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ANTI INFLAMMATORY AND ANTI DIABETIC ACTIVITY OF *DRYNARIA QUERCIFOLIA (L.)J. SM. –POLYPODIACEAE*

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ABSTRACT

Medicinal plants are assuming greater importance in the primary health care of individuals and communities in many developing countries. There has been an increase of demand in international trade because of very effective, cheaply available, supposedly have no side effects and used as alternative to allopathic medicines. Medicinal plants are believed to be much safer and proved elixir in the treatment of various ailments. Rhizome and roots of thisplants are used as tonic in typhoid fever and dyspepsia. Traditional use of this drug is in diarrhea, typhoid, jaundice, fever, headache, skin disease and syphilis. In another combination of drug, *Drynaria* is used for expelling rheumatism. In the treatment of hyperthyroidism, *Drynaria* along with other drugs are used. The ethnomedicinal uses of the fern *Drynaria quercifolia* have been pharmacologically confirmed by several workers such as anthelmintic activity, antibacterial and antidermatophytic activity. Hence the objective of this present study is to estimate the anti-inflammatory activity & anti-diabetic activity of the fresh and Cabinetdried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae.* In-vitro anti-inflammatory activity of the fresh and Cabinet dried were carried out by heat induced hemolysis method. In-vitro anti-diabetic activity of the fresh and Cabinet dried *drynaria quercifolia (l.)j. sm. –polypodiaceae* were carried out by α-amylase method. Cabinet dried *drynaria quercifolia (l.)j. sm. –polypodiaceae* have shown a better profile of anti-inflammatory & anti-diabetic activity compared to fresh *drynaria quercifolia (l.)j. sm. –polypodiaceae* and thus it can be used for therapeutic purposes. Results revealed that the *Drynaria quercifolia* rhizome extracts contains abundant amount of anti-inflammatory and anti-diabetic activity.

Keywords: Rheumatism, Pharmacologically**,** Medicinal plants, anti-diabetic, anti-inflammatory

I INTRODUCTION

There are extended stems of the dark green foliage fronds, which range in length from 60 to 90 cm. They are winged, have deep lobed or pinnate structures, and have sori on their lower surfaces. A sorus is a collection of sporangia, which are structures that hold spores and are present in ferns and fungi. The basal foliage fronds are accompanied by spherical, 7.5-30 cm long nest fronds. They are tenacious without sori and do not shed after death. The nest fronds are green at first, but they soon turn dark brown and form a "basket" to collect rubbish and organic debris. The accumulating trash decomposes into humus, which provides nutrients. The rhizome of basket ferns is used to treat headaches, migraines, typhoid, diarrhea, and cough (Medicinal Plants of Bangladesh, 2009).Terrestrial fern Drynariaquercifolia is found in moist tropical climates, mostly rain forests. In addition, they may grow as epiphytes on tree trunks, in the soil between stones, and in man-made constructions like brick walls. Western Australia, Bangladesh, India, Southeast Asia, South China, Malaysia, Indonesia, the Philippines, and New Guinea are among the regions where Drynaria Quercifolia is indigenous (Ferns of Western Australia,2013).Asvakatri, also known as Marappan kilangu or Attukal kilangu locally, is an epiphytic medicinal pteridophyte that is widely spread in the evergreen forests of Kerala's western Ghats. It is a member of the Polypodiaceae family. There are reports that indigenous groups in Tamil Nadu and Kerala use the rhizome to treat a variety of illnesses, including cough and dyspepsia (Caius,2001) .

Tamil refers to Drynaria Quercifolia (Drynariaceae) as "mudavaatukkal." The rhizome soup is used as a dietary supplement and as a rheumatism treatment. This fern has a fleshy, thick, and soft rhizome that is covered in soft, reddish-brown scales. In Indian medicine, rhizomes were used as anodyne, anti-inflammatory, and to treat migraine and arthralgia.Native Indians in the Kolli Hills of India used this herb as an anti-inflammatory(Irudayaraj and Senthamarai,2004).

