Mixotrophic algae use both oxygen and CO_2

Mixotrophic algae use the mechanisms of both plants and animals to grow. This lets them produce twice as much biomass as ordinary algae and at lower costs, says PhD candidate Fabian Abiusi. It makes algae cultivation a more competitive option.

In ordinary algae cultivation, the algal cells convert CO_2 and energy from daylight into carbon compounds, with oxygen as a 'waste product'. This autotrophic process is also used by plants. To keep the algae growing, the cultivators have to constantly ventilate the reactors to add CO_2 and remove oxygen. That takes energy and makes algal production relatively expensive.

Mixotrophs can combine this process with growth that does not need sunlight. In this second, heterotrophic process, they convert organic materials (sugars) into carbon compounds for cell growth. This second process, which takes place in humans too, utilizes oxygen and releases CO_2. That means the waste product of one process is an input for the other process.

PhD candidate Fabian Abiusi tested the mixotrophic algae *Chlorella sorokiniana* and *Galdieria sulphuraria* in a large, open-air bioreactor in Spain. He found that when sugar was added, the algal reactor no longer needed a system for removing oxygen and adding CO_2. He just had to slowly pump the algal culture around to get a good level of production, meaning he only needed a simple, cheap reactor.

Abiusi used this information to calculate the production costs for mixotrophic cultivation. The costs of *Chlorella sorokiniana*, which is currently grown using autotrophic methods, would fall from 4.9 euros per kilo to 2.6 euros, and the costs of *Galdieria sulphuraria* would come down from 11.8 euros to 4 euros. AS