ANTI-INFLAMMATORY ACTIVITY OF CARROT (*Daucus carota*) TAPROOT ETHANOLIC EXTRACT ON MALE WISTAR ALBINO RATS

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ABSTRACT

This study aimed to evaluate the anti-inflammatory property of Carrot (*Daucuscarota*) taproot in a carrageenan induced wistar rats. The phytochemical screening of carrot taproot shows the presence of alkaloids, carbohydrates, saponins, phytosterol, phenolic compounds, and flavonoids. Results showed that Carrot *(Daucuscarota*) extract contains flavonoids which are responsible for its anti-inflammatory activity. In comparison, the different concentrations of the Carrot (*Daucuscarota*) Taproot extract (50 mg/kg, 100mg/kg, 150mg/kg, and 200mg/kg) and Diclofenac (25mg/kg) showed no significant difference; thus, they have comparable anti- inflammatory effect which can be used as a safe alternative and accessible source for people who cannot afford expensive drugs and unable to be reached out by medical services.

Key words: *anti-inflammatory, Daucuscarota, ethanolic extract, phytochemical screening, flavonoids*

INTRODUCTION

Inflammation is a pathophysiological response of living tissue wherein white blood cells produce chemicals that protect our body from foreign organisms such as viruses and bacteria. Although the inflammatory response is a defense mechanism, the complex events and mediators involved in the reaction can induce, produce or create many diseases (Wang, Jin, Dai, Han, Bao, 2015). However, studies have shown that the currently available anti-inflammatory drugs pose a major threat, even if oftentimes effective can have unwanted side effects such as gastric ulceration, myocardial infarction and stroke (J. Maroon, Bost & A. Maroon , 2010).

Most physicians readily acknowledge that NSAIDs are important causes of gastrointestinal (GI) morbidity. In the current issue of the American Journal of Gastroenterology, Lanas and colleagues present a population-based study from Spain in which they use pharmacoepidemiologic tools to better quantify some of the current uncertainties regarding NSAIDs' clinically important GI toxicity. They calculated a frequency of 15.3 deaths per 100,000 NSAID users, occurring in 5% of all patients hospitalized with GI complications secondary to NSAIDs. Of note, mortality rates in the current study are only 30% of the widely popularized death rate from NSAIDs reported in the United States. Also important, and somewhat surprising, is that one-third of NSAID-associated GI mortality occurred in patients whose only NSAID taken was low-dose aspirin (Cryer, 2005).

Daucus carota Linn, commonly known as “Carrot”, belongs to the family Apiaceae (Umbelliferae) and is cultivated almost all over the world as a useful vegetable (Dias, 2014). Initially, the roots were long and thin, and either purple or yellow in color. These colors, as well as white and orange, still exist, with the orange or orange-red colors being by far the most popular today (Abbas, 2011). Its roots contain carotenoids, flavonoids, polyacetylenes, vitamins, and minerals, famous to all because of its use in salad, as a vegetable and as a main ingredient in a sweet dessert. Carrots are rich in beta-carotene, which is a red-orange pigment found in plants and fruits (Arscott & Tanumihardjo, 2010).

There were reports about the investigation of anti-inflammatory activities of *D. carota L*. extracts. However, there is still limited information regarding its mechanism of inflammation. This study, therefore, aimed to evaluate the anti-inflammatory activity of taproot extract of the plant, as the taproot is highly medicinal. Carrots, with so many health benefits like anti-inflammatory, gastroprotective, and hepatoprotective properties have been compared to some anti-inflammatory drugs like aspirin, ibuprofen, naproxen, and Celebrex.

Research Questions

Generally, this study aimed to evaluate the anti-inflammatory activity of *Daucus carota* extract in Wistar albino rats.

