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1st Week of Oct is "Nat'l Agriculture, Fisheries R&D Week"

Declares Estrada through Proclamation No. 382

There is an urgent need to increase public awareness of and support for agriculture and fisheries R&D.

In its continuing bid to achieve this, the government has declared the first week of October as "National Agriculture and Fisheries R&D Week" through Proclamation No. 382. This year, it was held on 2-6 October. The Bureau of Agricultural Research lead the orchestration of this annual event.

DA Asec. Ma. Theresa Capellan and Dr. Ponce open the exhibit of the 1st R&D Week last 3-6 October 2000 at the BSWM.

An offshoot of the Agriculture and Fisheries Modernization Act (AFMA), the Proclamation is an affirmation of the importance of R&D as it registers a more than 25% rate of return on investment, coupled with its significant impact on the country's production system. Furthermore, it works in conjunction with the mandate of the AFMA - promote food security and eradicate poverty in the country.

The event will help accelerate technology transfer and promote information dissemination to the various stakeholders in the agriculture and fisheries sector such as farmers, fisherfolk, processors, traders, scientists, researchers, and policy makers. It will also complement other R&D activities conducted by both public and private institutions which all aim to increase food availability, improve productivity, and enhance the sustainable use of agricultural resources. *(Thea Kristina M. Pabuayon)*

Mulching Arrests Uneven Fruit Ripening in Durian, Study Reveals

Quality and quantity are the keywords that put an industry ahead of its competitors. Though there is increased demand for Durian (*Durio zibethinus*) in the world markets - due largely to its rich and exotic taste, - the country has been unable to tap this opportunity for export earnings as the local industry is hampered by limited production of high-quality durian.

The durian production industry has been incurring losses due largely to a physiological disorder appearing in the fruits. Known as uneven fruit ripening (UFR), this disease is characterized by a hardened leathery aril, and a whitish color, odorless and tasteless pulp. It normally occurs when the fruits are about to ripen and remains invisible until the fruits are opened.

Efforts have been made to arrest the occurrence of this disease. One such effort has been the initiation of the study on the *"Uneven Fruit Ripening and other Physiological Disorder in Durian"* by the Bureau of Plant Industry (BPI) and Davao National Crop Research and Development Center, with the support of the Bureau of Agricultural Research

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Philippine Mangoes Break into World Market

The Philippines has created a premium niche in the world market farmers can take advantage of. The Philippine mango is widely recognized as one of the best due to its superior taste, excellent aroma and fiber-free quality. Mangoes are the country's third most important fruit products, next to banana and pineapple. The Philippines rank second among the top-exporting countries, supplying 11% of the world demand for mangoes.

Department of Agriculture (DA) Secretary Edgardo Angara said in a speech recently that he anticipates a great expansion of the country's current export volume of fresh mangoes. This, according to him, is due to increased consumption of mangoes in traditional mango-importing countries as well as new markets.

Globally competitive mangoes

Japan and Hongkong are the two major mango-importing markets. China had just recently agreed with the DA to consider a very favorable tariff exchange rates which could herald the entry of Philippine mangoes in the Chinese market with the rising of the living standards of its over one billion people. In March this year, Australia had allowed the entry of Guimaras mangoes. The US market remains closed as the current disinfestation treatment against pests do not conform to their rules. But Secretary Angara said DA has agreed with US Department of Agriculture to test fresh Philippine mangoes to meet the strict requirements for entry into the US market this year.

Developing the value-added potential of mangoes

The Philippine mango industry supports an estimated 2.5 million Filipino farmers. The current demand of mangoes in the world market plus the anticipated expansion necessitates an increase in the hectares of land devoted to planting mangoes.

Secretary Angara stressed that producers must take advantage of the value-adding potential of this industry. Aside from fresh mangoes, there's the dollar-earning potential of mango-processed products (such as dried mangoes) and its other products (such as mango juice) which now find great acceptance in the global market.

Government support

The DA under the current administration has committed to support the development of new technologies that will help improve the productivity of the mango industry. Research and Development (R&D) Centers for Mango Development will be put up in Luzon, Visayas and Mindanao. Moreover, the Bureau of Plant Industry (BPI) will put up a National Research and Development Center for Tropical Fruits in Davao City. The center will have a program of mango research and development geared to Mindanao conditions. One of its central activities is the establishment of a germplasm collection and fingerprinting of all tropical fruits with the mango as priority.

