

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



The Garlic Press



SUMMER/FALL 2012

www.garlicseedfoundation.info

#51

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Cornell University Cooperative Extension
Garlic Post-Harvest Study – Year One

Garlic is a \$20 million industry in New York, and it represents an important and growing niche crop across the Northeast. As the numbers of garlic growers and acreage in garlic have increased, the number of diseases associated with this once trouble-free crop have also increased. Nearly 25% of growers surveyed in 2011 indicated they have lost 30% or more of their garlic crop at least once in the last five years.

Diseases such as Botrytis neck rot, Penicillium and surface molds such as Embellisia Skin Blotch and Aspergillus are common in curing areas with variable moisture, such as barns and sheds. Effects of poor post-harvest treatment can be devastating. The simplest way to address issues with post-harvest diseases is to change the environment where garlic is cured. Based on the research available and consultation with the Garlic Seed Foundation, a series of treatments were developed to test this hypothesis.

Hypothesis: Optimizing post-harvest handling of garlic will reduce post-harvest loss and improve seed stock.

Treatments used to test hypothesis		Treatments were combined in all possible ways so that we could examine the effects of each separately and in combination. All treatments were compared to curing uncut in an open-air structure such as a shed or a barn. Each treatment was either applied to a ten pound sample or on an 8 foot piece of bed, averaging about 46 heads per sample. The trial was replicated on three farms.
A	Trim Roots flush with basal plate	
B	Trim tops to 6" long	
C	Wash	
D	Cure in High Tunnel	
E	Cure in open-air structure	
F	Leave Roots and tops un-cut	

Three farms were included in ear one of the post-harvest study: two in the Hudson Valley and one in the Mohawk Valley. Treatments were replicated at the three farms, with the exception of top-cutting, which was accomplished using a sickle-bar mower at one farm while the garlic was still in the field and using pruning shears at the other two farms after garlic had been harvested. Details of the treatments are shown below.

- A. **Root Pruning.** Roots were cut while garlic was still moist using a knife or pruning shears. Care was taken not to damage the basal plate.
- B. **Washing** was completed using a garden hose and a nozzle. Power washers were not used. After washing, garlic was air dried before being placed in the cutting area. Garlic was washed until dirt was removed from the bulb.
- C. **Open-Air Curing.** These treatments were placed in solid but well-ventilated buildings such as barns and sheds to dry without supplemental heat from the sun.
- D. **Top Cutting.** Tops were cut to a height of six inches while garlic was green. The mechanical cutting showed some variation in height.
- E. **Curing in high tunnels.** Garlic was moved to high tunnels immediately after other treatments were completed. All high tunnels had a shade cloth and were ventilated with fans, preventing temperatures from exceeding 100 degrees F.
- F. **Leaves, roots and tops uncut.** Garlic was left completely uncut in this treatment. It was spread out on drying racks to leave space for the bulbs to be one layer deep or it was tied into bundles of 6-10 and hung.

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Initial membership in the GSF is \$15/4 issues. Renewals are 8 issues for \$20. All submissions for The Garlic Press should be sent to GSF, Rose, NY 14542-0149 or rjdunkel@yahoo.com. All medical references should be taken for educational purposes and any recommendations should not preclude consulting with a health practitioner. Please, no reprinting any material herein without written permission.

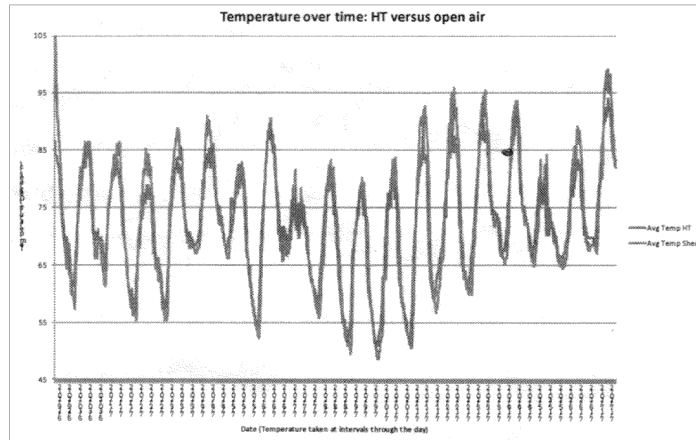
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Garlic Post-Harvest Study – Year One [Continued]

About High Tunnel Drying

The high tunnel drying temperatures for this year were kept conservatively cool, relative to the outdoor temperatures. Temperatures inside only averaged about 5 degrees warmer in the tunnel than outside. Next year temperatures will be increased to an average of 110°F during the day in the high tunnel. Overall this was a warm, dry curing season whether drying in a tunnel or in an open air system. Increased benefits of the high tunnel system are expected in cooler years.

