}	1.60^{klmn}	1.78^{m-p}
	A50+N75	1.05^{fg}	1.03^{j}	1.05^{k}	1.00^{m}	1.08^{mn}	1.10^{mn}	1.33^{op}

	A75+N25	1.05^{fg}	1.00^{j}	1.00^{k}	1.00^{m}	1.15^{mn}	1.30^{lmn}	1.53^{nop}
	A75+N50	1.00^{g}	1.00^{j}	1.00^{k}	0.98^{m}	1.00^{n}	1.00^{n}	1.03^{p}
	A75+N75	1.15^{de}	1.05^{ij}	1.05^{k}	1.05^{lm}	1.08^{mn}	1.20^{lmn}	1.45^{nop}

Means with same letters in each column are not significantly different (p≤0.05)

Table 5: Growth inhibition (cm) of *Aspergillus tamarii* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.38^{bcde}	2.38^{b}	2.98^{abc}	3.00^{cd}	3.15^{c}	3.05^{cde}	3.18^{efg}
	50%	1.18^{ghij}	1.50^{b}	1.58^{ijk}	1.68^{i-m}	1.73^{jklm}	1.85^{ijkl}	1.78^{klmn}
	75%	1.10^{hijk}	1.28^{b}	1.33^{jkl}	1.35^{k-q}	1.35^{lmno}	1.43^{klm}	1.43^{lmn}
Aloe vera	25%	1.30^{defg}	2.05^{b}	2.43^{ef}	2.73^{de}	3.05^{cd}	2.48^{e-i}	2.73^{efghij}
	50%	1.43^{bcd}	2.35^{b}	2.93^{abcd}	3.43^{abc}	3.85^{b}	4.48^{ab}	4.73^{bc}
	75%	1.35^{cdef}	2.20^{b}	3.03^{ab}	3.68^{a}	4.25^{ab}	4.15^{b}	4.60^{bc}
	Control	1.25^{efg}	1.80^{b}	2.15^{fg}	2.55^{ef}	2.95^{cde}	3.25^{cd}	3.65^{de}

Means with same letters in each column are not significantly different (p≤0.05)

Table 6: Growth inhibition (cm) of *Aspergillus tamarii* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.20^{ghi}	1.30^{b}	1.43^{ijk}	1.80^{hijk}	2.45^{efgh}	2.85^{cdef}	3.00^{efgh}
	50%	1.08^{ijk}	1.05^{b}	1.05^{l}	1.00^{q}	1.00^{o}	1.08^{m}	1.40^{lmn}
	75%	0.98^{k}	0.95^{b}	1.08^{l}	1.25^{l-q}	1.40^{k-o}	1.53^{jklm}	1.80^{j-n}
Aloe vera	25%	1.00^{k}	1.10^{b}	1.30^{kl}	1.50^{j-p}	1.85^{ijkl}	2.05^{g-k}	2.25^{g-l}
	50%	1.05^{jk}	1.05^{b}	1.05^{l}	1.03^{pq}	1.03^{no}	1.05^{m}	1.18^{mn}
	75%	1.00^{k}	1.08^{b}	1.03^{l}	1.08^{pq}	1.03^{no}	1.08^{m}	1.05^{n}
	Control	1.05^{jk}	1.03^{b}	1.03^{l}	1.10^{opq}	1.13^{no}	1.30^{lm}	1.50^{lmn}

Means with same letters in each column are not significantly different (p≤0.05)

Table 7: Synergistic effect of *Azadirachta indica* and *Aloe vera* extracts (aqueous and methanol) on *Aspergillus tamarii*