For this project, the DA through the Bureau of Agricultural Research (BAR) has allocated P10 million as seed money. BAR and the Bureau of Plant Industry (BPI) are currently working to establish a Mango Research and Development Satellite Station in Mindanao as well as in other mango-producing areas in the country. DA supports the two bills filed by Reps. Emily Lopez and Generoso Tulugan calling for the establishment of mango research centers in Guimaras and Pangasinan.

Furthermore, the DA has set aside $2.7 million for agricultural scholarships abroad plus P100 million for local scholarships. *(Rita T. dela Cruz)*

National Integrated RDE Agenda and Program for Fruits

The fruit sector is an important component of Philippine agriculture. Almost 600,000 hectares are planted to this, or 4.4% of the country's total cropland. The sector also accounts for 19% of the total value of agricultural crops, with an annual production worth P29.0 billion. During the last five years, the fruit crops industry exhibited increasing trends in terms of production area and yield which vary from crop to crop, contributing US$ 463.6 million annually.

The fruit crops industry plays a unique and vital role in the Philippine economy specifically in the areas of food security, human health and nutrition, and high income and foreign exchange. Fruits, like banana, become a supplement or substitute for cereal grains, rice and corn. In fact, banana can very well become a staple food. Ironically, our country's per capita consumption is only 10 kg, well below the 300 kg per capita consumption of some African countries, which regard banana as a staple food.

Farmers engaged in fruit production generate higher income than those engaged in other crop production. At the same time, though, greater production can be attained if more advanced technologies are created, disseminated and used by more fruit farmers.

GOAL

The goal of this program is to increase the production of globally competitive fruits using cost-effective production systems and environment-friendly techniques to supply the needs of the local market and increase the current export volume.

PROGRAM

The Fruits RDE Program, with the sub-programs banana, mango, citrus, durian and pineapple, shall focus on the following major programs:

Increase Productivity through Improved Production and Postharvest Technologies

Priorities include development of high-yielding cultivars resistant to major pests and diseases; identification of alternative pest control strategies; design/development of appropriate pre- and post-harvest equipment/facilities; and establishment of quality standards within the framework of global standards.

Preservation and Enrichment of Genetic Diversity

Focuses on the collection, characterization and maintenance of various cultivars/accessories, and development of reliable tools for cultivar identification.

Enhancement of Marketing System and Product Promotion

Improves the market promotion of fresh and processed Philippine fruits in foreign countries; and develops a market information database and market intelligence capability.

Development of Sound and Effective Policies for the Fruit Industry

Primarily, this will involve the review, improvement and development of sound and effective policies on the proper use of chemicals, irrigation facilities, quarantine regulations, credit facilities and transport.

Nurturing Knowledge System

Develops the expertise and skills of fruit researchers in the fruit RDE network.

Sweet Tamarind Propagation and Management

Tamarind *(Tamarindus indica* Linn.*)* is one of the minor fruit crops in the Philippines with a great potential for commercialization. In certain parts of the country, it is an important crop because its fruits and other parts have varied food and medicinal uses.

Tamarind has great export potential because its fruit may be processed into a number of acceptable products. But the mature and ripened tamarind fruit of the sweet type is said to be more important and expensive than when it is processed. However, the supply still does not meet the demand

Propagation.

Tamarind may be propagated by seeds and asexual propagation (i.e. grafting). Propagation by seeds is not recommended because the resulting plants do not grow true-to-type.

Seeds obtained from healthy and mature fruits should be cleaned. Individual seeds are planted about two centimeters deep in potted soil rich in organic matter. A soil media with one part soil, one part sawdust, and one part compost is suggested.

For sweet tamarind, cleft grafting is recommended especially for large-scale propagation because it gives a higher percentage of success.

Rootstocks which are six months or older (about 0.8 to 1 cm in diameter) are used for grafting. Mature scions (budsticks) measuring 8-15 cm long and with the same diameter as rootstocks, and with well-developed buds are collected from full-bearing trees of outstanding characteristics. Defoliate the scion after collection and graft immediately. After grafting, cover the scion with plastic ice bag (4x12 in) and place the newly grafted plants under the shade. Transfer them in the open (full sunlight) when the new shoots develop.

Water the plants regularly. In 3-4 weeks, the scion will start to form shoots. It's best to graft starting November up to May.

Transplanting

Before the onset of the rainy season, the land must be plowed once and harrowed several times until the soil is in its fine tilth. Stakes are set following the desired distance of planting (8 x 10 m). The dug holes must be large enough to accommodate the root system of the plants. The soil around the base of the plant should be packed firmly.

