ISSN 0919-8822

JIRCAS Newsletter

FOR INTERNATIONAL COLLABORATION

NO.19 June 1999

Ploughing upland rice field in Togo
(Photo by S. Asanuma)

CONTENTS

JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

Contribution of Biological Resources Research to the Stabilization and Increase of Production of Main Crops

Tsuguhiro Hoshino
Director, Biological Resources Division, JIRCAS

1. Background and importance of biological resources research

Human beings had succeeded in producing enough food by using natural resources hitherto. However, due to the rapid growth of the population, many developing regions in the world are now faced with the need to utilize land with major constraints on crop cultivation as well as to increase and stabilize agricultural production through methods compatible with the preservation of the environment. Agricultural technologies that optimize the use of biological resources will play an important role in determining whether these objectives can be achieved. In response to these concerns, the Biological Resources Division is placing considerable emphasis on collaborative on-site breeding research in foreign countries and on biotechnology in Tsukuba.

2. Current activities

JIRCAS is currently engaged in collaborative projects with 3 international centers supported by the CGIAR. At the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, doubled haploid breeding method has been applied for enhancing breeding efficiency. This is because the artificial production of haploid plants followed by chromosome doubling is the quickest method for developing homozygous breeding lines from heterozygous parental genotypes in a single generation. Different sources of resistance genes to fusarium head blight are being mapped using RFLP and SSR markers. In cooperation with the International Rice Research Institute (IRRI) in the Philippines, studies on rice blast resistance have enabled to identify rice blast resistance genes in IR varieties (see related article on page 7). The collaborative research on interspecific hybridization between the African and Asian rice species (*Oryza glaberrima* and *O. sativa*) has been initiated at the West Africa Rice Development Association (WARDA). Studies on the genetic and eco-physiological characterization of the interspecific progenies are being carried out with emphasis placed on tolerance to drought and acid soil conditions in West Africa.

In China, breeding research projects have started for the evaluation of genetic resources and development of novel breeding materials of rice and soybean. Through the projects, elite germplasm will be selected from the abundant indigenous germplasm for the development of disease and insect pest resistance. In soybean production in tropical and subtropical areas, one of the major problems is the damage caused by insects, especially *Spodoptera litura* Fabricius. Since highly resistant germplasm to *S. litura* has not been identified yet, soybean lines with a higher resistance will be obtained through back-crossing by pyramiding of moderate resistance genes. Moreover, breeding research for improving nutrient quality and disease resistance was initiated in Brazil. New rice and soybean cultivars with superior characteristics will be developed by the utilization of indigenous genetic resources.

Wheat and corn in CIMMYT field

Basic research for the application of advanced technology is being promoted in Tsukuba to support overseas research activities and to develop new technologies for the future. Molecular biotechnological methods have been recently utilized to study the tolerance to environmental stresses such as drought, salinity and freezing in higher plants. In particular, the researchers are determining how to use genes and regulatory factors for the production of transgenic crops tolerant to environmental stresses. A number of genes involved in stress tolerance were isolated using *Arabidopsis thaliana* and cowpea plants, and regulatory factors for the expression of these genes were analyzed for stress response. Many genes for transcription factors, controlling the expression of the stress tolerance genes, have been also isolated. Regulatory elements in promoters were identified that control stress-responsive gene expression. Using the genes for transcription factors and the stress-responsive promoters, multi-stress tolerance to freezing, drought and salinity was improved in transgenic *Arabidopsis* as a model. The existence of similar regulatory systems has been reported in other crop plants such as rice, tobacco and cowpea.

Such studies may lead to the development of commercial crops capable of withstanding potentially damaging environmental stresses, thereby contributing to mitigating problems relating to the food crisis and environmental degradation in developing countries.

3. Orientation of activities in the future

In developing countries, cooperation for biological resources research should be further promoted through consortia and networks with advanced research units worldwide. Therefore, JIRCAS plans to strengthen its activities in close collaboration with CGIAR centers for the evaluation of genetic resources and breeding methodologies. Through the use of genetic resources and application of biotechnological procedures, collaborative breeding projects should be implemented in various countries in order to develop new varieties of rice, soybean and wheat characterized by high yield potential and resistance to various diseases and environmental stresses. These new varieties should contribute to the increase and stabilization of agricultural production with lower inputs in the developing countries.

