Microbial food as a food production strategy of the future

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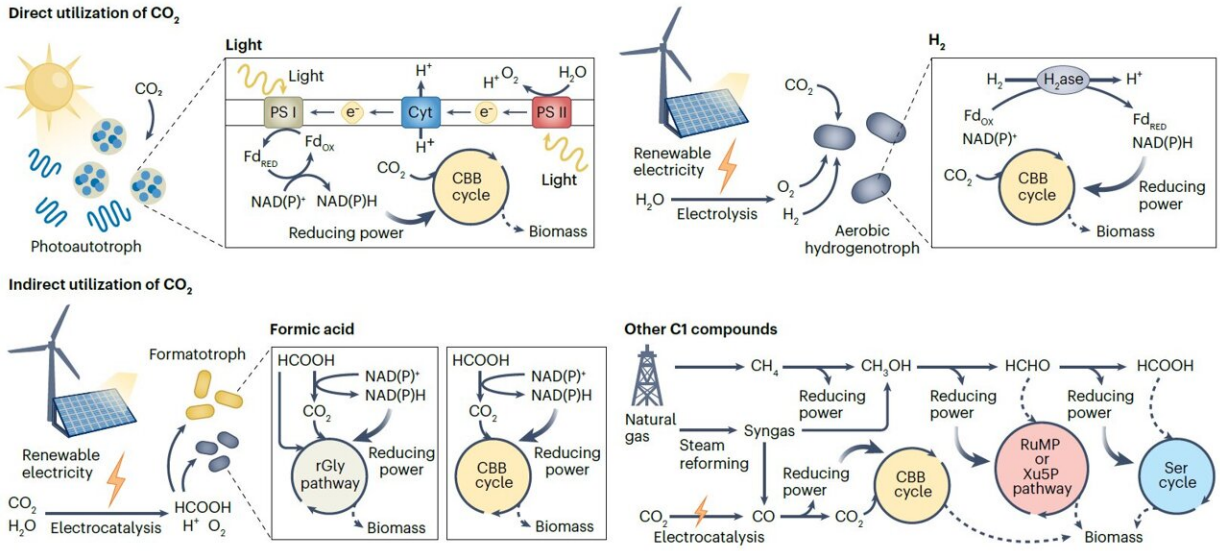


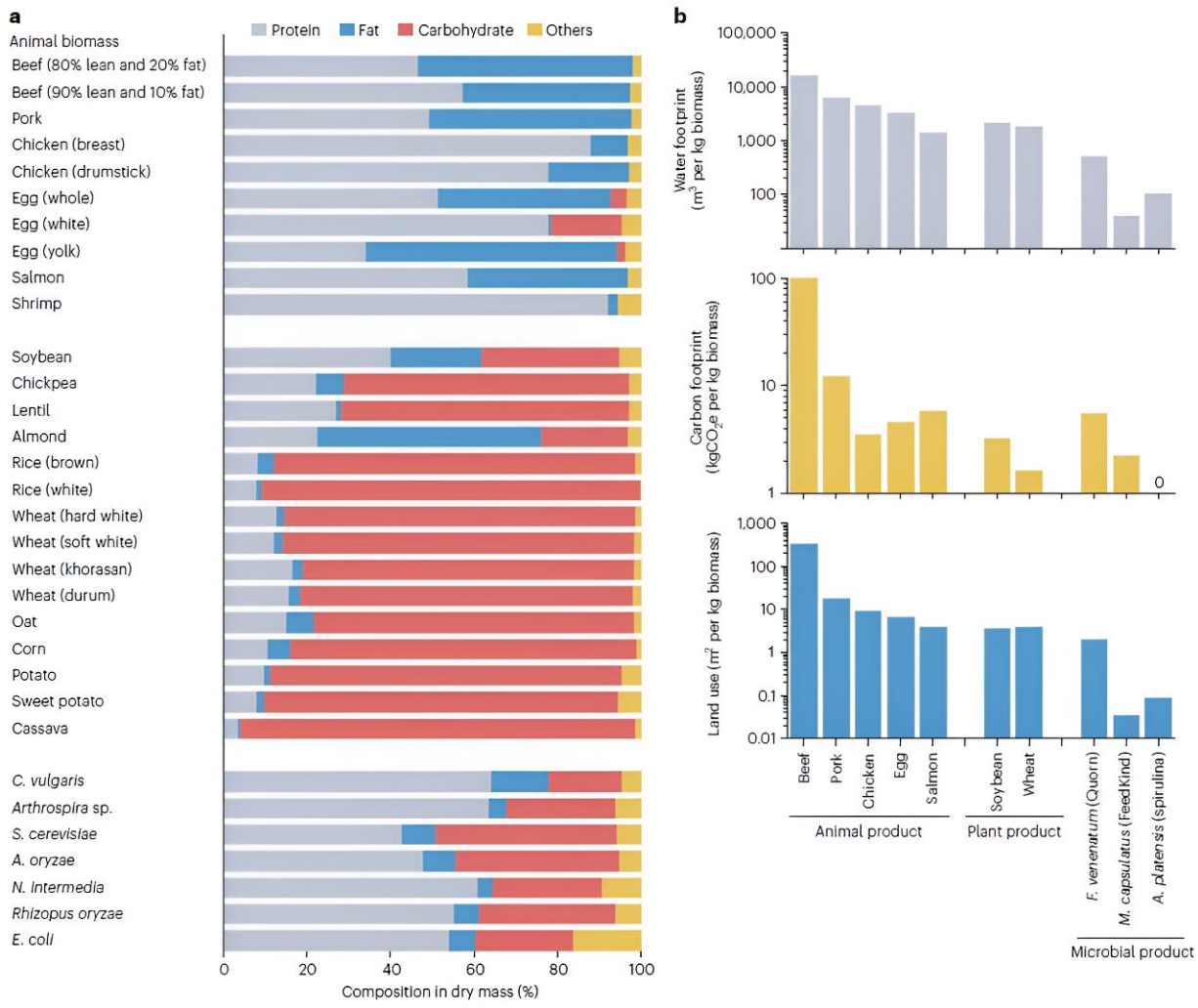
Schematic diagram portraying various microbial biomass production strategies utlizing sustainable feedstocks. Credit: The Korea Advanced Institute of Science and Technology (KAIST)

