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Grafted tomato technology for off-season production



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•photo by lcuevas

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NOTES

Our story of firsts

By ALVIN V. DIVINAGRACIA, Ph.D.



Who can ever forget one's first love, first kiss, first day of work, first career accomplishment, first investment? I always remember the firsts in my life. They serve as precedence to what my future undertakings will be, and as a way to reflect upon how I conduct myself in life. Indeed, there is always a first in whatever we do as long as we live.

In our lifetime, we experience many firsts. Our firsts usually bring with them a sense of daring, intriguing possibilities, a feeling of getting over, a time for learning, and in the end whether positive or negative, it is an experience that we commit to our memories. Our firsts are something we cherish and something that inspire or challenge us in life.

I would like to think that our story of firsts is about beginnings. It is quite timely that this issue revisits our concern for new beginnings in the agriculture sector. The second quarter ushers in the start of the new planting season. A new season is something that our farmers look forward to. Thus, we deemed it appropriate to look at some of our promising technologies and share with you some of our old but still practicable technologies to kick

start this new season.

Most of us associate the start of the planting season with rice production. In this issue, we share with you the important improvements in rice farming in both lowland and upland conditions that make significant increases in yield. The onset of the rainy season also brings with it new opportunities for trying out other crops and commodities such as off-season tomato, vegetables, sweet potato, mushroom, and prawns. With the leaves of some plants turning green and succulent, we hope you will like our feature on the silkworm industry.

The prospects of a new planting season bring some problems to the agriculture sector. As a precaution we highlight the major diseases of banana and an improved processing of cassava to avoid postharvest losses for our farmers.

In the months ahead, I hope that the BAR Digest will not only inform you but will also amaze, inspire, challenge, and provide you with some guideposts and more information and technologies on agriculture and fisheries research in the country. ●

BAFC conditions suited for upland varieties

By MA. LIZBETH J. BARONA



● photo by rdelacruz

A group of researchers at the Department of Agriculture's Regional Integrated Agricultural Research Center (RIARC) in Barangcot, Danggagan, Bukidnon, determined the adaptability of different rice varieties usually grown in mountainous, upland condition at the compound of the Bukidnon Agriculture and Fishery Complex (BAFC), a satellite station of DA-Northern Mindanao Integrated Agricultural Research Center (NOMIARC).

Since corn is considered the major crop grown in the uplands and upland rice production is low in these areas, it is important to come up with strategies, or discover other areas in the uplands where upland rice cultivars can adapt, to increase upland rice production.

Issues of upland rice production and marketing

Upland rice is grown usually as a low-input, subsistence crop in unpuddled fields, where no

standing water is maintained and soils remain aerobic throughout the growing season. Yields average 1-2 t/ha in most regions across the country. The usual reason for low production is, upland farmers lack the information that would help them increase their production, and even if information does reach them, they are slower to accept and adopt new technologies. Also, most researches are concentrated on lowland rice varieties.

There also exists a marketing constraint brought about by lack of transportation facilities to move farm inputs and farm output to and from the upland farming areas that are usually along the sides of mountain ranges.

These problems and this implication on upland farming communities, prompted researchers at the DA-NOMIARC to discover ways to widen the production of upland rice.

BAFC

The 67-hectare, flat, and slightly rolling stretch of the BAFC

was found to be an ideal site for upland rice development. It is 1,033 ft above sea level and the soil is clay-loam with high moisture.

Nine varieties tested

Nine varieties, Denorado, Guyod, Dahili, Pamintana, Azucena, PSB RC1, PSB RC3, UPL Ri5, and IR 30716, were tested using Denorado as the check variety.

The two important sets of data gathered by the scientists were the varieties' agronomic characteristics and the yield and yield components. Agronomic traits include days to emergence, days to maturity, seedling vigor rating, plant height, number of tillers per linear meter, and days to heading. Yield components are number of panicles per linear meter, number of grains per panicle, number of filled grains per panicle, percentage-filled grains, weight of 100 grains, and yield (in tons) per hectare.

Agronomic traits

All nine varieties emerged at the same time, which was six days



after sowing. The tallest variety was Azucena (156.40 cm), followed by Denorado (150.65 cm), and Pamintana (149.20 cm). The height of the three varieties had no significant differences with the others.

UPL Ri5 had the greatest number of tillers per linear meter (146), but this figure did not differ significantly with those of PSB RC1 (142) and IR 30716 (134). However, PSB RC1 had the most productive number of tillers per linear meter with 121 tillers.

The earliest variety to exhibit heading was IR 30716, which headed as early as 78 days after sowing (DAS). This trait was significantly different from the varieties that followed, which were Denorado with 81 DAS, and Guyod with 84 DAS.

The same variety (IR30716) that exhibited the earliest heading was also the earliest to mature, which was at 108 DAS. This figure was also significantly different from the eight other varieties. Denorado matured next with 112 DAS, followed by Guyod (114 DAS), and Pamintana (116 DAS).

Lodging occurred to all traditional varieties, particularly the tallest ones, which were Denorado, Pamintana, Guyod, and Azucena. The lodging that occurred during the earlier part of the maturity period was attributed to strong winds. The other varieties did not exhibit lodging at all.

UPL Ri5 and Guyod had the highest percentage of milling recovery at 72%, followed by Dahili, 68.75%. The variety with the lowest milling recovery was IR 30716 with 63.6%.

Varieties Guyod, Azucena, Pamintana, PSB RC1, PSB RC3 UPL Ri5, and IR 30716 were white and glossy. Denorado and Dahili, however, were reddish, which actually is the color of their grains. Over-all acceptability placed



● photo by rdelacruz

Denorado, Guyod, Pamintana, Azucena and UPL Ri5 in this order, as the varieties with very good taste and acceptable softness.

Yield and yield components

PSB RC1 had the most number of panicles per linear meter with 121 panicles, followed by PSB RC3 (116) and UPL Ri5 and IR 30716, both having 115 panicles.

Dahili had the most number of grains (101) followed by Guyod (98) and Pamintana (77). The difference among the three varieties had no significance statistically.

There were significant differences, however, in the number of grains per panicle with Dahili having the highest (93), followed by Guyod (79), and UPL Ri5, with 62. Dahili also had the highest percentage of filled grains (89%). This percentage had a significant difference with Guyod, which came in second with 85%, followed by UPL Ri5 (80%), Pamintana (79%), and Azucena (78%).

Azucena was the heaviest, with 100 grains weighing 2.9

grams. However, this weight has no significant difference with the varieties that followed, PSB RC1 (2.6 g), UPL Ri5 and IR 30716, both with 2.3 grams.

Cost and return analysis

Analysis showed UPL Ri5 to have the highest return on investment (ROI) of 67.50%, followed by Dahili with 61.92%, and PSB RC1 with 58.37%. The varieties Pamintana and Denorado gave a negative net benefit due to low yield.

The varieties UPL Ri5 and Dahili, therefore, were the varieties which the researchers found fit to be planted by upland farmers, both for home use and commercial production. ●

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● photo by rdelacruz

Rice-based farming: The BIAPP experience

By MIKO JAZMINE J. MOJICA

What is the surefire way to make the farmers adopt a technology? Involve them in the whole development process from selection, design, testing, and finally, adoption of technology. This is what a team of scientists and researchers learned from their experience in Bohol.

They showcased, assessed, and packaged the mechanics of technology integration and promotion through the rice-based farming model (RBFM) approach at the Capayas Irrigation System (CapIS) in Ubay, Bohol from November 2001 to November 2003. The team includes Aurea Madrio, Rizalina Cahiles, Maria Corazon Palileo, Eugene Cahiles, and Yoshitoshi Tsutsui in the study, "Rice-based farming models: BIAPP's approach

to technology integration and promotion at the Capayas Irrigation System".

What's BIAPP

The Bohol Integrated Agriculture Promotion Project (BIAPP) is a development scheme implemented through the Department of Agriculture and supported by the Japan International Cooperation Agency (JICA). Its direct partners and beneficiaries are the farmers cultivating land within the Capayas Irrigation System (CapIS) in Ubay, Bohol, the project's sub-site.

BIAPP had been involved in technical cooperation in the past that developed location-specific technologies particularly on rice, vegetables, and upland crops. However, a number of concerns

were not fully realized such as integrating technologies in a rice-based farming system, strengthening irrigators' associations, and improving agricultural promotion system through establishing linkages with concerned agencies. This led BIAPP to conduct a two-year follow-up project to attain the remaining targets.

The project aimed to integrate complementing technologies that can bring the best output, i.e., agricultural productivity and increased income by maximizing the limited resources of the farmers. Seven rice-based farming models were established in the project sub-site within the four lateral canals of the CapIS starting dry season (DS) cropping of 2002.

