

## EDN ISSUE 24. DECEMBER, 1988

**24-1 SEED FOR A TOMATO VARIETY TRIAL AVAILABLE.** We have purchased a quantity of five disease resistant tomatoes developed for Florida. We have mixed them together and will send a packet containing a few of each variety upon request. We selected only standard varieties. ("Standard" means they are not hybrids so you can SAVE YOUR OWN SEED). If you must have the identity of each variety we can package them up separately. This is five times as much work, so I hope the mixed packet will suffice for most of you. You will not know which plants require staking, so it would be well to plan on staking them all.

Packages of tomato seeds always include a series of letters that represent the disease resistances of that variety: V for verticillium wilt, F1 and F2 for fusarium wilt race 1 and 2, respectively, T for tobacco mosaic virus, N for nematodes. In the tropics you want to see as many letters as possible. I will use these abbreviations below, followed by any other resistances.

Tropic is a stake-type tomato resistant to V, F, T, gray leaf spot, leaf molds, tolerant to early blight. Walter is resistant to F1, F2, gray leaf spot. Hayslip is a fresh market variety with determinant vines (i. e. do not need staking) resistant to V, F1, F2, grey leafspot, resistant to blossom end rot, black shoulder, catface and cracking. Florida MH 1 is a high yielding variety that is very resistant to F1, F2, V, T, grey leaf spot, leaf molds, and graywall. Floradade is a determinant variety especially adapted to V infected alkaline soils. It is resistant to V, F1, F2, gray leafspot.

**24-1 BOOK REVIEW: ROOFTOP OR SHALLOW-BED GARDENING.** In 1983 (issue 6-3) I described our work with shallow and hence light-weight beds for gardening. Producing food on rooftops is a much overlooked opportunity. Even if a country is self-sufficient in food, most of the very poor in cities will be hungry. Their hunger is due to their poverty, not necessarily to a national food shortage. We need to find ways for them to grow a little food where they are.

I believe the ideal rooftop garden for many vegetables is not a group of deep pots, but a shallow bed covering at least a few square feet. We have a demonstration "garden" on a 64 square foot cement slab covered with 3 inches of compost. Daily watering is required, because it cannot hold much water. (It does not take more water than an ordinary garden, however). Some months ago I described this shallow bed technique in a 38 page booklet. It is written for a mixed audience of our ECHO network and U. S. gardeners, so please just disregard alternatives that may be written for suburban use. An interesting use is to make "wheelchair" gardens for the handicapped, placing them on a simple 40 inch high platform.

I recently learned that in southern Mexico people use a similar but higher platform gardening method to keep gardens away from wandering pigs and chickens. There is nothing new under the sun! We sell the book for \$5.00. We will pick up the airmail postage. If you want the book badly but simply cannot obtain the dollars, we will consider a request for a free copy. (*ed. note -- This book is no longer in print, but we do have other literature available about this and related methods.*)

**24-1 REACTION TO BEE STINGS.** The July 1987 issue of Florida's cooperative extension service bulletin on beekeeping, Apis, dedicated all four pages to the subject of reaction to bee stings. The facts are even subject to controversy in the medical profession. The normal "local" reaction is "pain, swelling, redness, and itching... [such people are] at little risk of death unless the mouth or throat is affected so that the respiratory tract is obstructed." "Many people continue to believe that because they swell up they are at risk of losing their life when stung by bees. Ironically, it may in fact be the reverse. Those far more at risk may show no reactions to stings at all." It is systemic or allergic reactions that can be life-threatening. "There is no evidence that the

very few who die as a result of a bee sting come from the pool of those who once before sustained a systemic reaction. On the contrary, no reaction at all may be a more ominous predictor of a lethal outcome on a subsequent sting." Stings inside the mouth and on the eyeball require special attention and are so very serious that when working with bees a veil should always be worn.

Death usually comes from multiple causes, not simple anaphylactic shock or allergy. In fact, most allergic reactions are in children, while 90% of those who die of bee stings are over age 25. "One may readily see how (1) a hot summer day, plus (2) strenuous exercise, plus (3) coronary atherosclerosis, plus (4) a bee may add up to death, whether or not one invokes an allergic mechanism...." "Panic by the person stung or those around him/her can produce a systemic reaction in itself." "The frightening aspect of being stung cannot be ruled out as a cause of a systemic reaction. A patient who suddenly develops hives, shortness of breath (sometimes with bronchospasm) and giddiness ... is terrified, as are those about him. The patient may think he is going to die, as may his family or physician. What people need to know is that the vast majority of patients, particularly if aged under 25, will quickly recover. ... patients who have these terrifying experiences need to know that there is no evidence either that they came to the brink of death or that they are at greater risk of dying from a subsequent sting than anyone else."

