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Comparative Study Of The Antidiarrhoea Activities Of Colocasia Esculents (Red Cocoyam) And Ocimum Basilicum (Sweet Basil) In The Treatment Of Castor Oil Induced Diarrhoea In Wistar Rats Laboratory Animals

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ABSTRACT

Medicinal plants have been used in the management and treatment of dysentery. The present study investigates the antidysentric activities of Ocimum gratissimum on Castor oil-induced dysentery in wistar rats' laboratory animals. Fresh plants were collected, subjected to air drying in a shade, the leaves were isolated and powdered. Proximate, phytochemical and elemental analyses of the plants were determined. The castor oil was administered orally accordingly into the animals' bodies to induce diarrhea. Animal stools were collected and observed before and after induction. The result showed a marked reduction in the frequency of defecations, faecal droppings and water content of the animal stools for both Colocasia esculenta and Ocimum gratissimum leaves. In vitro test of the aqueous extract of Colocasia esculenta and Ocimum gratissimum inhibited the growth of microorganisms such as 32mm, 26mm Escherichia coli, 10mm, 30mm, Stigella, 8mm, 8mm Salmonella typhi, 8mm, 6mm Bacillus and 6mm, 5mm Streptococcus pneumonae respectively. The values obtained showed no significant difference when compared with those obtained for a standard drug, Metronidazole. It can be concluded that aqueous extracts of Colocasia esculenta and Ocimum gratissimum contain bioactive ingredients such as Flavonoids, Tannins, Saponins, Oxalates, Phylates and Alleatoids that can offer anti dysenteric activities.

Keywords: Colocasia esculents (Red Cocoyam), Ocimum basilicum (Sweet Basil), Antidiarrhoea , Minimum Inhibitory Concentration

I. INTRODUCTION

Herbal remedies are a cheap alternative to conventional medicine leading to their increased demand globally and resulting in the realization of enhanced new drugs. (Ngoci et al, 2013).

Medicinal plants have been used in the management and treatment of dysentery.

The use of Colocasia esculenta (cocoyam) and Ocimum basiculum 'is' popular among the Yoruba people of such west, Nigeria, in the management of dysentery related ailments without any complication and their efficacies to treat such ailments need scientific backing.

Colocasia esculenta and Ocimum basiculum are very rich in phytochemicals such as tannins, flavnoids, saponin, oxalate, phytate and alkaloids.

The bioactivity in natural products is due to phytochemicals, often elaborated for the plant defense against abiotic stresses (Brikin, 2000, Ruba et al, 3013).

These phytochemicals advertently protect humans against pathogens as antimicrobial medicines.

Some photochemicals are known to have therapeutic and prophylactic properties, provides nutrition for normal cell health and repair inhibits (Ogunwemimo et al, 2007, Ngoci et al, 2011). Diarrhoea is an increase in water content frequency and volume of bowel movement. It can be a serious problem, and it was one of the common causes of morbidity and mortality among reorites animals and infants in developing countries (Al-Ukaily, 2009).

Diarrhoea is simply loose, watery stools (bowel movements). Diarrhoea onset if an animal has loose stools three or more times in one day. Acute diarrhoea lasts a short time. It is a common problem but usually lasts about one or two days, but it may last longer. Survival of the neonatal is imperative mild cases of diarrhoea which disappears within a few days, but severe cases can cause serious dehydration or nutritional problem. Severe dehydration can make the body go into shock and potentially fatal (Rice et al, 2000)

Signs of dehydration often begin with loss of the normal stretchiness of the skin and irritable

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behaviour. This can progress to decreased urination, loss of skin colour, a fast heart rate and a decrease in responsiveness as it becomes more severe, loose but no watery stool in babies who are exclusively breastfed however is normal.

The most common causes of diarrhoea include bacteria: Escherichia coli which is classified in the family Enterobacteriaceae, a gram-negative, facultative non-spore forming Coccobacilli (Shweash et al, 2014). Other bacteria include Shigella, Yersinia and Clostridium among others from contaminated food or water and viruses such as flu, Novovirus and Rotavirus.

dysentery in laboratory animals

Rotavirus is the most common cause of acute diarrhoea in children. Parasites, which are tiny organisms found in contaminated food or water. Also, food intolerance such as lactose intolerance and sensitivities, which constitute problems in digesting certain ingredients or foods, is a major contributor to diarrhoea.