FSR + FSD = Productivity

The operational framework for the RBFM incorporated two farming systems approaches that tackle research and development: the Farming System Research (FSR) and the Farming Systems for Development (FSD).

The FSR approach involved the farmers in the process of technology development. Its main goal is to "optimize production and income of the whole farm rather than of specific commodities by assessing field problems and potentials for appropriate technologies at specific sites".

On the other hand, FSD stemmed out from FSR. It intends to improve the well being of individual farming families by increasing the overall productivity of the farming system. This approach focuses on the farm household and encourages farmers to help in screening incorrect designs and farm management systems. It also fosters linkage of the farmers with researchers, extension staff, and policy support/service to catalyze the realization of the development process.



The way they did it

Seven farmer model cooperators, all representatives of the Irrigation Association (IA), were the main participants of the study. Technical coordinators were assigned per farming model cooperator to assist and monitor the daily farm record keeping activities of the farmers to secure the efficiency of farming practices.

Within the duration of the project, the team of scientists and researchers conducted focused group discussions (FGDs), consultative farm planning workshops, observation visits and regular monitoring, field demonstration on the use of rotary puddler and rice straw composting, farm management analysis and diagnosis, and implementation of the rice-based farming model (RBFM).

The good point is that, when RBFM was implemented, the farmers were given the option to cultivate based on their preferences, experiences or skills, and availability of resources such as farmland, family labor, and finance. The cooperators were able to avail of the BAPC Seed and Fertilizer Revolving Fund for their input needs on loan basis without interest, payable at harvest time.

After rice harvesting for DS 2002, a hands-on demo on rice straw composting was initiated to inculcate the importance of using rice straw as source of organic fertilizer as well as a hands-on demo on the use of rotary puddler. Information materials on techniques in rice straw composting and operation of rotary puddler were distributed.

As part of the RBRM, some soil amelioration activities started to improve soil granulation, water and nutrient holding capacity of soil. Lime was applied on areas where the pH level was below 5.0 for rice and below 5.5 for vegetable cultivation. Other activities included the use of organic fertilizers such as rice straw compost and animal manure,

preparation and use of carbonized hull, green manuring procedures and application of Natural Farming Systems (NFS) on crop and livestock production.

On the other hand, through a farm management analysis and diagnosis, an evaluation meeting was conducted with the farmers, BIAPP, and LGU to discuss issues and concerns as basis for the farmer cooperators to improve their farming management.

Reaping good results

The improvement in farm management activities resulted to a higher rice yield of 4.6 tons per hectare (average of 4 cropping seasons), which is higher than the target yield of 4.0 tons/ha for CapIS area. Also, the cultivation of vegetables and other upland crops in the idle areas maximized the use of slack labor while waiting for the rice crop to be harvested.

Apparently, this contributed to the improvement of the agricultural productivity and farm income of the farming model cooperators. Although the researchers did not report a dramatic increase in the income of farmer adopters, they have generally improved their farm management skills because of the RBFM.

Further more, the handbook on "Farming Models at the Capayas Irrigation System: Rice-based Farming System", written in English and Visayan versions is one of the outputs of BIAPP's approach to

technology integration and promotion. The activity illustrates the involvement and participation of farmers in the development and dissemination of location-specific technologies.

The handbook was produced to supplement the trainings conducted for the farmer participants regarding rice-based farming system.

Based on the results of the study, the team recommended that the RBFM approach to technology integration and promotion should be further tested and expanded in other areas of Bohol province and Region VII, considering the agro-climatic condition of the areas. This, according to the researchers, shall pave the way to the generation of location-specific technologies best suited to the needs and available resources of the farmers. ●

This article was based on the study, "Rice-based farming models: BIAPP's approach to technology integration and promotion at the Capayas irrigation system" by Madrio A.M., R. G. Cahiles, M.C. Palileo, E.C. Cahiles, and Yoshitoshi Tsutsui. This is a Bohol Integrated Agriculture Promotion Project (BIAPP), Bohol Agricultural Promotion Center, Dao District, Tagbilaran City



● photo by rdelacruz

Cruciferous crops for the lowlands

By RUDYARD R. ROXAS

Proper postharvest handling using refrigerated storage facility and transport vehicles are effective yet expensive means of maintaining freshness and quality of vegetables, particularly highly perishable crucifers. The absence of these facilities means that farmers are taking a huge gamble in transporting their produce from the field to the market.

But why take chances when the vegetables can be grown near the place of consumption.

Area specific plants and proper handling

Crucifers of the *Brassica* family are annual or biennial plants that grow best in cool, moist climate and higher altitude areas. Mostly native to Europe, Middle East, and Asia, many *Brassica* plants are important gourmet vegetables worldwide.

Cultivars of *Brassica oleracea* such as broccoli (*Brassica oleracea* var. *Italica*), cauliflower (*Brassica oleracea* var. *Botrytis*), and cabbage (*Brassica oleracea* var. *Capitata*) are commercially important vegetables grown in the high elevated areas of Mt. Province, Kanlaon, Negros Occidental, Cebu, and Mindanao. They are also grown in specialized areas in the Ilocos region (374 ha in Ilocos Sur; 18 ha in Ilocos Norte).

Despite the lucrative market for these produce, farmers are beset with problems such as high production cost (considering that seeds are imported from the United States, Japan and Taiwan) as well as

handling/distribution cost due to their short storage life. The recommended storage life (at $^{\circ}\text{C}$) for cauliflower is 3-4 weeks while cabbage is 3-6 weeks and broccoli, 4-2 weeks.

Profitability of vegetable production in the country has been on the decline for the past several years. The Philippine Peasant Institute (PPI) cited spoilage and postharvest losses among the factors that contribute to farmers' income losses. Production loss due to postharvest handling and processes is about 30 percent.

Proper care in harvesting and handling are important in highly perishable vegetables such as crucifers, which tend to lose their turgidity and color in a matter

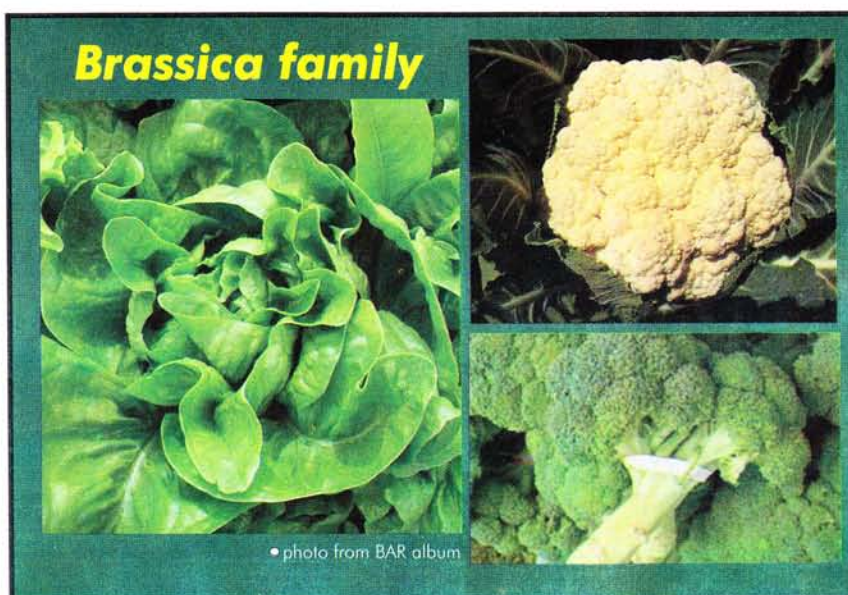
and storing between 0°C to 2°C , relative humidity (RH higher than 90%) using ethylene.

Promising highland veggies for the lowland

Researchers at the Mariano Marcos State University (MMSU) conducted varietal testing of *Brassica* cultivars to identify varieties that are adaptable to lowlands thereby minimizing the need for expensive postharvest handling.

The field trials were done during the dry season between October 1999 and February 2004 on 58 *Brassica* cultivars (11 broccoli, 33 cauliflower, and 14 cabbage). Promising varieties were identified based on the need for high yielding, early maturing and acceptable varieties.

Three broccoli varieties (Br-00-055, Br-00-209, and Br-00-309) matured between 50 to 65 days and yielded from 22.93 to 22.97 t/ha. Also, the three broccolis are highly preferred for their big curds, fine beads, and



of days. Australia's Department of Agriculture recommends controlling temperature (rapid cooling to below 2°C upon harvest

smaller stems.

