Microalgae as sustainable and potential feedstock for the production of biofuels and fine chemicals

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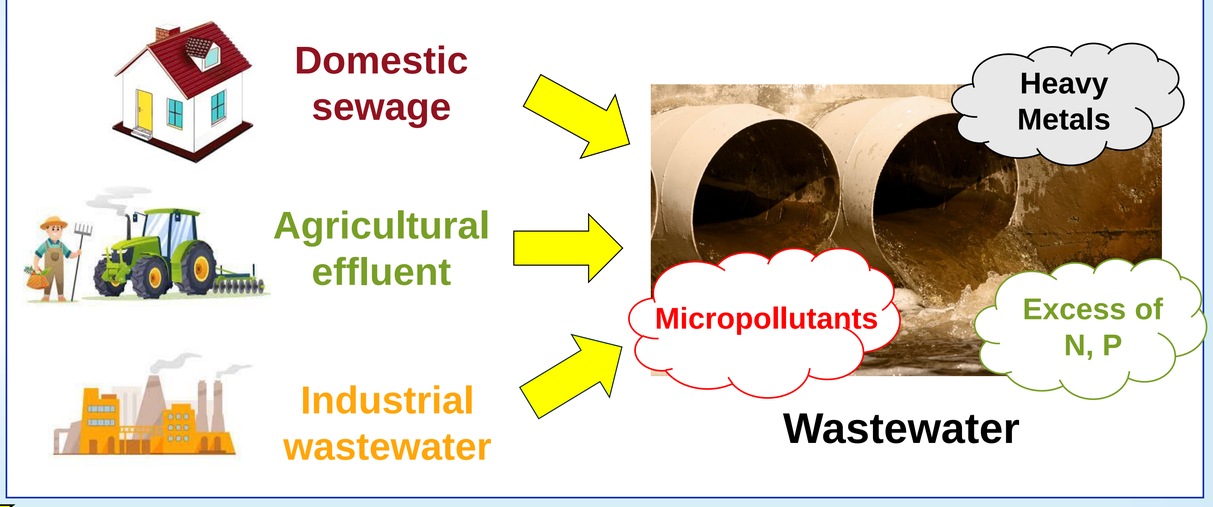
Introduction

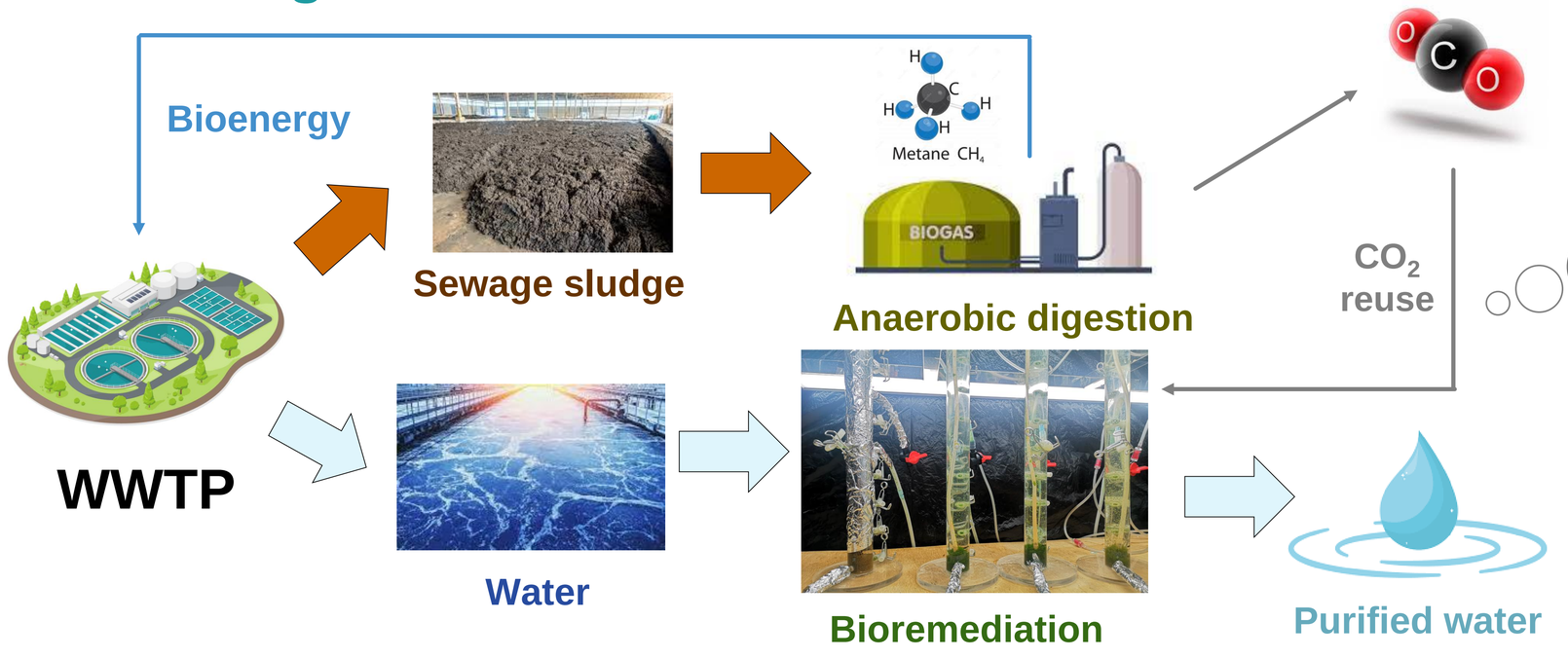
As a result of the growing world population and rapid industrialization, the increasing production of municipal wastewater has emerged as one of the major environmental problems. **Organic and inorganic pollutants** of various origins, including **micropollutants** and **heavy metals**, are discharged into water bodies nearby industrial and agricultural activities. The presence of excess nutrients such as **nitrogen (N) and phosphorus (P)** is the cause of eutrophication of **water bodies** and the **resulting environmental problems**. For this reason, there is a need to develop treatment processes that can remove these nutrients before wastewater is discharged.

