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ECHO is a Christian non-profit organization whose vision is to bring glory to God and a blessing to mankind by using science and technology to help the poor.

Issue Highlights

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Artemisia annua anamed: Hope against Malaria

By Dawn Berkelaar

Introduction

A medicinal plant, *Artemisia annua,* drew a lot of interest at the ECHO Agriculture Conference in November. For several years, ECHO staff members have followed reports on the use of *Artemisia annua* to treat malaria. Though artemisia leaves have been used medicinally to reduce fever for 2000 years, we hesitated to write about it, because it is a temperate plant. We were not sure how widely suited it would be to the growing conditions where most members of ECHO's network are located. For example, in the tropics it tends to flower when the plant is still very short and then dies. This is because the plant flowers when days have less than 13 hours of sunlight. In the tropics there are many days with less than 13 hours of sunlight!

But there is now a variety of artemisia that grows in the tropics despite short days (Figure 1). It also contains higher levels of medicinal compounds like artemisinin. Dr. Hans-Martin Hirt, a keynote conference speaker, obtained permission to purchase patented seed of a special hybrid variety, now called *Artemisia annua anamed*, which was developed by a pharmaceutical company. Dr. Hirt packages the seed for distribution by community development workers. He has introduced artemisia in many African countries, making its benefits available without the need to purchase pills.

Dr. Hirt works with a unique organization in Germany called anamed (Action for Natural Medicine). He defines "natural medicine" as a philosophy that combines the best of modern medicine (i.e. reliable and accurate prescriptions, given on a scientific basis) and of traditional medicine (i.e. using locally available resources, fitting the local language and culture, and almost always available). Dr. Hirt, who has a Ph. D. in pharmacy, regularly gives seminars to groups in Africa, where he discusses natural medicine with both healers and doctors. These discussions have proved effective in promoting artemisia as a treatment for malaria.

Figure 1: Seedbank Director Tim Motis stands beside a flourishing artemisia plant on ECHO's demonstration farm.

Artemisinin Pills for Malaria Treatment

Artemisinin, a compound found in the artemisia plant, is formulated into pills and sold for treatment of malaria. In the past few years, artemisinin has been recommended by leading donor agencies including UNICEF, the World Bank, and the World Health Organization (WHO). According to an article in the *New York Times* (May 10, 2004), artemisinin "has no significant side effects, quickly reduces fevers and rapidly lowers blood-parasite levels."

Artemisinin is often given along with other drugs in an attempt to avoid the development of resistant strains of the malaria-causing plasmodium. For example, Coartem is the trade name for the formulation of artemisinin with

Plant Name	Recommended up to body temp. of (ºC)	Part of plant	How used	Effective ness	Side effects
Cymbopogon citratus (lemon grass)	Always	Leaves	Tea[1]	+	None
Allium sativum (garlic)	Always	Cloves	Three heaped tablespoons chopped garlic each day	++	+ stomach ache
Zingiber officinalis (ginger)	37.5	Roots	Eat one handful fresh, or boil for 10 minutes. Do not filter; drink and eat everything.	+	None
Psidium guajava (guava)	37.5	Leaves	Tea (decoction*)	+	None
Carica papaya (papaya or pawpaw)	38.0	Leaves	Tea (infusion*)	++	+ possibility of allergies developing
Cassia occidentalis (coffee senna)	38.0	Leaves	Tea (decoction*)[2]	++	+ diarrhea
Azadirachta indica (neem)	38.5	Leaves[3]	Tea (infusion*)	++	++ irritation of the liver
Vernonia amygdalina (bitter leaf)	38.5	Leaves or root[3,5]	Leaves: infusion* Roots: decoction*	++	+ unknown; it contains cytotoxic substances
Cinchona officinalis (China tree)	40.0	Bark[4,6]	Tea (infusion*)	+++	+++ tinnitus (buzzing in ear). Sometimes giddiness, nausea, vomiting. With high dosages, a risk of deafness, and bleeding in the inner ear.
Artemisia annua (sweet Annie)	40.0	Leaves[4]	Tea (infusion*)	+++	none

Table 1: Herbal remedies for malaria. From an anamed publication called "Artemisia annua anamed: Malaria and other diseases."

*An infusion is made by pouring one liter of boiling water over a handful of fresh leaves, or 15 g dried leaves (5 grams for Artemisia or neem). Let stand 15 minutes, then pour through a sieve. A decoction uses the same quantities, but is boiled for 10 to 20 minutes, then cooled and sieved.

[1]Boil leaves for two minutes, let stand 15 minutes, then pour through a sieve.

[2]Boil 20 grams of fresh herb (without fruits) in one litre of water for 15 minutes. Cool and filter. Drink in four portions throughout day. Continue for five days.

[3]Pregnant women must not use neem or bitter leaf.

[4]China tree and artemisia should not be used during the first three months of pregnancy. Women more than three months pregnant and children under five years of age should use Artemisia only under supervision of a doctor.

[5]The leaves are very bitter. Bark of the roots is more effective. Use secondary roots (not the main roots) so that the tree does not die. Boil a handful of bark from the roots for 20 minutes.

[6]Boil 10 g or three heaped teaspoons of pulverized bark in one liter of water for 10 minutes. Filter and drink in portions over 24 hours. Give children less, depending on body weight.

another drug called lumefantrine. Coartem is sold by the Swiss drug company Novartis.