Drynaria Quercifolia is consumed to help strengthen and mend fractured bones. Additionally, it can be utilized to support the treatment of weak knees and loins, stress fractures, and sprains. It aids in promoting the repair of damaged ligaments, preventing osteoporosis, and increasing bone density (Brahmam and Dutta, 2002).By following this diet on a regular basis (for 48 days), those with persistent knee joint discomfort can begin to see results in two weeks. For children with rheumatism, our forefathers used to boil Drynaria Quercifolia in water, pour it over the legs, and massage the area well (for two to three months, roughly). It also addresses calcium deficiencies, relieves hip pain, and is the finest natural therapy for women's menstrual issues(Senthamarai, 2004).An essential ethnomed plant called Drynaria Quercifolia is utilized by many ethnic groups in their traditional medical systems to treat a range of illnesses. Together with other herbal combinations, Drynaria Quercifolia is used to treat lower back and ligament ailments as well as pain from traumatic injuries (Dagar,2005).Drynaria tonic has positive effects on the kidneys and liver. In addition to strengthening teeth with frequent ingestion, they can aid alleviate toothaches and bleeding gums. Additionally, it can be applied to tinnitus, an ear ailment (Sen and Ghosh, 2011).

Drynaria plants are a topical hair tonic that promotes hair growth and enhances hair quality. It has been reported that the entire Drynaria plant is effective against cough, dyspepsia, and TB *(Nayar,*

*2002).*The crushed leaves, or fronds, were used topically to areas that were inflamed. To treat headaches, the macerated paste of rhizome was applied to the forehead. The entire Drynaria plant was used to treat skin and chest conditions as an anthelmintic, expectorant, and pectoral (Kaushik and Dhiman, 2004).Thus the goal of this research is to determine the amount of anti inflammatory and anti diabetic activity in both fresh and dry *Drynaria Quercifolia*.

II MATERIALS AND METHODS

2.1 Selection and Collection of *Drynaria Quercifolia (L.)J. Sm. –Polypodiaceae*

Drynaria Quercifolia locally called as "Attukal kizhangu". The rhizome is reported to be used by tribal communities of Tamil Nadu and Kerala to cure various diseases like phthisis, dyspepsia, and cough. Scientific evidences form various research articles reported that the presence of chemical compound in the rhizome helps to cure the arthritis. Hence the Drynaria Quercifolia rhizome was selected for this study. Drynaria Quercifolia (Class Polypodiopsida, Order Polypodiales, and Family Polypodiaceae) plants were collected from the sirumalai hills, Dindigul district during September and October 2023.

The *Drynaria Quercifolia (L.)J. Sm.* –Polypodiaceae was identified and authenticated by scientist 'F' and officer incharge Dr.K.Karthigeyan, Botanical survey of India, Coimbatore and the letter no: BSI/SRC/5/23/2023/Tech-181 for *Drynaria Quercifolia (L.)J. Sm. –Polypodiaceae*

2.2Processingof Fresh and Cabinet Dried *Drynaria Quercifolia*

Plants have a short shelf life and are harvested and sold for only a short season but can benefit from the process of drying when it is surplus in its production and can be made more available throughout the year as well make it more versatile for use in different products. Collected *Drynaria quercifolia rhizome* were washed thoroughly for 2-3 times under running tap water and once with distilled water, after that it was spread in absorbent paper and kept at room temperature (25-35ºC) for 8 hours to remove any moisture on its surface.Later the skin in rhizome was separated. Cabinet dryer was used to dry the *Drynaria quercifolia rhizome.* The samples were placed in trays and the temperature was maintained at 60 ºC for 7 hours. After the heat treatment the samples were placed in room temperature, ground into fine powder and were stored in a well closed air tight container, free from environmental climatic changes till usage. The *Drynaria quercifolia rhizome* was weighed before and after drying.