Detection of Bruchid-Resistant Strains in Wild Adzuki Bean Germplasm

Yoshinobu Egawa, Katsuyuki Kohno, Keiichi Takahashi, Norihiko Tomooka, Somsong Chotechuen*2, Ithnin Bujang*3 and Yoichi Tateishi*4*

*Okinawa Subtropical Station, JIRCAS, *National Institute of Agrobiological Resources, *2Chai Nat Field Crops Research Center, Thailand, *3Universiti Malaysia Sabah, Malaysia, *4University of the Ryukyus*

Adzuki bean, *Vigna angularis* var. *angularis* (2n=22, 2x) considered to have originated in East Asia is one of the most familiar legumes for Japanese people. This bean is cultivated for the preparation of various forms of foods including "anko" (sweet bean jelly), "seki-han" (steamed rice with red adzuki bean), etc. Adzuki bean belongs to the subgenus *Ceratotropis* of the genus *Vigna*. This subgenus is divided into two groups morphologically and phylogenetically, adzuki bean group and mungbean group. It is known that several wild relatives (germplasm) belonging to the adzuki bean group occur in Asia. Wild germplasm should be considered to be primary and secondary gene pools for the breeding of cultigens. Wild germplasm, however, is now confronted with gradual extinction due to the disturbance of the natural habitat by recent widespread land clearance for the construction of roads and buildings. Against this background, we collected wild adzuki bean germplasm in Southeast Asian countries (Photo 1).

Adzuki bean weevil (*Callosobruchus chinensis*) causes serious damage to adzuki bean, mungbean and cowpea seeds during storage (Photo 2). One accession of wild progenitor species of mungbean (*V. radiata* var. *sublobata*), TC1966, is known to exhibit a complete resistance against *C. chinensis*. However, since there is a reproductive isolation between adzuki bean and mungbean, it was impossible to incorporate the resistance from TC1966 to adzuki bean through conventional crossing procedures. Therefore, we examined the accessions of wild adzuki bean germplasm including *V. angularis* var. *nipponensis* (wild progenitor of adzuki bean), *V. nakashimae, V. nepalensis, V. minima* var. *minor, V. hirtella, V. umbellata* and *V. trinervia*, etc. to detect the occurrence of bruchid-resistant strains within them.

Based on feeding tests by adzuki bean weevil, *V. hirtella, V. umbellata* and *V. trinervia* exhibited a resistance against the infestation with *C. chinensis* although other species were highly susceptible. It was reported that the resistance exhibited by TC1966 was controlled by a single dominant gene. We plan to examine this aspect for these three wild species. *V. hirtella* is distributed in India (Assam, Bengal), Myanmar, Thailand, Indo-China, South China and Malaysia and the strains examined by us were collected in the northern part of Thailand under a JIRCAS project. Cross-compatibility of *V. hirtella* with adzuki bean was high and we have successfully obtained fertile F_1 hybrids between them (Photo 3). We are now backcrossing the F_1 hybrids with adzuki bean to develop bruchid-resistant lines with a combination of feeding test by adzuki bean weevil. Wild form of *V. umbellata* is distributed widely in northern Thailand and several accessions have been collected under the JIRCAS project. Hybridization between adzuki bean and *V. umbellata* was impossible. *V. minima* var. *minor* was, however, cross-compatible with both adzuki bean and *V. umbellata*, and could be used as a bridging species for gene flow between them. To develop resistant lines of adzuki bean, we plan to transfer the resistance gene(s) of *V. umbellata* first to *V. minima* var. *minor* by backcrossing this species recurrently to the hybrid between *V. minima* var. *minor* × *V. umbellata*, and then incorporate the resistance to adzuki bean by crossing with *V. minima* var. *minor* (which has become resistant). Geographical distribution of *V. trinervia* ranges from Madagascar, through South India, Sri Lanka, Myanmar and Indonesia, to Papua New Guinea and we have successfully collected a large number of accessions from Peninsular Malaysia. Cross-compatibility of *V. trinervia* with adzuki bean has not yet been analyzed.

Generally, exploration and collection of wild germplasm are a time-consuming and difficult task, and there is little or no information available about potentially useful characteristics which it harbors. Considering the genetic erosion that occurs rapidly on a worldwide scale, it is important to collect wild *Ceratotropis* species from the areas covering their wide range of geographical distribution and evaluate and preserve them as genetic resources.