However, there are several problems related to the use of artemisinin pills. The pills are not always available, and when they are, they are expensive. Sometimes shopkeepers will sell one or two pills to patients who cannot afford a full course of 12 pills. Many leading malaria experts fear a shortage of artemisia plants from which to extract artemisinin. Also, despite recommendations to the contrary, drug companies often manufacture artemisinin pills as a monotherapy (i.e. as the only treatment), leading to worries that a resistant strain of the plasmodium will develop. And finally, counterfeiting is a problem. The *New York Times* article (referred to on page 1) mentioned that, in a study of artemisinin drugs in Asia, more than a third were fakes. Some of the pills contained talcum powder instead of artemisinin. More information on the widespread sale of fake artemisinin derivatives is found in a June 2006 article on www.plosmedicine.org.

Artemisia Leaf Tea for Malaria Treatment

Table 1 lists several herbal remedies for malaria. Artemisia is listed last on the table. Please read the footnotes, because

some of these remedies should not be used by certain individuals. Also note that papaya leaf tea (of which we have written in the past) is listed on this table.

To make artemisia tea, five grams (0.18 ounces) of dried artemisia leaves (about one 35 mm film canister full) are steeped for at least 15 minutes in one liter of boiling hot water (but do not boil the tea!). The patient should drink 250 ml (8.5 oz) of the tea, four times a day, for 7-10 days. Alternatively, 25 grams of fresh leaves can be used instead of the five grams of dried leaves. (Dr. Hirt also recommends drinking lemongrass tea whenever a fever is present.) Artemisia tea is taken for one day initially, and if the fever starts going down, the patient keeps using the tea. If the fever does not start going down, it is most probably not malaria that is causing the symptoms.

For smaller patients, a rule of thumb is to use one gram of artemisia leaf powder in 200 ml of water per 10 kg of body weight per day. So someone who weighs 20 kg would drink tea made from two grams of leaf powder in 400 ml of water. Someone weighing 40 kg would use four grams of leaf powder in 800 ml of water.

If a child is unconscious because of malaria, a double dose of leaf powder with half the volume of water is used as an enema. (i.e. for a 10 kg child, two grams of powder are mixed in 100 ml of water). This is administered in 10 ml increments with 10 ml given every two hours. Once the child becomes conscious, tea is administered orally as usual.

If artemisia tea alone is not effective against malaria (for example for AIDS or cancer patients whose immune systems are already compromised), it can be combined with such antimalarial drugs as fansidar, amodiaquine, etc.

More detailed instructions for the use of artemisia tea (for treatment of malaria and other diseases) are available on anamed's website (www.anamed.net). Anamed has recommended and used the tea to treat malaria with an 80-95% success rate.

[Note: this paragraph is only for those who know a little about chemistry and would like to know how artemisinin works.] Artemisia tea contains at least 46 medicinally active substances that are helpful in fighting malaria. Artemisinin is a "sesquiterpene lactone peroxide." Dr. Hirt describes its action this way: "Its lethal effect on the plasmodium is due to its two oxygen atoms in the peroxide bond. The plasmodia attack and digest the red blood cells, but because they cannot excrete the iron this accumulates within the plasmodium. When this iron comes into contact with the peroxide in the artemisinin, it breaks the peroxide bond; the oxygen atoms become charged and as such are called free radicals. These free radicals immediately attack the protein in the plasmodium, and the plasmodia are killed."

Dr. Hirt has commented that the position of the WHO with regards to artemisia is unclear. "On one side, [WHO] gave by its 'Roll back malaria initiative' a 'prize of excellency' to the anamed group Bukavu for their huge artemisia field, and all the directors never cease to underline the importance of 'traditional medicine' for developing countries. On the other side, another representative of the WHO refused to recommend artemisia tea arguing this would be a 'monotherapy'! In reality, WHO in the year 2004 recommended the 'monotherapy' with artemisinin, [but] now warns against it and recommends since 2006 the 'duplotherapy' with Coartem." Dr. Hirt suggests that the tea is already multitherapy because of the other nine antiplasmodial substances that are found in the artemisia tea.

The following question arose at our conference. "Since the plasmodium that causes malaria has developed resistance to other antimalarial medications, might it also develop resistance to artemisia?" If so, that could be devastating, since artemisia may be the world's last great defense against malaria.

Resistance is certainly a concern with artemisinin pills, since they are often used as a monotherapy. The tea does not seem to pose the same danger of resistance, for three reasons. First, the tea contains less artemisinin (10 mg, compared to 100 mg in an artemisinin pill). Second, the tea also contains other antimalarial compounds. Third, the artemisinin remains in the blood for only eight hours, but it takes 24 hours for the malaria plasmodium to multiply. Despite these facts, it is not recommended to drink artemisia tea continuously as a preventative, 'just in case.'

After reading a draft of this article, Dr. Hirt commented, "Malaria, AIDS and tuberculosis are responsible for 50% of all deaths in developing countries, according to the WHO. But these three diseases are not isolated. If you suffer from one of them you may easily get infected by another of these three diseases [see the following article]. Artemisinin is not only patented for malaria, but also as a 'natural antiretroviral' for AIDS patients. According to anamed, the isolation of artemisinin out of the artemisia leaves is not a 'purification', but a 'poorification'! Artemisia tea itself also improves often drastically the conditions of AIDS patients." We hope to share more on this topic in an upcoming *EDN* issue.