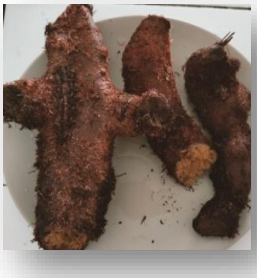

Fig2.1 Fresh *Drynaria Quercifolia* Fig 2.2 Cabinet dried *Drynaria Quercifolia Fig 2.3 Powdered Drynaria Quercifolia*

2.3 In vitro Anti-Inflammatory Activity

Heat-Induced Hemolysis

The method had been previously described by Shinde*et al*. (1999) and slightly modified and followed by Henneh*et al.* (2018). The reaction mixture (2 ml) consisted of 1.0 ml of 10% HRBC and 1 ml of various solvents plant extracts (1 mg/ml), which was added to each tube and gently mixed. The positive control consisted of 1.0 ml of HRBC and 1.0 ml of various concentrations of diclofenac sodium (10 to50 µg/ml). The negative control consisted of 1.0 ml of 10% erythrocyte suspension and 1.0 ml of normal saline alone. The experiment was performed in triplicates. The resulting solution was heated at 56° C for 30 minutes and cooled to room temperature and centrifuged at 2500 rpm for 10 minutes. The supernatant was collected and the absorbance of each solution was measured spectrophotometrically (UVmini 1240, Shimadzu) at 560 nm as an indicator of the degree of haemolysis. The percentage inhibition of hemolysis was calculated using the formula

$$\text{Percentage of inhibition} = \frac{Ac - At}{Ac} \times 100$$

Where ‘Ac’ is absorbance of control and ‘At’ is absorbance of the test.

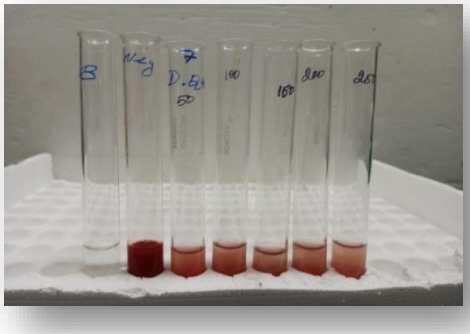
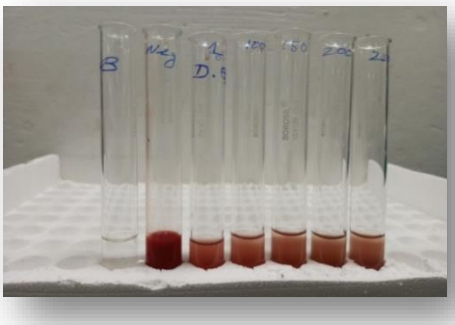

Figure 2.4 Fresh *Drynaria Quercifolia* **Figure 2.5 Cabinet dried *Drynaria Quercifolia***

2.4 In vitro anti-diabetic activity

Inhibition assay for α-amylase activity

α-amylase was premixed with extract at various concentrations (50-250 µg/mL) and starch as a substrate was added (0.5% starch solution) to start the reaction. The reaction was carried out at 37°C for 5 min and terminated by addition of 2 mL of DNS (3,5-dinitrosalicylic acid) reagent. The reaction mixture was heated for 15 min at 100°C and diluted with 10 mL of distilled water in an ice bath (Miller, 1959). α-amylase activity was determined by measuring spectrum at 540 nm. The IC_{50} value was defined as the concentration of α-amylase inhibitor to inhibit 50% of its activity under the assay conditions.

$$\text{Percentage of inhibition} = \frac{Ac - At}{Ac} \times 100$$

Where 'Ac' is absorbance of control and 'At' is absorbance of the test.

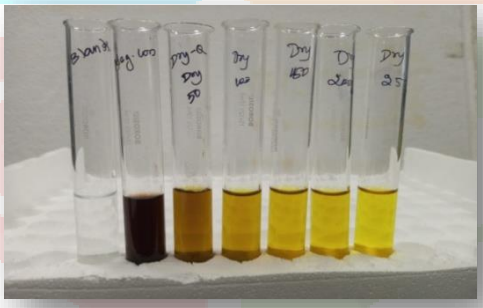

Figure 2.6 Fresh *Drynaria Quercifolia*

Figure 2.7 Cabinet dried *Drynaria Quercifolia*

III RESULT AND DISCUSSION

3.1 In vitro Anti-Inflammatory Activity

Table3.1

Heat-Induced Hemolysis ForFresh And Cabinet Dried *Drynaria Quercifolia*

EXTRACTS	% OF INHIBITION		% SCAVENGING ACTIVITY IC_{50} (µG/ML)
Drynaria Quercifolia (L.)J. Sm. –Polypodiaceae(Fresh)	50µl	35.09	**80.87**
	100µl	39.28	
	150µl	44.08	
	200µl	48.71	
	250µl	52.67	
Drynaria Quercifolia (L.)J. Sm. –Polypodiaceae(Cabinet dried)	50µl	28.05	**116.19**
	100µl	29.88	
	150µl	34.21	
	200µl	38.97	
	250µl	42.93	

