Phytosanitary Education System in China

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IPPC High-level Symposium on Cooperation of Phytosanitary Measures Among the Chinese Initiative “One Road” Countries
25-28 September 2018, Nanning Guangxi, China
The general situation of phytosanitary education system in China
The practice of phytosanitary education in China: CAU as an example
The challenges, opportunities and prospects of phytosanitary education in China
I. The general situation of phytosanitary education system in China
Plant Quarantine

- Official Control
- Public Participation
- Phytosanitary Education and Research

Governments
Universities & Institutes
Other organizations
The origin of phytosanitary education system

The professional education of plant protection in China:

has a history dated back 1905, courses of Plant Pathology and Entomology were opened in the College of Agriculture at Imperial University of Peking.

Group photo of teachers and students in the College of Agriculture (1913)

Group photo of the first graduate in the College of Agriculture (1916)

Establishment of the Department of Pest and Disease (1923)

(Photos cited from internet)
The earliest suggestion of plant quarantine in China: in 1916 by Dr. Bingwen ZOU. He emphasized the importance of plant quarantine.

The first paper named as plant quarantine in China: was published in 1927 by Dr. Fengmei ZHU. These papers emphasized the significance and basic methods of plant quarantine, including the import quarantine and export quarantine.
From 2001, as one member of WTO, China has faced more challenges from the global market and the international regulations.

In the trends of economic globalization and integration, pests are spread more quickly and widely in the world, which are causing significant economic and biological losing of plants and plant products.

China pays high attention to the phytosanitary education through Four-in-One system.

(Photos provided by quarantine officers in China)
The Four-in-One Education System

Organizations
- Universities
- Institutes
- Vocational colleges
- Vocational schools
- GACC
- MARA
- NFGA
- Branches
- Governments
- Universities
- Museums etc.

Types
- Degree education
- Vocational education
- On-the-Job education
- Public education

Objects
- Students
- Students
- Farmers
- Employees in plant quarantine
- Passengers
- Residents
- Others

Governments
Universities
Museums etc.
Public education: governments and universities mainly

• Passengers, regular program.
• Residents and other publics, periodical program.

The public phytosanitary education in China: phytosanitary regulations, phytosanitary procedures and quarantine pests

(Photos in 2017-2018, provided by plant quarantine workers in China)
On-the-job education: GACC, MARA, NFGA mainly

- Civil servants of plant quarantine, periodical program.
- Technicians of plant quarantine, periodical program.

The on-the-job phytosanitary education in China: national and regional technical training of plant quarantine

(Photos cited from the related news of plant quarantine on internet)
Vocational education: colleges and schools mainly

- Junior college students, 3-year program.
- Farmers, periodical program.

The farmer education in China: plant quarantine and IPM techniques

http://www.crdenet.net.cn/
Degree education: 50+ universities and institutes

- Undergraduates, 4-year program, Bachelor D.
- Postgraduates, 2-year program and 3-year program, Master D.
- Postgraduates, 3-year program, 4-year program, 5-year program, PhD.

The two-level major structure of plant protection in China
China Agricultural University

- MOE China (2017): First-class university and 9 Top disciplines (including Plant Protection)

College of Agriculture at Imperial University of Peking (predecessor of Peking University)

1905

China Agricultural University

Merged by
- Beijing Agricultural Engineering University
- Beijing Agricultural University

Beijing Agricultural University

Merged by
- College of Agriculture of Peking University
- College of Agriculture of Tsinghua University
- College of Agriculture of North China University

MOE China (2017):
First-class university and 9 Top disciplines (including Plant Protection)
II. The practice of phytosanitary education in China: CAU as an example
- **Faculties:** 100 faculties, including 37 professors, 33 associate professors.
- **Students:** 1038 students, including 422 undergraduates, 616 postgraduates (329 for Master Degree, 287 for PhD).
- **Directions:** 15 directions, for research and the education of postgraduates, including Plant Quarantine and Invasion Biology (PQIB).
From 1990 to 1995: Specialization of plant quarantine, leading by Prof. Ruihua Jin and Dr. Hong Chen.

From 2001 to now: Laboratory of plant quarantine and invasion biology (CAUPQL), leading by Dr. Zhihong Li.

From 2004 to now: Direction of plant quarantine and invasion biology (PQIB), leading by Dr. Zhihong Li, especially the education of postgraduates, including 5 laboratories.
The Missions of PQIB

- **Education**: training the undergraduates and postgraduates with advanced theory, method and technology of plant quarantine and invasion biology.

- **Research**: studying the techniques, measures and mechanism of prevention and control of quarantine pests and invasive alien species.

- **Service**: providing the technical guidance, decision supports and outstanding professionals of plant quarantine and invasive alien species management to government and other organizations.
The Team of PQIB (Sep. 2018)

- **22 supervisors:**
  - **10 faculties:** 5 Prof. + 4 Associate Prof. + 1 Lecturer
  - **12 collaborative Profs:** from phytosanitary institutes and centers, collaboration program from 2004

- **66 students:**
  - **15 PhD students** (4-year program and 5-year program, 1 student from Bangladesh of English education)
  - **36 Master degree students** (2-year program and 3-year program, 1 student from Bangladesh of English education)
  - **15 undergraduates** (1-year program, URP and script)
The phytosanitary education and research in CAU:
more practices in classroom, laboratory, field/port, and international platform.
The main courses

- **Plant Quarantine:** 32 hours, for undergraduates, required course of plant protection major, **from 1980s.**

- **Outline of Animal and Plant Quarantine:** 32 hours, for undergraduates, elective course, **from 2001.**

- **Treatment Technology of Plant Quarantine:** 32 hours, for undergraduates, elective course, **from 2006.**

- **Principles and Techniques of Plant Quarantine:** 48 hours, for postgraduates, elective course, **from 2003.**

- **Invasion Biology:** 32 hours, in **English**, for postgraduates, elective course, **from 2011.**

- **Professional English and Scientific Writing of Plant Quarantine and Agricultural Ecosystem Health:** 16 hours, for postgraduates, required course, **from 2013.**
More case studies of plant quarantine during courses:
The students from China, Pakistan, Bangladesh, Thailand, Malaysia, South Africa, Trinidad and Tobago, and Jamaica etc.
The sub-directions of thesis and dissertation

- **Pest Risk Analysis**: quantitative assessment especially, techniques such as SOM, @Risk, CLIMEX/MaxEnt, ArcGIS etc.