Specifically, it aimed to answer the following questions:

1. What are the phytochemical constituents present in the crude *Daucus carota* ethanolic stem extract?
2. What is the degree of paw edema/ inflammation as evidenced by the volume of water displacement of the different treatment groups?
    a. Post-induction of Carrageenan
    b. 1 hour post-treatment
    c. 2 hours post treatment
    d. 3 hours post treatment
    e. 4 hours post-treatment
2. Is there a significant difference in the degree of inflammation of subjects after induction of inflammation and after 1, 2, 3 and 4 hours post-treatment?
3. Is there a significant difference in the degree of inflammation of the different treatment groups 1, 2, 3 and 4 hours post-treatment?
    a. Negative Control (Distilled Water)
    b. Positive Control (Diclofenac Sodium 25mg/kg)
    c. 50 mg/kg *D. carota* extract
    d. 100 mg/kg *D. carota* extract
    e. 150 mg/kg *D. carota* extract
    f. 200 mg/kg *D. carota* extract

Research Hypothesis

1. There is no significant difference in the anti-inflammatory activity of the four different doses of the experimental control in male wistar rats.
2. There is no significant difference in the anti-inflammatory activity between the positive control Diclofenac and the experimental control carrot (*Daucus carota*) in the four doses 50 mg/kg, 100 mg/kg, 150 mg/kg, and 200 mg/kg.

Significance of the Study

This research study will be beneficial to the community through providing an alternative to the anti-inflammatory of the plant extract *Daucus carota Linn* which may be used by people suffering from inflammations. This study can become a useful tool in determining the proper therapeutic use of the plant *Daucus carota Linn*. This will also provide a safe and accessible source for people who cannot afford expensive drugs and unable to be reached out by medical services. It will also be beneficial in the medical field for further understanding of the therapeutic effect of this plant and in providing the natural remedy in inflammation. It could also lead the researchers and pharmacists to formulate a new drug through the use of indigenous herbal medicines for treatment in the Philippines with lesser side effects.

Literature Review

Carrots *(Daucus Carota)*

Carrots (*Daucus carota*) are examples of conical taproots, but taproots do not have to be straight or even tapered. A taproot is typically a long and somewhat thick root that goes deep down into the soil. It is the first root to appear from the seed and remain the largest, central root of the plant. A good example is a common carrot. The part we eat is the taproot, but you will also notice smaller roots all along the central root (Iannotti, 2017). *Daucus carota* is a root vegetable with carotenoids, flavonoids, polyacetylenes, vitamins, and minerals, famous to all because of its use in salad, as a vegetable and as a main ingredient in a sweet dessert. Carrots are rich in beta-carotene, which is a red-orange pigment found in plants and fruits.

D. carota, commonly known as carrot is a flowering plant in the family Apiaceae, native to temperate regions of Europe and southwest Asia, and naturalized to North America and Australia. Carrot is a worldwide important market vegetable. The roots are consumed raw or cooked, alone or in combination with other vegetables, as an ingredient of soups, dishes, sauces, juices, and in dietary compositions; large coarse roots are also used as fodder. Young leaves are sometimes eaten raw or used as fodder. Authors showed that dichloromethane extract was able to induce PPARγ transactivation, to stimulate glucose uptake in

adipocytes and in myotubes and to reduce fat accumulation in *C. elegans* (Kuete, 2017).

Phytochemical Constituents of Carrot Taproot (*Daucus carota*)

Carrot contains important phytochemicals such as phenolic compounds, alkaloids, carotenoids, polyacetylenes and ascorbic acid which are bioactive compounds and recognized for their nutraceutical effects and health benefits. These chemicals aid in the prevention of cancer and cardiovascular diseases due to their antioxidant, anti-inflammatory, plasma lipid modification and anti-tumor properties. This vegetable can be used to improve the health of poor people, especially in developing countries (Corresp, et al., 2017).

Benefits of Carrot Taproot (*Daucus carota*)

It improves vision; carrots are rich in beta-carotene, which is converted into vitamin A in the liver. Vitamin A is transformed into the retina, to rhodopsin, a purple pigment necessary for night vision. Beta-carotene has also been shown to protect against macular degeneration and senile cataracts. A study found that people who eat a large amount of beta-carotene had a 40 percent lower risk of macular degeneration than those who consumed little; it helps prevent cancer; studies have shown carrots reduce the risk of lung cancer, breast cancer, and colon cancer. Falcarinol is a natural pesticide produced by the carrot that protects its roots from fungal diseases. Carrots are among the only common sources of this compound. It helps slow down the aging of cells, helps prevent infection**;** carrots are known by herbalists to prevent infection. Carrots do not have only beta-carotene but also alpha-carotene and lutein. The regular consumption of carrots also reduces cholesterol levels because the soluble fibers in carrots bind with bile acids, cleanses the body; vitamin A assists the liver in flushing out the toxins from the body. It reduces the bile and fat in the liver. The fiber present in carrots helps clean out the colon and hastens waste movement, protects teeth and gums**.** Carrots clean your teeth and mouth. They scrape off plaque and food particles just like toothbrushes or toothpaste. Carrots stimulate gums and trigger a lot of salivae, which being alkaline balances out the acid-forming, cavity-forming bacteria.