The conclusion: "the risk of fatality ... is lower than previously thought. What must be emphasized, however, is that environmental factors and physical well being of the individual being stung cannot be ignored when judging who is at risk of dying from a bee sting. Nor can perceptions by the individual being stung. Panic by the person stung or those around him/her can produce a systemic reaction in itself. We will send you a photocopy of the entire article for \$1 (no charge for Third World requests).

**24-2 MORE ON MAKING YOUR OWN BIOLOGICAL CONTROL FOR CASSAVA HORNWORM.** The latest issue of the "Cassava Newsletter" contained a lot more details about the method mentioned in EDN # 23. I am passing it on in some depth not only for those who have a problem with this particular worm, but as an example of an approach that might be successful with many pests.

The cassava hornworm (*Erinnyis ello*) damages seed stakes, destroys leaves, and increases the incidence of blight. The field is searched for larvae that have a disease caused by the Baculovirus. You can identify them because dead or near-dead larvae are found hanging from leaf petioles by their "false feet". Use only recently killed larvae (those that break open easily and spurt a whitish liquid). Mash 10-12 large larvae (7-9 cm long) or 22 medium-sized larvae (4-6 cm long) in water and strain the solution through a clean cloth or very fine strainer so that it will not clog your sprayer. The filtered liquid containing the Baculovirus is mixed with sufficient water to spray one hectare of cassava.

The best time to spray is 5 days after the larvae hatch. As a rough guideline, apply the virus when the field is infested with 5-7 small larvae (as small as 2 cm) per plant. Younger, smaller plants need protection at a lower population of larvae than do larger plants. Inspect the field at least weekly. Larvae hide on the underside of leaves or in the apical buds. Inspection needs to be thorough because larvae longer than 5 cm are not satisfactorily controlled by the virus.

Larvae become infected only after eating the virus. They stop causing damage after 4 days and die a couple of days later. Spray in the early morning or dusk to avoid the hottest part of the day.

Only recently killed larvae should be collected. If they cannot be used immediately, place them in a container and freeze them. Thaw the frozen larvae before preparing the solution. (It might be a good idea to keep some frozen larvae in case you cannot find diseased caterpillars next season).

In the initial experiments, larvae in the control plots (no spray) began dying about the same time as those that were sprayed. This shows that the virus can be spread easily, perhaps by wind, rain, people, insects, or birds. This allows it to reach places which the spray did not directly contact.

This should provide helpful guidelines for doing your own experiments with other larvae and crops. Be sure to let us know of any successes or failures.

By the way, subscriptions to the "Cassava Newsletter" are free from the Marketing and Distribution Office; Publication Unit; CIAT; Apdo. aereo 6713; Cali, Colombia; South America. This article is more practical or ready to use than most, but people with a serious interest in cassava would profit from a subscription. The other features in this issue are "Insect pests of cassava in Thailand," Intercropping and population dynamics of the cassava whitefly," Traditional food preparations of cassava in Ivory Coast," Cassava alley-cropping project in Benin," and "Photosynthesis in cassava."

**24-2 CAN PEACH PITS BE USED AS FOOD?** Dennis Zehr wrote from Lesotho that they are blessed with an abundance of peach trees. The children eat the pits in limited quantity and they have been fed in limited amounts to chickens. He asked about their safety.

We passed the question on to Dr. Julia Morton. "As with certain varieties of lima bean and cassava, kernels of the peach, bitter almond, chokecherry, apricot and apple contain cyanogenic glycosides which, under certain conditions, release hydrogen cyanide gas. Some have caused human and animal fatalities when consumed in quantity. Pre-soaking and thorough cooking may render them safe for animal feed. But marketing would be a hazard as one would have no control of the manner in which they would be used. Peach kernels have been employed in homicide." It does not sound like it is worth the risk.

Dr. Peter VanSoest, a forage scientist at Cornell University, told me once that we should learn a lesson from the deer, which safely eat plants that are poisonous to cattle. Being browsers, deer eat a small amount of a plant, then move on for something different. Because the body can detoxify small amounts of many things, it likely will have no harmful effect. Cattle, on the other hand, will continue eating one kind of plant until they have consumed a large quantity. If that plant is poisonous they can be killed. The same principle is a strong reason why great variety is a good idea in human diets too.

