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THE ANTIMICROBIAL ACTIVITY OF VARIOUS SOLVENT TYPE EXTRACTS FROM SELECTIVE FRUITS AND EDIBLE PLANTS

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Abstract: As part of a research initiative to evaluate food crops for their nutritional and herbal values, the antimicrobial activity of the n-C6H14, CH2Cl2 and CH3CH2OH extract of *Brassica rapa* chinensis, Artocarpus altilis, Solanum melongena fruits and leaves of Moringa oleifera were investigated. Each plant part was subjected to selective extraction using the above solvents. Antimicrobial activity was investigated asceptically, using the Disc Diffusion Assay at a concentrations of 0.025g/ml, 0.05g/ml and 0.1g/ml against pathogens: *E. coli, S. aureus, Bacillus subtilis, K. pneumoniae* and *C. albicans* for *Brassica rapa chinensis* and *Artocarpus altilis*. Also, the combined CH3CH2OH and n-C6H14 extracts of A. altilis and Brassica rapa chinensis were investigated. The n-C6H14 and CH3CH2OH extract of Solanum melongena fruit and leaves of Moringa oleifera were tested for their antimicrobial activity at concentrations of 5%, 10% and 20% of crude extracts. The diameter of the zone of inhibition, DZOI was used as the food crop antimicrobial potency. The highest AZOI of 209.34 mm2 was induced by the CH3CH2OH extract of *Brassica rapa chinensis* against E. coli at a concentration of 0.025g/ml. The lowest AZOI of 12.56 mm2 was induced by *Brassica rapa chinensis* against *Bacillus subtilis* at a concentration of 0.025g/ml. Both the n-C6H14 and CH3CH2OH extracts of Solanum melongena fruit and Moringa oleifera leaves showed greater antibacterial activity at a higher concentration of 20% of crude extract. The order of bacteria susceptibility to *Moringa oleifera* extract being *S. aureus* > *K. pneumoniae* > *E.coli,* whereas that for *Solanum Melongena* extract being *S. aureus* > *E.coli* > *K. pneumoniae*. The area of zone of inhibition ranged from 44.15 mm2 to 53.55 mm2. Selective antimicrobial activity were observed for all four food crop extracts. Thus, the above food crops can be used as antibacterial agents in addition to their nutritional values.

Keywords: antimicrobial, *Brassica rapa chinensis, Artocarpus altilis, Solanum melongena* fruit, *Moringa oleifera* leaves, *E.coli, S .aureus, Bacillus subtilis, K. pneumoniae, C. albicans*, antimicrobial selectivity.

INTRODUCTION

Research in the design and syntheses of antimicrobials will continue to be problematic considering that bacteria and fungus developed resistance to antimicrobials over a period of time [1-7]. Antibiotic resistance has become a global concern[5-7]. This is primarily due to indiscriminate use of commercial antimicrobial drugs used for the treatment of infectious diseases. This has led to the search for new antimicrobials, both herbal and synthetic. However, synthetic drugs/medicine have several adverse side effects which are usually irreversible when administered and the cost of synthesizing drugs in most cases is an expensive endeavour [1-5]. In addition, phytochemical screening and natural products isolation can lead to novel and know natural products whose *in vitro* antimicrobial activity can be compared with that of the crude plant extract[8-9]. Guyana has a rich bio diversified flora whose organic and aqueous extract have been shown to possess potent

and selective antimicrobial activity compared with standard antibiotics: penicillin, nystatin and ampicillin[10-16] etc. In addition, there is also a need to assess the medicinal values of plant used as food source. Thus, efforts should be made to intensify the production of food crops in the agro-industry that have antimicrobial properties in addition to their nutritional properties.

In search of antimicrobials that have nutritional values (neutraceuticals), the use of the solventless C_6H_{14} and CH_3CH_2OH extracts of *Solanum melongena* (Solanaceae), *Moringa oleifera (*Moringaceae), *Brassica rapa chinensis (Brassicaceae), Artocarpus altilis* (Moraceae), against human pathogenic microorganisms: *E. coli, S. aureus, K. pneumoniae and C. albicans* are reported here. Several natural products have been isolated from these plants with a wide range of medicinal activities [17-34].

MATERIALS AND METHODS

Collection of Plant material:

Fresh parts of the above plants were handpicked from a local farm on the Coast Plain of Guyana and were placed in bags. These were washed with distilled water and dried for four (4) hours. They were further air dried for one week and sent for authentication at the Centre for the Study of Biological Diversity, University of Guyana. Breadfruit and Pak choi were collected from a local farm and were subjected to aerial drying.

