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An Overview on Turbinaria Ornata

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ABSTRACT
This paper describes the marine biosphere is the primary source that has produced excellent bioactive metabolites. Natural compounds isolated from various algae, especially brown algae, gained interest because of their wide variety of biological activities and biocompatibility. Among brown algae, *Turbinaria ornata* (*T. ornata*), a highly prevalent alga, because of the presence of bioactive substances, primarily polysaccharides and proteins, could be used for a broad range of pharmaceutical applications. Hence, this study focuses on the biological activity of *T. ornata* as reported in earlier studies, which includes antioxidant, anti-inflammatory, antidiabetic, antiproliferative, and neuroprotective effects.In order to understand the phytochemical components of the edible seaweed, *Turbinaria ornata*, it was subjected to hexanic, acetonic and methanolic extactions. The alkaloids, terpenoids, flavonoids, polyphenols and quinones were present in the hexanic extract of *T. ornata* whereas alkaloids, terpenoids and flavonoids were absent in acetonic and methanolic extracts of T. ornata. Overall, presence of five secondary bioactive components {neophytadiene; 2-hexadecen-1-ol,3,7,11,15-tetramethyl-,[R-[R*,R*-(E)]]; 17-pentatriacontene; 4,8,12,16-octadecatetraen -1- ol,4,9,13,17-tetramethyl; squalene} has been identified in *T. ornata*, of which four bioactive compounds except 4,8,12,16-octadecatetraen-1-ol,4,9,13,17-tetramethyl have been recorded in methanolic extract. Moreover, the presence of 17-pentatriacontene and squalene were unique only to methanolic extract of *T. ornata*. Further studies like isolation, purification and characterization of individual compounds are required to authentically tell their active principles. This review gives detailed information on the valuable natural resources being used as a potential component in pharmaceutical applications.

Keywords: Brown alga, bioactive compounds, , pharmacological, phytochemical, secondary metabolites, *Turbinaria ornata*

I. INTRODUCTION

Turbinaria ornata (T. ornata) is one of the main seaweeds in the marine ecosystem that has been used as a source of medicine among brown seaweeds[1]. *Turbinaria* species, such as *Turbinaria ornata* and *Turbinaria conoides*, have been extensively distributed along the coastal waters of Tamil Nadu.These brown algae belong to the family *Sargassaceae*. Therapeutic potentials of pure compounds isolated from the Genus Turbinaria are extraordinarily promising as antiproliferative, antipyretic, anti-inflammatory, immunostimulatory, anti-diabetic, anti-obesity, antiviral, antimicrobial, cardioprotective, hepatoprotective and hypolipidemic[2]. A wide range of biological properties of this seaweed, including antibacterial, anti-coagulant, anti-inflammatory and antioxidant properties, have been reported, which are used as thickening, gelling, and stabilizing agents in food and drinks, as well as in cosmetics and pharmaceutical products. Turbinaria ornate has a wide variety of health benefits and is being used for the pharmaceutical purpose because of its antioxidant, anti-inflammatory, anti-diabetic, anti-proliferative and neuroprotective effects on humans[3].

Brown seaweeds are receiving the most attention from researchers due to their biological activities. *Turbinaria ornata* (*T. ornata*) is one of the main seaweeds in the marine ecosystem that has been used as a source of medicine among brown seaweeds[4]. Several bioactive compounds with

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various pharmacological activities have been isolated from them. These pharmacological activities are caused by the presence of bioactive ingredients, and the phycochemical constituents exhibit these potentials of the seaweeds. The current study attempts to reveal a glimpse of the marine natural products, characterization of the isolated components of *T. ornata*, its phycoremediation, pharmacological activities, and finally biosynthesis of nanoparticles using natural products[5].

