ISSN: 2186-8476, ISSN: 2186-8468 Print
Vol. 2. No. 1. March 2013

DIURETIC POTENTIAL OF CAPSICUM FRUTESCENS LINN., CORCHORUS OLITURIUS LINN., AND ABELMOSCHUS ESCULENTUS LINN.

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ABSTRACT

This experimental study was explored to determine the diuretic property of C. frutescens L., C. oliturius L., and A. esculentus L. Specifically, it sought to determine the diuretic efficacy of the different plant decoctions in white rats. The study looked into the most effective concentration in each of the experimental plant decoction. It likewise determined the significant difference of the following variables: concentration in different plant decoction and between the control and the plant decoction. Determination of the diuretic property of the three plant material was done by Rat Metabolic Cage Method using 48 albino rats. Each treatment was replicated with three (3) rats. Measurements of urine volume excreted after five hours was done to measure their effectiveness as a diuretic. Based on the gathered data, there was an increase of urine output of albino rat in the 10 ml/kg concentration of C. frutescens L. Likewise in C. oliturius L. 10 ml/kg and 7 ml/kg concentration increased the urine output of rats. While in okra, all of the four concentrations (10 ml/kg, 7 ml/kg, 4 ml/kg, and 1 ml/kg) increased the urine output. Whereas in furosemide both 7 ml/kg and 4 ml/kg had an increase. This increase of urine output shows that the three plant materials possess diuretic potential. It was also found out that no significant difference was noted within the different concentration used in increasing the urine output of rats. Similarly, in the efficacy of the three plant materials and the commercial diuretic furosemide, no significant difference was revealed.

Keywords: Diuretic, Capsicum frutescens linn, Corchorus oliturius linn, Abelmoschus esculentus

INTRODUCTION

The natural world once served as the source of all medicinal agents, with higher plants constituting by for the principal sources of these. Today, higher plants continue to retain their historical significance as important sources of novel compounds that are useful directly as medicinal agents, as model compounds for synthetic or semi synthetic structure modifications and optimization, as biochemical and pharmacological probes, and as sources of inspiration for generations of synthetic organic medicinal chemists.

All plants produce chemical compounds as part of their normal metabolic activities. These can be split into primary metabolites, such as sugars and fats, found in all plants, and secondary metabolites found in smaller range of plants, some useful ones found only in a particular genus or species. It is these secondary metabolites which can have therapeutic actions in humans and which can be refined to produce drugs.

Higher plants served humankind as sources of medicinal agents since its earliest beginnings. In fact, natural products once served as the source of all drugs. Today, natural products and their derivatives and analogs still represent over 50 percent of all drugs in clinical use, with

ISSN: 2186-8476, ISSN: 2186-8468 Print
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higher plant-derived natural products representing 25 percent of the total. On numerous occasions, the folklore records of many different cultures have provided leads to plants with useful medicinal properties. In the past 2 centuries, the chemical investigation and purification of extracts of plants purported to have medicinal properties, and those used as toxins and hunting poisons in their native habitats, have yielded numerous purified compounds which have proven to be indispensable in the practice of modern medicine. (Kinghorn and Bandria)

Many of the pharmaceuticals currently available to physicians have a long history of use as herbal remedies, including opium, aspirin, digitalis, and quinine. The World health Organization estimates that 80 percent of the world's population presently uses herbal medicine for some aspect of primary health care. Herbal medicine is a major component in all traditional medicine systems and a common element in Ayurvedic, homeopathic, naturopathic, traditional Chinese medicine, and Native American medicine. According to the WHO, 74 percent of 119 modern plant-derived pharmaceutical medicines are used in ways that are similar to their traditional uses. The use of and search for drugs and dietary supplements derived from plants have accelerated in recent years. Pharmacologists, microbiologists, botanists, and natural-products chemists are combing the Earth for phytochemicals that could be developed for treatment of various diseases. In fact approximately 25 percent of modern drugs used in the United States have been derived from plants.