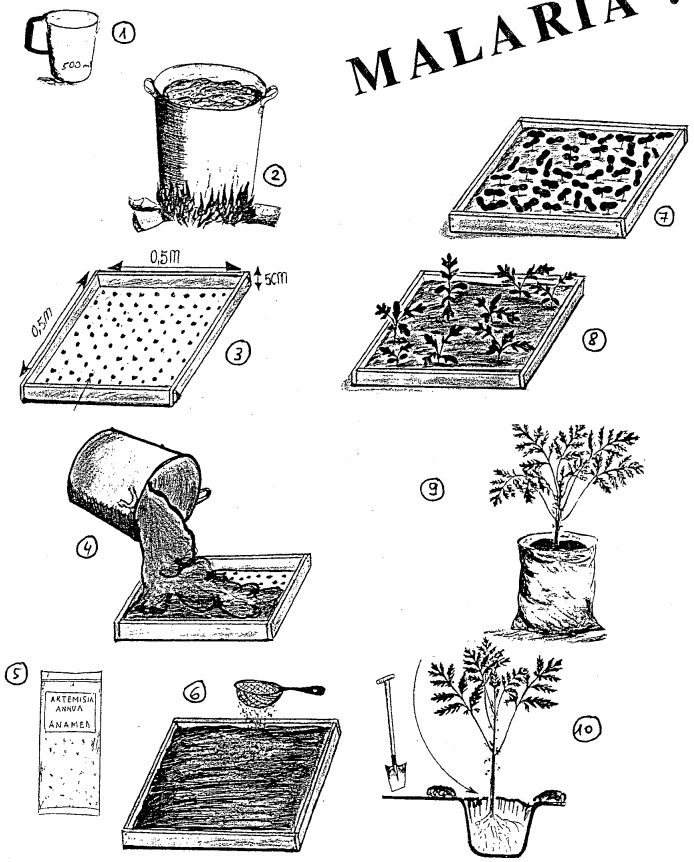
Please note: for tourists with no immunity to malaria, anamed strongly recommends that you take a chemical prophylactic when visiting a tropical country, rather than relying only on artemisia tea.

Growing Artemisia

Artemisia annua seeds are very tiny. Each seed weighs only 0.07 mg. We know from personal experience that artemisia is challenging to grow from the tiny seed, but it can be done. ECHO now has many vigorous plants growing.

To start seeds, line a tray with a towel or cloth, then wet it. Cover with one or two millimeters of sand or soil that has been boiled or baked (to kill any weed seeds or organisms that might infect the tiny plantlets). Sow the seed on top of the sand. The sand helps prevent roots from growing into the cloth, so that tiny plants are easier to transplant later.

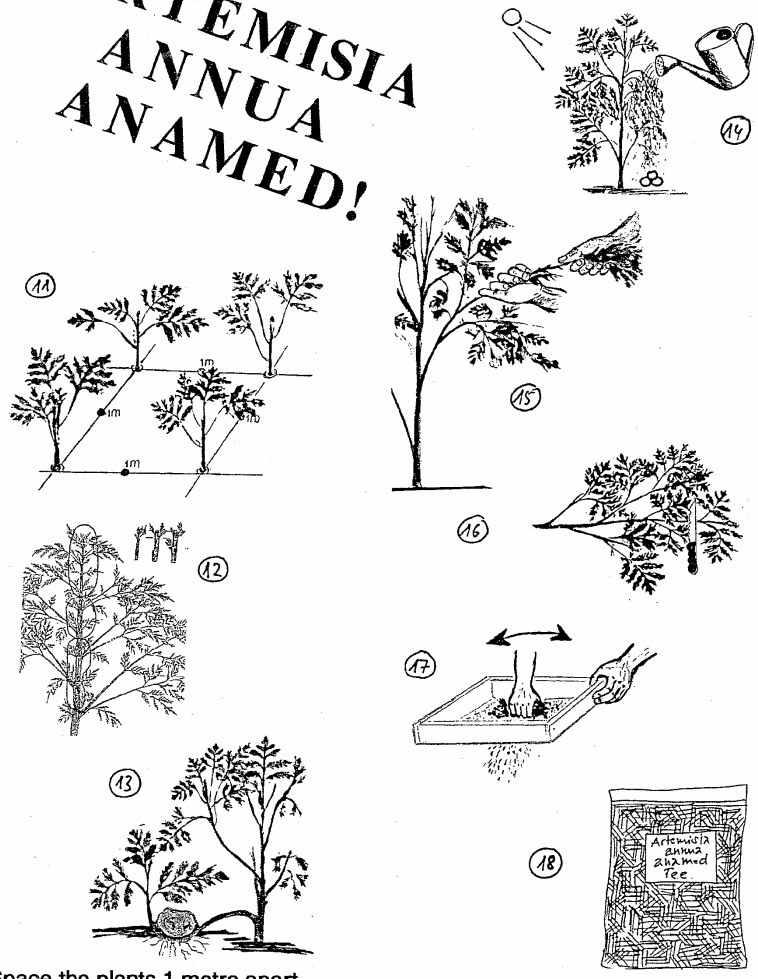
MALARIA ?