Hence, the present study investigates the comparative study of the efficacy of Colocasia esculenta (Red Cocoyam) and Ocimum basilicum (Sweet basils) in one treatment of castor oil-induced

II. RESULT AND DISCUSSION

RESULTS

TABLE 1: Proximate Analysis of Colocasia esculenta and Ocimum basilicum

	Total % Carbohydrates	% Protein	% Lipid	% Moisture	% Ash	% Fibre	%Crude
Ocimum basilicum	10.31	57.38	5.13	4.32	19.12		3.74
	10.10	57.25	4.98	4.26	19.64		3.77
Colocasia esculenta	12.08	62.56	3.75	2.57	17.17		1.87
	13.43	61.94	3.81	2.63	16.13		2.06

TABLE 2: Mineral analysis of Colocasia esculenta and Ocimum basilicum

Minerals (ppm)	Colocasia esculenta	Ocimum basilicum
Potassium (k) (ppm)	34.562	30.007
Sodium (Na) (ppm)	26.006	24.201
Calcium (Ca) (ppm)	31.005	22.001
Magnesium (Mg) (ppm)	15.933	19.106
Zinc (Zn) (ppm)	2.2008	1.4744

TABLE 3: Phytochemical Analysis of Colocasia esculenta and Ocimum basilicum

	Flavanoids mg/100g	Tannin mg/100g	Saponin mg/100g	Oxalate mg/100g	Phylate mg/100g	Alkanoids mg/100g
Colocasia esculenta	17.71	54.74	24.05	171.60	14.90	12.39
	18.35	54.40	23.78	167.20	16.38	12.92
Ocimum basilicum	49.59	70.81	37.71	158.40	11.92	8.85
	49.23	70.36	38.37	158.40	13.41	9.73

TABLE 4: Weight in grams of wistar rats (Laboratory animals) administered with Colocasia esculenta only

1st Week	2nd Week	3rd Week	4th Week	5th Week	After Induction	Weight Loss
95.2	97.4	99.8	102.1	103.8	103.0	0.8
97.7	99.1	101.7	104.0	105.0	103.9	1.1
99.3	100	102.5	106.2	108.3	107.2	0.9
101.9	103.6	105.3	108.5	110.5	109.3	1.2
102.9	109.2	112.0	115.3	118.1	116.7	1.4

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156.7	157.9	202.2	205.3	152.0	150.0	2.0

TABLE 5.0: weight in grams of wistar rats (laboratory animals) administered with Ocimum basilicum only

1st Week	2nd Week	3rd Week	4th Week	5th Week	After Induction	Weight Loss
106.0	108.1	112.0	116.6	121.6	121.1	0.5
104.9	108.0	108.1	109.2	119.1	119.0	0.1
101.5	105.2	108.1	114.8	120.0	118	2.8
120.9	123.3	126.1	131.6	129.6	129.3	0.3
111.2	115.9	119.1	121.0	140.9	140.8	0.1
111.0	113.4	116.0	117.1	130.9	130.6	0.3

TABLE 6.0: In vitro antimicrobial activity analysis of aqueous extract of Colocasia esculenta against some selected pathogens

Microorganisms	50%	75%	100%
E. Coli	2.4mm	2.8mm	3.2mm
Staph			
Proteus Vulgaris			
Shigella dysenteriae	0.4mm	0.8mm	1.0mm
Streptococcus	0.2mm	0.6mm	0.6mm
Pseudomonas	0.8mm	1.0mm	1.4mm
Salmonella typhsimisrium	0.6mm	0.8mm	0.8mm
Bacillus albus	0.4mm	0.8mm	0.8mm
Candida albicans			

Table 7.0: In vitro antimicrobial activity analysis of aqueous extract of Ocimum basilicum against some selected pathogens

Micro organisms	50%	75%	100%
E. Coli	2.0mm	2.2mm	2.6mm
Staph			
Proteus vulgaris			
Shigella dysenteriae	2.2mm	2.6mm	3.0mm
Streptococcus		0.4mm	0.5mm
Pseudomonas	0.6mm		0.8mm
Salmonella typhimurium		0.8mm	1.0mm
Bacillus albus		0.4mm	0.6mm
Candida albicans		0.2mm	