Traditional uses of Carrots (*Daucus carota*)

Daucus carota was cultivated for the enlarged fleshy taproot, eaten as a raw vegetable or cooked in many dishes. Eaten sliced, diced, cut up, or shoe-stringed, carrots were used in many mixed vegetable combinations. They were sold in bunches, or canned, frozen, or dehydrated. They may be baked, sauteed, pickled, and glazed, or served in combination with meats, in stews, roasts, soups, meatloaf or curries. A roasted carrot was used as coffee substitutes. The essential oil was used to flavor liqueurs and perfumes. Seeds were aromatic, carminative,

diuretic, emmenagogue, stimulant, and were used for dropsy, chronic dysentery, kidney ailments, worms, as aphrodisiac, nervine tonic, and for uterine pain. Roots were refrigerant and used in infusion for threadworm, as diuretic and eliminating uric acid. The ethnobotanical uses of this species also included applications in the treatment of cough, diarrhea, dysentery, cancer, malaria, tumors, as an antiseptic, abortifacient, aphrodisiac, carminative, stimulant, stomachic and tonic. Daucus carota was used by the Ancient Egyptians as a stimulant, carminative, diuretic, anthelmintic and as a decoction for infantile diarrhea.

Inflammation

Inflammation is a defense mechanism in the body. The immune system recognizes damaged cells, irritants, and pathogens, and it begins the healing process (Nordqvist, 2017). Inflammation is categorized into five cardinal signs which are known as redness, swelling, heat, pain and loss of function. Prostaglandins are produced by the cells which are involved in the production of pain, fever and inflammation. Several enzymes such as cyclooxygenase including COX-1, COX-2, and COX-3 are responsible for the production of prostaglandin. COX-2 is responsible for promoting pain, inflammation and fever by producing the prostaglandin. (Parveen, Akash, Rehman, Mahmood & Qadir, 2014).

Anti-inflammatory Properties of Carrot Taproot (*Daucus carota*)

NSAIDS have been explained on the basis of their inhibition of the enzymes that synthesize prostaglandins. However, it is clear that NSAIDs exert their analgesic effect not only through peripheral inhibition of prostaglandin synthesis but also through a variety of other peripheral and central mechanisms. Carrot extract also has anti-inflammatory properties and provided anti-inflammatory benefits that were significant even when compared to anti-inflammatory drugs like Aspirin, Ibuprofen, Naproxen and Celebrex (Mercola, 2013).

Diclofenac

Diclofenac, a phenylacetic acid derivative, is a non-steroid anti-inflammatory agent of a new chemical structure, which shows a high degree of anti-inflammatory and antipyretic activities. Also, its gastrointestinal tolerability is better than that of other highly effective non-steroid anti-inflammatory agents (Menasse et al., 2009).

Traditional and Alternative Medicine Act of 1997

The Republic Act No. 8423 which is also known as Traditional and Alternative Medicine Act (TAMA) of 1997 is an act that aims for the acceleration of the development of traditional and alternative healthcare in the Philippines. This act has also paved the way for the production of alternative medicines from certain

herbs for proven, safe, effective and affordable medicines. Some of the objectives of this act are: To encourage scientific research on and develop traditional and alternative healthcare system that has a direct impact on public health care. To promote and advocate the use of traditional, alternative, preventive and curative health care modalities that have been proven safe, effective, cost-effective and consistent with government standard on medical practice; and to promote traditional and alternative health care.

Due to the adverse effects induced by long-term administration of the drugs readily available in the market, the use of herbal medicine is gathering momentum. Traditional and Alternative Medicine Act of 1997 is an act creating the Philippine Institute of Traditional and Alternative Health Care (PITAHC) to accelerate the development of traditional and alternative health care in the Philippines, providing for a traditional and alternative health care development fund and for other purposes.

