ACIAR

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PROJECT NEWS

Indian phosphine resistance studies reviewed

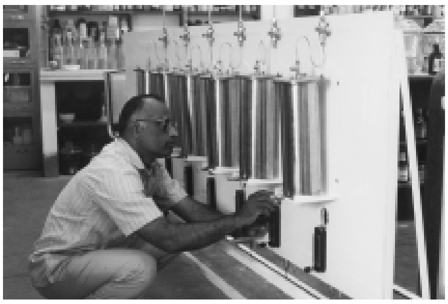
A review of Indian activities in project PHT/1994/015, “Phosphine resistance in insect pests of stored grain”, has commended the work of the research team at the Central Food Technological Research Institute (CFTRI) in Mysore.

Phosphine is the most widely used fumigant gas for controlling stored product pests. Any loss of efficacy or failure of control recommendations will be of major concern, because satisfactory alternative fumigants are not yet available.

The research team in India, led by Dr S. Rajendran and under the overall direction of Dr N.G.K. Karanth, has detected and quantified phosphine resistance in Indian stored grain pests. Very high levels of phosphine resistance were detected in several strains of pests (especially the grain beetles *Rhyzopertha dominica* (resistance factor ×1200), *Sitophilus oryzae* (×425), and *Tribolium castaneum* (×10)), indicating that fumigation failures are inevitable with current practices and demanding urgent action to avoid exacerbating the problem.

For phosphine fumigations to be effective (i.e. to kill all life stages of all pest species present) it is critical that the concentration of the gas in the storage be held high enough for long enough. A survey by the CFTRI team found that phosphine concentrations were frequently below that required to give complete kill. It is therefore clear that extra effort must be made to enforce good fumigation practices as a major weapon to contain the resistance problem.

The PHT/1994/015 team and reviewers at CFTRI: centre front is Dr S. Rajendran; to the right of him are Dr N.G.K. Karanth, Mr B.B. Pattaniack, and Dr Rick Hodges; to Dr Rajendran’s left is Ms Mary Lupul, ACIAR Country Manager for South Asia; Dr Greg Daglish is behind Ms Lupul.



CFTRI’s Mr N. Muralidharan assembling test chambers during the project, for fumigating infested grain to estimate dosage requirements for phosphine.

ASEAN/APEC Seminar Papers

Papers from the 19th ASEAN/ 1st APEC Seminar on Postharvest Technology are beginning to appear on the Postharvest Technology pages of the ACIAR Web Site. Go to:

<www.aciar. gov.au/projects/ postharvest/index.htm>

thence to the link ASEAN/APEC. ■

IN THIS ISSUE

Contributors to this issue: Jimmy Botella, Bruce Champ, Jonathan Donahaye, Ed Highley, Greg Johnson, Daryl Joyce

As well as promoting good fumigation practices, CFTRI has been working with industry partners to test slow-release phosphine-generating formulations that promise to be of great help in overcoming resistance, or at least retarding its spread. It is hoped that this CFTRI–industry work will continue, so as to refine methods of using the newer materials.

The review of PHT/1994/015 work in India was undertaken in November 1999 by Dr Rick Hodges of the Natural Resources Institute, University of Greenwich, UK and Mr B.B. Pattaniack, who is Joint Commissioner (S&R) for the Department for Food and Civil Supplies, Ministry of Food and Consumer Affairs of the Government of India.

Concluded at foot of page 8.

CONFERENCE REPORT

Oiling the wheels of international trade

Against a background of accelerating globalisation in the food trade on the one hand, and an increasing incidence of food contamination problems on the other, the Food and Agriculture Organization of the United Nations (FAO) held a "Conference on International Food Trade Beyond 2000: Science-Based Decisions, Harmonization, Equivalence and Mutual Recognition" in Melbourne, Australia on 11–15 October 1999.

The conference, which was held in cooperation with the World Health Organization (WHO) and the World Trade Organization (WTO), attracted over 200 participants, including the representatives of 75 countries and observers from 25 international government and nongovernment organisations.

Mr Hartwig de Haen, the FAO representative at the conference, noted that consumers had become increasingly concerned about the quality and safety of the food supply. Recent food contamination problems, he said, had contributed to lack of confidence in the safety of food among a significant number of consumers.

The conference in Melbourne was the third in a series that began nearly 40 years ago. The first FAO/WHO Joint Food Standards Conference in 1962 established the Joint FAO/WHO Standards Programme and the Codex Alimentarius Commission. Codex Alimentarius — the food code — has become the primary global reference point for consumers, food producers and processors, national food control agencies, and the international food trade in setting standards for the composition of food and foodstuffs offered for consumption. Its primary objective is consumer health and safety.

