

## **Biodiversity of Microbes-the potential for Bioindustry Development in Vietnam.**

*Duong Van Hop, Nguyen Kim Nu Thao.*

Institute of Microbiology and Biotechnology,  
Vietnam National University, Hanoi.



1977-1981 Hanoi University Vietnam : B.Sc

1990-1995 Hanoi University Vietnam : PhD

1996-1999 International Centre for Biotechnology and Genetic Engineering, New Dehli India : Post -Doctoral fellowship holder

2000-2002 Plant Institute, Munich University. Germany : Post -Doctoral Humboldt fellowship holder

2007- Institute of Microbiology &Biotechnology, Vietnam National University (VNU) ,Hanoi, Vietnam : Director

### **1. Vietnam's biodiversity**

Vietnam is located in Southeast Asia. The country has a north-to-south distance of 1650 km with a 3260 km coastline. Because of the differences in latitude, the climate changes from humid subtropical in the northern regions to tropical in the southern regions. Moreover, Vietnam has many different types of landscapes such as mountains, highland, delta flat and coastal lower flat as well as many types of ecosystems such as forest, agriculture, coral reef, mangrove, bay, lakes, hot spring, etc... Vietnam is reported to be one of the centers of high biodiversity in the world with 1300 animal species and 13700 plant species. Meanwhile, there is limited report on microbial biodiversity. An additional factor that influences on the microbial biodiversity is a number of 56 ethnic groups living in the highland and mountain areas through out the country with various life styles and traditional fermented foods.

### **2. Microbial biodiversity study and culture collection management**

Studies on microbiology have been started from 1960 at some leading institutions and universities including National Institute of Science and Technology, Hanoi University, Food Industry Research Institute, University of Agriculture, Hanoi University of Technology. The field of study is very diverse and covers several main topics such as production of biomass and microbial spores, enzymes (native and recombinant), bioactive compounds and microbial biodiversity for various applications in agriculture, industry, healthcare and environment.

As an agricultural country, since 1993, Vietnam government has implemented priority policy for science and technology development in which biotechnology is one of the key fields. In this case, the microbial gene management policy was requested. In 1997, Vietnam Ministry of Science and Technology (MOST) issued Art 2117 for bio-resource management (including plants, animals and microbes). Up to date, there are 8 culture collections of microbes maintaining 18000 microbes mainly isolated from Vietnam (fungi, yeasts, bacteria, actinomycetes, micro algae and virus).

### **3. Some typical traditional fermented foods**

Several most well-known fermented products in Vietnam are described below.

- a. Products from cereal (rice, corn and cassava).
- Nep cam (fermented brown rice). This is fermented brown rice, which was first steamed and added yeast cake (amylase producers containing yeast and bacteria) as starters. All saccharification and ethanol fermentation processes happen at the same time in anaerobic

condition. The process should be stopped after 4-5 days at room temperature. The product can be ready to be used or mixed with yogurt. In some cases, glutinous spirit can be added and kept for 2 weeks before use.

- Ruou nep (Glutinous spirit). The process is almost as same as Nep cam but boiled water should be added after 2-3 days of incubation, kept at room temperature for additional 2-3 days until no more bubbles appear. Distillation is carried out to collect the glutinous spirit. The concentration of ethanol in the glutinous spirit can reach 45-55 % (v/v).
- Ruou can. This is a typical solid-state ethanol fermentation. A mixture of steamed rice, yeast cake (amylase producers including yeast and bacteria) and rice hull is incubated at room temperature for 1-2 days. The mixture is stored in a closed vase for 2-3 months. Before using, some qualified water should be added for extracting the ethanol from the fermented solid mixture as rice-wine.
- b. Products from meat.  
Nem chua (fermented pork) is one kind of lactic fermented meat. A mixture of fresh qualified pork and boiled pig skin, fried rice fine powder, salt, garlic and pepper is wrapped in medicinal plant leaves, kept at room temperature for 2-3 days.
- c. Products from soybean.  
Tuong (fermented soybean). This is a fermented product from the mixture of fried soybean, steamed glutinous rice and some salt, fermented by *Aspergillus oryzae* as protease and amylase producers. The mixture is kept at room temperature for 7-15 days.
- d. Products from fish.  
Nuoc mam (fish sauce). This is a natural fermentation process of fish and salt with 3:1 (w/w) ratio. The mixture is kept in a wooden containers at room temperature for 3-6 months. The liquid is extracted as fish sauce

#### **4. Current enzymatic research activities**

Research on enzymes from microbes is one of the main field in research activities in Vietnam. In general, all research activities focus on screening for enzyme producer, purification and characterization of the target enzymes. Several studies have been conducted to develop the fermentation process by both liquid and solid state fermentation. The types of studied enzymes are very diverse involving various kinds of substrates such as protein, carbohydrate, lipid, biomass sources. Several recombinant enzymes for feeds, functional food, diagnosis are also studied. Most of the research is conducted in several key universities and institutes such as :(1) Institute of Microbiology & Biotechnology, VNU, Hanoi, (2) Institute of Biotechnology, (3) Food Industry Research Institute, (4) Hanoi University of Technology, (5) University of Science, VNU, Hanoi, (6) University of Science, Ho Chi Minh City. However, all those studies are on-going and there is not any kind of enzymes which have been produced or developed for commercialization for domestic market. All domestic used enzymes are imported from foreign suppliers.

#### **5. Domestic market demands for enzymes.**

At present, all kinds of enzymes from domestic demands are imported from abroad, mainly from Novozymes, a Chinese company. Several main fields in industry that require imported enzymes are textile, animal feeds, brewery, food processing and medical diagnosis.

It is reported that the domestic market for enzymes is about 25-40 millions USD.