Research Paradigm

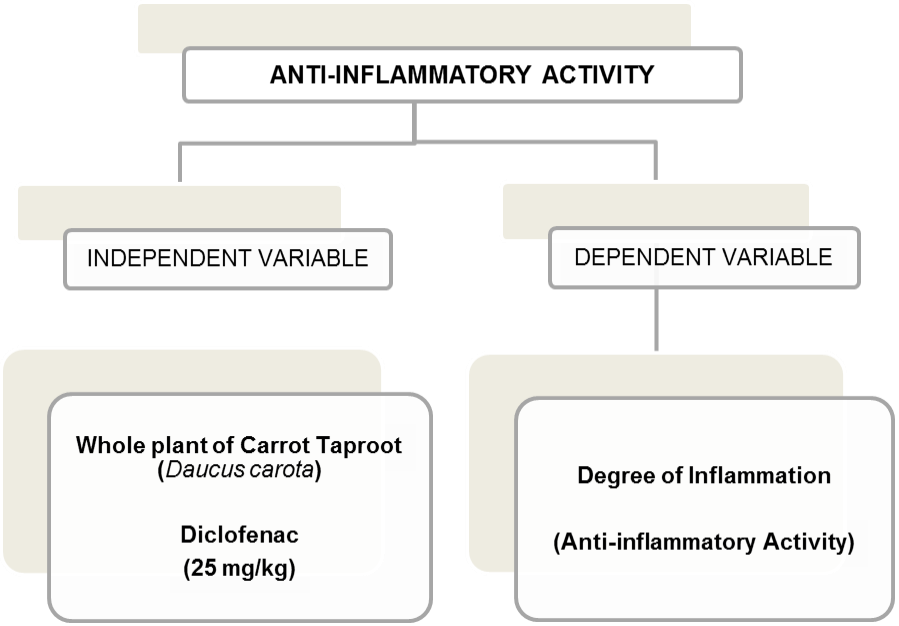

Figure 1. *Research Simulacrum*

The figure above shows how the independent variable which is the whole plant of Carrots (Daucus carota) as the experimental control and the positive control

which is Diclofenac sodium can affect the degree of inflammation in experimental animals and how the dependent variable responds to the different controls.

METHODS

Research Design

Experimental method was used in this study.

Subjects of the Study

Wistar Albino Rats (*Rattus norvegicus*) were used in this study (Paschapur, Patil & Kumar, 2009). According to Foundation for Biomedical Research (FBR), 95% of all lab animals are mice and rats. Scientists and researchers rely on mice and rats for several reasons. Rodents are small, easily housed and maintained, and adapt well to new surroundings. They also reproduce quickly and have a short lifespan of 2-3 years, so several generations of mice can be observed in a relatively short period of time.

Male Wistar rats weighing 150 grams to 175 grams were obtained from Isabela Hamstery and Rattery Santiago City, Isabela**.** The animals were then be housed and maintained in Cagayan Valley Herbal Processing Plant- Philippine Institute of Traditional and Alternative Healthcare (PITAHC). The animals were fed ad libitum with standard feed and water except when fasting was needed in the course of the study.