1. BROWN SEAWEEDS

The southwest coast of India has a diverse marine habitat of seaweeds, with brown algae being the most prevalent. The brown algae are differentiated by their colour which differs from olive green via light golden shades of brown[6]. This is due to the occurrence of a golden-brown xanthophyll pigment fucoxanthin in their chromatophores. The brown algae are brownish in colour because of the huge quantities of the carotenoid and fucoxanthin covering the residual pigment chlorophyll a and c, carotene, and other xanthophylls. The cell walls are composed of alginic acid, which was extracted as alginate or agent for industrial use. Brown algae range from smaller cords to the largest seaweed, and the majority are found in the intertidal belt. Brown seaweeds are mostly utilized to cure hypothyroidism, fatigue, cellulite, cough, asthma, stomach ailments, and headache. Brown seaweeds are also utilized to encourage weight loss besides assistance in skincare. The prospective antioxidant compounds in brown seaweeds were recognized as polyphenols and pigments mostly. These compounds are dispersed in plants or algae and are widely known for displaying antioxidant activities by reactive oxygen species (ROS) recovery activity and lipid peroxidation inhibition[7].

Brown seaweeds are found to comprise huge quantities of cell-wall polysaccharides, the major part of which are the sulfated polysaccharide and fucoidanthat are not found in terrestrial plants[8]. Fucoidan has a considerable element of L-fucose and sulfate ester groups and has an extensive assortment of pharmacological and biomedical properties[9]. There have been more than a few investigations on the diverse bioactivities, structural parameters, molecular weights, and physiological features of seaweed polysaccharides. There are various species of brown algae, and among them, *Turbinaria* species, such as *Turbinaria ornata* and *Turbinaria conoides*, have been extensively distributed along the coastal waters of Tamilnadu. *Turbinaria ornata* (Turner) J. Agardh, 1848 is a brown alga from the *Phaeophyceae* family, abundant in fucoids and polysaccharides. It is usually established in small clusters connected to the fissures of basalt rocks in great wave act regions besides the fissures of coral heads at 20-30 meters. The morphological features of this alga allow it to live under great ecological circumstances[10].

1.1 TAXONOMICAL CLASSIFICATION[11]

Kingdom	:Chromista
Subkingdom	:Harosa
Infrakingdom	:Heterokonta
Phylum	:Ochrophyta
Class	:Phaeophyceae
Subclass	:Fucophycidae
Order	:Fucales
Family	:*Sargassaceae*
Genus	:*Turbinaria*
Species	:*Turbinaria ornata*

1.2 SYNONYMS[12]

- *Fucus turbinatus var. ornata* Turner
- *Fucus turbinatus var. ornatus* Turner
- *Sargassum turbinatum var. ornatum* (Turner)

1.3 DESCRIPTION

Stiff, erect plant, 2 -20 cm tall when reproductive. Blades conical, hard, thick, with double row of stiff spines around the irregularly triangular margin of the blade when viewing from above.Holdfast bears one terete, erect portion and basal portion is conical or irregular, usually with several unbranched or dichotomously branched root-like structures growing from basal area of the erect axes.Mostly light yellowish brown to dark brown with dark brown spots[13].Plant is usually isolated or in small groups, but occasionally forms large, low mats in high intertidal. Rhizoids common in upper intertidal.

1.4 HABITAT

Very common.Found mid intertidal to at least 30 m deep[14]. Grows in a variety of habitats including rocky intertidal, tide pools, intertidal benches, reef flats and deeper water.

1.5 ECOLOGY/IMPACT

Turbinaria ornata is a very common brown alga found intertidally on Hawaiian reefs and throughout the Pacific and Indian Ocean.It is normally found in small clusters attached to the

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crevices of basalt rocks in high wave action areas as well as in the crevices of coral heads at 20-30 meters deep. The morphological characteristics of this alga enable it to survive extreme environmental conditions. The alga's tough thallus is able to withstand the high energy hydrodynamics of the intertidal environment as well as resist herbivory[15]. The strong holdfast provides a stable grasp on the substrate and is capable of recolonization if the thallus are removed. The species has also exhibited seasonal changes. The thalli of T. ornata are often scoured from the holdfast in the winter season, and the remaining viable holdfast propagates newblades.*T.ornata* successfully reproduces from either sexual reproduction or fragmentation. Fragments of the stolon and blade can attach to the substrate and initiate new plants. The pictorial representation of *Turbinaria ornata* are shown in figure 1.