Photo 1: Collection of wild adzuki bean germplasm in Peninsular Malaysia

Photo 2: Infestation with adzuki bean weevil (*Callosobruchus chinensis*)

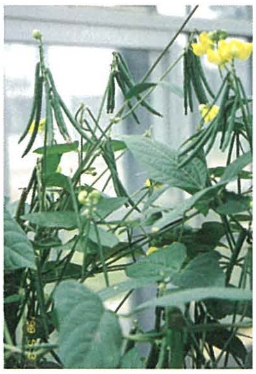


Photo 3: Hybrid plant between *V. hirtella* and adzuki bean, showing that the F_1 fertility is high

Surface Analysis of Starch Granules

*Tamao Hatta, Seiko Nemoto and Keiji Kainuma**
Environmental Resources Division, JIRCAS
**Bio-oriented Technology Research Advancement Institution (BRAIN)*

Surface-sensitive analytical techniques, AFM (Atomic Force Microscopy) and XPS (referred to as either X-ray Photoelectron Spectroscopy or ESCA: Electron Spectroscopy for Chemical Analysis) have been developed in many fields. With AFM, imaging of nearly any surface can be achieved by atomic force under vacuum, air and solution conditions and surfaces can be observed during reactions. XPS is used for the characterization of electron structure, chemical binding state, and alteration process of the area near surface (less than 5 nm in thickness) of solid. A large number of recent studies on the mechanisms of rock weathering, mineral dissolution, soil genesis and desertification have been reported using AFM (SPI3800+SPA300, Seiko Instruments Inc.) and High-Resolution XPS (ESCA300, Gammadata-Scienta AB) in our laboratory. Recently, AFM and XPS have been applied to a wide variety of materials.

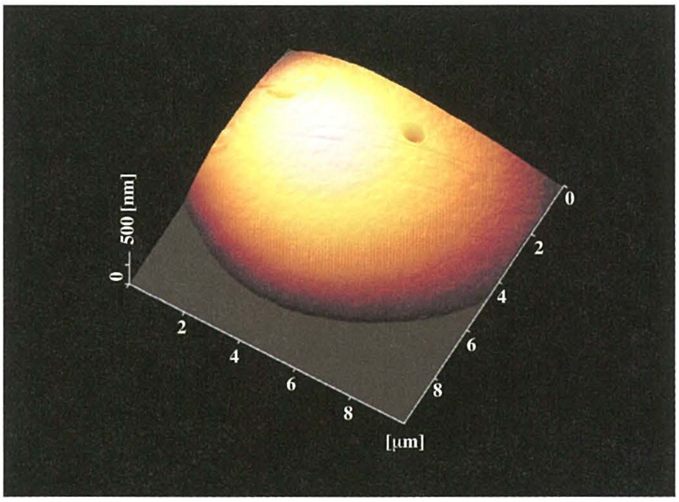
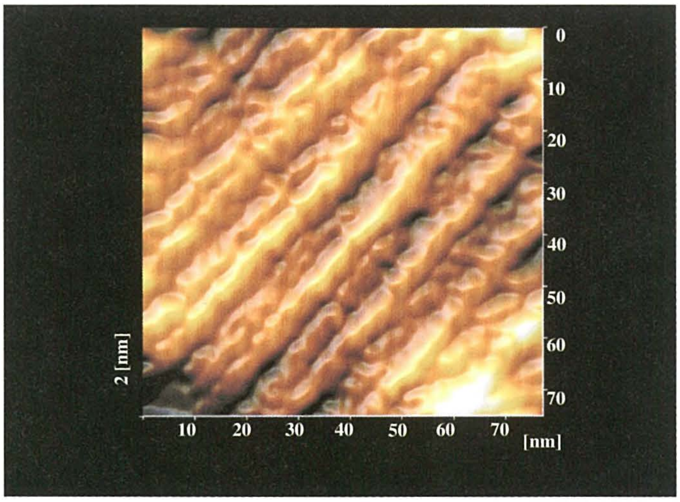


Fig. 1. AFM images of a potato starch.
(a) A granule of potato starch. 10 μm □.



(b) Inner part of potato starch granule. 80 nm □.

The results of application of AFM and XPS for the characterization of the surface structure of starch granules is presented in this paper. Data on AFM imaging and detailed XPS spectra of starch had not been reported hitherto. The detailed structure of the starch surface observed by AFM is shown in Fig. 1a . This is the first time that the rough surface structure of a potato starch granule was studied by AFM. We observed a cavity, presumably hilum, less than 1 μm in diameter. After embedding potato starch in paraffin, sample specimens were prepared by cutting with a microtome and the linear structure of the inner part of the granule was observed at the molecular level (Fig. 1b).