	Level of interaction	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aqueous	A25+N25	1.25^{efg}	1.15^{a}	1.70^{hi}	1.65^{jklmn}	2.38^{fghi}	2.60^{c-i}	3.08^{efgh}
	A25+N50	1.25^{efg}	1.53^{b}	1.70^{hi}	1.73^{ijkl}	2.28^{ghi}	2.60^{c-i}	2.60^{f-k}
	A25+N75	1.23^{fgh}	1.70^{b}	1.75^{hi}	1.93^{ghij}	2.55^{defg}	2.55^{d-i}	2.63^{f-k}
	A50+N25	1.30^{defg}	2.33^{b}	2.90^{abcd}	3.53^{ab}	4.43^{a}	5.13^{a}	5.75^{a}
	A50+N50	1.38^{bcde}	2.35^{b}	2.73^{bcde}	3.15^{bcd}	3.98^{ab}	4.20^{b}	5.08^{ab}
	A50+N75	1.73^{a}	2.50^{b}	3.08^{a}	3.63^{a}	3.90^{b}	4.08^{b}	4.15^{cd}
	A75+N25	1.38^{bcde}	2.28^{b}	3.00^{ab}	3.60^{a}	4.23^{ab}	4.70^{ab}	5.30^{ab}
	A75+N50	1.35^{cdef}	1.95^{b}	2.20^{fg}	2.28^{fg}	2.85^{cdef}	2.78^{defg}	2.88^{efghi}
	A75+N75	1.45^{bc}	2.38^{b}	2.68^{cde}	3.05^{cd}	3.30^{c}	3.30^{c}	3.30^{ef}
Methanol	A25+N25	1.08^{ijk}	1.35^{b}	1.05^{l}	2.15^{fghi}	2.55^{defg}	2.85^{cdef}	3.18^{efg}
	A25+N50	1.05^{jk}	1.30^{b}	1.90^{gh}	1.88^{ghij}	2.18^{ghij}	2.50^{d-i}	2.73^{e-j}
	A25+N75	1.03^{jk}	1.18^{b}	1.63^{hij}	1.68^{ijklm}	2.13^{ghij}	2.65^{c-h}	2.90^{efghi}
	A50+N25	1.10^{hijk}	1.30^{b}	1.43^{ijk}	1.98^{ghij}	2.35^{fghi}	2.63^{c-h}	2.88^{efghi}
	A50+N50	1.03^{jk}	1.03^{b}	1.70^{hi}	1.58^{j-o}	1.93^{hijk}	2.18^{fghij}	2.45^{f-k}
	A50+N75	1.05^{jk}	1.08^{b}	1.43^{ijk}	1.58^{j-o}	1.85^{ijkl}	2.20^{fghij}	2.53^{f-k}
	A75+N25	1.08^{ijk}	1.20^{b}	1.28^{kl}	1.83^{ghijk}	2.13^{ghij}	2.53^{d-i}	2.75^{efghi}
	A75+N50	1.02^{k}	1.02^{b}	1.48^{ijk}	1.20^{m-q}	1.54^{klmno}	1.94^{hijkl}	2.28^{g-l}
	A75+N75	1.10^{hijk}	1.07^{b}	1.06^{l}	1.20^{mnopq}	1.57^{klmn}	1.93^{hijkl}	2.53^{f-k}

Means with same letters in each column are not significantly different (p≤0.05)

Table 8: Growth inhibition (cm) of *Aspergillus flavus* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.23^{cde}	2.23^{bcde}	2.85^{abcd}	3.30^{bcdef}	4.13^{abcd}	5.38^{a}	5.70^{abc}
	50%	1.25^{cde}	2.30^{abc}	2.95^{abc}	3.75^{abc}	4.30^{abc}	4.83^{ab}	5.23^{abcd}
	75%	1.25^{cd}	1.73^{gh}	2.28^{fghi}	2.58^{ghi}	3.03^{fghi}	3.40^{fg}	3.53^{fgh}
Aloe vera	25%	1.18^{defg}	1.80^{fg}	2.35^{efghi}	2.78^{fghi}	3.28^{efgh}	3.53^{efg}	3.83^{fg}
	50%	1.30^{bc}	2.08^{cde}	2.53^{defgh}	2.95^{efgh}	3.53^{def}	3.98^{cdef}	4.38^{def}
	75%	1.38^{b}	2.20^{bcde}	2.68^{bcde}	3.23^{bcdef}	3.90^{bcde}	4.25^{bcde}	4.80^{cde}
	Control	1.25^{cd}	2.00^{ef}	2.60^{cdef}	3.15^{cdefg}	3.80^{cde}	4.35^{bcd}	4.90^{bcde}

Means with same letters in each column are not significantly different (p≤0.05)

Table 9: Growth inhibition (cm) of *Aspergillus flavus* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.08^{hi}	1.13^{j}	1.28^{jklm}	1.45^{klm}	1.63^{lmn}	1.93^{hij}	2.23^{ijk}
	50%	1.08^{hi}	1.00^{j}	0.98^{m}	1.03^{m}	1.10^{mn}	1.40^{ijk}	1.40^{klm}
	75%	1.00^{i}	1.00^{j}	1.00^{lm}	1.00^{m}	1.18^{mn}	1.53^{hijk}	1.98^{ijkl}
Aloe vera	25%	1.05^{hi}	1.03^{j}	1.13^{jklm}	1.20^{lm}	1.33^{lmn}	1.48^{ijk}	1.60^{ijklm}
	50%	1.00^{i}	1.00^{j}	1.00^{lm}	1.00^{m}	1.00^{n}	1.00^{k}	1.03^{m}
	75%	1.00^{i}	1.00^{j}	1.00^{lm}	1.00^{m}	1.00^{n}	1.00^{k}	0.98^{m}
	Control	1.00^{i}	1.03^{j}	1.03^{lm}	1.03^{m}	1.08^{mn}	1.15^{jk}	1.30^{lm}