Garlic dryness was rated numerically on a scale of 1-4 from green (1) to roots and tops completely dry (4). Garlic was observed every 3-4 days until all treatments were dry.



Results

High Tunnel vs. Open Air. Across the three trials, garlic in high tunnels dried an average of three days faster in high tunnels than in open air structures. Garlic dried in high tunnels had slightly better wrapper quality (tighter, less discoloration) at one site. Garlic dried in tunnels also had slightly lower disease incidence (*Aspergillus* and *Embellisia*) in two of the three sites, though disease was not severe in any site or treatment. No garlic treatments showed damage from being dried in the high tunnel.

Roots trimmed vs. roots untrimmed. No statistically significant differences were observed between these treatments in regards to bulb quality, weight, or disease incidence.

Tops trimmed vs. tops untrimmed. Trimming the tops mechanically in the field greatly increased the speed of harvest, and reduced the space needed for drying. Top trimming did not have a significant effect on disease incidence in cured bulbs, but there were differences in bulb weight at two of the farms with un-cut bulbs being slightly heavier (Table 1). It is unclear if this difference is due to weight loss or to double bulbs, since the number of bulbs is greater in the treatments with lower weights. Bulb quality was comparable between treatments.

Table 1: Bulb weight comparison for cut versus uncut garlic plant tops.

Farm	Average Weight/ Bulb Tops Cut	Number of bulbs in sample	Average Weight/Bulb Tops Uncut	Number of bulbs in sample
1	0.11	386	0.15	375
2	0.11	346	0.1	365
3	0.12	304	0.14	232

Washed vs. Unwashed. Washed garlic looked very good initially, but became more discolored than the unwashed garlic during the drying and curing process. Most discoloration could be removed by removing 1-3 wrapper leaves, but this extra step is time-consuming. Disease incidence, particularly *Aspergillus* and *Embellisia*, was slightly higher in washed garlic.

Next Steps

- Replicate post-harvest trial, increasing temperature in the high tunnel treatment and reducing humidity at night.
- Complete fertility trial on three farms from the Mohawk Valley to Long Island, NY. Report results in fall 2013.
- Complete weed control trial on three farms. Includes mulches, cultivation and chemicals.

Planting Considerations for Garlic

Without a certification program in place some growers are wondering how they should treat new seed introduced onto the farm. Many growers have been able to find sources of nice, healthy-looking seed from sources who have tested negative for Garlic Bloat Nematode, but this result is not a guarantee that every bulb that the grower produced is GBN free; it is only a guarantee that the garlic used in the test is GBN free! Additionally, new seed may come with *Fusarium* or surface molds. To minimize risk of infesting established seed stock, and to promote healthy and vigorous garlic next year, include a few safeguards and best practices in your fall plans.

1. **Map it out.** Create a planting map for the garlic and separate the new seed from your existing seed stock. The separation doesn't have to be large, since GBN can move no more than one foot in soil. However, if your soil moves, the GBN can move with it, so make sure you plant new seed down hill from established seed to prevent movement with erosion. Also place your new garlic where you will be able to plant and cultivate it last. Avoiding movement of soil around GBN-infested plants to areas with uninfested plants with your cultivation equipment is a key preventative action during the growing season. Label the new garlic clearly in the field for reference next year.
2. **Cull bulbs or cloves with symptoms or damage when crack-ing.** Carefully feel and look at each clove during this process, and remove anything that looks suspect. Discard cloves with unhealthy looking basal plates, with dents or lesions on or under the wrapper leaf, and any cloves that feel unusually light. Do not compost these cloves – either bury them away from the field or throw them away.
3. **Treat all seed with a surface sterilizer.** Sterilizing the surface of the cloves will NOT control GBN! However, it will reduce issues with surface molds such as *aspergillus* and will kill surface penicillium. This is a best practice for all garlic. You can either use a 10% commercial bleach solution (1 part bleach and 9 parts water) or you can use an OxiDate dip (23 pz. Per 25 gallons water). Remember to test bleach and OxiDate dips for activity if treating large amounts of seed, and replace solution when activity decreases. Plant cloves immediately after dipping, not after they have dried back out.
4. **Optimize pre-planting soil fertility.** See Table 1 for Cornell fertility recommendations. All phosphorous and potassium should be applied at planting. Slow release organic forms of N such as alfalfa and soybean meal can be applied at planting. Quick release synthetic or soluble forms of N should be reserved for use in the spring. Optimum fertility and soil conditioning will help keep garlic healthy, and healthy garlic will withstand everything from GBN to *Fusarium* better than stressed, unhealthy garlic.