1. Mix 10 cups each of soil, sand and water.
2. Boil this mixture for 5 minutes to destroy the weed seeds.
3. Make a portable seedbed out of wood, and put small holes in the base.
4. Put the soil into the seedbed.
5. The white powder consists of seeds mixed with kaolin.
6. Spread the seeds evenly. Do not cover them, and put the seedbed in a bright place. When the earth begins to become dry, place the seedbed in water.
7. The seeds germinate in 3 to 7 days. They need plenty sun.
8. Thin the plants out.
9. One to three weeks after sowing: Give each plant its own paper or plastic pot.
10. Once the plant is 10cm high, plant it out in the garden or field.

Figure 2: Summary description of how to grow and prepare artemisia plants to make leaf powder for treatment of malaria. Used with permission from anamed.

ARTEMISIA ANNUA ANAMED!



11. Space the plants 1 metre apart.
12. From the best plants take cuttings.
13. Or propagate the plant by the "stone-method"
14. The plants need a lot of sunshine, a lot of water and a lot of compost.
15. As soon as the first flowers appear, harvest the whole plant. Strip the leaves from the tip of the branches to the base.
16. Remove all the stems, cut the leaves into small pieces, and dry within 3 days.
17. Rub the dried leaves through a sieve and throw the remaining stems away.
18. Artemisia tea, in a labeled and sealed bag, ready for use. Keep in a dry place.

(Continued from page 3)

The cloth will wick moisture to the seeds. The tray should be kept moist by gently pouring water along the edge(s) of the tray so that it touches the cloth. Do not pour water over the sand and seeds; one drop of water weighs 600 times more than a baby artemisia plant, so you are likely to kill plants if you water that way. Make sure the tray is in full sunlight or is five cm away from a 100-watt bulb. Seeds need the light to trigger germination. Young plants that do not get enough light become tall and thin and flower too early. For the first three to six weeks, you will need to care for the seeds as you would care for a baby—very carefully! (See Figure 2 for diagrams)

A Gardening Hint for planting tiny seeds.

Extremely tiny seeds are difficult to spread evenly on top of the soil. Place some sugar or clean sand in the palm of your hand and mix thoroughly into it the amount of seed you want to end up in the container. Take pinches of sand/sugar and seeds and sprinkle them over the entire surface. It is likely that each pinch will contain about the same number of seeds.

Once an artemisia plant is established, it needs daily access to water or else it will flower prematurely. Established artemisia plants also benefit from lots of nitrogen fertilizer and sunshine. After six to eight months, by which time artemisia plants are often three meters tall, they are ready to be harvested. Cut the stems, remove the leaves, and dry the leaves in full sun.

According to Dr. Hirt, the plant material should be dried until the leaves have a moisture content of 7.5% (i.e. 100 g of leaves do not contain more than 7.5 g of water). When a considerable quantity of leaves dried to this degree are placed in a closed container with a hygrometer (an instrument for measuring relative humidity, available from opticians, electronics stores, or anamed), the relative humidity should read no more than 40%. If you do not have a hygrometer, dry the leaves as you would normally dry herbs for cooking. As long as the leaves are then kept very dry (probably best done in an airtight container), they can be used for up to three years. Harvest the plant as soon as you discover the first flowers, because then the artemisinin content is highest. Once the plant fully flowers, it is already too late to harvest.

Although artemisia seed can be sown throughout the year, you can take advantage of the different seasons. If you live in a dry area, start the seeds in the middle of the dry season. In places with a monsoon climate like Florida, seed should be sown in the middle of the rainy season (but protect it from the rain—remember the small size of seeds). Young seedlings can then be planted out in the dry season when there are fewer plant diseases because it is cooler and less humid. By the start of the next rainy season (when the incidence of malaria rises in endemic areas), leaves will be ready to harvest.

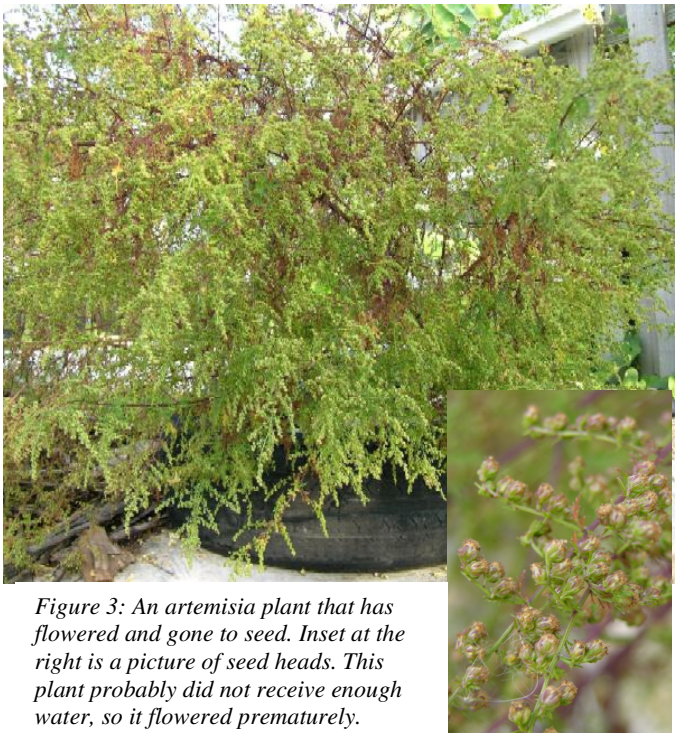


Figure 3: An artemisia plant that has flowered and gone to seed. Inset at the right is a picture of seed heads. This plant probably did not receive enough water, so it flowered prematurely.