Figure1: *Turbinaria ornata*

1.6 BOTANICAL DESCRIPTION

Plants erect and stiff, 2-20-(30) cm long when reproductive, usually isolated or in small groups, often rusty brown to dark brown; holdfast bearing one (or more) terete erect portion, basally a conical or irregular holdfast with several unbranched or dichotomously branched stolons, these often remaining when erect portion torn off, or appearing before erect portion formed[16]. Juvenile plants with flattened blades can form new plants, become free-floating; larger plants with several orders of branching.Blades peltate, with "petiole" and double row of stiff spines often with secondary branching from lower adaxial surface of blades; rarely irregularly triangular margin of leaves in apical view; petiole cylindrical near base, becoming triangularly compressed in distal portions; many plants with some leaves having hollow centers that function as floats. Receptacles develop into tightly branched clusters on adaxial side of leaf petiole near base, mostly cylindrical, to 1.5 cm long, with blunt apices.

1.7 MACROSCOPICAL CHARACTERS

The plant body consists of branched cylindrical axis and terminal clusters of funnel shaped expanded bodies.The surface of the plant body is smooth and even[17].

1.8 MICROSCOPICAL CHARACTERS

The axis is 1.85 mm in diameter. It consists of thin layer of small thick walled darkly stained epidermis and parenchymatous ground tissue.The outer ground tissues include fairly thick walled smaller angular cells. The central ground tissue includes circular, slightly larger thin walled cells.Funnel shaped terminal bodies have thick cylindrical stalk and widely expanded circular flat funnel.The stalk portion is similar to the stem. The marginal portion of the funnel appears cylindrical while the terminal part is wide and semicircular. It is 950 µm thick. It has a small angular thick walled epidermal layer and thin walled sub epidermal layers. The ground parenchymatous cells are wide, angular thick walled and compact[18].

II. PHYTOCHEMICAL CHARACTERIZATION OF THE MARINE BROWN ALGA TURBINARIA ORNATA

Seaweeds are able to biosynthesize secondary metabolites that can mediate a broad range of intra and inter specific ecological interactions between organisms including chemical defenses. The components reported to be found are sterols (some are fucosterol), different molecules containing vinyl and ethyl cholesterol types, cyclohexane and some sulfated polysaccharides fucoidan, neutral glucan and guluronic and mannuronic acid residues containing alginic acid providing a medicinal value for the brown and red algae[19]. There are several studies revealing the medicinal value of marine algae, they have antitumorals, anticoagulant, antifouling, antioxidant and antimicrobial activities. In this line, the present work dealt with the profiles of the primary and secondary phytochemicals of *T. ornata*.

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Table 1: Phytochemical analysis of Turbinaria ornata extract in different solvents.

Sl No	Phytochemicals	Aqueous	Ethanol	Methanol
1	Carbohydrates	-	-	+
2	Alkaloids	+	-	+
3	Saponins	-	-	+
4	Phenolic Compounds	-	+	+
5	Flavonoids	-	+	+
6	Tannins	-	+	+
7	Coumarins	-	+	+
8	Proteins	-	-	-
9	Steroids	-	+	+
10	Anthroquinones	-	-	-
11	Terpenoids	-	+	+

+ ; presence - ;absence

2.1 QUALITATIVE ANALYSIS OF PHYTOCHEMICALS

Each solvent extract was subjected to primary phytochemical analysis such as presence of alkaloids, terpenoids, flavonoids, tannins, polyphenols, saponins, cardiac glycosides and quinones by adopting the standard qualitative procedures[20].

Methanolic extract of *T. ornata* contained 5 primary compounds such as tannins, polyphenols, saponins, cardiac glycosides and quinones of which polyphenols, saponins and quinones were luxuriantly present. Tannins and cardiac glycosides were moderately present[21].

The hexanic extract of *T. ornata* showed presence of 5 primary compounds such as alkaloids, terpenoids, flavonoids, polyphenols and quinones of which alkaloids were luxuriantly present. Polyphenols and quinones were moderately present. The others such as terpenoids and flavonoids were poorly present. Acetonic extract of *T. ornata* showed presence of 5 compounds of which quinones were luxuriantly present. Polyphenols, saponins and cardiac glycosides were moderately present. The other compound such as cardiac glycosides was poorly present.