Procedure:

(a) Preparation of Herbal Extracts for antimicrobial assay: Solvent Extraction:

n-C_6H_{14}, and CH_3CH_2OH solvents were freshly distilled prior to use. (387 g) of *Solanum melongena* fruit and 350g of *Moringa oleifera* leaves were extracted thrice in six hundred milliliters (600 ml) of n-C_6H_{14}. The procedure was repeated using freshly distilled CH_3CH_2OH. The contents for each extraction was filtered, solvents dried over anhydrous Na_2SO_4 and removed in *vacuo*, resulting in viscous extracts whose state are shown in Table 1.0..The weighed plant parts of *Brassica rapa chinensis* (375g) and *Artocarpus altilis* (361g) were also placed in extraction jars and extracted sequentially with solvents of varying polarity: n-C_6H_{14}, and CH_3CH_2OH. After extraction, solvents were filtered and dried over anhydrous Na_2SO_4. Solvents were removed in *vacuo* resulting in viscous extracts and semi-solids, Table 1.0. Antimicrobial properties of *Solanum melogena* and *Moringa oleifa* C_2H_5OH and n-C_6H_{14} extracts were investigated in *vitro* at concentrations of 5%, 10% and 20% of extract per solvent. For *Brassica rapa chinensis* and *Artocarpus altilis*, each extract was prepared in concentrations of 0.025g/ml, 0.05g/ml and 0.1 g/ml respectively. Solutions containing varying concentration of *Solanum melongena*, *Moringa oleifera*, *Brassica rapa chinensis* and *Artocarpus altilis* extracts were subjected to antimicrobial susceptibility tests against human pathogens: *E.coli*, *S. aureus*, *K. pneumoniae* and *C. albicans*.

(b) **Antimicrobial Susceptibility Tests**:

The Disc Diffusion assay was used to evaluate the antimicrobial activity of these edible plants. This method has been previously reported [10-27]. Each disc was impregnated with the anticipated antimicrobial plant extract of *Solanum Melongena* and *Moringa oleifera* at appropriate concentrations of 5%, 10% and 20 % of n-C_6H_{14} or CH_3CH_2OH extract using a microlitre syringe.

For *Brassica rapa chinensis* and *Artocarpus altilis*, these were at concentration of 0.025mg/L, 0.5g/L and 0.1 g/L respectively. The plates were then incubated with the test organism: Bacteria at 37ºC for 24 hours. The antimicrobial compound diffuses from the disc into the medium. Following overnight incubation, the culture was examined for areas of no growth around the disc (zone of inhibition, ZOI). The diameter of the zone of inhibition, DZOI, was measured using a transparent plastic ruler. Each experiment was done in triplicates. *Ampicillin* was choosen as the reference for all bacteria species used: *E.coli*, *S. aureus* and *Klebsiella pneumonia,* whereas Nystatin was used for fungal species. The Control experiment consists of a plate of solidifying agar onto which was inoculated pure solvent with microorganism mixed in a 1:1 portion, [35-37] . Gram negative (-) *E. coli,* Gram positive (+) strains *Staphylococcus aureus* (ATCC 25923), *Klepsiella pneumoniae* and Gram positive (+) strains were obtained from the Georgetown Public Hospital, GPH and stored in a refrigerator until required.

RESULTS

Table 1.0: State and % yield of solvent type extract for *S. melongena*, *M. oleifera*, *Brassica rapa chinensis* and *Artocarpus altilis*.

Name of Plant	Weight of ground plant material (g)	Type of extract	State of Extract	Weight of Extract (g)	% yield of Extract
Solanum melongena	387 g	n-C_6H_{14}	Black viscous extract	3.6	0.9
Solanum melongena	387g	CH_3CH_2OH	Green Viscous Extract	4.1	1.1
Moringa oleifera	350g	n-C_6H_{14}	Green semi viscous Extract	3.7	1.1
Moringa oleifera	361g	CH_3CH_2OH	Green Viscous Extract	4.5	1.2
Brassica rapa Chinensis	375g	n-C_6H_{14}	Green viscous solid	2.5	0.7
Brassica rapa Chinensis	375g	CH_2Cl_2	Light green	0.7	0.2
Brassica rapa Chinensis	375g	CH_3CH_2OH	Dark green	21.9	5.9
Altocarpus altilis	361g	n-C_6H_{14}	Off-White yellow	2.5	0.69
	361g	CH_2Cl_2	Green	1.4	0.39
	361g	CH_3CH_2OH	Viscous light brown	22.5	6.23

Table 2.0: TLC profile for *Solanum Melongena*, *Moringa oleifera, Brassica rapa chinensis* and *Artocarpus altilis*.

