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Original Article

Antimicrobial Properties of *Carica papaya* (Papaya) Different Leaf Extract against *E. coli*, *S. aureus* and *C. albicans*

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A B S T R A C T

Many herbal remedies individually or in combination have been recommended in various medical expositions for the cure of different diseases. Free radicals are implicated for many diseases including diabetes mellitus, arthritis, cancer; aging etc. in the treatment of these diseases, antioxidant therapy has gained utmost importance. Currently there has been an increased interest globally to identify antioxidant compound that are pharmacologically potent and have low or no side effects. As plants are source of natural antioxidants, much attention has been gain to plants. Medicinal plants represent a rich source of antimicrobial agents. Plants are used medicinally in different countries and are sources of many potent and powerful drugs. Antimicrobial and antifungal activity of *Carica papaya* (Papaya) plant different leaves extract is tested by methods reported in literature. Phytochemical screening of leaves extracts for alkaloids, carbohydrates, saponins proteins, amino acids, tannins, flavonoids, glycosides, terpenoids is also done by standard test procedure reported in literature. Both methods (well diffusion and poison plate) showing strongest activity in methanol extract. Among four extract methanol extract showing inhibition against in *S. aureus* than *E. coli* and *C. albicans*.

Keywords: Antioxidant, antimicrobial agents, *Carica papaya,* flavonoids, glycosides, Microorganism.

INTRODUCTION

A natural product is a substance produced by a living organism found in nature that usually has a biological or pharmacological activity for use in drug discovery and drug design. Natural products are important in the treatment of life – threatening conditions. Natural products may be obtained from extraction of tissues of plants, marine organism or from micro-organism fermentation.

Secondary metabolites are organic compounds that are not directly involved in the normal growth and reproduction of an organism. Secondary metabolites often play an important role in plant defense against herbivores. Humans use secondary metabolites as medicines, flavoring and recreational drugs. Some examples of Secondary metabolites are alkaloids, terpenoids, natural phenols,flavanoids, tannis etc.

Phytochemicals (phyto means plant) are chemical compounds that occur naturally in the plants. These compounds are responsible for colour and other organoleptic properties. These compounds have antioxidants, anti-cancer, anti – inflammatory and pain relieving properties. Some examples of phtochemicals are Saponins, Coumarin, Hippocrates, SalicinTexol, etc.

Antioxidants are chemical compounds are substance that inhibit oxidation or that retards deterioration by oxidation, especially of fat, oils, and foods. The same examples of antioxidants are vitamins A, C and E, β-carotene, enzymes catalase, superoxide, dismutase and various peroxidases.

Antimicrobials are agents that kill microorganism or suppress their multiplication or growth, e.g. penicillin (Natural), Sulphonamides, nitroglerine, etc. Antimicrobial agents are used to treat infectious disease.

Papaya is native to the tropics of the Americas. The papaya is a tree like plant of 5 to 10 M tall. Leaves are 50-70 cm in diameter with seven lobes. Fruit is 15-45 cm long and 10-30 cm in diameter. Papaya fruit contains high percentage of vitamins C, A, E, magnesium, potassium, calcium and carbohydrates. Vitamins B, C and E, carotenoid and phenolic compounds are the most abundant antioxidants present in the plant foods. Papaya leaves are used to cook in some tropical countries which contain high calories than papaya fruit. The leaves also have high levels of protein (7.0 g), phosphorus (142 mg), vitamin B and E (136 mg), calcium (334 mg) and sodium (16 mg).

Papain and specific enzymes found in both papaya fruits and latex, which has been utilized for meat tenderization. Papaya lipase which is a component of papaya latex used as biocatalyst for fat and oils modification, esterification and inter – esterification reactions in organic media. Papaya use for prevent oxidization of cholesterol, treating of gastrointestinal tract disease, nausea and morning sickness, weight loss, looting of body immunity, recovery of kidney, effect liver cancer cells, dengue fever treatment and menstrual irregularities in women. Papaya root, seed and leaf extracts used for pest control[1].

Sherwani *et al*[2] investigated the presence of phytochemical constituents including carbohydrates, proteins, anthraquinones, flavonoids, saponins, cardiac glycosides and alkaloids in the leave extract of *C. papaya*. Crushed and boiled leaves extracts of *C. papaya* tested for their antifungal activity against 6 yeasts. The crushed leaves extract was found to be more effective.