Cauliflower entries: Ca-01-003; Ca-01-226; Ca-00-463; Ca-01-236; Ca-01-031;

Ca-00-412; and Meigetsu 45, have maturity period of 40-45 days after transplanting. These varieties yielded 24.18 - 28.43 t/ha and have creamy curd that is acceptable to local consumers.

Cabbages that matured from 55 to 65 days, yielded 56.85 t/ha to 61.65 t/ha and of compact heads were selected. These were Cb-99-157; Cb-99-152; and Cb-99-156. In cases where the market prefers smaller head, Cb-99-246 is recommended. It has a maturity period of 50 days.

Profitability of selected promising varieties was computed based on the cost of producing a kilo of head or curd. For broccoli (Br-00-213), with a production cost of PhP3.13/kg, a net income of PhP809,400 was realized on a 25,400 kg/ha yield on a selling price of PhP35/kg.

As for cauliflower (Ca-01-003), with a production cost of PhP2.79/kg, a net income of PhP489,000 was realized (at PhP20/kg) on a 28,430kg/ha yield.

Producing a kilogram of cabbage at PhP1.29 (using Cb-99-157 variety) can net an income of PhP536,900 computed on a 61,650 kg/ha yield at PhP10/kg.

Sowing, transplanting and cultural management

Seeds were sown on a 10-15 cm seedbed mulched with rice hay. The seeds were watered every other day and covered with a portable plastic shed to protect them from too much rain.

The seedlings were transplanted 30-32 days after emergence. To prevent transplanting shock, seedlings were not watered and gradually were exposed to sunlight a week before transplanting, hardening



● photo by betterhealth.vic.gov.au

the seedlings.

The area for planting was plowed twice, fairly deep to fully pulverize the soil. Furrows of 40 cm wide to allow double row planting were made at 0.8 meter interval. Each furrow was watered prior to transplanting to moisten the soil.

Newly transplanted seedlings were immediately watered along the furrows to establish good root contact with the soil. Inorganic fertilizer (14-14-14) was applied basally at the rate of 70-70-70 kg NPK/ha or 10 bags per ha. Fertilization with 46-0-0 was done one week after transplanting (WAT) and 3 WAT at the rate of 230 kg N/ha in a split application.

The area was irrigated twice a week during the first month and once a week on the second month (or as needed) to keep the soil moist.

Integrated Pest Management (IPM) was practiced in monitoring and controlling insect pests. Insecticide spraying was applied only when ETL reached 2-3 diamondback moth (DBM) larvae (at seedling to vegetative stage) and 5 DBM larvae per plant (at pre-heading to heading stage). Insecticides used were B.T., Fenvalerate, and Carbaryl. These could also control other lepidopterous pests.

Recommended planting period is in the cooler months of September to December to check DBM population. ●

This article was based on the study, "Performance Evaluation of Cruciferous Crops under Ilocos Condition" Cocson, L.G. and L.J. Flora of the Mariano Marcos State University, Batac 2906 Ilocos Norte, tel. no. (077) 792-3131; telefax: 792-2547; e-mail: rrdirectorate@mmsu.edu.ph

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Stop the sap-sucking pest go botanicals

By RITA T. DELA CRUZ

They are white with a tinge of green and pink that eventually turns to shiny black as they mature. They grow from 8 to 9 mm long. They are active and deadly. They weaken their hosts by sucking and leaving them almost stunted, their leaves burned, and their grains half-filled. They are the worst sap-sucking pests that ever lived - the rice black bugs (*Scotinophara coarctata*).

Rice black bugs thrive in rainfed and irrigated wetland environments especially during the vegetative stage of the rice crop. They thrive best in continuously cropped irrigated rice areas and poorly drained fields. They are frequently observed during dry season, specifically in rice fields with densely planted crops. They are widely distributed in the rice planting areas of Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Thailand, and the Philippines.

In an IRRI study (2003), the researchers attributed the rice black bug pattern to the lunar cycle. They observed that large numbers of adult black bugs swarm during full moon nights as they are attracted to light sources. Staggered planting of rice and too much nitrogen also favor the buildup of black bugs.

Extent of damage

The infestation of the black bugs leads to tremendous losses on the part of the farmers, and if not given immediate attention, more resources would be lost.

But before the problem can be solved it is reasonable to understand the enemy better. What are they like during their different life

stages? What is the extent of their damage to the plants? What management practices can eradicate them? Answering these questions does not only give the farmers a better grip of the problem but it also puts them in a better position to prevent if not totally eradicate the pests from further damaging their rice field.

What are rice bugs like during their different life stages?

The eggs of the rice black bugs are round and are either pinkish or greenish. Incubation period takes from 4 days to even a week. Eggs are laid in groups on the lower part of the leaves, on stems, roots, and on soil cracks. When the eggs become nymphs, their colors change to brown or yellow with black spots on their bodies. They come in different sizes and it takes them 29-35 days before six nymphal instars are completed. When they reach the adult stage, their colors turn to shiny black. They are commonly found at the base of the plant during the day and they move upwards during nighttime.

What is the extent of the damage to the plants?

Both adults and nymphs start early as sapsucker. Sap removal reduces the number of tillers of rice plants. Tiller is the shoot growing from the base of stem. Black bugs particularly like to infest the bases of the rice stems thus, weakening the plants and preventing them from producing seeds. Heavy infestation results to stunted growth, formation of white heads, half-filled or empty grains,



●photo by knowledgebank.irri.org

and browning of leaves or what is commonly referred to as "bugburn" or "deadheart". It has been observed that 10 adult black bugs per hill could cause losses up to 35% in some rice farms.

What are some of the management practices?

Since the rice black bug is not new in the list of rice plant nemesis, various management practices have already been made available to the farmers. An IRRI factsheet mentioned some simple and easy to do cultural control practices like, maintaining a clean field, removing weeds, and drying rice field during plowing to reduce the population of black bug. To break the insect's cycle, varieties of rice with the same maturity date can be planted. It is also better to resort to direct-seeded crops since they tend to have fewer tillers thus discourage population growth of the pest. Flooding the fields can also cause higher egg mortality. After harvest, it is advisable to plow the field to remove remaining insects.

Other means of control could either be mechanical (using light traps) or biological (use of botanicals).

Fighting the sapsuckers the natural way

Resorting to botanicals as one effective, safe, and natural way

of controlling the rice black bugs is anchored on the premise of integrated pest management and sustainable practices for production. Botanicals are natural insecticides derived from plant extracts. When processed and concentrated, these botanical insecticides are similar to synthetic insecticides but are safer to use. This is because, generally, botanicals degrade more rapidly than most conventional pesticides, and so are considered relatively environment-friendly and less likely to kill beneficial insects than insecticides with longer residual activity. (Insect Management, 1995).

The recent study conducted by Rizalito C. Mallorca of the Central Mindanao Agricultural Research Center (CEMIARC), identified three botanical plants that are not only effective and economical against rice black bug but are also readily available. There are: neem seeds (*Azadirachta indica*), wild carrot/kayos (*Dioscorea hispida*) and, makabuhai (*Tinospora rumphii*). These botanicals are found convenient, applicable and acceptable to farmers.

Parameters used to determine the effectiveness of the botanicals were: population count of adults and nymphs

black bugs, extent of damage and, grain yield. Result of the study showed that the effectiveness of these three botanicals is comparable to chemical treatments. In terms of grain production (t/ha), rice crops treated with botanicals increased in grain yield while low grain yield was observed in the untreated plots. Moreover, since botanicals are not bought, the return on investment is higher. ●

This article was based on the study, "Selected Botanical Plants Against Rice Black Bug" by R. C. Mallorca of the Department of Agriculture-Central Mindanao Integrated Agricultural Center (DA-CEMIARC), Amas, Kidapawan City.

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Kayos vine



Neem fruits



Makabuhai vine

Energizing...from page 20

need to increase our yearly production target to tens of thousand tons of raw silk per year. Furthermore, we should aim to produce international grade silk that will place us in the competitive level in meeting the demand of the global market.

The annual production of silk in the world is estimated at 45,000 tons, of which Japan and China contribute 18,936 and 13,200 tons, respectively. South Korea, USSR, and India are the other leading countries in the world involved in sericulture. In India, over three million people are employed in various fields of sericulture. It is a cottage industry, and provides ample work for the women in the rural areas by rearing silk worms, while the male members work in the fields. ●

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Getting rid of white stem borers

By MA. LIZBETH J. BAROÑA

White stem borers (WSB). You can actually minimize these pests' infestation of your rice field by changing the planting date. A management strategy to control the white stem borer was developed by researchers of the Philippine Rice Research Institute (PhilRice)- Agusan del Norte. The results showed that December 15, for the November to April cropping season, and July 1 for the May to October cropping season, are the best dates to sow rice. In Agusan del Norte, the white stem borer infestation is a serious and persistent problem, since it is a threat to their rice production, and consequently, their income.

