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Abstract:

Foot inflammation is a medical condition that refers to a localized or systemic response of the body's tissues triggered by injury, infection, or irritation. It's a natural defence mechanism involving the release of chemicals, white blood cells, and increased blood flow to the affected area. Common indicators of foot inflammation include redness, warmth, pain, and swelling. Various factors, such as trauma, infections, autoimmune diseases, and inflammatory conditions like arthritis, can lead to inflammation. This study aimed to assess the impact of different concentrations of cayenne pepper on hind paw edema inflammation in adult male albino rats. Twenty-five white male albino rats, averaging 220±5 grams each, were divided into 5 groups, with 5 rats in each group. Over a 28-day period, the rats were fed diets containing cayenne pepper powdered blends at concentrations of 2.5%, 5%, and 7.5%, respectively. Additionally, inflammation was induced by injecting formalin at a concentration of 0.1 ml/kg/body weight. Formalin injection resulted in a notable decrease in, HDL levels and a significant increase in ESR,TC, TG, VLDL, LDL, uric acid, creatinine, and urea levels. However, the results showed an improvement in all these parameters for rats with foot inflammation that were fed various experimental diets. The most effective diet was the one containing 7.5% cayenne pepper, suggesting that it produced the best therapeutic outcomes.

Keywords: Rats, Foot inflammation, kidney functions.

Introduction:

Foot inflammation, also known as podiatric inflammation or foot swelling, refers to the body's natural response to injury, infection, or irritation in the foot. Inflammation is a complex biological process that occurs as the body's immune system attempts to protect and heal the affected area. It is characterized by various symptoms, including redness,

warmth, pain, swelling, and sometimes loss of function in the affected foot **(Gialal and Devaraj 2018).** Higher species have evolved a defence mechanism called the inflammatory response to shield them from injury and infection. Its objective is to locate the harmful substance, remove it, and remove any damaged tissue components so that the body can start to heal. Blood flow is altered, blood vessels become more permeable, and fluid, proteins, and white blood cells are transferred from the circulation to the area where tissue injury has occurred. ***(*Ferrero *et al.*, 2007).** The WHO estimates that 0.3–1% of people worldwide suffer from inflammatory diseases, with women three times more likely than men to get the illness. It's an autoimmune disorder of the system. **(WHO, 2016).** Numerous prevalent and frequently fatal diseases, such as diabetes, cancer, heart disease, arthritis, and possibly even depression, are influenced by inflammation. Symptoms of inflammation include the following: inflammation, redness, heat, soreness, and loss of function **(Gialal and Devaraj , 2018).** Once resident immune cells, mainly mast cells, kupffer cells, dendritic cells, histiocytes, and resident macrophages, are present in the affected tissue, they start the inflammatory process. These cells have pattern recognition receptors on their surface that are able to identify two different types of molecules: pathogen-associated chemical patterns. **(Robbins *et al.*, 2014)**. These cells become activated with the commencement of an infection, burn, or other injury, releasing inflammatory mediators that cause the visible symptoms of inflammation. Redness and higher heat are the results of vasodilation and the increased blood flow that follows. Swelling is caused by the exudation of fluid and plasma proteins into the tissue (oedema) as a result of increased blood vessel permeability. Bradykinin is one released mediator that makes people more sensitive to pain. Additionally, these mediator molecules alter blood arteries to facilitate leukocyte migration—particularly that of neutrophils and macrophages—out of the vessels and into the tissue. To get to the site of injury, neutrophils move along a chemotactic gradient generated by the surrounding cells. **(Ferrero *et al.*, 2007).** It's conceivable that a neurological reflex in reaction to pain caused the loss of function. Cayenne pepper is a famous vegetable in Asia and throughout the world. It is a perennial herbaceous plant of to the Solanaceae family. Moreover, pepper is a key component of the traditional Korean cuisine kimchi and a preferred spicy spice. Spices are