The presence of steroids, alkaloids, phenolics, flavonoids, saponins, carbohydrates, coumarines, xanthoproteins and tannins is reported in *T. ornata*. Alkaloids are reported to be biologically and therapeutically active (e.g. morphine, atropine and quinine) and have numerous medical applications13. In the present study, alkaloids were luxuriantly present in hexanic extract of *T. ornata*[21].

Terpenoids are reported to be useful in the prevention and therapy of several diseases including cancer. Terpenoids are also known to possess antimicrobial, antifungal, antiparasitic, anti-viral, anti-allergenic, anti-spasmodic, antihyperglycemic, anti-inflammatory and immunomodulatory properties. In the present study, terpenoids are poorly present in hexanic extract of *T. ornata*[22]. Flavonoids are reported to possess antioxidant, free radical scavenger, antileukemic, vasodilator and antibacterial properties and are reported to be useful for improving blood circulation in brain of Alzheimeric patients. In the present study, poor presence of flavonoids was observed in hexanic extract of *T. ornata*.

Tannins are used in medicine as mild antiseptics in treatment of diarrhea and to check small hemorrhages. In the present study, acetonic extract showed poor presence of tannins and moderately presence in methanolic extract of *T. ornata*. Phenols are structural and allelopathic components which are associated with diverse functions including activation of enzymes, nutrient uptake, protein synthesis and photosynthesis[23].

In the present study, moderate to luxuriant presence of polyphenols was detected in all the three solvents extracts of *T. ornata*. Saponins have a wide range of medicinal properties including hypo-cholesterolemic, anticarcinogenic, anti-inflammatory, anti-microbial and antioxidant. In the present study, moderate to luxuriant presence of saponins was seen in *T. ornata* extract of which moderately present in acetonic and luxuriantly present in methanolic extracts was recoded. The cardiac glycosides are basically steroids with an inherent ability to afford a very specific and powerful action mainly on the cardiac muscle when

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administered through injection into man or animal. Cardiac glycosides and catecchloamine are agents of choice in treatment of congestive cardiac failure (CCF). In the present study, moderate presence of cardiac glycosides was detected in acetonic and methanolic extracts of

T. ornata. Quinones are compounds very much used in pharmacopoeia in the treatment of malaria and more recently of tumours. They are having good source of anti- inflammatory, antibacterial and immunomodulating potentials. In the present study, in *T. ornata* moderate to luxuriant presence of quinones was detected in all the three solvents extracts of which hexanic extract showed moderate presence and acetonic and methanolic extracts showed luxuriant presence[24].

Table 2: The primary phytochemicals present in *T.ornata* extracted with different solvents

SL No	Phytochemicals	Hexane (non polar)	Acetone (middle polar)	Methanol(polar)
1	Alkaloids	+++	--	--
2	Terpenoids	+	--	--
3	Flavonoids	+	--	--
4	Tannins	--	+	++
5	Polyphenols	++	++	+++
6	Saponins	--	++	+++
7	Cardiac glycosides	--	++	++
8	Quinones	++	+++	+++

+,Poor presence ; ++, Moderate presence; +++, Luxuriant presence ; -- Absence

2.2 SECONDARY PHYTOCONSTITUENTS OF *T. ORNATA*

Methanolic extract of *T. ornata*, it contains 5 different secondary compounds {Ethyl [3-methyl-3- (pentamethyldisilanyl) cyclohexylidene] acetate; Neophytadiene; 2-Hexadecen-1-ol,3,7,11,15-tetramethyl-, [R-[R*, R*-(E)]]; 17-Pentatriacontene; Squalene} of which 4 compounds are having bioactive principles except Ethyl [3-methyl-3-(pentamethyldisilanyl) cyclohexylidene] acetate.