The above table 3.1 shows the anti-inflammatory activity of fresh and cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae.* Inhibition assay for heat-induced hemolysis *in fresh Drynaria Quercifolia (l.)j. sm. –polypodiaceae (35.09%, 39.28%, 44.08%, 48.71%, 52.67%)* and cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae (28.05%, 29.88%, 34.21%, 38.97%, 42.93%). The total % scavenging activity of Drynaria Quercifolia (l.)j. sm. –polypodiaceae in fresh is 80.87*µG/mL and in cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae is 116.19*µG/mL.

There are many methods to estimate the anti-inflammatory action of drugs and anti-diabetic activity. The extract was effective in reducing the heat-induced hemolysis at various concentrations**.** The result showed that maximum inhibition was with aqueous extract of fresh *Drynaria Quercifolia (l.)j. sm. –polypodiaceae with 52.67% at* 250µl/mL compared to cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae with 42.93% at* 250µl/mL.

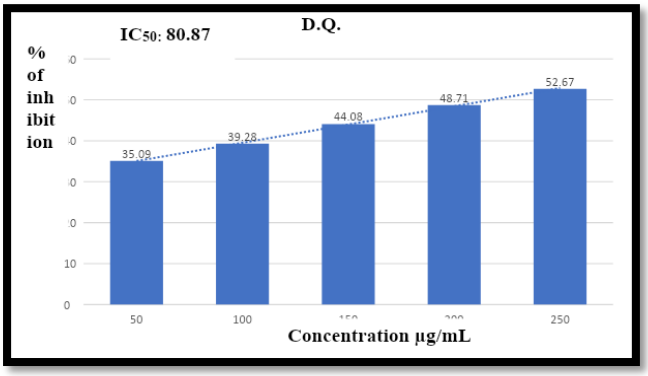

Figure 3.1 Anti- Inflammatory Activity of Fresh *Drynaria Quercifolia*

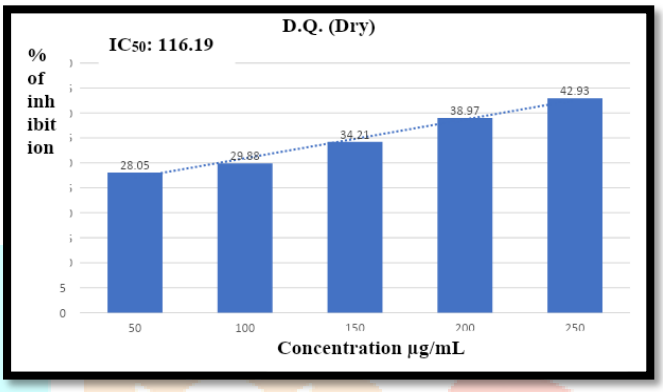

Figure 3.2 Anti- Inflammatory Activity of Cabinet dried *Drynaria Quercifolia*

3.2In Vitro Anti-Diabetic Activity

Table3.2

Inhibition Assay For α-Amylase activity of Sample

EXTRACTS	% OF INHIBITION		% SCAVENGING ACTIVITY IC_{50} (µG/ML)
Drynaria Quercifolia (L.)J. Sm. –Polypodiaceae(Fresh)	50µl	18.75	62.65
	100µl	32.56	
	150µl	42.18	
	200µl	51.45	
	250µl	64.79	
Drynaria Quercifolia (L.)J. Sm. –Polypodiaceae(Cabinet dried)	50µl	16.85	78.03
	100µl	30.53	
	150µl	38.65	
	200µl	44.82	
	250µl	54.50	

DISCUSSION

The above table 3.2 shows the anti-diabetic activity of fresh and cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae.* Inhibition assay for heat-induced hemolysis *in fresh Drynaria Quercifolia (l.)j. sm. –polypodiaceae (18.75%, 32.56%, 42.18%, 51.45%, 64.79%)* and cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae (16.85%, 30.53%, 38.65%, 44.82%, 54.50%). The total % scavenging activity of Drynaria Quercifolia (l.)j. sm. –polypodiaceae in fresh is 62.65*µG/mL and in cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae is 78.03*µG/mL.