becoming more and more popular because of their known health benefits. In Korea, pepper leaves (PL) are also eaten as cooked vegetables, even though pepper fruits (PF) are mostly utilised as spices or vegetable dishes. **(Boweri *et al.*,2016).** Cayenne pepper is a plant known for its numerous benefits, including its anti-inflammatory properties. It belongs to the genus *Capsicum*,with *Capsicum annuum* L. reported as an excellent source of polyphenols, particularly flavonoids such as quercetin and luteolin **(Lei and Young, 2013).** The primary pungent ingredient found in cayenne pepper is a phenolic substance named capsaicin (8-methyl-N-vanillyl-trans-6-nonenamide). This compound has garnered significant attention over the past two decades due to its chemoprotective properties against certain diseases **(Lei and Young, 2013).** The spiciness of cayenne pepper is primarily attributed to the active compound called capsaicin. This natural chemical is found in various types of chili peppers, including cayenne peppers, jalapeños, and habaneros, and it's responsible for the sensation of heat or spiciness when consumed. Capsaicin has several potential health benefits and applications due to its ability to affect nerve endings and reduce pain signals. Additionally, it has been studied for its possible anti-inflammatory properties, which may contribute to its role in pain management **(Wolkerstorfer *et al.*, 2016).** This study investigates the use of Cayenne pepper in treating inflammatory symptoms and its impact on the foot.

Material and Methods:

Material:

Cayenne pepper was purchased from a local market in Shibin El-Kom, while casein, maize oil, a vitamin mixture, and minerals were obtained from Morgan Co. in Cairo, Egypt. The chemical kits used in this investigation (TG, HDL-c, LDL-c, VLDL-c, ESR) were provided by Al-Gomhoria Company for Chemical, Medical, and Instruments, based in Cairo, Egypt.

Preparation of materials

Cayenne pepper was obtained from the local market. Samples were purchased, dried in an air oven dryer at 60 ºC, and ground to a powder form.

Identification and quantification of phenolic compounds in cayenne pepper powder powder by HPLC.

The efficacy of Cayenne pepper extraction was assessed using 0.05 g of powdered , which were subjected to extraction with 4 mL of 70% MeOH. This process involved vortex mixing using a Top-Mix

vortex mixer , followed by an hour-long immersion in a cooled ultrasonic bath. Subsequently, centrifugation at 12,000× g for 10 minutes using an Eppendorf 5810 R centrifuge , After separating the supernatant, it was put in vials and kept at -20°C after being filtered with 25 µm polyamide filters (Chromafil AO 45/25; Macherey-Nagel, Dueren). Tandem mass spectrometry (MS/MS; LTQ XL; Thermo Scientific, Waltham, MA, USA) with heated electrospray ionisation in negative ion mode was used to identify phenolics, adhering to guidelines provided by **Medic *et al.*, (2021).** Quantification of phenolics was performed via a UHPLC system (Vanquish; Thermo Scientific, Waltham, MA, USA)through a UHPLC-PDA Thermo Scientific Dionex UltiMate 3000 HPLC system, coupled with a TSQ Quantum Access Max quadrupole mass spectrometer (MS) from Thermo Fischer , Waltham, MA . A Gemini C18 column (Gemini; 150 × 4.60 mm, 3 u; Phenomenex, Torrance, CA, at 25 ◦C was employed, aligning with parameters and mobile phases as detailed by Zamljen et al. The procedure adhered to the parameters set out by **Zamljen *et al.*, (2021).**

Experimental animals

Twenty-five white male albino rats were obtained from the Research Institute Ophthalmology Medical Analysis Department. The experiment took place in the laboratory of the Faculty of Home Economics at Menoufia University, where the rats were housed in wire cages. The diet was provided in special feed cups to minimize feed scattering, and water was delivered to the rats through a glass tube in a wire casing. Rats weighing an average of 220 ± 5g were used in this investigation. During the seven-day adaption phase, each animal was kept in a separate, clean laboratory setting in well-ventilated cages and fed a normal meal compliant with AIN-93 guidelines. **(Reeves *et al.*, 1993)**. The rats were randomly divided into 5 groups, each consisting of 5 rats. The first and second groups were fed a standard diet. The other three groups were fed a basal diet supplemented with 2.5%, 5%, and 7% cayenne pepper powder, respectively. After 28 days, the second group and the other three groups fed a basal diet were administered injections of 2.5%, 5%, and 7% cayenne pepper powder. The left hind paw of the rats was injected with 0.1 ml/kg formalin, inducing hind paw edema and inflammation. Paw volume was measured after the injury using a volume displacement method with water. The oedema volume was assessed using a specialized apparatus consisting of an open-top glass cylinder with a 2 cm internal diameter and a height of 5 cm. This cylinder contained 4 cm of water and was positioned on an electronic balance. To determine the paw volume, the animal's paw was submerged to a specified depth in the water, resulting in a noticeable change in weight on the balance. Paw

volume was quantified using a volume displacement technique at various time points (0 hours, 2 hours, 4 hours, 8 hours, 4 days, 8 days, 12 days, 14 days, 19 days, 21 days, 24 days, and 28 days) after formalin injection, following the methodology described by **Fereidonia *et al*., (1999).** Following a 12-hour fast at the conclusion of the trial, diethyl ether was used to anaesthetize the rats. After gathering blood samples, component 1 was put into a glass tube for a centrifuge that was dry and clean. Centrifugation was used to separate the serum at 3000 r.p.m. for 10 minutes at room temperature. The serum was carefully aspirated, put into spotless, snug-fitting plastic tubes, and refrigerated at -20 °C until analysis. **(Schermer, 1967).**

