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# MICROSCOPIC EVALUATION AND PHYSIOCHEMICAL ANALYSIS OF ALGAE *ARTHROSPIRA PLATENSIS*

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## ABSTRACT

**Objective:** To evaluate the microscopic analysis and physiochemical examination of algae, *Arthrospira platensis*

**Methods:** Macroscopical and microscopical examinations were done on dried samples. Plant material underwent an initial phytochemical analysis. There were additionally standardisations using additional WHO-recommended metrics.

**Results:** Powder microscopy studies on algae of *Arthrospira platensis* species has been documented as per standard procedures. The proportion of foreign substances, the swelling index, the ash values, the loss on drying, the extractive values, and other physiochemical parameters were also determined. Initial phytochemical analysis found alkaloid, steroids, saponins, flavonoids, phenolic compounds, glycosides, and tannin in the sample.

**Conclusions:** *Arthrospira platensis* microscopic and physiochemical examination is used for establishing standards for sample verification, quality, and the utmost.

**Keywords: *Arthrospira platensis*, powder microscopy, physicochemical parameters, phytochemical analysis,algae**

## INTRODUCTION

Blue-green algae (cyanobacteria) of the genus Arthrospira, including A. platensis, A. maxima, and A. fusiformis, which are naturally floating in seawater, are used to make the well-known dietary supplement spirulina. In reservoirs with alkaline water, spirulina typically occurs and is commercially produced in subtropical and tropical parts of North America, Asia, and Central Africa. Spirulina is well-liked by consumers and used as a dietary supplement because of its high nutrient contents and many therapeutic properties **[1, 2]**. The photosynthetic cyanobacterium known as Arthrospira (Spirulina sp.) has lately acquired popularity as a dietary ingredient and nutritional supplement due to its high protein content of over 60% and other purported health advantages **[3]**. Many ailments, including diabetes, obesity, arthritis, anemia, cardiovascular conditions, allergies, tumors, and cancer can reportedly be treated with Arthrospira. Moreover, it has antioxidant, anti-inflammatory, and anti-virus properties **[4]**. Spirulina (Arthrospira) is one of the best sources of protein. It contains 60–70% protein **[5]**. Blue-green microalgae Spirulina platensis, which has been widely used as food and feed additives in agriculture, the food industry, pharmaceuticals, perfume manufacturing, medicine, and science, are one of the trends in biotechnology **[6]**. Research hasshown that consuming spirulina for four weeks lowers human serum cholesterol levels by 4.5% **[7]** and body weight is greatly reduced. Tumor necrosis factor is activated in macrophages by spirulina extract, suggesting a potential mechanism for tumor elimination **[8]**. A study indicated that spirulina could treat allergic rhinitis **[9]**. A variety of allergic reactions, including asthma, atopic dermatitis, and allergic rhinitis, are protected against by a number of chemicals made from marine organisms, including cyanobacteria. [10]Because antibacterial and antimycotic compounds have been identified from Spirulina platensis through medicinal research, spirulina has potent antiviral activity. These findings demonstrate excellent in vitro HIV-1 restraint in human lymphocyte lines and human monocytes **[11]**. Spirulina has been researched as a stimulant of animal cell growth and as an alginate-based residual water treatment **[12]**. Spirulina supplementation has also been shown to reduce the incidence of anemia that occurs during pregnancy and breastfeeding. In their research, Kapoor and Mehta **[13]**. In the presence of acidic polysaccharides from A. platensis, macrophages produced a significant amount of tumor necrosis factor (TNF) **[14]**. Infected Balb/C mice were used to assess S. platensis extract's immunostimulatory effects **[15]**. Thus, in

this study, we describe an effort to standardise A. platensis through microscopic assessment and physiochemical investigation.

## MATERIALS AND METHOD

### Chemicals

All of the chemicals employed in the study, including phloroglucinol, glycerin, hydrochloric acid, chloral hydrate, potassium hydroxide, were of analytical grade.

### Plant material

Arthrospira platensis's fresh algae were procured from the area of Auroville Pondicherry, India. Prof. P. Jayaraman, Ph.D., Director of the Plant Anatomy and Research Centre (PARC) in Tambaram, confirmed and authenticated the algae.

### Macroscopic and microscopic analysis

The plant's macroscopy and microscopy were investigated using the Brain et al. approach **[16]**. For powder microscopic, A small dried piece of the sample was soaked for 4 h in distilled water. A drop of 50% glycerol was used to mount the algal sample suspended in water on a tiny slide. A Zeiss Axiolab-5 Trinocular microscope and a Zeiss Axiocam-208 colour digital camera were used to observe the characters in bright field and phase contrast I and II. Diagnostic characteristics were photographed and recorded as photomicrographs. A scale bar served as the indicator for the magnifications **[17, 18]**.

### Physiochemical analysis

The official method suggested and in compliance with the WHO recommendations on quality control methods for medicinal plant material were used to assess the physiochemical Ash and extractive values **[19-21]**.

### Preliminary phytochemical screening

The usual approach was used to conduct preliminary screening. Kokate **[22]**.

## RESULT AND DISCUSSION:

### Macroscopic characteristics

The algae sample is dark green with a characteristic odor and saline mucilaginous taste. It forms the gel with water.

### Microscopical characteristics

### Powder microscopy

The fine powder was dyed with phloroglucinol and concentrated HCl, as well as mounted in glycerin. When examined under a microscope, it revealed helical filament bodies and solitary cells with a cylindrical form **(Figure 1, 2)**.