Acetonic extract of T. ornata showed presence of 4 different secondary compounds {Neophytadiene; Docosanoic acid,13-[2,3,4,6-tetrakis-O-(trimethylsilyl)-D glucopyranosyl]oxy]; Methanesulfonic acid 2-(3-hydroxy-4,4,10,13,14-pentamethyl 2,3,4,5,6,7,10,11,12,13,14,15,16,17-tradecahy dro-1H-cyclopenta[a]phenanthryl);4,8,12,16-Octadecatetra en-1- ol, 4,9,13,17-tetramethyl}, of which 2 compounds {Neophytadiene; 4,8,12,16-Octadecatetraen-1-ol, 4,9,13,17- tetramethyl} having biological properties.

Therefore, *T. ornata* contains overall presence of 9 different secondary compounds {Ethyl [3-methyl-3-(pentamethyldisilanyl) cyclohexylidene] acetate; Neophytadiene; Docosanoic acid,13-[2,3,4,6-tetrakis-O-(trimethylsilyl)-D glucopyranosyl]oxy]; 2-Hexadecen-1-ol,3,7,11,15-tetra methyl-,[R-[R*,R*-(E)]]; 17-Pentatriacontene; Methanesulfonic acid 2-(3-hydroxy-4,4,10,13,14-pentamethyl 2,3,4, 5,6,7,10,11,12,13,14,15,16, 17-tradecahydro-1H-cyclopenta [a] phenanthryl); 2,2,4-Trimethyl-3-(3,8,12,16-tetramethylheptadeca-3,7,11,15-tetraenyl)-cyclohexanol;4,8,12,16-Octadecatetraen-1-ol,4,9,13,17-tetramethyl; Squalene}, of which 5 compounds {Neophytadiene; 2-Hexadecen-1- ol,3,7,11,15-tetramethyl-, [R-[R*,R*-(E)]]; 17-Penta triacontene; 4,8,12,16-Octadecatetraen-1-ol,4,9,13,17-tetra methyl; Squalene} are having bioactive properties[25].

III. Uses of T.Ornata

Turbinaria ornata has a wide variety of health benefits and is being researched for pharmaceutical purposes because of its antioxidant, anti-inflammatory, antidiabetic, antiproliferative, and neuroprotective effects on humans. *Turbinaria ornata* has the proper compounds to be used as a potential source for reducing postprandial hyperglycemia in humans making it an alternative therapeutic approach in treating diabetes. *Turbinaria ornata* can be grown and used as a natural alternative wastewater treatment that would reduce untreated dangerous chemicals from being dumped into land and water bodies. Compounds found in *T. ornata* can also be used to restore land and bodies of water that were

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previously contaminated by toxic and environmentally destructive chemicals[26].

Human Uses:
Pharmaceutical Potential: Turbinaria ornata is being researched for its health benefits. It has antioxidant, anti-inflammatory, antidiabetic, antiproliferative, and neuroprotective effects. Compounds from *T. ornata* could potentially help reduce postprandial hyperglycemia in diabetes treatment[27].
Wastewater Treatment: It can be grown and used as a natural alternative for wastewater treatment, reducing the release of dangerous chemicals into land and water bodies[28].
Environmental Restoration: Compounds found in T. ornata can help restore previously contaminated land and water[29].
Culinary and Cultural Significance:
Indonesia: Young Turbinaria ornata thalli are consumed fresh, salted, or with curry sauce[30].
Samoa: Used as a stir-fry ingredient.
Animal Feed: Brown algae like Turbinaria are used in animal feed for nutritional supplements and growth improvement[31].
Other uses :
Habitat for Marine Life: Turbinaria ornata provides a habitat for various marine organisms, offering shelter and protection[32].
Biodiversity Support: The intricate branches of this coral create complex microhabitats, promoting biodiversity by attracting and sustaining different species of marine life[33].
Coral Reef Structure: Along with other coral species, Turbinaria ornata contributes to the overall structure of coral reefs, providing the foundation for the diverse ecosystem they support[34].
Food Source: Some organisms, such as certain species of fish and invertebrates, may feed on the coral or the algae associated with it.
Calcium Carbonate Production: Like other corals, Turbinaria ornata plays a role in calcium carbonate deposition, contributing to the growth and maintenance of coral reefs.It's important to note that coral species, including Turbinaria ornata, are vulnerable to environmental stressors such as climate change, ocean acidification, and pollution. Conservation efforts are crucial to protect these ecosystems and the services they provide[35].

