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JIRCAS Newsletter

for

INTERNATIONAL COLLABORATION

Rice plants tolerant to unfavorable environmental conditions being grown in the JIRCAS greenhouse (Photo by K. Toriyama)

In This Issue

JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

JIRCAS in the Next Ten Years: Issues and Challenges

With regard to its international development assistance program, last year marked a major turning point for Japan in that the outline of Official Development Assistance (ODA) was revised in September, and JICA became an independent administrative agency also in September, while the Third Tokyo International Conference on African Development (TICADⅢ) was held in November. This year is a memorable year as we celebrate the 50th anniversary of our country's participation in the Colombo Plan in 1954 and implementation of ODA.

Besides, an international symposium was held last year commemorating the 10th anniversary after the inauguration of JIRCAS in which the necessity of cooperation between organizations concerned, and the importance of Japan's contribution to the international community through research and technological development were emphasized, raising great expectations both here and abroad. Also in the follow-up meeting, JIRCAS received valuable advice on modalities for future joint international research. In accordance with discussions conducted in these meetings, we would like to propose the following four issues for the development of JIRCAS in the next ten years.

The first is to strengthen joint research with research centers affiliated to the Consultative Group on International Agricultural Research (CGIAR) for the development of public goods. For example, JIRCAS has achieved major breakthroughs in the field of biotechnology such as the isolation of useful genes. When developing a new variety of plants through the introduction of these useful genes, we believe that it is essential to draw upon the expertise of CG centers, and accomplish results that can be widely utilized across the world. With regard to breeding, we are planning to strengthen joint research with WARDA (NERICA), CIMMYT (wheat), IRRI (rice), etc.

The second is to create a new mechanism of joint research with developing countries. In the past, joint research between JIRCAS and developing countries has been on a bilateral basis. However, some of these countries are building up capacity to support others. Given this background, it has become important for JIRCAS to launch multilateral, regional joint research projects participated in by CG centers and research institutes from developed countries. In JIRCAS's project with Vietnam that will commence this year to develop methods for controlling citrus greening disease, the participation of the French Agricultural Research Centre for International Development (CIRAD) with established results in this field has been confirmed.

The third is to enhance the development of human resources. In order to solve difficult problems that developing countries are confronted with, individuals with professional knowledge and experience are required. It has become a pressing issue in this respect to develop human resources from medium and long-term viewpoints. Recognizing that joint research with CG centers and research institutes of developed countries will further aid this objective, we plan to initiate joint research with these institutions within this year including personnel exchange. In addition, as directed by the Agriculture, Forestry and Fisheries Research Council Secretariat, we will initiate a new human resources development program to facilitate training of graduate students and young researchers from national and public research institutes of our country at CG centers etc., in order to awaken their interest in and deepen their understanding of international development research.

President:
Dr. Mutsuo Iwamoto

The fourth issue is that JIRCAS will assume the role of a national center for international development research related to agriculture, forestry and fisheries. For this purpose, we will act as the secretariat for the Japan Forum on International Agricultural Research for Development, the establishment of which is now underway with the cooperation of the government ministries concerned to facilitate collaboration between organizations associated with international development of agriculture, forestry and fisheries, such as universities, JICA and other institutions.

All of the above issues are closely linked with those that have been brought up as JIRCAS's future strategies when I became its president last April.

The Agriculture, Forestry and Fisheries Research Council published "Guidelines for the Promotion of International Agriculture Research" last year. Based on its subtitle "Japan's Challenge Aiming at the Solution of Food and Environmental Issues," guidelines were laid down for Japan as a whole to tackle international development research issues effectively and efficiently towards the development of a research infrastructure that can cope precisely with the changing conditions associated with international development. The outline of the promotion guidelines was disseminated to the world at the CGIAR Annual General Meeting held in Nairobi in October 2003, and met with a hearty response.

Further, in February this year, an international workshop entitled "Toward More Effective and Efficient International Collaborative Research for Sustainable East Asian Agriculture and Rural Development" was held in Bangkok. It was held as part of JIRCAS's strategy for joint international research, particularly to deepen understanding of future joint research modalities in East Asia. Valuable comments were offered by representatives from participating countries, including the necessity of conducting joint research by the multilateral method in relevant areas.