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[Garlic Post-Harvest Study – Year One [continued]

- Next year, watch new seed closely.** During the growing season, cull suspicious looking plants and have them tested for GBN. Selecting the most suspicious plants gives you the highest probability of detecting GBN, if present. If a seed certification program is developed, farm inspectors will take this step for you. Until then, you can act as your own informal inspector.
- If the seed turns out to be positive,** you can still sell it as food. Use your planting maps to help you avoid planting the area with infested seed into any allium for four years. This is a best practice for garlic in general, so if you can move the whole garlic planting out of alliums for four years that is the best option. After that time you should be able to safely plant garlic back into the ground.

Table 1: Cornell Fertility Guidelines

Garlic	Nitrogen (N) Lbs/Å	Phosphorus (P2O5) Lbs/A					Potassium (K2O) Lbs/A				
		Very low <3lbs/A	Low 3-6	Medium 7-13	High 14-40	Very High >40	Very low <50	Low 51-100	Medium 101-200	High 201-300	Very High >300
Incorporate at planting	0	200	150	100	50	0	200	150	100	50	0
Sidedress before emergence	25-50	0	0	0	0	0	0	0	0	0	0
Sidedress 2-3 times, 3-4 weeks apart	25-50 divided among sidedressings	0	0	0	0	0	0	0	0	0	0
TOTAL	50-100	150	100	75	50	0	150	100	75	50	0

Excess supply of garlic leads to slump in China



The wholesale prices of garlic have been falling since March this year in contrast to the high prices of 2010 (Photo/Xinhua)

Want China Times, 5/14/2012

The wholesale price of garlic – one of the major crops in China – has slumped since March after experiencing an increase in 2010, with prices of many popular varieties, such as Yunnan Da Du and Xiao Du even plunging by more than 30 percent.

Speaking about the reasons for the drop in garlic prices Chen Mingjun, who is in charge of handling garlic market information in China’s Vegetable Circulation Association, said the price fluctuations were the result of oversupply caused by farmers expanding their crops in anticipation of a continuous rise in garlic prices in the domestic market.

“Prices will continue falling if the country is free from natural disasters in the next month, when the garlic harvest is expected,” he added.

Last year, the main garlic production areas in China were hit by a spring chill, leading to a significant drop in output. Market speculation then drove prices to a peak of 11 yuan (US\$ 1.69) per 500 grams.

Although prices started to fall soon after, they were still around 5 yuan (US\$ 0.71) per 500 grams of garlic before the Chinese New Year festival in February.

At the Shaheyuan agricultural product center, which is the major garlic wholesale market in Chengdu, a trader surnamed Li said garlic prices had experienced a sharp decline over the past month. “Currently, the wholesale price of Da Du garlic from Yunnan stands at 3 yuan (US\$ 0.46) per 500 grams, while Xiao Du garlic is selling for 4 yuan (US\$ 0.62). They both registered a more than 30 percent drop of 1 yuan and 1.5 yuan, respectively, from the previous month,” Li said.

According to Xinhua News Agency data on nationwide agricultural product prices, garlic prices began to slide from mid-March. From April 18, prices started to drop rapidly; by May 7 prices had tumbled 8.6 percent.

Chen estimated that this year garlic supply would be high since farmers had increased their crops by 20-30 percent.