The nutritional and medicinal applications of *C. papaya* reported by Milind and Gurditta[3]. The whole papaya plant including its leaves, seeds, fruits and

their juice is used as a traditional medicine. The prominent medicinal properties of papaya include anti-fungal, antibacterial, antitumor, wound – healing, etc. Baskaran *et al*[4] has described antimicrobial activity and phytochemical screening of ethyl acetate, acetone, chloroform, petroleum ether, hexane, hot water, ethanol and methanol extract of *C. papaya*. The antimicrobial activities of different solvent extracts of *C. Papaya* were tested against the Gram – positive and Gram – negative bacterial strains and fungus.

Ifesanetetal[5] has prepared ethanol, hexane and water extracts from leaves of *Anacardiumoccidentale* (cashew), *Cocosnucifera* (coconut), *Citrus sinesis* (sweet orange) *Citrus limon* (lemon) and *Carica papaya* (pawpaw) and screened for their anti-oxidant and antimicrobial properties.

Ocloo *et al*[6] observed the presence of alkaloids, flavonoids, reducing sugars, phenols, saponins, tannins, and terpenoids in organic and aqueous extract of dried seed of papaya and also tested for antibacterial activity against *S. aureus* (gram positive), *E. coli* (gram positive) and Shigella flexneri (gram negative) using the disc diffusion method.

Okoye[7] has tested antibacterial and antifungal activity of crude ethanolic and aqueous extracts of seeds of *Carica papaya* against four different test bacteria and fungi. The four test bacteria are *S. aureus, P. aeruginosa, S. typhi*and *E. coli*. The four test fungi are *Aspergillusniger, Penicilliumnotatum, Fusariumsolani and Candida albicans.*

Alibi *et al*[8] has done comparative studies an antimicrobial and anti-fungal property of extracts of fresh and dried leaves of *Carica papaya*. Study repeated by various concentration of extract using the disc diffusion method. *C. papaya* leaves showed better antibacterial activity than antifungal activity.

Antifungal and antibacterial activities of aqueous and methanolic root extracts of *Carica papaya* Linn. Tested against eleven microorganism species seven bacteria and four fungi by Adeiuwonetetal[9]. Ampicillin and tetracycline were used as standard drugs for investigating the bacterial species, while griseofulvin was selected for fungi. TLC confirmed the presence of anthraquinones, cardiac glycosides and alkaloids.

Maisarah *et al*[10] conducted study to compare the total antioxidant activity, total phenolic content, and total flavonoid content from the different part of papaya tree including their seed, fruit and leaves. The two methods namely DPPH radical scavenging activity and carotene bleaching assay were used to determine total antioxidant capacity. Anti-oxidant potential follow the sequence, young leaves > unripe fruit > ripe fruit > seed.

Anti-oxidant activities of the ethanol, petroleum ether, ethyl acetate, n-butanol and aqueous extract of seed of papaya tested by Zhou *et al*[11]. It is observed that high amount of total phenolics and total flavonoids in the ethyl acetate and n-butanol fractions contribute their antioxidant potential.

Irondi *et al*[12] determined comparative potential for antioxidant properties of *Carica papaya* and *Azadarichta* leaves, which are popularly used as medicinal plants. The antioxidant potential measure were the levels of total phenol, tannin, total flavonoids, total carotenoid, vitamin C, 1, 1 – diphenyl – 2 – picrylhydrayl free – radical scavenging ability, trolox equivalent antioxidant capacity and ferric reducing antioxidant power. This study conclude that mixture of papaya and neem leaf extract has more antioxidant property in comparison to single neem leaf extract has more antioxidant

property in comparison to single neem or papaya leaf extract.

Tiwari *et al*[13] tested antimicrobial activity of *Carica papaya* root extract against *P. vesicularirs, S. faecalis, A. hydrophilia, S. typhae, S. cohni, S. ficarioa,* and *E. coli* by well diffusion method.Ethanol extract of powdered leaves of *Carica papaya* partitioned in chloroform and water and used for testing of antibacterial activity against clinical isolates of *E. coli, K. pheumoniae, P. mirabilis* by Yusha'u *et al*[16]. Phytochemical screening indicated the presence of alkaloids, flavonoids, steroids and tannins.