The analytical approach

Chemical Composition

Total protein, fat content and ash were determined according to **(A.O.A.C 2010).**

Crude fibre was determined using **Pearson (1971)** technique. The sample was digested in boiling 0.128 M. sulphuric acid for 45 minutes, rinsed three times with distilled water, then digested again in boiling 0.223 M. sulphuric acid. Serum total cholesterol was determined by using the method proposed by **Thomas (1992)**, The serum triglyceride level was determined using an enzymatic method according to the **(Young, 1975) and Fossati & Prencipe, 1982),** High-density lipoprotein cholesterol HDL-c.was determined According to **Friedwaid (1972), Grodon and Amer (1977) & Lee and Nieman (1996),** very low-density lipoprotein cholesterol VLDL-c was computed in milligrams per deciliter using the following formula: VLDL-c(mg/dl) = Triglycerides / 5, while low-density lipoprotein cholesterol LDL-c was calculated in mg/dl according to **Lee and Nieman (1996)** as follows:

LDL-c (mg/dl) = Total cholesterol – (HDL-c + VLDL-c).

Assessment of Kidney Function

Creatinine levels were determined using the kinetic method outlined in studies by **Henary *et al*., (1974) and Patton and Crouch (1977).**

Urea levels were measured employing the enzymatic method detailed in research by **Fatwctt and Socett (1960) and Schultz (1984).** Uric acid levels were determined through an enzymatic colorimetric test using commercially available kits, following the procedure described by **Fossati and Prencipe (1982)**, complete blood Ccount (CBC) Analysis: This test encompasses the assessment of white blood cell (WBC) count, hemoglobin (Hb) concentration, red blood cell (RBC) count, and platelet count (PLC). The results of the CBC were obtained using highly automated electronic and pneumatic multichannel analyzers, which utilize

aperture-impedances and/or laser beam cell sizing and counting techniques, in accordance with the methodology outlined by **Jacobs *et al.* (2001).**

Erythrocyte sedimentation rate (ESR)

Erythrocyte S–Rate was determination according to the method **Bogdaycioglu *et al.*, (2014).**

Organs

The hind paw was removed, washed in a saline solution, weighed, and then preserved in a 10% formalin solution according to **Drury and Wallington (1980).**

Histopathological examination

Small samples were extracted from the hind paw of each rat group and preserved in neutral buffered formalin. Subsequently, These samples were dehydrated using ethanol concentrations that increased gradually (70%, 80%, and 90%). After that, they were cleaned in xylene and put into paraffin. Next, hematoxylin and eosin was used to produce and stain thin sections that had a thickness of 4-6 µm. **(Carleton, 1976).**

Statistical Analysis

The results collected were analyzed using the SPSS program. ANOVA test results were compared between groups, considering a significance level of $P<0.05$. **Wolfinger and Chang, (1995).**

RESULTS AND DISCUSSION:

Identification and quantification of chemical composition compounds in cayenne pepper powder .

Table (1) shows that cayenne pepper powder contains carbohydrates, protein, fat, and energy at values of 8.99g, 1.99g, 0.30g, and 41 kcal, respectively. Additionally, it contains minerals such as iron, calcium, sodium, potassium, phosphorus, copper, and selenium at amounts of 1.30 mg, 19 mg, 7 mg, 339 mg, 450.29 mg, and 0.4 mg respectively. These results are consistent with those reported by **Ranjitha *et al.* (2018).**

Table (1) Identification and quantification of chemical composition compounds in cayenne pepper powder .

Parameters	Quantity (g)
carbohydrate	8.99
Protein	1.99
Fat	0.30
Energy	41
Iron	1.30
Calcium	19
Sodium	7
Potassium	339
Phosphorus	45
Copper	0.29
Selenium	0.4

Identification and quantification of phenolic compounds in Cayenne pepper powder powder by HPLC.

