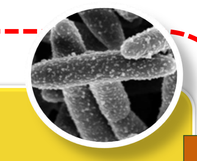
Efficient Lignocellulose Conversion to Functional Protein and Oil

Metabolomics Group, Synthetic Biotechnology Center, QIBEBT, CAS

Research strategy

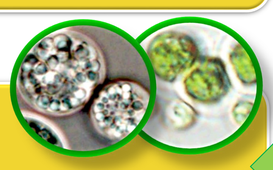
Agri-wastes



Phase I:
Lignocellulose saccharification

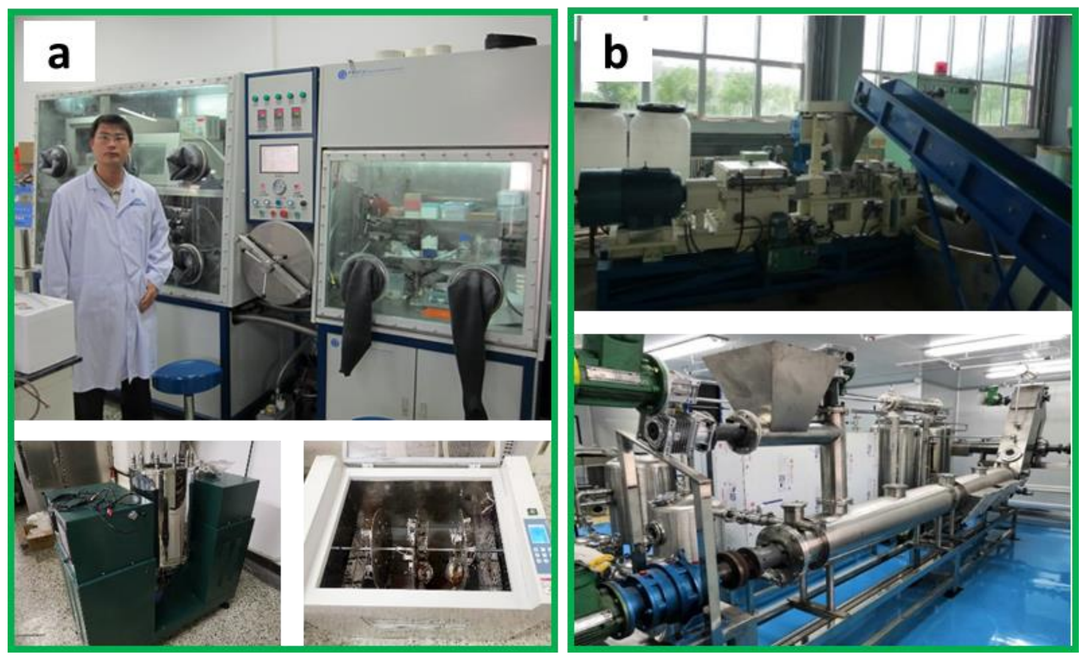
Sugars as platform chemical

Functional protein & oil



Phase II:
Microalgae fermentation

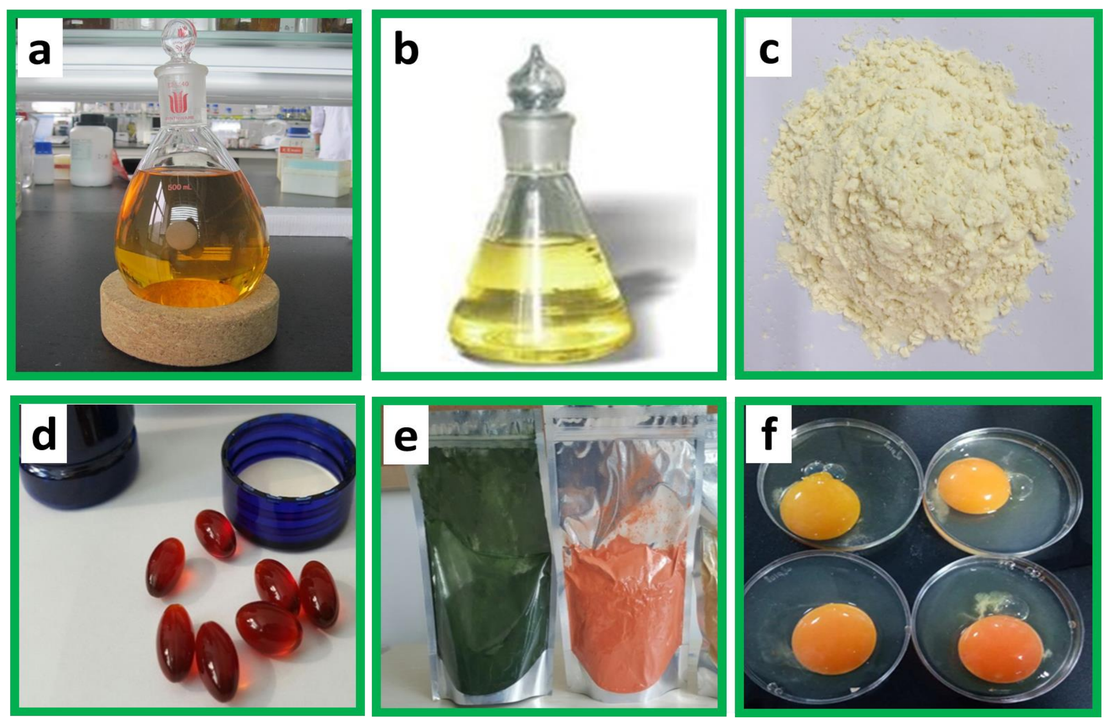
Lignocellulose Saccharification



a, Custom devices for highly efficient genetic engineering and process optimization
b, Pilot-scale demonstration of pretreatment and saccharification

- **Custom devices and tools for genetic engineering of non-model microorganisms** (e.g., *Clostridium thermocellum)*
- **Unique consolidated bio-saccharification** using engineered cellulosome-producing thermophile as the biocatalyst: **No addition of enyzmes → Low cost**
- **Compatible chemical pretreatments with biological hydrolysis**
- **Capability of full-component utilization** of lignocellulosic biomass to fermentable/functional sugars, 2nd G-ethanol, lignin-based chemicals
- **Pilot-scale demonstration** of pretreatment-saccharification coupled process
- **NO waste water; LOW energy consumption (< 500 kWH/ton); HIGH sugar yield (> 90%)**

Large-scale Microalgae Fermentation



a，DHA/EPA-rich oil；b，ARA-rich oil；c，Peptide powder；
d，DHA/EPA/Astaxanthin capsule；e， Microalgae powder；f，DHA-rich eggs

- **High oil producing strains** obtained by high throughput screening, genetic engineering aided by metabolic analysis
- **Fermentation regulation and optimization** to shorten the process and reduce the cost by 30%
- **Solvent-free oil extraction technology**: safe, efficient and pollution-free
- **Complete 5-step oil refining :** degumming → deacidification → decolorization → deodorization → dewaxing
- **Full-chain process** for production of high-quality protein and functional lipid (e.g., **DHA, ARA and EPA**) with lignocellulosic or starch sugar as the carbon source

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