White stem borer

Scientifically known as *Scirpophaga innotata*, the white stem borer is a major rice insect pest that lays its eggs near the tip of the rice's leaf blade in batches of about 100 per batch. The eggs take about 8 days to incubate. They reach full growth in about 30 days. Pupation is completed in approximately 8 days, with complete development in 46 days. The larvae of the borer penetrate and feed on the leaf sheath, and later bore into the stem and feed on the tissue inside.

If the damage occurred during the vegetative state, this is called "deadbeat" damage. If it occurred during the reproductive state, it is called "whitehead" damage.

As cited in the study, the height of the pest's infestation could result to a devastating 50-60% yield loss.

Planting dates

To test the effects of planting date on the pest's infestation, different planting schedules were conducted during the 2002 to 2003 planting seasons of November to April, and May to October.

For the November to April planting season, the planting schedules were December 15, January 1, January 15, February 1, and February 15. For the May to October planting season, the four schedules were June 1, June 15, July 1, and July 15. Recommended cultural management practices for irrigated lowland rice were followed. The rice varieties were PSB Rc82 and Angelica.

Using PSB Rc82 variety, the effects of lunar phases on the borer infestation was also tested.

Samplings of white stem borer adults were done at 20, 30, and 40 days after transplanting (DAT). Damage assessment of the borer was done at 35 and 50 DAT on 25 random hills per plot by counting the number of damage and undamaged tillers per hill, and converted the figures to percentage deadhearts.

At 10 days before harvest, also called the ripening stage, damaged and undamaged panicles per hill on 25 random hills were counted and converting to percent whiteheads.

Planting dates on infestations and yield

For the November to April planting season, rice planted on December 15, January 15, and February 1 had significantly less incidence of deadhearts at the vegetative stage or at 35 to 50 DAT, regardless of the variety.

For the incidence of



• photo by Philrice

whiteheads, December 15 planting date also had the lowest percentage of damage. The later planting date, February 15, had the highest whitehead incidence, with PSB Rc82 variety having higher infestation (36.87%) than that of Angelica (24.21%). A comparison of the two varieties' damage during the reproductive stage show PSB Rc82 having highest incidence of whiteheads, regardless of the date of sowing.

The yield of PSB Rc82 variety was highest at 3.96 tons/ha on the December 15 planting date while Angelica produced 4.84 tons/ha during the January 15 planting date. Lowest yields were obtained from the later planting periods of February 15, with PSB Rc82 yielding 0.66 tons/ha, and Angelica yielding 1.08 tons/ha. This was attributed to the high incidence of whiteheads, bacterial blight, and sheath blight.

As for the May to October planting season, the incidence of

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It is impossible to leave out tomato in our entire diet. Tomato is a valuable ingredient in many of our common Filipino dishes. But are we satisfying the demand for tomatoes in our country?

Apparently, tomato production in the Philippines is a hit or miss enterprise since it is fully dependent on climatic condition. It has been observed that the dry months of December to May cause market glut of tomatoes while it can command a skyrocket price during the hot-wet season. Experts agree that seasonality occurs mainly because the tomato varieties available in our country are not tolerant to flooding and bacterial wilt problems.

Grafted tomato technology

Researchers from the Asian Vegetable Research and Development Center (AVRDC) developed the grafted tomato technology for off-season production, which was refined at Central Luzon State University (CLSU). The researchers claim that the grafted tomato technology is capable of producing tomatoes even during wet-hot months. They say that its low temperature tolerance carries a growth period extension, bearing quality fruit. It was found that the cultivation of tomato grafted onto eggplant rootstock and the use of rain shelters and heat tolerant varieties can minimize seasonal stresses. According to the researchers, eggplant roots can tolerate flooding better than tomato roots and can resist infection of bacterial wilt-causing organism. While the rain shelters protect plants from the impact of heavy rain, heat tolerant varieties, set fruit at ambient temperatures (35 degrees Celsius), inhibit pollination and fertilization.

Dissemination and adoption

The technology is met with skepticisms from farmers and even agricultural technicians. To counter this apprehension, the agricultural technicians and farmers attended a farmer field school (FFS). This is an extension approach to enhance adoption and dissemination of the grafted tomato technology.

To determine the effectiveness of the FFS, a study was conducted by Teotimo M. Aganon, Clarita P. Aganon, Aurea C. Roxas, Eduardo G. Marzan Jr., and Rolando V. Pagaduan in Central Luzon State University, Science City of Muñoz, Nueva Ecija, entitled, "Farmer field school: A vehicle for accelerating dissemination of grafted tomato technology for off-season production".

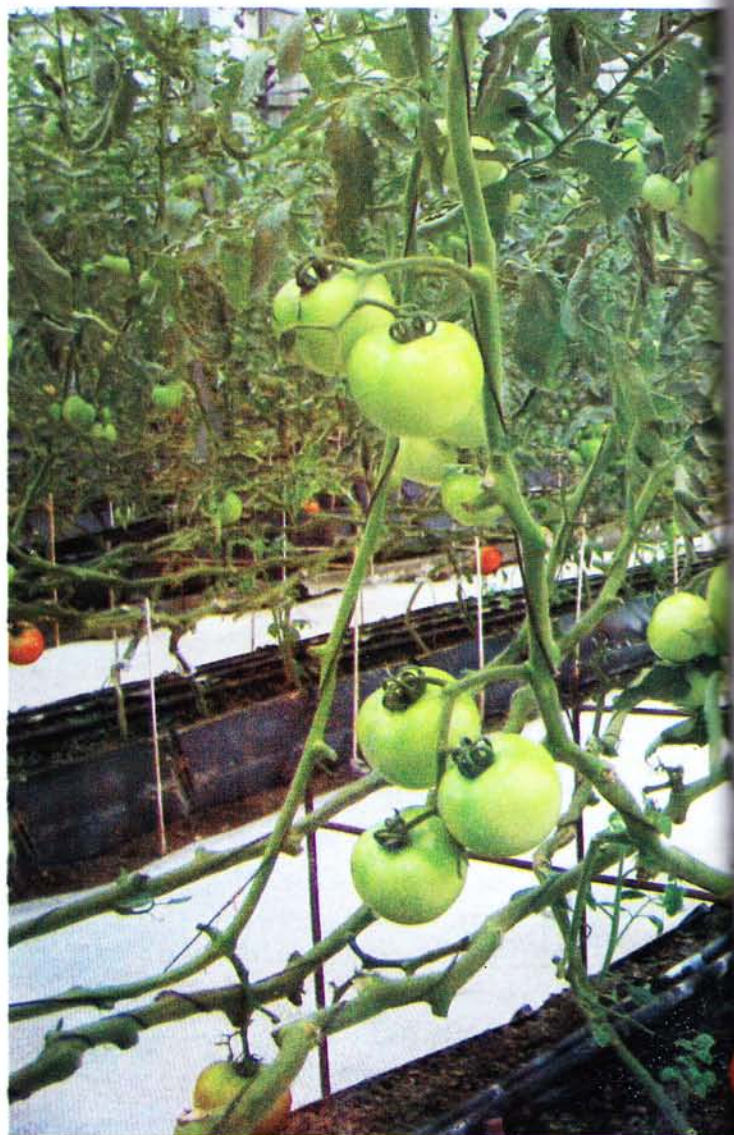
Selected local government units (LGUs) of Region 3 expressed interest and support for the project as manifested by their signing of an agreement to formalize a procedure for technology promotion among off-season vegetable growers. Training manuals were distributed during training programs, technology fairs, and field days in farming communities and project sites.

Farmer field school

The benefits and requirements for adoption of the grafted tomato technology were discussed during the training of

Grafted tomato for off-season

By MIKO J.



It was found that the cultivation of tomato grafted onto eggplant rootstock and the use of heat tolerant varieties can minimize seasonal stresses.

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• photo by mjmajica

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farmers. Moreover, a training of trainers (ToT) was also conducted to equip the agricultural technicians and technical workers with the right knowledge and skills needed in the conduct of an FFS in their respective municipalities. The participants were the high-value commercial crops (HVCC) coordinators and technicians assigned in HVCC projects in each municipality.

With and without rainshelter

In the FFS demo farms, the yields obtained from grafted tomato with and without rainshelter outyielded all the other learning plots. The learning plots demonstrated the effectiveness of grafting over non-grafting and with rainshelter over without rainshelter. There was a low yield from Bocaue, Bulacan which was due to a very high incidence of tomato yellow leaf curl virus that attacked the plants at flowering stage. There was, however, a very dramatic effect of grafting as seen by the zero survival rate of non-grafted plants.

