GARLIC SEED FOUNDATION
ROSE VALLEY FARM
ROSE, NY 14542-0149

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Origins and Distribution of Garlic
Garlic Storage Research
Book Review: Fateful Harvest

Garlic Braiders of Arleux

THE REGULAR, AND NOT SO REGULAR, NEWSLETTER OF THE GARLIC SEED FOUNDATION

The Garlic Press

SPRING 2002

#40

File

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Membership in the GSF is $15/1st year, $20 for 2-year renewals, and includes this newsletter. All submissions for ***The Garlic Press*** *should be sent to the editor, Bob Dunkel, 2079 Washburn Rd., Stanley, NY 14561. (716-526-5779 - phone evenings only, please). As always, all medical references should be taken for educational purposes and any recommendations should not preclude consulting with a health practitioner.*

The Origins and Distribution of Garlic: How Many Garlics Are There?

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Garlic in History

Garlic is among the oldest known horticultural crops. In the Old World, Egyptian and Indian cultures referred to garlic 5000 years ago, and there is clear historical evidence for its use by the Babylonians 4500 years ago and by the Chinese 2000 years ago. Some writings suggest that garlic was grown in China as far back as 4000 years ago.

Garlic grows wild only in Central Asia (centered in Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) today. Earlier in history garlic grew wild over a much larger region and, in fact, wild garlic may have occurred in an area from China to India to Egypt to the Ukraine.

This region where garlic is grown in the wild is referred to as its "center of origin," since this is the geographic region where the crop originated and the only place where it flourished in the wild. In fact, although we sometimes hear about "wild garlic" elsewhere in the world, this is the only region where true garlic routinely grows in the wild without the assistance of human propagation. There are other plants locally referred to as "wild garlic," but these are invariably other species of the garlic genus (*Allium*), not garlic itself (*Allium sativum*). For example, *Allium vineale* is a wild relative of garlic that occurs in North America and is commonly called "wild garlic."

The "center of origin" for a plant or animal species is also referred to as its "center of diversity," since it is here that the broadest range of genetic variation can be expected. That is why those of us who have sought to find new genetic variation in garlic have collected wild garlic in Central Asia.

Once cultivated by the first garlic farmers outside of its "center of origin," what types of garlic did early aficionados grow? In fact, we know almost nothing about the early types of garlic produced. No designation of garlic varieties was made in the early writings discovered to date, be it hardneck or softneck, red or white, early or late, local or exotic. Throughout its earlier history some have speculated that softneck garlic was the predominant type cultivated, although evidence of what would be interpreted as a hardneck type was found interred in Egyptian tombs. It was not until garlic was cultivated in southern Europe within the last 1000 years that the distinction between hardneck and softneck was routinely noted. Until more ancient writings that describe garlic are found, or old, well-preserved samples are unearthed, we can only speculate about the early types of garlic grown.

Garlic producers and consumers have come through 5000 years of history growing and eating their crop with little need to specify type of variety. In fact, it is a rather modern habit of only the last few hundred years whereby more detailed descriptions of varieties have come to be developed for any crop plant.

Garlic Migration, Propagation, and Reproduction

Throughout history, humans migrating and travelling through central Asia and surrounding areas have collected wild garlic (and still do) and carried it with them for later consumption and cultivation. In 1989 I was fortunate enough to participate in a germplasm collection expedition seeking garlic and other alliums in nature reserves of Central Asia. We observed primarily hardneck garlic in the wild, but some softneck plants also occurred. It is easy to imagine early garlic connoisseurs migrating beyond the natural range of wild garlic and carrying wild garlic far from its center of origin. Only with cultivation could a supply for subsequent years be assured. And so garlic came to be cultivated.

The wild hardneck garlic we collected is among the more prolific for production of true garlic seeds. We presume that the vast diversity that has been observed in cultivated garlic goes back to variation generated from sexual reproduction in the wild crop. In contrast to wild garlic, as far as we know, garlic in cultivation throughout history has only been propagated asexually by way of vegetative cloves, bulbs, and bulbils (or topsets), not from seed. These asexually propagated, genetically distinct selections of garlic we cultivate are more generally called "clones." Unlike sexually reproduced crops propagated from seed, vegetative reproduction assures a very uniform crop.

Yet this asexual lifestyle of cultivated garlic forgoes the possibility of combining traits proffered by interpollinating diverse parental stocks. Let's say you have two garlic clones, clone A and Clone B. Clone A has excellent yield but poor storage ability, while clone B stores well be yields poorly. Without an opportunity for interpollination and sexual reproduction, the only way to obtain a garlic clone with high yield and long storage is to wait for the desired mutation(s) to occur in clone A or clone B. If these two clones can, however, be interpollinated and set true seed, a very realistic opportunity exists to develop a new line with both desired traits in several generations of progeny selection beyond this cross. Sexual reproduction and selection are at the heart of plant breeding in agriculture and, for that matter, evolution in wild plants.

No sexual reproduction, that is, production of true garlic seed, was underway in cultivated garlic before the 1980s. Therefore, relatively small numbers of garlic clones, perhaps numbering only a few thousand, have been in the hands of growers around the world through most of history. We conjecture that these clones represent the cumulative array of garlic diversity resulting from sexual reproduction in the wild which has been disseminated from its center of origin throughout history and then been able to successfully produce a crop in the hands of garlic growers around the world today. Superimposed upon the variation resulting from sexual reproduction of garlic in the wild, we can also expect to find variation due to mutations that accumulated throughout the history of cultivation of the crop.

Garlic Today

Garlic is a crop widely grown for fresh market by many producers on a small scale for local markets and, particularly in the U.S., by a few large-scale producers for processing and fresh sales. About one million Hectares (2.5 million acres) of garlic produce about 10 million metric tons of garlic globally each year, according to the United Nations Food and Agriculture Organization.

Although widely cultivated, it is only since routine seed production became possible in the 1980s that garlic can be called a domesticated crop, since a strict definition of domestication is the process of selective breeding of a plant or animal to better meet human needs. Clones held by growers today have been maintained as separate entities, but a system to confirm or refute the identity of a given clone has not been established. Only with several seasons of careful field observation can garlic clones be identified, and even then ambiguities often remain. For example, virus infection can dramatically reduce plant size and vigor, and alter leaf color and shape, making unequivocal garlic identification impossible.

Why Fingerprint Garlic Clones?

Fingerprinting was developed to prove, or disprove, the identity of humans. Today the term "fingerprinting" is used more widely to include evaluation of DNA patterns of any organism. High-profile criminal/legal proceedings have made the concept of fingerprinting (in its broader sense) familiar to the general public in that context. The very same DNA methodologies useful for humans are applicable for any organism.

What can be learned from garlic fingerprinting? Three situations arise where it would be useful to have an unequivocal means to verify the identity of a garlic clone: identification of existing garlic clones in production, tracking of new garlic clones derived from true seed as they enter and move into production, and development of a garlic lineage.

For garlic, there is a good likelihood in any large collection that several garlic clones held under different names are, in fact, identical. Another scenario we often confront is that several clones occur as a mixture under the same name. This brings us to the first motivation for fingerprinting garlic. The possibility that perhaps only a few thousand garlic clones were collected in Central Asia and found their way into cultivation outside of that region with a vegetative method of propagation, makes the prospects for an opportunity to fingerprint most of the garlic cultivated today a realistic proposal.

Furthermore, with true garlic seed being produced on a large scale today, many new clones will certainly enter the production stream for the first time in history. With this, the need for varietal identification becomes more urgent. A DNA fingerprinting effort of garlic today will serve as a useful foundation for tracking new clones coming to growers in the future.

A third rationale for DNA fingerprinting of garlic is more subtle. This methodology not only tells us that clone A is different from clone B and clone C, but it also can tell us how closely related clones A, B, and C are relative to each other. In this way DNA fingerprints provide modern insights into historical events for which no other historical record is available. Comparative analysis of DNA fingerprints have provided important insights about the origins and movement of human populations, cultivation and domestication histories of crops and farm animals, and sources of disease organisms.

Garlic is a compelling and well-appreciated, but little-studied crop. It has a long history in the hands of humans and a significant monetary, health, and social value in modern society. A better understanding of garlic origins and distribution may help us better understand not only garlic, but perhaps our own human history.

[Excerpted from http://www.hort.wisc.edu/usdavcru/simon/garlic_origins.html)

"Technology is a way of organizing the universe so that man doesn't have to experience it."

— Max Frisch

Press #40: April 2002

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The 2001 Garlic Crop in Eastern Ontario

by Paul Pospisil, Master Gardener

Adverse weather has been a dominant factor limiting the Eastern Ontario garlic industry in the past two years. Last year, the problem was crop loss due to winterkill, followed by a wet, cold spring and summer that delayed the harvest. This year, the problem was the very opposite. Following a nearly ideal winter with unbroken snow cover, spring brought drought followed by a summer of more drought and record high temperatures. Lack of precipitation in April and early May prevented adequate top growth needed for good bulb development. Then, a hot, dry July brought on a premature harvest, cutting short the time needed for bulb formation. The double effect significantly reduced garlic bulb size and total yield by an estimated 25%. In our region, rain and snow equivalent measured a total of 1.5 mm in April. May was slightly better with 54.5 mm of rainfall.

Garlic is a bulbous root vegetable. It produces a lush growth of top greens from early April through to mid-June. During this period of its growth, it needs about 1" or 25 mm of rainfall or irrigation per week. At about the summer solstice, the plant turns its energy from growing tops to moving the nutrients in the leaves downward for the purpose of developing the bulb required for reproduction. Bulbs form quickly over the next 4-5 weeks. A greater top growth will produce a larger bulb, and, conversely, a stunted top produces a smaller bulb. This year, plants were shorter and bulbs smaller.

The harvest was compressed into a 10-day period, starting with early strains in mid-July and August-maturing strains ready by July 24 or 25, about three weeks early. The cause? Evidently, high temperatures and powder dry soil caused premature drying of the plant, requiring earlier lifting to prevent overmaturity and breakdown of bulb wrappers.