Though already an international reference point, the food code gained even greater global significance as a result of the Uruguay Round of multinational trade negotiations finalised in 1994. Both the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT) encourage international harmonisation of food standards. The SPS Agreement cites Codex standards, guidelines, and recommendations as the preferred international measures for facilitating international trade in food. Thus, the Codex can now also function as a guideline for free and fair trade.

Many of the recommendations of the Melbourne conference exhorted the governments of developing countries to implement effective food control systems to protect their own people and open the gate to food export and international trade. A background paper on the challenges to developing countries in doing so was presented by H.E. Cham Prasidh, Cambodia's Minister of Commerce.

Developing countries were asked to accept the challenge of strengthening the abilities of their national food regulatory systems by devoting increased resources, improving information technology systems, and participating more actively in meetings of technical committees and commissions dealing with food regulatory matters. For their part, FAO, WHO, and funding agencies should, it was recommended, give priority to the special needs of developing countries, including infrastructure, resources, technical, and legal capabilities.

The conference also supported the view that governments of developing countries should take all necessary steps to apply Codex standards to all imported, exported, and domestically produced and traded foods. Further, support should be given to accredited research institutes in developing countries to contribute to the international effort in food safety research, surveillance systems, and data collection and analysis.

An overarching recommendation was that FAO, WHO, WTO, and other international organisations, in cooperation with funding agencies and other donors, should increase technical support to developing countries to strengthen their food quality and safety assurance and control systems in order to allow them to participate as full and equal partners in international food trade. An important component of this support would be direct regional and national training, for example through workshops and seminars or by electronic means, focusing on appropriate levels of protection, risk analysis, improved sanitary conditions, and the development of equivalence/mutual recognition as principal lines of action. ■

FORTHCOMING MEETING

Asian Plant Pathology Conference

The 1st Asian Conference on Plant Pathology will be held in Beijing, China on 25–28 August 2000, organised by the Chinese Society for Plant Pathology with support from The Phytopathological Society of Japan and the Korean Society of Plant Pathology.

A call has been made for titles and abstracts of papers offered for presentation at the conference. The deadline for submission of these is 30 April.

The program for the conference has 14 sessions, as follows:

1. Host–parasite interactions
2. Host–nematode interactions
3. Integrated disease management
4. Epidemiology and crop-loss assessment
5. Resistance of plants and resistance breeding
6. Etiology and new diseases
7. Ecology and biological control
8. New approaches to chemical control
9. Seed pathology and quarantine
10. Strategies for reducing the cost of disease control
11. Postharvest diseases
12. Forest pathology
13. Control of diseases in tropical crops
14. Media workshop

For further information, go to <http://www.ciccst.org.cn/acpp/>.

Enquiries about the technical program can also be directed to: Prof. Tang Wenhua, Plant Protection Bldg. No. 313, China Agricultural University, Beijing 100094, China. Fax: +86 10-6289 1025; Email: <bauicbe@public.bta.net.cn>; web site: <http://www.chinaspp.com>. ■

Control of ripening in papaya by genetic engineering

A*CIAR Postharvest Newsletter* No. 51 contained a short report on recent activities* in project PHT/1994/045, “Control of ripening in papaya and mango by genetic engineering”. As a follow-up, project leader Dr José Botella here outlines the approach the project is taking in seeking to control ripening in papaya, and some other potential uses of plant genetic engineering.

As in many other tropical fruits, ripening in papaya is initiated by the natural production of ethylene gas within the fruit. The resulting fully ripened fruit undergoes natural tissue breakdown, which can leave the farmer with significant financial losses in transportation and storage. Since the influence of ethylene in ripening was elucidated, it has been a high priority of researchers to limit the production of endogenous ethylene gas and hence the rate of ripening.

In plants, the ethylene biosynthetic pathway involves the conversion of methionine to ethylene via several intermediate compounds. In the final stage of this conversion, s-adenosyl methionine (SAM) is converted to 1-amino-cyclopropane-1-carboxylic acid (ACC) via the enzyme ACC synthase. The ACC molecule is then changed to ethylene following its conversion by ACC oxidase. ACC synthase and ACC oxidase have both been studied to determine whether knocking out of one or both of these molecules would hinder the production of ethylene and hence reduce the rate of fruit ripening.

