ANTI INFLAMMATORY ACTIVITY OF *VETIVERIA ZIZANIOIDES* MEDIATED SILVER NANOPARTICLES

Keerthana B [1] , *Karthikeyan M [2]

1)Undergraduate Student, Department of Periodontics,Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences(SIMATS) Saveetha University, Chennai, Tamil Nadu, India.Email: 151901090.sdc@saveetha.com

2)Senior Lecturer,Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS) Saveetha University, Chennai-600077, Tamil Nadu,India.Email: karthikeyanmurthykumar@gmail.com

*Corresponding author :Dr. Karthikeyan M,
Senior Lecturer,Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS) Saveetha University, Chennai-600077, Tamil Nadu,IndiaEmail: karthikeyanmurthykumar@gmail.com

ABSTRACT:

Introduction: Vetiver, scientifically known as *Chrysopogon Zizanioides* is a perennial bunchgrass of the family Poaceae. Vetiver is most closely related to sorghum but shares many morphological characteristics with other fragrant grasses, such as lemon grass, citronella and palmarosa. It is a plant with more economic importance due to its aromaticity. Anti-inflammatory agents block certain substances in the body that cause inflammation. They are used to treat many different conditions. Some anti-inflammatory agents are being studied in the prevention and treatment of cancer. Silver nanoparticles are used to estimate the anti-inflammatory activity.

Materials & Method: Extract preparation- 1g of *Vetiveria Zizanioides* powder is mixed with 100ml of distilled water and boiled for 10- 15 mins. The extract is filtered using whatman's no.1 filter paper. Then it is transferred into the pellet

Anti inflammatory activity - albumin denaturation assay : The anti-inflammatory activity for silver nanoparticles was tested by the following convention proposed by Muzushima and Kabayashi with specific alterations. 0.05 mL of Solanum tarvum gel of various fixation.
(10µL,20µL,30µL,40µL,50µL)was added to 0.45 mL bovine serum albumin(1% aqueous solution) The samples were cooled and the absorbance was estimated spectrophotometrically at 660 nm. Diclofenac Sodium was used as the standard. Percentage of protein denaturation was determined.

Results: From the results obtained, it is evident that *vetiveria zizanioides* has anti-inflammatory activity. Results were calculated at 660 nm for accuracy. Though *vetiveria zizanioides* possess anti-inflammatory activity, at varying concentrations, the activity may vary. Statistical analysis is done using Chi square test using SPSS software, where P value less than 0.05 is considered statistically significant.

Conclusion: From this it is concluded that the root extract *Vetiveria zizanioides* has significant anti-inflammatory activity mediated through the silver nanoparticles. The finding of this present investigation suggests that this plant could be a stalwart source of natural antioxidant that could have enormous importance as restorative agents in preventing or slowing the steps forward of ageing

Keywords: *Vetiveria zizanioides*, Anti-inflammatory, silver nanoparticle, root extracts, commercial uses, Eco friendly.

INTRODUCTION:

Vetiver, scientifically known as *Chrysopogon Zizanioides* is a perennial bunchgrass of the family Poaceae. Vetiver is most closely related to sorghum but shares many morphological characteristics with other fragrant grasses, such as lemon grass, citronella and palmarosa (1). It is a plant with more economic importance due to its aromaticity(2) . Vetiver grows to 150cm high and forms clumps as wide (3). Stems are tall and the leaves are long, thin and rather rigid (4). The vetiver bunch grass has a gregarious habit and grows in tufts. Shoots growing from the underground crown make the plant frost and wildfire resistant, and allow it to survive heavy grazing pressure (5). They can survive deep water flow (6). Under clear water, plants can survive upto two months. This plant acts as a soil stabilizer and protects against erosion. It can also protect fields against pests and weeds. The root system of vetiver is finely structured and very strong (7). It can grow 3 meters to 4 meters deep within the first year. Vetiver has neither stolons or rhizomes(8) . Because of all these characteristics, the vetiver plant is highly drought tolerant and can help to protect soil against sheet erosion. In case of sediment deposition, new roots can grow out of buried nodes. Though it originates in India, *Chrysopogon Zizanioides* is widely cultivated in tropical regions (9), (10). The most commonly used commercial genotypes of vetiver are sterile (do not produce fertile seeds), and because vetiver propagates itself by small offsets instead of underground stolons, these genotypes are non invasive and can easily controlled by cultivation of the soil at the boundary of the hedge (11).