Solvent Extract	*Solanum melongena* *Rf*	*Moringa oleifera* *Rf*	*Brassica rapa Chinensis* R_f	*Altocarpus altilis* R_f
CH_3CH_2OH	0.21, 0.35, 0.56, 0.61	0.35, 0.41, 0.61, 0.75	0.8, 1.88	0.8, 0.6
C_6H_{12}	0.35, 0.5, 0.75, 0.81	0.25, 0.41, 0.49, 0.61	0.32, 0.44,0.88,0.96	0.30, 0.51, 0.63

R_f: Retention factor

Table 3.0: Mean, Standard Deviation and Area of Zone of Inhibition for the n-C_6H_{14} and CH_3CH_2OH extract of *Solanum Melongena* and *Moringa oleifera*.

Sample	Pathogenic Microorganism	Concentration (%)	Mean Diameter	Mean Diameter with Standard deviation	Area of Zone of Inhibition (mm^2)
***Solanum melogena* Hexane**	*E.coli*	5	4.43	4.43 ±3.85	15.04
		10	4.46	4.46 ± 2.97	15.65
		20	7.03	7.03 ± 0.25	38.79
	S. aureus	5	6.77	6.77 ± 1.04	35.87
		10	7.1	7.1 ± 0.22	39.57
		20	5.03	5.03 ± 2.53	19.86
	Klebsiella pneumoniae	5	2.33	2.33 ± 1.04	4.26
		10	7.97	7.97 ± 3.87	48.99
		20	7.17	7.17 ± 0.25	40.24
***Solanum melongena* Ethanol**	*E.coli*	5	7.2	7.2 ± 0.71	40.69
		10	7.43	7.43 ± 0.30	43.33
		20	7.63	7.63 ±0.42	45.7
	S.aureus	5	7.87	7.87 ± 0.32	48.49
		10	7.73	7.73 ± 0.64	46.9

		20	8.27	8.27 ± 0.21	53.55
	Klebsiella spp	5	7.03	7.03 ± 0.11	38.79
		10	7.53	7.53 ± 0.32	44.51
		20	7.5	7.5 ±0.17	44.15
***Moringa oleifera* Hexane**	*E.coli*	5	4.4	4.4 ±3.81	15.19
		10	7	7 ±0.2	38.46
		20	7.06	7.06 ±0.11	39.12
	S.aureus	5	4.66	4.66 ±4.07	17.04
		10	7.4	7.4 ±0.52	42.98
		20	7.53	7.53 ±0.49	44.51
	klebsiella pneumoniae	5	7.33	7.33 ± 0.28	42.17
		10	7.26	7.26 ± 0.20	41.37
		20	4.86	4.86 ± 4.23	18.54
***Moringa oleifera* Ethanol**	*E.coli*	5	6.73	6.73 ±0.25	33.55
		10	4.76	4.76 ± 4.12	17.78
		20	7.73	7.73 ± 0.11	46.9
	S.aureus	5	5	5 ± 4.35	38.46
		10	8.1	8.1 ±0.79	51.5
		20	8.1	8.1 ±0	51.5
	Klebsiella pneumoniae	5	6.93	6.93 ±0.05	37.69
		10	7.33	7.33 ±0.05	42.17
		20	7.93	7.93 ±0.11	49.36

Table 4.0.

Plant Extracts	Tested Microorganism	Diameter of DZOI	Mean Diameter of ZOI	Area of ZOI
Hexane extract of *Brassica rapa chinensis* at low concentration (0.01 g/ml)	*E. coli*	10mm, 9mm,14mm	11± 2.65	94.9
	S. aureus	13mm, 14mm, 8mm	11.67± 3.22	106.9
	Bacillus subtilis	8mm, 6mm, 6mm	6.67 ± 1.16	34.9
	C. albicans	18mm, 8mm, 11mm	12.33 ± 5.13	119.3
Hexane extract of *Brassica rapa chinensis* at high concentration 0.1g/ml	*E. coli*	No Inhibition		0
	S. aureus	8mm, 6mm, 0	7 ± 4.16	38.5
	Bacillus subtilis	No Inhibition		0
	C. albicans	11mm, 10mm, 8mm	9.67 ± 1.53	73.4

Table 5.0. Antimicrobial activity of n-C_6H_{14} extract of *A. altilis* at low and high concentration.