For lahar-laden areas, mix 5 kg compost with the soil. Put about six inches of the mixture before planting. Cover the base of the plant with the remaining mixture. Planting is best done during the rainy season.

Intercropping

For large-scale planting, intercrop the tamarind with short-season cash crops. This way, some income could be derived while the trees are not yet bearing fruits. When the trees have grown and their branches begin to touch each other, intercropping should be stopped.

Irrigation

Water the plants right after planting. This must be done as the needs arises. Sufficient water should be provided during the early years. In later years, watering becomes less critical. Irrigation is beneficial, especially for the development of flowers and fruits.

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Micropropagation: Propagating Coconut through Tissue Culture

The era of trade liberalization opens an opportunity for the Philippine coconut industry to become a dominant player in the world market, as the country ranks as the third largest producer of coconut products such as coconut oil and desiccated coconut. However, low production output and the high incidence of pests and diseases impede on the industry's ability to assume this role.

In a bid to arrest these problems, or at least lessen its impact, a study on the "*Micropropagation of Coconut from Epicotyl Tissues*" was conducted in the Philippine Coconut Authority- Albay Research Center.

Micropropagation through tissue culture remains as the only means to asexually propagate coconut, according to Ms. Erlinda P. Rillo, lead researcher of the study. This technology involves multiplying selected individuals with desirable characteristics such as high-yielding capacity, high tolerance to important pest and diseases and adaptability to adverse growing conditions.

Micropropagation is a series of inoculating processes wherein tissues excised from the epicotyl of coconut are subjected to a medium containing growth-inducing hormones. These hormones, technically known as auxin, trigger the multiplication of cells which subsequently initiates the development of embryoids. These embryos are then placed in a regeneration media containing some hormones to further develop and germinate the embryos. Germinated embryos are maintained in a medium and incubated in a lighted growth room until these embryos develop into plantlets. Rooted plantlets are then transferred to the screenhouse.

Proponents of the study confirmed that micropropagation from epicotyl tissues is relatively more efficient than micropropagation from inflorescence tissues because the former is more responsive to *in-vitro*.

One disadvantage of this technology, as observed by the researchers, is that individuals produced from the culture are genetically heterogeneous. However, cloned individuals from identified elite parents are likely to show many - but not all - of the desired characteristics of the parents.

The use of this technology to mass-produce *Makapuno* coconut, a high-value coconut in the Philippines, was nonetheless recommended by the researchers. (*Mary Charlotte O. Fresco*)

(For more information contact Ms. Erlinda P. Rillo et. al., Philippine Coconut Authority, Albay Research Center, Guinobatan, Albay or call at tel. no. 052-4846615).

Study Identifies Dynamics of Jackfruit Infestation

With a recorded 18 commercial and non-commercial uses, jackfruit (*Artocarpus heterophyllus* Lam.) displays great export potential specially as the fruit is gaining increased popularity beyond Asian shores. The Department of Agriculture (DA) has made jackfruit one of its banner commodities, attesting to this fruit's foreign earning generation capacity.

In Eastern Visayas, efforts are underway to commercialize this crop. But the full commercialization of jackfruit, like other crops, encounter numerous problems which all result to low yields. Insect pest attack is the most predominant obstacle to the growth of the industry in the said region. Jackfruit is considerably attacked by fruit fly (*Bactrocera umbrosa* Fabr.) during the fruiting period, according to Coronel (1979).

In any crop production scheme, crop protection is always crucial to prevent insect-pest infestations. Crop protection activities include: a) pest identification, b) population fluctuation, c) assessment of damaged done by the insect pests and d) understanding of some biological information of the insect pests (life cycle, mortality, alternate host, and natural enemies attacking of insect pests).

However, literature or information on insect infestation conditions, in Eastern Visayas in particular, is not available.

A study was conducted in Eastern Visayas to identify the dynamics of insect pests associated with jackfruit. The study identified insect pests that attacked the crop in the provinces of Leyte, Southern Leyte, Samar, Northern Samar and Eastern Samar. It also determined the population fluctuation while developing an understanding of the basic biological information, assessing the damage inflicted by the major insect pests and establishing a management system for the major insect pests.

Monthly surveys and sampling of the insect pests from the selected municipalities of the above provinces revealed 10 insect pests that attack the crop - bark borer/stem borer, gray mealybug, pink waxy scale, cottony cushion mealybug, white grub, red worm, fruit fly, fruit borer and leaf weaver. These pests are present throughout the year and infest the crop at various stages of growth and at various parts.