Considering the electron shell in relation to the molecular structure, we analysed the electronic state of the starch granule using XPS as chemical structural probe. The narrow spectra of C*1s* orbital of potato starch and waxy corn starch were measured compared with those of several saccharides (Fig. 2). The C*1s* photopeak of starch is characterized by the presence of a chemical shift with a small peak at the low binding energy site. To examine this peak, the amorphous precipitate was prepared by gelatinization of native crystalline starch. The peak at the low energy site disappeared in the C*1s* spectrum of the amorphous product as anticipated. Consequently, it was revealed that the specific photopeak of starch corresponds to the three-dimensional structure of the crystal in reference to the double helix structure of starch. Investigations of the atomic structure and binding state of crystals of starch and saccharides using AFM and XPS have just been initiated.

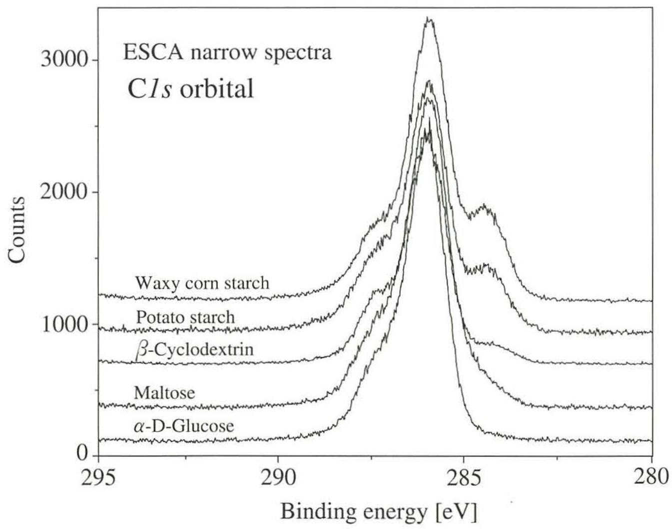


Fig. 2. C*1s* narrow spectra of two kinds of starch and related saccharides.

Assessing Nitrogen Pollution in Chinese Agriculture

Kazuyuki Yagi
Environmental Resources Division, JIRCAS

China is the largest producer, as well as the largest consumer, of food in the world. The introduction of new technologies and reform policies has substantially improved food supply conditions to meet the large demand for grain in this country. On the other hand, adverse effects of modern intensive agriculture on the environment have recently become apparent and the sustainability of land resources and environment has become a cause for concern. Environmental problems due to intensive agriculture, such as land degradation, shortage of irrigation water, and pollution of air and water, have become serious in various parts of China. Many of these problems have resulted from the use of agricultural land in a manner that overloads nutrients, in particular nitrogen. Indeed, consumption of nitrogen fertilizer in China has increased by about 60% during the last decade and accounted for 23.6 M ton nitrogen in 1995. Chinese agriculture must now address serious issues: How large is the environmental impact of intensive cropping systems? How is the impact changing? What will happen in future? How can we mitigate the impact?

To answer these questions, JIRCAS launched a 7-years' collaborative research project entitled "Evaluation and Development of Methods for Sustainable Agriculture and Environmental Conservation" with two Chinese research institutes: the Institute of Soils and Fertilizers, Chinese Academy of Agricultural Sciences and the Institute of Soil Sciences, Chinese Academy of Sciences since 1997. The project is conducted as one of the components under the comprehensive collaborative research project between JIRCAS and research institutes and universities in China and aims to develop technologies that minimize the adverse impact associated with nitrogen fertilization and, at the same time, secure sustainable food production.

The project covers four major and remarkable agricultural regions in China (Fig. 1): 1) Huang-Huai-Hai plain which is one of the main maize-wheat production areas distributed in alluvial lands of three large rivers. 2) Jing-Jin-Tang region where highly intensive farming of upland crops and vegetables is performed in the suburbs of big cities. 3) Tai-hu region where highly intensive rice-wheat cropping is performed in the lower reaches of Changjiang River. 4) Red soil region where double cropping of rice is widely adopted in hilly lands located in the subtropical zone. Both field experiments and regional analyses are conducted at typical sites of each study area. The field experiments determine the plant uptake efficiency and environmental impact of different types and management practices of nitrogen fertilizers. The regional analyses evaluate the nitrogen balance and its losses to the environment in the region by the application of a nitrogen flow model. Combining the results of the field experiments and the regional survey, the status of nitrogen pollution in each region will be evaluated and alternative management strategies to minimize the impact on the environment will be proposed.