IV. PHARMACOLOGICAL ACTIVITIES OF *T. ORNATA*

The solvent and aqueous extracts of *T. ornata*, which contain phytoconstituents, will exhibit pharmacological activities as in Figure 2.

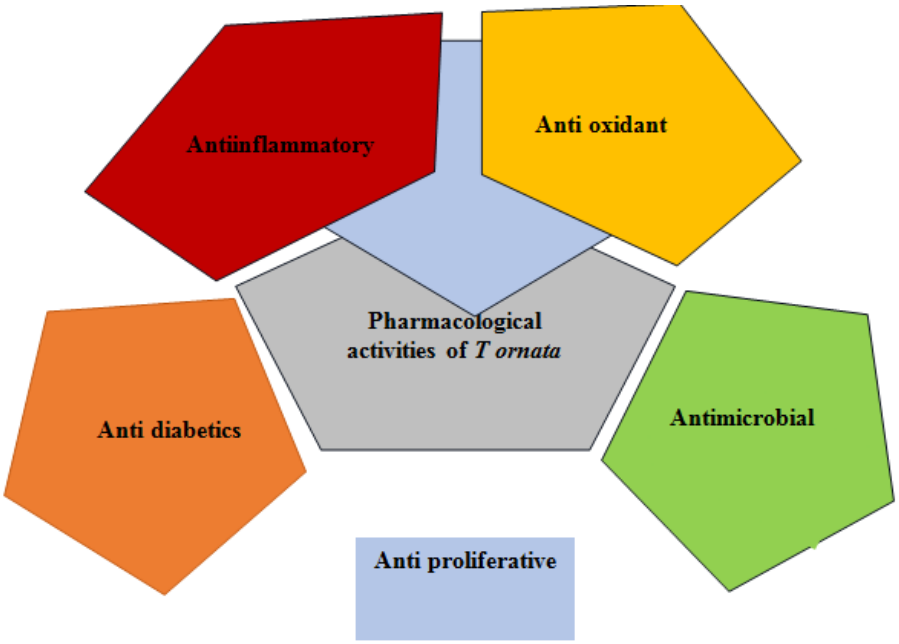

Figure 2: Pharmacological activities of T. Ornata

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4.1 Antioxidant Activities[36]

The methanol extract of T. ornata (TOME) was examined for its in vitro total antioxidant activity, DPPH scavenging assay, nitric oxide, reducing power assay, and hydrogen peroxide and superoxide scavenging assays. The antihemolysis and anti-inflammatory activities in the red blood cell model were done by collecting the blood from hale and hearty helpers of 22-25 ages. The result showed that T. ornata is affluent in bioactive compounds. TOME contains alkaloids, carbohydrates, phenolic compounds, saponins, tannins, flavonoids, coumarins, terpenoids, and steroids. TOME at 100 µg concentrations displays 89.11% of overall total antioxidant properties.

4.2 Anti-Inflammatory Activities[37]

There have been very few studies that show *T. ornata* has anti-inflammatory properties. The induced cotton granuloma in rats was investigated to assess the anti-inflammatory activity of the aqueous *T. ornata* extract (ATO) which was associated with dexamethasone, a normal anti-inflammatory drug. Plasma markers (LDH, GPT, and CRP), granuloma weight, and haematological parameters were assessed. Moreover, oxidative stress marker levels (GPx, GSH, SOD, Nitrite, and LPO) and inflammatory markers (MPO and Cathepsin D) in the liver tissue have been analysed. The ATO significantly reduced the scope of inflammatory and biochemical markers compared with vehicle-treated rats.*T. ornata* methanolic extract concentrations improved human RBC membrane stability; the higher concentration level at 500 g/ml exhibits approximately 81% anti-inflammatory activity, which is comparable to standard Diclofenac.