Table 8: Minimum Inhibitory Concentration (MIC) of Colocasia esculenta and Ocimum basilicum against selected pathogens

Ocimum	Colocasia	Ocimum	Colocasia	Ocimum	Colocasia
Micro organisms	0.1%		0.01%		0.001%
E. Coli	25	17.0	10	06	__	__
Staph	27	18	07	05	__	__
Proteus	__	__	__	__	__	__
Shigella	24	12	12	09	__	__
Strep	22	12	12	09	__	__
Pseudomonas	22	10	08	07	__	__
Salmonella	21	12	09	05	__	__
Bacillus	28	6.0	1.4	04	__	___
Candida	__	__	__	__	__	__

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Antidiarrheal

Table 9: Antidysenteric activity/effect of Colocasia esculenta on castor oil-induced diarrhea

Group	Treatment (ml) Dose	Mean Weight of Faeces after 4hours	% Inhibition of defecation
I	Control		
II	Metronidazole		
III	0.3ml		
IV	0.4ml		
V	0.5ml		
VI	0.6ml		

Antidiarrheal

Table 10: Antidysentric activity/effect of Ocimum basilicum on Castor oil-induced diarrhea

Group	Treatment (ml) Dose	Mean weight of % faeces after 4 hours
I	Control	2.28 ± 0.09a
II	Metronidazole	2.10 ± 0.04 d
III	0.4ml	1.17± 0.11 c
IV	0.4ml	0.66± 0.019 b
V	0.5ml	0.472± 0.06 ab
VI	0.6ml	0.25± 0.119

Minimum Occimum Colocasia Inhibitory Concentration

	0.1%		0.01%	0.001%	0.001%
E. Coli	25	17	10	06	____
Staph	27	18	07	05	____
Proteus	___	____	____	_____	____
Shigella	24	12	12	09	____
Strep	22	12	12	09	____
Pseudomonas	22	10	08	07	____
Salmonella	21	12	09	05	____
Bacillus	28	6.0	14	04	____
Candidas	___	____	____	_____	_____

III. DISCUSSION

Proximate analysis which reveals: Total carbohydrate (%), protein (%), Lipid (%), Moisture (%) Ash (%), Crude fibre (%) of Colocasia esculenta (Red cocoyam) and Ocimum basilicum. The chemical composition of Colocasia esculenta (Red cocoyam) and Ocimum basilicum shown in Table 1

Carbohydrate has the highest proximate content (62.56%) in Colocasia esculenta and (57.38%) in Ocimum basilicum while ash was found to have the lowest proximate content (1.87%) in Colocasia esculenta and (3.74%) in Ocimum basilicum (Table 1, respectively when total carbohydrate and crude fibre were compared (Table 1) in both samples. It was found that Colocasia esculenta had a higher total carbohydrate (62.56%) and crude fibre (13.43%) than total carbohydrate (57.38%) and crude fibre (10.31%) Observed in Ocimum basilicum (swat basils)

However, when protein, lipids, moisture and ash contents of both samples were compared, the values observed were higher in Ocimum basilicum: 5:13%, 4.32%, 19.64% and 3.77% when compared to the values observed in Colocasia esculenta: 3.81%, 3.81%, 2.63%, 17.17% and 2.06% respectively (Table): The results presented in Table 2 confirmed that both samples are rich in carbohydrates and crude fibre, although Colocasia esculenta is richer that Ocimum basilicum showing that both samples are good sources of energy for metabolic activities. The high level of carbohydrate observed in this study agrees with the findings reported by FAO (2002) that the main nutrient supplied by cocoyam as with other roots and tubers is dietary energy provided by carbohydrates.

The crude fibre values observed and confirm that both samples contained crude fibres which ease the removal of waste from the body system thereby preventing constipation, cancer and cholesterol content

The values obtained for protein, lipids, moisture and ash contents for Colocasia esculenta

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are consistent with those reported by Sefah Dedeh and Agyr Sackey (2002).