Finally, this year has been designated as the "International Year of Rice" by the United Nations. In commemoration of this, a symposium sponsored by the Ministry of Agriculture, Forestry and Fisheries of Japan will be held in November in cooperation with other relevant organizations. JIRCAS, in its capacity as the secretariat of the "World Rice Research Conference," is making detailed preparations for the successful conduct of the symposium.

In conclusion, JIRCAS, having passed the intermediate year of its medium-term plan and having entered the fourth year of becoming an Incorporated Administrative Agency (IAA), is determined to continue fulfilling its task as a national center through the promotion of diversified programs related to international development, as well as research and technological development.

What is the Causal Agent of Sudden Death Syndrome in Argentinean Soybean?

Soybean cultivation in Argentina, especially in the Pampa area has rapidly expanded during the last two decades. Argentina is now the 3rd largest producer of soybean in the world with a cultivated area of about 14 million ha and a total production of about 32 million ton. Soybean is grown by double cropping with winter wheat using no-tillage methods.

Recently, concerns have grown about the spread of and damage caused by soil-borne diseases such as sudden death syndrome (SDS), which have been associated with continuous cropping of soybean plants on untilled land. The control of soil-borne diseases will be necessary to breed resistant cultivars. In order to develop a method for evaluating resistance of soybean crops to SDS, identification of the pathogen that causes the disease is critical.

Toward this objective, JIRCAS has conducted cooperative studies with the National Institute of Agricultural and Farming Technology (INTA) in Marcos Juarez, Argentina, entitled the "Ecology and control of major diseases of soybeans" since 1999.

In Argentina, severe outbreaks of SDS have occurred in the Cordoba and Santa Fe Provinces. Infected plants were collected from the fields and the symptoms of SDS were observed and recorded. The symptoms of SDS are characterized by yellow spots on the leaves in the early stages of the disease, by the browning interveins of the leaves in the later stages, and by a loss of leaves in the final stage (Fig. 1a). SDS also causes red-brown discoloration at the upper part of the main and lateral roots, and root rot, making the plant easy to uproot (Fig. 1b).

While researchers are aware of the symptoms of SDS, identification of the pathogen that causes the disease has proven more difficult. Tissue samples were taken from the infected plants and the isolated pathogen was observed under a microscope for its morphological characteristics. A strain of the pathogen was cultured on a grain of sorghum, then dried and macerated to inoculate into soil. Soybean plants were grown for 40 days in a greenhouse for evaluation of the symptoms of SDS. The pathogen displayed a very slow growth rate on potato dextrose agar (PDA) with one half to a third of the saprophytic *Fusarium* producing more than 50 μm of macroconidia, while the rest produced none. Sporodochya of the pathogen were frequently observed on the surface of the lesion of the roots. *Fusarium* was more frequently isolated from the red-brown colored tissues of the upper main roots and the lower hypocotyls than from the lateral roots (Table 1). The symptoms of the leaves and roots tested in greenhouse conditions were similar to those observed in fields. Yellow spots formed on the leaves two weeks after inoculation and the interveins subsequently began to brown.

Table 1. Re-isolation of the MJ161 strain of *Fusarium solani* f. sp. *glycines* from the roots infected in greenhouse test

Roots	Pieces tested	* Re-isolated	%
Main root (upper part)	25	19	76.0
Main root (lower part)	25	4	16.0
Lateral root	25	12	48.0

* Confirmation of the characteristics of the MJ161 strain on test tube culture of potato dextrose agar (PDA).

Based on the observations and the application of Koch's Postulates, it was concluded that the SDS pathogen in Argentina could be identified as *Fusarium solani* f. sp. *glycines*. The identification of the SDS pathogen is expected to help in the process of cultivating SDS-resistant soybean plants in Argentina. Recently, this strain of SDS pathogen from Argentina was reported as a new species *Fusarium tucumaniae* by Aoki *et al*. (2003).

Y. Homma[1], T. Aoki[2], R. Martin[3], M. J. Francioni[3] and A. Lattanzi[3]
[1]Biological Resources Division, JIRCAS, [2]Genetic Diversity Department, NIAS and [3]INTA EEA Marcos Juarez

Fig. 1. Leaves and roots showing symptoms of sudden death syndrome in the field.

