ALGAPPA UNIVERSITY

(A state University Established in 1985)

Karaikudi – 630 003, Tamil Nadu, India

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Department of Fisheries Science

Newsletter

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Department of Fisheries Science

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Alagappa University, Karaikudi – 630 003, Tamil Nadu

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Department Profile

About the Department

The Department of Fisheries Science was established in 2018 with the primary objective of cultivating proficient and skilled professionals in the fields of Fisheries and Aquaculture, including inland and marine segments. Prof. C. Govindasamy was the first Head of the Department and retired in June 2020. After him, Prof. E. Kannapiran successfully serving as the Head of the Department. It is steadfast in its commitment to provide excellent Postgraduate programmes. Operating under the Choice-Based Credit System, the department offers a Master of Science in Fisheries Science Programme, accommodating a capacity of 20 students. It maintains the aquarium and fish tanks in the entire University campus which provide therapeutic effects as it lowers blood pressure, reduces stress and has a calming effect on people. It maintains percolation tank for the culture of freshwater fishes.

Programs Offered

- M.Sc. Fisheries Science (Two year)

Faculty Members

S. No	Name	Designation
1	Dr. E. Kannapiran	Professor & Head i/c
2	Dr. R. Srinivasan	Adjunct Faculty
3	Dr. R. Kumar	Adjunct Faculty
4	Dr. A. Veeruraj	Adjunct Faculty
5	Dr. N. Padmini	Adjunct Faculty
6	Dr. P. Marimuthu	Adjunct Faculty

“Teach all men to fish, but first teach all men to be fair. Take less, give more. Give more of yourself, take less from the world. Nobody owes you anything, you owe the world everything.”

— Suzy Kassem

Field Visits

Field visits were conducted for the students of MSc Fisheries Science to facilitate experimental learning and practical knowledge under the supervision of Dr. R. Kumar, Dr. N. Padmini, Dr. P. Marimuthu, Adjunct Faculties in the Department of Fisheries Science, Alagappa University, Karaikudi and Dr. K. Kannan, Assistant Professor, Department of Zoology, Kongunadu Arts and Science College, Coimbatore, Tamil Nadu.

Karaikudi fish market

An educational excursion was organized at Karaikudi fish market by the Department of Fisheries science, Alagappa University on 3rd December, 2021 for M.Sc. 1st and 2nd year students to educate the students with the information about commercially valuable fish and shrimp species in Karaikudi region and the socio-economic scenario of the sellers too. They were actively engaged in the learning process, demonstrating a keen interest and eagerness to acquire new knowledge.

Socioeconomic status of fishermen in Karaikudi, Tamil Nadu

Department of Fisheries Science, Alagappa University organized an individual survey for the students of 1st and 2nd year to the Karaikudi fish market to be acquainted about the socio-economic status of fishermen on 14th May, 2022. The main motive of this survey was to interact with the fishermen and know about the socio-economic status of the fishermen and to understand the occupational patterns and allied occupational hazards. Through this survey students got a basic idea about the types of data and the techniques of collecting data. The interaction between individual students with each fisherman was done according to the questionnaire method which was prepared before the commencement of the survey and the analysis of data acquired, gave a clear idea about the personal and socio economical attributes like family size, age, caste, social participation, educational status, experience in fish farming, income-expenditure pattern etc. They perceived the importance of international forum to establish the protection of the fishermen engaged in catching fish overseas and the regional organization working on the welfare activities of fishermen should come forward to offer joint support to the bottom level workers.

P.V.R. Koi Center, Pudukottai, Tamil Nadu

For industrial exposure, students of M.Sc. (Fisheries Science) 1st and 2nd year visited P.V.R Koi Centre, Permanadu in Pudukottai district on 12th December, 2021. In this farm, assembly of various culture systems like L. vannamei culture, GIFT Tilapia culture in biofloc, raceway aquaculture system (RAS) and multi business like bricks are done along with koi culture with major priority. Students learnt everything about culture, breeding and marketing of Koi carp (Cyprinus carpio) locally known as 'Nishikigoi'. Starting from 2011 this koi farm has been developing with lands of about 2 hectares comprising 10 mud ponds and 10 concrete ponds to manage and supervise large area fish farm for research and development. Students were privileged to get clear idea about the cost analysis of a farm setup which will be beneficial for their future plan. They also learnt the safety and sanitation protocol and their significance in fish farm. All the teaching faculties accompanied the students during the industrial visit and thanked them to provide an opportunity to the students for the industrial visit.