Mineral Analysis of Colocasia esculenta and Ocimum basilicum

The mineral compositions of Colocasia esculenta and Ocimum basilicum are shown in Table 2. Potassium (k) was the most abundant mineral in both samples, Colocasia esculenta contains a considerable amount of potassium (34.562ppm) and Ocimum basilicum (30.007ppm) potassium was the highest to other minerals investigated in the present study. Potassium is necessary for electrolyte balance controls high pressure etc. Potassium is essential and is required in large amounts for proper growth and plant reproduction (Linder, 1991). Also, Calcium (Ca) is found in considerable amounts in both samples, Colocasia esculenta (31.005ppm) and Ocimum basilicum (22.001ppm). Calcium is reported to be essential for blood clotting, bone and teeth formation and as a co-factor in some enzyme catalysis (Robert et al, 2003), formation of cyclic AMP and other second messengers for body mechanisms, etc. (Olusanya 2008).

Sodium (Na) and Magnesium ions were present in moderate quantities in both samples; Sodium (26.006ppm) in Colocasia esculenta and (24.201ppm) in Ocimum basilicum while the amount of magnesium present in Ocimum basilicum is (15.933ppm) and Ocimum basilicum (19.106ppm) (Table 2) Sodium is associated with high blood pressure in the body (Olusanya, 2008).

Sodium is a principal cation of extracellular and intracellular fluids and aid in maintaining electrolyte balance in the body (Robert et al, 2003).

In humans, magnesium is required in the plasma and extracellular fluid where it helps maintain Osmotic equilibrium. It can also prevent some heart disorders and lower blood pressure in humans (Thomas and Krishnakumeri, 2013).

Mineral found to be present in trace quantities in both samples is zinc, (2.2008ppm) in Colocasia esculenta and 1.4744ppm in Ocimum basilicum respectively. Zinc Pathak and Kapil, (2004) reported that zinc is vital in protein synthesis, cellular differentiation and replication, immunity and sexual functions.

Phytochemical Analysis of Colocasia esculenta and Ocimum basilicum

The phytochemical analysis of Colocasia esculenta and Ocimum basilicum shows the presence of flavanoids, tannin, saponin, oxalate, phytate and alkaloids in both samples from Table 3

Oxalate is the most abundant phytochemicals in the two samples with concentration 171.60mg/100g in Colocasia esculenta and 158.40mg/100g in Ocimum basilicum respectively (Table 3)

Tannin and flavanoids are present at a moderate concentration in both samples. Tanin has a contrary concentration in Colocasia esculenta (54.74mg/100g) and Ocimum basilicum (70.81mg/100g) respectively. The result shows that Ocimum basilicum is richer than Colocasia esculenta in tannin. Tannin is reported to have anti-diarrheal, antiseptic, antifungal properties and parasitic, anti-irritant properties and also used in curbing hemorrhage, in mould healing and improving vascular health by suppressing peptides that hardness arteries (Awoyinka et al, 2007, Ogunwemimo et al, 2007, Ngozi et al, 2011)

From Table 3. Similarly, Ocimum basilicum (49.5mg/100g) higher concentration of flavonoids than Colocasia esculenta (18.35g/100g). Flavonoids possess antimicrobial and antidiarrheal activities (Tiwari, 2011). They also act as antimicrobial by completing extracellular and soluble proteins and by completing bacteria cell walls.

More Lipophilic Flavonoids may also disrupt microbial membranes (Navarro et al 2003, Al-Bayati and Almola, 2008, Samy and Gopala Krishnackone, 2008, Kaw and Arora, 2009).

The Concentration of Saponin, Phytate and alkaloids are low in both analysed samples of Colocasia esculenta and Ocimum basilicum and the observed values in Colocasia esculenta were: 24:05mg/100mg, 16.38mg/100g, 12.92mg/100 and in Ocimum basilicum were: 38:37mg/100mg, 13.41mg/100g, 9.37mg/100g respectively.

Saponin. (Table 3)

Saponins have antidiarrheal activities. They serve as vaccine boosters by acting as an adjuvant. They also have anti-Oedema, antitussive, purgative and immunoregulatory properties (Ngoci et, al, 2011)

Alkanoids are reported to have antimicrobial, antihelmintic and anti diarrheal activities (Tiwari et al, 2011)

3.16 Table 4.0: Showed in vivo studies: Weights in grams of wistar rats (Laboratory animals) administered with Colocasia esculenta only. Table 4.0 showed a reduction in the weight of rats administered with Colocasia esculenta only. This weight reduction may probably be due to frequent defecation, the elevated water content in the feaces leading to loose stool after six hours of induction.