Imaga *et al*[14] has described phytochemical and an antioxidant constituent of *Carica papaya* and *Parquetinanigresceus* leaves extracts. Phytochemical screening indicates the presence of folic acid, vitamin B_{12}, alkaloids, sapoinins, glycosides, tannins and anthraquinons. Both plant leaves extract use as herbal remedy for the management of sickle cell anemia. Comparative study of the phytochemical composition of the leaves of five Nigerial plants investigated of Eleazu*et al*[15]. The percentage phytochemical composition of the leaves of pawpaw, bitter cola, tetrapleura, neem and gender was investigated using the methods of Harbone and the alkaline picrate methods. Presence of tennin indicated its use in treatment of burns and wounds.

Antimicrobial activity of *Carrica papaya* leaf extract a *Pseudomonas aeruginosa* was reported by Anibijuwon and Udeze[16]. The extract demonstrates higher activities against all gram positive bacteria than the gram negative bacteria. Phytochemical analysis indicated presence of alkaloids, tannins, saponoins, glycosides and phenols in the leaf extract. *C. Papaya* extract may be used for the treatment of gastro enteritis, urethritis, would infection and otitis media. Zuhairetetal[17] explained antioxidant capacities of extract of papaya fruit at their ripening stages. The antioxidant capacity of *C. Papaya* as determined by total phenol content (TPC), ferric reducing anti-oxidant powder (FRAP), 2, 2- diphenyl – 1 – picrylhydrazyl (DPPH) and scavenging systemand (ABTS). The results showed the important role of the ripening stage in increasing the antioxidant content of papaya fruit.

Antibacterial activity of root extract of *Carica papaya* tested against some pathogenic bacteria using the cup plate agar diffusion method. Phytochemical analysis showed the presence of alkaloids, tannins, saponins, glycosides and phenols *C. papaya* may be used for the treatment of gastroenteritis, typhoid fever, and wound infection.Oloyede*et al*[18] has described antioxidatiive properties of ethylacetate fraction of unripe pulp of *C. papaya* in MICE. It is concluded that quercetin and β - sitasterol may be responsible for the antioxidant potential of ethyl acetate extract of unripe fruit.

Anti HIV – I effect of *Carica papaya* extract reported by Rashed*et al* [19]. Present study focus on evaluation of anti HIV – I effect of *C. papaya* aerial part polar extracts also the investigation of the chemical contents from polar extract of the plant. Result have shown that *C. papaya* methanol and aqueous extracts have drug ability as anti – HIV – I agents. Romasi*et al*[20] has investigated anti-bacterials potential of leaf extract of *C. papaya* against bacteria *Rhizopus stolonifere*. The extract inhibited β. Stearothermophilous spore as well. Papaya leaves are potential antibacterial which might be used in certain kind of foods.

Boshra and Tajul[21] have discussed nutritional and pharmaceutical value. Papaya has been much studied in pharmaceutical and has wide applications in food industry. National value of fruits and

medicinal properties of various part of papaya are discussed in this review. *In vitro* antimicrobial activity, antihelmentic activity and phytochemical screening for the hydroalcoholic extract of *Coriandrumsativum*, *Cassia occidantalis*, *Carica papaya* and *Moringafoetida* described by Pavan Kumar *et al* [22].

The influence of concentration on hydroxyl radical scavenging and antioxidant activities of polyphenol extracts and pawpaw leaves were assessed *in vitro* by Olabinri*et al*[23]. A non-significant moderate positive correlation was observed between total phenolic concentration and antioxidant activity of aqueous extract of mango and papaya leaves. Sheri-Ann Tan *et al*[24] has investigated protective effects of papaya extracts on test – butyl hydroperoxide mediated oxidative injury to human liver cells. This study concluded papaya extract as next therapeutic remedy for liver disease. Amsaveni and Sudha[25] have studied antimicrobial potential of different ethanolic plant extracts against pseudomonas *Aeruginosa* bacterial species.

Bamisaye*et al*[26] has described ethnobotanical uses of *Carica papaya*. The quantitative phytochemical screening of leaves aqueous extract revealed the presence of tannins (0.001 %), flavonoids (0.013 %), saponins (0.022 %), phenolics (0.011 %), steroids (0.004 %) and alkaloids (0.019 %) while that of root gave tannins (0.12 %), flavonoids (0.014 %), saponins (0.026 %), phenolics (0.011 %), steroids (0.006 %), alkaloids (0.021 %)

Melariri *et al*[27] has investigated antiplasmodial properties and bioassay – guided fractionation of ethyl acetate extracts from *Carica papaya* leaves. The study demonstrated greater antiplasmodial activity of the crude ethylacetate extracts of *Carica papaya* leaves.