Both the growing and harvest conditions contributed to an overall reduction in the harvest. Growers reported a reduction of one to two grade sizes over previous years, with a resultant smaller harvest weight. Those who replaced the absent rainfall with irrigation were less affected.

On the positive side, the smaller harvest and shortage of garlic was advantageous for growers. Retail prices continue at a profitable level as market demand for locally grown, organic garlic continued to outstrip availability by a wide margin. This year's crop was essentially sold out by the end of August. Little or none found its way to supermarket shelves. Direct sales at farmers' markets, garlic festivals and at the farm gate continue to be the primary marketing means used by growers. Few, if any, depend on wholesale buyers to sell their garlic.

The Glorious Garlic Festival, started in 1997, has now multiplied into three Eastern Ontario festivals, one each in greater Ottawa (Carp), Perth and Picton. Local growers report their major sales at these events.

The reduced crop, high market demand, and advantageous price continue to attract more growers into this emerging farm sector. Weather difficulties notwithstanding, the organic garlic industry continues to provide an attractive secondary crop for many farms in the region.

18th Century Cures

Feeding a child garlic would cure bedwetting or worms. Eating garlic was thought to cure bronchitis and was used as a remedy for colds, rheumatism and "lung trouble" when boiled in milk.

Market Shrinkin' or Stinkin'?

According to the latest statistics of the American Farmland Trust (AFT), we are now losing 1.2 million acres of farmland a year. Far from what we could call a sustainable trend, part of what makes this worse is that we are losing prime farmland to development. If we link this into the concept of free trade, we have a prescription for radical change for farmers. Getting this back around to the small farmer means that local markets and sustainable practices are the only hope for viable economic survival.

An incredible amount of supermarket produce comes from greenhouse production. Computerized systems that regulate inputs, water and heat are supplanting traditional systems. This is both a threat and a challenge to the small grower. As far as garlic goes, of course, the challenge is from imports of tons of bottom-priced wholesale bulbs that squeeze the California market but leave local rural markets relatively free for niche production and various marketing tactics. The seed garlic market has gone sky high as any examination of this year's catalogs will surely show. That is one reason I would like to see us pursue a program that gives incentives to our members to swap and sell varietal selections that can benefit us in many ways. With some funding and volunteers, we could establish and print a listing of members' available stock and create some reasonable pricing guidelines for member-to-member transactions. I see the amazing success of Seed Savers Exchange and realize that our sustainable future depends ultimately upon each of us. We can't wait for corporate conscience to support common folk. We need to be resolved to be part of solutions at our local level and to support organizations that do not put profit before people.

The GSF cannot take responsibility for quality or pricing, but we would certainly like to support a means to make high-quality garlic and seed available to each and every one of our members, as well as to help you in finding supportable ways to keep your community healthy and happy with garlic breath abounding. Please send us your comments and suggestions as to how we can better meet your needs. (B.D.)

THE INDIAN SUPPRESSION THEORY

by L. John Harris

The introduction of garlic into the Americas is not nearly as well documented as are its travels along the trade routes from its home in southwestern Asia to Europe. We know that the Spanish explorers brought garlic to the Americas, but there is also a Native American tradition of garlic consumption, especially for medicinal purposes. There are many stories about wild garlic being used by the Native Americans to cure sick Europeans. It is also fairly clear that progressive waves of European and Asian immigrants brought a taste for garlic to Anglo-Saxon America. Many immigrants realized, however, that to assimilate and compete in the American Melting pot, they would have to tone down their garlic consumption. And thus, the American mouthwash and breath-mint industry was born. But Native Americans were not allowed to assimilate. Why? I shall hazard a guess that may seem more absurd than it actually is.

Native Americans knew where the wild garlic was. The Anglo-Saxons wanted to control garlic awareness in America, knowing that garlic-loving Europeans and Asians would eventually flock to America. Perhaps the new Americans feared that the native Americans, with access to wild garlic (*Allium canadense*), would later pose a threat to their plans to cultivate, *Allium sativum*. So they got nasty with the natives. For hundreds of years, therefore, the Anglo-Saxons, and their assimilated European brothers, have built the garlic industry in America to serve their own needs and those of the Asians, who love garlic too much to assimilate. Now, with two world wars under our belts, the United States has emerged as a garlic-loving country, but control of garlic is now held by an increasingly diverse lot. As the poet, William Stafford, writes in his *Ode to Garlic*, "It makes us all alike, all offspring of powerful forces, part of one great embrace of democracy ...."

A Blast From The Past

from Louis Van Deven

William Shakespeare must have liked alliums, for his people talk a lot about herbs and onions and garlic. And Homer, in his *Iliad*, tell us that Nestor served garlic to his guest Machaon.

Galen, the famous physician of first-century Rome, said garlic was the countryman's best antidote and he prescribed it liberally. He said a meal of garlic completely purges a dog of worms. If allowed the run of the garden where it is grown, he will help himself, but I doubt if he will be allowed in the house for some time. (Also, my own experience is that this is not true.)

Director's Notes

The root of the word amateur means "to love." Like amour (love affair) and amorous (of love), amateur means doing what you love to do. Because of your love for the garlic, you are reading this now and belong to this Foundation. Some love to grow it, others love to taste it; others love garlic for its place at our tables and in history, and still others for its effect on our bodies. We are all amateurs.

I don't know how the word amateur got to be placed in reference to the word "professional," which basically refers to an exchange of money. I am tempted to say "professionals" have more knowledge, but we all know stupid professionals, so that doesn't fit. Who knows more about garlic - a person who has grown the stinky stuff for 20 years or the Consultant/Agent who looks it up under "Alliums"? So, if you've ever sold one bulb of garlic, call yourself a "professional." But here at the GSF, we're all amateurs and love our association with the garlic. We share the adventure of wanting to learn and wanting to experiment. I know, because I get much mail and talk to hundreds of you each year. Do you know what I never hear? I never hear "fear of trying" something new. There is no fear of failure, there are no boundaries that limit direction that plague the professional.

"Unskilled" is another term you'll hear in reference to amateur, which again I take offense at when I think of the proficiency, technique, and experience it takes to grow and cook with the garlic. It is an art requiring sound mind and body. Let's continue to grow/cook/eat the garlic because it's something we love to do, as amateurs.

* * * * *

The lights burned late in every fire hall in this country on the night of September 11, mine included. I saw firefighters and medics, who didn't smoke, smoking cigarettes. I couldn't count the pots of coffee that were made and poured about. Talk was optional; our need was to be together and to reflect. We were in a collective shock, not yet sure if our eyes and hearts could comprehend what we were shown so many times. Anger had not yet arrived, but there was a very deep sadness. We didn't know where to go or what to do, so we came to the "Hall." Once there, each person started to reflect on his/her own experiences of fighting fire inside a burning structure, cutting people from twisted motor cars, giving medical attention to an injured patient pinned under unstable farm machinery, and .... We don't talk about "danger" or "taking chances." That ain't cool. But on September 11 we talked and reflected on our fear and why we do what we do. Why are we running into buildings while everyone else is running out?

I had just delivered a patient to the hospital ER and was giving a report to the doctor when a nurse came in and old us there had been an explosion at the Pentagon. By the time I got home to the farm I knew what the story was all about, and I was once again thankful not to live with a television set. I grabbed the dogs and tools and went to the woods. When this world and/or my life become too confusing, I retreat to the forest and Mother Earth's creation. How can we live in a world of so much bounty and beauty and yet create so much anger and pain? Except for the honking of the geese, Father Sky was empty and quiet, clear and sunny, and a beautiful blue. How can we do this?

Now I am 6 months older and wiser, as are you, and we each reflect on our world with different eyes and perspectives. I now feel, more than ever, that I am a world citizen, and in the ways of Ghia, I am connected to all who live on this planet earth. I now realize that tribal and religious loyalties (which I don't understand) are more powerful and passionate than the boundaries of nations. I now feel that "the chickens have come home to roost," and as the great military and economic power that we are, we must use less muscle and more brains. The military-industrial complex cannot protect us from the injustice, disease, and hunger which many people face every day. These issues are far too complex to be labeled "good vs. evil." I do not feel that patriotism is judged by the number of American flags one wears or defined by our Attorney General as justification to suspend our rights and freedoms. This will not make our homeland safe any more than increased military budgets or the "bio-terrorism" and "weapons of mass destruction" classes that I (and many others) have attended — or airport monitors, or irradiation machines at your local Post Office. These are knee-jerk bandaids to a much larger ailment. Our security is directly connected to our actions as a very rich and very powerful nation. This is an opportunity for us all to ask questions. While this world is at war over resources and inequality, there can't be peace. If there isn't peace, there isn't security. We all have much to think about as we work our garlic this year. (D.S. com)

GARLIC EDUCATION DAY
POTLUCK LUNCH & TOUR
Sunday, June 23, 2002 — 11 AM to ?
Garlic Delight Farm
Rte 170 and Sabin Rd.
Little Falls, NY 13365

An informal education and social event for everyone interest in garlic.

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Donation: $5.00 per person for beverage, food, and education materials

RSVP appreciated by
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DIRECTIONS: From NYS Thruway exit 29A, take route 169 north to Little Falls, route 169 merges with route 170 north, continue on route 170 for 2 miles, note golf course on left. Sabin Rd. on right.

From NYS Route 5 east or west, enter Little Falls on arterial, watch for stop light and intersection of 169, take route 169 north merging with route 170, continue on route 170 for 2 miles, note golf course on left, Sabin Rd. on right.