Since ACC synthase has been found to be the rate-limiting enzyme involved in this pathway, there are now many researchers seeking to control ripening by altering the rate at which the fruit expresses ACC synthase. One way is to introduce the ACC synthase gene in an antisense orientation — that is, the reverse of the gene as it occurs naturally in the plant. The antisense gene acts in an antagonistic way toward the natural gene via a process called co-suppression. The result of this is that both antisense and sense genes are inactivated, and no ACC synthase enzyme is produced to take part in the ethylene biosynthesis pathway. The pathway is then either blocked or severely hindered, with little or no ethylene being produced by the plant. Ethylene must now be applied externally to complete ripening of the fruit.

To capitalise on all this, the appropriate ACC synthase gene first needs to be isolated from the particular plant. Papaya plants produce several forms of the enzyme, which are used either at different times during fruit ripening or during generalised tissue wounding. The correct gene is cloned into a plant DNA plasmid downstream of a promoter element, in a reverse orientation to the naturally occurring gene. The plasmid next needs to be placed into the plant, and maintained in a stable way. One way of performing this is through a process known as “particle bombardment”, whereby the plasmid enclosing the antisense gene is literally shot into embryonic callus tissue derived from the plant. The resulting *transgenic* callus cells are grown in tissue culture on a series of root and shoot-inducing media to ultimately form full plantlets. In papaya, this procedure usually takes around 6–9 months. These plantlets are then grown on sterile soil for several weeks until they are able to be transplanted out into the field.

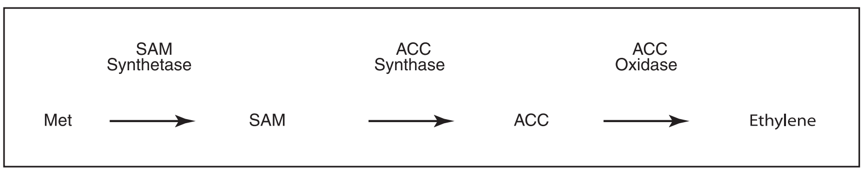
It is the number and location of the inserted gene which will ultimately determine effectiveness within the transgenic plant. Because of this, we would expect a wide range of ACC synthase-suppressed plants, ranging from partial to total inhibition of ethylene production, and its resulting effects on fruit ripening. This factor can be seen as a benefit — growers may seek either delayed or totally suppressed ripening in their fruits, depending on their desired markets.

The chief benefit arising from this technology is the longer shelf life imposed on the fruit of the transgenic plants. This might mean that new markets can be opened — markets which do not need to depend on rapid, refrigerated transportation of the papaya fruit. Fruit could also be stored for longer periods with considerably less damage than is currently suffered. The full ripening of the fruit would be undertaken at the point of sale following the simple application of ethylene gas. In addition, the fruits are expected to retain their peak nutritional value for a longer time, an obvious attraction to the consumer. We expect no other changes, negative or positive, to fruit quality.

Genetic engineering of plants offers many other possibilities, disease resistance being one of the main areas of focus. Papaya ringspot virus (PRSV) is a debilitating disease of papaya the world over. Causing the death of the whole plant, PRSV has been responsible for the near total destruction of the papaya industry in places such as Hawaii and the Philippines. The virus consists of many geographically distinct isolates, making protection a case for localised concern. In Australia today, the virus is confined to south-eastern Queensland. Quarantine procedures have so far prevented its northward spread. Currently, the only sure way to provide complete resistance is to insert a construct containing viral DNA into the plant. The mechanism for resistance is, in principle, similar to the delayed ripening process. A sense/antisense construct of a small region of viral DNA would be inserted into the papaya embryonic cells. The construct would then confer complete viral immunity on the resulting plant. In addition, this immunity would be specific to the Australian viral strain.

The new process of transgenically altering plants will have applications in many other areas, ranging from insecticide resistance to plant production on sub-standard soils. Compared with plant breeding techniques, the technology can more rapidly develop plants that have been stably altered to overcome a specific agricultural problem. ■

The ethylene biosynthesis pathway



* A photograph that accompanied that article gave Dr William Padolina as Secretary for Science and Technlogy in the Government of the Philippines. We note that Dr Padolina’s current position is Deputy Director General for Partnerships in the International Rice Research Institute.

PROJECT NEWS

Protectant research has helped China's grain storers

The size of the world's annual grain harvests is truly colossal; but since harvesting is not spread evenly throughout the year, the safe and hygienic storage of grain is as important as the growing and harvesting. Unfortunately, protecting stored grain from pests and infestations of various kinds is both a difficult and a costly business, the fact of which farmers and the postharvest community are very well aware.