**24-3 CROP PRODUCTION BULLETIN #2, SOYBEANS, IS NOW READY.** This is the second in our new series by Dr. Frank Martin. He chose soybean because it is one of the most important food plants of the world and is growing in importance in Third World countries. It produces more protein and oil per unit of land than almost any other crop and can substitute for meat and to some extent for milk. In 7 pages he discusses cooking/processing methods, climatic and soil needs, varieties and their differences, care of seed, and culture of soybean. Members of ECHO's network who assist small farmers in the Third World can write us for a free copy (others send \$1.50).

Many of you no doubt share my skepticism as to whether you would personally enjoy eating soybean and whether it would be accepted in your community. Yet I have seen examples where it has become much appreciated in a new community. The trick is that soybean must have special processing and be used in special ways. Here are some basic processing methods from the bulletin.

SHELLED GREEN SEEDS are boiled until tender (boil pods first for easier shelling). Cooked beans can be eaten as is or used in other dishes. Frank describes their flavor as "unique but very good."

**PREBOILED BEANS.** Normal boiling of dry soybeans results in an "off flavor". This can be avoided by destroying the enzyme that causes the problem by preboiling the beans. Bring to a boil two parts of water, add one part of soybeans and boil for 5 minutes. Meanwhile, boil 4 parts of water. Remove seeds from the first water, rinse, and boil in the second water for 5 minutes. Discard the water and rinse. This is called "preboiled soybeans".

**BOILED SOYBEANS** are made by boiling preboiled beans until soft. Use as desired. Alternatively the soft beans can be mashed and used to enrich baked products.

**SOYBEAN NUTS** are made by deep frying preboiled soybeans for 12 minutes at 350 degrees F. Drain and salt.

**SOYBEAN MILK.** Grind preboiled soybeans as fine as possible, using a home blender, a hand mill, or an electric mill. The ground soybeans should be low in grittiness. Mix one part ground, preboiled beans to two parts water. Filter with cloth or colander. The liquid is left to stand one hour and is then decanted or filtered. The liquid portion is then boiled gently for one hour. This is soybean milk.

**FRIED BEAN CAKE.** The residue from filtering (or the precipitate from letting the filtrate settle) can be used for fried bean cake. Mix 4 parts residue with 1 part flour. Fry slowly in an oiled frying pan.

**CHEESE (TOFU).** Soak beans (not preboiled beans) overnight in water. Discard water and rinse. Grind as fine as possible (see above). Mix three parts water to one part ground soybean. Filter through a cheese cloth. Heat to boiling, stirring to avoid scorching. While the milk is still boiling, add one part of a precipitating solution as follows:

1% solution of MgSO<sub>4</sub> (Epsom salts) -- one part solution to 8 parts milk, or

vinegar -- One part solution to 66 parts milk.

Curd formation occurs immediately. After 15 minutes filter through cheesecloth, discarding the solution. Wash curd twice. Press to shape and to remove water. Use this as a cheese substitute in cooked dishes.

**24-4 IS VELVET BEAN SAFE TO EAT?** I am devoting three pages to this question because velvet bean is generating so much interest and the pressure to use it for human food is considerable. The multiple uses of velvet bean (*Mucuna pruriens*) as a green manure plant, for weed and erosion control and for moisture conservation has been discussed in EDN #12 and #20. Its use by World Neighbors and others in Central America is increasing rapidly. It has now become the most frequently requested seed in ECHO's seedbank and others are starting to get excited too. For example, Felix Quero in the Philippines says, "What impresses us most is its aggressiveness. It could even compete with the problem grass *Imperata cylindrica* and has potential of at the same time controlling this grass and providing food."

Yet its safety as a human food is questionable. The book Food Legumes says the plants are mainly used for grazing although mature seeds are also fed to animals. "They are used mainly for feeding cattle or sheep [i. e. ruminants] and can only be fed to pigs if they constitute less than 25% of the diet. They are considered unsuitable for poultry." [This may not be as bad as it sounds if, as I presume, they are speaking of raw beans. You cannot feed very much raw soybean either and a raw kidney bean diet will kill rats]. "Velvet beans can be used as a human food but require considerable care in their preparation... In many parts of Africa and Asia they are regarded as a famine food. The toxic principle can be removed by boiling and soaking the seeds in several changes of water."

Their safety is a very important question. The vines produce beans abundantly. It would be a terrible waste to not use such a nutritious bean [28-32% protein] for human food unless it is indeed dangerous. For example, when I visited the World Neighbors project in Honduras last December a drought had destroyed the regular bean crop. Yet there was a heavy yield of velvet beans. Because velvet beans were all they had, I understand that the people were eating and enjoying them regularly. They would boil them with corn, remove the seed coats by hand, then grind equal amounts of beans and corn to make tortillas. I also tasted and enjoyed refried velvet beans there.