Koi fishes in P.V.R. Koi Center, Pudukottai

Koi carp farm

PVR Sekaran explaining the Koi fish farming to the students

Koi fish pond

L. vannamei farming in recirculating raceway system

Visit to P.V.R. Koi Center, Pudukottai, Tamil Nadu

Tharun Aqua Shrimp Farm, Karankadu, Tamil Nadu

Department of Fisheries Science, Alagappa University organized an excursion to Shrimp farm at Chitturvadi and Karankadu mangrove on 19th December, 2021 to illuminate the theory into practical knowledge through which students are benefited. All the students of 1st and 2nd year, observed the method of pond construction, topographic condition, water supply management system, culture technique and feeding strategy for *Litopenaeus vannamei* in that farm. They also learn about the important biological features like morphology, life cycle of *L. vannamei* and hygiene, sanitation practices which play a very important role in running a farm to avoid any loss.

Visit to Tharun Aqua Shrimp Farm, Karankadu

Karankadu Mangrove

The Karankadu mangrove forest is situated in Ramanathapuram district, Tamil Nadu falling under the Gulf of Mannar Marine National Park. This is a human-made mangrove forest and is important to the surrounding ecosystem. This area is present between Ramanad–Thondi East Coast Road. At Karankadu mangrove (Lat 9º36´ N, Lon 78º 83´ E), students observed the dominant species of mangrove plants like *Avicennia marina*, *Rhizophora mucronata*. Most importantly they observed the rich biodiversity over there with fish, bivalves, crustaceans, birds, snakes. They learnt about the mangrove forest and it's both aquatic and terrestrial flora and fauna at coastal areas and moreover their importance in maintaining the environment, where they were guided by all faculty members. Dr. R. Kumar explained the adaptations of the mangrove plants and different types of mangroves.

Forest Department has been running a community-based eco-tourism project in Karankadu. Safety precautions were put in place and those involved in boating were strictly urged to wear lifejackets. The boating covers a distance of about two to three kilometers through the sea with mangrove colonies. The forest department arranged boat ride into the mangroves and into the sea.

Visit to Karankadu Mangrove

Boat ride in Karankadu mangrove

Planting of mangroves

Dr. R. Srinivasan explaining the making of fishing net

Fish are smart and can learn

- Fish will avoid situations they know to cause them pain
- Fish will seek out experiences with rewards.
- Fish can also learn how to use tools.
- Many fishes use rocks to crack open bivalves such as clams, oysters and mussels for food.
- The archerfish specifically displays incredible intelligence. With incredible aim, archerfish can shoot powerful jets of water out of their mouths to knock down insects flying above them. They learn this by watching and copying other archerfish – learning the correct volume based on target size.

Landing Centre, Mandapam, Tamil Nadu

1st and 2nd year students of dept. of Fisheries Science, Alagappa University visited Mandapam landing Centre (Latitude 9º16´14´´ N, Longitude 79º 7´10´´ E) on 27th March, 2022. Institution arranged this educational tour to enrich the students with clear overview on the distribution and diversity of various finfish and shell fish in south-east coastal region of India, where they got accompany of Dr. K. Kannan, guest faculty member and taxonomist with his able guidance. They also got the chance to enhance their knowledge about fishing crafts and gears used to catch marine organisms including seaweed.

All students collected data from the fisherman about some important aspects like daily catch, amount of bycatch, commonly used fishing gear and craft, closed season etc in questionnaire method which was prepared beforehand. Additionally, they learnt about the mechanism of some navigating gadgets like GPS, SONAR and the fishing experience of a fisherman during voyage. All the fishermen were very cooperative to the students in collecting data regarding the government subsidiary in aquaculture to the fishermen. They gave the detailed information about the techniques of fish preservation, storage and transportation to market. Communication between student and fisherman made that tour informative and valuable to them.