Project PHT/1990/035, supported by ACIAR from 1992 to 1995, relied on the fact that, at the time, Australia had considerable expertise and experience in the technology needed to reduce the losses caused by pests in stored grain. The Australian expertise was particularly strong in respect of grain protectants, chemical compounds used to protect grain from insect pests.

Australia itself, as a major exporter of wheat, has to be very watchful. Its wheat may become unacceptable if it contains insects; and equally it may be rejected if it contains too much residue of the chemicals used to eliminate those insects.

Because of these constraints, researchers had developed a range of approaches to protecting harvested grain from deterioration during storage. In particular, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) had developed a prototype "expert system" for centralised storage, based on the operations of the Victorian Grain Elevators Board, while another such system developed by the Queensland Department of Primary Industries was aimed at farm storage systems.

Application to China

Obviously, these expert systems were of importance to Australia in its exporting of wheat to China, although that country imports far more from the USA and Canada. On the other hand, China's own wheat crop is huge and it is estimated that the annual crop there has grown from around 400 million tonnes in 1990, when this project started, to some 500 million tonnes in 1999. Not surprisingly, growth on this scale gave rise to major problems in handling and storing the grain safely.

The project therefore aimed at discovering whether the expert system developed by CSIRO could be enhanced for Australian use (partly by extending it to rice and maize) and at the same time adapted for China and extended there.

The use of protectants

The use of protectant chemicals in storing grain is a complex matter which involves the chemistry of the various grains, the type of storage, the ambient temperature and moisture, the characteristics of the chemicals and the reaction to them of the pests they are intended to destroy.

Malathion was one of the first protectants to be used, but insects began to show resistance to it and other chemicals had to be found. Ultimately, fenitrothion and deltamethrin when used together in combination with malathion proved to be effective against all insects.

As well as developing the expert system, the project therefore aimed to assess the extent of resistance to malathion and to determine what dosages of the other two chemicals would need to be used to control the major storage pests under Chinese conditions.

The difference between Australian conditions and those in China widened during the course of the project. In the mid-1990s, market requirements in Australia demanded that grain must be free both of insects and of chemicals. As a result, research has concentrated on finding and applying non-chemical methods of pest control. In China, on the other hand, the growth of production meant that before the project, the country did not have the technical capacity to upgrade its storage and use its storage facilities to best effect. In tackling this problem, Chinese authorities were looking, among other things, for ways of applying grain protectants effectively.

Grain stored in China's centralised storage system (as distinct from farm storage) had largely been protected by fumigation, for example with phosphine, and protectants such as malathion were widely used too. However, the increasing resistance to malathion meant that more had to be used, with the consequent risk of excessive residue. This, combined with the search for other chemicals and for an appropriate technology for using them, was making the management of grain storage increasingly complex and expensive.

The results

As far as Australia is concerned, the direct benefits of the project have been relatively small, largely because of the substantial reduction here in the use of protectants. There was, however, a spin-off from the use of the expert system as enhanced by the ACIAR project. One of the products of the exercise was a package of computer-assisted learning (CAL) for the management of grain storage and this aroused widespread interest. ACIAR has supported projects in this area in Indonesia, and the CAL package has also been extended to the Philippines, Thailand, and Vietnam. The Australian Agency for International Development (AusAID) has also supported the follow-on activities.

In China, however, where the use of protectants is still widespread, the project has brought about a greater confidence and knowledge in the use of the new protectants. Consequently, they are now being used both in centralised storages and on-farm. In percentage terms, the use of the new protectants is low, but in terms of the enormous Chinese grain crop, the reduction in losses of stored grain that results from more effective pesticide use is considerable. In addition, the new chemicals have reduced the pressure for the increasing use of malathion. These results are particularly important because it is unlikely that the use of protectants will decline substantially in China for some time.

As for the expert system, part of it was used to develop a Chinese version called Grain Protection Insect Control which is now being used in 110 storages and 10 training and research institutions. This is producing cost savings mainly because it enables managers to be more innovative in their approach to grain treatment and to have more confidence in the decisions they make. As a consequence, the storages become more economical in their use of protectants and of labour.

Concluded at foot of page 7.

* This article is based on information in "Use and management of grain protectants in China and Australia. ACIAR Project PHT/1990/035", by P.D. Chudleigh, ACIAR Impact Assessment Series No. 15, copies of which can be obtained from ACIAR.

Can sealed storage stop fungal damage to moist paddy?

This was the question tackled by a USAID-funded project* that ran in the Philippines between 1995 and the end of 1999. The project was a collaborative effort involving researchers from the Bureau of Postharvest Research and Extension (BPRE) in the Philippines and Israel's Agricultural Research Organization (ARO).