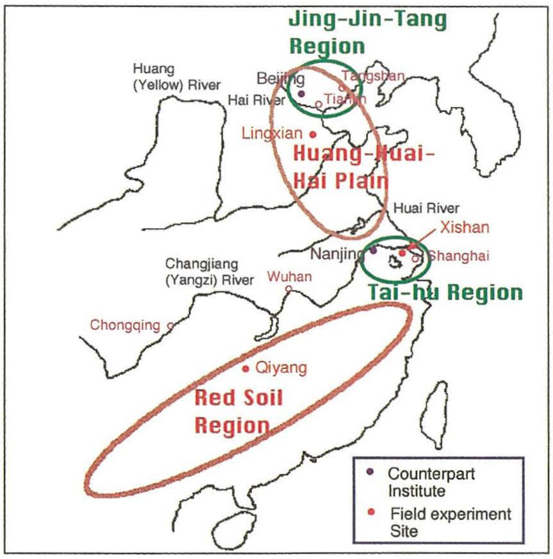


Fig. 1. Map showing the study area of the project.

The project is proceeding and is entering the third year as planned. Field experiments at Lingxian, Xishan, and Qiyang are currently being conducted. Attempts to analyse regional nitrogen flows are also being made at the corresponding sites. For instance, based on a preliminary analysis of the nitrogen flow in Lingxian County, Shandong Province, it was estimated that the input of nitrogen to cultivated land was, on the average, 594 kgN ha^{-1} $year^{-1}$, while the output was 265 kgN ha^{-1} $year^{-1}$ (Fig. 2). These findings indicate that cultivated land in this region receives a balance of 329 kgN ha^{-1}, annually. A part of the excess nitrogen flows out to groundwater through leaching, to surface water through runoff, and to the atmosphere through volatilization in various forms of gaseous nitrogen. The remaining part accumulates in the soil layers. The results for Lingxian in this analysis suggested the potential risk of substantial pollution in the near future.

Although increased use of nutrients is essential for meeting the growing demand of food, it is a double-edged sword. Unless nutrient supply is managed properly, the contribution to agricultural productivity could be offset by the adverse impact on the environment. This collaborative project may enable to develop environmental conservative agricultural technologies in order to contribute to sustainable development of agriculture in China.

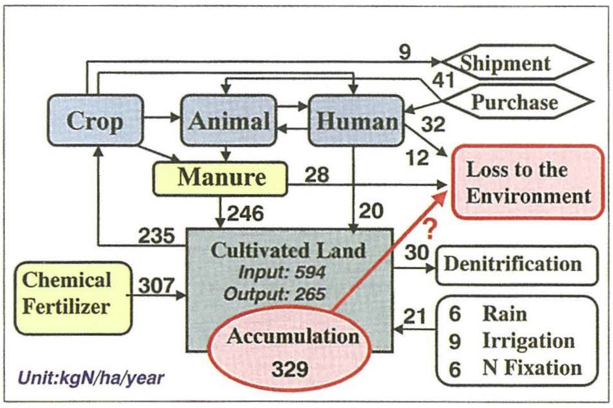


Fig. 2. Estimated nitrogen flow in agro-ecosystems of Lingxian, 1997. The value for the flow from accumulation in cultivated land to the environment will be determined from the results of ongoing field experiments.

International Workshop on "Learning from the Farming Systems Research Experiences in Indonesia"

The International Workshop on "Learning from the Farming Systems Research Experiences in Indonesia" jointly organized by JIRCAS and the Center for Agro-Socioeconomic Research (CASER), the Agency for Agricultural Research and Development (AARD), Ministry of Agriculture, Republic of Indonesia, was held in Bogor, Indonesia during the period 3-4 March, 1999.

Farming Systems Research (FSR) is a highly controversial subject. Some critics pretend that it has been proved to be ineffective, while some others tend to criticize the excess expectation from donors and policy-makers and lack of consensus among the different actors involved in the FSR activities during the boom period of the 1970s and early 1980s. Indonesia was not an exception and hosted a myriad of internationally funded farming systems projects. Compared to these, FSR activities in Indonesia in recent years did not attract the attention of international observers. However, with the establishment of the Assessment Institutes for Agricultural Technology throughout the country in 1995, it appears that Indonesia has entered another stage of FSR.