Aquagri Processing Private Limited, Manamadurai

Department of Fisheries Science, Alagappa University organized an industrial visit at AquaAgri Processing Pvt. Ltd (APPL) a seaweed processing facility, Manamadurai for al 1st and 2nd year students on 22nd April, 2022. The prime objective of the institution was to make student acquit with industrial exposures along with proper practical knowledge on that respective field. The industry provided a package of information regarding the importance and use of seaweed in everyday life, agriculture and food processing along with the practical field experience of seaweed processing as they also provide necessary training which extends technical knowhow to the students. Students learnt the processing technique of seaweed mainly from red macro algae, *Kappaphycus alvarezii* and uses of their extract carrageenan in agriculture as fertilizer (certified by ISO22000). They also came to know about the contribution of this company behind making all the efforts to improve the status of coastal communities by creating entrepreneurs. Students were also provided with the opportunity to visit 4 different laboratories there viz., analytical lab, quality control lab, quality assurance lab and R & D Food ad Agri Division. Throughout the visit, the students were accompanied by the faculty members of the department to help the students to understand everything very easily.

ARTICLES

ORNAMENTAL AQUACULTURE

Dr. R. Srinivasan

Adjunct Faculty, Department of Fisheries Science

Introduction to Aquarium

Ornamental fish production is one of the significant sectors of aquaculture in which the culture of attractive, colour fish in the confined aquatic systems. It is also called as "living jewels". Ornamental fish keeping in aquariums is the second most popular hobby, next to photography. Ornamental fish provide aesthetic pleasure and entertainment, relieve stress, and have a soothing effect on the human mind. The ever-increasing demand for aquarium fish gradually paved the way for the emergence of a global trade for ornamental fish. There are more than 130 countries involved in the ornamental fish trade, and there are about 1,800 species of ornamental fish on the market, of which over 1000 varieties are of freshwater origin. 90% of the freshwater fish are farmed, while 10% are collected from the wild.

Around 200 million ornamental fish are sold every year, of which 80% are freshwater and 20% are marine. In freshwater, 90% are captive-bred, and in marine, 99% are wild-caught. India is endowed with a rich biodiversity of 400 marine and 375 freshwater native ornamental fishes. In India, most of the ornamental fish are exporting to Japan, Singapore, and the United States. Moreover, India is the one of the largest exporter in the world. About 90% of native ornamental species are collected and reared to meet export demand. Presently, about 100% native fish species have been earmarked as aquarium fish. Kolkata, Mumbai, and Chennai are major exporting centers. About 90% of our exports mainly from Kolkata, followed by 8% from Mumbai and 2% from Chennai. Around 4000 people are involved in this trade, including breeding, live feed collection, trading, and exporting.

India is culturing the ornamental fishes only because of rich fish diversity, suitable climate, and lower labour cost. In particular, the following states such as West Bengal, Tamil Nadu, and Kerala are the major places involved in ornamental fish farming. Two categories of ornamental fish are being marketed in India: exotic and native. The exotic varieties *Osteoglossum bicirrhosum* (Arowana), *Astronotus ocellatus* (Oscar), *Betta splendens* (Fighting fish), *Cyprinus rubrofuscus* (Koi carp), *Heros severus* (Golden severum), *Monodactylus argenteus* (Silver moony),

Carassius auratus (Gold fish) have been marketed 99% domestically. Already, 288 exotic varieties have been recorded in the Indian market. More than 200 species of these freshwater fish are breed in different parts of India. Most native ornamental fishes are exported *Haludaria pradhani* (Melon barb), *Pethia setnai* (Narayan Barb) *Danio rerio* (Zebra Danio), *Channa marulius* (Great snakehead) *Xenentodon cancila* (Freshwater garfish), *Glyptothorax lonah* (Mountain catfish).

Freshwater ornamental fish resources in India

The Western Ghats of India is one of the biodiversity 'hotspot' of the world. In Western Ghats, approximately 300 freshwater fish species are recorded. In that 155 species are considered ornamental fishes. Among them about 117 species are comes under the category of endemic. Rivers of northeastern states and their Himalayan streams have an abundant variety of ornamental fish species. Available varieties in the Western Ghats are Barbs, Rasboras, Killifishes, Glass fishes, Catfishes, Catopra, Hill trouts, and Danios. These species are suitable for the trading.