ALLIO-PHILE

- "Garlic Slow Cooked in Oil." *Fine Cooking*, March, 2002: Assistant Editor Tony Rosenfeld slow cooks peeled cloves in olive (or other) oil for 35 minutes on low heat 'til garlic is opaque and soft. Store ready to use in separate airtight containers in refrigerator for up to a week. Thanks to Janet Gordon.
- Congratulations to John Zadiraka of Berwick, PA, for his 1st place Hardneck and Elephant Garlic Blue Ribbons at the Bloomsburg Fair!
- Sharon Springs (New York) Garlic Festival: Bill Ziese, of Gildameister Organic Garlic, is wanting to contact potential vendors to call him at (518) 284-2203. He's got a beautiful location, dates not yet set. Call NOW!
- Anyone tried Garlic Clips? - repellent garlic oil (1000 times stronger than garlic) that are clipped to shrubs or stakes or placed in the ground to ward off deer, rabbits and vampires. We'd like a product report from anyone who has used them. I wonder how they'd taste on pasta?
- Agricultural Chemical Usage on Garlic - USDA, July 2001: California was the only state summarized: Herbicides were used on 45% of the acres with Oxyfluorfen most often used at 22% with bromoxynil and pendimethalin at 13% each. Fungicides were applied to 61% of the acres with tebuconazole, the leading active ingredient. No active ingredient insecticides were listed on the 40,000 acres summarized.
- The GSF Renewal Post Cards are now a regular part of our mailing system. You will receive a friendly reminder shortly after your membership expires. We want to thank all of you who renew and thanks for your kind words, encouragement and trust that we're going to stay alive.
- Garlic as an Alternative Parasiticide for Organic Lamb Production: Dragon Mountain Farm, Box 31, Bastin R.R. #7, Quesnel, BC, Canada, V2J 5E5, used garlic and 4 other organic treatments for controlling worms in young lambs. Their conclusions were that none of the treatments was successful. There was a small weight gain by those fed the crushed garlic cloves, but no comment on the flavor of the meat. Reported by the Organic Farming Research Foundation (Winter 2001, #9).
- American Journal of Clinical Nutrition reports that eating an average of six (6) cloves per week (raw or cooked) may reduce colorectal cancer risk by at least 30% and stomach cancer by about 50%. Most of us reading this probably eat an average of 6 clove a day!
- New ATTRA Garlic Packet: Thanks to Janet Bachmann for her good work. See enclosed report.
- Rochester (NY) Public Market Garlic Festival held in conjunction with their "Harvest Jamboree Country Fair." For those who can't find the time or folks to help organize a festival, why not piggy-back onto an existing activity? Food, demos, garlic sales ....
- GSF vs. Jolly Green Giant (*Press* #37, Spring 2000). We filed a complaint against Mr. Giant (aka Pillsbury Company) because his Corn Niblets with Garlic Flavored Sauce contained no garlic. Ms. Kelli Giannattosio, Office of Nutritional Products, Labeling and Dietary Supplements, Department of Health and Human Services/Food and Drug Administration/Public Health Service has responded saying that they allow such labeling but they can't discuss their communications with the Giant unless we file a Freedom of Information request, which we shall. Our quest for justice shall never end!
- Photos and Slides: Why not use your camera this year and share what you're doing! We can always use slides for the GSF educational programs. Thanks.
- Total Land Area of the U.S. is 2.3 billion acres, of which (in 1997) 28% is forest, 26% is pasture/grassland/range, 20% crop land (.01% garlic), 13% special use (parks and wildlife) and 13% miscellaneous (of which 46% is urban and rural residential). Private ownership is 60%; Federal 29%; and State, Indian Trust, and special public lands the remaining 11%.0
- Garlic Business Cards: Please send to GSF/Rose. Thanks.
- Some Bad News to share: The "Garlic Information Center/Museum" and "Garlic Country USA" (Garlic theme park) both to be located in Gilroy, CA, have been "killed off by the City just like any unique and potentially profitable venture that tries to locate in Gilroy." Personally, I thought the theme park had great potential.
- How Sad It Is Department: Bill Gates lost $6 billion last year and back to a net worth of only $52.8 billion! Poor Bill, and he's not alone. 83 members of the World Billionaires Club had to step down, leaving only 497 with the net worth of $1.54 trillion. Number 2 went to Warren Buffett at $35 billion, then Germans Theo and Karl Albrecht (Food Systems) with $26.8 billion, Paul Allen (Microsoft) has $25.2 billion, and Larry Ellison (Oracle) at #5. Spots #6 - #10 all belong to the heirs of Sam Walton (Walmart). There are 25 under 40 years old, led by Michael Dell at #18, who is 37. The richest woman is Alice Walton at #8 with $20.5 billion. Makes me want to puke.
- Garlic Festivals: Please send us your name, dates, location and contact person so we can list you in the *Press*. Thanks.
- Hey Guys, "Eat them 'Maters'"! Men who eat tomato products two or more times a week can reduce their chances of contracting prostate cancer by as much as 36%. Cooked tomatoes are particularly high in lycopene, a powerful antioxidant. So, more sauce, ketchup, and salsa as well as garlic, fresh vegetables, garlic, fresh fruits, and garlic. This study was conducted by Dr. Edward Giovannucci of Brigham and Woman's Hospital and the Harvard School of Public Health, and published in the *Journal of the National Cancer Institute*, March 2002.
- Bob and David continue to request your submissions to the *Press* (ideas, questions, articles or suggestions). We need your help. We share your frustration and agitation. Our only response to your calls and letters is a request that you contribute. Out thanks to all who have.

(D.S. com)

Garlic Storage Research

Dr. Gayle Volk, USDA-ARS, National Center for Genetic Resources Preservation, Ft. Collins, Colorado

In Ft. Collins, Colorado, there's a unique federal facility recently renamed the "National Center for Genetic Resources Preservation" (formerly the National Seed Storage Laboratory). It's here that we house about 350,000 accessions of seeds and other regenerative plant materials as part of the National Plant Germplasm System. USDA maintains this facility as a backup of germplasm collections that are located at sites throughout the United States, with some of the larger locations, including Geneva, NY; Pullman, WA; Ames, IA; and Griffin, GA.

One of the goals of our Research Unit is to determine methods to store seeds, buds, or other vegetative materials (such as bulbs) for extended periods of time. Seeds, thankfully, are usually dried naturally and prepackaged in a seed coat. After adjusting the moisture content, seeds can be placed in bags and stored at -18°C or in liquid nitrogen (~-180°C) indefinitely. Unfortunately, garlic plants rarely produce seeds. In Pullman, WA, more than 200 lines of USDA's garlic collection are maintained by Dr. Rich Hannan and curator Barbara Hellier. Garlic accessions are not currently backed up at a federal facility (such as ours) since bulbs are much more difficult to store than seeds for extended periods of time.

I've recently begun research to determine how the storage life of garlic can be lengthened. Ideally, we'd like to store materials at our facility indefinitely, and theoretically, we should be able to store and regenerate garlic plants from material that has been placed into liquid nitrogen via a process called cryopreservation. Preliminary results are promising. We have been able to remove the dormant shoots from cloves, sterilize them, and immerse them in liquid nitrogen after a few treatments with cryoprotectant solutions. After thawing, we place the 8mm^3 shoot tips on sterile media, and observe the regrowth. Depending on media, we either have one large shoot emerge with roots, or many smaller shoots that grow into garlic "clumps." Hopefully, in the next garlic growing season, we'll be able to adapt our methods to the many diverse varieties of garlic that are currently held in the garlic collection at Pullman.

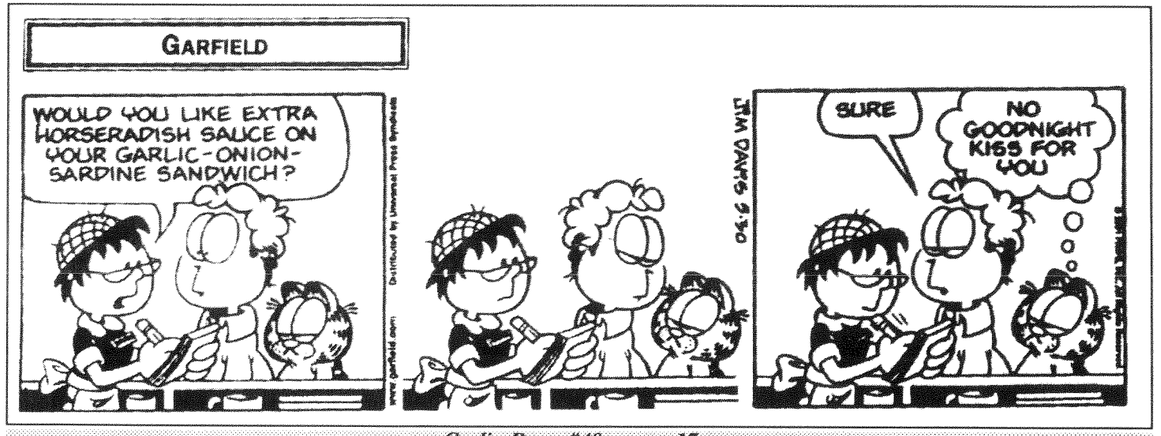
We also have a project to determine how varietal garlics can be stored for more than just a few months. Our storage studies at 0°C and at -5°C have kept garlic accessions alive for more than a year, and we currently have some of these garlic varieties planted in field plots so the productivity of this stored material can be determined.

Finally, we are determining the extent of duplication of garlic accessions in the national collection by a "DNA fingerprinting" technique. We have cloves from all the garlic accessions in the Pullman garlic collection as well as some varieties commercially available. We'd like to determine how much genetic variability exists within these collections. We know that "identical" strains of garlic can appear and yield very differently, dependent upon growing conditions, and different strains can respond similarly to some field conditions. Our genetic testing should allow us to determine the true genetic differences among garlic varieties.

Since my background isn't in farm production, I still have a lot to learn from garlic growers. Attending the "Garlic is Life Symposium" (Tulsa, OK) in 2002 was a very educational experience for me. I've also been fortunate to collaborate with Walt Lyons (www.TheGarlicStore.com) to see how garlic is produced. I hope that our projects will benefit growers as well as horticulturists as we research methods to better store varietal garlics. I plan to provide updates on our research results through this newsletter as our studies progress.

"Sour cream makes it Russian ... Soy sauce makes it Chinese ... Garlic makes it good."