In San Ildefonso, Bulacan, grafted tomato was unaffected by rainshelter. In fact, yield was higher in plots without rainshelter (early planting time). In San Jose Del Monte City, there was a dramatic yield decrease when grafted tomato was not provided with rainshelter.

It was found that all the adopters had not growing tomato during the rainy season (wet-hot months) because of the extremely serious problem of bacterial wilt and flooding. Majority of them tried growing tomatoes in the wet-hot months at least once but all of them failed to produce quality tomatoes.

Direct effects of FFS

According to the participants in the FFS, they were motivated because of the efforts shown by researchers and scientists to train them. They saw the commitment of LGUs to make them adopt the technology. FFS participants who became adopters even formed associations for easy exchange of experiences and information. Consequently, the self-confidence of the farmers was boosted because of their acquired skills and support from LGUs.

Spill-over effects

It was also observed that there is an increased interest among non-participants of the FFS who have seen the effect of the technology. There is also an increased demand for grafted seedlings. In fact, there has been a shortage in the supply of the grafted seedlings because of the high demand by farmers.

The increasing number of farmers adopting the grafted tomato technology is largely attributed to their actual experience during the FFS. This is a "to see is to believe" approach in disseminating technology which has always been found effective. ●

This article was based on the study, "Farmer field school: A vehicle for accelerating dissemination of grafted tomato technology for off-season production" by Aganon T.M., C.P. Aganon, A.C. Roxas, E.G. Marzan, and R.V. Pagaduan of the Central Luzon State University (CLSU), Science City of Muñoz, Nueva Ecija.

Rid your bananas of *bugtok* and bunchy top

By MA. LIZBETH J. BAROÑA

Nothing ruins banana eating like biting into dark, hard masses that is nothing like the white, soft banana flesh you expected. Eating mood is not the only thing that gets sour because what you've probably bitten into is a disease that is crippling the country's banana industry.

Scientists at the Department of Horticulture at the University of the Philippines Los Baños (UPLB) have come up with preventive and management measures for *bugtok* and the banana bunchy top virus.

BBTV and *bugtok*: The destructive duo

The banana bunchy top virus (BBTV) is one of the most serious diseases of banana. The organism that makes this disease prevalent is the aphid. It acquires the virus at least 4 (and usually 18) hours after feeding on an infected plant. It retains the virus throughout its adult life, which lasts between 15-20 days. This organism transfers the virus from plant to plant, and once a carrier aphid infects a banana plant, there is virtually no cure for BBTV. Some banana varieties, like the Cavendish, is easier to infect than other varieties, but no variety is resistant to this virus. Once infected, the plant rarely bears fruit and has become a reservoir for the virus, therefore it must be destroyed.

Identifying symptoms precedes destroying an infected

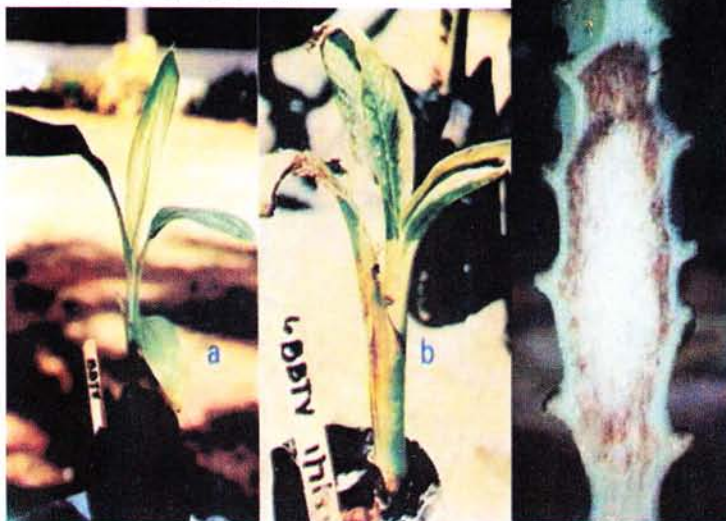
plant to keep it from contaminating the neighboring plants. The first symptom you must look out for would be dark green streaks in the veins of the leaf midrib, leaf stem, and the leaf

blades. This symptom is called "Morse code streaking". The edges of the leaf blades also thin out and turn yellowish. New leaves also do not grow to their normal size. During severe infections, the leaves get smaller, crumpled, and yellowish.

Bugtok, on the other hand, is a bacterial disease that usually infects cooking banana cultivars. This disease causes even a ripened fruit to remain hard, and if that is not enough to give you a clue that *bugtok* has found its way into the fruit, check out the black spots inside the flesh. A previous study said the outbreak of the disease caused the abandonment of plantations of saba and cardaba, two of the most popular cooking bananas in the country.

Unlike the BBTV infection which can be readily identified by the plant's outside appearance on the outside, the plant infected with *bugtok* cannot be readily identified from the outside. Even if the inside of the plant is already brimming with the infection, leaves can still remain

• Bugtok photo courtesy of AC Hayward
• BBTV photo courtesy of Dr. RR Espino



Symptoms of banana bunchy top virus (a and b) Bugtok symptom

green and the fruit does seem to develop normally. One way to identify the disease is through observance of the inflorescence of the plant. We normally call this "puso ng saging". The "puso" would seem dry and loose. Also, by cutting the fruits across, you'll see black spots in the flesh that make the fruits hard, even after cooking.

Control measures

For BBTV, you have to keep the aphids from infecting any more plants, so they have to be dealt with first. Kill the aphid vector also called the disease carrier - and destroy the infected plants. Since the host of the virus is the infected banana plant itself, destroy the whole plant at the onset of infection.

Spray the neighboring plants first with insecticide, with the infected plant sprayed last. Wait for 24 hours after spraying before removing the whole infected plant including the corms. After removing, cut the infected plant into small pieces and

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All about sweetpotato

From where this writer comes, we call it "wakay". But for the rest of the country, sweet potato is good 'ol kamote.

It is actually a crop with inferior animal feed value that is why sweet potato is hardly incorporated in animal feeding rations. But the study conducted by researchers from the Tarlac College of Agriculture (TAC) and the Negros State College of Science and Technology (NSCST) involved fermenting sweet potato to increase its nutritive content, particularly crude protein, and evaluated its feeding value on swine, and as aqua-feed.

The sweeter potato

Sweet potato, *Ipomoea batatas*, is a tender, warm-weather vegetable that requires a long growing season to mature into large, useful roots. Sweet potato is grown in most parts of the country. It is one of the most important food crops in tropical and subtropical countries, where both the roots and tender shoots are eaten by humans as vital source of nutrients. The tender leaves



● photo by hort.purdue.edu

carbonaceous nature, it is of inferior nutritive value as feeds. It has low crude protein value and low percentage ash and mineral matter.

The technology for protein-enrichment of the sweet potato pulp is through fermentation. Through this process, the erstwhile low-value crop for animal feed takes on an inexpensive, high-value form, which

30.87%, as compared to 1.60% in its natural form. Its carbohydrate substances were also converted to amino acids, and eventually to microbial proteins through the microorganism's own growth and metabolic activities.

Where nutrition is concerned, a good response from an animal at certain stages of growth after being fed with the protein-enriched sweet potato-laced feed, would prove the suitability of the sweet potato. To set the standards for the inclusion rate of the protein-enriched sweet potato in a feed material, feeding trials and analysis of animal responses were carried out by the researchers.

Testing the enriched kamote

Sweet potato chips, grounded and fermented, were fed to hogs, tilapia fingerlings, milkfish, prawn, and blue crab. From these feeding trials, the researchers determined the

1) Protein-enriched kamote

By MA. LIZBETH J. BAROÑA

are good source of vitamin A, while the roots are excellent source of carbohydrates, whether boiled or fried.

Protein-enrichment

Although sweet potato is a good energy source due to its

if utilized by the animal industry to replace the expensive, quality commercial feeds, would be beneficial for both the animal and sweet potato industry.

Analysis of the fermented sweet potato showed a substantial increase in crude protein content at

nutrient composition of the sweet potato, evaluated the response of animals to rations containing protein-enriched sweet potato, and assessed the cost-efficiency of using the protein-enriched sweet potato.

For the hogs, two sets of



animals were studied, the one fed with feed incorporated with fermented sweet potato, and the other without it. The inclusion rate of the sweet potato feed was 20% at various stages of growth.