Plant Extracts	Tested Microorganism	Diameter of ZOI	Mean Diameter of ZOI	AZOI
Hexane extract of *A. altilis* at low concentration (0.01g/ml)	*E. coli*	No Inhibition	0	0
	S. aureus	No Inhibition	0	0
	Bacillus subtilis	No Inhibition	0	0
	C. albicans	No Inhibition	0	0
Hexane extract of *A. altilis* at high concentration (0.1 g/ml)	*E. coli*	No Inhibition	0	0
	S. aureus	No Inhibition	0	0
	Bacillus subtilis	12mm, 10mm, 10mm	10.67 ± 1.16	89.2
	C. albicans	No Inhibition	0	0

Table 6.0. Antimicrobial activity of CH_3CH_2OH extract of *Brassica rapa chinensis* at low and high concentration.

Plant Extracts	Tested Microorganism	Diameter of ZOI	Mean Diameter of ZOI	Area of ZOI (mm^2)
Ethanol extract of *Brassica rapa chinensis* at low concentration 0.01g/ml	*E. coli*	17mm, 17mm, 15mm	16.33 ± 2.7	209.3
	S. aureus	9mm, 17mm, 15mm	13.67 ± 3.73	146.7
	Bacillus subtilis	7mm, 5mm, 0	4 ± 3.61	12.6

	C. albicans	16mm, 15mm, 11mm	14 ± 2.6	153.9
Ethanol extract of *Brassica rapa chinensis* at high concentration, 0.1g/ml	*E. coli*	9mm, 8mm, 7mm	8 ± 1	50.2
	S. aureus	15mm, 13mm, 9mm	12.33 ± 3.05	119.3
	Bacillus subtilis	5mm, 9mm, 15mm	9.67± 5.03	73.4
	C. albicans	15mm, 14mm 9mm	12.67± 3.27	126.0

Table 7.0 Antimicrobial activity of CH_3CH_2OH extract of *A. altilis* at low and high concentration

Plant Extracts	Tested Microorganism	Diameter of ZOI	Mean Diamter ZOI	Area of ZOI
Ethanol extract of *A. altilis* at low concentration 0.01g/ml	*E. coli*	9mm, 8mm, 9mm	8.67 ± 0.6	59.00
	S. aureus	13mm, 11mm, 9mm	11 ± 2	94.9
	Bacillus subtilis	9mm, 8mm, 6mm	7.66 ± 1.5	46.7
	C. albicans	No Inhibition	0	0
Ethanol extract of *A. altilis* at high concentration 0.1g/ml	*E. coli*	No Inhibition	0	0
	S. aureus *Bacillus subtilis*	No Inhibition No Inhibition	0	0
	C. albicans	No Inhibition	0	0

Graphs:

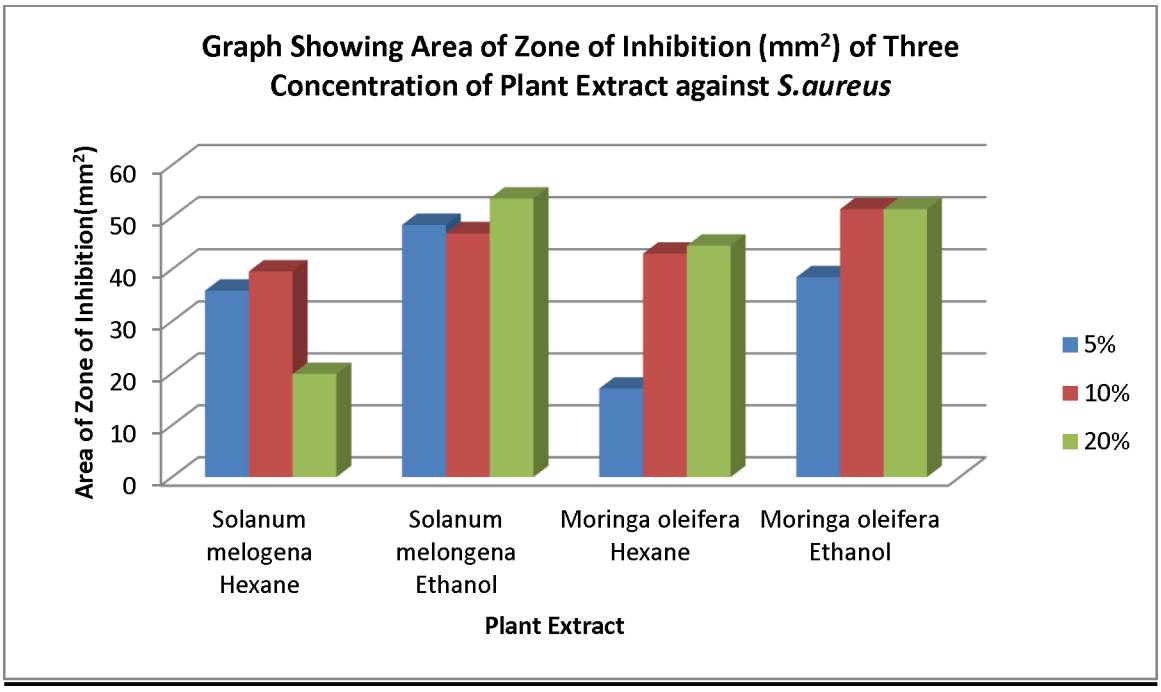

Fig. 1.0. Area of Zone of Inhibition (mm^2) of plant extracts against *S. aureus* at concentration of 5, 10 and 20%

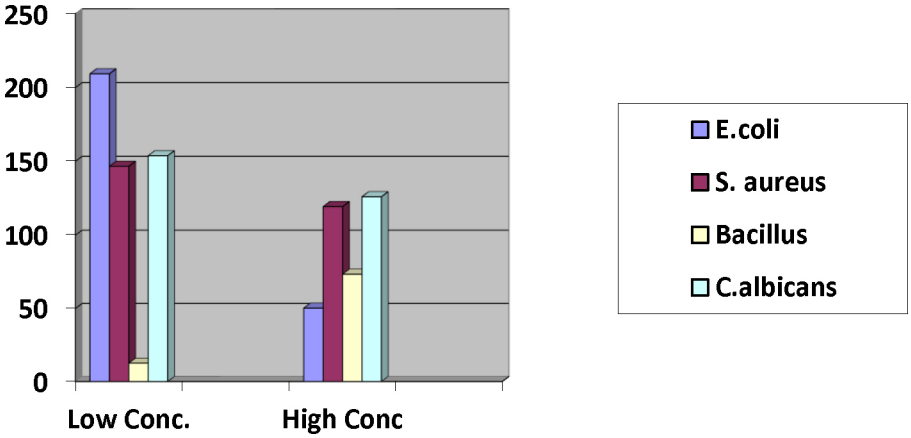

Fig. 2.0. Antimicrobial activity of CH_3CH_2OH extract of *Brassica rapa chinensis* at a concentration of 0.01g/ml, 0.05g/ml and 0.1 g/ml.

DISCUSSION

The percentage yield (%) of the solvent type extract follows the sequence: CH_3CH_2OH > n-C_6H_{14} in accordance with solvent increasing polarity. These range from 0.2 to 6.23 % and are generally low yielding. TLC analysis of the CH_3CH_2OH and n-C_6H_{14} extract of all four plant parts are shown in Table 2.0. Each spot is probably due to a pure phytochemical constituent.