Comparison of Water Conservation Practices between Tropical Rain Forest and Rubber Plantation Sites

The construction of agricultural plantations for oil palm and rubber production has devastated a significant proportion of Malaysia's natural forests during the early 20th century. Oil palm and rubber plantations in Malaysia account for 46% and 32% of the total area planted with major crops according to the records of the Ministry of Primary Industries, Malaysia in 1996. The rubber trees are usually planted on bench terraces on steep slopes. Bench terracing has been used in many parts of the world for agriculture, and in Southeast Asia in particular, for more than a thousand years. The conversion of forests to cultivate crops has caused major soil disturbances which have led to an increase of stormflow. The primary objective of this research was to compare the physical properties of forested and rubber plantation sites in order to determine how soil disruption impacts water conservation and how available water resources might differ depending on land-use qualification.

Soil depth and physical properties were investigated at the Bukit Tarek Experimental Watershed in a tropical rain forest (Fig. 1) and an adjacent rubber plantation (Fig. 2) in Peninsular Malaysia. Using a portable dynamic cone penetrometer, it was discovered that total soil depth in the rubber plantation was shallower than the 277 cm mean observed in the tropical rain forest. Moreover, total soil depth at the rubber plantation terrace bench, with a mean of 119 cm, was shallower than the 141 cm mean of the rubber plantation riser bank.

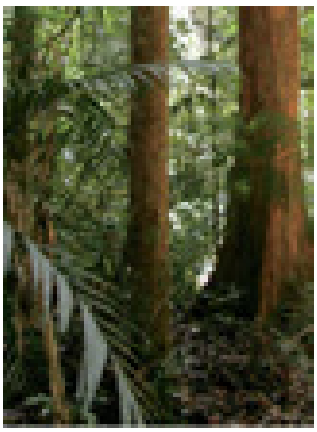

Fig. 1. Experimental site in a tropical rain forest.

Fig. 2. Experimental site in a rubber plantation.

Saturated hydraulic conductivities (Ks) were measured using vertical undisturbed soil cores from the tropical rain forest and the rubber plantation site (Table 1). Ks values decreased with increasing soil depth at both sites, however, the average Ks values in the tropical rain forest were larger than the prevailing rainfall intensity in this region, illustrating that rainwater infiltrates the soil. Though the average Ks values at the rubber plantation riser bank were similar to those in the tropical rain forest, the average Ks values at the terrace bench were smaller. Soil porosities decreased with increasing soil depth with the following order of magnitude: the tropical rain forest > riser bank > bench terrace (Table 1).

Fig. 3. Overland flow and surface detention at terrace benches in a rubber plantation during a heavy rainfall.

Mechanical establishment of rubber plantations causes considerable topsoil removal and compaction. Plantation workers further compact terrace bench topsoil when trapping and collecting latex. Thus, terrace bench soils display low permeability and low water storage capacity, characteristics that could explain the frequent overland flow of rainfall during storms (Fig. 3), while forest soils display high permeability and water storage capacity, which leads to higher rainfall absorption and baseflow production. These results should help policy makers and land managers understand how water conservation differs in forest and rubber plantation sites.

Shoji Noguchi
Forestry Division, JIRCAS

Table 1. Physical properties of soil in a tropical rain forest and rubber plantation

Site	Depth (cm)	Macro - porosity (%)	Meso - porosity (%)	Total porosity (%)	Saturated hydraulic conductivity (mm h^{-1})
Tropical rain forest	10	8.5	35.2	72.1	1573.0
	20	9.7	30.2	69.5	1498.0
	40	8.6	16.7	61.9	706.0
	80	8.6	15.9	55.5	378.0
Rubber plantation (bench terrace)	10	5.7	8.4	45.4	29.9
	20	4.0	11.1	39.9	19.8
	40	5.2	5.9	29.2	18.4
Rubber plantation (riser bank)	10	5.0	21.1	60.4	921.0
	20	5.4	20.5	65.2	838.0
	40	2.7	9.7	51.1	1062.0
	80	3.8	6.7	51.7	260.0

Toward More Effective and Efficient International Collaborative Research for Sustainable East Asian Agriculture and Rural Development

JIRCAS in cooperation with the Department of Agriculture, Thai Ministry of Agriculture and Cooperatives and Center for Applied Economic Research, Kasetsart University held an international workshop in Bangkok on February 19-20, 2004. The workshop aimed at exchanging views emerging from various international collaborative agricultural research activities for development as well as innovation, exploring the possibilities of developing new partnerships with institutions in both developing and developed countries, and establishing a more effective and efficient collaborative project/program.