The data provided in Table (2) revealed that Cayenne pepper is known to have a high content of phytochemicals, particularly phenolic compounds, which contribute to their medicinal properties . The structure-activity correlations of total phenolic levels may be revealed through qualitative and quantitative investigation of significant individual phenolic in spices **(Shaimaa *et al*., 2016).** Active phenolic components in prepared Cayenne pepper powder were characterized using high-performance liquid chromatography. The analysis revealed that Cayenne pepper powder contains numerous phenolic compounds, detailed in Table (2). A total of 26 compounds were extracted. The highest concentrations of phenolic compounds observed were for vanillic acid and benzoic acid, measured at 91.49 mg/100g and 64.55 mg/100g respectively, while the lowest concentrations were found for methoxy cinnamic acid and Caffeine at 0.21 mg/100g and 0.12 mg/100g respectively. These results agree with the finding obtained by **(Alfaro and Ruiz, 2018) .**

Table (2): Fractionation of phenolic compounds in cayenne pepper using HPL

Phenolic compounds	Concentration(mg/100g)
	Cayenne pepper
Vanillic	91.49
Benzoic	64.55
Catechol	20.75
Hydroxy tyroso	l 8.51
Oleuropein	16.53
Chlorogenic	12.96
Pyrogallol	11.77
Salicylic	10.87
Caffeic	9.70
Cinnamic	8.86
Vanillic	6.10
lydroxy benzoic	6.00
Ferulic	2.00
P-coumaric	2.00
α-coumaric	2.00
Reverstrol	2.00
Isoferulic	1.45
Epicatechin	1.04
Coumarin	0.74
Ellagic	ND
Catechin	0.70
Gallic	0.71
Protocatchoic	0.50
Amino benzoic	0.33

Methoxy cinnamic	**0.21**
Caffeine	**0.12**

The data in Table (3) presents the serum lipid fractions (cholesterol, triglyceride, LDL-c, VLDL-C, and HDL mg/dl) indicated as mean ± SD. Cholesterol levels (mg/dl) were measured in rats fed a diet supplemented with cayenne pepper at concentrations of 2.5%, 5%, and 7.5% over 28 days. Significantly high variations (P≤0.05) were observed across all experimental groups. Notably, the rats in the positive control group exhibited the highest levels of cholesterol among all recorded values. These results align with the findings from **Ludy and Mattes (2011).** The triglyceride levels (mg/dl) in rats fed a diet with Cayenne Pepper at concentrations of 2.5%, 5%, and 7.5% over 28 days showed very significant differences (P≤0.05) respectively. Several investigations have explored the cardiovascular benefits of Cayenne Pepper. It is often associated with improved circulation. Understanding how it achieves this involves exploring various research findings. Studies indicate that the components within cayenne may contribute to this effect through several mechanisms. Research has demonstrated their potential to reduce total cholesterol, LDL cholesterol, and triglyceride levels while simultaneously boosting HDL cholesterol, suggesting a multifaceted approach to enhancing cardiovascular health **(Lee *et al.*, 2003).**The impact of Cayenne Pepper on endothelial function involves elevating nitric oxide levels, a process scientifically linked to arterial relaxation and expansion, ultimately enhancing circulation. In a noteworthy study conducted on guinea pigs, capsaicin, a component of cayenne, demonstrated a reduction in plaque formation within artery walls, shedding light on its potential to mitigate this concerning issue **(Yang *et al.*, 2019).** Obesity stands as a significant risk factor for heart disease, but incorporating cayenne pepper into one's diet could potentially aid in weight loss. Specific constituents in cayenne pepper, known as capsinoids, have demonstrated the ability to reduce body weight and fat mass in a study involving 80 overweight individuals. Additionally, a separate study revealed that the ingestion of 1 gram of cayenne pepper led to heightened thermogenesis and increased fat oxidation as reported by **Samy *et al.* (2019)**.

The fasting serum low-density lipoprotein cholesterol (LDL-C, mg/dl) levels were examined in tested groups of rats fed a diet supplemented with Cayenne Pepper at concentrations of 2.5%, 5%, and 7.5% over 28 days. Notably, substantial differences (P≤0.05) were observed compared to the positive control group, indicating significant reductions in LDL-C levels. Additionally, the intervention groups at 2.5%, 5%, and 7.5% demonstrated noteworthy decreases in serum triglyceride and VLDL levels, in agreement with findings from **Yang *et***

***al.* (2019).** Additionally, serum very low-density lipoprotein cholesterol (VLDL-C, mg/dl) levels were evaluated in rats consuming a diet supplemented with cayenne pepper at concentrations of 2.5%, 5%, and 7.5% over a 28-day period. Significant reductions (P≤0.05) were observed in serum triglyceride and VLDL levels within the respective intervention groups, indicating substantial effects attributable to cayenne pepper supplementation **(Samy *et al.*, 2019).**