#### Macroscopical evaluation:

Spirulina platensis, an air-dried coarse powdered algae, had its ash values (total ash, water-soluble ash, acid insoluble ash, and sulphated ash) and extractive values (water soluble extractive value, alcohol soluble (extractive values), as well as moisture content) assessed (loss on drying). All of the values have been determined and listed in **Table 1**.

### Preliminary phytochemical Evaluation:

Initial phytochemical analysis found alkaloid, steroids, saponins, flavonoids, phenolic substances, glycosides, and tannin in the sample **(Table 2)**.

**Physiochemical parameters**

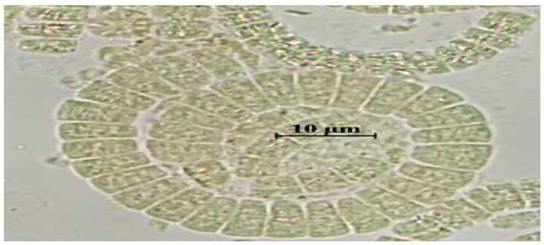
The physiochemical parameters, including ash values, drying losses, swelling index, and the percentage of foreign matter, were determined and are displayed in **Table 3**.

**Figure: 1** ***Arthrospira paltensis***

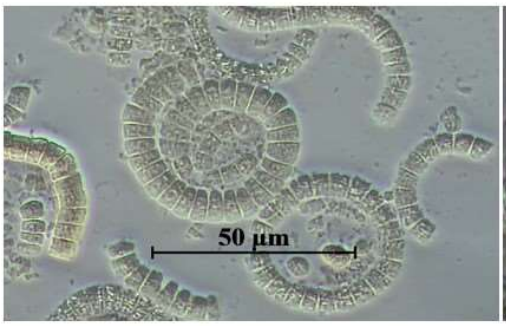
**Single cells and filamentous body under a bright field light**

**Single cells and filamentous body under a phase contrast I**

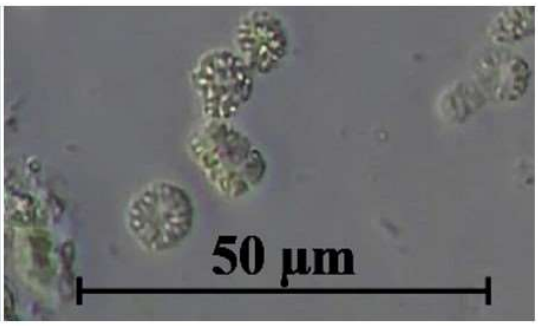
**Single cells and filamentous body under a phase contrast II**



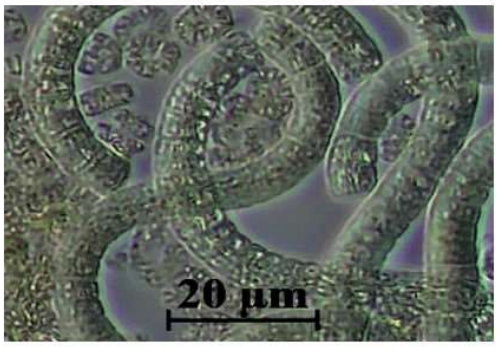

**Single cells and filamentous body under a bright field light in 100X**




Single cells and filamentous body under a phase contrast II enlarged view




Single cells under a phase contrast II enlarged view




Filamentous body under a phase contrast II enlarged view

**Figure 2: Powder microscopy of *Arthrospira platensis***

**Table 1: Extractive value of Crude drugs**

| S. No. | solvent | Extractive values (%w/w) |
|---|---|---|
| 1. | Petroleum ether | 2.23 |
| 2. | Chloroform | 2.51 |
| 3. | Ethyl acetate | 2.15 |
| 4. | Ethanol | 15.4 |
| 5. | Water | 5.4 |

**Table 2: Preliminary phytochemical of crude drug**

| S. No. | Constituents | Report |
|---|---|---|
| 1. | Alkaloids | + |
| 2. | Proteins | + |
| 3. | Carbohydrates and amino acids | + |
| 4. | Steroids | + |
| 5. | Saponins | + |
| 6. | Flavonoids | + |
| 7. | Phenolic compounds | + |
| 8. | Glycosides | + |
| 9. | Tannins | + |

**Table 3: Physicochemical Parameters**

| S. No. | PHYSICOCHEMICAL PARAMETERS | VALUE(%W/W) |
|---|---|---|
| 1. | Foreign matter | 0.23 |
| 2. | Loss on drying | 11.5 |
| 3. | Total ash Value | 9 |
| 4. | Acid-insoluble ash | 1.8 |
| 5. | Water soluble ash | 1.9 |
| 6. | Sulphated Ash | 5 |

## CONCLUSION

Although there are advanced research techniques available today for evaluating plant medications, One of the simplest and most affordable ways to start identifying the correct source materials is still using the microscopic approach. In the current study, A. platensis leaf physiochemical analysis and microscope evaluation were performed. *Arthrospira platensis* (Family: oscillatoriaceae). The extractive values can be used to assess the chemical components of a crude medication and to estimate which components are soluble in a given solvent. Alkaloids, steroids, saponins, flavonoids, phenolic compounds, glycosides, and tannin are present, according to preliminary phytochemical investigation. The information from the initial phytochemical test will be useful in figuring out how innovative the drug truly. A drug's ash values provide information about any earthy or inorganic components as well as other contaminants that may be present. The percentages of total ash, acid-insoluble ash, and water-soluble ash are calculated. The identification of used-up or tampered pharmaceuticals is the main application of extractive values. In conclusion, the goal of the current effort was to establish criteria that could determine the legitimacy of this plant's medical value. To support and authenticate the drug, physiochemical benchmarks and microscopic analysis may be helpful.

## ACKNOWLEDGMENT

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