Alice May Brock - Owner, Alice's Restaurant



Recipes

Lemon-Garlic Roasted Chicken

1 whole chicken
2 tbsp. butter, softened
Salt and pepper to taste
2-3 garlic cloves, minced or pressed through a garlic press
1 tsp. oregano
1 carrot, cut into sticks
1 stalk celery, cut into sticks
⅓ small onion, sliced
3 tbsp. lemon juice

Wash the chicken inside and out and pat dry. Combine the butter, salt, pepper, garlic and oregano into a paste and rub over the chicken. Place the cut-up vegetables in the bottom of the slow cooker and add the chicken. Cook on low heat for six to eight hours. About one hour before serving, add the lemon juice. To serve, transfer the bird to a cutting board and carve. Skim the fat from the juices and spoon some of the juice over the chicken.

Green Beans with Garlic

4 tbsp. olive oil
4 garlic cloves, smashed with the side of a knife blade
1 lb. green beans, cut into 1¼-inch pieces
2¼ cups fresh bread crumbs, preferably made with Italian or French bread
Salt and pepper to taste

Heat the olive oil in a large skillet, and when hot, toss in the smashed garlic cloves. Watch to be sure the garlic doesn't burn. When it begins to turn transparent, add the green beans, and stir to coat the beans. When the beans become a dark green, add the bread crumbs, and stir quickly so that they do not burn or stick to the bottom of the pan. Remove from the heat, and add salt and pepper to taste before turning out onto a serving platter. Serves 4.

Vegan Garlic Soup (Serves 8)

3 Quarts Water
½ Cup Pearl Barley
¼ Cup Long grain wild rice
3 Celery stalks sliced
1 tsp. Thyme
¼ tsp. Rosemary, ground
2 Tbl. Veg. broth powder
2 tsp. Simply Organic seasoning
4 Russet potatoes, small chunks
3 Fresh Garlic Bulbs
4 Lg. Onions, chopped
1 Tbl. Parsley dried flakes
¼ Cup Tamari/Soy sauce
1 Tbl. Spike
2 tsp. Vegit
1 Cup Mushrooms, sliced
2 tsp. Dill weed, dried

Place 2 cups of the water in a large stock pot. Add the whole garlic cloves and cook over medium heat for 15 minutes. Add the remaining ingredients. Bring to a boil, turn down to simmer, and cook until tender, about 30-45 minutes.

Although this recipe is called garlic soup because it has so much garlic in it, it is actually a very hearty soup with a very sweet garlic flavor. It is well worth the time it takes to peel the garlic, but you must use fresh garlic; do not replace with dried minced. This soup tastes best if made a day or two in advance to give flavors a chance to blend. Nutrition (per serving): 274 calories - Fat: 1g (3% of calories). From collection of Sue Smith.

From Garlic is Life Symposium and Festival, 2001 - Chef: Liv Lyons, www.TheGarlicStore.com

Garlic-Almond Soup

2 garlic cloves, chopped
1 cup peeled almonds (brown skin removed)
1 cup fresh, white bread crumbs, packed together
2 tbsp extra virgin olive oil
1 tbsp white vinegar
2½ cups cold water
salt and pepper to taste
4 oz. seedless grapes, halved
2 tsp chopped fresh cilantro

Place the garlic, ground almonds and bread crumbs in a food processor or blender. Add a little of the water and process to form a paste. while motor is running, pour in the oil, water and vinegar little by little. Transfer to bowl, season with salt and pepper and refrigerate for at least an hour. Stir the soup and adjust seasoning if necessary. Stir in grapes and cilantro. Serve cold.

Pickled Garlic

3 cups white vinegar
1 cup water
1 2/3 cups sugar
3 cups peeled garlic cloves

Bring vinegar, water and sugar to a rolling boil. Allow to cool completely. Place the peeled garlic cloves in heat and acid proof container (glass, ceramic, porcelain, stainless steel) that holds at least 2 gallons, and pour the brine over the cloves. Cover, and let stand for 2-3 days. Separate the garlic from the brine, and bring the brine to a rolling boil. Allow the brine to cool slightly. In the meantime, fill the garlic in sterilized pickling jars and fill the jars up with brine. Screw lids on tightly and turn the jars upside down for about 5 minutes after closing. Remember to make extra brine to fill up jars after reboiling. The pickled garlic needs at least 2 weeks to be ready to eat, but keeps for a year or longer.

OUT OF MY HEAD

Bob Dunkel

There was a different feeling to Tulsa this year. The mix of folks changed a little and there were quite a few more Ph.D's and working researchers represented, while the number of small growers and farmers seemed about the same. Don't know how most of you look at your expenses but it was nice to see a display by a Buffalo based company with a nice drip irrigation system. Irrigation is critical to many of you especially in the Southwest. For us it has always seemed more of a knee jerk reaction. A wait and see attitude that hopes to keep apace to a wet or dry year and do the best you can. There were some great folks in attendance, and we were lucky to have Nancy Arrowsmith fly in from Europe to meet up with Kent Whealy of Seed Savers Exchange. Nancy has done great work in support of sustainable ag and seed saving and has been a strong supporter of sane environmental policies in Europe.

For me it was a further insight to see how industry impacts research budgets and agendas. As in all programs it seems that endowments and grants seem to be initiated by the big players. It's taken a long time for organic and sustainable ag to get on the playing field and remarkably it is only when it becomes an issue of viable economic alternatives that some strange bedfellows seem to be coming together. If they aren't purchasing small farms or farmers to have a piece of this pie, then they are at least reacting to the mounting consumer pressure to being accountable or insidious for the biotech debacle. Interestingly, a whole new group of players are coming out of South America these days. Using Argentina as an example, we know that they have a certain effect on the garlic market. During the usual winter season here in the north they typically export garlic into at least the southern markets of our country. Of course since Taiwan (read China) has begun their massive exports and the economy in Argentina is doing the enron shuffle, they have found a new market in grain for Europe that is not genetically altered. Markets change...

Fortunately, garlic is not a big enough money crop for the big players to set research budgets to. After the tariff struggles that we and our fellow Canadians have pursued to stall these huge imports of cheaper than cheap garlic,I hope we are waking up. The GATT and NAFTA policies still have created major problems because countries can still claim that we use illegal trade barriers when asking for sanity in pesticide, fungicide and herbicide and fumigant use. As critical to me as issues of education and technology transfer are to outreach policy on sustainable thinking, I am afraid to admit to a certain naivete that believes in the response to sane environmental concern in the arena of economics. That is why I continue to hope that the consumerism that is coming out of emerging third world economies and the European block may eventually lead back to changes here at home. Unfortunately, the way this behemoth of governmental regulation and policy moves, it is certainly a likelihood that unless the consumers in this country build consensus and make quality and health issues that impact politics, we will see the continued dilution of policy like what is happening to the national organic program. It really takes a huge groundswell to make an inch of regulatory headway.

After September 11 and the huge swing of money to the defense budget, one can see that more and more peripheral programs in other areas of government are very vulnerable to cuts that essentially cease to empower their intended focus. The USDA is reeling away from any such teeth they'd developed to fight the type of oversight that along withEPA and FDA allowed them to be players in the world market. Security issues have overwhelmed us and many good intentioned programs have been doomed to the back burners. That is why it is even more necessary that you and I, the small we of we the people, need to let our voices be heard. Through cell phones and emails we must advance our petitioning for sanity in the face of a war torn economy. Though it will take more than words to wage this battle of consumers against the world forces, we must not surrender our conscience! Though it is a great journey that lies before us in this new century, we must demand change toward sustainability to turn back the engines of destruction. Non renewable energy policies must be thwarted by consumer demands for tax credits in alternatives. The madness for revenge in our economic decisions must not deafen the cries for peace and the need for true freedom to compete cooperatively for the restoration of ethics and respect for life. Indeed, we need to rally around all the interconnectedness of issues that derail this huge war mandate aimed at one world government-not one of people but of economy and economic control. Many more innocent victims have died in Afghanistan than the near 3000 we lost on 9/11. Payback is not the issue. Revenge has never done anything but create a new cycle of violence that is karmic.

It's a real show that is going on- a magical maneuver based on image and illusion. A very precise sleight of hand is occurring that is distracting all of us away from issues that protect women, children and future generations. It is a volatile issue and one that is hard to separate from the needs of food, health policy and sanitation. I am not trying to alienate any of you with my views but farmers have a tough enough row to hoe without this most recent conflagration. Any voices of dissent have been muffled, attacked and essentially silenced. The demonstrations in the streets are either ignored by the press or have resulted in provocation and violence and therefore have been destined to fail. Where is the voice of Ghandi? No wonder the Dalai Lama is sickened trying to purge this world agenda!

In our own ways we must make wise choices in our daily lives. Wherever we can we must not let economics be the sole factor that rules over our decisions. We must walk the talk of peace and know that the wisdom that cries out from our hearts will lead us through these times of despair. To make peace with the planet we need make everyday our workplace. In the small ways of conversation we need to educate one another of the issues that are so overwhelming in the moment. We need perhaps to let food itself lead us back to peace and stability. So at our garlic markets and festivals we need to forge friendships, to answer questions honestly and know this is our battlefield for true change. We need to speak of quality and health and build sanity into our smiles. We cannot be afraid to raise issues and to call for the people and businesses in our communities to make the strides that can change our world. It has and always will be the few that change the many! Peace to you all and may the spring bring you a renewed commitment to grow along with the garlic.