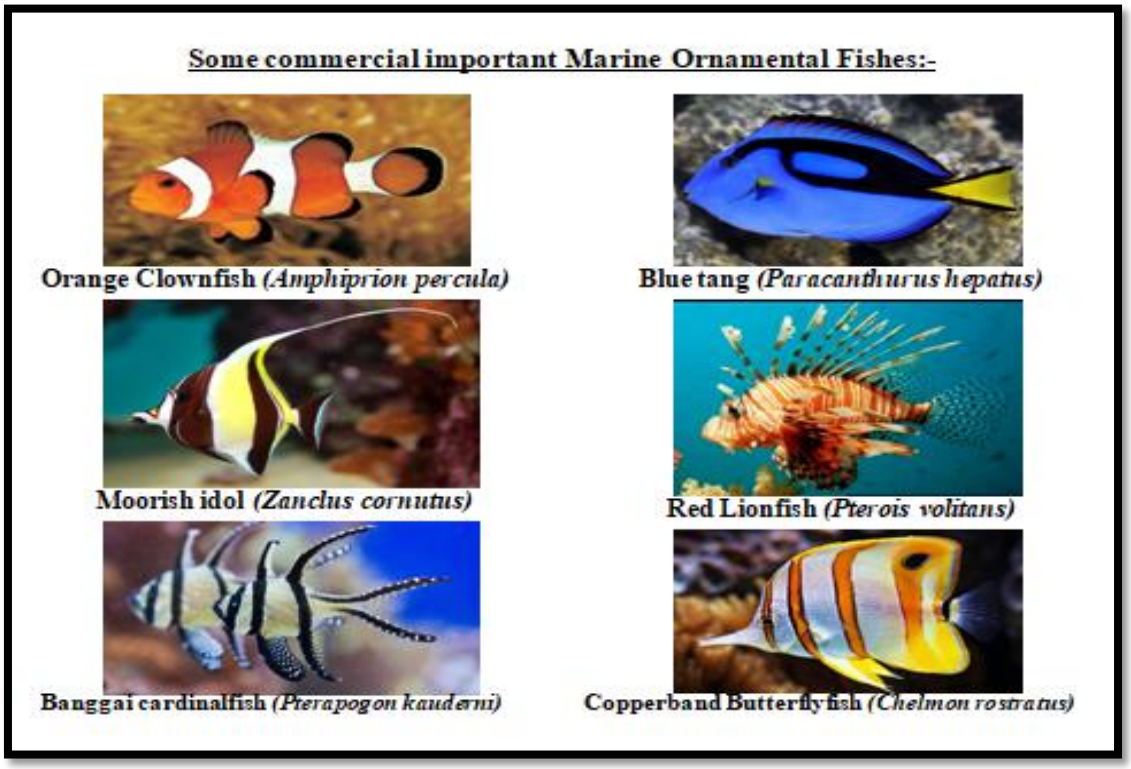
Freshwater Ornamental Fishes

Marine Ornamental fish resources in India

Marine ornamental fish get a much higher price per unit than their freshwater counterparts. India possesses rich marine ornamental fishes in the lagoons and coral reefs of Lakshadweep, Minicoy Islands Andaman and Nicobar Islands, Gulf of Kutch, Coast of Kerala, Gulf of Mannar, and Palk Bay.

In the Gulf of Mannar, a total of 113 marine ornamental finfish species recorded less than 24 families. Andaman and Nicobar Islands contribute 150 Marine Ornamental fish species and Lakshadweep islands contribute marine ornamental fish 300 species. CMFRI hatcheries have resulted in the development of hatchery technology for more than 20 species and crossbreeds of marine ornamental fishes, *Percula clown, Tomato clown, Skunk clown, Maroon clown, Percula crossbreds, Picasso platinum, Snowflake, Oellaris crossbreds Black ocellaris* and *damsels.* CMFRI has developed hatchery technology for 14 species of marine ornamental fish species including 5 Clown fish species, 8 damsel fish species, and 1 Dotty back fish.