Sharma *et al*[28] has determined minerals by using Inductively Coupled Plasma Optical Emission Spectrometry (ICE-OES) method in *Carica Papaya* L. leaf found in northern India. The Mg, Fe, Zn, Mn, Cu, K, Na, Cr, Ca, etc. elements are detected in various samples of *C. papaya* leaves. Majica – Henshaw *et al*[29] has demonstrated immunomodulatory and anti-inflammatory actions of *Carica papaya* seed extract. The immunomodulatory activities of crude *Carica* seed extracts and its bioactive fractions were examined *in vitro* using lymphocyte proliferation assays and compliment mediated hemolytic assay.

Orhue and Momoh[30] have investigated antibacterial activities of different solvent extracts of *Carica papaya* fruit parts on *E. coli* and *S. aureus*. The solvents used were petroleum ether, water, acetone, ethanol, etc. It is suggested that *C. papaya* may be used as an antibiotic and extracts in petroleum ether seems more potent.

A search of literature indicated few or no report on antifungal, antimicrobial, antioxidant properties and phytochemical investigations of *Carica papaya* (Papaya) leaves extracts. In view of this attempt has been made to investigate above mentioned properties. In addition present work described phytochemicals, antimicrobial, and antifungal and antioxidant properties of *Carica papaya*.

MATERIALS AND METHODS

Collection of Carica papaya leaves

The leaves of *Carica papaya* are collected from Johns Science Centre, University of Guyana, Berbice Campsu, Berbice, Guyana.

Preparation of Plant Materials

The collected leaves sample of *Carica papaya* are weighted on Citizen CTG 3000 E electronic balances. The leaves dried in oven (Gallenhamp Incubator Model IH-150) at 50-60ºC. The dried leaves were

cooled at room temperature and weighted again on same citizen electronic balance. Weight of green leaves, dried leaves and value of percentage moisture content in various samples of *Carica papaya* are given in Tables1. The weights of ground leaves of *Carica papaya* are found to be 320 g.

Collection of Text Organism

Human pathogens culture of *Escherichia coli* (*E. coli*), *Staphylococcus aureus* (*S. aureus*) and *Candida albicans* (*C. albicans*) used in this study are obtained from Microbiology Laboratory of Georgetown Public Hospital Corporation, Georgetown (GHPC). All cultures are maintained in nutrient broth (Himedia, M002) at 37ºC and maintained on nutrient agar (Himedia MM012) slants at 4ºC.

Extraction and Preparation of Test Solutions

The grounded leaves of *Carica papaya* were extracted in each chloroform, ethanol, ethyl acetate and methanol solvents. At a time 20 g of dried pulverized leaves were soaked with 200 mL of solvent for 48 h. Solvent is decanted and residue again soaked with same solvent for 24 h. The total extract is combined and filtered. The evaporation of solvent was done on rota vapour (Buchi). The respective solvent was added to viscous semi solid liquid extract to make up the desired volume of extract solution.

Reducing antioxidant power (Oyaizu)

The reducing antioxidant power of the plants methanolic, ethanolic, ethyl acetate and chloroform extract was determined by the method of Oyaizu[31]. Different concentration of plant extracts (100- 1000 µL) in 1 mL of distilled water were mixed with phosphate buffer (2.5 mL, 0.2 M pH 6.6) and potassium free cyanide (K_3 Fe$(CN)_6$) (2.5 mL,1%). The mixture was incubated at 50°C for 20 min. Then, 2.5 mL of trichloroacetic acid (10%) was added to mixture, which was then centrifuge for 10 min at 3000 rpm. The upper layer of solution (2.5 mL) was mixed with distilled water (92.5 mL) and $FeCl_3$ (0.5 mL,) 1%. The absorbance was measured at 700 nm against a blank using UV-Vis spectrophotometer (Phillips X 500). Increased absorbance of the reaction mixture indicates increase the reducing power.