No matter what publication one picks up, an editor seems to begin with some reference to 9/11 and how the world has changed. So, to be different, I'll pick 11/1/01 as another date that has changed this world of ours. This day, to be dramatic perhaps, two twin towers fell, or at least wobbled a bit. On this the first day of the Garlic Is Life Conference, a hefty group of world scientists came and met with the lovers and growers of garlic. A body of established published data came toe-to-toe with anecdotal experience. Maybe this is an extreme view of what may have been other folks' perception, but the truth lies somewhere between these two classically divergent worlds. Hopefully, everyone involved came a little closer to accepting and understanding that none of us is alone in this business. In some senses, the spectrum has widened and yet, at the same time, a type of cohesiveness through communication and respect has resulted. Let's mark some suggested points of agreement:

1. We all share the global effects on soil quality, air and ground water.
2. Different growing systems require different focuses.
3. Seed quality and purity are essential: diseases hurt everyone.
4. Zones and calendars don't tell the whole story.
5. We all need to understand growing a business and the business of growing.
6. We all need to listen and learn and also speak our truth to one another.
7. The whole bulb is greater than the sum of its parts, but the parts have unique values as well.
8. Scales of production seem inversely related to issues of quality and health.
9. Nature vs. nurture—factors of taste and inputs or DNA? What do we really want?
10. The farther from your farm your market is, the more quality and storage matters.
11. The measure of success is much more than money.
12. Garlic terrorism is multinational.

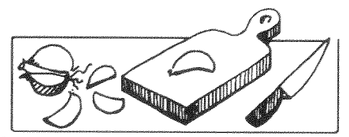
GARLIC SEED

Nothing but assumptions are simple
A seed is a compact unit
A complexity yet expressed
Not hidden though, but not understood.
You stare at the clove and wonder
Figure its orientation
Build the box of logic
Watching the longer storing ones sprout
Long after the time of planting.
Cracking taught you about membranes
Not the why of separations!
The geometry defied itself
Yet strengthened its own integrity.
You assume the duty of roots
Never seeing their networking
Shying away from your own connectedness
And curiously, one day dig.
The clove is gone!
A mushy mystery is all that remains
Above that ring of magic
You've been taught to call a basal plate.
Leaves have arisen branchlessly
While greening fingers reach skyward
Distracting their watcher.
You've read the story of storage leaves
You remember eating an artichoke
Yearning for its base richness
While digging to find its fairy ring.
You stop and wonder awhile, and wait...
Where false seed stalk gleams
No culmination of flower or bud is found
Oh yeah for those hardnecks!

We applaud that topsetting wonder
Learn to not wait for bulbils
Unless we are curiouser yet
To think seeing is advantage...
You've found there are choices
Still every year you wonder more and more
Ask the why of why itself while waiting
And watch and weed and water and still wait.
Tips start dying, a flush has passed
The bluish green splendor is fading...
Again you guess, dig and slice
Or grasp and squeeze or calculate
Percentages of the dead and dying
And knowing the little you know, harvest time comes.
Parables have arisen:
Out of the one come the many
A long phase of crescent moon dust
Now is the fullness of four to twenty cloves.
So in the less lengthy night of no moon we store understanding
Barter and sell stories and suppositions of this stinky sulfur
And celebrate and share it, to accommodate a sense of worth.
Again you remember the seed...
The discovery of impossible fertility
Confronts you from laboratory histories.
It is suggested that you could patent
And cross names, as familiar as your own!
The money changers are assembling
Gathering in their temples of greed
The contracts are made ready...
Nothing but assumptions are real
Except of course the GARLIC!

(B.D.)

La Cucina



Garlic in My New Kitchen

I recently bought a small restaurant. This is the first restaurant I have owned. I have worked for many restaurants and hotels in the past 18 years, which has helped me to understand the business in every aspect. Working for a restaurant owner never gave me enough satisfaction and gratification as working for myself. Now I have the chance to run my restaurant in the way I prefer.

In the kitchen now, I can finally cook the food in the right way, with the right equipment that I chose, following my techniques, and above all, using only the freshest ingredients. Nothing comes already prepared, canned, or frozen. Every day's menu is seasonal and prepared from scratch, and a lot of times, to order. In this way, my cooks and I learn more about the product by understanding it and respecting it. Only by this method can we choose the best ingredients, because, after all, you cannot make good food with mediocre or bad ingredients.

The same argument can be applied to the garlic. I know the garlic is never the main ingredient, and is never the "star" on the plate, but in my kitchen it is in 80% of my dishes. A lot of the time one wouldn't even know there is garlic in the dish, and it is subtlety used. I make sure the garlic is fresh, like the other ingredients, that it is firm to the touch and has a nice aroma. I keep the cloves ready to use and we peel them only when we are ready to use them.

The following are a few answers to some questions that readers have asked.

In a large establishment with a big kitchen, the dishwasher or prep cook peels the garlic. Any time of day is sufficient for this. In a well organized kitchen, whoever is in charge of peeling the garlic will make sure that you have enough quantity always available for use on the line, although most of the large establishments that use a lot of garlic will buy jars of already peeled cloves. The taste is definitely different. It loses the aroma and it goes bad much quicker.

In my kitchen, we buy only fresh garlic and peel it when we are ready to use it. Most of the time I use a whole clove lightly smashed, add it to the preparation while it is cooking, and then remove the clove before serving.

The amount of garlic I use doesn't change with the season; it is the ingredients that make the dish that will change seasonally. I may change the amount of garlic used depending on the dish itself or the kind of ingredients I am using for the dish.

Buon Appetito!

Alberto Vanoli
Chef/Owner
Ristorante Locust Tree
New Paltz, NY 12561

BAGNA CATIDA

A typical dish from the Piedmont region of Italy, in the northwest, this dish is a great starter to a dinner and a fun hors d'oeuvres. It is a sauce served in terracotta dishes, and vegetables - cooked or raw - get dipped into it. The sauce must be hot all the time, so the dishes are served on little burners (fondue style).

Raw vegetables may be: endive, escarole, artichokes, small cabbage leaf.
Cooked vegetables may be: potatoes, squash, beets, onions.

Per each guest:
- 1 Tbsp. Olive oil
- 1 each anchovy
- 3 each garlic cloves

Slice the garlic very fine (or chop it), and cook it in the oil with the anchovies at low heat.
Do not brown the garlic. Cook it until everything blends together, for about 10-15 minutes.
Serve it in little dishes, one for each guest.

[Note: Got a question for the Chef? Alberto has volunteered to answer any questions you might have relating to his use of the garlic, his tools, or recipes. Send them to GSF Rose, Attention Alberto, and if you're in New Paltz, NY, stop in for a great dining experience! (D.S. com)]

Garlic Recommendations (continued)

Curing garlic is the process by which the outer leaf sheaths and neck tissues of the bulb are dried. Warm temperatures, low relative humidity, and good airflow are conditions needed for efficient curing. Under favorable climatic conditions in California, the garlic is usually cured in the field. Curing is essential to maximize storage life and have minimal decay.

Garlic flavor is due to the formation of organosulfur compounds when the main odorless precursor alliin is converted by the enzyme alliinase to allicin and other flavor compounds. This occurs at low rates unless the garlic cloves are crushed or damaged. Alliin content decreases during storage of garlic bulbs, but the effect of time, storage temperatures and atmospheres has not yet been well documented.

Pink Garlic Gets More Respect

The Furrow, December 2001

Like pink champagne, pink garlic is held in higher esteem than its white counterpart. Its strong aroma holds up better during cooking, and when eaten raw, its flavor is less sharp.

In France, the average yield of pink garlic is nearly 2 tons per acre, half the yield of white garlic. "In the first year, we can get 3 tons per acre, but it"s not all top grade," says Alexandre Garibal. Six of the 25 acres of garlic he grows near Lautrec, France, are the pink variety.

Prices are highly dependent on garlic markets in Spain, Europe's leading producer with 243,000 tons of output annually. Imports from China, which produces a whopping 5.5 million tons per year, also have a huge impact on world markets. But in general, pink garlic brings three times the price of its white cousin.

Garlic Supplements May Block AIDS Drug

Finger Lakes Times, 12/7/01

WASHINGTON (AP) — Garlic supplements, often taken in hopes of lowering cholesterol, can seriously interfere with drugs used to treat the AIDS virus, a new federal study concludes.

The study makes garlic the second popular herbal remedy found to interact dangerously with prescription drugs. Experts already warn that St. John's wort, which claims to ease depression, can block the effectiveness of several drugs, including AIDS treatments and a medicine vital for organ transplant recipients.

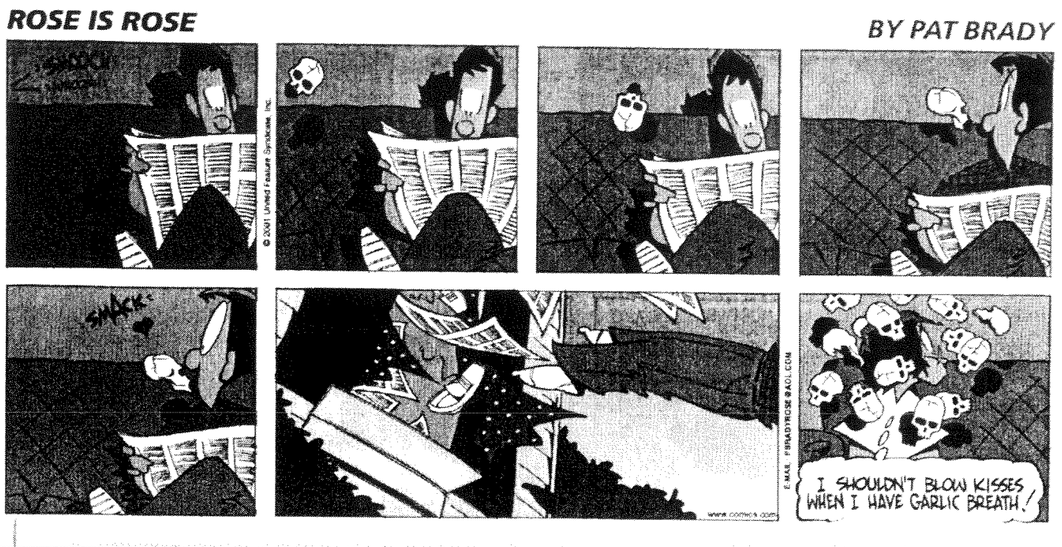
"Doctors and patients should not assume that dietary supplements are benign therapies," wrote Dr. Judith Falloon of the National Institutes of Health, co-author of the garlic study.