For the aquatic species, the stocks were raised in a nursery pond first and fed with commercial feed mash, before transferring them to their respective experimental ponds where they were fed the fermented sweet potato and commercial tilapia feed for two months.

In terms of growth parameters, which include body length, heart girth measurement, height, and body weight, the treated and untreated sets of hogs had no significant differences.

However, during the first three weeks of feeding trial, the treated hogs performed significantly better in these growth parameters.

The researchers found that using fermented sweet potato significantly reduced the cost of feed per kilogram live-weight and as much as P11.10/kilogram live-weight is saved.

The characteristics of the tilapia fed with fermented sweet potato was the same as the tilapia fed with commercial feed mash. The same holds true for milkfish in terms of body length, width and weight. However, the stock fed with fermented sweet potato required lesser amount of feed to add to a unit of weight. For the prawns and blue crab, a not-significant

difference was also observed, which means the inexpensive fermented sweet potato can be fed to the animals in lieu of the commercial feeds.

The researchers concluded that the fermented sweet potato can be used as sole ration to tilapia, milkfish, prawn, and crab because the species' growth performances did not differ from the more expensive commercial feed. The difference, however, lies on the cost of feeding, which was greatly reduced. ●

Sources:

"Production and utilization of protein-enriched sweet potato for animal feed," RA. Demo-os, MTSJ Valdez, M.Beldia, Tarlac College of Agriculture and Northern Negros State College of Science and Technology www.urbanext.uiuc.edu/veggies/sweetpotato1.html

Getting rid...from page 11

deadhearts was highest during the July 15 planting season on both varieties. Whiteheads, for the other hand, are lowest on the June 1 planting schedule.

The highest yield for both varieties was on the July 15 planting, although this was comparable to the June 15 planting. Lowest yield was obtained from the June 1 planting schedule, in spite its having the lowest incidence of whiteheads. This was attributed to rat infestation in the field.

Lunar effect

There was less incidence of adult white stem borer on rice that were planted on the last quarter and full moon phases. This meant lesser damage on the plant both at the vegetative and reproductive stages. Yield was highest on rice plant sown during the last quarter, although it did not have significant difference with the yield of that sown during full moon.

The researchers suggest the use of cultural methods for managing white stem borer, combined with biological control and host plant resistance. This way, preventing the damage of rice production would not only be effective, but also economically and environmentally sound. ●

Sources:

Management options for white stem borer, *Scirpophaga innotata*, walker in irrigated lowland rice in Agusan del Norte, EH Batayan, AB Estoy, AA Ortiz, RT Cruz. Philippine Rice Research Institute- Agusan del Norte. 2004

Increase mushroom...from page 19

important in the growing of mushroom but what position is the best? After subjecting the mushrooms to three different fruit bagging arrangements: hanging, vertical, and horizontal, the results revealed that growing of oyster and shiitake mushroom either in the hanging or vertical arrangements gave better yield and economic benefits.

Both the oyster and the shiitake mushroom had more harvests under the hanging arrangement. But based on the size of fruits, the vertical arrangement registered the biggest size and highest yield.

Shiitake had bigger fruits than that of the oyster. It also registered the highest yield under the vertical arrangement while oyster performed best in the hanging arrangement. In terms of the economic benefits, shiitake had higher return of investment (ROI) than oyster in all fruit bagging arrangements. ●

This article was based on the study, "Yield Performance of Mushroom Species Using Different Fruiting Bag Arrangements" by O.O. Teimo, E.O. Oller, E.L. Aglubio, G.B. Vallente, and O.C. Blaza of the Department of Agriculture-Research Outreach Station (DA-ROS) La Paz Experiment Station, La Paz, Zamboanga City.

2) Sweetpotato in a barren land?

By RITA T. DELA CRUZ

In 1991, when Mount Pinatubo erupted, the world was shocked by the extent of its damage. The once brown, fertile soil suddenly turned into a barren land with tons of ash and volcanic material spreading across the vast area. Thousands of people lost their livelihood and hectares of agricultural land went to waste. Now, even after more than a decade, the people remain hopeless in regaining the productivity of their once fertile lands. Lahar from the volcano is still entrenched in the lands. These lahar and ash-laden areas have very low nutrient content, poor water holding capacity, and susceptible to heavy leaching making the growing of agricultural crops difficult.

Over the past years, various studies have been conducted to determine the full potential of growing crops in this type of soil. Significant advances have been made in generating technologies to restore the productivity of the lahar and ash-laden areas. Researchers even developed technologies to enrich the soil, particularly increasing its nitrogen efficiency and coarse texture to suit certain agricultural crops.

Researchers from the Tarlac College of Agriculture (TAC) found good and promising results in rootcrop production, specifically planting sweetpotato.

There's hope in sweetpotato

Sweetpotato is an important



• photo by clagettfarm

rootcrop. Planting it is an income-sustaining livelihood particularly for our poor farmers. It is beneficial as livestock feed and source of sugars and starches for industrial processing. Considered as the "crop suited for marginal lands", sweetpotato easily grows even in less fertile soils such as lahar and acidic soils, and drought-prone areas. It does not only withstand poor soils but it can thrive even with the rough, extreme weather. A true survival crop, sweetpotato is usable from its leaves to its roots either as food or feed. It is easily grown and stored including its vines and roots that are being harvested regularly.

In terms of production, initial findings of the studies showed that lahar and ash-laden areas are suitable for sweetpotato root. Moreover, varieties of sweetpotato that can yield from 2 to 3 times higher than that of the traditional varieties grown in lahar-affected areas were identified.

Following early research findings on the potential of

sweetpotato production, the Bureau of Agricultural Research (BAR) funded a study on integrated R&D program for sweetpotato in lahar and ash-laden areas. The main objective of the program is to generate database information on production and postproduction of sweetpotato and package these as technologies for dissemination to growers and development workers through training and

demonstration. These packaged technologies are also tried on-farm. This program also aims to produce and evaluate the yield performance of sweetpotato using tissue cultured sweetpotato seedpieces. Eventually, the researchers hope to develop marketing strategies for sweetpotato grown in lahar areas.

Sweet varieties of sweetpotato

Since 1990, VSP6 or the Superbureau variety has been widely grown in lahar and ash-laden areas, particularly in Tarlac and Bataan. It replaced *Bureau*, the more common variety grown by farmers before it was wiped out by the feather mottle virus (FMV). Another sweetpotato variety being planted by the farmers is the UPL SP6.

When the two varieties were tested for their physical attributes, the result showed that VSP6 and UPL SP6 differed significantly in terms of length of

One of the major constraints of sweet potato production and postproduction is marketing the produce.

vines and diameter of roots. UPL SP6 has longer vines than the Superbureau. There was no significant difference in terms of their forage weight, number of marketable and non-marketable roots, length of roots and yield per plot.

In terms of yield, Superbureau and UPL SP6 have comparable yield under lahar-laden areas. However, a higher yield was observed when the sweetpotato plants were irrigated three times or five times and fertilized with a combination of compost fungus activator (CFA) and organic fertilizer. Superbureau produces higher yield when fertilized with one ton of CFA and 28-28-28 kg NPK/ha. Meanwhile, in ash-laden areas, Superbureau out yielded UPL SP6. The recommendation is to irrigate three or five times to achieve higher yield.

Market for sweetpotato

One of the major constraints of sweetpotato production and postproduction is marketing the produce. The market development of lahar-laden grown sweetpotato follows two streams of utilization: the requirement of the local consumers and the potential of sweetpotato roots for commercial processing.

The TAC study noted that the marketability of sweetpotato roots for both market prospects is dictated mostly by size. Regardless of sizes, the sweetpotato roots are consumed depending on the form

of product that the consumers prefer. This means that sweetpotato follows a specific route of trading with size as the indicative factor of preference.

On the processing aspect, the size is not a preference. The profitability indicator is dictated by the capability to deliver the daily processing requirement which unfortunately cannot still be delivered by the local producers. They cannot yet produce enough to meet the requirement of 140 tons/day of fresh sweetpotato roots of the processing industries.

The project recommended market strategies to help the local producers in making the best out of sweetpotato production and postproduction. One is to pursue a legitimate marketing linkage with foreign processors to guarantee revenues for the local government and higher and steady income for

the producers. Second, promote by-product development of the sweetpotato tubers as a vertical integration for some local feed processing industries. While some residues of processed by-products are stored as waste, it should be further processed as a minor finished product. Lastly, farm production of sweetpotato roots must be done in two production periods, one intended for the processing industry, and the other, for local consumption. With these strategies, profitability for both the farmers and the processors are assured. ●

This article was based on the study, "Integrated Research and Development Program for Sweetpotato in Lahar and Ash-laden Areas by J.A. Valdez of the Tarlac College of Agriculture (TAC), Camiling, Tarlac.