Roland Bunch reports that velvet bean coffee is becoming popular in their project area, where it is sold as "nutricafe." Daniel Salcedo's organization Pueblo to People wants to market nutricafe in the States to provide income to small farmers in Honduras. He mentions that older people who have had trouble with coffee because it is diuretic (increases urination) love nutricafe, which does not have this effect. But if the toxic material is removed by boiling the beans and discarding the water, might this be a dangerous drink? Or does roasting the beans or the boiling process itself render it harmless?

TOXICITY The instruction to "boil in several changes of water" does not provide perspective. The same warning could mean that velvet beans that are not so prepared could prove fatal with a single meal or that they would cause some slight symptom if consumed regularly for a year -- or any degree in between.

The most likely toxic principle is L-dopa. Velvet beans contain so much L-dopa (6-9% of the dry weight of seeds with seed coats removed) that they are the primary natural source of this compound. It is one of the most effective drugs against Parkinson's disease. Neurophysiologist Dr. Judy Toronchuk tells us that L-dopa causes neurological symptoms. These can include hyperactivity, muscle spasms, cardiac irritability, hypotension and vasoconstriction. But it causes nausea at much lower doses. "So probably if people were to ingest the un-degraded L-dopa they would voluntarily stop eating it, due to nausea, before they had eaten enough to affect the brain."

Judy checked with a pharmacology professor. He felt that the L-dopa would break down sufficiently with cooking, particularly if cooked in water. It breaks down readily in the presence of moisture and forms the harmless pigment melanin. In fact the drug must be stored in dry, brown bottles which must not be allowed to exceed room temperature. (Might beans that have been stored for a year in the hot, humid tropics have less L-dopa than freshly harvested beans?)

There is also an unusual compound (a cyclic amino acid) that presumably is a natural derivative of L-dopa. The articles I reviewed mentioned no biological effect of this compound.

RESEARCH This brings us to an aspect of ECHO's ministry that is not normally visible to our network. Many undergraduate programs require research as part of the science major. ECHO encourages such students and their professors to undertake projects that would benefit small farmers in the Third World. One of the projects we suggested in our "Research Opportunities" write-up was to look into this question of safety of velvet bean. Senior premedical major Sarah Kramer and her advisor Dr. Bob Kistler at Bethel College in Minnesota did just that, and came up with some very interesting information.

First, a computerized literature search turned up two journal article reports of people eating velvet beans. One study mentioned that they found a village in Ghana where some people ate velvet bean daily. Another study found that rural people in southern Nigeria use it as a soup thickener by first boiling to remove the hard seed coat, then grinding it.

Tom Post in Belize forwarded us a report like none other I have encountered from the book Poisonous Plants of the United States and Canada by J. M. Kingsbury. Using the velvet bean grown in Florida years ago "even boiled for an extended time, the beans were unpalatable and produced, an hour or more after ingestion, symptoms of nausea and discomfort. While cooking, the beans gave off a volatile substance which produced a smarting sensation in the eyes and a pronounced headache among those experimenting with them." This is so unlike recent reports where the tropical velvet bean is being used that there must be considerable differences in toxicity between varieties. ECHO distributes two varieties of velvet beans. One is the kind that has no itch-producing fuzz on the pods and produces seed only during short days. We call it our "tropical velvet bean." That is the one we normally send overseas unless specified differently. Seeds may be white, mottled or colored. The other is the less vigorous kind grown in the southeastern U. S. A. which we call the 90-day velvet bean and is possibly the kind mentioned in this report. However, Sarah's experiments with mice described below were with this 90-day type and she found no such problems.

Sarah's computer search turned up a rat feeding trial in Ghana using velvet beans. Results were reported in terms of grams of weight gain per gram of protein eaten (the protein efficiency ratio or PER). Rats fed raw beans lost weight (PER -3.03). The PER for rats fed autoclaved (i. e. pressure cooked) beans was 2.31 and for rats fed only the ideal diet 3.41. The lower value for beans does not necessarily mean there was still some toxicity. The protein of many legumes is not always digestible, or may be lower in one of the essential amino acids than the ideal control diet. The latter appears to be the case here because rats fed autoclaved beans to which the amino acid methionine (which is often in inadequate supply in legume seeds) was added had a PER of 3.59.

A study in the States showed that the likely benefit to the plant of such a high concentration of L-dopa is protection of the seed. "Mature seeds of velvet bean are conspicuously free from attack by small mammals and insects." Small amounts of L-dopa that they added to an insect diet produced toxic effects. Concentrations as high as found in velvet bean seeds inhibited feeding completely.