The workshop was attended by about 40 participants working in the East Asian region including those from agricultural research institutions in the region as well as from advanced countries such as Japan, France and Germany, and from international organizations such as ESCAP Regional Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre), Asian Vegetable Research and Development Center (AVRDC) and FAO Regional Office for Asia and the Pacific. The participants made comprehensive presentations on the present status of international collaborative research mainly focusing on the sustainable development of agriculture and rural areas. Participants from the region explained that they were conducting various multi-faceted research projects/programs which reflected the differences in stages of development of the countries in the region; however, they were of the opinion that the more-developed countries could share their own experiences, good or unfortunate with less-developed countries. Participants from advanced countries and international organizations reported that they were conducting collaborative research projects focusing on the technical issues arising from the rapid economic integration in the region and the common nature of the farming systems in the basin of the international Mekong River, income improvement for poverty alleviation, and sustainable use of the environment and natural resources. A majority of the participants reached a common consensus that various research efforts had been made in the region in order to achieve rather similar objectives and goals so that a more sophisticated, efficient and effective framework for collaboration could be developed.

During the general discussion session, many of the participants raised various possible actions for the future, based on which the following ideas were evolved:

- to increase dialogues in order to identify focal points of interest, benefits for participation in collaborative work, and needs and niches of research,
- to develop an information center including an inventory of research and development programs as well as existing databases from FAO, Asia Pacific Agricultural Research Information System and other relevant websites,
- to develop a common platform, forum, network, or consortium and combine it with existing research networks, and
- to integrate capacity building for young scientists into existing international collaborative research projects/programs.

This workshop was the first attempt to strengthen regional collaboration in order to achieve common goals being sought by various stakeholders working in the region. JIRCAS President Dr. Iwamoto concluded the workshop by announcing his plan to upgrade the Center's Bangkok Office to a regional office as an initiative towards realizing proposed actions.

JIRCAS will publish the Proceedings of the workshop shortly and is now making efforts to follow up the outcome of the workshop in cooperation with the participating organizations.

Satoru Miyata
Research Planning and Coordination Division, JIRCAS

Collaborative Research on Fusarium Head Blight Resistance in Wheat and Barley

Fusarium Head Blight (Scab, FHB) caused by *Fusarium* fungi is one of the most destructive diseases of small grain cereals in areas where the weather is warm and humid during the heading to harvesting period. Fusarium not only reduces grain yield and quality, but also produces mycotoxins in the grain that are harmful to animal and human health. This disease poses a grave threat to wheat and barley industries around the world. It is now recognized that FHB of wheat and barley is an emerging disease of ultimate importance to the vitality of sustainable production of these crops in developing and developed countries. Impressive and unique genetic and breeding studies on FHB resistance have been conducted in Japan since the 1960s. We are also aware of the remarkable progress that has been made in the field of FHB resistance research all around the world after the major FHB outbreak in the 1990s. It has thus become more obvious that we need to integrate all our wisdom and information assets to overcome the war on FHB.

Aiming at extensive exchange and cooperation for collaborative research on FHB resistance in wheat and barley, a workshop sponsored by JIRCAS was held on February 10-11, 2004 in Tsukuba, Japan. We had presentations by invited speakers working on FHB resistance in wheat and barley through national (9 speakers) and international (10 speakers) research consortiums, and a wrap-up discussion for future international collaboration. The workshop was attended by approximately 100 people.

The workshop consisted of three sessions. In the first session ‘ Status and future prospects of national and international research collaboration on FHB resistance, ’ CIMMYT Director General, Dr. Masa Iwanaga delivered a keynote speech on the status of international collaborative research on FHB resistance. Project leaders of genomic and breeding projects from USWBSI (USA), AAFC-Canada, EUREKA (EU), East Asia, ICARDA, CIMMYT and Japan discussed the present status and future prospects in their respective research fields. Moreover, they also provided useful comments on germplasm enrichment for marginal lands during the discussion in the second session ‘ Current updates and perspectives on genomic and breeding studies on FHB resistance. ’ In the last session ‘ Current updates and perspectives on disease and mycotoxin control studies for FHB risk management, ’ we also invited various key persons working on FHB resistance and risk management in the fields of Integrated Pest Management (IPM), plant pathology, and mycotoxin remediation using advanced biotechnological methods.