Fruit fly (*Bactrocera umbrosa*) and pyraustid and curcullionid fruit borers were the most dominant in terms of number and damage inflicted. The insect feedings considerably destroyed the fruits of the crop.

The pyraustid and curcullionid fruit borers are newly identified insect pests. The overall metamorphosis and the natural controlling factors of these borers were determined under laboratory conditions. In the cages and glassware, the borers are capable of producing several generations given their total life cycle (33.8 days for pyraustid fruit borer and 65.8 days for curcullionid fruit borer). However, in the actual crops, their life cycles were higher. Mortality of the borers in its original host is higher during the first instar period of the larva and tends to decrease as the growth of the insect-pests progresses. Collected larvae from the field showed parasitism by *Apanteles sp.*, a hymenopterous parasite.

The control of fruit fly and fruit borers attacking jackfruit was also studied. Five strategies of control against fruit fly on jackfruit were tested. The use of Dipterex (0.75 kg ai/ha applied at the fruit setting and bi-weekly thereafter) and bagging the fruits earlier effectively reduced infestation. (*Mario A. Martinez and Rufino B. Ayaso, III*)

(For more information, please contact Mr. Ayaso, EVIARC, Abuyog, Leyte, or call at tel no. 062-3332537 or e-mail at daeviarc@tac.weblinq.com)

Tamarind...

Fertilization

Tamarind trees bear fruit well even without fertilization. However, fertilizer application is recommended to keep the trees in healthy condition. As a general recommendation: apply 50 g of 16-20-0 and 100 g of 14-14-14 per tree one month after planting. The same amount is added at the end of the rainy season. The amount of fertilizer is gradually increased as the trees grow.

For early bearing fruits, apply 500 g of 14-14-14 per tree twice a year. A full bearing tree may need at least 3 kg of 14-14-14 per year.

Trimming and Pruning

Young trees require little trimming during the first few years. Remove the very low branches and cut long upright shoots during the early years. For bearing trees, remove dead, weak, diseased branches and water sprouts.

Control of Insect Pest and Diseases

There are no major diseases of sweet tamarind observed. However, insect pests such as bagworms, mealybugs, scale insects, leaf feeding caterpillars, shorthole borers and green locust were recorded. These pests may be controlled by spraying the trees with common insecticides at the recommended dosage.

Harvesting

Grafted sweet tamarind may start fruiting in about a year after planting. The fruit may be harvested half-ripe (*malasebo*) stage and full ripe stage.

To determine the half-ripe stage, scratch the fruit surface with the fingernail at the side not exposed to the sun to remove the brownish powdery material. Mature fruits have brown shells.

Fully ripened fruits are determined by just tapping with the finger which produces a hollow, loose sound. This is because the pulp shrinks at maturity and the skin becomes brittle. Since the fruits mature at different times, harvesting must be done by priming.

Fruits are usually harvested from January to February as the trees bear flowers in May or June. *(Filomena K. Reyes)*

(For more information contact the Pampanga Agricultural College, Magalang, Pampanga, or visit their website at http://www.pac.edu.ph)

Accelerating Coconut Replanting Program Through Biotech

Advances in crop biotechnology have led to novel applications of DNA-based marker technologies in identifying superior planting materials and preserving genetic diversity. For instance, molecular marker technologies can be used to study percentage and population structures, determine effective population size, identify population-specific markers, test hybridity and accurately assess genotypes of individuals or genetic purity/variability of different populations.

The Bureau of Agricultural Research (BAR) recognizes the potentials of biotechnology. It recently awarded a research grant to the Institute of Plant Breeding (IPB) in UP Los Baños entitled "*Marker-Assisted Identification and Utilization of Outstanding Tall Populations and Hybrids for Accelerated Coconut Replanting*," a project that utilizes and explores the possibilities of this new paradigm in agriculture.

The Replanting Scheme

Coconut is undoubtedly the Philippines' most important crop. It is the country's top commodity earner, with an annual average contribution of US$800 million. These earnings come from exports of both traditional and non-traditional products. From 1995 to 1997, coconut products were valued at P30 billion, accounting for 10% of the total value of agricultural crops.

While the Philippines still remains the largest exporter of coconut products, it must address the problem of declining productivity through a massive replanting or rehabilitation program. For this program to be effective, replanting initiatives must utilize improved varieties of coconut, which include hybrids and outstanding open-pollinated tall populations.

However, with an estimated 600,000 hectares of coconut area targeted for the replanting program, there is just not enough supply of superior planting materials available. To meet the enormous challenge of replanting at the shortest time possible, the identification and production of superior planting materials have to be fast-tracked. Furthermore, the replanting program must ensure the superiority of the planting materials and preserve the genetic diversity inherent in the target areas.