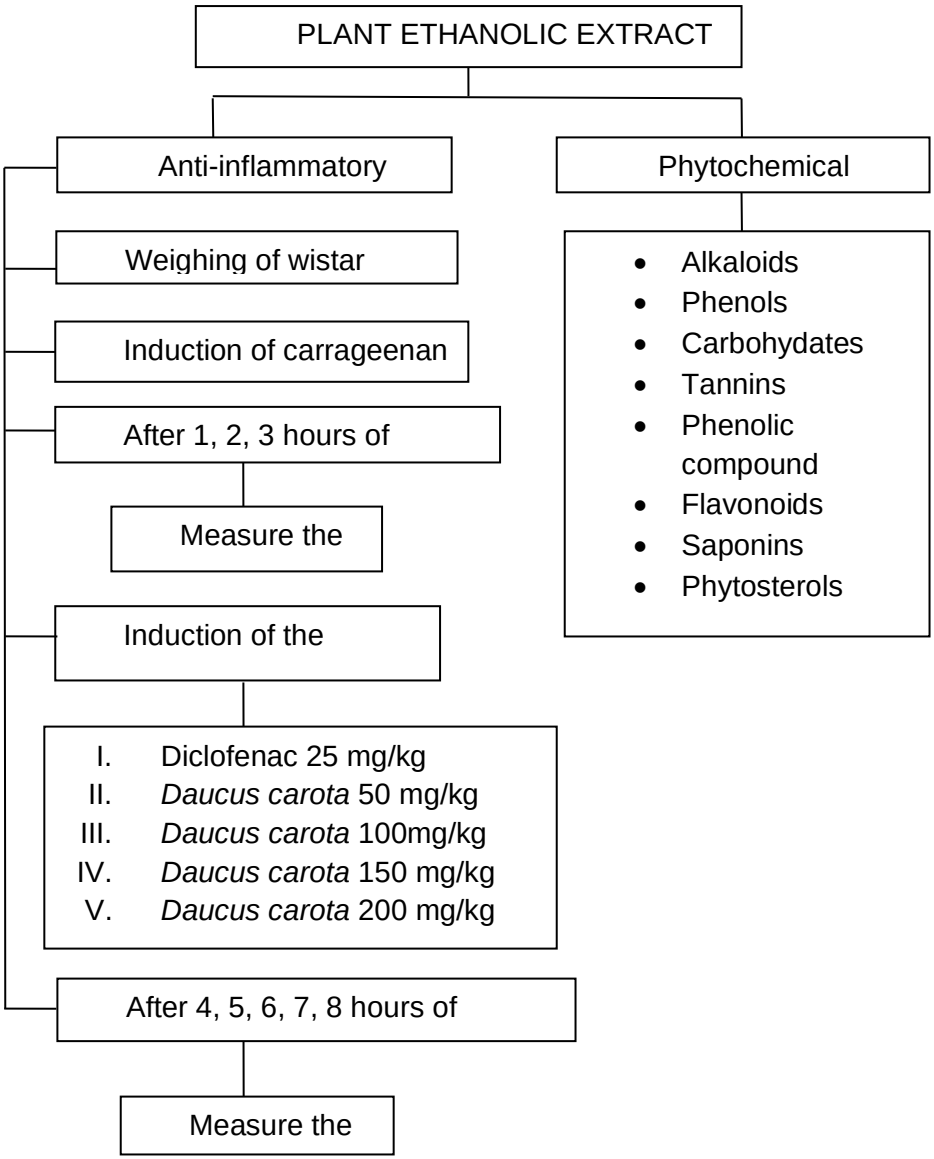

Figure 2. *Methodological flowchart*

Collection and Preparation of the Plant Sample

The botanical verification and authentication of the plant sample were done in Botany Division of National Museum, Manila, Philippines. The unwashed fresh plant sample was tightly sealed in a plastic bag in the coolest part of the refrigerator to preserve its freshness.

1. Phytochemical Screening

Phytochemical screening was conducted by a registered analyst in Saint Louis University, Baguio City. The result of the analysis was then given to the researchers in which the results indicated all the positive and negative constituent of the plant sample.

2. Acclimatization

A total of eighteen (18) male wistar rats with weight ranging from 150-175 grams were used in this study and kept in cages under standard condition (temperature of 25±2˚C, 12 hour light and 12 hour dark cycle). All animals were fed with commercially formulated rat feed and water ad libitum (or in accordance to their needs or wants).

After randomization into various groups, the rats were acclimatized for a period three (3) weeks in the environment before the initiation of the experiment. Their cages were cleaned three times a week. All procedures involving the use of animals in this study complied with the guiding principles for research involving animals as recommended by the declaration of Helsinki and the guiding principles in the care and use of animals (World Association, 2002).

In the present study, the attempt focused on the evaluation of the anti-inflammatory activity of *Daucus carota linn* extract in Carrageenan-induced paw edema in male Wistar rats. For comparison purposes, Diclofenac Sodium was used as a reference drug.

3. Bioassay of the Anti-inflammatory Activity of Carrot (*Daucus carota linn)*

3.1. Preparation of Carrageenan Suspension

Suspension of carrageenan sodium salt 1% was prepared by sprinkling 100 mg of carrageenan powder on 10 ml of saline (0.9%) solution and set aside to soak for 1h. A homogeneous suspension was obtained by thorough mixing with a magnetic stirrer (Theophile, Laure, Anatole, Emmanuel, Pierre, 2005).