"The problem of wastewater management"



In this sense, the use of algae as a means of bioremediation of wastewater can effectively extract nitrogen and phosphorus from wastewater, keeping dissolved oxygen levels constant and helping to reduce the pathogens and fecal bacteria present in wastewater

"The use of algae for bioremediation of wastewater"



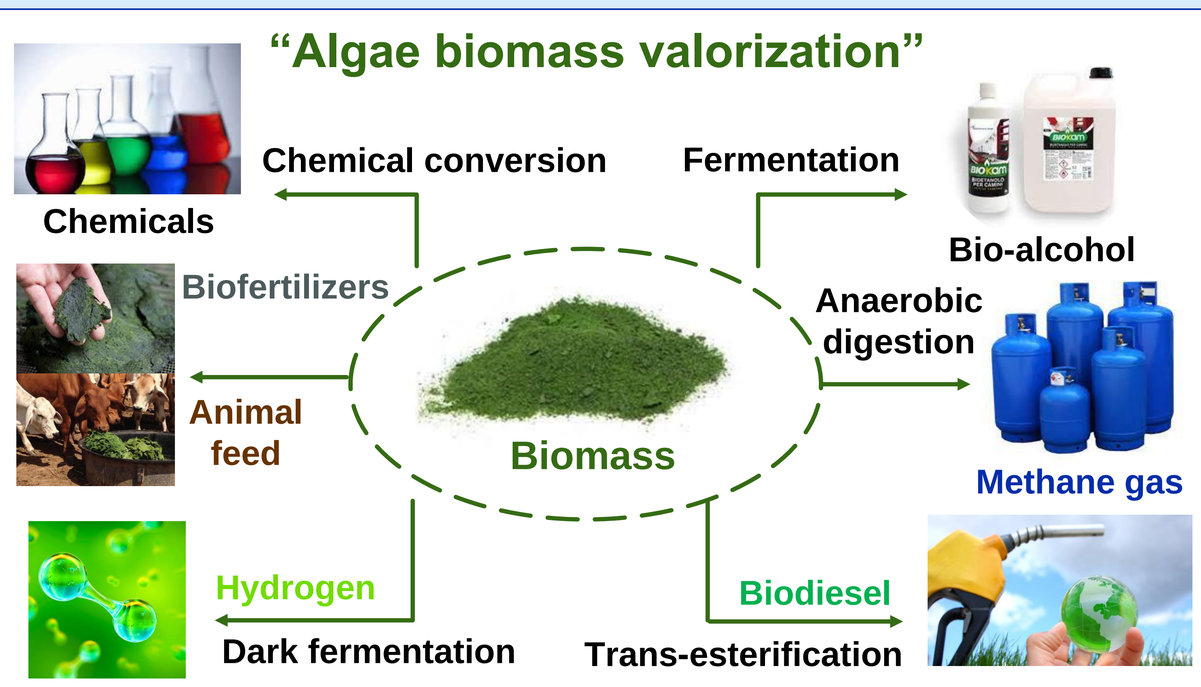
In addition, it is also an **environmentally sustainable option** as it has the ability to convert carbon dioxide into chemicals and useful products, thus helping to reduce **greenhouse gas emissions**

However, **the cost of this technology** is the main factor that limits its application on an **industrial scale**

Aim of work

In this work, a detailed analysis of the **chemical composition of microalgae (Chlorella Vulgaris)** grown using **wastewater** as a substrate was carried out. The identification and quantification of **Total Lipids**, **Proteins**, **Easy Hydrolysable Sugars (EHS)**, **Lignin**, **Ashes** and **Carboxylic Acids** were performed in order to identify the possible prospects of its possible reuse for **the production of platform molecules and fine chemicals**

"Algae biomass valorization"



Results and discussion

Chemical characterization of microalgae "Chlorella Vulgaris"

Total solids (TS) composition	
Total Lipids	85.3 ± 3.1 mg/g_{TS}
Proteins	556 ± 25 mg/g_{TS}
Easy Hydrolysable Sugars (EHS)	91.3 ± 6.1 mg/g_{TS}
Arabinose	*3.9 ± 0.2 mg/g_{TS}*
Glucosamine	*5.9 ± 0.2 mg/g_{TS}*
Galactose	*9.4 ± 0.2 mg/g_{TS}*
Glucose	*59.5 ± 2.3 mg/g_{TS}*
Xylose	*0.5 mg/g_{TS}*
Lignin	49 mg/g_{TS}
Ashes	56 mg/g_{TS}
Other compounds (i.e. Carboxylic Acids)	162.4 ± 31 mg/g_{TS}

The protein content is the main component with a value of 556 ± 25 mg/g_{TS}. This suggests a possible use as a **biofertilizer** for agricultural use. At the same time, **the Carboxylic Acids present 162.4 ± 31 mg/g_{TS} (i.e., levulinic, maleic and malonic acids)** could be extracted and used for the production of **Biopolymers and fine-chemicals**

biofertilizers and **biopolymers**

Conclusions

Microalgae (Chlorella Vulgaris) deriving from **wastewater treatment** was characterized in order to determine its potential to be valorized as potential source of biofuels and biochemicals. The high content of **Proteins** and **Carboxylic Acids** suggests the main use for the production of **Biofertilizers and Biopolymers**, respectively, reducing the total **costs of wastewater treatment** with the obtaining of products with high added value.

Acknowledges

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