The project sought a solution to the problems that arise in far-eastern Asia when paddy-rice is harvested at high moisture contents during the wet season. This paddy must be dried to a safe moisture content in order to prevent it from moulding and rotting. But if the paddy is dried rapidly from about 30% to a moisture content at which it can be safely stored, the grains are stressed, and this can result in cracking and breakage during milling. To overcome this problem, collaborative studies in Southeast Asia supported by ACIAR have developed a two-stage drying procedure in which the paddy is first quickly dried to 18% (an intermediate moisture content), which suppresses yeast and bacterial activity, followed by a second stage drying from 18 to 14% moisture content to prevent the development of storage moulds. This procedure does not seriously reduce head rice yield when the paddy is milled. However, the drying problem is compounded by the fact that most farmers do not have flash dryers for rapid, first-stage drying and are obliged to sell their grain directly to the traders. Even if flash dryers are available, insufficient capacity of second-stage dryers creates a bottleneck at harvest time.

Coping with delays in drying

Principal investigators Drs Silvestre Andales and Jonathan Donahaye report that the BPRE–ARO project was designed to develop a technology that would enable farmers to overcome this bottleneck at the second drying stage by providing them with a means of storing the intermediate moisture content paddy under tightly sealed conditions and thereby prevent spoilage for prolonged periods until drying by sun or machine becomes possible.

The present policy of the Filipino Government seeks to provide small-scale farmer cooperatives with on-site storage units so as to decentralise storage of the national grain reserve and provide greater food security to rural communities. This policy is being implemented, and the concept of sealed storage to protect grain from insect infestation has been widely promoted, and supported by the distribution of flexible plastic outdoor storage cubes that are an outcome of an earlier ARO–BPRE project. About 200 units of these structures were purchased and distributed to farmer cooperatives throughout the Philippines in 1998. More recently, the government purchased another 300 units for distribution among farmer cooperatives through a soft-loan scheme. This is being done to mitigate the effects of an expected “La Niña” episode.

Storage in an oxygen-depleted atmosphere

However, the problem of harvesting moist paddy in the rainy season remains. Although the storage technology developed in both the previous and present project is based on the principle of hermetic storage, the objective of the present project was to employ the principle of “self-regulated atmospheres” caused by aerobic metabolism in order to arrest fungal development and preserve grain quality in paddy of intermediate moisture content. To prevent fungal spoilage, oxygen depletion must be much greater and more rapid than that required to control insects, and it was anticipated that this would require a level of sealing higher than that needed for insect disinfestation.

Two questions had to be answered before field trials could begin:

- Do the rates of oxygen depletion obtainable by sealed storage of moist paddy prevent mould proliferation sufficiently in the damp grain?
- Can hermetic storage of intermediate moisture content grain be carried out without harming the aroma, taste, and cooking qualities of the rice?

Answers to these questions were sought in laboratory studies in the Philippines during the first and second years of the project. These investigated the effect that hermetically storing moist paddy for various lengths of time had on rice quality parameters such as milling and organoleptic characteristics. Concurrent studies in Israel, using the same paddy but also wheat, were directed at evaluating rates of aerobic metabolism at different moisture contents and temperatures as a basis for determining rates of oxygen depletion within the storage enclosures.

Choosing the right storage structure

In the first year of the project, a flexible storage structure of 10 tonnes capacity was manufactured from a plastic laminate chosen from a series of materials that were screened to test their permeability to oxygen and carbon dioxide. This structure was field-tested in Israel before shipping for paddy storage trials to be undertaken in the Philippines.

Although calculations indicated that the low permeability of the liner material would give a sufficient seal to reproduce laboratory conditions, it was expected that convection currents inside the enclosure would be an important additional factor influencing the storage environment under field conditions. These currents, driven by temperature gradients resulting from diurnal temperature fluctuations, can carry moisture to the top of the stack and deposit it there. This phenomenon was noted in the previous study when storage cubes were set up at unshaded sites. As a counter measure, an insulating layer of rice hulls was placed over the top layer of bags and this solution became standard procedure. However, for the storage of intermediate moisture content grain the situation is much more critical since any rise in moisture content above 18% is liable to stimulate the anaerobic metabolism of bacteria and yeasts that have a strong influence on grain quality, particularly taste and aroma.

Shading the stacks

A better solution developed during this project was the use of an external reflective shade cover placed over the storage cube in order to reduce temperature gradients within the grain and thereby minimise moisture migration.

Continued at foot of page 6.