The IPB project has two major components: identification and utilization of outstanding tall populations, and development of DNA markers for the identification and utilization of tall populations and hybrids, headed by Dr. Consorcia Reaño and Dr. Desiree Hautea, respectively.

The other agencies collaborating on the project are the Philippine Coconut Authority-Albay Research Center (PCA-ARC) and Zamboanga Research Center (PCA-ZRC), Visayas State College of Agriculture (ViSCA), and Aurora State College of Technology (ASCOT), with IPB as the lead agency. *(Joey U. Carcallas)*

(For more information, contact Dr. Consorcia Reaño or Dr. Desiree Hautea at the Institute of Plant Breeding at tel. nos. (049) 536-233/536-2512/536-2697/536-3304/536-3528)

Mulching...

in the conduct of a study. The study aimed at determining the causal agents of UFR in durian fruits and controlling the occurrence of the said disease in maturing and ripening stage of durian.

Results of the study revealed that mulching significantly minimized the incidence of UFR and wet core in durian. Mulching is the principle of covering the soil surface of the plant's base with materials such as rice straws and plastic sheets to reduce the infiltration rate of water into the soil and minimize the absorption of water into the roots. It was observed that the excessive water uptake by plant is the major cause of UFR and wet core. Wet core is somewhat similar to UFR by the fact that it affects the flesh or pulp of durian giving its pulp a watery and dull taste.

One significant observation obtained from the study is the amount of rain as the major causal agent of UFR in durian. It was concluded that high rainfall at 200 mm and above during maturity period of durian incurred the highest incidence of UFR and wet core. Results of the study showed that rainfall triggers the growth of shoots that compete for the nutrients needed by the fruit to attain full maturity and development.

Moreover, the study recommends to apply mulching using plastic sheets one month before maturity or harvesting especially during rainy season. (*Mary Charlotte O. Fresco*)

(For more information, please contact Mr. Virgilio L. Loquias, Davao National Crop Research and Development Center (DNCRDC), BPI Bago Ushiro, Davao City) or call at tel. no. 087-227-9838)

FRUITS NETWORK COMPOSITION

Program Leader: Dr. Hernani G. Golez (BPI-NMRDC)
Core Technical Team: Dr. Rene Rafael C. Espino (UPLB) (Sub-Program Leader for Banana)
Dr. Pablito P. Pamplona (USM)
Dr. Elda Esguerra (UPLB)
Dr. Zenaida M. Sumalde (UPLB)

Sub-Program Leaders: Dr. Fe Laysa (DA-RFU V) for pili
Dr. Simeon Crucido (CaVSU) for pineapple
Ms. Lorna Heradura (BPI) for citrus

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A. Banana
- UP at Los Baños
- Bureau of Plant Industry
- University of Southern Mindanao
- Central Mindanao University
- Don Mariano Marcos Memorial State University (DMMMSU)
- Mariano Marcos State University
- Quirino State College
- DA RFUs (II, IV, VI, X, XI, XII, ARMM)

B. Mango
- BPI-National Mango Research and Development Center (NMRDC)
- UP at Los Baños
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- Mariano Marcos State University
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- Don Mariano Marcos Memorial University
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C. Citrus
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D. Durian
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E. Pili
- DA-RFU V

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Members: Mr. Severino Belviz - Mindanao (Production/Packaging)
Mr. Rex Rivera - Mindanao (Production/Trading)
Mr. Abas Candao -Mindanao (Production/Marketing)
Mr. Alfonso Ponce Enrile -Visayas (Production/Trading)
Mr. Onofre Griño -Luzon (Production/Trading)
Mr. Jesus Tanchanco - Luzon (Processing and Exporter)
Mr. Carlos Buenafe - Luzon (Exporter/Shipping)
Mr. Rey Manguilit - Luzon (Fresh Fruit Exporting)

Ensuring Fruit Quality and Longevity through HWD

A simple, non-chemical solution may be the postharvest treatment that would effectively inhibit ripening and rapid disease development in fruits.

This developed as a study conducted by Mr. Antonio Acedo et al. at the Postharvest Technology Laboratory in ViSCA, Leyte, found that Hot Water Dip (HWD) stops the ageing of banana (Latundan and Saba) and mango (Carabao and Indian mango).

High perishability has been one of the major problems besetting the Philippine fruit industry. Serious postharvest losses are attributed to the physiological behavior of fruits - rapid ripening sets in and postharvest diseases usually develop when mature fruits are harvested.