Table (3): Effect of cayenne pepper on lipid profile of foot inflammation male rats

Groups	Total cholesterol mg/dl	Triglycerides mg/dl	(HDL-C) mg/dl	(LDL-C) mg/dl	(VLDL-C) mg/dl
Control negative (-)	60.67^{d}±0.25	58.0^{e}±1.00	13.5^{a}±0. 26	35.57 ^{e}±.06	11.6^{e}±0.20
Control positive (+)	125.0^{a}±4.36	166.0 ^{a}±2.65	7.8 ^{e}±0.1	87.33 ^{a}±1.52	33.2 ^{a} ±0.53
G3 Rats + Cayenne Pepper(2.5%)	97.33^{b}2.52	152.67^{b}±2.52	9. 00 ^{d}±0.20	57.8 ^{b}±2.12	30.53^{b}±0.50
G4 Rats + Cayenne Pepper (5%)	85.33^{c}±2.50	104.0 ^{c}±2.65	11.37^{c}±0.15	53.17 ^{c}±3.12	20.8 ^{c}±0.53
G5 Rats + Cayenne Pepper (7. 5%)	80.67^{c} ±2.08	99.0 ^{d}±1.00	11.8 ^{b}±0.11	49.07 ^{d}±1.95	19.8^{d}±0.21
LSD (P≤ 0.05)	4.89	3.85	0.32	3.67	0.77

Each value is shown as mean ± standard deviation, Mean in the same column with different superscript letters differ significantly (P≤ 0.05).

Table (4) displays kidney function parameters, specifically creatinine, urea, and uric acid levels indicated as mean ± SD. These parameters were measured in rats provided with a diet supplemented with Cayenne Pepper at concentrations of 2.5%, 5%, and 7.5% over a period of 28 days. Notably, significant variations (P≤0.05) were observed across all experimental groups, suggesting notable impacts of cayenne pepper supplementation on kidney function parameters, particularly in the 7.5% cayenne pepper group. These results align with the findings from **Rubin and Chouhan (2012).** Cayenne pepper is renowned for its active compound capsaicin, which may have various effects on the body, potentially influencing kidney function. Some studies suggest that capsaicin, found in cayenne pepper, might have both positive and negative effects on the kidneys. On the positive side, capsaicin is believed to possess antioxidant and anti-inflammatory properties. These properties may benefit kidney health by reducing inflammation and oxidative stress, which can be detrimental to the kidneys over time **(Ajah *et al.*, 2021).** However, on the flip side, excessive consumption of capsaicin or cayenne

pepper might potentially exacerbate existing kidney conditions or lead to complications in some individuals. Capsaicin can increase the excretion of certain substances through urine, potentially affecting electrolyte balance and kidney function **(Ygwu, 2017).**

Table (4): Effect of cayenne pepper on kidney functions of foot inflammation male rats .

Groups	Creatinine (mg/dl)	Urea (mg/dl)	Uric acid (mg/dl)
Control negative (-)	0.4^{d}±0.11	27.67^{d}±1.53	2.8^{e}±0. 10
Control positive (+)	1.13^{a}±0.14	56.67^{a}±2.08	10.63^{a}±0.21
G3 Rats + Cayenne Pepper(2.5%)	0.77^{b}±0.06	37.00^{b}±1.01	6.77^{b}±0.16
G4 Rats + Cayenne Pepper (5%)	0.77^{b}±0.02	31.33^{c}±1.53	5.6^{c}±0.20
G5 Rats + Cayenne Pepper (7. 5%)	57.0^{c} ±0.05	29.0^{cd}±1.04	3.77^{d}±0.14
LSD (P≤ 0.05)	0.16	2.70	0.30

Each value is shown as mean ± standard deviation, Mean in the same column with different superscript letters differ significantly (P≤ 0.05).

Table (5) shows the complete blood count (CBC) parameters-haemoglobin (HGB), red blood cells (RBC), hematocrit (HCT), white blood cells (WBC), and platelets (PLT)—measured as mean ± SD. These CBC values were assessed in rats receiving a diet enriched with Cayenne Pepper at concentrations of 2.5%, 5%, and 7.5% over a 28-day duration. Notably, substantial variations (P≤0.05) were evident across all experimental groups, indicating noteworthy impacts of cayenne pepper supplementation on the measured CBC parameters. These results align with findings from **Rollyson *et al.* (2014).** Cayenne pepper's influence on the complete blood count (CBC) remains a topic of interest. Studies exploring this area suggest potential effects on certain CBC parameters. However, these effects can vary based on factors such as dosage, duration of use, and individual responses. Some research has hinted at potential impacts on red blood cell count, white blood cell count, and platelet count, but comprehensive and consistent evidence is still evolving in this area of study **(Mark *et al.*, 2015).**

Table (5): Effect of cayenne pepper on complete blood count CBC of foot inflammation male rats .