- **Pests Identification**: molecular identification especially, techniques such as DNA Barcoding, PCR, Real-time PCR, Chip etc.

- **Pests Treatment**: environmentally friendly treatment especially, techniques such as fumigation, irradiation, heat and cold treatment etc.

- **Pests Invasion Mechanism**: invasive fruit flies and viruses especially, techniques such as genome, transcriptome, RNAi, informatics etc.
More training of advanced phytosanitary techniques:

Quantitative assessment training by Dr. Kriticos and Dr. Paini (CSIRO, Australia), DNA barcoding training by Dr. Norman Bar (USDA-APHIS-CPHIST, USA)
More training of scientific writing:
More opportunities of international and national communication on plant quarantine and invasion biology:
Academic meetings, joint-education abroad, and visiting scholars etc..
The practices and services

More phytosanitary practices in field and ports
Guided by the quarantine officers and experts of MOA-NATESC and GACC etc.
- **Technical support in China:** PRA of import fruits and seeds, species identification of fruit flies, stored insect pests and virus etc..

- **Decision support in China:** plant quarantine measures and standards for GACC, MARA, etc..

- **International services:** ISPMs of IPPC, Member of International and regional steering committee of pests (e.g. TAAOSC), DNA Barcodes database of EIFF for Papua New Guinea 2018, Editors of international journals etc.

More international and national services of plant quarantine: PRA, training, review, evaluation and workshop etc.
Most of the 168 graduates are working in the fields of plant protection, especially for plant quarantine and Invasion Biology.
Main Development Steps of CAUPQL

- **CAUPQL: 2001-2005**
  - Undergraduates education, software programming + PRA research as starting

- **CAUPQL: 2006-2010**
  - Postgraduates especially, PRA + molecular identification research as starting

- **CAUPQL: 2011-2015**
  - Postgraduates especially, PRA + molecular identification research, society services

- **CAUPQL: 2016-2020**
  - Education, invasion mechanism research especially, society services

**Education and Research plan of 2016-2020**

[Diagram showing the development plan with steps from 2001-2020]
To promote the international education program with more collaborations

**Chinese-teaching program:**
- Language: learning Chinese, 1 year
- Courses: 1 year
- Thesis/dissertation: 1-2 year/3 years
- Funds: CSC/Beijing and other scholarship + research program

**English-teaching program**
- Courses: 1 year
- Thesis/dissertation: 1-2 year/3 years
- Funds: CSC/Beijing and other scholarship + research program

International students from Thailand, South Africa and etc., guided by Chinese experts.
To promote the research programs with international collaborations

- **Pest Risk Analysis**: e.g., fruits + seeds, especially potential economic loss, ALOP and sampling basing on quantitative assessment models etc.

- **Phytosanitary Diagnosis & Treatment**: e.g., fruit flies + stored insect pests, especially the species complex and cryptic species basing on mitochondrial genome, and the alternative technologies of methyl bromide etc.

- **Pest Invasion Tracing and Invasion Mechanism**: e.g., *Bactrocera sp.*, especially the invasion origin and pathway, the mechanism related with flight ability, temperature adaptation and symbiotic bacteria basing on stable isotope, simplified genome/re-sequence, transcriptome, RNAi, CRISPR/Cas9 etc.
III. The challenges, opportunities and prospects of phytosanitary education in China
The Challenges of Phytosanitary Education

- **Movement increasing**: especially the development of trade, tour and e-commerce. For pests: So free trip!
- **Global changing**: especially the development of climate change and nitrogen deposition. For pests: So suitable environment!
- **Pests evolving**: especially the development of invasive mechanism of pests. For pests: So happy life!

The increasing of pest intercepted data from import plants and products to China
**The Opportunities of Phytosanitary Education**

- **More attentions:** Public Education Day of National Safety from 2015, including plant quarantine and IAS management.

- **More supports:** National First-Class University and Top Discipline Programs from 2017, and National Key R&D Programs from 2016.

- **More platforms:** One Belt and One Road Initiative, e.g., Collaborative laboratory and center. FAO-China SSC program and IPPC 2020-2030, e.g., 4 packages, ISPMs, Third party entities etc..

The Prospects of Phytosanitary Education

- **To strengthen the Four-in-One education system:** especially the public education and the postgraduates education as the basis of prevention and control of pests.

- **To establish the international platform of education and research:** especially the international/regional collaborative center of phytosanitary education and research.

- **To develop and share the education resources:** especially the international remote education system/database of plant quarantine.

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species complex/cryptic species + molecular identification + invasion mechanism + ISPMs  

International education system of plant quarantine
The general situation of phytosanitary education system in China

The practice of phytosanitary education in China: CAU as an example

The challenges, opportunities and prospects of phytosanitary education in China
BEST WISHES FROM CAU!
LOOKING FORWARD TO MORE COLLABORATIONS AND PROGRESS ON PHYTOSANITARY EDUCATION AND RESEARCH!