NIH researchers recruited 10 healthy volunteers—people who did not have HIV—and gave them doses of an AIDS drug called saquinavir. Saquinavir is a protease inhibitor, one of a class of potent drugs credited with helping thousands of patients battle HIV and live longer lives.

HEALTH - *Safe Surgery*

(*Rochester Democrat & Chronicle*, 1/29/01)

If you're about to have surgery, don't be surprised if your doctor tells you to stop taking certain herbal and natural products. A report in the *Journal of the American Medical Association* lists eight common herbal remedies that may cause complications. The report includes recommendations on how long before surgery to stop taking herbs, including ephedra (24 hours), garlic (seven days), ginkgo (36 hours), ginseng (seven days), kava (24 hours) and St. John's wort (five days).



GARLIC IS LIFE FESTIVAL

Well as you all may be aware this was the third and most expansive conference and symposium yet in Tulsa. It has been more difficult than usual for me to look at what happened objectively and report to those of you who could not attend. There is something coalescing here that can only be seen perhaps as a whole than in its separate parts. Darrell Merrell is to be commended once more for pulling off an even greater assemblage of folks that cover the garlic spectrum. It was the first time also that the growers were given a full day to explore the issues that are common as well as to realize that geography and climates make growing a challenge to all.

The first day worked into a split agenda that had the health benefits of garlic in the morning, followed by an afternoon dedicated to cooking with garlic. Beginning with our good friend Eric Block from SUNY/Albany we were treated to Eric's always entertaining slide show of chemistry mixed with National Enquirer headlines and great art! Next up was David Mirelman, a biochemist from the Weizman Institute in Israel. They are really doing some astounding research on pathogens and have synthesized a stable form of allicin which has a great deal of promise in many areas, including the possibility of replacing methyl bromide as a soil sterlizer. He also showed us a new way of targeting cancer cells using monoclonal antibodies which bond directly to an antigen. It really was a treat to have such a dedicated scientist grace us with an overview of his work. Larry Lawson was the next speaker and our readers will recognize Larry from his work with Grace Reynolds as well as his work GARLIC-The Science And Therapeutic Effects of Allium Sativum. Larry no longer works for Natures Way but this certainly has not stopped his research. He took us on a tour of the world of garlic supplements. He also did review some of the work with Grace Reynolds and showed us there is variation in allicin content that is related to harvest date. Softnecks do not produce as much allicin as hardnecks in general, however there is quite a range of results within the topsetting garlics. For growers it may be wise to watch but clearly the maximum on allicin was reached about two weeks later than most of us harvest.

Lunch turned out to be the first course of the day as it was followed by three food presentations. One was by a local Tulsa chef, followed by Liv Lyons who whipped up some very tasty samples and made a nice presentation on pickling garlic and making relish. The third speaker for the afternoon was William Woys Weaver, food historian and contributing editor to Gourmet Magazine. He did a wonderful job of giving a presentation on his current focus which is the culinary history of Cypress. He did an original local version of Skordalia which is a lenten feast using vinegar, wild thyme, carpathian garlic and special homemade bread. He was adamant that one cannot take food away from lifestyle and even on a small island there are incredible variations and techniques. All in all it was a wonderfully tasty afternoon and one that lingered well into evening!

The second day was a speakers forum that ran a real gamut of focus and experience. Unfortunately the details of each speakers work would take up an incredible amount of time and space and as the sessions were videotaped, hopefully we all will have access to the details of this day. Briefly, the day began with special guest Peter Hanelt,Ph.D of the institute of plant genetics in Gatersleben, Germany. He is a world renown collector of plants and has completed a life's work of cataloging a 6 volume edition of *Mansfield's Encyclopedia of Agricultural and Horticultural Crops*. He did a very nice slide presentation. After a break Maria Jenderek gave us an update on her work with garlic seed production and some of the anomalies she is working through in growing out the true seed. She also covered geography of garlic as it spread from its sites of origin. Next we had Patty Martin, who flew in from Washington state to recount her trials and tribulations with exposing hazardous waste in fertilizer.(please see book review in this issue) After lunch We met with two old friends, Phil Simon and Rich Hannan who were both back after a years absence. Phil brought us up to date with his DNA work in fingerprinting garlics and continuing to let us know that by any name there are only so many garlics. Rich followed by showing us the storage system he developed at the USDA site in Pullman Washington where the government garlic collection is maintained. After a break we had Gayle Volk from Fort Collins who took the other extreme in garlic storage for the government by using cryopreservation. Certainly not a do it at home strategy but interesting in realizing the future of seed storage. The final speaker of the afternoon was Bill Randle from the University of Georgia, where he has done great work with the Vidalia onion growers. He did a special section on flavor intensity and quality in alliums and how the environment and cultural habits and inputs can have profound effects on flavor. Variants like temperature and nitrogen certainly do make the taste of garlic change. All in all it was a heavy science day but one of great value to all.

The growers conference was scheduled for the last day, before the festival that was open to the public. John Swenson who was our extra special guest of honor and coordinator of the symposium spoke a few modest words. He certainly is to thank for the years of citizen science and research he has contributed to the garlic world. We had a full spectrum of presenters this day also as Ron Voss from U.C. Davis did the general overview of growing garlic California style and his work with the garlic industry. Walt Lyons was as usual all over the place both coordinating the growers day and videotaping and we all have him to thank for doing a great job with audio visual work and getting the speakers together. John Zandstra from University of Guelph did a session on the garlic growout in Ontario ,Canada. This was followed by a presentation by Fred Crowe from OSU on garlic diseases. Always a scary subject to growers this is an area that we need to all keep up with and explore together. There are some nasty organisms out there that can really impact your operation and we thank Fred for his slides and time to talk about some of them. Throughout these presentations we opened up the floor to questions and answers and really tossed the bulb around. After lunch we saw things from Richards Smith's perspective who represents Garlicsmiths of Kettle Falls, Washington. John Turner of Ag-Org talked about his formulation of poultry litter based organic fertilizer and Walt Lyons did a session on marketing garlic from his highly successful business at garlicstore.com. Bob Anderson from Bangs Texas was a key moderator from the southern view of garlic and also is a web savvy entrepeneur. David Stern filled out the days agenda with his usual deep insight into the real world of organic, sustainable garlic and vegetable growing. Though his topic was industry issues, as the final speaker it was nice to see the program finish off with David as he certainly is knowledgeable and a very conscientious grower.

The final day was of course the festival, where the folks of Tulsa come around to see what all the ruckus has been about. Each year the public there has continued to be more educated about our product and it is really good outreach to have representatives from all the aspects of this culture and cult of garlic to be there and to be accessible. Thanks again Darrell for again getting festival of the year cudos from the GSF. As he would love to remind us,"it just keeps getting better!"

(B.D.)

BOOK REVIEW

Fateful Harvest: The True Story of a Small Town, A Global Industry, and a Toxic Secret

by Duff Wilson

"Quincy, Washington, had been a sleepy northwestern farming town until its rest is disturbed by a shocking secret beneath its once-fertile fields: chemical manufacturers are disposing of leftover toxic waste by selling it to unsuspecting farmers as fertilizer. The tainted fertilizer—containing arsenic and cadmium, lead and dioxins—is believed to be destroying crops, sickening animals, and endangering the nation's food supply. And owing to a gaping regulatory loophole, it is completely legal.

"Up against the secrecy and greed of powerful corporations, a local lifelong tomboy and mother of four will make an impassioned stand. Patty Martin begins a fateful journey that will lead to her election as mayor, but also invite the resentment of most of her neighbors for daring to confront the industry that has been Quincy's lifeblood. Martin is joined by a small number of brave farmers who bring ingenuity, outrage, and an investigative reporter to the fight against seemingly unsurmountable odds to expose the truth. They learn that toxic waste is turned into fertilizer around the world, spread on food-growing land, absorbed by plants, and, ultimately, consumed by all of us.

"Duff Wilson, whose *Seattle Times* series on this story was a finalist for the Pulitzer Prize, here provides the definitive account of a new and alarming environmental scandal. *Fateful Harvest* is a gripping study of corruption and courage, of recklessness and reckoning. It is a story that speaks to the greatest fears—and ultimate hope—in us all.

"**Duff Wilson** is a reporter at the *Seattle Times*. His work has been awarded a Goldsmith Prize for Investigative Reporting from Harvard University and was a finalist for the Pulitzer Prize for Public Service. He lives near Seattle with his wife and two children."

At the Garlic is Life Festival we were fortunate to have Patty Martin Fly in from Washington State to do a workshop presentation on this very important subject. The book is a great read and I recommend it to everyone out there. When issues like this arise that affect the very food we eat, we cannot afford to do nothing. Patty summed this up with a quotation from Lincoln: "To sin by silence when they should protest makes cowards of men." Her newest venture is called SAFE FOOD AND FERTILIZER, with a web site you should all see that lets you check up on products you yourself may be using. Her e-mail is martin@nwi.net and the web address is safefoodandfertilizer.com.

Faithful Harvest, Copy © 2001 by Duff Wilson. Harper Collins Pub., 10 E. 53rd St., New York, NY 10022. ISBN 0-06-019369-7.

CURRENT RESEARCH

Over the past year there have been several research projects of interest in planting densities and leaf removal. We asked ourselves many years ago what was the optimal density? how close can you plant? Our criterion was fresh market quality, not tons per acre, because it was very clear that we would grow either quality or quantity. When you start to increase the numbers per square area, the bulbs get smaller due to water and nutrient competition and decreased sunlight for photosynthesis. We found that, yes, we could grow on a 4" x 4" grid, but we couldn't sell 1" diameter bulbs. What we found was that in our area we had to go to a 5" x 10" to achieve 2" to 2½" bulbs. Most of us have good land to use and are able to open up our spacing. We never tested the double-tight in-row with wider between rows configuration that some of you are using. It would be helpful if producers using that spacing would share their observations.