The result showed that the anti-diabetic effectively inhibited the α-amylase enzyme activity with a maximum inhibition of fresh *Drynaria Quercifolia (l.)j. sm. –polypodiaceae with 64.79% at* 250µl/mL compared to cabinet dried *Drynaria Quercifolia (l.)j. sm. –polypodiaceae with 54.50% at* 250µl/mL.

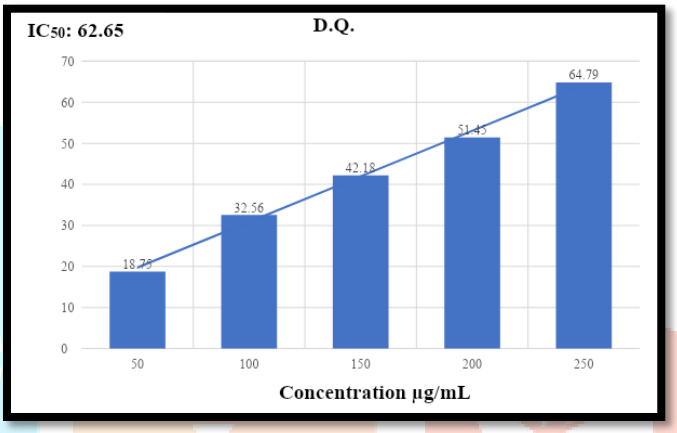

Figure 3.3Anti-Diabetic Activity of Fresh *Drynaria Quercifolia*

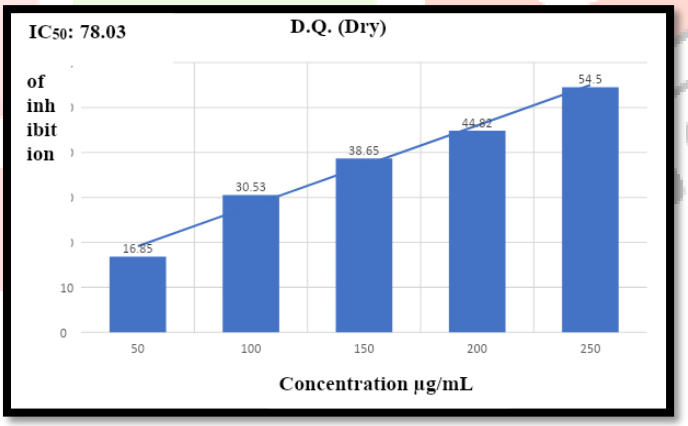

Figure 3.4 Anti-Diabetic Activity of Cabinet Dried *Drynaria Quercifolia*

IV CONCLUSION

Extract from the rhizomes of *Drynaria quercifolia* is used extensively in traditional medicine. Fresh or dried rhizome is used for hemoptysis In Bangladesh, rhizomes are also used in the treatment of excited mental disorders for calming effect and it also can reduce hair loss. It is also used as astringent and antihelminthic. Peeled rhizome is chewed or its juice mixed with sugar is taken in scanty urination and spermatorrhoea by the Marma tribe. The extract of the rhizome is taken by Chakma as a remedy for jaundice and dysentery. Leaves are used as poultices and used to treat fever, dyspepsia, and phthsis, skin diseases and cough. In Tamil, Nadu the leave of *Drynaria Quercifolia* used to treat arthritis. According to

the results of the present study, aqueous extract of cabinet dried *Drynaria Quercifolia* had the highest anti-inflammatory activity and anti-diabetic activity compared to aqueous extract of fresh *Drynaria Quercifolia.*

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