By combining both historical and up-to-date information regarding FSR experiences within the AARD organizations, this workshop contributed to the reconciliation of views between the two extremes, negative or positive, regarding the benefit of FSR. The participants in the workshop tried to address the following key issues from various angles and with diverse personal experiences.

Participants in the workshop

- -How can we interpret the past 25-year history of FSR in Indonesia?
- -What are the roles and relationships of researchers and extension specialists in FSR?
- -What are the roles of the social and natural sciences in the FS approach?
- -How adequate or inadequate is the institutional framework?
- -Foreign assistance in and commitment to FSR: How can Indonesia use these most effectively?
- -Technology in FS approach: assessment of technology vs. technology for assessment

Approximately fifty people from Indonesia, Japan, Australia, and the U.S.A. participated in the workshop. The workshop was successful due to the strong commitment of the experienced staff of CASER. All the participants realized that the system of FSR still needs improvement and stressed the importance of mutual exchange of information. The Proceedings of the Workshop will be published by JIRCAS in 1999/2000.

(Junko Goto)

"JIRCAS Seminar in Bangkok"

JIRCAS Thailand Office held a seminar entitled "JIRCAS Seminar in Bangkok 1999" on March 3, 1999 at Maruay Garden Hotel in Bangkok. The main purpose of the seminar was to introduce our collaborative research activities to the people who had been concerned about or interested in the activities of JIRCAS in Thailand. This type of seminar was held in 1994 at the time of the 25th anniversary of the collaboration between the research organizations in Thailand and TARC (Tropical Agriculture Research Center)/JIRCAS. Therefore, this seminar covered JIRCAS activities in Thailand during the past 4 years.

To better understand and overcome agricultural problems in Northeast Thailand, JIRCAS initiated a research project entitled "Comprehensive Studies on Sustainable Agricultural Systems in Northeast Thailand." Therefore, most of the scientists who have been dispatched to Thailand by JIRCAS at present are more or less related to the Northeast Thailand project except for the collaborative project in the field of fisheries entitled "Studies on the Development of Sustainable Aquaculture Technology in Southeast Asia."

There were 150 participants from the Department of Agriculture (DOA), Department of Livestock Development (DLD), Land Development Department (LDD), Kasetsart University (KU), Khon Kaen University (KKU), Asian Institute of Technology (AIT), National Research Council of Thailand (NRCT) and International Board for Soil Science Research and Management (IBSRAM).

After the Inaugural Address delivered by Dr. Ananta Dalodom, Director General of DOA, 19 reports were presented during 6 sessions. In Session 1, an outline of the project on "Sustainable Agricultural Systems in Northeast Thailand" was given by the project leader Dr. S. Matsui and 3 reports were presented. Technical reports on animal production and grassland were presented in Session 2. In Sessions 3 and 4, nine reports were presented on soils and plant nutrition. Three reports were presented in the field of fisheries in Session 5. In Session 6, 2 reports were presented on plant pathology and postharvest technology.

At the end of the seminar, special comments related to the activities of JIRCAS in Thailand were made by Prof. Karl E. Weber, Vice President of AIT, Mr. Chaiyasit Anecksamphant, Deputy Director-General of LDD, Associate Prof. Supot Faungfupong, Vice President of KU, Associate Prof. Anake Topakngam, Dean of KKU and Ms. Tuenchai Niyamangkoon, Chief of NRCT.

The proceedings entitled "Highlights of Collaborative Research Activities between Thai Research Organizations and JIRCAS" with 58 reports were published by JIRCAS Bangkok Office.

(Masaaki Suzuki)

IRRI-JIRCAS Collaboration within the Framework of the Special Project Funded by the Japanese Government

Hiroshi Kato and Motohiko Kondo
IRRI, Los Baños, Laguna, Philippines

Background of the project

Japan International Research Center for Agricultural Sciences (JIRCAS) and International Rice Research Institute (IRRI) have been collaborating by assigning Japanese breeders, agronomists and physiologists to IRRI in the Philippines under a special project funded by the Japanese Government since 1984. The first phase of the project covering the period 1984 to 1989 dealt with the development of low nitrogen input technology and the identification of genes that conferred a resistance to various races of the pathogen of bacterial leaf blight disease. The second phase covering the period 1989 to 1994 dealt with the development of direct seeding technology and study of genetic aspects of rice tungro disease. The third phase of the project initiated since December 1994 will be terminated in November 1999. Studies on the genetic control of rice blast and nutrient-water interaction in upland rice are being currently carried out.