Means with same letters in each column are not significantly different ($p \leq 0.05$)

Table 10: Synergistic effect of *Azadirachta indica* and *Aloe vera* extracts (aqueous and methanol) on *Aspergillus flavus*

Solvent	Level of interaction	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aqueous	A25+N25	1.25^{cde}	1.53^{hi}	1.98^{i}	2.38^{hij}	2.75^{ghi}	3.15^{fg}	3.73^{fg}
	A25+N50	1.15^{efgh}	1.60^{ghi}	2.15^{hi}	2.55^{ghi}	2.88^{fghi}	3.23^{fg}	3.68^{fg}
	A25+N75	1.15^{efgh}	1.45^{i}	1.98^{i}	2.30^{ij}	2.68^{hij}	3.10^{g}	3.48^{fgh}
	A50+N25	1.13^{fgh}	2.05^{de}	2.55^{defg}	3.08^{defg}	3.75^{cde}	4.68^{abc}	5.45^{abc}
	A50+N50	1.20^{def}	2.27^{abcd}	2.97^{ab}	3.80^{ab}	4.43^{abc}	4.93^{ab}	5.38^{abc}
	A50+N75	1.63^{a}	2.48^{a}	3.10^{a}	3.63^{abcd}	4.60^{ab}	5.20^{a}	5.45^{abc}
	A75+N25	1.10^{ghi}	2.33^{ab}	3.03^{ab}	3.93^{a}	4.68^{a}	5.20^{a}	5.90^{a}
	A75+N50	1.18^{defg}	1.75^{gh}	2.18^{ghi}	2.60^{ghi}	3.00^{fghi}	3.28^{fg}	3.43^{gh}
	A75+N75	1.13^{fgh}	1.83^{fg}	2.43^{efgh}	2.85^{fghi}	3.45^{defg}	3.83^{defg}	4.18^{efg}
Methanol	A25+N25	1.05^{hi}	1.15^{j}	1.50^{j}	1.73^{kl}	2.05^{jkl}	2.35^{h}	2.68^{hi}
	A25+N50	1.05^{hi}	1.10^{j}	1.38^{jkl}	1.48^{klm}	1.80^{klm}	2.10^{hi}	2.35^{ij}
	A25+N75	1.05^{hi}	1.03^{j}	1.28^{jklm}	1.38^{klm}	1.73^{klmn}	2.03^{hi}	2.33^{ij}
	A50+N25	1.10^{ghi}	1.08^{j}	1.35^{jklm}	1.50^{klm}	1.80^{klm}	2.13^{hi}	2.38^{ij}
	A50+N50	1.00^{i}	1.03^{j}	1.18^{jklm}	1.43^{klm}	1.78^{klm}	2.13^{hi}	2.53^{ij}
	A50+N75	1.00^{i}	1.03^{j}	1.25^{jklm}	1.53^{klm}	1.80^{klm}	2.18^{hi}	2.68^{hi}
	A75+N25	1.05^{hi}	1.13^{j}	1.43^{jk}	1.88^{jk}	2.43^{ijk}	3.13^{g}	3.78^{fg}
	A75+N50	1.00^{i}	1.00^{j}	1.13^{jklm}	1.15^{lm}	1.38^{lmn}	1.70^{hijk}	1.98^{ijkl}
	A75+N75	1.00^{i}	1.08^{j}	1.00^{lm}	1.13^{m}	1.40^{lmn}	1.78^{hijk}	2.55^{i}

Means with same letters in each column are not significantly different ($p \leq 0.05$)

Table 11: Growth inhibition (cm) of *Botrytis cinerea* by different concentrations of *Azadirachta indica* and *Aloe vera* aqueous extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.55^{d}	6.88^{a}	8.45^{a}	8.50^{a}	8.50^{a}	8.50^{a}	8.50^{a}
	50%	1.48^{d}	5.60^{b}	8.50^{a}	8.50^{a}	8.50^{a}	8.50^{a}	8.50^{a}
	75%	1.83^{bc}	3.28^{de}	3.10^{k}	3.48^{h}	3.58^{f}	8.50^{a}	8.50^{a}
Aloe vera	25%	1.00^{fg}	1.58^{h}	2.00^{l}	2.83^{i}	4.18^{e}	4.83^{d}	5.45^{d}
	50%	1.50^{d}	3.48^{de}	5.90^{ef}	8.13^{ab}	8.50^{a}	8.50^{a}	8.50^{a}
	75%	1.73^{c}	3.30^{de}	5.33^{gh}	7.93^{bc}	8.50^{a}	8.50^{a}	8.50^{a}
	Control	1.50^{d}	3.60^{ed}	6.35^{de}	8.40^{a}	8.40^{a}	8.40^{a}	8.40^{a}