Most commercial facilities producing marine ornamental fish are near the ocean for access to salt water. Intensive culture in recalculating aquaculture systems is most often used to allow complete control over water parameters, conserve water usage, and maximize production. Facilities normally produce numerous varieties of clownfish, a staple species, alongside additional species from several families.



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Weight–length Relationships and Fulton's Condition Factors of Ten Commercially Important Scombridae Fish Species in Southeast Coast of India, Bay of Bengal

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Abstract
The aim of the present study was to assess the length–weight relationship and condition factor of ten fish species belonging to Scombridae family. Samples of the each species caught by using multiple types of gear like drift gill net, long line, gill nets and commercial trawls were collected from July 2018 to January 2020. Mainly, drift gill net (mesh size: 120- 140 mm) of 50 m length and 6–8 m breadth by multiday fishing trip lasts for 5 to 6 days and trawlers with a cod-end mesh size of 25–35 mm in single day fishing operated at a depth ranging from 20 and 300 m were used. Among the ten species, five species (i.e. *Auxis thazard*, *Auxis rochei*, *Acanthocybium solandri*, *Thunnus albacares* and *Euthynnus affinis*) showed isometric growth. Growth results of four species (i.e. *Katsuwonus pelamis*, *Rastrelliger kanagurta*, *Scomberomorus commerson* and *Sarda orientalis*) indicate positive allometric growth and one species, *Thunnus tonggol* showed negative allometric growth. The calculated Fulton's condition factor value ranged from 1.145 to 1.722 indicating a very healthy condition of the fishes. The results revealed intercept slope 'b' value range as 3.271 to 2.2581 with r^2 value of 0.959–0.993. The present study has contributed the additional knowledge of fish population of Scombrideae, which could assist fishery management scientists in carrying out future ecological conservative strategies for restoration and management.

Keywords Condition factor · Isometric growth · Length–weight relationship · Scombridae fish · Southeast coast of India

Introduction

The length—weight relationships (LWRs) and condition factors are necessary data for assessing the population stock, biomass and age of fishes (Froese 2006). The LWRs in fishes is often defined by an exponential function $W = aL^b$, where W is the weight of the fish, L is the length of the fish and 'a' and 'b' are constants. The growth of fish is isometric when b = 3. It may vary depending on numerous factors such as sex, gonad maturity, annual differences in environmental conditions, food availability, season, fishing gears and size of the samples (Le Cren 1951; Mozsar et al. 2015). Generally, the condition factor show the health (physiological condition and yield) of the fish populations and also reflects the lipid content and growth rates which are influenced by biotic and abiotic factors (Barnham and Baxter 1998; Blackweel et al. 2000; Richter 2007).

Scombridae (Perciformes) is one of the largest and most economically important fish families because of their high economic value and extensive international trade. It covers 54 species belonging to the 15 genera including tunas, mackerels and seer fishes (Collette and Nauen 1983; Fricke et al. 2020). Their sustainable management is subject to great challenges owing to their highly migratory and often straddling distributions. Total global landings of marine fishes are 79.3 million tonnes in 2016 and Scombridae family is one of the major contributor and its demand ever increasing which resulted in increasing commercial catches of costal

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Rare earth (RE: La and Ce) elements doped $ZnWO_4$ nanoparticles for enhanced photocatalytic removal of methylene blue dye from aquatic environment

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ABSTRACT

In the present study, the enhanced photocatalytic behaviour of La:$ZnWO_4$ and Ce:$ZnWO_4$ nanoparticles produced by a simple co-precipitation technique is reported. The X-ray diffraction study suggested that La and Ce ions are harmoniously incorporated into the Zn^{2+} sites or interstitial sites within the $ZnWO_4$ lattice without altering the monoclinic wolframite phase. The field emission scanning electron microscopic study showed the formation of spherical particles and nanorod-like morphology for La:$ZnWO_4$ and Ce:$ZnWO_4$ samples. The shrinkage in optical band gap energy of La and Ce doped $ZnWO_4$ nanoparticles was realized owing to the effect of dopant concentration induced microstructural defects. The broad blue-green emission peak perceived at 350–600 nm regions is ascribed to the electronic transition from O2p to W5d orbitals. The highest surface area of 283.272 m^2/g was obtained for 2% La doped $ZnWO_4$ sample. The elemental composition of samples was ascertained by x-ray photoelectron spectroscopic study. La:$ZnWO_4$ and Ce:$ZnWO_4$ nanophotocatalysts showed an excellent dye removal efficiency towards the degradation of methylene blue than the pure $ZnWO_4$ catalyst. This may be due to the fact that the RE ions (La and Ce) endorse the separation of photo-induced electron-hole pairs in $ZnWO_4$.