Vetiver has been used to produce perfumes, creams and soaps. It is used for its antiseptic properties to treat acne and sores (12). The oil of vetiver is amber brown and viscous. Its odor is described as deep, sweet, woody, smoky, earthy and balsam (10,13,14). Like patchouli and sandalwood essential oils, Vetiver odor develops and improves with aging. The oil's characteristics can vary significantly depending on where the grass is grown and the climate and soil conditions (15). Vetiver has been used in traditional medicine in South Asia. A recent study found that the plant is capable of growing in fuel contaminated soil. In addition, the study discovered the plant is also able to clean the soil, so in the end, it is almost fuel free (15–17)Recent research has shown that phytoextraction approaches often require soil amendments, such as the application of EDTA, to increase the bioavailability of heavy metals in soils (15–17). In a study,

Vetiver grass was studied for its potential use in the phytoremediation of soils contaminated with heavy metals (18). The results showed that Vetiver had the capacity to tolerate high lead concentrations in soil. Vetiver is also used in genetics, Random amplified polymorphic DNAs were used to examine accessions of Vetiver from around the world. It appears that only one genotype accounts for almost all the germplasm utilized(19,20). Anti inflammatory activity is defined as, A drug or substance that reduces inflammation (redness, swelling and pain) in the body (21). Anti-inflammatory agents block certain substances in the body that cause inflammation. They are used to treat many different conditions. Some anti-inflammatory agents are being studied in the prevention and treatment of cancer (22). Nanoparticles are used to estimate the activity of extracts (23). Our team has extensive knowledge and research experience that has translated into high quality publications (24). Silver nanoparticles are used in this study (19). It is used in various fields such as medical, food and industrial purposes, due to their unique physical and chemical properties (25). The aim of this study is to estimate the anti-inflammatory activity of *vetiveria zizanioides* mediated through Silver nanoparticles.

MATERIALS AND METHOD:

Plant Extract preparation:

1g of *Vetiveria Zizanioides* was added in 100ml of distilled water. It was boiled for 10- 15 minutes at 70 degree celsius. After boiling, the plant extract was filtered using Whatmann's no.1 filter paper. In a 250 ml conical flask, 90 ml of 1 millimolar silver nanoparticle was prepared and 10 ml of the filtered plant extract was mixed. This flask was kept in a magnetic stirrer. The synthesised nanoparticles were preliminarily analysed by using UV visible spectrophotometer. The nanoparticle solution was centrifuged at 8000 rpm to prepare nanoparticle pellets. The nanoparticle pellet was dried in a hot air oven at 80 degree celsius. The dried powder was sent for keratinization.

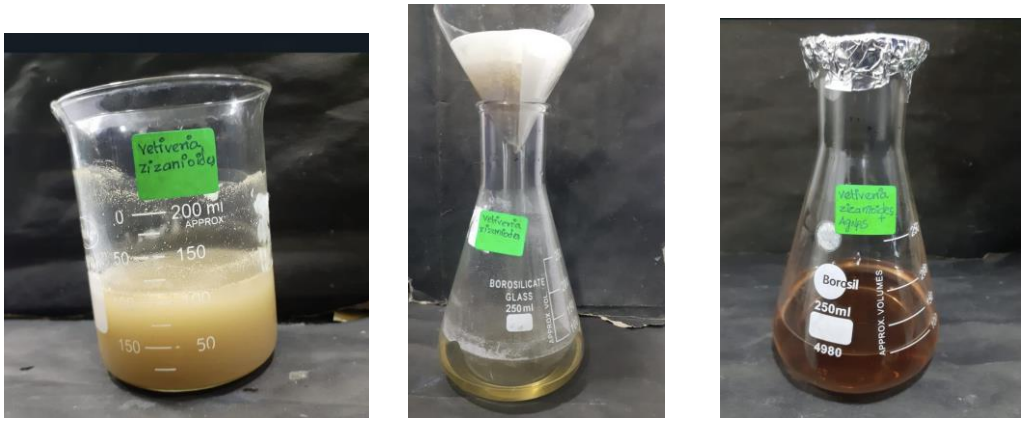

Figure.1 This figure shows the prepared extract of *Vetiveria zizanioides* with Silver nanoparticles the colour change of the extract.