Means with same letters in each column are not significantly different ($p \leq 0.05$)

Table 12: Growth inhibition (cm) of *Botrytis cinerea* by different concentrations of *Azadirachta indica* and *Aloe vera* methanol extracts at different days of incubation

	Treatment levels	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Extracts								
Azadirachta indica	25%	1.13^{f}	1.0^{i}	1.0^{m}	1.05^{j}	1.33^{hij}	2.18^{e}	3.00^{e}
	50%	1.03^{fg}	0.98^{i}	1.03^{m}	1.03^{j}	1.03^{j}	1.0^{i}	1.03^{jk}
	75%	1.0^{fg}	1.0^{i}	1.0^{m}	1.0^{j}	0.98^{j}	1.0^{i}	1.25^{ijk}
Aloe vera	25%	1.0^{fg}	1.0^{i}	1.0^{m}	1.0^{j}	1.05^{j}	1.18^{hi}	1.40^{hijk}
	50%	1.0^{fg}	1.03^{i}	1.0^{m}	1.08^{j}	1.0^{j}	1.05^{hi}	1.00^{jk}
	75%	1.0^{fg}	1.0^{i}	1.0^{m}	1.0^{j}	1.0^{j}	1.0^{i}	0.98^{k}
	Control	$1.0f^{g}$	0.98^{i}	0.98^{m}	1.03^{j}	1.05^{j}	1.28^{ghi}	1.70^{ghi}

Means with same letters in each column are not significantly different ($p \leq 0.05$)

Table 13: Synergistic effect of *Azadirachta indica* and *Aloe vera* extracts (aqueous and methanol) on *Botrytis cinerea*

Solvent	Level of interaction	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aqueous	A25+N25	1.33^{e}	2.63^{f}	3.58^{j}	3.90^{h}	4.58^{d}	5.13^{d}	5.90^{d}
	A25+N50	1.58^{d}	2.85^{f}	5.80^{fg}	6.78^{e}	7.33^{b}	7.43^{c}	8.08^{ab}
	A25+N75	1.48^{d}	2.70^{f}	4.63^{i}	5.58^{g}	6.65^{c}	7.15^{c}	7.63^{bc}

	A50+N25	1.50^{d}	4.45^{c}	6.70^{cd}	7.73^{bcd}	8.50^{a}	8.50^{a}	8.50^{a}
	A50+N50	1.28^{e}	2.85^{f}	4.25^{i}	6.08^{f}	7.10^{b}	7.33^{c}	7.80^{bc}
	A50+N75	2.10^{a}	3.33^{de}	5.55^{fgh}	7.40^{d}	8.50^{a}	8.50^{a}	8.50^{a}
	A75+N25	1.93^{b}	5.60^{b}	7.80^{b}	8.50^{a}	8.50^{a}	8.50^{a}	8.50^{a}
	A75+N50	1.73^{c}	2.23^{g}	5.33^{gh}	7.53^{cd}	8.50^{a}	8.50^{a}	8.50^{a}
	A75+N75	1.73^{c}	4.30^{c}	7.08^{c}	8.50^{a}	8.50^{a}	8.50^{a}	8.50^{a}
Methanol	A25+N25	1.0^{fg}	1.05^{i}	1.20^{m}	1.25^{j}	1.50^{ghj}	1.68^{fg}	1.85^{fghi}
	A25+N50	1.0^{fg}	1.0^{i}	1.20^{m}	1.43^{j}	1.85^{g}	2.23^{e}	2.48^{ef}
	A25+N75	1.03^{fg}	1.0^{i}	1.0^{m}	1.23^{j}	1.58^{gh}	1.95^{ef}	2.33^{fg}
	A50+N25	1.05^{fg}	1.05^{i}	1.08^{m}	1.15^{j}	1.38^{hij}	1.73^{fg}	1.93^{fgh}
	A50+N50	1.03^{fg}	1.0^{i}	1.0^{m}	1.05^{j}	1.13^{ij}	1.38^{ghi}	1.63^{hij}
	A50+N75	1.0^{fg}	1.0^{i}	1.10^{m}	1.10^{j}	1.30^{hij}	1.50^{fgh}	1.84^{fghi}
	A75+N25	1.08^{fg}	1.0^{i}	1.0^{m}	1.13^{j}	1.25^{hij}	1.45^{ghi}	1.73^{ghi}
	A75+N50	1.0^{fg}	0.90^{i}	0.95^{m}	1.05^{j}	1.30^{hij}	1.65^{fg}	1.90^{fghi}
	A75+N75	1.0^{fg}	1.0^{i}	0.98^{m}	1.0^{j}	1.15^{ij}	1.25^{ghi}	1.58^{hijk}