Groups	HGB (mg/dl)	RBC (mg/dl)	HCT (mg/dl)	WBC (mg/dl)	PLT (mg/dl)
Control negative (-)	15,57^{a}±0.15	7.7^{a}±0.26	57^{a}±1. 0	11.3^{C}±1.53	504.33^{e}±2. 52
Control positive (+)	10.7^{d}±0.20	4.2^{e}±0.10	31.33 ^{e}±1.53	19.33 ^{a}±2.08	694.33 ^{a}±4.04
G3 Rats + Cayenne Pepper(2.5%)	10.67^{d}±0.14	5.1^{d}±0.13	38. 33^{d}±1.52	15.0^{b}±1.0	677. 0^{b}±2.00
G4 Rats + Cayenne Pepper (5%)	11.4^{c}±0.26	6.1^{c}±0.17	42. 67^{c}±2.52	12. 0^{c}±1.07	604. 67^{c}±2.53
G5 Rats + Cayenne Pepper (7. 5%)	14.07^{b} ±0.21	6.9 ^{b}±0.12	50.67^{b}±2.08	10.0^{c}±1.06	542.67^{d}±2.51
LSD (P≤ 0.05)	0.36	0.27	3.29	2.53	5.10

Each value is shown as mean ± standard deviation, Mean in the same column with different superscript letters differ significantly (P≤ 0.05).

Table (6) Show case the erythrocyte sedimentation rate (ESR), measured in millimetres up to 1hour and 2hour is highlighted for various groups of rats consuming a basal diet supplemented with cayenne pepper at concentrations of 2.5%, 5%, and 7.5% across a 28-day period. Remarkably, notable and statistically significant differences ($p \leq 0.05$) were observed within all experimental groups. Furthermore, the intervention groups at 2.5%, 5%, and 7.5% exhibited substantial reductions in serum ESR levels. The findings indicated that the positive control group exhibited the highest erythrocyte sedimentation rate (ESR) compared to the negative control. A decreased ESR is commonly linked to conditions such as increased blood viscosity, sickle cell anemia, leukemia, diminished plasma protein levels, and inflammation **(Dekh *et al.*, 2021).**

Table: (6) Effect of cayenne pepper on erythrocyte sedimentation rate ESR (MM up to 1and 2 hours) of Foot inflammation male rats .

Groups	ESR (MM up to 1 hour)	ESR (MM up to 2 hour)
Control negative (-)	6.97^{d}±0.21	20.67^{b}±0.25
Control positive (+)	32.67^{a}±2.52	38.47^{a}±0.28
G3 Rats + Cayenne Pepper(2.5%)	18.47^{c}±0.25	19.5^{c}±0.26
G4 Rats + Cayenne Pepper (5%)	8.7^{d}±0.20	14.8^{e}±0.100
G5 Rats + Cayenne Pepper (7. 5%)	22.67^{b} ±2.53	17.47^{d}±0.15
LSD (P≤ 0.05)	2.91	0.39

Hind paw weight

In Table (7), throughout the conducted experiment, noteworthy trends were revealed. Initially, at 0 hours, no change was observed. Subsequently, there was an increase in foot weight, most prominent in the positive group, which continued through 2, 4, and 8 hours, peaking at 8 days. Thereafter, a decrease was noticed at 12, 14, 19, 21 days, and 24, stabilizing by day 28, showing a significant difference ($p \geq 0.5$). These results align with findings from **Young and Zhang (2012).**

Table (7) Effect of cayenne pepper on weighing the hind paw of of foot inflammation male rats