Finally, in the wrap-up discussion we encouraged the speakers as well as general participants to seek new directions for future international collaboration. The workshop was very fruitful in the sense that JIRCAS took the initiative as a national and international center to bring together relevant people working on FHB resistance, and made it possible to conduct productive discussions focused on this very important issue. As the next step we believe that the JIRCAS-CIMMYT initiative should play an active role to elevate the work on FHB resistance breeding including crop improvement, so that we can better combat this global challenge. This workshop could lead to a new paradigm for international cooperation and collaborative research on FHB resistance. Proceedings of the workshop will be published by JIRCAS later this year.

Tomohiro Ban
Biological Resources Division, JIRCAS

The " Cooperation Agreement " with Tokyo University of Agriculture

On March 11th, JIRCAS tied an " Agreement on the Education and Research Partnership based on the Cooperative Graduate School System " with Tokyo University of Agriculture. Under this new contract, extensive cooperative activities will become possible between the two institutions, such as opportunities for JIRCAS researchers to provide educational guidance to graduate students as visiting professors at the University. This agreement will be beneficial for both institutions.

The advantages that JIRCAS will be able to gain from this agreement are: first, by utilizing the results of fundamental studies that are carried out in the University, new research perspectives, as well as the application of new techniques will advance; second, by gaining the graduate students ' participation, research structure will be solidified, and most importantly, the agreement will enable researchers to train future successors of each field.

As for the University, in forming connections with researchers of JIRCAS, basic disciplines can be extended to applied research, allowing the introduction of new methodologies and stimulating participation in research projects. In addition, through utilization of various facilities, university education will be advanced.

Agreement with Tokyo University of Agriculture.

JIRCAS has now created two contracts with educational institutions, following its contract with the Graduate School of the University of Tokyo signed in April, 2001. Because these partnerships not only permit both the University and JIRCAS to retain their original qualities, but also strengthen JIRCAS research projects and University education, JIRCAS hopes to establish new partnerships with other universities in the future.

Toshihiro Uetani
Research Planning and Coordination Division, JIRCAS

JIRCAS Opens to Public

On April 14th, major research centers, including JIRCAS, in the Tsukuba Science City was opened to public, as one of the events for " Science and Technology Week. "The theme for JIRCAS Open Day this year was" Make the World Prosperous: Overseas Collaborative Research and International Year of Rice, 2004. " The UN declared this year as the " International Year of Rice. " In this connection, JIRCAS together with MAFF, IRRI and other institutes plans to hold a major international symposium in Tokyo and Tsukuba in early November.

For Open Day, JIRCAS displayed panels of the collaborative overseas projects and domestic research projects conducted in Tsukuba and the Okinawa Subtropical Station and exhibited various types of rice, such as NERICA, aromatic rice, and newly developed rice products. In a mini-seminar open to the public, JIRCAS researchers gave presentations followed by a question-and-answer session. Visitors enjoyed observing the fresh-water prawns in the Fisheries Division, the tropical plants greenhouse, and the domestic varieties of rice displayed by MAFF 's Ibaraki Office. As one of the customary features of Open Day, gifts of hibiscus seedlings were handed out. Although the weather was unfavorable, more than 1,000 people, including high school students, came to JIRCAS that day.

Ingenuity Award for a Novel Nutrient Culture Bed Model for Plants

Koji Yamato, Hirokazu Ikema and Masato Shimajiri, staff members of the Field Management Section, Okinawa Subtropical Station, JIRCAS were honored with the Ingenuity Award for the Year 2004 from the Ministry of Education, Culture, Sports, Science and Technology of Japan. The purpose of the award is to recognize individuals who have contributed significantly to the development of innovative technologies in their respective disciplines. This is the 4th time for the Okinawa Subtropical Station to receive this award.