Means with same letters in each column are not significantly different (p≤0.05)

Table 14: Overall growth inhibition (cm) of the isolated fungi by aqueous and methanol extracts of *Azadirachta indica*

Solvent	Concentration	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aqueous	25%	1.37^{bcd}	3.36^{a}	4.21^{ab}	4.33^{ab}	4.65^{bcde}	5.00^{cde}	5.21^{bcdef}
	50%	1.29^{cde}	2.88^{abcd}	3.98^{abc}	4.38^{ab}	4.69^{bcd}	5.00^{cde}	5.16^{cdef}
	75%	1.36^{bcd}	1.96^{efg}	2.08^{ji}	2.26^{gh}	2.40^{ij}	3.74^{fg}	3.76^{h}
Methanol	25%	1.10^{gh}	1.11^{h}	1.17^{k}	1.33^{i}	1.61^{jk}	2.03^{hij}	2.43^{i}
	50%	1.05^{h}	1.01^{h}	1.01^{k}	1.01^{i}	1.03^{k}	1.12^{ij}	1.21^{klm}
	75%	0.99^{h}	0.97^{h}	1.01^{k}	1.06^{i}	1.14^{k}	1.26^{hij}	1.51^{ijklm}
	Control	1.30^{cde}	2.21^{defg}	3.19^{defg}	4.08^{bc}	4.32^{bcdef}	4.61^{def}	4.89^{cdefg}

Means with same letters in each column are not significantly different (p≤0.05)

Table 15: Overall growth inhibition (cm) of the isolated fungi by aqueous and methanol extracts of *Aloe vera*

Solvent	Concentrations	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aqueous	25%	1.16^{fg}	2.00^{efg}	2.41^{hi}	2.79^{efg}	3.34^{gh}	3.43^{g}	4.08^{gh}
	50%	1.36^{bcd}	2.54^{bcdef}	3.45^{cdef}	4.43^{ab}	4.91a^{bc}	5.20^{bcd}	5.38^{bcd}
	75%	1.44^{b}	2.43^{cdefg}	3.31^{cdef}	4.37^{ab}	4.99^{abc}	5.19^{bcd}	5.51^{abc}
Methanol	25%	1.10^{h}	1.03^{h}	1.14^{k}	1.24^{i}	1.39^{k}	1.53^{hij}	1.71^{ijklm}
	50%	1.02^{h}	1.02^{h}	1.01^{k}	1.03^{i}	1.01^{k}	1.03^{j}	1.05^{lm}
	75%	1.00^{h}	1.02^{h}	1.01^{k}	1.02^{i}	1.01^{k}	1.02^{j}	1.00^{m}
	Control	1.30^{cde}	2.21^{defg}	3.19^{defg}	4.08^{bc}	4.32^{bcdef}	4.61^{def}	4.89^{cdefg}

Means with same letters in each column are not significantly different (p≤0.05)

Table 16: Synergistic effects of *Azadirachta indica* and *Aloe vera* aqueous extracts on growth (cm) of the isolated fungi

Concentrations	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
A25+N25	1.23^{ef}	2.64^{bcde}	2.45^{ghi}	2.62^{fg}	3.12^{hi}	3.43^{g}	4.02^{h}
A25+N50	1.26^{de}	2.05^{efg}	3.02^{efgh}	3.36^{cdef}	3.73^{efgh}	3.94^{fg}	4.31^{efgh}
A25+N75	1.24^{ef}	1.84^{g}	2.71f^{ghi}	2.91^{defg}	3.53^{fgh}	4.06^{efg}	4.46^{defgh}
A50+N25	1.31^{cde}	2.93^{abc}	3.86^{abcd}	4.46^{ab}	5.13^{ab}	5.64^{abc}	6.16^{ab}
A50+N50	1.24^{ef}	2.40^{cdefg}	3.06^{efgh}	3.74^{bcd}	4.37^{bcdef}	4.73^{cdef}	5.29^{bcde}
A50+N75	1.80^{a}	2.81^{abcd}	3.97^{abc}	5.18^{a}	5.78^{a}	6.26^{a}	6.41^{a}
A75+N25	1.36^{bcd}	3.19^{ab}	4.38^{a}	5.21^{a}	5.68^{a}	6.04^{ab}	6.40^{a}
A75+N50	1.34^{bcd}	1.93^{fg}	2.98^{efgh}	3.63^{bcde}	4.14^{cdefg}	4.18^{efg}	4.25^{fgh}
A75+N75	1.35^{bcd}	2.62^{bcdef}	3.58^{bcde}	4.18^{bc}	4.38^{bcdef}	4.47^{def}	4.58^{cdefgh}