Anyone who has grown an acre knows that removing the scapes can be very time consuming. I've never calculated the costs, but I've tried to sell 500#s of them! (That's why we're enjoying more pickled scapes and scape pestos). But can you do it mechanically? Or more importantly, how much leaf can you lose without bulb reduction? Machines don't know a leaf from a scape, and they don't care. When you use any machine other than your hand, you lose some leaves. Use a tractor-mounted machine, and you can lose a lot of them.

Are the scapes marketable? John Zandstra, from Ridgetown College in Guelph, Ontario, experimented with leaf removal and found that with an average plant leaf area of 500 cm^2, the removal of 1, 2, 3, or 4 leaves was equal to a reduction of 11, 28, 48, and 63% of total leaf area. John theorized that leaf reduction would be related to yield reduction. Exactly right! By removing one leaf at scape removal there was a 13% size reduction and a 17.5% yield reduction! Most of our margins don't allow us that amount of loss.

Last year, John studied and reported that scape removal was necessary for good yields. So, if you're thinking about machinery, consider waiting until the scape erects above the leaves before you cut. Scapes can grow to 15" before yield reduction, but if you don't cut the scapes, you can face 30-35% yield reduction by weight!

Anyone have ideas and experiments on mechanical removal?

(D.S. com)

Garlic: Recommendations for Maintaining Postharvest Quality

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Maturity Indices

Garlic can be harvested at different stages of development for specialty markets, but most garlic is harvested when the bulbs are well mature. Harvest occurs after the tops have fallen and are very dry.

Quality Indices

High quality garlic bulbs are clean, white (or other colors typical of the variety), and well cured (dried neck and outer skins). The cloves should be firm to the touch. Cloves from mature bulbs should have a high dry weight and soluble solids content (>35% in both cases). Grades include U.S. No. 1 and unclassified, and are based primarily on external appearance and freedom from defects. Minimum diameter for fresh market is about 4 cm. (1.5 inches).

Optimum Temperature

-1°C to 0°C (30°-32°F). The variety of garlic affects potential storage life, and the recommended conditions for commercial storage depend on the expected storage period. Garlic can be kept in good condition for 1-2 months at ambient temperatures (20°-30°C [68-86°F]) under low relative humidity (<75%). However under these conditions, bulbs will eventually become soft, spongy and shriveled due to water loss. For long-term storage, garlic is best maintained at Temperatures of -1°C to 0°C (30°-32°F) with low relative humidity (60-70%). Good airflow is also necessary to prevent any moisture accumulation. Under these conditions garlic can be stored for more than 9 months. Garlic will eventually lose dormancy, signaled by internal development of the sprout. this occurs most rapidly at intermediate storage temperatures of 5°-18°C (41°-65°F). Garlic odor is easily transferred to other products and should be stored separately. High humidity in the storages will favor mold growth and rooting. Mold growth can also be problematic if the garlic has not been well cured before storing.

Optimum Relative Humidity

Temperature	0°C (32°F)	5°C (41°F)	30°C (50°F)	15°C (59°F)	20°C (68°F)
ml CO_2/kg•hr					
Intact Bulbs	2-6	4-12	6-18	7-15	7-13
Fresh peeled cloves	12	15-20	35-50		
To calculate heat production multiply ml CO_2/kg•hr by 440 to get Btu/ton/day or by 122 to get kcal/metric ton/day.					

Rates of Ethylene Production

Garlic produces only very low amounts of ethylene (<0.1 μ/kg•hr).

Responses to Ethylene

Not sensitive to ethylene exposure.

Responses to Controlled Atmospheres (CA)

Atmospheres with high CO_2 (5-15%) are beneficial in retarding sprout development and decay during storage at 0-5°C. Low O_2 alone (0.5%) did not retard sprout development of "California Late" garlic stored up to 6 months at 0°C. Atmospheres with 15% CO_2 may result in some yellow translucent discoloration occurring on some cloves after about 6 months.

Physiological Disorders

Freeze injury. Due to its high solids content, garlic freezes at temperatures below -1°C (30°F).

Waxy breakdown is a physiological disorder that affects garlic during latter stages of growth and is often associated with periods of high temperature near harvest. Early symptoms are small, light yellow areas in the clove flesh that darken to yellow or amber with time. Finally the clove is translucent, sticky and waxy, but the outer dry skins are not usually affected. Waxy breakdown is commonly found in stored and shipped garlic but rarely in the field. Low oxygen levels and inadequate ventilation during handling and storage may also contribute to development of waxy breakdown.

Pathological Disorders

Penicillium rots (*Penicillium corymbiferum* and other spp.) are common problems in stored garlic. Affected garlic bulbs may show little external evidence until decay is advanced. Affected bulbs are light in weight and the individual cloves are soft and spongy and powdery dry. In an advanced stage of decay, the cloves break down in a green or gray powdery mass. Low humidity in storage retards rot development. Less common storage decay problems include **Fusarium basal rot** (*Fusarium oxysporum* cepae) which infects the stem plate and causes shattering of the cloves, **dry rot** due to *Botrytis allii*, and **bacterial rots** (*Erwinia* spp., *Pseudomonas* spp.).

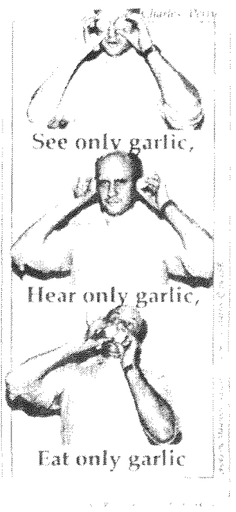
Special Considerations

To control sprout development and lengthen the storage period, garlic may be treated with preharvest applications of sprout inhibitors (i.e., maleic hydrazide) or be irradiated after harvest. Outer cloves of bulbs are easily damaged during mechanical harvest and these damaged areas discolor and decay during storage. Therefore, high quality garlic for the fresh market is usually harvested manually to avoid mechanical damage.

Garlic Leaves, Slowly ....

Think of the top side of a garlic leaf—meaning the side that catches most of the light, and where raindrops bead and fall. There is a glossiness there, a certain shine. The underbelly of the leaf is much duller and less smooth. I think of the backridge of animals being darker and of their lighter undersides—clearly more of a noticeable environmental response to predators and perspective. From the hawk's view there is camouflage by the darker earth, and where there are white bellies, as in fish or mammals, there is an association with sky and cloud that is a protective adaptation. So how does this relate to garlic you ask? Well, let's see to what we can attribute this dualism to leaves as respondents, for survival and for expediency.

The flat and shiny upper sides of our garlic leaves shed the rain into the plant's root zone quite readily. The bottom side is not nearly as hospitable as, say, brassica leaves for egg-laying insects to hide their legacy amongst. The spear-like leaves that bend and droop offer a greater area for the angles of sunlight to be captured during the photosynthetic season, and they are true extensions of the clove bud from which they spring. They also become interestingly expendable early on and impart a great defensive shot of sulfurous warning to scavenging wildlife. For soil-borne disease, they become banners or flags that sacrifice themselves before the bulb or cloves become overtly pathogenic. Interestingly, in my experience, the root systems are more indicative of bulb size than the number of leaves, which seem more variety and degree day specific. One of the enigmas of bed planting, or even condensed row planting configuration, is the issue of shading. There certainly is a point where this impacts the overall results of your crop! The number of cloves seems to be related to extremes of climate and temperature and varies as we see these regional varieties being swapped more and more to very diverse areas.



The sexuality of garlic, which has finally been brought out of more recent research, has left certain important pieces of the bigger puzzle out of sight. One can see that, in a fewer cloved topsetting garlic, each individual clove is more challenged and endowed with survival mechanisms and, therefore, backed up with bulbil production. In hot-weathered multi-cloved types, the exigencies of culture hints at overdomestication, inducing a lapse in this survival strategy except in situations of heat or water stress that can result in a backup production of a few midstem bulbils that seems to be, perhaps, a plant's dejá-vu of a not so fertile memory. Specifically, in artichoke types one sees the outer "toes" as having the greatest investment in survivability. We are so prone to viewing this garlic world in numbers—a socioeconomic astigmatism indeed!—especially when we view more productive varieties because of their multiplication factors based on clove/gram ratios, we blur the lines. Just as fewer cloved types seem less productive, their vigor and clove size can easily offset the fact that a silverskin may produce a 15/1 ratio, but the usability to a chef or consumer is certainly limited conversely. Getting back to survival skills, however, and seeing the individual garlic plant as a unique community, we can begin to acknowledge that there are different perspectives.

The idea of "perennial" garlic comes and goes with insidious laziness by the gardener. Yes, left to itself garlic will survive communally, but in a relative "specie" way it will expand and contract due to space constraints. Obviously, less space means smaller and smaller cloves until, in the case of older, abandoned farm areas, we see garlic the size of grass leaves. When resurrected and coddled for a few years, the bulbs will size back up, but it does take time. Topsets will widen the circle of perennial constancy quicker, but whether there is any specific evolutionary advantage is arguable. To a predatory scavenger, the sulfur attack is lessened in greater populations, as there is less need, collectively, to repel the tasting tongue, but the lone enclave of one bulb must muster its own defenses to the sulfurous manifestation of hell-fire! Wrapper leaves, which is the internal counting of leaves, seems to protect in areas of greater heat and longer, more extended seasonal growth due to the higher incidence of dissolution indicative of those climatic zones. Cold, being more of an insulating factor, seems to unburden the cold hearty, fewer leafed strains; however, in the case of heavy rains or wet soils at harvest, situations may turn dire if not watched on a daily basis.

There are also very interesting membrane configurations that can be shown to have specie-specific utility. In the cold climate garlics that are topsetting, the hemispherical membrane seems to be a type of reinforcement like a piece of rebar in a pad of cement. Structural integrity is the essential intent of these configurations, and when the multi-cloved varieties are studied, the whorls become segmented in ever more complex combinations that still imply integrity. What also seems to be happening is the segmentation that happens in softnecks would allow part of the bulb to be sacrificed to the indulgent scavenger, while still assuring the survival of part of the bulb. Like a rhizome that separates laughingly in the face of eradication, we must learn that these plants have thousands of years of adaptive response built into their systems.