Anti-Microbial Assay

Antimicrobial assay was done by disc diffusion and poisons plate method (NCCLS, 1993, Awoyinka *et al*.,) [32] using plants (*Carica papaya*) extracts (ethanol, methanol, ethyl acetate and chloroform) and commonly used antibiotics. The test quantities of specific extracts were dissolved in depending upon the solubility of the extracts. The dissolution of the organic extracts (Chloroform, methanol, ethanol and ethyl acetate) were aided by water, which did not affect the growth of microorganism, in accordance with our control experiments. The surfaces of media were inoculated with bacterial from a broth culture. After 18 h of incubation at a specific temperature 28°C-30°C for *E. coli, S. areus* and *C. albicans*, the plates were examined and the diameters of the inhibition zones were measures to the nearest millimeter.

RESULTS AND DISCUSSION

Reducing power

Reducing power is to measure the reductive ability of antioxidant, and it is evaluated by the transformation of Fe(III) to Fe(II) in the presence of the sample extracts. The reducing power of plant extracts are summarized in Tables 2,3, 4 and 5. From the tables, reducing power increased with an increased in samples increased their reducing ability when the contraction of extracts was

increased. The ability to reduce Fe (III) may be attributed from hydrogen donation from phenolic compounds, which is also related to presence of reducing agent. In addition, the number and position of hydroxyl group of phenolic compounds also rule their antioxidant activity.

It is observed from Tables 2 to 5 that:
Reducing antioxidant power of *Caricapapaya* leaves extract follow the order
Methanol > ethyl acetate > ethanol > chloroform.

Carica papaya leaves extract is found to have high reducing power than Ocimum sanctum leaves extract in ethyl acetate and ethanol solvents.

Antimicrobial activity

The results indicated that Tables 6, 7, 8 and 9 in disc diffusion and Tables 10,11, 12 and 13 poison plate , all plants extracts showed that antimicrobial activities toward the gram positive bacteria *S. aureus* as well as gram negative bacteria *E.coli* and *C. albicans*. The methanol extract of all the plants extracts showed more effective result against bacteria and fungi. Between the plants *Caricapapaya* showing effective results in inhibition zones in both methods. Thus it was evident that the plant the organic extracts were more effective.

Phytochemical analysis

Phytochemical analysis 14 of the *Carica papaya* leaves different extracts revealed the presence of carbohydrates, flavonoids, Terpenoids, saponins and tannins.

It is observed from Table 14 that Phytoconstituent (carbohydrate) is present in each solvent extract. Alkaloids protein and amino acids are absent in each solvent extracts. Tannins are present in methanol and ethanol solvent extract and absent in ethyl acetate and chloroform extracts. Saponins are present only in methanol extract.

CONCLUSION

The present study clearly indicates the *Carica papaya* a rich source of phyto-constitutents having immense antioxidant potential. Non standardized procedures of extract may lead to the degradation of the phytochemicals present in the plant and may lead to the variations thus leading to the lack of reproducibility. It is suggested that *Carica papaya* may be recommended as useful source to prepare natural bioactive products from which we can develop new antimicrobial drugs which will be cost-effective because the plants are free available in Guyana. In the search for new pharmaceuticals, screening of such various natural organic compounds and identification of active agents must be considered as a fruitful approach.

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CONFLICTS OF INTEREST

We declare that we have no conflict of interest

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Table 1. Percentage Moisture Content for Carica Papaya Leaves

No. of Leaves	Wt. of green leaves	Wt. of leaves after 24 h	Wt. of leaves after 48 h	Wt of leaves after 72 h	Percentage moisture content
1	52.60	36.72	36.79	36.80	30.19
2	60.60	41.49	41.35	41.90	31.77
3	64.20	39.67	39.59	40.02	38.33
4	91.90	50.01	49.85	50.02	45.76
5	81.30	34.50	34.41	34.88	57.68
6	103.70	41.28	41.00	41.65	60.46
7	109.50	34.80	34.71	34.87	68.30
8	108.25	41.43	41.08	41.21	62.05
9	77.02	27.65	27.72	27.85	64.10

$$\text{Percentage moisture content} = \frac{\text{Weight of green leaves – weight of dry leaves}}{\text{Weight of green leaves}} \times 100$$

Table 2. Reducing antioxidant power of ethanol leaf extract of *Carica papaya*

S. No	Leaf Extract µL	Papaya (nm)*
1	Ethanol (control)	0.00
2	1	0.002
3	2	0.004
4	3	0.006
5	4	0.009
6	5	0.010
7	6	0.013
8	7	0.016
9	8	0.018
10	9	0.018
11	10	0.019