Means with same letters in each column are not significantly different (p≤0.05)

Table 17: Synergistic effects of *Azadirachta indica* and *Aloe vera* methanol extracts on growth (cm) of the isolated fungi

Concentrations	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
A25+N25	1.06^{gh}	1.17^{h}	1.46^{jk}	1.66^{hi}	1.99^{jk}	2.26^{h}	2.54^{i}
A25+N50	1.03^{h}	1.11^{h}	1.33^{k}	1.51^{hi}	1.84^{jk}	2.13^{hi}	2.36^{ij}
A25+N75	1.03^{h}	1.06^{h}	1.20^{k}	1.38^{hi}	1.73^{jk}	2.10^{hi}	2.40^{ij}
A50+N25	1.07^{gh}	1.19^{h}	1.33^{k}	1.55^{hi}	1.83^{jk}	2.24^{j}	2.48^{i}
A50+N50	1.02^{h}	1.01^{h}	1.18^{k}	1.33^{i}	1.56^{jk}	1.82^{hij}	2.09^{ijk}
A50+N75	1.03^{h}	1.03^{h}	1.16^{k}	1.27^{i}	1.48^{jk}	1.70h^{ij}	2.06^{ijkl}
A75+N25	1.06^{gh}	1.08^{h}	1.23^{k}	1.46^{hi}	1.74^{jk}	2.10^{hi}	2.44^{i}
A75+N50	1.00^{h}	0.98^{h}	1.03^{k}	1.10^{i}	1.32^{k}	1.59^{hij}	1.82^{ijklm}
A75+N75	1.06^{gh}	1.05^{h}	1.01^{k}	1.09^{i}	1.28^{k}	1.51^{hij}	1.99^{ijkl}

Means with same letters in each column are not significantly different (p>0.05)

Table 18: Overall effects of concentration (aqueous and methanol) on the fungal growth inhibition potential of the plant extracts

Concentration	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
A25+N25	1.15^{cde}	1.90^{abcd}	1.96^{def}	2.14^{def}	2.56^{de}	2.84^{cde}	3.28^{cdef}
A25+N50	1.14^{cde}	1.58^{cd}	2.17^{bcde}	2.43^{cde}	2.78^{cde}	3.03^{cde}	3.33^{cdef}
A25+N75	1.13^{de}	1.45^{d}	1.95^{def}	2.14^{def}	2.63^{de}	3.08^{cde}	3.43^{cde}
A50+N25	1.19^{bcd}	2.03^{abc}	2.60^{abc}	3.01^{abc}	3.48^{abc}	3.94^{ab}	4.32^{ab}
A50+N50	1.13^{de}	1.71^{bcd}	2.12^{bcde}	2.53^{bcde}	2.97^{bcde}	3.27^{bcd}	3.68^{bcd}
A50+N75	1.41^{a}	1.92^{abcd}	2.56^{abc}	3.22^{ab}	3.63^{ab}	3.98^{a}	4.22^{ab}
A75+N25	1.21^{bcd}	2.14^{ab}	2.80^{a}	3.34^{a}	3.71^{a}	4.07^{a}	4.42^{a}
A75+N50	1.17^{bcd}	1.45^{d}	1.98^{def}	2.36^{cde}	2.72^{de}	2.88^{cde}	3.02^{def}
A75+N75	1.20^{bcd}	1.83^{abcd}	2.30^{adcde}	2.63^{bcde}	2.84^{cde}	3.00^{cde}	3.30^{cdef}

Means with same letters in each column are not significantly different (p>0.05)

Table 19: Overall growth inhibition of the isolated fungi by all extracts at different incubation days

Organism	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Aspergillus tamarii	1.19^{b}	1.17^{b}	1.83^{b}	2.06^{b}	2.39^{bc}	2.59^{c}	2.83^{c}
Penicillium digitatum	1.13^{c}	1.52^{b}	1.78^{b}	1.98^{b}	2.14^{c}	2.36^{c}	2.61^{c}
Aspergillus flavus	1.14^{c}	1.49^{b}	1.82^{b}	2.13^{b}	2.54^{b}	2.93^{b}	3.28^{b}
Botrytis cinerea	1.29^{a}	2.20^{a}	3.33^{a}	3.95a	4.30^{a}	4.63^{a}	4.84^{a}

Means with same letters in each column are not significantly different (p>0.05)

Table 20: Overall comparisons of fungal inhibitions by the aqueous and methanol extracts