Many plants synthesize substances that are useful to the maintenance of health in humans and other animals. These include aromatic substances, most of which are phenols or their oxygen-substituted derivatives such as tannins. Many are secondary metabolites of which at least 12,000 have been isolated, a number estimated to be less than 10 percent of its total. In many cases, these substances (particularly the alkaloids) serve as plant defense mechanisms against predation by microorganisms, insects and herbivores. Many of the herbs and spices used by humans to season food yield useful medicinal compounds.

Within the last few decades, edema, high blood pressure, heart failure, kidney problems, liver problems, and glaucoma have been considered as the common diseases of man. Medication of these diseases is one of the problems of the people particularly among those of low socio-economic level because of the high costs of medication. Thus, patients sometimes choose not to medicate at all in the hope that their condition shall resolve by itself.

Many people are turning to natural foods and herbs with diuretic properties instead of over-the counter and/or prescription diuretic pills.

Diuretics are non habit-forming medications that stimulate the kidneys to produce more urine, flushing excess fluids and minerals from the body. They may be used to treat a variety of conditions, including high blood pressure (hypertension), heart failure or kidney disease.

The diuretic effect of *Capsicum frutescens Linn., Corchorus oliturius Linn., and Abelmoschus esculentus Linn.* commonly known as siling labuyo, saluyot, and okra respectively has shown potential. If these plants proved to be effective, then, patients can acquire an inexpensive alternative remedy in the care of blood pressure, heart failure or kidney disease.

Researches on alternative medicine are booming these days. It is our interest to research in herbal medicines which serve as a treatment for diseases or a medication which is non toxic to human health.

OBJECTIVES

This study was conducted to determine the diuretic property of *C. frutescens L., C. oliturius L., and A. esculentus L.*

Specifically, the study aimed to:

1. Determine the diuretic efficacy of the different plant decoctions in white rats.
2. Determine the most effective concentration in each of the experimental plant decoction.
3. Determine the significant difference in the following variables:
   a. concentration in different plant decoction
   b. control and plant decoction

HYPOTHESES

1. There is no difference in the effectiveness of concentration in each of the experimental plant decoction.
2. There is no significant difference among the concentration of the different plant decoction.
3. There is no significant difference among the control and the three plant decoction.

METHODS

Materials

The materials that were used in this study are:

The reagents include normal saline solution and distilled water. On the other hand, the apparatus that were used are: weighing balance, beakers, Erlenmeyer flask, corks, hot plate, strainer, syringe, gavage neddle, metabolic cages, and rat cages.

Experimental Design and Treatment

The researcher followed the Complete Randomized Design (CRD) with pre and post measurement. The treatments were assigned completely at random so that each experimental dose level had the same chance of receiving any one treatment.

The treatments were as follows:

T1 = NSS with 10 ml/kg (Capsicum frutescens Linn)

T2 = NSS with 7 ml/kg (Capsicum frutescens Linn)

T3 = NSS with 4 ml/kg (Capsicum frutescens Linn)

T4 = NSS with 1 ml /kg (Capsicum frutescens Linn)

T5 = NSS with 10 ml/kg (Corchorus oliturius Linn)

T6= NSS with 7 ml/kg (Corchorus oliturius Linn)

T7 = NSS with 4 ml/kg (Corchorus oliturius Linn)

T8= NSS with 1 ml /kg (Corchorus oliturius Linn)

T9 = NSS with 10 ml/kg (Abelmoschus esculentus Linn)

ISSN: 2186-8476, ISSN: 2186-8468 Print
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T10= NSS with 7 ml/kg (Abelmoschus esculentus Linn)

T11 = NSS with 4 ml/kg (Abelmoschus esculentus Linn)

T12= NSS with 1 ml /kg (Abelmoschus esculentus Linn)

T13 = NSS with 10 ml/kg (Positive control -Furosemide)

T14 = NSS with 7 ml/kg (Positive control –Furosemide)

T15 = NSS with 4 ml/kg (Positive control –Furosemide)

T16 = NSS with 1 ml /kg (Positive control –Furosemide)

Operationalization

This experimental research had two phases:

Phase 1. The preparation and extraction of the three plant decoctions for biological test; and,

Phase 2. The biological test of the fruit extracts of *C. frutescens L.*, and *A. esculentus L.*, and the leaf extracts of *C. oliturius L.* using albino rat as subject of experimentation.