The area of zone of inhibition, AZOI was used as an indicator of the plant's antimicrobial properties. Larger the diameter of zone of inhibition, DZOI, greater is the plant's antimicrobial activities. A comparison of the effect of the various solvent type extracts against the three human pathogenic microorganisms at three different concentrations can be discussed. In general, there seem to be an increase in the plant's extract antimicrobial activity as the concentration of the extract is increased. For example, *Solanum melongena* C_2H_5OH extract induces area of zone of inhibition (AZOI) of 40.69, 43.33 and 45.7 mm^2 against *E.coli* as the concentration of the plant extract increased from 5% to 20%. However, there were exceptions to the above general increase in bacterial activity. For example, *Solanum melogena* n-C_6H_{14} extract showed an increase in antimicrobial activity of 39.57 mm^2 at 10% concentration against *S.aureus,* followed by a decrease of 19.86 mm^2 at the 20% concentration. *Moringa oleifera* C_2H_5OH extract also showed a decreased in antimicrobial activity followed by an increase against *K. pneumoniae*. Against *E.coli,* value of 33.35 mm^2, 17.78 mm^2 and 46.0 mm^2 was obtained at the respective concentrations of 5, 10 and 20 % of extract. Of significance, there was a decrease in the area of zone of inhibition, AZOI for *Moringa oleifera* hexane extract against *K. pneumoniae* species at all three concentrations. Area of zone of inhibition of 42.17 mm^2, 41.37 mm^2 and 18.54 mm^2 were obtained against *K. pneumoniae* at respective concentrations of 5, 10 and 20% of extract. The highest area of zone of inhibition, AZOI of 53.55 mm^2 was induced by *Solanum melogena* C_2H_5OH extract against *S. aureus* at 20% concentration of extract. The smallest area of zone of inhibition, AZOI of 15.04 mm^2 was induced by *Solanum melogena* n-C_6H_{14} extract against *E. coli,* where values of 15.04 mm^2, 15.65 mm^2 and 38.79 mm^2 were registered at the respective concentration.

The C_2H_5OH extract of either plant seems to be more antimicrobial than the n-C_6H_{14} extract, suggesting greater localisation of plant antimicrobial natural products agents. For example, *Solanum melogena* n-C_6H_{14} extract induces area of zone of inhibition, AZOI of 35.87 mm^2, 39.57 mm^2 and 19.86 mm^2 against *S. aureus*. However, *Solanum melogena* CH_3CH_2OH extract induced area of zone of inhibition of 48.49 mm^2, 46.9 mm^2 and 53.53 mm^2 against *S. aureus* at concentration of 5%, 10% and 20% concentration respectively.

Graph 1, shows the area of AZOI (mm^2) at 5%, 10%, & 20% concentrations of both plant extracts against colonies of *S.aureus*. From the graph, the n-C_6H_{14} extract of *Moringa oleifera* is more antimicrobial than that of *Solanum melogena against S. aureus*. Values of 44.51 mm^2 and 19.86 mm^2 were observed respectively. However, *Solanum Melongena* C_2H_5OH *extract is more antimicrobial against S.aureus than Moringa's* C_2H_5OH extract at the 20% concentration. Values of 53.55 mm^2 and 51.5 mm^2 were observed respectively.

Antimicrobial activity of *Brassica rapa chenensis* and *A. altilis* at a concentration of (0.025g/ml, 0.5g/ml and 0.1g/ml, were investigated using the Disc diffusion assays under asceptic conditions. It was found that the n-C_6H_{12} extract of *Brassica rapa chinensis* was significantly more antimicrobial than that of *A. altilis* at both high and low concentration, Table 5.0 and Table 6.0. For example, the n-C_6H_{12} extract of *Brassica rapa chinensis* is antimicrobial against all pathogens with the exception against *E. coli* and *Bacillus subtilis* at a concentration of 0.1g/ml. AZOI ranging from 34.92 to 119.34 mm^2. Negligible AZOI was obtained against all pathogens at both concentrations for *A. altilis*. For *A. altilis*, only the n-C_6H_{14} extract at high concentration was antimicrobial against *Bacillus subtilis*. The AZOI being 89.2 mm^2. The others show zero AZOI. Fig. 2.0 shows the disc diffusion assay for the hexane extract of *Artocarpus altilis* against human pathogens.

The antimicrobial activity of the CH_3CH_2OH extract of *Brassica rapa chinensis* was investigated at a concentration of 0.01g/ml, 0.05g/ml and 0.1 g/ml with AZOI, ranging from 12.56 mm^2 to 209.34 mm^2. The highest AZOI of 209.34 mm^2 was noted for the *Brassica rapa chinensis* extract against *E.coli* at a concentration of 0.01g/ml, whereas the lowest of 12.56 mm^2 was induced by *Brassica rapa chinensis* against *Bacillus subtilis* at a concentration of 0.01g/ml. Interestingly, the ethanol extract of *A. altilis* at a concentration of 0.1g/ml was microbial in nature, as zero ZOI was induced. However, the CH_3CH_2OH extract of *A. altilis* at a low concentration induced a maximum AZOI of 94.99 mm^2 against *S. aureus* and a minimum AZOI of 46.7 mm^2 against *Bacillus* subtilis. Fig. 10.0 and Fig 11.0 shows the antimicrobial profile of *Brassica rapa chinensis* and *Artocarpus altilis* at a concentration of 0.01g/ml, 0.05g/ml and 0.1g/ml respectively.