Evaluate Time (Mean± SD)												
Category / Statistical	0h	2h	4h	8h	4days	8days	12days	14days	19days	21days	24days	28days
Control negative (-)	0.41^{e} ±0.01	0.41^{e} ±0.01	0.41^{d}± 0.01	0.41^{d} ±0.02	$.41^{c}$± 0.01	$.41^{d}$±0 .01	$.41^{d}$±0. 01	0.41^{c} ±0.01	0.56^{e}± 0.02	0.56^{e}± 0.02	0.56^{e} ±0.02	0.56^{e}± 0.02
Control positive (+)	0.75^{b} ±0.03	1.23^{a} ±0.06	1.8^{a}±0. 11	2.03^{a}± 0.15	1.7^{a}± 0.12	1.9^{a}±0 .11	1.4^{a}±0. 10	1.17^{a} ±0.15	0.93^{a}± 0.03	0.96^{a}± 0.01	0.97^{a} ±0.01	0.98^{a}± 0.01
G3 Rats + Cayenne Pepper(2.5%)	0.87^{a} ±.05	0.88^{b} ±0.02	1.27^{b}± 0.15	1.2^{b}±. 11	0.9^{b}± 0.13	1.1^{b}±0 .13	0.89^{b}±. 02	0.85^{b} ±0.02	0.88^{b}± 0.02	0.77^{b} ±0.02	0.72^{b} ±0.02	0.69^{b}± 0.11
G4 Rats + Cayenne Pepper (5%)	0.69^{c} ±0.01	0.73^{c} ±0.03	0.7^{c}±0. 12	0.8^{c}±. 13	0.87^{b} ±0.06	0.93^{c}± 0.02	0.87^{b}±. 01	0.79^{b} ±0.02	0.82^{c}± 0.03	0.72^{c}± 0.03	0.68^{c} ±0.02	0.66^{c}± 0.02
G5 Rats + Cayenne Pepper (7. 5%)	0.52^{d} ±0.02	0.62^{d} ±0.02	0.53^{cd}± 0.14	0.87^{c}± 0.02	0.93^{b} ±0.02	0.84^{c}± 0.02	0.73^{c}± 0.05	0.71^{d} ±0.01	0.70^{d}± 0.02	0.63^{d} ±0.01	0.65^{d} ±0.01	0.62^{d}± 0.03
LSD (P≤ 0.05)	0.06	0.05	0.21	0.170	0.13	0.12	0.08	0.13	0.04	0.03	0.03	0.03

Histopathological investigatiom:

Effect of cayenne pepper on scatological structure of, rats foot inflammation:

The results revealed that the rats in the control group did not show any change in foot inflammation. However, in the rats from the positive control group, a massive inflammatory exudate infiltrated the foot, indicating edema. In the group treated with cayenne pepper at 2.5%, a narrowed joint space was observed, while in the group treated with 5%, there was evidence of pannus formation. Interestingly, the rats treated with Cayenne Pepper at 7.5% did not show any histopathological alterations. These results are consistent with **Citation *et al.* (2022)**

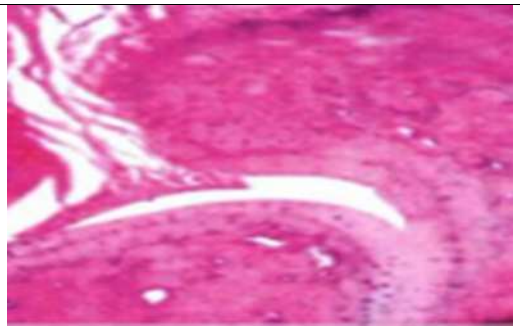

Photo (1): This photomicrograph from group 1 displays two normal articular cartilages separated by a healthy joint space, alongside a normal synovial (membrane (H&E, 100x)

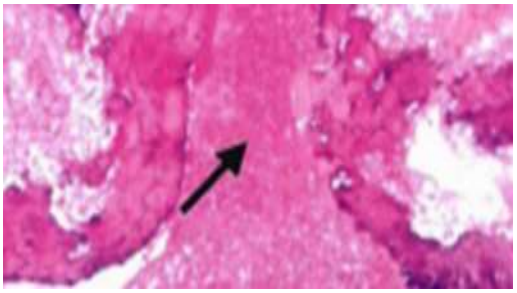

Photo (2): This photomicrograph from group 2 illustrates a substantial inflammatory exudate infiltrating the joint space (H&E, 100x).

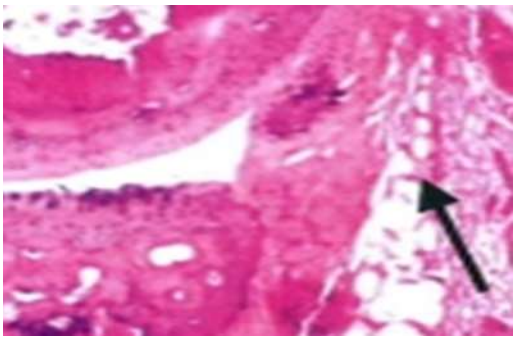

Photo (2-b): Photomicrograph of group 2 displaying edema (H & E X 100).