Preparation of Extracts for the Biological Test

Five hundred grams of each of the plant material were washed with water and simmer in 1000 ml distilled water until the volumes were reduced by five hundred ml to obtain a 100 percent decoction. Extracts were cooled, strained and refrigerated ready for use in the biological test.

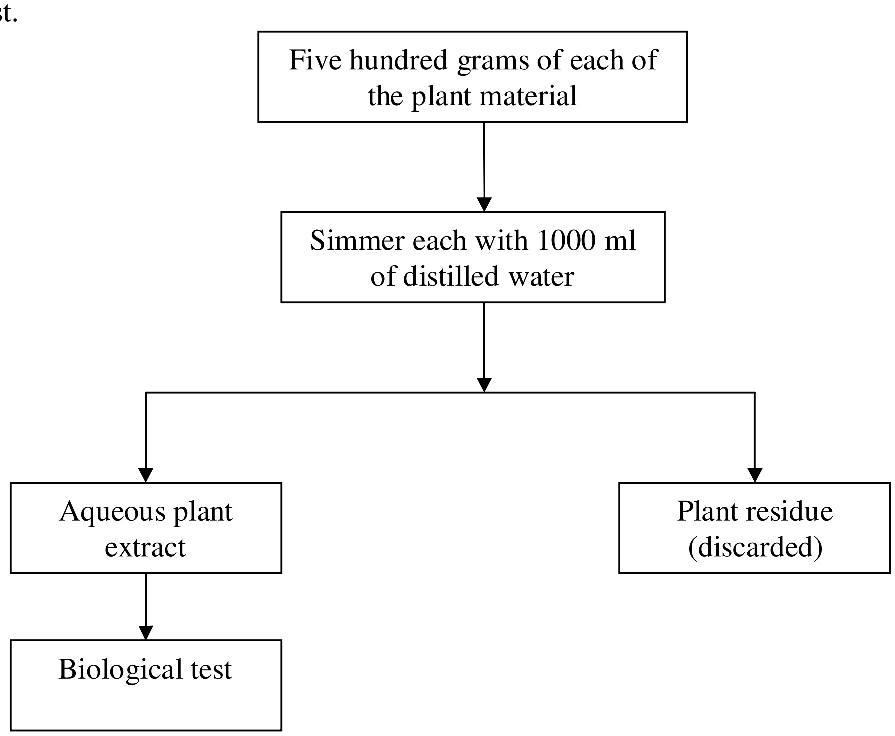

Figure 1. Schematic Diagram for the Biological Test of the Three Plant Material

Determination of Diuretic Property

Forty eight (48) healthy Albino Rats of approximately the same age were used in the study. The rats were bought at Philippine Institute of Traditional and Alternative Health Care – Animal Laboratory Carig, Tiguegarao City.

The procedure in determining the diuretic property of each of the plant material was based on the standard procedure of Quijano, Romeo F. Bioassay of Medicinal Plants Products. PCHRD, Bicutan, Taguig Metro Manila, 1989.

Each of the rats was acclimatized for three days in individual metabolic cages. The metabolic cages were provided by the Philippine Institute of Traditional and Alternative Health Care – Animal Laboratory Carig, Tiguegarao City. It consists of a metal frame for holding firmly and protecting the cage which is made of transparent fiber glass. In the upper portion of the fiber glass is a divider made of metal with holes where the rats are placed and the lower portion is designed like a funnel. When the rats urinate, the urine runs down the funnel-like structure and is collected in the graduated cylinder just below the cage. The feces also go directly to another graduated cylinder which is attached opposite the urine collector.

The animals were given free access to water and food in the form of pelleted feeds daily. Cleaning of the cages and food containers were done regularly to prevent contamination and unpleasant smell that could adversely affect the rats.