* The leading investigators in this USAID funded project (C12-057), were Jonathan Donahaye and Shlomo Navarro from the Agricultural Research Organization, Israel, and Silvestre Andales and Filipinas Caliboso of the Bureau of Postharvest Research and Extension in the Philippines.

TRAINING NEWS

Degree course offered in fresh produce management

Cranfield University at Silsoe in the UK is offering a new MSc course in fresh produce management (FPM). This has been developed to provide candidates with industry-orientated skills and knowledge of technology and quality management of fruits, vegetables, and ornamentals within the modern supply chain.

The course is run by highly qualified staff with many years of teaching and research experience in postharvest technology and produce marketing and management techniques. The aims of the course are to:

- provide produce technologists with a thorough knowledge of the quality requirements of produce retailers, together with training in the technologies that are required to achieve the requisite quality standards; and
- provide graduates with an understanding of current marketing and management concepts to enable them to integrate fully into modern businesses that handle fresh produce.

Structure

The course runs from October to March and is comprised of 10 taught modules and a research project. The course is assessed by in-module assignment (30%), two integrating examination papers (20%), a research project (45%), and an oral examination (5%). The 10 taught course modules are as follows.

- Fresh produce biology and quality
- Preharvest quality management of fresh produce
- Principles of marketing management
- Fresh produce handling technology
- Technical and commercial data analysis and interpretation
- Management accounting
- Retail logistics and management
- International marketing and export management
- Fresh produce pest and disease control
- Fresh produce processing technology

Entry requirements

A good honours degree (or equivalent) in a bioscience-related subject is needed. For prospective candidates already working within the horticulture/food sector, other qualifications and relevant post-qualification experience may also be considered.

Employment opportunities

Most graduates who completed MSc courses at Cranfield University in postharvest subjects have found excellent first destination employment within 3 months of graduating. Examples of post-course careers for our graduates have included UK fresh produce suppliers, fruit importers, flower importers, food processing companies, logistics companies, and government posts.

For further information contact:

Student Enquiries
Cranfield University at Silsoe
Silsoe
Bedford MK45 4DT, UK
Fax: +44(0) 1525 863399
Email: <StudentEnquiries.silsoe@cranfield.ac.uk>.

For general information go to:

<http://www.silsoe.cranfield.ac.uk>
or
<http://www.silsoe.cranfield.ac.uk/IAT/MF&P/PHL/PHL.htm>. ■

Sealed storage of moist paddy ... from page 5.

Initial trials of this procedure carried out in both countries during the second year of the project were inconclusive. However, after modifications, further trials carried out during the third year in both countries gave positive results. This has led to adoption of this concept for all outdoor storage in plastic liners, and inclusion of reflective covers in the standard commercial enclosure kits.

Effects on paddy quality

It was clearly demonstrated in the first year that the rates of oxygen depletion in hermetically sealed moist paddy could prevent mould proliferation, but the effects of hermetic storage upon paddy quality took longer to evaluate than planned. The evaluation required repeat experiments to enable detailed assessments of cooking and acceptability parameters after 1, 3, and 6 months of storage. This work was done by Prof. Del Mundo at the University of the Philippines, Los Baños. The project findings indicated that, after 1 month, the quality of sealed paddy stored at up to 18% moisture content had not deteriorated. However, further evaluations made on paddy stored hermetically for 1, 3, and 6 months under both laboratory and field conditions confirmed that, after the first month of storage, the quality of moist paddy (16–18% moisture content) deteriorated progressively and the grain was judged by the taste panels as no longer acceptable. These findings enable the following tentative recommendations to be made for safe storage intervals for paddy:

Conclusion

The present widespread implementation of the hermetic storage technology at the cooperative and village level throughout the Philippines has been backed up with BPRE-initiated “on-the-spot” extension courses. Many aspects of this technology have not yet been explored, especially field validation of the laboratory findings at 15–17% moisture content. However, the BPRE–ARO team expects that this enterprise will serve as a starting point for the adoption of hermetic storage to protect paddy of intermediate moisture until it can be dried to a level safe for longer term conventional storage. So the answer to the question that heads this article is a guarded “yes”. ■

Safe storage intervals for moist paddy in sealed storage

For 18% MC	one (1) month
For 17% MC	one (1) month*
For 16% MC	can be extended to two (2) months*
For 15% MC	can be extended to three (3) months*
For 14% MC	still the recommended level for long-term paddy storage

* Not confirmed by field trials.