3.2. Induction of Paw edema

3.2.1. Wistar Albino Rats (*Rattus norvegicus*) were used in the experiment.

3.2.2. Before the induction of edema, the paws of the rats were measured using volume displacement.

3.2.3. Prior to the administration of carrageenan suspension, Lidocaine hydrochloride was administered intramuscular on the right foot of each rat.

3.2.4. Edema is induced by injecting 0.1 ml of 1% carrageenan suspension subcutaneously into the sub plantar tissue of the right hind paw of each mouse. Six groups with 3 rats each were treated with 0.1ml of 1% carrageenan.

3.2.5. Before and after 1, 2, and 3 hours of carrageenan injection, the paw edema volume was measured using the volume displacement. Rat hind paw edema is induced by carrageenan injection.

3.2.6. Of these three groups, one mouse per group was treated with Diclofenac (25mg/kg) as the positive group and the ethanolic extract of Daucus carota as the experimental group was treated with (50mg/kg, 100mg/kg, 150mg/kg, and 200mg/kg).

3.2.7. After 4,5,6,7 and 8 hours of the administration of the control methods, the edema was measured using the volume displacement.

3.3. Administration of Positive and Experimental Group

3.3.1. Rat's hind paw edema was induced by administration of Carrageenan solution done intradermally.

3.3.2. Three rats per group were treated with ethanolic extract of Daucus carota Linn. Each rat that was administered with Daucus carota Linn extract received specific dose. Such doses are the following: 50 mg/kg, 100mg/kg, 150mg/kg, and 200mg/kg. Another rat for the positive control was treated with Diclofenac (25mg/kg).

3.3.3. After 4,5,6,7 and 8 hours prior to the administration of control methods, the edema was measured using the volume displacement method.

3.4. Measurement of Paw Edema

Measurement was carried out immediately after 4, 5, and 6 hours of the administration of the different doses of carrot (50 mg/kg, 100 mg/kg, 150 mg/kg and 200 mg/kg) extract and diclofenac 25mg/kg.

Statistical Analysis

The results gathered were tabulated and subjected to statistical treatment, which is the one-way analysis of variance (ANOVA) using 0.05 level of significance and least significant difference for comparative analysis.

Ethical Considerations

The experimental animals were surrendered to the Philippine Institute of Traditional and Alternative Health Care (PITAHC) for proper disposal of the experimental animals that were used in this study. The researchers underwent University Research Ethics Board feedback.

RESULTS

The data presented in tables were analyzed and were further interpreted to give a clear and accurate presentation on the anti-inflammatory activity of *Daucus carrot linn* extract on wistar male albino rats.

Table 1.*The chemical constituents of the Ethanolic extract of Daucus carota Linn.*

Chemical Constituents	Results
Alkaloids	+
Carbohydrates	+
Glycosides	-
Saponins	+
Phytosterol	+
Phenolic compounds	+
Flavonoids	+
Proteins	-

Legend: (+) presence (-) absence

The result implies that alkaloids, carbohydrates, saponins, phytosterol, phenolic compounds, and flavonoids are present in the extract of *Daucus carota.* Flavonoids are common compounds occurring in this plant. It has an anti-inflammatory effect and may be responsible for the reduction of edema.

Table 2. *Degree of Paw Edema/ Inflammation (Volume of Water Displacement) of the Different Treatment Groups Pre and Post-Treatment*

Treatment Groups	After Carrageenan Administration (mean)	1 Hour (mean)	2 Hours (mean)	3 Hours (mean)	4 Hours (mean)	5 Hours (mean)
Positive (Diclofenac 25mg/kg)	1.633	1.333	1.100	.933	.867	.767
Experimental group 1 (50mg/kg Carrot Extract)	1.533	1.300	1.133	.900	.800	.700
Experimental group 2 (100mg/kg Carrot Extract)	1.400	1.167	1.100	1.033	.933	.833
Experimental group 3 (150mg/kg Carrot Extract)	1.400	1.100	1.033	.933	.867	.800
Experimental group 4 (200mg/kg Carrot Extract)	1.333	1.067	.967	.933	.833	.767

Table 3.1. *Test of Significant Difference of the Degree of Inflammation of Subjects under the Positive Control after Induction of Inflammation and Post-treatment*