Extract	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Aqueous	1.34^{a}	2.46^{a}	3.25^{a}	3.83^{a}	4.28^{a}	4.63^{a}
Methanol	1.03^{b}	1.04^{b}	1.13^{b}	1.23^{b}	1.40^{b}	1.62^{b}

Means with same letters in each column are not significantly different (p>0.05)

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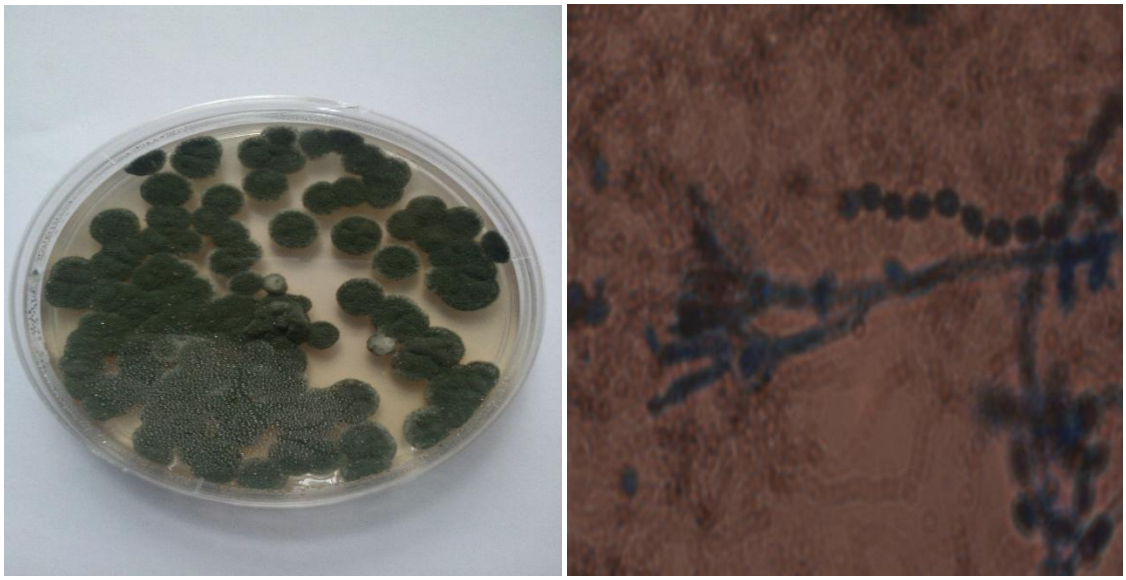
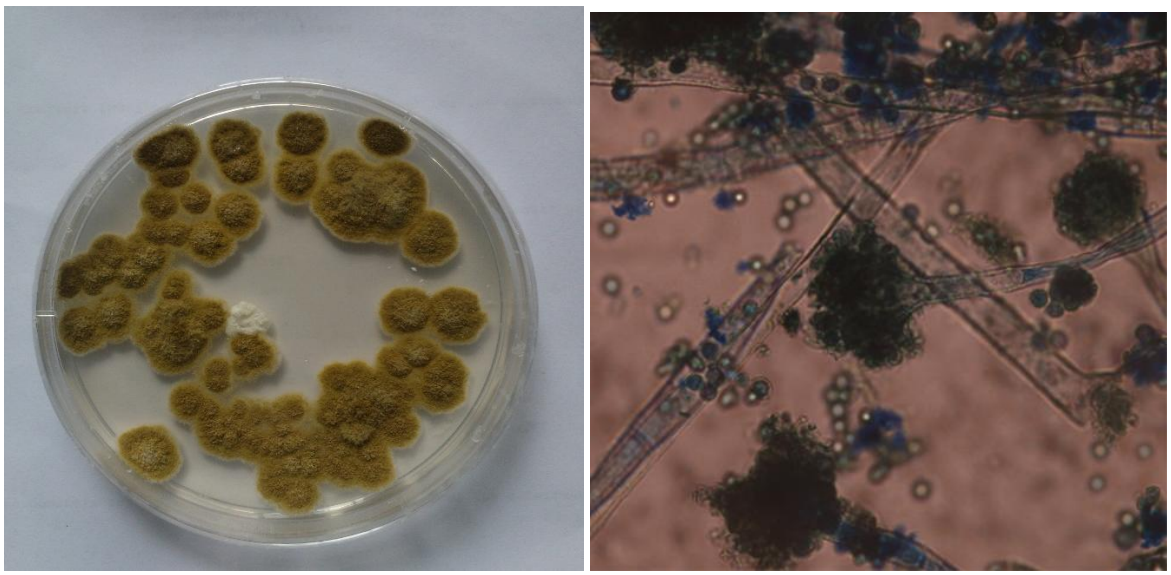