Rice blast

Rice blast is a major disease of rice worldwide. For improving the varietal resistance against rice blast, pyramiding of major genes, accumulation of minor genes, combination of major and minor genes, and development of multilines of major genes are considered to be effective methods. Information about the genetic constitution of major genes in rice cultivars and the pathogenicity of blast isolates is a prerequisite for all these strategies.

Resistance genes of various varieties were estimated based on their reactions to Philippine blast isolates whose pathotypes were confirmed by the use of Japanese differential varieties. Inheritance of blast resistance and allelism tests were also conducted by inoculating BC_1F_2 lines of crosses of IR varieties with CO39. Blast resistance genes, *Pi b*, *Pi k-s*, *Pi a*, and *Pi 20* were identified in IR24. *Pi 20* has been recently identified. The blast resistance gene constitution of IR34, IR36, IR46, IR56, IR60, IR64, and IR74 was determined and the resistance genes of other IR varieties were also estimated based on the reaction to Philippine blast isolates.

We are developing lines with a single additional resistance gene from crosses with four recurrent parents and over 40 donor parents with blast resistance genes. The lines possess the genetic background of Lijiangsintuanheigy (LTH), CO39, IR24, and IR49830-7-1-2-2. LTH is a *japonica* variety which does not harbor any known rice blast resistance genes. CO39 is an *indica* variety which is expected to harbor a *Pi a* gene for rice blast. These lines will be used as rice blast differential systems for the identification of the pathogenicity of blast isolates in each country. By using such isolates, the resistance genes of different varieties in the world will be identified. IR24 is a variety suitable for irrigated rice ecosystems and IR49830-7-1-2-2 is an elite line for rainfed lowland areas in Thailand. These lines will be used as rice blast-resistant multilines for the first time in tropical areas.

Nutrient-water interaction in upland rice

In the last few decades, a remarkable increase in rice yield was achieved in irrigated ecosystems in Asia. In contrast, the average yield in the upland areas remains at 1.2 t ha^{-1}, a value much lower than the average yield of 3.5 t ha^{-1} in the irrigated systems. Major factors that limit the productivity of upland rice include unstable water-availability and low nutrient supply. The IRRI-JIRCAS Project seeks to analyse the role of the interaction of water and nutrients in determining yield and develop management options for overcoming these two constraints.

The study focuses on the effect of soil and crop management on the water-capturing capacity of rice roots and the improvement of N use efficiency under fluctuating water regime in upland areas. High sensitivity of rice to water stress can be primarily attributed to the low capacity of shallow roots to capture water. After water stress, corn could extract water from lower layers deeper than 60 cm, while rice could extract it only at a low rate below 40 cm so that the total water uptake declined rapidly (Fig. 1). It is important to improve the effective rooting zone for water capture by genotypic and environmental manipulation. Field experiments in major upland rice areas in the Philippines, Thailand, and India, revealed that the nutrient supply environment for N and P in the surface soil may have a significant effect on the water-capturing capacity from layers below the surface through its effect on root development and, consequently, on the performance of the rice plant under stress. This finding implies that the deficiency in nutrients is likely to enhance water stress. In the course of the project, a quantitative analysis of the compensating effect of nutrient input on yield loss due to drought in tropical Asia

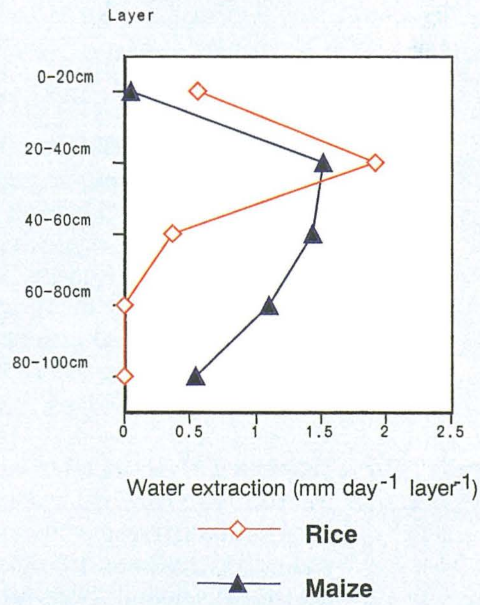


Fig. 1. Water extraction from soil profile by rice and maize under water stress.

is being conducted presently.

