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Comparative Analysis for Different Seaweeds of two Phyla (Chlorophycota and Phaeophycota-Order-Fucales) against *Leishmania Major*

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Methanolic crude extracts derived from species within the Chlorophycota and Phaeophycoata groups, gathered from the Karachi coast during the years 2003 and 2004, underwent analysis utilizing the 96-well Micro Titer Plate method. The study indicated that certain species of Chlorophycota displayed notable activity against the promastigote form of Leishmania major. Seaweed species with mean IC50 values below 100 µg/mL were considered active. Codium flabellatum (IC50/72h=34.4±6.2/µg/mL), *Caulerpa faridii* (IC50/72h=34.0±0.15/µg/mL), *Caulerpa racemosa* (IC50/72h=37.6±0.45/µg/mL), and *Ulva fasciata* (IC50/72h=50±0.65/µg/mL) effectively inhibited the growth of Leishmania major. In contrast, brown seaweed species from the Phylum Phaeophyta, particularly *Sargassum ilicifolium*, *Sargassum weightii*, and *Cystoseira indica*, demonstrated no action in the same bioassay technique.

[**Keywords:** *Comparative study,Seaweed,cholophycota, Phaeophycota, Antileishmania*]

INTRODUCTION

Parasitic diseases represent a considerable threat to human populations worldwide, especially in tropical and subtropical areas, and are among the primary causes of illness and mortality, even exceeding the impact of bacterial and viral diseases on human health and well-being (Godfrey, 1984). Nevertheless, there is a scarcity of effective medications for the treatment and prevention of these diseases, particularly concerning protozoan parasites, which are responsible for some of the most severe tropical diseases that affect both humans and animals.

Consequently, there has been an increasing interest in parasitic diseases over recent decades due to their profound effect on billions of individuals globally (Volks & Benjamin, 1991). In 2020, data from the WHO indicated that Bolivia, Brazil, Ethiopia, and Peru reported over 90% of mucocutaneous leishmaniasis cases, while Afghanistan, Algeria, Brazil, Colombia, Iran, Libya, Pakistan, Peru, Syria, and Tunisia represented more than 85% of cutaneous leishmaniasis cases Furthermore, Bangladesh, Brazil, China, Ethiopia, Eritrea, India, Kenya, Somalia, South Sudan, Sudan, and Yemen accounted for more than 90% of new visceral leishmaniasis cases (WHO.2020https://www.who.int/news-room/fact-sheets/detail/leishmaniasis).

Leishmania is endemic in Pakistan, with major affected regions including Larkana, Dadu, Jacobabad, and Mehargrah (Altaf et al., 2002). Additional cases have been documented in Multan (Mujtaba & Khalid, 1993) and Islamabad (Hassan et al., 1995). The World Health Organization reports an annual increase of two million new *Leishmania* cases (Anonymous, 2001). Previously, various naturally derived compounds, such as triterpenes and lignins from terrestrial plants, were employed against this pathogen. However, their use was limited due to the widespread issue of general toxicity (Tendon et al., 1991).

Research into pharmacologically active chemicals found in marine algae has yielded a number of potential medicines that are acceptable for clinical use. The marine environment is an important source of bioactive natural compounds, with structural and chemical features that differ from those found in terrestrial sources (Carté et al., 1996; López-Hortas et al., 2021). The ocean, which covers 71% of the Earth's surface (Akhter et al., 2002), is rich in biodiversity, making it an ideal habitat for such discoveries. Green seaweeds, despite being recognized as a substantial source of bioactive chemicals, are underutilized in the nutraceutical and pharmaceutical industries (Xu et al., 2023). Seaweed generates physiologically active metabolites that are critical for survival in a highly competitive ecology; these secondary metabolites have complex chemical structures and posses antioxidant, antibacterial, anti-photoaging, anticancer, anti-inflammatory, antitumor, and antidiabetic properties (Park et al., 2022; Wang et al., 2023; Agarwal et al., 2021). The majority of