Artemisia plants will eventually produce a lot of seed if they are not harvested first (Figure 3). However, since *Artemisia annua anamed* is a hybrid, planting seed from your own plants will probably result in inferior plants. Such plants will tend to move towards the native form, with shorter stature, fewer leaves, and less quantity of the medicinal compounds.

It is better to regularly take and root cuttings from an established plant. This will produce plants that are identical to the parent plant. It will also eliminate dependence on a continual source of imported seed. But ECHO recommends that if you grow new plants from cuttings, you take the cuttings from many plants. It might be that there is still a lot of variation between plants, even in a field grown from the hybrid seed.

Once an artemisia plant is well-established, it can also be propagated by a method called the "stone method"—place a stone on a branch to hold it to the ground and roots will form along it.

Dr. Hirt commented that artemisia is "easily offended," especially as a plant gets older. For example, if the plant is about five months old and you forget to water it one day, it will flower and die. The hormone levels inside the plant have changed. Any cuttings planted after the hormone threshold changes will flower right away too. Try to take cuttings each month from a variety of plants (especially young plants). The first cutting can be taken when a plant is 10 cm tall. Using a razor blade to cut, make the cutting 5 cm long. Remove all leaves from the bottom half and plant it in a tray. It is helpful to use a mesh or something similar over the top of the tray, to hold the cuttings upright.

Figure 4: An artemisia plant at ECHO. This picture was taken in early February. Seeds were sown in mid-September on the surface of soil placed in a shallow (6 cm or 2.4 in) tray. Resulting seedlings were transplanted to a four-inch pot and then to a raised bed watered with drip irrigation. Photo by Tim Motis.

Dr. Hirt sent some artemisia seeds to ECHO in September, for us to propagate before the conference in November. Tim Motis, ECHO Seedbank Director, started the seed.

"The way I propagated our first batch of seed was similar but not identical to Dr. Hirt's method. I filled a shallow (6 cm/2.4 inch) tray with potting soil and sprinkled a few seeds on the surface of the soil in each of the 50 compartments. The seeds are TINY. Remembering Dr. Hirt's admonition not to water overhead, I put the plug tray (described above) into a larger tray (a cement mixing tray) that did not have drainage holes. That way, I could fill the larger tray with half an inch of water, enough to allow for water to wick up into the soil in the plug tray. I placed one tray in the screened-in area of the seed bank that receives filtered light (in case the hot Florida sun was too intense). I placed the other tray on a bench outside the seed bank. Seeds germinated fine either way. In fact, I had to thin the seedlings. Before and after germination I made sure the tray of seeds sitting outside was put back indoors if it looked like it might rain. By germinating in a plug tray, I did not need to transplant from a towel into a plug tray, although I could have transplanted thinnings into additional plug trays. Once the seeds had germinated, trays that had been in filtered sunlight were moved to areas with full sun."

Dr. Hirt planted some seeds at the conference, as a demonstration. Tim wrote, "Dr. Hirt planted seeds in soil on a towel like you mentioned. I kept that tray moist, and the seeds germinated well. I may have waited too long to transplant from the towel into plug trays. The roots had embedded themselves in the towel, and I invariably broke a lot of them as I pulled them out with tweezers. Most of the seedlings survived in the mist house, even with the loss of much of their root system."

"The seedlings grew very slowly at first. I think I could have sped things up by applying soluble fertilizer sooner than I did. I ended up transplanting from plug trays into four-inch pots without waiting for the seedling roots to fill the cells in the plug trays. I mixed about a teaspoon of six-month slow release fertilizer into the nursery mix with which I filled the four-inch pots. After doing that, growth rate increased significantly. The seedlings shown at conference time in November had been seeded in mid-September. You can see a photo in Figure 4 of one of these plants taken three months later. It was transplanted from a four-inch pot to a raised bed and watered with drip irrigation."

Figure 5: An artemisia cutting that is putting out leaves. Photo by Tim Motis.

Dr. Motis has also propagated artemisia from cuttings (Figure 5). "I have been taking cuttings at various times to make sure I get some that will produce more tall plants. I haven't had enough cuttings at any particular time to do a whole tray full as Dr. Hirt mentioned. I've tried putting some in water in a jar and some in plug trays (with potting soil) in the mist house. Both methods work well. I've even tried just planting directly into a planting bed next to drip tape emitters. I'm still monitoring those—we had a frost/freeze, so they were set back, but the cuttings seem to have recovered."

Dr. Motis added, "Dr. Hirt is right, artemisia likes to be well-supplied with water and fertilizer. Some artemisia planted in a tire garden have started to flower prematurely. My guess is that the soil in the tire dried out too often. The seedlings established in full sun, with plenty of water and fertilizer, are continuing to grow vegetatively."