The global food crisis is increasing due to rapid population growth and declining food productivity from climate change. Moreover, today's food production and supply system emits a huge amount of carbon dioxide, reaching 30% of the total amount emitted by humanity, further aggravating climate change. Sustainable and nutritious microbial food is attracting attention as a key to overcoming this impasse.

Research Professor Kyeong Rok Choi of the BioProcess Engineering Research Center and Distinguished Professor Sang Yup Lee from the Department of Chemical and Biomolecular Engineering have published a paper in *Nature Microbiology* that proposes a direction of research on microbial food production from sustainable raw materials.

Microbial food refers to various foods and food ingredients produced using microorganisms. Microbial biomass contains a large amount of protein per unit in dry mass, comparable to that of meat, and emits the smallest amount of carbon dioxide and is required to produce a unit mass compared to various livestock, fish, shellfish, and crops. Since the amount of water and space requirement is small, it can be an eco-friendly, sustainable and highly nutritious food resource.

Fermented foods are the most readily available microbial foods around us. Although the proportion of microbial biomass in fermented foods is small, compounds with relatively low nutritional value, such as carbohydrates, are consumed during the fermentation process, and as microorganisms proliferate, the content of nutrients with higher nutritional value, such as proteins and vitamins, increases.



Compositions and environmental footprints of animal, plant and microbial biomass.

Various food compounds isolated and purified from biomass or culture media obtained through microbial culture are also a branch of microbial food. Examples that can be found around us include various amino acids, including monosodium glutamate, food proteins, enzymes, flavoring compounds, food colorings, and bioactive substances.

The fundamental form of microbial food can be said to be microbial

biomass or extracts produced through microbial culture and foods cooked using them. A representative example is single-cell protein, which collectively refers to microbial biomass or microbial proteins extracted from it.

In this paper, the researchers cover various non-edible raw materials and strategies for using them to produce microbial food in a more sustainable way. Furthermore, they cover various microbial foods that are actually produced in the industry using the relevant raw materials and their characteristics, as well as prospects for the production and generalization of sustainable microbial foods.

Research Professor Kyeong Rok Choi, the first author of this paper, said, "Microbial foods produced from various sustainable raw materials will soon be commonly encountered at our tables."

Second author Seok Yeong Jung, a doctoral student, said, "Microbial foods of the future will not be limited foods consumed only out of a sense of obligation to the environment, but will be complete foods that are consumed by choice because of their nutritional value and taste."

Distinguished Professor Sang Yup Lee said, "It is time for the industry and academia, as well as the public and private sectors, to cooperate more closely so that more diverse microbial foods can be developed and supplied in order to create a sustainable society for ourselves and our descendants."

More information: Kyeong Rok Choi et al, From sustainable feedstocks to microbial foods, *Nature Microbiology* (2024). DOI: 10.1038/s41564-024-01671-4