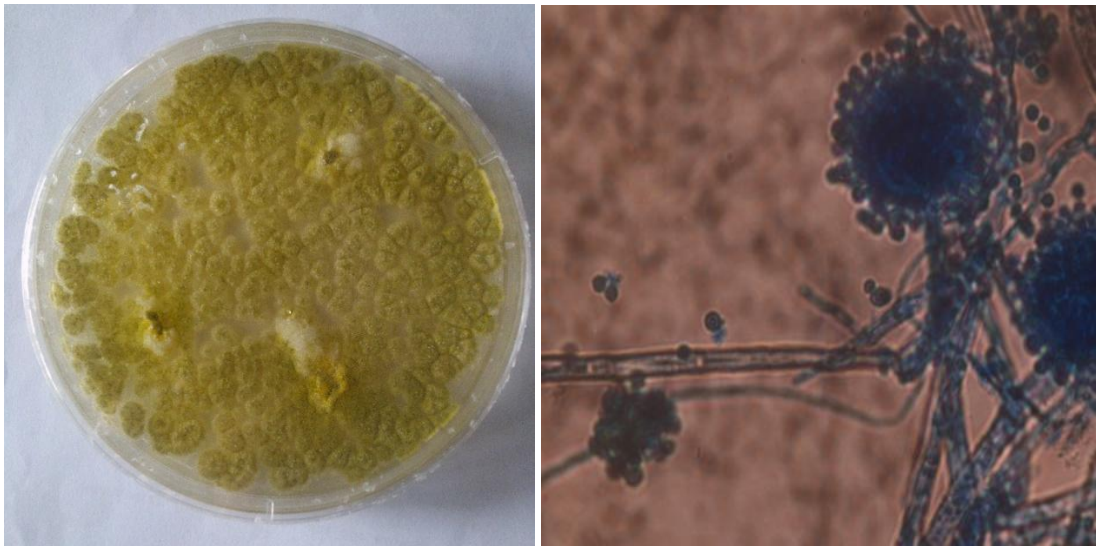
(A) (B)

Plate 1: Pure culture (A) and photomicrograph (B) of *Penicillium digitatum*.



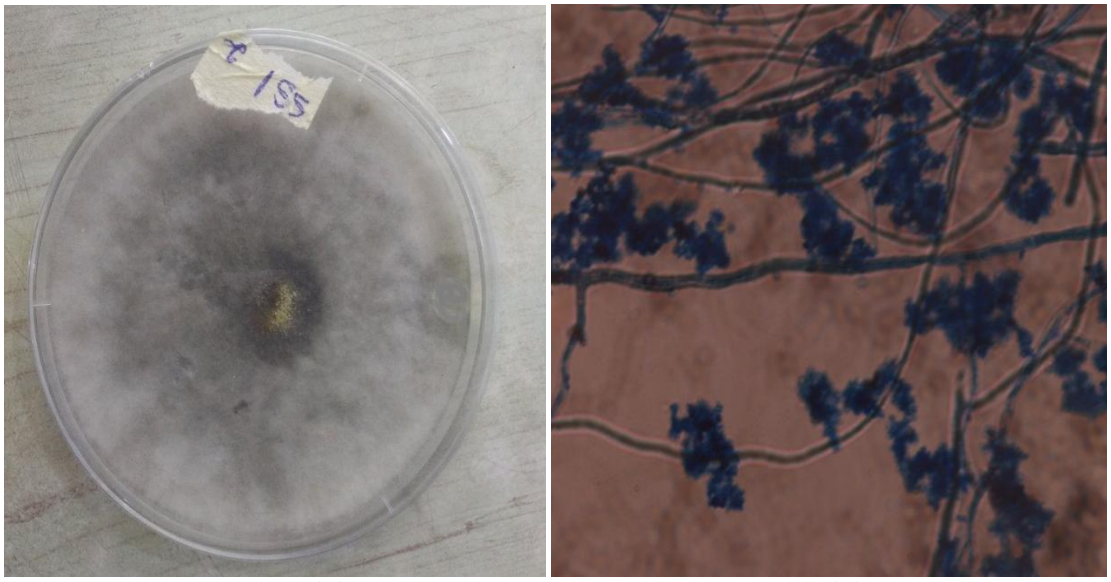
(A) (B)

Plate 2: Pure culture (A) and photomicrograph (B) of *Aspergillus tamarii*



(A) (B)

Plate 3: Pure culture (A) and photomicrograph (B) of *Aspergillus flavus*



(A) (B)

Plate 4: Pure culture (A) and photomicrograph (B) of *Botrytis cinerea*