Albumin denaturation Assay:

The anti-inflammatory activity for Silver nanoparticles was tested by the following convention proposed by Muzushima and Kabayashi with specific alterations. 0.05 ml of Solanum tarvum gel of various fixation (10µL, 20µL, 30µL, 40µL 50µL) was added to 0.45 mL Bovine serum Albumin (1% aqueous solution) and the pH of the mixture was acclimated to 6.3 utilizing a modest quantity of 1N hydrochloric acid. These samples were incubated at room temperature for 20 minutes and then heated at 55 C in a water bath for 30 mins. The samples were cooled and the absorbance was estimated spectrophotometrically at 660nm. Diclofenac sodium was used as the standard. DMSO is utilized as control. Percentage of protein denaturation was determined utilizing following equation,

%inhibition = Absorbance of control - Absorbance of sample x 100 / Absorbance of control.

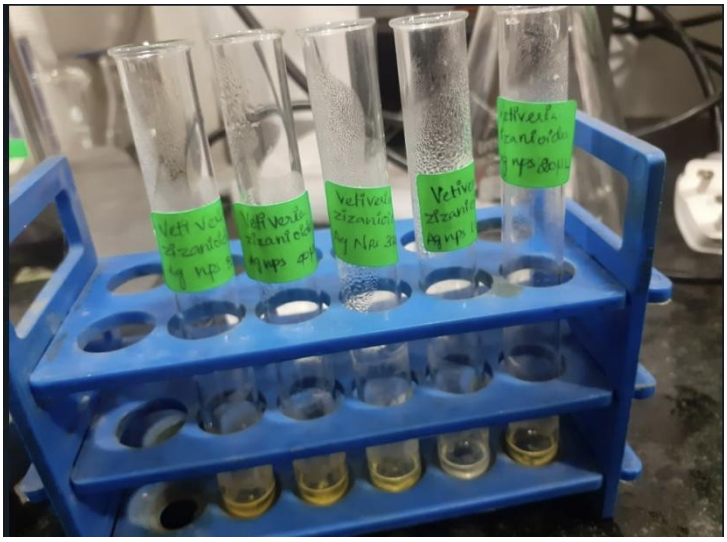

Figure.2 This figure shows the Albumin denaturation assay of *Vetiveria Zizanioides* to estimate the anti-inflammatory activity.

RESULTS:

Table.1 This table shows the concentration of the extract and the % of inhibition of *Vetiveria zizanioides.*

concentration	Wavelength (nm)	% of inhibition
10µL	660	0.32
20µL	660	0.42
30µL	660	0.32
40µL	660	0.28
50µL	660	0.23