He concluded, "I've enjoyed working with artemisia. Yes, it needs regular watering and sunlight, but it grows vigorously and is easy to propagate from cuttings. It has done very well in the cooler fall and spring months. We'll see what it does in the hot summer."

We have seen artemisia plants at ECHO set seed (Figure 3). We wonder about its potential for weediness, especially since it and other species in the same genus (*Artemisia vulgaris* (mugwort) and *Artemisia absinthium* (absinth wormwood)) are listed as potentially invasive weeds on the USDA Natural Resources Conservation Service Plants database (http://plants.usda.gov/index.html). Dr. Hirt says that anamed has initiated projects in more than 70 countries and has not heard of *Artemisia annua anamed* becoming a weed problem.

Obtaining Artemisia Seeds

Anamed sells a starter kit that contains seeds and instructions on growing artemisia. The seeds have a germination rate of 90%, which drops by approximately 10% per year. To keep the seeds dry, anamed uses a plastic container with seeds kept inside in a separate little bag. In the container, anamed puts rice that has been heated for one hour until it is almost yellow (so that it is extremely dry). The dry rice will absorb moisture within the container. Though the volume of seed inside the starter kit looks small, each kit contains 5000 seeds. Don't plant all of them at once!

A starter kit costs €110 (110 Euros) plus postage. With it, you can start growing artemisia in many different locations at once. However, only the purchaser of the kit should contact Dr. Hirt with questions. If you need an import permit and phytosanitary certificate to import the seeds, you will need to get the permit from your government and ask Dr. Hirt to enclose the certificate with the package. In addition to seeds, the starter kit contains a packet of artemisia leaves; peat discs for seed sowing; material to help in taking cuttings; several helpful anamed documents; a poster of medicinal plants; and a request for feedback. Ordering information for the starter kit is available from anamed's website. If you do not have access to the web, contact us and ask for a copy of anamed's ordering information.

Those that order a starter kit are encouraged to form a network of other individuals/groups who are interested. If you order a kit, you will receive the addresses of other starter kit members in your country.

For More Information

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Follow this link to an article about the World Agroforestry Centre's work with *Artemisia annua anamed* in Mozambique: http://www.worldagroforestry.org/news/Default.asp?NewsID=32C239E6-2CE6-4349-919F-E758CA15AB87

A short article in Spore 122 can be found at: http://spore.cta.int/spore122/spore122_brief.asp

The New York Times published the following article on artemisinin in May 2004: http://query.nytimes.com/gst/fullpage.html?sec=health&res=9405E7DD123CF933A25756C0A9629C8B63

Malaria Fuels AIDS Spread in Africa

The following is abstracted from a Reuters article from December 7, 2006. http://www.alertnet.org/thenews/newsdesk/N07316294.htm

Malaria and AIDS interact to greatly expand the prevalence of both diseases among people in sub-Saharan Africa, according a study in the journal *Science*.

Malaria greatly boosts viral load (amount of virus in the blood) for six to eight weeks in HIV/AIDS infected people. This makes them more likely to infect a sex partner with HIV. [Editors: Please note that the article is NOT saying that HIV is spread by mosquitoes.]

"Higher viral load causes more HIV transmission, and malaria causes high HIV viral load….Abu-Raddad, an AIDS researcher, estimated that malaria has helped HIV infect hundreds of thousands and perhaps millions of people in sub-Saharan Africa."

"At the same time, HIV fuels malaria's spread because HIV-infected people are more susceptible to malaria as a result of HIV ravaging the immune system."

"Scientists were puzzled when they realized that the risky sexual behavior by people in the region was not by itself sufficient to explain the swift spread of HIV."

Their study was done in "Kisumu, a Kenyan city by Lake Victoria where HIV and malaria are both common. They said 5 % of HIV infections can be blamed on the increased HIV viral load due to malaria, and 10 % of adult malaria cases can be blamed on HIV. [They estimate that] since 1980, 8,500 more people got HIV infections, and there were 980,000 more episodes of malaria (a person can get it more than once) in a city whose adult population is 200,000…."

We [EDN editors] think this makes an even stronger case for the importance of mosquito control measures, such as promoting insecticide-impregnated mosquito nets, spraying or campaigns to eliminate standing water where mosquitoes can breed.

Energy Needs for HIV-infected Persons

By Martin Price

When I work hard in my garden, I am very much aware that I have been expending energy because the muscle movement is so obvious. But when I have an infection, I have no sense of the energy my body is exerting to fight the infection. I was surprised to learn that when a person has been infected with HIV but still has no symptoms of AIDS, the basic metabolic rate (energy requirement) increases and requires 10% more calories each day just to maintain the hidden fight that keeps the virus under control.

There is more. It is important to know this if you work with people living with HIV/AIDS (the acronym being used now is PLWHA). Let me quote exactly from p. 350 of the book *AIDS, Poverty and Hunger: Challenges and Responses.* (Edited by Stuart Gillespie. Highlights of the International Conference on HIV/AIDS and Food and Nutrition Security, Durban, South Africa, April 14-16, 2005.) This is in chapter 18, called *HIV/AIDS, Nutrition, and Food Security: looking to future challenges* by Tony Barnett.

"HIV-infected adults and children have greater energy needs than uninfected adults and children. Energy needs increase by 10% in asymptomatic HIV-infected adults and children, and, in adults with more advanced disease, by 20-30%. For HIV-infected children experiencing weight loss, energy needs are increased by 50-100%.