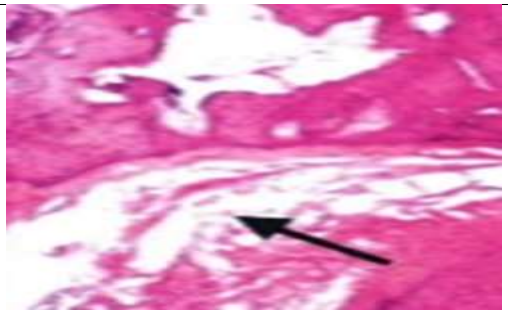

Photo (2-c): This photomicrograph from group 2 exhibits edema within the joint space (H&E, 100x).

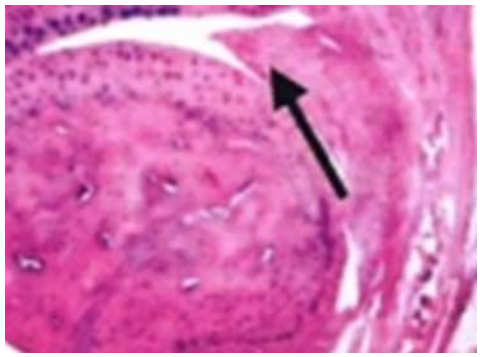

Photo (4): Photomicrograph of group 4 displaying pannus formation (H&E X 100).

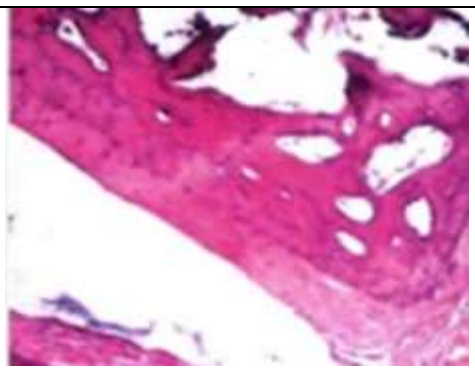

Photo (5): Photomicrograph of group 5 exhibiting no histopathological alterations (H&E X 100).

CONCLUSION:

The 28-day Cayenne Pepper Treatment showed potentially beneficial effects on inflammation and serum lipids in rats. Therefore, we recommend using Cayenne Pepper to reduce inflammation and lipids.

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الملخص

التهاب القدم هو حالة طبية تشير إلى استجابة موضعية أو جهازية لأنسجة الجسم ناجمة عن إصابة أو عدوى . إنها آلية دفاع طبيعية تتضمن إطلاق المواد الكيميائية وخلايا الدم البيضاء وزيادة تدفق الدم إلى المنطقة المصابة. تشمل المؤشرات الشائعة لالتهاب القدم الاحمرار والسخونة والألم والتورم. عوامل مختلفة مثل الصدمات، والالتهابات، وأمراض المناعة الذاتية، والحالات الالتهابية مثل التهاب المفاصل يمكن أن تؤدي إلى الالتهاب. تهدف هذه الدراسة إلى تقييم تأثير تراكيز مختلفة من الفلفل الحار على التهاب واوديما المخلب الخلفي في ذكور الفئران البيضاء البالغة. تم تقسيم خمسة وعشرون فأرًا أبيضًا من الذكور، متوسط وزن كل منهم ٢٢٠ ± ٥ جرام، إلى خمس مجموعات، بواقع ٥ فئران في كل مجموعة. على مدار فترة ٢٨ يومًا، تم تغذية الفئران بنظام غذائي يحتوي على مزيج من مسحوق الفلفل الحار بتركيزات ٢.٥% و٥% و٧.٥% على التوالي. بالإضافة إلى ذلك، تم إحداث الالتهاب عن طريق حقن الفورمالين بتركيز ٠.١ مل/ كجم / وزن الجسم. أدى حقن الفورمالين إلى انخفاض ملحوظ في مستويات HDL وزيادة كبيرة في ESR، TC، TG، VLDL، LDL، حمض اليوريك، الكرياتينين، و مستويات اليوريا. ومع ذلك، أظهرت النتائج تحسنا في جميع هذه العوامل بالنسبة للفئران المصابة بالتهاب القدم والتي تم تغذيتها على أنظمة غذائية تجريبية مختلفة. كان النظام الغذائي الأكثر فاعلية هو النظام الذي يحتوي على ٧.٥% من الفلفل الحار، مما يشير إلى أنه حقق أفضل النتائج العلاجية.

الكلمات المفتاحية: الفئران، التهاب القدم ، وظائف الكلى.