The honored staff members designed a novel culture bed by improving upon a single-story nutrient culture bed model for plants in the following manner: 1) the single-story culture bed was changed to a double-storied one to make efficient use of limited space, 2) a portable nutrient tank was set up at one corner of each culture bed, making automatic watering by gravity possible whenever necessary, and 3) the whole standing frame was furnished with casters to make it easy to move the nutrient culture bed to the desired place for seeding, planting, observation, harvesting etc. The new nutrient culture bed model has been proved to be efficient, labor-saving and economical in the production of seedlings of sugarcane and cultivation of various leaf vegetables and is currently in submission to the Japan Patent Office.

This model was exhibited in Brunei in 2001 during the APEC Science and Technology Week and was well recognized for its utility. It is expected to find use not only in research stations but also in kitchen gardens for the cultivation of leaf vegetables.

Shuichi Asanuma
Director, Okinawa Subtropical Station, JIRCAS

Life and Research in Tsukuba Science City

There is an old saying that " the more you travel, the more your benefits and experiences. " To be more specific, going abroad for research in a developed country involves more struggle, perseverance and challenge, and doing one's utmost to learn and to cope with the advanced technology and techniques.

Almost ten years ago, during my PhD at Tohoku University located in Sendai city, I had heard about Tsukuba Science city and its many research institutes, and the difficulties in transportation and other services at that time. However, being in Tsukuba city now, I believe that a lot of effort has been made to ease the life of residents and meet their needs. Moreover, being among researchers both at JIRCAS and at the guest house facilitates acquiring more knowledge and experience through scientific discussions and cultural exchange.

By working at JIRCAS, I gained an understanding of the significant contribution being made by JIRCAS programs towards solving the agricultural problems of various regions in Africa, Asia and South America. JIRCAS has been focusing its research activities and funds on improving food security and agricultural sustainability in most of the developing countries, in view of the rapid increase in population and food needs. It was a great opportunity for me to further my research at JIRCAS as a member of the Animal Production and Grassland Division by working on endophytic nitrogen fixing bacteria associated with different rice varieties.

In terms of cost and use, nitrogen fertilizers are the single most important purchased material input particularly in rice production in irrigated ecosystems. Moreover, water pollution caused by nitrogen runoff from fertilizers poses a bigger problem than air pollution. Thus, the identification of a safe source of nitrogen such as biological nitrogen is crucial. Endophytic nitrogen fixing bacteria were found to be able to increase nitrogen input in cereal crops, although their contribution was not as high as that of symbiotic bacteria in legume plants. Besides isolated bacteria, our study was also extended to exploring the existence of other nitrogen fixing endophytes which are probably more abundant inside plant tissues but cannot be cultured on known media. Thus, clarification of the process of biological nitrogen fixation will bring financial benefits to farmers and environmental benefits to the society at large.

Dr. Adel El-Beltagy (second from right) and his colleagues.

I would like to thank the JIRCAS authorities, my host Dr. Ando and the Director of the Animal Production and Grassland Division for giving me this great opportunity to be a member of JIRCAS through the Visiting Research Fellowship Program.

Adel El-Beltagy
Visiting Researcher

ANNOUNCEMENT

The World Rice Research Conference being co-organized by JIRCAS will be held on November 4-7. Please register at http://www.irri.org/wrrc2004/ by October 10, 2004.

rice is life
INTERNATIONAL YEAR OF RICE 2004
www.rice2004.org

PEOPLE

Dr. Akinori Noguchi, formerly Director of the Research Planning and Coordination Division was appointed as Vice-President. Dr. Masami Yasunaka, formerly Director of the Research and Development Division of AFFRC, MAFF was appointed as Director of the Research Planning and Coordination Division. Dr. Yutaka Mori, formerly Development Research Coordinator in the Development Research Division, was appointed as Director of the Food Science and Technology Division. Dr. Shozo Nakamura, formerly Head of the Research Information Section, Forestry and Forest Products Research Institute, was appointed as Director of the Forestry Division. Dr. Koji Nakamura, formerly Director of the National Research Institute of Fisheries Sciences, was appointed as Director of the Fisheries Division.

Dr. Noguchi

Dr. Yasunaka

Dr. Mori

Dr. Nakamura

Dr. Nakamura

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