So what does this mean for your work with PLWHA? It means that nutrition is every bit as important as medicine. It means that in order to keep from losing weight the infected individual must actually consume a lot more calories each day than if s/he were not infected. That means they must eat more, at a time when they may be losing their appetite and may be less able to afford quality food. I quote once more from the book, "Loss of appetite and poor dietary intake are important causes of weight loss associated with HIV infection. Effective ways of improving dietary intakes need to be developed and documented."

I came across this information while preparing for ECHO's workshop last December on agricultural and nutrition options for people living with HIV/AIDS. Both medical and agricultural workers attended. We assumed that delegates had basic knowledge about HIV/AIDS. Our teaching, which alternated from classroom to farm, focused on practical, hands-on things they could do to be more effective in working with PLWHA. The evaluations were so positive that we have scheduled a second "HIV/AIDS, Agriculture and Nutrition Workshop" this year. It will take place here at ECHO December 3-7, 2007.

For information you may check our website (www.echonet.org), write to HANA Workshop at the ECHO address or send an email to our Educational Programs Coordinator, Rhoda Beutler (email rbeutler@echonet.org).

Can You Help Us?

From time to time we at ECHO get feedback regarding how ECHO has been able to help you in your work. This feedback is extremely important to the future of ECHO. We can only make a difference in the world if we help you, our readers, be more effective in your own work. Our staff will never know if their work has made a difference unless you write and tell us. Our donors, who make it possible for us do so many things without charge, also want to know if their support of ECHO has made a difference.

If a seed or idea from ECHO has helped you on a particular project you are working on, could you please let us know. Your photographs are also welcome.

If your name or project is confidential, please let us know that in your correspondence. Otherwise we will assume that we may quote you. Write to ECHO, Attn: Mark Maerten, or e-mail Mark at mmaerten@echonet.org.

BOOKS, WEBSITES & OTHER RESOURCES

ECHO Now Has a Blog Site

Martin Price

ECHO now has a blog site (www.echoglobalfarm.blogspot.com). If you are not familiar with the term "blog site," it is essentially a website where very informal postings are made. Usually something new is posted at least weekly. Our blog site is designed to give friends of ECHO a "behind the scenes" view of things going on at ECHO's Agricultural Resource Center in Florida. We use a LOT of pictures.

Most members of ECHO's overseas network have never had the opportunity to visit ECHO and probably have little idea of what goes on here. Others, who have visited, might like to keep up on some of the new things happening. You never know what will be featured next.

I just took a look again. There are photos and brief descriptions of some variety trials our seedbank is doing; photos of interns working in the Global Village; ECHO volunteers making "exotic tropical fruit" jams and jellies to sell in our gift shop; a jujube fruit tree we just got that has fruit the size of small apples; some pictures of delegates to our workshop on HIV/AIDS, Agriculture and Nutrition touring the farm; photos of our new composting toilet under construction etc. Take a look if you have access to the web.

FROM ECHO'S SEEDBANK

Insights from a Simple Sorghum Trial in Haiti

By Tim Motis
ECHO Seedbank Director

My wife and I had the privilege of spending our first three years as ECHO staff overseeing a Small Farm Resource Development Project (SFRDP) in Haiti. A major emphasis of the SFRDP concept is to conduct "adaptive research" in which ideas and innovations developed elsewhere are evaluated for their potential under local conditions. In this case, research efforts were focused on new varieties of locally-grown crops.

The challenge was to identify promising varieties, get sample quantities of seeds into the hands of local farmers as quickly as possible, and use what we learned to help others in ECHO's network. As it turned out, a simple sorghum trial provided the basis for involving farmers in experimentation and, in doing so, introducing crop varieties into the community.

Sorghum (*Sorghum bicolor*) is thought to originate in Africa where it ranks second only to maize in grain production. Belonging to the grass family, the leaves appear similar to those of maize; however, the grain is produced at the tip of the main stem and/or tillers (offshoots from the main stem) in a panicle (head) instead of on enclosed cobs. With its deep, fibrous root system, it can be grown successfully in areas where maize would not do well without irrigation.

When the SFRDP started in 2004, most of the trials were replicated to allow for statistical analysis. This meant that, in each trial, every crop variety had to be grown in at least three plots of ground. This was relatively easy to do with a limited number of varieties. By the end of 2004, though, I had obtained seeds of over 40 varieties of sorghum as well as numerous varieties of corn, peanut, and pigeon pea. It quickly became apparent that replication required too much land and that another experimental approach was needed.

In planning trials for the rainy season of 2005, a decision was made to evaluate as many varieties as possible in simple "observation" trials. In observation trials, each variety is grown in only one plot of ground (Figure 6). Observations from such trials are not as conclusive as with replication. As long as site conditions are fairly uniform, however, they give the experimenter a pretty good idea of likely "losers" and "winners." The "winners" in on-site observation trials can then be studied further in on-farm trials. This results in lots of replication as multiple farmers try new varieties on small portions of their own fields.

