

Knowledge-based Systems for Bioresource Management and Service in BCRC/FIRDI

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The Bioresource Collection and Research Center (BCRC) of Food Industry Research and Development Institute (FIRDI) was established in 1982 mainly with the support from Ministry of Economic Affairs (MOEA), Taiwan. In 2001, the BCRC is the first bioresource center to obtain the certification of ISO 9001. Since then, the BCRC continues improving the quality management system under the framework of ISO 9001 for long term preservation and distribution of microbial, cells and gene resources products, as well as over 150 customer services. The BCRC is also a TAF-accredited testing laboratory, which was certified based on the International Standard ISO/IEC 17025:2005. To ensure the high level quality assurance on products, the BCRC has been officially accredited as a reference material producer based on ISO guide 34 in 2012.

The BCRC holds more than 25,800 microbial resources, over 19,100 cell resources and about 1,250,000 genetic resources. Among them, 30,301 bioresources are found and ordered from the BCRC's online catalogues in support of industrial, academic and government research activities. Microbial collection consists of actinomycetes, archaea, bacteria, yeast, fungi and mushroom belongs to 1,309 genus and 4,943 species in total. The diversity is constantly increasing by collecting strains from domestic and foreign countries, and also by isolating microbes from various unique environments in Taiwan.

Information and communication technology (ICT) is applied to the knowledge-based systems for management and service, such as the BCRC eFLOW, eCommerce, data exchanger and fungal barcoding database system, built on the base of solid knowledge and empirical data provided by experienced scientists. The BCRC eFLOW is a database web application software, involving a workflow framework from bioresources' collection, preservation and distribution. It is designed to serve a broad of group/wide range of users, including BCRC staffs and research scientists, as well as to provide selective access to data using a role-based system. Members are allowed to import experimental data, such as rDNA sequence that is applied to authenticate microbial strains as a part of quality control on strains' preservation, into the system via web application and file submission. The work of authentication by DNA sequence has began in 2011 and so far 2,711 sequences of SSU, LSU and selective house-keeping genes of microorganisms in BCRC collections has been accumulated in the DNA dataset.

The eCommerce is integrated into eFLOW to provide an online shopping cart and payment service for customers to order bioresources. Customers can pay their bills by the payment service online such as credit card and ATM (Automatic Teller Machine), or to download e-form bill to pay later in the 24 hr convenient stores. The government regulation on the biosafety issue is also controlled in this system. The

packaging notice and SMS (short message service) notice on mobile phones are also produced followed by the order and shipping.

Global Biodiversity Information Facility (GBIF) is an international government-initiated facility, focuses on making the world biodiversity data freely and universally available via the internet. The BCRC is one of the data providers of GBIF. A data exchange service had been built by the BCRC using the communication protocol tool TAPIR with Darwin Core standard to provide metadata to GBIF periodically. The BCRC also provides BCRC strain information to the strains network of StrainInfo, a data exchange platform in global BRC. Based on the microbial common language (MCL) structure, BCRC strain information was fished out from database and written in XML, then uploaded and synchronized with StrainInfo network automatically rather than screen scraping.

Fungal barcoding database (FunCode) system is developed to integrate the taxonomic dataset created by BCRC's scientists to identify fungal strains used in the traditional fermentation foods and edible mushrooms. Up-to-date, 334 species has been established in total. This web service is mainly to offer a DNA comparison tool using two alignment algorithms, FASTA3 and Smith-Waterman, against data source from BCRC in-house database and Genbank.

The BCRC website is visited by 213,000 visitors from more than 150 countries and is hit 1,010,100 times according to the annual report generated from Google Analytics. Based on the current services provided by the BCRC, the ICT and knowledge-based solution will continuously be incorporated into the management and service systems. Creating "win-win" cooperation with research bodies/organizations and the BRCs worldwide will be the ultimate goal of the BCRC.