Pairs	t-value	p-value	Decision
Post-Carrageenan Administration- 1 hour Post Treatment	5.196	.035	Reject Ho
Post-Carrageenan Administration- 2 hours Post Treatment	6.047	.026	Reject Ho
Post-Carrageenan Administration- 3 hours Post-Treatment	6.062	.026	Reject Ho
Post-Carrageenan Administration-4 hours Post Treatment	8.693	.013	Reject Ho
Post-Carrageenan Administration-5 hours Post Treatment	9.827	.010	Reject Ho

The table reveals that the positive control significantly decreased the paw edema of the test subjects 1, 2, 3, 4 and 5 hours after administration.

Table 3.2. *Test of Significant Difference of the Degree of Inflammation of Subjects under the Experimental Group 1 after Induction of Inflammation and Post-treatment*

Pairs	t-value	p-value	Decision
Post-Carrageenan Administration- 1 hour Post Treatment	7.000	.020	Reject Ho
Post-Carrageenan Administration- 2 hours Post Treatment	6.928	.020	Reject Ho
Post-Carrageenan Administration- 3 hours Post-Treatment	19.000	.003	Reject Ho
Post-Carrageenan Administration-4 hours Post Treatment	22.000	.002	Reject Ho
Post-Carrageenan Administration-5 hours Post Treatment	9.449	.011	Reject Ho

The table reveals that the 50mg/kg of the carrot extract significantly decreased the paw edema of the test subjects 1, 2, 3, 4 and 5 hours after administration.

Table 3.3. *Test of Significant Difference of the Degree of Inflammation of Subjects under the Experimental Group 2 after Induction of Inflammation and Post-treatment*

Pairs	t-value	p-value	Decision
Post-Carrageenan Administration- 1 hour Post Treatment	7.000	.020	Reject Ho
Post-Carrageenan Administration- 2 hours Post Treatment	5.196	.035	Reject Ho
Post-Carrageenan Administration- 3 hours Post-Treatment	4.158	.050	Reject Ho
Post-Carrageenan Administration-4 hours Post Treatment	5.292	.034	Reject Ho
Post-Carrageenan Administration-5 hours Post Treatment	4.715	.042	Reject Ho

The table reveals that the 100mg/kg of the carrot extract significantly decreased the paw edema of the test subjects 1, 2, 3, 4 and 5 hours after administration.

Table 3.4. *Test of Significant Difference of the Degree of Inflammation of Subjects under the Experimental Group 3 after Induction of Inflammation and Post-treatment*

Pairs	t-value	p-value	Decision
Post-Carrageenan Administration-1 hour Post Treatment	5.196	.035	Reject Ho
Post-Carrageenan Administration-2 hours Post Treatment	11.000	.008	Reject Ho
Post-Carrageenan Administration-3 hours Post-Treatment	14.000	.005	Reject Ho
Post-Carrageenan Administration-4 hours Post Treatment	16.000	.004	Reject Ho
Post-Carrageenan Administration-5 hours Post Treatment	10.392	.009	Reject Ho

The table reveals that the 150mg/kg of the carrot extract significantly decreased the paw edema of the test subjects 1, 2, 3, 4 and 5 hours after administration.

Table 3.4. *Test of Significant Difference of the Degree of Inflammation of Subjects under the Experimental Group 3 after Induction of Inflammation and Post-treatment*

Pairs	t-value	p-value	Decision
Post-Carrageenan Administration-1 hour Post Treatment	4.000	.050	Reject Ho
Post-Carrageenan Administration-2 hours Post Treatment	5.500	.032	Reject Ho
Post-Carrageenan Administration-3 hours Post-Treatment	4.000	.050	Reject Ho
Post-Carrageenan Administration-4 hours Post Treatment	5.000	.038	Reject Ho
Post-Carrageenan Administration-5 hours Post Treatment	8.500	.014	Reject Ho

The table reveals that the 200mg/kg of the carrot extract significantly decreased the paw edema of the test subjects 1, 2, 3, 4 and 5 hours after administration.