1. Introduction

Nowadays, photocatalytic technology occupies a major role in the degradation of environmental pollutants compared with other traditional methods due to its non-toxic nature, easy to handle, avoid secondary toxic nature from dyes, cost-effectiveness, high stability, and also reusability [1,2]. The promising photocatalytic materials being studied nowadays are TiO_2 [3], ZnO [4], etc, due to their stability and non-hazardous nature [5], however, the search for excellent active materials is still being done by the researchers. In this aspect, most of the researchers have focused their attention towards the wolframite structure of zinc tungstate ($ZnWO_4$) compound for photocatalytic application owing to its unique physical and chemical features. $ZnWO_4$ is one of the most promising photocatalysts due to its small cationic radius with A^{2+} sites, luminescence center ZnO_6-WO_6, high chemical stability, high average refractive index, not being hygroscopic nature, cost-effectiveness, odorless, and inert effects on human health [6–8]. $ZnWO_4$ nanoparticles are being proven to be a very important candidate for developing industrial applications such as photo-electrocatalyst [9], supercapacitor [10], photocatalytic activity [11], antibacterial activity [1], etc. However, there is a scope still to tune the photocatalytic ability of pristine $ZnWO_4$.

In this aspect, multifarious strategies such as surface tunning, composites formation, energy band gap tuning, and the incorporation of rare-earth (RE) elements or transition metals have been established to intensify the photocatalytic performance of pure $ZnWO_4$ nanoparticles. Among them, doping of rare earth (RE: La and Ce) elements into $ZnWO_4$ matrix is a possible way to increase the reactive oxidative species (ROS) system, to adjust the energy band structures and to inhibit the electron-hole recombination, which in turn improves the photocatalytic activity against the dye pollutants [5,12–14]. For example, Anandan et al. [15] established that La doped TiO_2 displayed excellent photoactive catalytic

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Extracellular synthesis of silver nanoparticles by bioluminescent bacteria: characterization and evaluation of its antibacterial and antioxidant properties

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Rajendran Srinivasan, Krishnamurthy Mathivanan, Rasiravathanahalli Kaveriyappan Govindarajan, Jayaraman Uthaya Chandirika & Chinnavenkataraman Govindasamy

Abstract

In this study, the silver nanoparticles (AgNPs) were extracellularly synthesized using a bioluminescent bacterium, *Vibrio campbellii*, and characterized their functional properties and morphological nature by UV–Vis spectroscopy, X-ray diffraction (XRD), Fourier transformed infrared spectroscopy, scanning electron microscopy coupled with energy dispersive X-ray spectroscopy (SEM–EDS), and atomic force microscopy (AFM). Further, the synthesized AgNPs were analyzed for their antibacterial and antioxidant activity (2,2-diphenyl-1-picrylhydrazyl (DPPH), and hydrogen peroxide) in in vitro method. The antibacterial activity of AgNPs was tested against pathogenic bacteria such as *Aeromonas hydrophila* MTCC 1739, *Klebsiella pneumoniae* MTCC 4030, *Klebsiella oxytoca* MTCC 3030, and *Pseudomonas aeruginosa* MTCC 1934. Characterization studies revealed that the synthesized AgNPs were poly-dispersed, spherical shaped with various size ranges, and exhibited as crystalline in nature. The assay of antibacterial activity showed the synthesized AgNPs strongly inhibited the tested pathogenic bacterial growth. Also, the AgNPs showed good antioxidant activity by strong scavenging actions on DPPH (61.88%) and hydrogen peroxide (53.48%) free radicals. Overall results demonstrated that AgNPs could be used in the pharmaceutical field due to their good antibacterial and antioxidant activity.

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