4.3 Antimicrobial Activities[38]

The antibacterial activities of methanolic extracts of brown seaweeds such as *T. ornata* and *Sargassum wightii* were studied. The antibacterial activities were tested against numerous Gram-positive and Gram-negative humanoid pathogenic microorganisms. This activity is owing to the presence of polyphenols, and these phenolic compounds affect the growth and metabolism of bacteria according to their composition, and the dose results recommend the use of methanol extracts of *T. ornata* as a good source of the antimicrobial agent.The antimicrobial activities of different extracts of *T. ornata* were verified contrary to twenty-three microorganisms, comprising Gram-positive and Gram-negative bacteria, fungi, and yeasts. The disc diffusion technique was tracked by altering the Resazurin Microtitre Assay (REMA). The outcomes attained from altered REMA utilizing both techniques of fluorometric and colorimetric were related. The highest antimicrobial properties were reported in dichloromethane extract for disc diffusion assay.

4.4 Antidiabetic Activities[39]

The extracts of *T. ornata* for their antidiabetic activity of enzyme inhibitory assays (dipeptidyl peptidase-IV α-amylase and β-glucosidase) were evaluated. Of all the verified extracts, acetone and methanol extract exhibited important inhibitory properties on dipeptidyl peptidase-4 (55.2 g/mL), α-amylase (IC50 250.9 g/mL), and β-glucosidase (535.6 g/ mL) correspondingly. The free radical scavenging activity of these extracts was analysed by DPPH assay (65%). Extracts were analysed for in vitro toxicity by DNA fragmentation, hemolytic, and MTT assay. GC-MS analysis of lead extracts exhibited the occurrence of the main compounds, 1-heptacosanol and hentriacontane, z,z-6,28- 6 Journal of Nanomaterials heptatriactontadien-2-one, and 8-heptadecene. T. ornata could also be utilized as a prospective basis for further in vivo studies in monitoring hyperglycemia.

4.5 Antiproliferative Activities[40]

The range of antiproliferative efficacy (mg/mL) of hexane extract and water extract for cells such as A549 and Vero was 62.91 and 93.00 and 72.64 and 106.6 [56]. T. ornata boiled and normal water extract decreased tumor cell viability to 68.9% and 81.8%, respectively. Oleic acid and palmitic acid were extracted with 100 g organic solvents of T. ornata air-dried powder. Various concentrations of these acids showed antitumor activity against the carcinogenic cells of Ehrlich ascites. In addition, their study indicated that palmitic acid had higher anticancer activity than oleic acid. The effects of aqueous T. ornataextract, oleic acid, and palmitic acid on tumor cells in vitro have been shown to depend on time and dose.

V. CONCLUSION

Turbinaria ornata (T. ornata) is one of the main seaweeds in the marine ecosystem that has been used as a source of medicine among brown seaweeds. These brown algae belong to the family *Sargassaceae*. Therapeutic potentials of pure compounds isolated from the Genus *Turbinaria* are extraordinarily promising as antiproliferative,

antipyretic, anti-inflammatory, immunostimulatory, anti-diabetic, anti-obesity, antiviral, antimicrobial, cardioprotective, hepatoprotective and hypolipidemic.*Turbinaria ornate* has a wide variety of health benefits and is being used for the pharmaceutical purpose because of its antioxidant, anti-inflammatory, anti-diabetic, anti-proliferative and neuroprotective effects on humanspresent study suggested that T. ornata has significant amount of primary and secondary phytochemical constituents. Further, it is suggested for isolation, purification and characterization of individual bioactive compounds from T. ornata to study their unique active principles.hytochemical screening for *T. ornata* in recent years has been successful in the extraction and isolation of several compounds. Bioactive compounds are considered to be the major constituents of *T. ornata* that exhibit numerous pharmacological effects, including antioxidant, anti-inflammatory, and anticancer potentials. These seaweeds are distributed widely and have adapted to a wide range of environmental conditions. This has allowed it to develop a wide range of resistance to environmental conditions, and this advantage caused considerable use of algae in contaminating bioremediation, resulting in water treatment that included the processing of useful biomass.

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