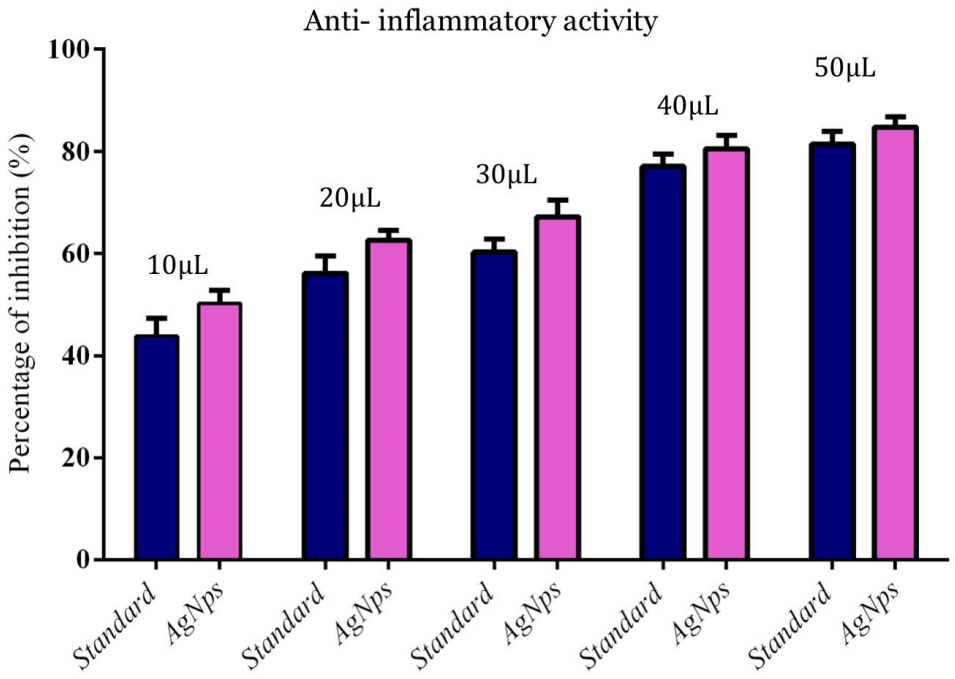

Figure.3 This graph shows the concentration of extract (X-axis) and the % of inhibition (Y-axis). Blue colour denotes the inhibition of standard (Diclofenac sodium) and the red colour denotes the inhibition of silver nanoparticles.

DISCUSSION:

The results obtained are recorded and the percentage of inhibition is calculated and is shown in table.1. Statistical analysis is done using Chi square test using SPSS software, where P value less than 0.05 is considered statistically significant.

It shows the anti-inflammatory activity of *vetiveria zizanioides.* From this it is seen that this plant possesses significant anti-inflammatory activity. Figure.1 shows the graph between concentration of the extract and the % of inhibition. Both the standard one, Diclofenac sodium and the silver nanoparticle have been compared. With increase in concentration, the percentage of inhibition also increases. From this it is evident that *vetiveria zizanioides* has anti-inflammatory activity. Results were calculated at 660 nm for accuracy(26).Though *vetiveria zizanioides* possess anti-

inflammatory activity, at varying concentrations, the activity may vary. By doing statistical analysis, the P value was found to be insignificant, so this plant can be used commercially(27).

Plant derived substances have recently become a great interest owing to the versatile applications (28). Medicinal plants and herbs contain the high quantity of bio-resource of drugs of traditional systems of medicine, modern medicine, pharmaceutical intermediates and chemical entities for synthetic drugs (29), (30)Phytochemical screening of *Vetiveria zizanioides* using extracts like aqueous, methanol, ethanol, acetone, hexane and chloroform. *Vetiveria zizanioides* has a significant anti-inflammatory activity (29,31). Ethanolic extract of *Vetiveria zizanioides* were used for the evaluation of various in vitro antioxidant activities such as reducing power ability, superoxide anion radical scavenging activity, deoxyribose degradation assay, total antioxidant capacity (32). The results obtained in other studies clearly indicate that *Vetiveria zizanioides* scavenges free radicals, ameliorating damage imposed by oxidative stress in different disease conditions and serves as a potential source of natural antioxidant (33). Other studies have provided proof for the ethnomedical claims and reported biological activities. The plant has, therefore, very good therapeutic and antioxidant potential. (34)*Vetiveria zizanioides* has potent antioxidant, anti-inflammatory, antimicrobial and antifungal activities (35). Moreover *Vetiveria zizanioides* essential oil is a safe and valuable food additive for flavouring syrups, ice cream and beverages and also for food preservation (36). Therefore, the prospective uses and applications of *Vetiveria zizanioides* in food science are fairly extensive (37). Another study has concluded that Vetiveria *zizanioides* root extract contains bioactive molecules that have beneficial effects over the biofilm formation of MRSA and its clinical isolates. (38)Limitations of this study include, only the powdered form of *Vetiveria zizanioides* is used in this study. Also, only the anti-inflammatory activity of this extract has been observed in this study mediated through silver nanoparticles. Furthermore, studies can be done with other extracts of *Vetiveria zizanioides* and also by using other nanoparticles like selenium to observe the cytotoxic activity, and copper nanoparticles to estimate the antimicrobial activities.

CONCLUSION: From this it is concluded that the root extract *Vetiveria zizanioides* has significant anti-inflammatory activity mediated through the silver nanoparticles. The finding of this present investigation suggests that this plant could be a stalwart source of natural antioxidants

that could have enormous importance as restorative agents in preventing or slowing the steps forward of ageing and age related oxidative stress related degenerative diseases. Further investigation on the isolation and characterisation of the antioxidant constituents is however required.

CONFLICT OF INTEREST: None declared

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