One final topic of interest is the midstem bulbil in softneck garlic that seems to occur during period of heat or water stress, or in some varieties more than others. Here we come to a quandary and can see a more fractious set of possibilities. When we allow for the concept and reality of fertility in the development of true seed, we can put bulbil production into a new light. Perhaps the illusion of limitation that is assumed with the inference of the asexual nature of garlic is reaching a new paradigm with our newer techniques and technologies. It may turn out that as we reintroduce the viability of seed production, in the FI and later generations we will come to see that bulbils will become more and more of a recessive trait. Just as in the mechanism that induces the midstem bulbil, we are seeing an ancient immune/survival response that we do not normally tend to focus on. Anyway, enough said. It is truly an interesting subject as a whole, if we look at seed or bulbil, vegetative or propagative utility, etc. In the end we must relegate the inevitability of change, not only to ourselves, but to all else with which we share this life. (B.D.)

Stinky Replies

I enjoyed the Tulsa, 2001 Garlic Growers Conference very much. Sure was a lot of knowledge and experience there.

In a previous veggie garden plot I planted 3 beds, 2' x 60', more or less—some Silver Skins bought at local supermarket and some Nootka Rose from Filaree Farms, plus a few Ajo Rojo cloves, about 1,000 cloves in all, 12 pounds or so. Soil is rich sandy loam about 6" deep over one foot of sandy soil and rocks. The only fertilizer I know of is last year is a pickup truck load of local sale barn cow manure.

I planted and mulched with sale barn hay bales. Wow! I could have grown wheat with that stuff. I had to remove the mulch and pull the wheat grass then replace the mulch. Next time I'll sure use something else. Planted at approximately 6", spacing 4 rows to a bed.

It seems that all cloves have sprouted and everything looks well. Soil is damp. Next year I can expand. Sure don't want to get into more than I can handle, as help is hard to find. Here it's all by hand.

So far I have an outlet for my garlic. Depending on yield, I may put ads in local newspaper.

I am a beginner, so my knowledge about garlic is limited, but growing.

Bill Thompson
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P.S. I do not use any chemicals—everything is organic!

THE FARMER'S SHARE OF YOUR FOOD DOLLAR!

Item	Price	Farmer's Share
Gallon of milk	2.89	1.07
A dozen of eggs	1.09	$ .63
Sirloin steaks	$4.99 per lb.	$ .68
Corn Flakes cereal	$2.49	$ .09
10 lb. potatoes	$3.09	$ .68
Lettuce	$ .75 per lb.	$ .15 per lb.
A loaf of bread	$1.69	$ .04
Orange juice	$1.59	$ .39

Courtesy of Tioga County, New York, Farm Bureau Promotion Education Committee

Elmer

This is one of those articles that I have been promising myself to write for about two years. You know how things go and how we tend to put things off ... well here goes.

Elmer Dodds has been growing organic garlic for a long time and lives about a quarter mile from me. About five years ago we were doing variety trials with Jim McFerson of the USDA germplasm lab in nearby Geneva, NY. He moved out to Washington state to head up the research directorship of the Washington State Apple Growers, and I was in dire straits to find enough land to do the trials. After finding myself tying up about 75% of my large backyard garden space in trials, I knew I couldn't go back to that space and, through the meetings we have had over the years, I had come to know Elmer. Well, it couldn't have turned out better, as he offered to work with me and give me plenty of land to work on.

Stanley, NY, is an old farm community that has turned to almost a ghost town since the days that farmers shipped produce by rail. All we have left is a post office, fire hall, two churches, and a mill house. Elmer has been around a lot longer than I, as he is 72 and I'm a newcomer living here only 20 years! What makes this area and hamlet nice is the way folks get along. Elmer has bottom land along Flint Creek that is good for some crops but not the best for garlic. He has managed to work a deal with two of our neighbors to work a 9-acre and about a 5-acre piece of land in return for keeping the weeds down and mowed. Having grown up in Kansas, Elmer knows heavy equipment and farming. He has a farmer's natural wisdom and eye, and for a young 51-year-old upstart like me, coming from a gardening background, it has been a great opportunity to experience the differences of row cropping and learning to work at the farm field level. Not only has Elmer cover-cropped extensively for years to build a loamy clay soil from old neglected fields, but to meet someone of his generation that was so sold on organics was indeed a delight.

One point that initiated this article in my mind for a long while is the theme of partnership. As much as we lament environmental degradation and specie extinction and endangerment, the loss of the wisdom of our elders is often unrecognized. Elmer knows everything that grows or moves on those three pieces of land and has shared and taught me so much. Coming from a college background, it seems that for someone like me, the chance to partner with Elmer is a perfect situation. Basically, he fits the field and runs a 50-inch tiller off his Kubota only once over the field, then marks the rows for me. He used to use an old corn planter for this, but now has designed and welded up an attachment of steel that allows for two shoes or sweeps that fit between the 40-inch wide beds on which we do two rows of garlic. He uses two straight pieces of steel like a middle buster to mark the furrow for planting and then for cultivating uses the shoes with two on the outside and one in the middle that leaves me with only having to hand weed in the row. To harvest, we have left the old potato harvester behind and use a single shoe to go under and lift the bulbs for harvest, one row at a time. After that you only need to pull and gather the plants. The potato digger did a lot of bruising, and in dry days threw a lot of heavy clods of dirt with the garlic, and even taking off the chains was not the best system. Like Elmer says, "Just about the time we finally get it right we'll be too old to want to plant as much as we do now."

Well, old Ken owns the 9-acre piece of ground we work and is quite a hermit. Even when he is home, he won't come to the door. So it got to be October and we at least liked to check to see that it's okay to go another year. Well it was a Friday morning when Elmer's wife Peg called and said Ken gave us a thumbs up. I went over on my lunch and had coffee with Peg and Elmer and set it up to meet early Saturday morning to start planting. I got up and got two of my boys and headed over to Elmer's. There was a sheriff parked out front, and as I approached Elmer walked out. He said, "I lost Peg this morning! She had come down in the night and laid on the couch. Elmer had gone over to let her know he was heading out. When he shook her, she was limp.

Peg was a wonderful person, kind and loving, and a great partner for him. Many of you might have gotten to know her over the years at festivals and meetings and know her warm smile and gentle nature. I was dumbstruck, and I told Elmer I would take the boys over to the diner and give him some time to sort things out and make some phone calls. One hour later we were coming back down Flint Road and I spotted the tractor pulling off the field and into the road. Elmer lifted his arm to say more than he could put into words. I still get a lump in my throat thinking about this ... In the midst of the hardest moment of his life, Elmer had driven to the tractor and marked out about 12,200 foot rows to get me going. I suppose he went to the one thing he had left nearby (besides family), to the land, the sky, and his work.

I feel so blessed to know Elmer and Peg and how much we have shared over time. I don't think I could ever expect to find a better friend or farmer as a partner, and I encourage any of you who are younger and want to expand your operation to take a look around you. There are a lot of retired folks who have a lifetime of wisdom to share and can create possibilities in your life like I have had in mine. Thanks Elmer, for everything.

(B.D.)

UPDATE: MOSTLY GARLIC

Doug Urig, editor of *Mostly Garlic* magazine, has indicated to us that there is little chance he will resume publishing in the near future. He is "making good" to the best of his ability. We wish him well and suggest that you contact him with any concerns. It was a dandy publication while it lasted ....

GOOD NEWS FESTIVAL

After feeling the sadness of our national tragedies in New York, Washington, DC, and Pennsylvania since September 11th, going to the Garlic Festival in Saugerties was a wonderful respite. It was the first time since the terrorists' attacks that my husband Bill and I felt truly safe. As soon as we walked onto Cantine Field and glimpsed the festival, we began to feel good once again.

Naturally, the first tent I stopped at was the one for the Garlic Seed Foundation. I cheerfully walked up to our Director, David Stern, to chat and I felt warmness in my heart. I am happy to report that David looks well and he is working as hard as ever. I now have an official *Garlic Press* t-shirt, which I shall proudly wear as one of the columnists of this newsletter. After talking to David, I listened to Ted Maczka"s exuberant lecture on how to grow garlic. One of the best qualities of garlic growers is their willingness to share their knowledge on how to grow garlic. Everyone at the festival is happy to help our his/her fellow garlic growers.

This year, I purchased garlic for Ray Cain, Jr. Ray lives in Hindsboro, Illinois, and grows garlic for his retirement community. Ray couldn't attend the festival and he asked me to purchase garlic for him. I purchased German White, Music, Romanian Red, Sicilian, and Polish bulbs to send to him.

I also spent time with Matt Gambino of Gambino Garlic Growers. Matt's parents came from the same village in Sicily that my grandparents came from. As soon as I spoke to Matt, I realized that he had the same tone of voice as my Dad (who passed away three years ago), so it was especially wonderful to listen to Matt speak. Naturally I bought some of Matt's garlic. Matt very graciously gave me some of his homemade red wine. When we came home, I made delicious roast pork and my husband and I toasted Matt when we drank his wine.

We will be planting our 2002 garlic garden on Saturday, October 6th. As usual, our son Gus, his children, and our daughter Tamar will help with the planting. Bill and Gus will dig the holes and our grandchildren, Allison and Caroline, will drop the garlic cloves into their designated beds. Allison and Caroline will run barefoot back and forth over the garlic beds to pat down the soil. We'll all laugh and take photos of our happy family time. Then we'll cover the entire garden with straw and put it to sleep until the spring.

We wish all of our fellow garlic growers a good planting season!

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"Would anyone think of investing in genetic engineering biotechnology if they knew how fluid and adaptable genes and genomes are? The notion of an isolatable, constant gene that can be patented as an invention for all the marvelous things it can do is the greatest reductionist myth ever perpetrated."

Mae-Wan Ho
from *Genetic Engineering: Dream or Nightmare*