The farmers' enthusiastic responses were very insightful. As I had anticipated, grain color and yield were important to them. They liked varieties with large heads (panicles) of light-colored grain. Black-colored and low-yielding varieties were rejected. What I had not anticipated was the importance farmers placed on plant height. Varieties less than 3ft (0.9m) tall were rejected even if they produced an abundant amount of grain. They said the grain on these short varieties was too close to the ground where it could be eaten by foraging animals. It was also interesting to hear their thoughts on earliness. They recognized that an early-yielding variety could produce a crop during a short rainy season, or even two crops during a normal season. They pointed out, though, that they wanted to time the planting of early-yielding varieties to produce grain at the same time as local sorghum. This, they said, would avoid excessive bird damage.

With all of this in mind, we planted 41 varieties of sorghum in June of 2005 on a flat strip of land near a major road where people pass on their way to and from a local market. Each variety was established in a three-row, 20ft-(6m)-long by 4ft-(1.2m)-wide plot. Inputs and methods used were similar to those used by local farmers. Interest in the very visible plantings made a great opportunity to get valuable feedback from local farmers. Key farmers from various communities were invited to a "field day" to evaluate each of the varieties. We encouraged the farmers, "Don't just tell us you like everything. We really want to know what varieties you like and don't like."

Farmers took cuttings of several cassava and sweet potato varieties and were eager to have seeds of five or six of the sorghum varieties to try in small plots in their fields. To quickly multiply seeds of these varieties, we grew sorghum during the following dry season on irrigated land rented from a local farmer. This worked well for cassava and sweet potato, but seeds in the grain heads of an October planting of sorghum did not fill. Short day length was probably not the cause, as ECHO has had success with winter plantings in Florida; it may have been an insect problem. It meant that propagation of seeds of the most popular sorghum varieties had to be delayed till the very start of the rainy season.

Figure 6. Sample layout of a non-replicated observation trial with three varieties (A, B, C).

Variety B	**Variety A**	**Variety C**

*Each variety appears in only one plot.

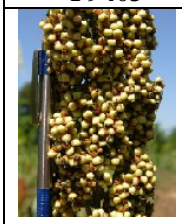
**Though not as critical as with a replicated design, randomization minimizes bias.

To sum up, a simple sorghum trial enhanced the project in the following ways:

- it gave farmers a much greater role in the process of identifying better varieties.
- insights from local farmers were used to plan and expand the project.
- it immediately led to on-farm trials of cassava and sweet potato.
- farmers participated in a low-risk method of variety evaluation/ multiplication.
- it led to a dry-season method of propagation (for cassava and sweet potato) that allowed greater interaction with farmers.

Locally grown varieties are hardy and already accepted, but farmers in one location may not know of other varieties being grown in neighboring areas. It is worth the effort to gather and include local varieties in trials. Additionally, ECHO's seed bank carries some of the sorghum varieties that farmers in Haiti liked. Let us know if you are interested in a packet of any or all of the varieties shown in Figure 7 (above).

Figure 7: Select sorghum varieties from ECHO's Seedbank.

P9403	M91051	IS12965[A]	Giza 114	IS15401[A]
				
Purdue Univ. Striga resistant	Purdue Univ.	ICRISAT	Egypt-for fuel (stalk), food	ICRISAT
3.5 months[B]	3.5 months[B]	3.5 months[B]	3.5 months[B]	5.5 months[B]

[A]Currently multiplying at ECHO in Ft. Myers; will provide sample if available.

[B]Approximate time to harvest with a seeding date of June 10 or 13. Local sorghum harvested 5.5 months after seeding.

UPCOMING EVENTS

Konferans Agrikol 2007

Bergaud (near Les Cayes), Haiti
May 28 to June 1

The theme of the conference (co-sponsored by ECHO) centers on Genesis 1 and 2. The first day's theme is Biodiversity and the Environment, the second day will cover Forestry and Fruit Production, and the third day will be about Entrepreneurship.

The number of participants will be limited to about 70 grassroots groups, with two participants from each group that commit to share what they learn when they return home.

The cost for participants will be $450 Haitian dollars, or about 60 USD. Interested participants should contact Kai Bauer at SEED, (email address: kaiericbauer@hotmail.com). Those who wish to lead a presentation or workshop should contact Ludger Jean Simon at World Concern (e-mail address: jsludger@yahoo.com). ECHO farm manager Danny Blank will be speaking on tropical fruit and extending the growing season.

South East Asia ECHO Agricultural Conference

Chiang Mai, Thailand
June 10 to 14, 2007

We wrote about this conference in the last issue of EDN. Visit the ECHO website for more information (www.echonet.org).

Registration information is available on the ECHO Events website at www.echonet.org. Click on "Southeast Asia ECHO agricultural conference" on the bottom right hand side. The registration deadline is May 1. Six ECHO staff members will be there and look forward to meeting many of you.

Central American and Caribbean Regional Agroecological Conference

Rancho Ebenezer, Nicaragua
July 23-27, 2007

This conference was inspired by ECHO's annual November Agriculture Conference. The first conference of this type was held in July 2003, followed by others in 2004 and 2005. Previous conferences have had between 47 and 65 participants. More than 15 organizations from seven countries have been represented by delegates.

The conference offers a chance for participants to share experiences with agriculture (both successful and otherwise), and to discuss goals.

Contact Sebastián Alberto Ampié at sebasampie@yahoo.com for more information. ECHO staff Martin Price and Danny Blank expect to be there.