OUT OF MY HEAD

Bob Dunkel

The merry-go-round of growing with garlic seems to spin on and on. Sadly, some of the elders have passed centrifugally on to regenerate the care-giving they have learned. It arises anew in the young starry-eyed youths who have inherited this addictive pattern and, like Spring, feel a sense of renewal and the hope of fat bulbs to come. Overall, however, the challenges have not only changed but to some extent increased in this world market in which we have been inevitably enmeshed. As the trees and birds and insects march ever northward, things have changed in ways we still do not fully understand. Here in the Eastern U.S. we used to speak about diseases that were across that divide called the Great Mississippi. We could talk about the sulfur that fell on our fields out of the smokestacks of the Ohio valleys and the rain that just came our way. Then we considered garlic from California as the import crop after our fresh garlic was harvested and sold. Well, as I mentioned that was then....

Now we have shifted in so many ways out of that lifestyle and perspective. Stem and bulb nematodes arrived from a borderless North, and thrips and Iris yellow spot virus have invaded New York State and more. In the last couple years I have run into a couple of cases of the dreaded White Rot that damaged the fields of California and now may be as far flung as Maine. Chinese garlics have become ubiquitous and a bane on many countries that look for seed stock, while their borders have tightened and tariff wars *et al* rage on and on and on.

To beat another drum, even the definition and understanding of the word "Organic" has been convoluted as we invent new fixes for some of the same old problems. The one thing that tethers me to this world is the garlic and my belief that garlic never dies, but some of it has become quite sickly and less medicinal and too cheap! So I ask you, "Where do we go from here?" As much as I enjoy putting together this rag on garlic, as irregular as it is, I realize that we need to be more vigilant in many ways. We need to speak and have a national and even international forum on climate change, or weather wars, depending on our "lean". Scary political machinations, like Codex Alimentarius, are flattening the world, and not in a good way, while most folks that farm the small acres and hunt out their food at farmers markets are being attacked for their lifestyle choices. Soap boxes.

That is why, in a way, we were kicked and dragged into this cyber-world and its offspring: chat rooms, blogs, spyware, endlessly self-infatuating statistics, etc. We hear the words "social networking" and fail to see the net that is containing us! Still, however, the potential is always there. There are still wise ways to grow more and more good food for more and more folks whose wallets and faces have shrunken, and we still have the garlic! I laugh at myself too often when I realize how much and how quickly this dog and pony show ride we are on spins. We go to a lot of garlic festivals and talk with growers and novices and the folks that just have their lips watering over the stinking rose, but again even in those situations things have changed, and not all for the worse! We get a lot of questions from the newbies, like, "Which way is up? When do we plant? What is garlic seed?" etc! But over the years the audiences have also become quite sophisticated and challenge us with, "What the heck happened to this garlic? What cover crop winter kills or feeds the garlic? What new equipment is out there to help plant or

harvest?", and the marketing has gone from dirty or cleaner bulbs and braids to all kinds of product-added garlic-centered dips and vinegars and sauces and sprays. You know the tune.

So again, where do we go from here in this Brave New World? Folks want it all and they want it now, before someone else gets it first. We have been switching over the *Press* to an electronic version for those riding the fast lane, while never forgetting the farmers and others who still read by lantern or in the wee hours when dead tired from a too-hard day's work.

What we do not get, and mostly never did get, is help from you folks, our members. Send us some pictures or stories of how and why you grow garlic. Somebody out there write an article so you don't have to read me filling up the pages for lack of anything better. And you techies that see this cyber-world for what it is, please give us some help to make our group more widely-ranged and more wide-reaching. Festivals are needed more than ever in this economy, and we need you to take this to your churches and town halls and communities as a viable way to gather and have fun and bring in some dough!

One last note in this plea for welcoming in the new, is that we have finally come out with our *Garlic Farmers Cookbook*, and you can help us get this out. Buy it for your friends and try some of our wild dishes yourselves! A few of the recipes are included in this issue of the *Press*, so please let us know how you like 'em or what we need to tweak. But regardless, do not give up on us! We could take this group for a quantum leap or let us oldsters just pass away, stinky as we are, but jump aboard!

MY SUMMER VACATION

Thought I would try a catchy title to get your attention...

The summer vacation period I speak of is the post harvest and drying time leading up to the festival season which is later August thru September. Anyway, this is just an intro into a couple new projects that I played with during that period of time...