FORTHCOMING MEETINGS

Trade opportunities for irradiated food

A seminar on this topic will be held at Kona, Hawaii on 29–30 May 2000, organised by the International Consultative Group on Food Irradiation (ICGFI) established under the aegis of FAO, the International Atomic Energy Agency (IAEA), and WHO in 1984.

As background to the seminar, the organisers note that irradiated foods are gaining wider acceptance. Increasing quantities of food are being processed by irradiation, and several different foods are now available at the retail level in several countries as irradiated commodities. Some major food companies in the USA have decided to market irradiated food, and commercial irradiators have been built in Asia, the Pacific, and the USA, and more are planned. The stage is therefore set, say the seminar organisers, for greater international trade in irradiated food.

The aim of the seminar is to inform representatives of the food industry and trade in Asia, the Pacific, and the USA of the role of that irradiation can play as a sanitary and phytosanitary treatment in expediting international trade in food and agricultural commodities. It is expected to bring together food importers and exporters, processors, distributors, and retailers from Asia–Pacific countries and their US counterparts, under the guidance of experts and officials of the ICGFI.

Major issues to be considered at the seminar include: national, regional, and international regulatory requirements; market development, from the perspectives of importers, exporters, processors, retailers, and consumers; international trade prospects for various commodity groupings including spices and seasonings, fresh fruits and vegetable, and meat and poultry; and future needs for information and education, labelling, and international cooperation.

For further information, contact:

ICGFI Secretariat
Food and Environment Protection Section
Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture
A-1400 Vienna, Austria
Fax: +43 1 26007 [This is correct. Ed.]
Email: <p.loaharanu@iaea.org>.

General information about food irradiation can be found at the ICGFI web site: <www.iaea.org/icgfi>. ■

Technology and equipment for grain storage

A call for papers has been made for an "International Symposium and Exhibition on Technology and Equipment of Grain Storage" to be held in Beijing, China in October 2000 (the precise date is not given in the material to hand).

The symposium is being sponsored by the China American Culture Science Technology Exchange Association and organised by the China Association for Food Construction Sector.

The organisers note the pressing need to develop new grain storage technology and build new grain bins to keep pace with the unprecedented economic growth and rising living standards in China. During 1999, new grain storage facilities totalling 25 million tonnes capacity were built in China, and a further 10 million tonnes capacity will be added in 2000. Because the new bins are of dimensions never before used in China, it is expected that novel problems will be encountered, and that new grain storage technologies and equipment will be needed.

The organising committee of the symposium is inviting all interested entrepreneurs, scientific workers, and manufacturers from home and abroad, especially the industrial suppliers from Africa, America, Asia, Europe, and Australia, to participate in this symposium to present their current technologies and equipment.

Topics

The main topics listed in the preliminary program for the symposium are:

- Business opportunities and marketing outlook of the Chinese grain industries
- Grain storage technology
- Technology for the control of stored grain insects
- Mould control technology
- Sealing technology
- Other equipment and instruments used in grain depots.

The items listed under these topic headings in literature received from the organisers suggest that a very detailed program is envisaged.

A call has also been made for contributions to an exhibition of equipment, instruments, and facilities. The following items are mentioned specifically:

- complete facilities for gas recirculation during PH_3 fumigation;
- PH_3 rapid detection instruments;
- grain chilling equipment;
- aeration equipment;
- grain information monitoring, analysis and control instruments; and
- grain quality analysis instruments.

The contact person for correspondence and information is:

Mr Wang Guosheng
China Association for Food Construction Sector (CAFC)
No.11 Baiwanzhuang Street
Xicheng District
Beijing 100037
China
Fax: +86 10 68361542
Email: <cafc@263.net>. ■

Protectant research ... from page 5.

It is difficult to produce precise estimates of the value to China of this research project, both because of the sheer size of the Chinese grain storage system and the numerous variables that apply, but it seems clear that the benefits to farmers are already significant. Moreover, China's place in the world economy means that even marginal improvements in the handling of so important a crop may ultimately have beneficial effects elsewhere in the world.

The economic assessment of the project used a discounted cash flow analysis to estimate investment criteria. The analysis was carried out for a 30-year time span, with the first year of the analysis as the first year of funding for the project (fiscal year ended 30 June 1992). A discount rate of 5% was used. The computed net present value of the project was A$10.1m (in 1997 dollar terms as of the year ended 30 June 1997), the benefit–cost ratio 7 to 1, and the internal rate of return 43%. ■

CURRENT AWARENESS

NEWS

Brian Lee to join ICRAF

Brian Lee, who has been in charge of ACIAR's Communication Program since the Centre's establishment 16 years ago, is leaving to take up a position with the International Centre for Research in Agroforestry (ICRAF), based in Nairobi, Kenya.