*replicate

Table 3. Reducing antioxidant power of methanol leaf extract of and Papaya (*Carica papaya*)

S. No	Leaf Extract µL	Papaya (nm)*
1	Methanol (control)	0.00
2	1	0.012
3	2	0.024
4	3	0.026
5	4	0.029
6	5	0.130
7	6	0.133
8	7	0.136
9	8	0.148
10	9	0.148
11	10	0.156

*replicate

Table 4. Reducing antioxidant power of ethyl acetate leaf extract of Papaya (*Carica papaya*)

S. No	Leaf Extract µL	Papaya (nm)*
1	Ethyl acetate (control)	0.00
2	1	0.002
3	2	0.004
4	3	0.006
5	4	0.009
6	5	0.010
7	6	0.013
8	7	0.016
9	8	0.09
10	9	0.08
11	10	0.09

*replicate

Table 5. Reducing antioxidant power of chloroform leaf extract of Papaya (*Carica papaya*)

S. No	Leaf Extract µL	Papaya (nm)*
1	Chloroform (control)	0.00
2	1	0.001
3	2	0.002
4	3	0.003
5	4	0.009
6	5	0.003
7	6	0.014
8	7	0.002
9	8	0.009
10	9	0.007
11	10	0.009

*replicate

Table 6. Antimicrobial activity of crude of ethanol leave extract of medicinal plant compared with control by disc diffusion method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	Ethanol	0.00	0.00	0.00
	300	14.60	10.67	10.13
	600	15.85	10.98	11.35
	900	17.87	12.45	12.67

*replicate

Table 7. Antimicrobial activity of crude of methanol leave extract of medicinal plant compared with control by disc diffusion method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	methanol	0.00	0.00	methanol
	300	14.67		300
	600	15.00		600
	900	15.56		900

*replicate

Table 8. Antimicrobial activity of crude of ethyl acetate leave extract of medicinal plant compared with control by disc diffusion method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	Ethyl acetate	0.00	0.00	0.00
	300	11.12	13.15	16.70
	600	13.40	15.03	16.98
	900	14.10	15.98	16.99

*replicate

Table 9. Antimicrobial activity of crude of chloroform leave extract of medicinal plant compared with control by disc diffusion method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	chloroform	0.00	0.00	0.00
	300	17.16	16.09	15.12
	600	17.67	16.68	15.98
	900	17.99	16.98	16.00

*replicate

Table 10. Antimicrobial activity of crude of ethanol leave extract of medicinal plant compared with control by poison plate method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	ethanol	0.00	0.00	0.00
	300	17.56	16.69	15.72
	600	17.87	16.98	15.90
	900	17.19	16.29	16.30

*replicate

Table 11. Antimicrobial activity of crude of methanol leave extract of medicinal plant compared with control by poison plate method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	methanol	0.00	0.00	0.00
	300	17.86	16.79	15.62
	600	17.08	16.95	15.90
	900	17.97	16.98	16.17

*replicate

Table 12. Antimicrobial activity of crude of ethyl acetate leave extract of medicinal plant compared with control by poison plate method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	ethyl acetate	0.00	0.00	0.00
	300	17.16	16.09	15.12
	600	17.67	16.68	15.98
	900	17.99	16.98	16.00

*replicate

Table 13. Antimicrobial activity of crude of chloroform leave extract of medicinal plant compared with control by poison plate method

Plants	Extract solvent (µ)L	Diameter of the inhibitory zone (nm)*		
		E. coli	*S. aures*	*C. albicans*
Papaya *(Carica papaya)*	chloroform	0.00	0.00	0.00
	300	17.06	16.19	15.02
	600	17.57	16.58	15.88
	900	17.89	16.88	15.99

*replicate

Table 14. Phytochemical analysis of Papaya (*Carica papaya)*) leaves

S. No	Phyto constituents	Ethanol	Methanol	Ethyl acetate	Chloroform
1	Alkaloids	-	-	-	-
2	Carbohydrate	+	+	+	+
3	Saponins	-	+	-	-
4	Protein and amino acids	-	-	-	-
5	Tannins	+	+	-	-
6	Flavonoids	+	-	-	+
7	Glycosides	-			
8	Terpenoids	+	-	-	-

= Absence + = Presence