Twelve (12) hours prior to experiment, the rats were fasted. A normal saline load of 10 ml/kg were given orally to the rats using a gavage needle. After one hour, another normal saline 15 ml/kg were given. Urine excreted after 5 hours were used as a base line. The urine output of the albino rats was collected in a receptacle attached to the metabolic cages and then measured. In reading the urine excreted in small amount, a syringe was used to aspirate the urine. After three days, same rats were given normal saline load of 10 ml/kg. After one hour, *Capsicum frutescens Linn., Corchorus oliturius Linn*., and *Abelmoschus esculentus Linn* extract were administered orally to the rats with a dose rate of 10 ml/kg, 7 ml/kg, 4 ml/kg, and 1 ml /kg. The urine excreted after 5 hours were measured. Each treatment was replicated with three rats. The same procedure was done for the positive control (Furosemide).

In handling the rat during the administration of normal saline, the plant decoctions, and furosemide, the rat was grasped around the shoulder. The handler's thumb should be positioned under the mandible to prevent the animal from biting. (Guevara, Beatrice Q. A Guidebook to Plant Screening: Phytochemical and Biological. Research center for the Natural Sciences University of Sto. Tomas. Thomas Aquinas research Complex, 2004)

DATA ANALYSIS

The statistical tool that was used in this study is the Two Way Analysis of Variance (ANOVA) in Complete Randomized Design (CRD) and was tested at 0.05 level of significance.

DISCUSSIONS

Comparison of Mean Urine Output of Rats

Table 1 shows the comparison of mean urine output of rats before and after administration of 0.9 percent normal saline solution, different concentrations of 100 percent decoction of the three plant material and the commercial drug furosemide.

Urine output in this study is the basic criterion of a potential diuretic agent since increasing urine volume after a purposeful administration of a diuretic agent reflects its potential use in medicine.

ISSN: 2186-8476, ISSN: 2186-8468 Print
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Analysis shows that normal saline solution had affected positively the excretory system in rats. Hence, it is used as the negative control in this study procedure.

It can be gleaned from Table 1 that there is an increase of urine output in the treatments: 1 of siling labuyo which is from 1.23 ml to 2.25 ml; 5 (from 0.667 ml to 1.8 ml) and 6 (from 2.1 ml to 2.2 ml) of saluyot; 9, 10, 11, and 12 of okra which is from 1.25 ml to 2 ml, 0.9 ml to 1.87 ml, 1.82 ml to 2.2 ml, and from 0.58 ml to 0.73 ml respectively; and treatments 14 and 15 of furosemide which is from 1.47 ml to 2 ml and from 1.05 ml to 1.23 ml, correspondingly.

The table also presents that in treatments: 2, 3, 4 of siling labuyo; 7, 8 of saluyot; and 13 and 16 of furosemide had a decrease of urine output which is from 1.9 ml to 0.83 ml, 2.3 ml to 1.7 ml, 1.47 ml to 0.73 ml, 1.1 ml to 1 ml, 1.67 ml to 0.83 ml, 1.513ml to 1.5 ml, and from 0.67 ml to 0.33 ml in that order.

Table1. Comparison of Mean Urine Output of Rats

TREATMENT(DOSE RATE)	*MEAN URINE OUTPUT*	
	BEFORE	*AFTER*
10 ml/kg of siling labuyo	1.23 ml	2.25 ml
7 ml/kg of siling labuyo	1.9 ml	0.83 ml
4 ml/kg of siling labuyo	2.3 ml	1.73 ml
1 ml/kg of siling labuyo	1.47 ml	0.73 ml
10 ml/kg of saluyot	0.667 ml	1.8 ml
7 ml/kg of saluyot	2.1 ml	2.2 ml
4 ml/kg of saluyot	1.1 ml	1.0 ml
1 ml/kg of saluyot	1.67 ml	0.83 ml
10 ml/kg of okra	1.25 ml	2.0 ml
7 ml/kg of okra	0.9 ml	1.87 ml
4 ml/kg of okra	1.82 ml	2.2 ml
1 ml/kg of okra	0.58 ml	0.73 ml
10 ml/kg of furosemide	1.51 ml	1.5 ml
7 ml/kg of furosemide	1.47 ml	2.0 ml
4 ml/kg of furosemide	1.05 ml	1.23 ml
1 ml/kg of furosemide	0.67 ml	0.33 ml

This demonstrates that within the 4 treatments of siling labuyo, only the 10 ml/kg concentration had an increase in urine output. Similarly, in the 4 concentrations of saluyot, 10 ml/kg and 7 ml/kg had an increase. Likewise in furosemide, only 7ml/kg and 4 ml/kg concentration had increases. While in Okra all the 4 concentrations (10 ml/kg, 7ml/kg, 4 ml/kg, and 1 ml/kg) had increases in the urine output of rats. Though the said concentration had an increase in the urine output of rats, statistically, they are not significant.