Table 4.1. *Test of Significant Difference in the Degree of Inflammation of the Different Treatment Groups 1, 2, 3, and 4 hours Post-treatment*

Pairs	F-value	p-value	Decision

1 hour Post-treatment	5.933	.005	Reject Ho
2 hours Post-treatment	1.920	.164	Accept Ho
3 hours Post-treatment	.814	.562	Accept Ho
4 hours Post-treatment	.964	.477	Accept Ho
5 hours Post-treatment	.726	.617	Accept Ho

The table above shows that there is a significant difference in the degree of paw edema/ inflammation among the different treatment groups after administration of the respective treatments for 1 hour. The different doses of the extract manifested significantly similar effect as the positive control after 2, 3, 4 and 5 hours of treatment.

Table 5.1. *Post-Hoc Analysis of the Test of Significant Difference in the Degree of Inflammation of the Different Treatment Groups 1 hour Post-treatment*

	Mean	**Positive control**	**Exp. Group 1**	**Exp. Group 2**	**Exp. Group 3**	**Exp. Group 4**
Positive Control	1.633					
Exp. Group 1	1.533	.626				
Exp. Group 2	1.400	.028*	.069			
Exp. Group 3	1.400	.004*	.011*	.337		
Exp. Group 4	1.333	.002*	.004*	.159	.626	

**The mean difference is significant at the 0.05 level*

The table shows that only 100mg/kg, 150mg/kg and 200mg/kg have shown significantly better anti-inlammatory effect than the positive control after 1 hour of administration of the treatment

DISCUSSION

This research study was intended to determine the anti-inflammatory activity of *Daucus carota* and its comparable effect with Diclofenac. To attain the objectives of the study, phytochemical screening and induction of edema were performed by the researchers (Shakheel, Saliyan, Satish & Hedge, 2017).

Based on the results of the data gathered, the phytochemical screening of the ethanolic extract of *Daucus carota* yielded alkaloids, carbohydrates, saponins, phytosterol, phenolic compounds, and flavonoids (Ahmad,et al., 2017). Studies say that flavonoids are responsible for its anti-inflammatory properties (Wehbe, Mroueh & Daher, 2009). On the determination of anti-inflammatory effects between Diclofenac and *Daucus carota* extract, it shows that it has no significant difference which implies that they were comparable in reducing the edema. On the other hand, the determination of the anti-inflammatory effects of Diclofenac and the four

different doses of *Daucus carota* extract showed that they have no significant difference and their effects were comparable as well in inhibiting the edema in rats. The fourth table indicates that after four hours of induction of Diclofenac and the four different doses of *Daucus carota* extract, it has a significant difference particularly because of the onset of action of each treatment. Lastly, the determination of efficacy of Diclofenac and the four different doses were compared. It has been shown that Diclofenac and *Daucus carota* 200 mg/kg extract has the greatest anti-inflammatory activity in reducing the edema in rats.

The introduction of 0.1% carrageenan suspension was performed in the right hind paw of the rats to induce the inflammation (Chandra, Kishore & Ghosh, 2015). Based on the statistical analysis conducted, it showed that there is no significant difference on the four different doses of the ethanolic extract of *Daucus carota* and Diclofenac which is the positive control. Therefore, the *Daucus carota* 200 mg/kg extract can be an alternative to expensive anti-inflammatory drugs like Diclofenac which was used as a reference drug for comparing the anti-inflammatory activity with the *Daucus carota* extract.

CONCLUSION

Based on the results and findings of the anti-inflammatory activity, it was found out that there is no significant difference on four doses (50 mg/kg, 100 mg/kg, 150 mg/kg, and 200 mg/kg) of the ethanolic extract of *Daucus carota,* and Diclofenac 25 mg/kg, thus, they have comparable effect in inhibiting the edema on wistar albino rats.

RECOMMENDATIONS

Based on the aforementioned findings and conclusions drawn, the following recommendations and suggestions are deemed significant:

1. Future researchers should also carry out the Gastroprotective Activity of *Daucus carota.*
2. Future researchers may conduct a comparative study on different anti-inflammatory drugs.
3. Future researchers should further study the anti-inflammatory activity of *Daucus carota*using aqueous as its extract.
4. Future researchers should also conduct isolation for the chemical constituents present in Daucus carota that is responsible for its anti-inflammatory activity.
5. Future researchers should conduct stability testing for the anti-inflammatory activity of *Daucus carota linn.*
6. Future researchers may conduct a socio-economic study.

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