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● photo by cees.iupui.edu



Shiitake mushroom
● photo courtesy of oakshire.com

Oyster mushroom
● photo courtesy of mushroomadventures.com

smallscale farming mostly by the private sector, thus it cannot sustain the growing market demand for this commodity. Most of the mushrooms produced are for local consumption only.

Increase mushroom harvest? Bag it!

By RITA T. DELA CRUZ

Fruit bagging could affect the level of production in mushroom. This is according to the recent study of the Department of Agriculture-Regional Field Unit IX (DA-RFU IX) after trying three fruit bagging arrangements (hanging, vertical, and horizontal) in two common varieties of mushrooms, oyster (*Pleurotus spp*) and shiitake (*Lentinus edodes*). The study was conducted to evaluate the yield performance and production potential of mushroom using these fruit bagging arrangements and eventually recommend which produced the optimal yield.

The benefits of growing mushroom

Mushroom is beneficial to humans both for its nutritional and medicinal values. For instance, the oyster and shiitake are mushroom species containing substrates that are scientifically found to prevent,

if not, alleviate cancer, heart disease, and viral infection. Mushroom is high in protein, vitamins (B1, B2, and C), and minerals. It does not contain cholesterol and chlorophyll.

Growing mushroom is completely different from growing green plants. It depends on dead plant materials and substrates for growth. It can be raised in logs outside or placed inside, on synthesized sawdust logs or even on sawdust in bags. Growing mushroom should meet the desired specific requirements for growth like humidity, light, temperature, and carbon dioxide to oxygen ratio. It can be grown on a smallscale business with moderate initial investment.

In terms of marketing, growers have no problem since there is a wide demand for mushroom especially shiitake. Producing mushroom in the Philippines is often done in

Oyster and shiitake: The chosen few

Two of the most common mushroom species being grown are oyster and shiitake. In the food industry, these mushrooms are preferred. Oyster mushroom tastes mild, and its chewy texture mixes well with crunchy vegetables while shiitake has a strong, earthy taste and large umbrella-like caps and is favored in many dishes.

Oyster mushroom can be grown in a composted sawdust and is often cultivated along with other species of mushroom. It grows best in a wide variety of high cellulose waste materials. This mushroom is profitable for production due to its high percentage in converting substrates to fruiting bodies.

Meanwhile, growing shiitake mushroom is best for low input alternative enterprise. It grows best under low temperature on logs either placed outside or inside or on sawdust bags. Although second only to the button mushroom when it comes to worldwide production, shiitake is favored among Asian countries, particularly Japan.

In the DA-RFU IX study, these two species of edible mushrooms were chosen due to their high market demand and good price in the local market.

Bagging arrangements

Bagging arrangement is

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Energizing the silkworm industry

By MIKO JAZMINE J. MOJICA

It's smooth, luxurious, and fashionable. What else can you think but silk? Thanks to China for not keeping the secret of weaving silk forever. But more thanks to squashy silkworms which churn out these strands of fibers.

Potentials and constraints

Sericulture, or simply, silkworm culture is recognized to have a promising economic, social, and ecological potential which can generate jobs and incomes for the Filipinos. As a matter of fact, the province of Negros is recognized as the center of sericulture industry and major supplier of silk products in the country. What's more, Negros claims to produce silk that is one of the best in the world.

But just like any farming enterprise, problems are inevitable. Apparently, the cost of silkworm culture is quite high for the farmers. There was a time when they had to import the eggs of silkworms from other countries due to their shortage. A box containing 20,000 eggs during that time costed up to 700 pesos regardless whether the eggs are in unhealthy condition and there were some that have hatched untimely.

However, information reveals that silk farmers earn a minimum of P3,000 for every box of cocoon harvested. But to expand the market and maintain high income, the farmers should acquire the right knowledge and skills to produce quality raw silk for high-end silk commodities.

Promising silkworm hybrids

With these in mind, the scientists and researchers from Don

Mariano Marcos Memorial State University (DMMMSU) in Bacnotan, La Union, and who are affiliated with the Sericulture Research and Development Institute (SRDI) in the university, conducted a study on silkworm hybrids developed locally which is suitable for sustainable commercial production. The study is entitled, "Promising Silkworm Hybrids for Sustainable Commercial Cocoon Production".

In order to prepare for the accreditation by the National Seed Industry Council (NSIC), the study sought to determine and evaluate the performance of silkworm hybrids under various agro-ecological conditions, climatic types and seasons in Luzon, Visayas, and Mindanao. Through this study, they were able to identify the promising silkworm hybrids most adaptable and stable for commercial production.

Yield data of all the ten hybrids tested at four state colleges and universities (SUCs), namely: University of Rizal System (URS) in Tanay, Rizal; Quirino State College (QSC) in Quirino province; Mariano Marcos State University (MMSU) in Batac, Ilocos Norte; and DMMMSU-SRDI in Bacnotan, La Union representing climatic types I and III, were consolidated and analyzed. Adaptability and stability of ten silkworm hybrids were tested using the Bilbro-Ray procedure, while economic benefits were computed for the qualitative and quantitative performance giving emphasis on yield.



● photo by encarta.msn

Best performing hybrids

Results of the study showed that among the silkworm hybrids evaluated for qualitative and quantitative parameters. Hybrids 406, 408, 203, 346, were the best performing hybrids adaptable under climatic types I and III of Luzon and consistently produced higher yields over the control (Hybrid 222). All the hybrids were found stable with average adaptability. The best rearing seasons for good harvest were January-September. On the other hand, hybrids 203, 406, 408, 346 were determined to produce higher economic benefits compared to hybrid 222.

The study recommended that hybrids 406, 408, 203, and 346 be used for commercial cocoon production in all the different locations in Luzon for better yield and economic benefits. However, according to the authors of the study, silkworm hybrids must be subjected to bulk mass rearing under farmer's field. Moreover, performance evaluation should be conducted in other areas representing other climatic types in the country to meet the volume requirements of the industry.

Can we meet the demand?

The increasing demand for high-grade silk from local markets and abroad poses the

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4 in 1 Cassava grater: The complete processing machine

By RITA T. DELA CRUZ

Cassava, locally-known as *kamoteng kahoy*, with wide use both as food and feed, is an important crop in the Philippines. When grated, it is used as the main ingredient in many of our traditional food products like the cassava cake, *pitsi-pitsi*, *suman*, and *bibingka* (now known in the US as the Philippine pancake). Since it is easy to grow and is drought-resistant, is an ideal food-security crop. It has been an important food source in many developing countries.

Cassava is a source of food from the leaves down to its roots. The roots are excellent sources of energy, while the leaves, which are also cooked and eaten, contain vitamins A and C, calcium, protein, and iron. The bitter variety (white cassava) has larger concentrations of cyanide than the sweet variety (yellow cassava) but Filipinos have learned how to prepare cassava to avoid being poisoned.

New and improved grater machine

The Philippine Rootcrop Research and Training Center (PhilRootcrops), with funding assistance from the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA) has recently developed an integrated cassava grates processing system that is better than the previously developed root crop processing machines developed by PhilRootcrops. The newly improved cassava grates processing system includes four machines that complete the line of processing equipment used in the production of dried cassava grates. The machines were patterned, developed, and further improved from

the traditional/existing cassava grater. The four machines include: cassava grater, grates spinner, grates pulverizer/siever, and rotary drum dryer.

To determine the performance of this new processing system, three parameters were used: capacity of each machine; weight of materials before and after loading into the machine to compute the material balance of the system; and cost of operating the system.

The newly developed grater machine, also known as the DA-BARPhilRootCrops Cassava Grater, has a capacity of more than 200 kg/h of cassava, which is better than the existing PhilRootcrops grater since it could only accommodate 100 kg/h. It was also observed that the newly developed grater is more efficient when it comes to wasted materials. It can practically grate all the roots resulting to very negligible losses that mostly consist of fibers and woody portion of the roots.

The newly developed spinner or the DA-BAR PhilRootcrops Cassava Grates Spinner, also proved to be more convenient and mashes faster than the previous screw-type manual presser. The presser could only accommodate 20 kg/h of cassava while the newly developed spinner has a capacity of about 200 kg/h, which is 10 times better.