This increase of urine output of rats shows that the three plant materials are potential diuretic. This finding therefore confirmed the literature cited in the webpage

http://www.naturalopinion.com/nmp/nmp5/capsicum.htm that C. frutescens L. is a mildly diuretic, Quisumbing (1978) that C. oliturius L is a diuretic, and http://stuartxchange.com/Okra.html can be used in urinary problems.

Comparative urine output of rats before and after medication with the different plant material is shown in Figure 6. Albino rats administered with 10 ml/kg of *C. frutescens L.*(T1), 10 ml/kg (T5), and 7 ml/kg (T6) of *C. oliturius L.* ,10 ml/kg (T9), 7 ml/kg(T10), 4 ml/kg (T11), and 1 ml/kg (T12) of *A.esculentus L.,* and 7 ml/kg (T14) and 4 ml /kg (T15) of Furosemide decoction induces rats to excrete urine output of 2.25 ml, 1.8 ml, 2.2 ml, 2.0 ml, 1.87 ml, 2.2 ml, 0.73 ml, 2.0 ml, and 1.23 ml respectively. Before the treatment, albino rats were administered with normal saline solution at equal dose of 10 ml/kg and after one hour 15 ml/kg. Administration of NSS to establish baseline had caused a mean urine volume of 1.2, 1.8, 2.2, 2.0, 1.87, 2.2 0.73 2.0, and 1.23 ml for the above treatment.

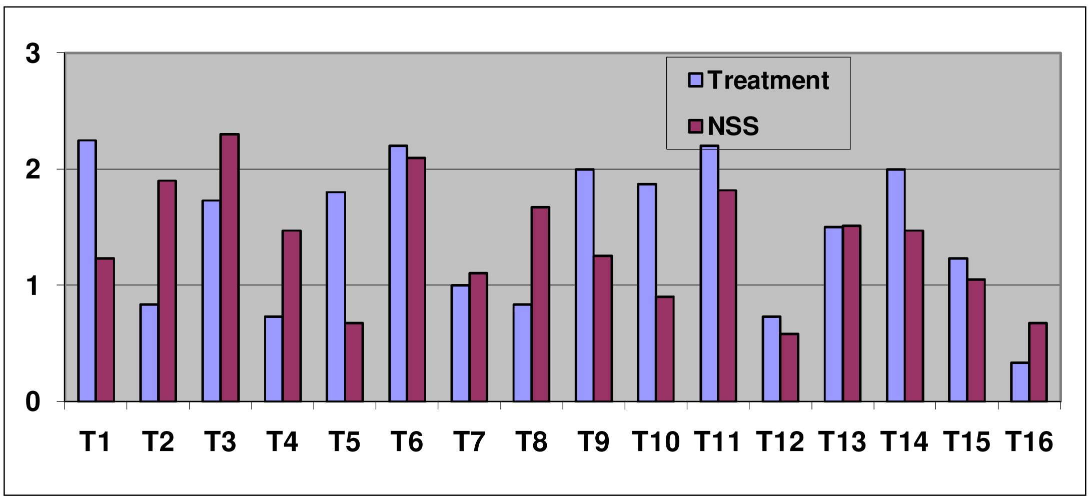

Figure 6 Comparative urine output of rats before and after medication with the three plant material

Legend:

T1 = 10 ml/kg (Capsicum frutescens Linn)

T2 = 7 ml/kg (Capsicum frutescens Linn)

T3 = 4 ml/kg (Capsicum frutescens Linn)