Using several treatments, the study revealed significant results. A 10-minute direct dip in 47-49° C water temperature delayed the ripening of "Latundan" by four days compared to untreated fruits. A delay of five days in fruit ripening with "Saba" banana indirectly (enclosed in plastic bag) dipped in 47-49°C water temperature was also achieved. Researchers said HWD treatment could inhibit fruit ripening in banana without adversely affecting the quality of the fruits such as taste, texture and peel color. They said HWD may have stopped the ripening of fruits by inhibiting the biosynthesis of the ripening hormone called ethylene.

Moreover, HWD was found effective in minimizing the postharvest diseases in banana such as anthracnose and finger rot. A relatively high temperature suppressed the growth and even killed the pathogens which are the causal agents of diseases. The researchers also noted that indirect treatment in 47 to 49 ° C water temperature was effective for disease control in both "Latundan" and "Saba". They concluded that the hot air inside the plastic bag during the indirect HWD application probably heated the fruit tissues thus suppressing the growth of fungus more effectively than direct application.

HWD treatment is also found effective in the case of "Carabao" mango. Dipping in 51-53° C water for 10 minutes delayed ripening for 10 days while increasing the water temperature to 54-56° C water further delayed ripening by 2-3 days more thus expanding the fruit storability and freshness.

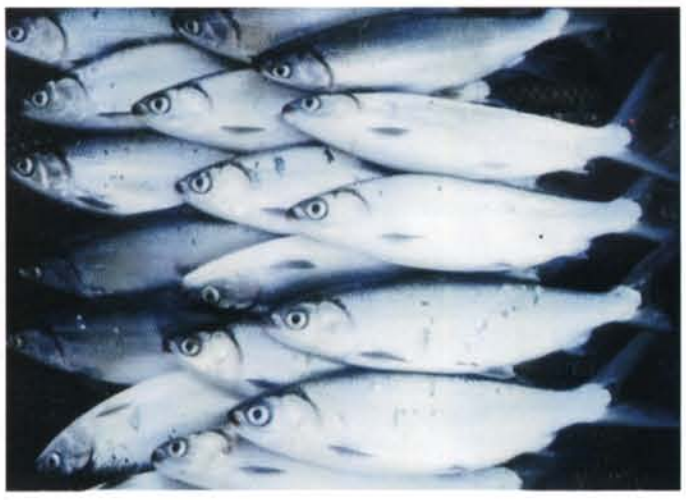
The results also established the effectiveness of HWD in controlling the postharvest diseases such as anthracnose and stem-end rot in "Carabao" mango. It is concluded that a higher water temperature of 54-56°C is required to significantly retard the development of anthracnose and stem-end rot. A double HWD treatment, consisting of 10-minute dip in 40°C water followed by 10-minute dip in 51-53°C water, is also found more promising treatment for disease control.

Researchers of the study recommended to develop future studies on other postharvest treatment and the use of hot water additive such as calcium and other anti-senescent or anti-microbial compounds to develop postharvest technologies that are cheap, safe and residue-free. (*Mary Charlotte O. Fresco*)

(For more information, contact Mr. Antonio Acedo et. al., Postharvest Technology Laboratory, Department of Horticulture, ViSCA, Baybay, Leyte, or contact at tel. no. 053-3352628.)

Transgenic Fish 21st Century Solution to Decreased Fish Farming Productivity

Fish, seaweed and shellfish farming are traditional practices in the Philippines. Farming *bangus*, oyster and *tahong* cultures are probably the older practices as compared to tilapia farming which was introduced only in the 1950s, and prawn and seaweed farming in the late-1970s. Farming other fish and shellfish started only recently. Fish farming or aquaculture needs to grow in order to feed a rapidly growing population. And the continuing decrease in fish catches from both fresh and saltwater sources makes this need all the more urgent. This concern is felt not only in the Philippines but in the whole world. In the US alone, aquaculture production has grown 5-10% annually in the past decade. From 1984 to1998, global aquaculture production more than doubled. The UN said world aquaculture production must increase seven times in the next 25 to 30 years just to maintain current levels of consumption.



Fish farming, however, faces many challenges. To wit, the increasing cost of feeds, pest and diseases, and pollution. All these have impacted on the Philippine prawn industry. In the early 1980s, the industry grew to a thousand farmers. Now, it has dwindled to only a handful of farmers.