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3.17 Table 5.0 Showed in vivo studies weights in grams of wistar administered induced with Ocimum basilicum. A similar trend was also observed in laboratory animals (rats) administered with Ocimum basilicum.

However, the average reduction in weight observed in rats induced with Ocimum basilicum (0.60g) is higher than the value obtained in rats treated with an aqueous extract of Colocasia esculenta (0.51g).

3.18 In vitro antimicrobial activity analysis of aqueous extract of Colocasia esculenta against some selected pathogens.

Table 6.0 showed the results of antimicrobial activities of aqueous extract of Colocasia esculenta checked against nine clinical pathogens by measuring the zone of inhibition against all pathogens.

From Table 6.0, the aqueous extract of Colocasia esculenta showed characteristics zone of inhibition against selected pathogens at 100mg/ml for Escherichia coli (3.2mm), Pseudomonas aeruginosa (1.4mm), Shigella dysenteriae (1.0mm), Salmonella typhimurium (0.8mm), Bacillus albus (0.8mm), Streptococcus pyogenes (0.6mm), Staphylococcus aureus (0.6mm) while Proteus vulgaris and Candida albicans showed no resistance.

In vitro antimicrobial activity analysis of aqueous extract of Ocimum basilicum against some selected pathogens

Table 7.0 showed antimicrobial activities of aqueous extract of Ocimum basilicum were checked against nine pathogens by measuring zone of inhibition against all pathogens. The aqueous extract Ocimum basilicum leaves showed a characteristic zone of inhibition against most pathogens at 100mg/ml for Shigella dysenteriae 3.0mm E, Coli 2.6mm, Salmonella typhi (1.0mm), Pseudomonas aeruginosa (0.8mm(, Bacillus albus (0.6mm), Proteus vulgaris (0.5mm) Streptococcus pyogenes (0.5mm) but Staphylococcus aureus and Candida albicans showed no resistance against Ocimum basilicum.

3.20 Table 8: Minimum Inhibitory concentration (MIC) of Colocasia esculenta and Ocimum basilicum against selected pathogens

Table 8 showed the minimum inhibitory concentration (MIC) at 0.01% observed for aqueous extraction (MIC) at 0.01% observed for aqueous extract of Colocasia esculenta corn against Bacillus albus (6.0mm) E Coli (17.0mm) Staphylococcus (18.0mm), E coli Sigella dysenteriae (12.0mm), Streptococcus pyogenes (12.0mm), Pseudomonas aerogenosa (10.0mm), Salmonella typhi (12.0mm) Proteus wilgaris and Candida albican showed no inhibition at 0.01% against the aqueous extract of Colocasia esculenta corn.

However, the minimum inhibitory concentration at 0.01% for aqueous extract of Ocimum basilicum against Bacillus alcans (28.0mm), E coli (25.0mm), Staphylococcus aureus (27.omm), Shigella dysenteriae (24.0mm), Streptococcus pyogenes (22.0mm) Pseudomonas aeruginosa (22.0mm) and Salmonella typhimurium (21.0mm) on the other hand, Proteus vulgaris and Candida albicans showed no inhibition at 0.01% against both aqueous extract of Colocasia esculenta corn and aqueous extract of Ocimum basilicum.

Table 9: Comparative analysis of the antidiarrhoel activities

B4 Induction		After Induction			
Ocimum	Colocasia	Ocimum	Colocasia	Metro	Untreated
Frequency of defaection	1	5	3	3	3	5
Elevated H20 content in the feaces	1	5	2	3	2	5
Irregular shaped tool	1	5	2	2	2	5
Loose Stool	1	5	3	2	2	5

The result of the frequency of defaecation of the laboratory rats on a scale of 1 to 5 times per hour with 1 assigned the minimum value 3 assigned with the medium and 5 assigned the highest value showed that castor oil-induced diarrheal in rats treated with aqueous extract of Ocimum basilicum reduced the frequency of defaecation to the barest minimum (3). Elevated water in the rats was greatly increased after induction then it was decreased with treatment with Ocimum basilicum and Colocasia esculenta.

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