T4 = 1 ml /kg (Capsicum frutescens Linn)

T5 = 10 ml/kg (Corchorus oliturius Linn)

T6= 7 ml/kg (Corchorus oliturius Linn)

T7 = 4 ml/kg (Corchorus oliturius Linn)

T8= 1 ml /kg (Corchorus oliturius Linn)

T9 = 10 ml/kg (Abelmoschus esculentus Linn)

T10= 7 ml/kg (Abelmoschus esculentus Linn)

T11 = 4 ml/kg (Abelmoschus esculentus Linn)

T12= 1 ml /kg (Abelmoschus esculentus Linn)

T13 = 10 ml/kg (Positive control -Furosemide)

T14 = 7 ml/kg (Positive control –Furosemide)

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T15 = 4 ml/kg (Positive control –Furosemide)

T16 = 1 ml /kg (Positive control –Furosemide)

Analysis of Variance on the Dose Rates and the Three Plant Material and Furosemide

Table 2 shows the analysis on the different dose rates used and the three plant material and furosemide. Analysis of variance reveals that there is no significant difference within the different dose rates used. This is shown by the F-values of .631. So, the different dose rates used do not differ significantly in their effectiveness in increasing the urine of rats. Thus, the null hypothesis that there is no significant difference among the concentrations of the different plant decoction is accepted.

Table 2. Analysis of Variance on the Dose Rates and the Three Plant Material and Furosemide

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig*
Corrected Model	17.984 (a)	15	1.199	1.356	.228
Intercept	56.377	1	56.377	63.766	.000
TYPE	1.543	3	2.245	2.540	$.074^{ns}$
RATE	9.705	3	.514	.582	$.631^{ns}$
TYPE * RATE	28.292	9	1.078	1.220	$.318^{ns}$
Error	102.653	32	.884		
Total	46.276	48			
Corrected Total		47			

a R Squared = .389 (Adjusted R Squared = .102)

No significant difference was likewise seen in the efficacy of the three plant materials and furosemide as revealed by the F- values of .074. Therefore, the three plant materials are as effective as the commercial diuretic drug furosemide in increasing the urine of rats. Hence, the null hypothesis that there is no significant difference among the control and plant decoction is accepted.

Considering all factors under control, the non significant difference could be directly attributed to the fact that they might have the same chemical constituents that induce urination. Literature cited that the three plant materials contain saponins, glycoside (glucosides), and other polyphenolic compounds.

Marzan, 1988, stated in her thesis that flavonoid glycosides, being rich in phenol groups are responsible for the diuretic properties of Achuete, Mongo, Papaya and Upo.

Negado and Tan, 1991, also cited in their thesis that mannitol and other glucoside substance are responsible for the diuretic action of Apium graviolens (Kintsay).

Mallillin 2005, cited that mannitol is administered intravenously to reduce excess fluid accumulation or pressure particularly in the head and to increase urine flow in certain types of kidney failure. Glucose, like mannitol, as cited in the webpage http://en.wikipedia.org/wiki/diuretics is a sugar that can behave as an osmotic diuretic.

Literature also discloses that *C. frutescens L.*, and *C. oliturius L.* and A. *esculentus L.* contain carbohydrates.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were drawn:

- The different concentrations used: 10 ml/kg, 7 ml/kg, 4 ml/kg, and 1 ml/kg in increasing the urine output of rats were comparatively effective.
- *C. frutescens L., C. oliturius L.*, and *A. esculentus L.,* had diuretic potential. Their decoctions were comparable to furosemide which is a commercial diuretic in inducing urine of rats.

Based on the previous findings and conclusions of the study, the researcher suggests the following recommendations:

- *Capsicum frutescens Linn., Corchorus oliturius Linn*., and *Abelmoschus esculentus Linn.* should be planted and multiplied in the vicinities for ready and immediate substitute of commercial diuretic.
- The isolation of the active constituents responsible for the diuretic effect of the different plants should be done.
- The preparation of the three plant material should be studied further as an alternative diuretic.
- Phytochemical screening on the presence of alkaloids, saponins, tannins, and flavonoids of A. esculentus should be conducted.

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