Science offers a solution. The perfect fish - resistant to disease, fast-growing, great-tasting and easy to raise - is being developed through genetic engineering or the transfer of specific, desirable genes by hybridization. In fact, a fast-growing transgenic Atlantic salmon is now ready for commercialization. Other species like tilapia, bass, rainbow trout, etc. will be made available soon.

The fast-growing transgenic Atlantic salmon has received a gene construct that increases the amount of growth hormone produced by the fish. The gene construct is comprised of a DNA sequence, which is obtained from an edible Arctic fish, and a growth hormone gene of the Atlantic salmon. The gene construct is expressed in the liver and in the brain, thereby producing more of the growth hormone. In an ordinary fish, the growth hormone is produced only in the brain, hence only a small amount of the hormone is produced. The increased growth hormone has allowed the transgenic fish to mature within 14-18 months compared to the three-year cycle of the ordinary Atlantic salmon. According to the US-based AF Protein, the company that developed the transgenic fish, the taste is the same as the wild varieties and looks essentially the same as those caught in the wild. There are no clear health risks associated with the transferred genes since these are obtained from edible fish. Farmers and consumers alike are both projected to gain much from this. A farmer may see increased profits due to a reduced feed requirement and faster turnaround time, while the consumer pay less for the product. Genetic engineering is expected to usher in a new era in aquaculture, which proponents call the "Blue Revolution" - the solution to feeding an increasing population and saving the seas and waters from overfishing.

Critics like Greenpeace and similar groups predict that the introduction of transgenic fish will prompt a disaster. They believe transgenic fish which escape from fish farms will out-compete the native variety in the wild or that a transgenic fish-native species hybrid would produce weak offsprings - only those who have the transferred gene will survive. In either case, biodiversity will be reduced. Biodiversity is important, as it is the source of desirable genes. The fast-growing transgenic fish would not be possible without the Arctic fish, after all. This scenario happened with the native "hito" in the Philippines. When the Bangkok "hito" was introduced in Southern Tagalog, the native hito became rare. But one prediction in the 1950s - that of tilapia becoming a pest or killing other native fishes - has not come true. Proponents of the "Blue revolution" are improving further on the transgenic fish. To prevent the spread of the transferred gene into wild fish populations, they are engineering the transgenic fish to be sterile, rendering it incapable of hybridization. Other desirable genes are being transferred such as resistance to disease, tolerance to cold and improved flesh quality.

The National Biotechnology Research and Development Program which is coordinated by the Bureau of Agricultural Research has approved the implementation of a project on transgenic tilapia proposed by Dr. Cynthia Saloma from the National Institute of Molecular Biology & Biotechnology, UP Diliman. With the increasing problems borne of fish kill and pollution in bangus farms, the BAR is inviting study proposals on developing transgenic bangus as well. *(Saturnina Halos)*

(For more information, contact Dr. Halos at the Bureau of Agricultural Research or call at telephone numbers 920-0226; 9288624 loc 162)

Early Detection of Viral Infection in Shrimps Possible Through Use of New Protocol

A polymerase chain reaction (PCR) protocol has been developed for the early detection of White-spot syndrome virus (WSSV), one of the most widespread and devastating infectious agents that have hit the shrimp aquaculture industry.

Dr. Lourdes Tapay of BIOTECH-UPLB, Dr. Cesar B. Nadala, Jr. and Dr. Philip C. Loh of the University of Hawaii, with support from the Department of Agriculture's Bureau of Fisheries and Aquatic Resources (BFAR) and the Oplan Sagip Sugpo Task Force, were the developers of the method. The details of the protocol were included in an article entitled "*A polymerase chain reaction protocol for the detection of various geographic isolates of the white spot virus*" by the Journal of Virological Methods 82 (1999) 39-43, which won for Dr. Tapay an International Publications Award from the University of the Philippines System.

This development comes in an opportune time. Shrimp aquaculture used to be a lucrative industry until disease outbreaks wreaked havoc worldwide, especially in Asian countries, including the Philippines. Among the infectious agents reported to affect the shrimp, viruses remain the most potent threat simply because viral infections remain untreatable. It is thus important that these viruses, especially those which cause massive disease outbreaks, such as the yellow-head virus (YHV) and the WSSV are detected early.