Antimicrobial selectivity was observed for all of the extracts against human pathogens. For example, the n-C_6H_{14} extract of *Brassica rapa chinensis* showed a high degree of inhibition against *C. albicans* (AZOI, 119.34 mm^2) than against *Bacillus subtilis* (AZOI, 34.92 mm^2) at a concentration of 0.01g/ml. Likewise the CH_2Cl_2 extract of *A. altilis* at a concentration of 0.01g/ml showed inhibition of 59.0 mm^2 against *Bacillus subtilis*, but zero AZOI against *E. coli*, *S. aureus* and *C. albicans*. The CH_2Cl_2 extract of *A. altilis* at a concentration of 0.1g/ml registered a value of 54.1 mm^2 against *S.aureus* but zero AZOI against *E.coli*, *Bacillus subtilis* and *C. albicans.*

Further antimicrobial selectivity is seen for the CH_3CH_2OH extract of *Brassica rapa chinensis* at a concentration of 0.01g/ml against *E. coli* and *Bacillus subtilis*. For the former, AZOI of 209.37 mm^2 is noted, whereas for the latter, AZOI of 12.56 mm^2 was registered. Again for the CH_3CH_2OH extract, *A. altilis* at a concentration of 0.01g/ml showed antimicrobial selectivity against *E.coli*, *S.aureus* and *Bacillus subtilis* over *C. albicans*. For the latter, zero AZOI was observed whereas for the first three, AZOI, ranging from 46.7 mm^2 to 95.00 mm^2 were observed.

Moringa oleifera n-C_6H_{14} extract is more resistant than *S. melogena* extract against *E.coli* and *S. aureus*. *Solanum melogena* hexane extract is more resistant against *Klebsiella pneumoniae compared* to that of *Moringa oleifera* extract. For the CH_3CH_2OH extract, *Moringa oleifera* extract is more resistant against *E. coli* and *Klebsiella pneumoniae*. However, *Solanum melogena* extract is more resistant against *S. aureus*

Thus, for *Brassica rapa chinensis*, extract at low concentration showed the solvent type extract selectivity: CH_3CH_2OH > n-C_6H_{14}. For *A. altilis*, at a low concentration, the solvent type extract showed the selectivity of CH_3CH_2OH > n-C_6H_{12}. The n-C_6H_{14} extract of *Brassica rapa chinensis* should be more selective for *S.aureus, C. albicans* infection whereas the CH_3CH_2OH extract of *Brassica rapa chinensis should be more suited against E.coli and C. albicans infection.* The CH_3CH_2OH extract of *A. altilis* at low concentration should be suited for *S. aureus infection.*

Antimicrobial activity was also investigated for the positive control, Ampicillin and Nystatin against the pathogens. It's found that the area of the zone of inhibition, AZOI in several instances is less than that induced by the n-C_6H_{14} and CH_3CH_2OH extract of *Solanum melongena, Moringa oleifera, Brassica rapa chinensis and Artocarpus altilis.*

Fig. 2.0. Disc diffusion assay of *Artocarpus altilis* hexane extract against human pathogens

CONCLUSION

From this study it can be concluded that n-C_6H_{14} and CH_3CH_2OH extract of *Solanum melogena*, *Moringa oleifera, Brassica rapa chinensis* possess antibacterial activity as significant zone of inhibition, ZOI were observed. The area of ZOI ranging from 15.0 mm^2 to 49.0 mm^2 for the n-C_6H_{14} extract of *Solanum melogena* and *Moringa oleifera.* The CH_3CH_2OH extracts showed more potent antimicrobial properties than the n-C_6H_{14} extract with AZOI ranging from 18.0 mm^2 to 53.55 mm^2. For *Brassica rapa chinensis* and *Artocarpus altilis*, AZOI for the hexane extract range from 0.00 mm^2 to 119.3 mm^2. However, for the ethanol extract, AZOI ranges from 0.0 mm^2 to 209.3 mm^2. The n-C_6H_{14} and CH_3CH_2OH extract of *Solanum melogena*, *Moringa oleifera, Brassica rapa chinensis and Artocarpus altilis* also display antimicrobial selectivity, an important factor in preventing antimicrobial resistance. Thus,these fruits and vegetables can be used as potent antimicrobial agents, in addition to their nutritional status (neutraceuticals).

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