The two remaining pulverizer/siever (DA-BAR PhilRootcrops Cassava Grates Pulverizer/Siever) and rotary drum dryer (DA-BAR PhilRootcrops Rotary Drum Dryer) are the other newly designed and developed machines. The pulverizer/siever grinds the lumps in grates after spinning as it separates the grates from the coarse

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Cassava grater



Grates spinner



Cassava grates pulverizer/siever



Rotary drum dryer

• photos courtesy of PhilRootcrops

Grow-out farming of the giant freshwater prawn

By MIKO JAZMINE J. MOJICA



●photo by shrimpcrbandcrayfish.co.uk

Here's to a promising alternative to the expensive lobster and tiger prawn: the freshwater prawn.

The freshwater prawn, locally known as *ulang*, has a similar palatable taste with that of the tiger prawn and lobster, and has wide market acceptability both local and foreign. It was reported that there are 15 species of freshwater prawn in the Philippines, but the *macrobrachium rosenbergii* is the most popular to culture. This indigenous aquatic species is also known in the country as *udang* in Ilocano, *kising-kising* in Pangasinan, and *swahe* in other regions. It is also a popular aquatic food in Africa, Asia, and the Pacific region.

The "catch" in *ulang*

In the Philippines, *ulang* is reported to abound in the provinces of Ilocos, Cagayan, Pangasinan, Pampanga, Aurora, Quezon,

Cordillera, Bulacan, Laguna, Mindoro, Palawan, Bicol, Leyte, Samar, Cotabato, Lanao, Maguindanao, and Agusan.

The culture of *macrobrachium rosenbergii* is appealing because of its rapid growth performance and ability to survive and grow in turbid water conditions. *Ulang* can tolerate moderate temperature and salinity changes, and can be caught in tributaries and cultured in ponds, tanks, cages, and rice paddies. They feed on anything such as terrestrial animal feeds, fish feeds, kitchen leftovers, and vegetables like carrots, winged beans, etc.


Commercialization potentials

The Bureau of Agricultural Research (BAR), convinced by the potentials of the freshwater prawn, identified its grow-out farming technology as mature that is ready for commercialization.

During the Technology Forum held by BAR, the freshwater prawn culture in Region II was launched as one of the first batch of commercializable technologies that will be supported by BAR through wide scale commercialization.

During the Techno Forum, Mr. Hermogenes Tambalque III, senior agriculturist from Region II, presented an overview on the potential of the grow-out farming of freshwater prawn along with its possible market linkage. He also provided a simple cost and benefit analysis of the freshwater prawn culture in Abulug, Cagayan.

Preparations for culture

During the techno forum, Mr. Tambalque presented the procedures of pond preparation for the culture of giant freshwater prawn, from pond draining, 

poisoning, and washing. In pond draining, old stocks, predators, and unwanted species should be collected and eliminated. As to pond poisoning, this is done by applying biodegradable organic materials such as tea seed cake and tobacco dust to kill all unwanted species. Pond washing is done with lime to remove the effect of toxic chemicals when insecticides are used. The rate of the application of lime is 100 g/m² or 1,000 kg/ha.

The inlet and outlet water sources should also be screened to prevent the entrance of unwanted species and the escape of stocks. In leveling the pond bottom, excess mud and dirt should be removed.

Pond activities

Installation of artificial shelters is needed because during the grow-out period, the hard-shelled prawns will eat the soft-shelled prawns (molting). Bamboo twigs, sampaloc stems, PVC pipes or recycled materials like nets, bricks or stones, and recycled mineral bottles can be used as shelters.

Mr. Tambalque said that these shelters are placed in the nursery/grow-out ponds to serve as the hiding place of the post-larvae during molting.

According to him, other routine pond activities include feeding, side dressing, weeding, and record keeping to keep track of the success and failure of the project. Indigenous or local feeds which are present in the locality can be used as feeds like freshwater mussel (*sulib*), golden snail, winged bean (*sigarilyas*), carrots, fish, coconut pulp, etc. Side dressing or fertilization can be with organic or inorganic fertilizer. Organic fertilizer is chicken manure which is applied at 250-

500 kg/ha/week, while the inorganic fertilizer is ammonium phosphate, which is applied at 25-50 kg/ha/week.

He said that weeding is done through manual removal of aquatic weeds for backyard ponds but for commercial/progressive farm, the grass cutter machine is used. He added that it is important to remove the weeds because they affect photosynthetic activity and hamper harvesting.

Moreover, there are also water quality parameters set for the proper *ulang* culture. The water's pH level should be 7.5 - 8.5 with the temperature at 26 - 31°C. The pond should be filled with water 1.0 to 2.0 meters deep.

Nursing the prawn

Mr. Tambalque further discussed nursing the post-larvae to juvenile prawn before releasing them into the pond. Post-larvae is the stage when shrimp begins to swim headfirst, tail down and dorsal side up. This stage is reached 16 to 28 days from egg stage. The prawn juveniles should first be acclimatized into the pond surface for at least 20 minutes before releasing them in the pond. This will prevent thermal shock and consequently, mortality. He explained that the size of the post-larvae ranging from 1.5 to 2.0 cm (0.10-2 g) must reach juvenile size of 5 - 8 cm (3-5g) before transferring them into the grow-out ponds. This helps in attaining the marketable size of the freshwater prawn. The size of the nursery pond must be 100-200 sq m with a depth of

0.8-1.5m.

Harvesting ulang

According to Mr. Tambalque, harvesting of *ulang* can be done when they reach their marketable size, at 5-6 months from stocking. *Ulang* can be harvested through selective or total harvesting. Selective harvesting is done after 5 months of culture, using seine to harvest. The bottom of the seine net should be kept intact on the pond bottom to avoid the escape of the prawn. Seining should be done before the total draining of pond. The second method is total harvesting. The prawns are collected manually.

Ulang farmers in other regions said that a well-managed pond could produce prawn of more than 40g in five months. They pointed out that the growing period for freshwater prawn depends on the market-size preference. In areas where wild stocks abound like in the province of Bulacan, *ulang* with an average weight of 30g are sold at Php 250/kg. The selling price can even go up to Php 400-700/kg depending on the size. ●

This article was based on the study, "Techno-demo on grow-out farming of the giant freshwater prawn (*Macrobrachium rosenbergii*)" by H. S. Tambalque III, OIC extension division chief, BFAR RFU2, Carig, Tuguegarao



● photo by shrimpcrabandcrayfish.co.uk

Rid your...from page 14

leave it out to dry.

If too many of the plants in the plantation have been infected, cut the plants that have bent close to the ground, and using a bamboo spear which has been soaked in an herbicide solution, pierce the buds to prevent the plant from growing further. Next, spray the plant with insecticide.

Planting certified virus-free plants is also one way of preventing the virus from getting nowhere near your plantation.

Keep away insects carrying the *bugtok* bacteria by bagging the young inflorescence as soon as it emerges. The bagging material can be polyethylene or fine nylon mesh bag. After all the fruits have set, remove the bag, and the inflorescence.

Also, keep the plantation free of dead leaves to keep carrier insects from setting-up breeding grounds in the mat.

Keeping the prospects bright

Data on banana world production and trade put the Philippines as 4th largest banana exporting country, the only Asian country to reach the world's top ten. In fact, we are the top banana supplier of Japan, taking

a whopping 74% of the trade share.

Since export prices of the banana from our country average at \$189 per ton while the Japanese and American imports prices are at \$520 and \$491, respectively, there is a chance for the Philippines to raise our export price, given improved quality, and postharvest handling. This means that our banana farmers should start adopting technologies that keep their banana plantation disease and defect-free, while decreasing losses during production.

Lest we forget, all these opportunities start with a healthy banana plant. ●

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materials before drying while the drum dryer dries the grates. The pulverizer could accommodate up to 100 kg while the dryer could dry the grates to less than 12% of their moisture content in 15 min and could hold up to 20 kg/h of cassava.

What are the outcomes?

The developers of this cassava grates processing system noted that the limiting capacity of the system lies mainly in the drying operation where there is only an average capacity of 20 kg/h the lowest capacity in the whole processing system. However, they explained that at this capacity, the newly developed drying machines could produce more than two tons of dried grates in a month and that by increasing the number of dryers or its size, the capacity of the system could also be improved.

For the economic benefits, the researchers/developers noted that the breakeven processing cost in the production of grates using the newly developed system amounts to P24.84/kg.

With this newly developed cassava grates processing system, good quality dried cassava grates could now be produced in commercial quantity. Processors, traders, and users are not the only beneficiaries but more of the cassava farmers who provide the raw material. ●

This article was based on the study, "Dried Cassava Grates Processing System" by D.L.S. Tan, R.R. Orias, and R.V. Piedroverde of the Philippine Rootcrop Research and Training Center (PhilRootcrops), Baybay, Leyte 6521A, Philippines. Tel.: +63 53 335 3866/2616 Fax: +63 53 335 2616 Email: philrootcrops@philwebinc.com

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