Conventional diagnostic methods, which are widely used, are not as specific and sensitive. They fail to detect viral infections during the early stage of infection. Thus, a continuous effort is being made to develop sensitive and specific diagnostic protocols through biotechnology for the early detection of the virus, especially among broodstock and postlarval (fry) populations, including asymptomatic animals of harvestable "age" so that the shrimp farmer can harvest the infected crop prior to total infestation. The PCR protocol was developed based on a unique cloned DNA fragment of the viral genome determined by Dr. Nadala and Dr. Loh. Several sets of primers were designed to amplify the target sequence but Primers C (Forward) and D (Reverse) were chosen since with these were able to amplify the target sequence even at a stringent annealing temperature of 65°C. The protocol involves several rounds of amplification, rendering it sensitive enough to detect low levels of the virus (10 to 100 picograms of WSSV DNA) by producing 211 bp product which can be analyzed by agarose gel electrophoresis. Furthermore, the WSSV-specific primers could detect various geographic isolates of the virus, e g. U.S., Japan, China, Indonesia and India. The protocol was used here in the Philippines to determine the prevalence of WSSV in shrimp farms and hatcheries.

In a nationwide survey conducted from January to May 1999, 72% were found positive for WSSV after 1-step and 39% after 2-step, non-nested PCR. Of the post larvae (PL) and the juvenile/adult shrimp samples tested, 50 and 79% were positive for WSSV, respectively. Twelve percent (12%) of the PCR-positive samples also tested positive by Western blot assay, an antibody-based assay developed for WSSV using a hyperimmune polyclonal anti-WSSV IgG. This is the first report of the occurrence of WSSV in the Philippines. Results of this survey are presented in a paper entitled "White spot syndrome virus (WSSV) in cultured *Penaeus monodon* in the Philippines" which has been accepted for publication by the Diseases of Aquatic Organisms.

In an effort to contain the spread of the infectious agent in farms and hatcheries, the Bureau of Fisheries and Aquatic Resources has modified the current fry quality assessment to include screening for WSSV in the routine testing of fry. Eight (8) satellite laboratories strategically located throughout the country have been identified to conduct PCR testing for WSSV: *Luzon:* Fish Health Section, BFAR Central Office; *Panay Island*: SEAFDEC AQD; N*egros Island:* Negros Prawn Production and Marketing Cooperative, Inc.; *Cebu:* Regional Fisheries Office VII; *Bohol:* Bohol Aquaculture Research Foundation, Inc.; *Mindanao*: RFO XIII (Agusan, Surigao and Misamis),RFO IX (Zamboanga) RFO XII (Pangil Bay Area).

BIOTECH at UPLB will serve as the national reference laboratory to validate, intercalibrate, and monitor the satellite laboratories and at the same time conduct training of personnel in the satellite laboratories. (*Dr. Lourdes Mahilum-Tapay)*

(For more information, contact Dr. Lourdes Mahilum-Tapay at the Philippine National Collection of Microorganisms, National Institute of Molecular Biology and Biotechnology (BIOTECH), UP Los Baños, College, Laguna or contact at tel. no. 049-53628-84)

New Technique to Boost Shrimp Industry

The demand for shrimp is great in the international and local markets. However, an inadequate supply of natural food for shrimps presents a stumbling block to increased grow-out production.

Through the years, aquaculture scientists have sought for ways to improve the supply of natural food in the hatchery production of shrimps. Such is the motivation behind the development of a new technique in shrimp hatchery operations and management by Dr. Jesse D. Ronquillo of the College of Fisheries, UP Visayas, Dr. Toshio Saisho and Shigehisa Yamasaki of the Fisheries, Kagoshima University.

The foremost objective of the study was to determine the best conditions to culture algae inexpensively and subsequently evaluate the efficiency of this alga as live feed for different species of shrimps from the Indo-West Pacific region. Furthermore, it aimed to determine the effects of different concentrations of organic and inorganic media-such as vitamins and trace metals on food. The dietary value of algae was determined by feeding to different shrimp larvae.

Results of this study reveal that a cheaper natural diet of phytoplankton is beneficial to shrimps. Algae (*Tetraselmis tetrathele)* were found to be a good alternative to artificial diets and expensive zooplankters. Algae have a high nutritional value and are easy to culture. In fact, algae, a four-flagellated prasinophyte, is currently used as direct live feed in both temperate and tropical regions. It can tolerate various adverse environmental conditions due to its *eurythermal* and *euryhaline* characteristics.

This technique, according to Dr. Ronquillo could boost the production of healthy shrimp seedlings and inavariably reduce hatchery operational costs and reap profits for the shrimp industry *(Rita T. dela Cruz)*

(For more information contact Dr. Jesse Ronquillo of the Institute of Aquaculture, College of Fisheries, University of the Philippines in the Visayas, Miag-ao, Iloilo or call at tel. no. 033-3158324 or 513826)

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