To alleviate the scarcity of water which is becoming a serious constraint on agriculture in the tropics with increasing population, efforts for the improvement of rice production under water-limited conditions are considered to be crucial for maintaining the food security.

The fourth phase

The fourth phase is under preparation, and it will start in October 1999 until September 2004. In that phase Japanese scientists will conduct "Physiological and genetic studies on yield determination and ecological adaptability for sustainable agriculture." The Japanese scientists are expected to breed varieties that are resistant to multiple diseases and pests and are environment-friendly and to develop suitable agronomic practices for the new varieties by using DNA marker selection technology.

ICRISAT/JIRCAS International Workshop

The International Workshop: Food Security in Nutrient-Stressed Environments: Exploiting Plant Genetic Capabilities

The workshop on "Food Security in Nutrient-Stressed Environments: Exploiting Plant Genetic Capabilities" will be held at ICRISAT-Patancheru, India during the period of September 27-30, 1999, organized by the International Crops Research Institute for the Semi Arid Tropics (ICRISAT) and Japan International Research Center for Agricultural Sciences (JIRCAS).

ICRISAT has been hosting a Special Project funded by the Government of Japan on "Sustainable Cultivation of Upland Crops in the Semi-Arid Tropics" since December 1984. During the first phase (1984-89), scientists found that pigeonpea can increase the available phosphorus (P) pool of cropping systems in which it is grown by accessing Fe-P via its unique root exudates. In the second phase (1989-94), root distribution in cropping systems was examined as a prerequisite to understanding N acquisition from the soil. The current phase III (1994-1999) is examining the physiological and genetic adaptation of crop plants to low-nutrient environments. This workshop is being organized to round off the activities of phase III of the project.

The objectives of the workshop are:

- To explore the scope for genetic manipulation of the ability of crop plants to gain access to and utilize nutrients (N, P)
- To prioritize candidate mechanisms for enhancing nutrient uptake and use in terms of suitability for genetic manipulation
- To examine appropriate methodologies for genetic enhancement of crop plant ability to absorb nutrients and use them efficiently
- To suggest how genetic options can best be combined with management options to improve nutrient uptake and use

The workshop consists of four sessions as follows:

Session 1: Breeding for low nutrient environments: is it sustainable?
Session 2: Candidate mechanisms
Session 3: Methodology for genetic manipulation of nutrient availability
Session 4: Combining genetic improvement with natural resource management

For further information, please contact:
Dr. J. J. Adu-Gyamfi
ICRISAT, Patancheru, 502 324 AP, India
Tel +1 650 833 6640, Fax +1 650 833 6641
E-mail: j. j. adugyamfi@cgiar.org

PEOPLE

Kazuyuki TSURUMI, an agricultural economist, became Director of JIRCAS's International Research Information Division, succeeding Mr. Kunio TSUBOTA who moved to Agricultural and Economic Development Analysis Division, Economic and Social Department, FAO. Mr. Tsurumi, until recently, was Managing Director, Agriculture Forestry and Fisheries Development Study Department, Japan International Cooperation Agency (JICA). He joined the Headquarters of the Ministry of Agriculture, Forestry and Fisheries (MAFF) in 1974 and mainly worked in the field of international affairs. During 1986-1991, he served as an agricultural economist at OECD, Paris.

Toshiaki TANIGUCHI, a veterinary pathologist, succeeded Dr. Mitsugu SHIMIZU as Director of JIRCAS's Animal Production and Grassland Division. Before joining JIRCAS, he was Associate Director for Research, Department of Pathology and Physiology, National Institute of Animal Health. Dr. Taniguchi was involved in several JICA's animal health projects in Indonesia, Malaysia and Thailand as a short-term expert.

Japan International Research Center for Agricultural Sciences (JIRCAS)
Ministry of Agriculture, Forestry and Fisheries
Editor: *Kazuyuki Tsurumi*
Assistant Editor: *Hiroko Takagi*

Address: 1-2, Ohwashi, Tsukuba, Ibaraki, 305-8686 JAPAN
Tel.: +81-298-38-6304
Fax.: +81-298-38-6342
E-mail: letter@jircas.affrc.go.jp