

4. Given the growing focus on green technology and sustainability, the utilization of *A. niger* extracted from EFB is expected to become increasingly important in driving environmentally friendly and economically efficient industrial innovation. Furthermore, the organism can also produce enzymes, including amylase, pectinase, glucoamylase, protease, cellulase, and phytase, which can be utilized in the food, animal feed, textile, and bioethanol industries to reduce reliance on non-renewable resources and promote a circular economy.