ICRAF is one of the 16 international research centres that together make up the global network known as the Consultative Group for International Agricultural Research (CGIAR).

Brian will start with ICRAF in early July.

New facility for PNG cocoa and coconut research and development

A new laboratory and office building for the Papua New Guinea Cocoa & Coconut Research Institute (CCRI) at the Tavilo Research Centre near Keravat in East New Britain was officially opened on 17 March 2000.

The new facility was built in three stages. The first stage was funded by a loan from the Asian Development Bank; the second by the National Goverment; and the third by European Union Stabex funding. The original plan and budgetary costing for the project was done by a volunteer architect whose services were arranged by the Australian Executive Services Overseas Program.

New appointment to IPGRI

Dr Jacoba (Coosje) Hoogendoorn has been appointed as the new Deputy Director General Programme of the International Plant Genetic Resources Institute (IPGRI) with headquarters in Rome. Dr Hoogendoorn, a Dutch national, obtained her PhD at the Plant Breeding Institute in Cambridge, England, in collaboration with Wageningen University, the Netherlands.

Dr Hoogendoorn is currently the Head of the Research Strategy Department of the Agricultural Research Service (DLO) in the Netherlands, a position she has held since 1998. She will take up her new position with IPGRI in July.

Food Science Australia — new numbers

The Werribee facility of Food Science Australia has new phone and fax numbers. They are: phone [+61 3 (int'l)] (03) 9731 3200; fax: [+61 3 (int'l)] (03) 9731 3201.

POSTHARVEST PUBLICATIONS

Posharvest technology of coffee

Mangalore University, India has published the abstracts of papers presented during a "Colloquium on Postharvest Technology of Coffee" organised by the university's Department of Applied Botany and held in October 1999. Copies are available from the department at a cost of 500 Indian rupees. The contact address is:

Department of Applied Botany
Mangalore University
Mangalagangotri – 574 199
Karnataka, India
Fax: +91 824 742 367; +91 742 414
Email: <root@mnglr.ernet.in>.

Some 29 papers were presented at the colloquium in four sessions:

- coffee trade and economics;
- biology and chemistry of coffee;
- postharvest technology; and
- research needs for technical development.

Mycotoxin problems in coffee were the subject of several papers. Dr Ramesh Bhat of the National Institute of Nutrition gave an overview paper on the topic, and other papers dealt with specific aspects of the occurrence of ochratoxin in coffee and its significance to health and trade. Diverse topics were covered by papers presented in the postharvest technology session, including pests and pest management, aspects of processing and storage, and environmental aspects of coffee production and processing. A paper on the use of a spouted-bed device to roast coffee beans was one of three papers from the Central Food Technological Research Institute, Mysore presented in this session. ■

Phosphine resistance studies reviewed ... from page 1.

Among the recommendations formulated on the basis of their review were that:

- ACIAR should encourage use of the computer-assisted learning tools developed in two other projects (PHT/1993/021 and PHT/1997/131) to improve training standards in grain storage management, including fumigation technologies;
- the Indian project partners should be encouraged to organise subsequent extension workshops for industry people; and
- ACIAR should explore how it could encourage further support for CFTRI–industry work on slow-release of phosphine formulations.

Project PHT/1994/015 was a joint effort between the CFTRI team and a team in the Farming Systems Institute of the Queensland Department of Primary Industries led by Dr Greg Daglish. ■

ACIAR Postharvest Newsletter

This newsletter is published quarterly in March, June, September, and December by the ACIAR Postharvest Technology Program.

The Australian Centre for International Agricultural Research was established in June 1982 by an ACT of the Australian Parliament. The Centre encourages research aimed at identifying agricultural problems in developing countries and finding solutions to such problems. It is empowered both to commission research and to communicate the results of such research to interested persons and institutions.

ACIAR
AUSTRALIAN CENTRE FOR INTERNATIONAL AGRICULTURAL RESEARCH

Newsletter Compiler and Editor: Mr E. Highley

Program Manager: Dr G. I. Johnson

ACIAR's address:
GPO Box 1571
Canberra, ACT 2601, Australia.
Phone: (02) [Int'l 61 2] 6217 0500.
Fax: (02) [Int'l 61 2] 6217 05011.
Editorial email: ed@arawang.com.au

Home Page: http://www.aciar.gov.au

Mailing list enquiries: Arawang Communication Group, GPO Box 661, Canberra, ACT 2601, Australia. Fax: (02) [Int'l 61 2] 6257 7808.

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