**24-5 SARAH'S EXPERIMENT** Sarah did a 27 day feeding trial with mice. She used the 90-day variety of velvet bean because we did not have enough of the tropical kind to do a feeding trial. Four mice were assigned to each of 9 experiments. The control mice were fed commercial mouse chow. When an experimental diet was used, every third day 4.0 grams of the control diet (mouse chow) was added to provide nutrients missing in the experimental diet. This amount was chosen because that is the average daily amount eaten by rats fed only the control diet. Mice fed the control diet gained 8 grams. Mice fed the control plus the amino acid methionine gained 7.5 grams, which statistically was not significantly different at the 1% confidence level.

[A note to those not familiar with statistics. In everyday English we use the word "significant" about the same as the word "a lot." "A Mercedes is significantly more expensive than a volkswagon" means it costs a "lot" more. A scientist uses the word differently. If the weight of rats in two experiments is "significantly" different we mean that statistically speaking the probability is small that random chance could have accounted for the results.]

**EFFECT OF "NUTRICAFFE."** One set of mice was fed the control diet except that velvet bean coffee was the only thing available to drink. Beans were roasted at 300 F on a cookie sheet for one hour. To make coffee, 40 g of roasted beans were boiled in 700 ml of water for one hour. Mice gained 10.2 grams, which was not significantly different from the control.

**EFFECT OF RAW VELVET BEANS.** Mice fed raw beans lost 5.6 grams. With added methionine they lost 6 grams. This could be caused by the L-dopa, but so many harmful things occur in raw bean seeds that some other cause cannot be ruled out. This was significantly different from the control.

**24-6 EFFECT OF BOILING THE BEANS.** Beans that had been soaked with one change of water were boiled 30 minutes (40 g in 700 ml water) then another 30 minutes in fresh water. They gained 4.8 grams. Mice fed boiled beans with added methionine gained 3.8 grams. These were not significantly different from the control.

**EFFECT OF ROASTING THE BEANS.** Mice fed beans roasted at 300 F on a cookie sheet for one hour gained 1.5 grams. Those fed roasted beans plus methionine gained 3.0 grams. Both were significantly less than the control but not than the cooked beans.

WHAT PERSPECTIVE CAN I GIVE? There is not enough evidence to say with certainty that there are no problems from eating cooked velvet beans. We very much need more research, but human need does not wait for science. What should you recommend in the meantime? Considering everything that has been said above, if velvet beans were available and I was hungry or my diet was low in protein, I would definitely eat them after thorough cooking. I probably would not change the water unless velvet beans became a regular food, then I might consider it. If I were neither hungry nor malnourished, but was living at a subsistence level, I would occasionally eat velvet beans. (I am none of the above and do not eat velvet beans except as a curiosity if they are offered). I would definitely eat modest servings at first, and consider changing my cooking methods if nausea occurred. If at all possible I would "learn a lesson from the deer" (see note on peach pits as food in this issue of EDN).

If buying coffee was hard on my budget I would drink velvet bean coffee in moderation. If neither I nor anyone in my community had problems, I might drink it freely after a time. I base this on the fact that people in several places are drinking it without problems, Sarah's mouse trial showed no problems, and the two "treatments" of first roasting then boiling are substantial. The "nutri" part of the name is probably misleading. Daniel Salcedo told me he had brewed nutricafe tested for protein and found little.

I would feel a little safer eating beans that had been stored for several months in the tropics than freshly harvested beans, but do not really know if this matters. I would warn families of possible symptoms and ask them to report any problems to me.

I would not eat the wild velvet beans unless forced to do so and would be doubly cautious. The same would go for any new variety that I might obtain unless I knew that it was eaten elsewhere.

I would feed them freely to pigs and chickens only if I had the firewood to cook them first.

You can be a great help to the entire ECHO network if you will QUICKLY report any problems or lack of problems from people or animals eating velvet beans in your community. Have any of you found them to become a weed problem? We would also be interested in recipes and public acceptance. ***[Ed. Note: New evidence has required us to modify our recommendations. Currently (7/93), we offer the following guidelines. Has there been a failure of the bean crop in your area, but velvet beans are abundant? If so, it is almost certainly better to make use of velvet bean than to suffer hunger or protein malnutrition. Is the food situation a bit less desperate than that, but people still do not have enough to eat? If so, consider using velvet beans in moderation and not every day. Are there plenty of alternative sources of protein? If so, don't eat the velvet beans. Velvet bean coffee has a lot of dopa in it. It should not be consumed regularly. EDN #37 for more details.]***