The first was trying to get back to an old process that I had played with about twenty years ago along with a now deceased Cornell plant manager. It is a way to make garlic powder using a freeze dryer and even though I did a less than sterling job with details, I wanted to take another shot at determining if this process would be worth the extra costs.

Say, maybe ten or more years ago we saw very little powder at the garlic festivals other than the California companies that tried to move east, but now it would be uncommon to not see a few folks that expand their market and crop into some type of dehydrated garlic. Now, with the surge in those three and four tiered driers that folks use for so many things it has come to be expected. The first angle we took was to decide to play with one hundred pounds of fresh garlic and see where we could go from there. After contacting Cornell in Geneva NY where I had done the project in the eighties, I found that they still had the old vintage unit that I had experimented with but, just in the last year they had updated to a newer and better unit that had a lot more dials and functions. That at least got us moving, knowing we couldn't put the cart before the horse. The next two issues were to decide on 1, 2 or 4 ounce containers and glass or plastic. We decided to work with 2 ounce containers as it was enough to allow average garlic users a good supply and we could figure that roughly about a dollar a piece would ballpark that end of the deal, while figuring that with a computer and a label packet we could come up with a simple label that would show folks what it was and where to get more down the road. Then, we came to the hard part...peeling! Well, sticky fingers or wearing those purple gloves and a knife were not the way to go for us, so after after trying

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MY SUMMER VACATION (continued)

that methodology, we started searching the internet to see if there were commercial peelers in New York State. I should clarify that to say we realized that we were not looking to buy one right off as they run between \$900 – 1400 for the electric versions that run water thru the system and peel up to 66 pounds an hour. We also looked at Chinese systems that used air instead of water but they were thousands of dollars and clearly we realized that we had to figure another way forward. As luck would have it we found one upstate NY grower in Rome NY that does Rome grown garlic and makes a product that mixes olives and garlic or even olives, garlic and hot pepper! These folks proved to be the ticket and were kind enough to give us a call back and let us do a run on the same day that they were going to fire up their unit to peel a couple hundred pounds themselves. It was a cold rainy day that we took the two hour drive to their business location and it turned out to be a fun time for all. It is always a treat to work with garlic folks and see their operations. It turned out that they had bought a used Chinese peeler that worked on a lot of power and used air to do the peeling. They do not normally rent out their unit and had never let others into their processing area, but did allow us to come and check it out. We found that the first issue was temperature and because it was so cold and wet that morning we had to put all the garlic into the top hopper and then it took awhile to actually get it warm enough to get out the excess moisture and get dry enough to peel properly. This peeler works off a vacuum system that drops about a pound of garlic at a time into the area where 8 jets of air blow the skins off and then drop them to a conveyor belt while at the same time sucking off the debris with a vacuum hose into a big trash bag. Two women worked the line along with the two of us poking around grabbing any garlic's that were not completely peeled and tossing them back to run again. The conveyor ended by emptying into a container with water to lessen any bruising and was a beautiful thing to watch! The whole process may have taken three hours but that's with a lot of joking and a tour about the place etc. They charged us \$150 for doing the peeling but said that was lower than they would charge if they did it again.

We were more than happy with the superior end product as there was almost no bruising and no peels at all left on the cloves. We had to strain out the cloves from the water and bag them up for our return journey, thanked them once again and were off. This is where things got really wild. We were on the NY thruway about an hour into our trip home, driving in the fast lane in the pouring rain when BAM we got a front wheel blowout. Long story short since we had no cell phone and no spare tire we climbed the fence and looked for the nearest house and ended up scrambling back over it to meet a NY state trooper after calling a tow truck. I'll never forget the look on the fellows face as he came to my window and as it was rolled down he took two steps back and said..."Is that GARLIC?" "Needless to say he went back to his car to wait for the tow truck and that was priceless as they say...One hundred pounds of now pretty stinky garlic worked the trick indeed!

Round two: this is getting the garlic to the pilot plant, deciding on how thin to slice them and getting them onto racks one layer deep that go into the freeze dryer. Twenty years ago we had run our batch on a Friday nite and got it out late Saturday and dried it at 90 degrees which impressed me but not the professors that came into work in the food lab Monday morning! This time we had more options and basically had to choose between lower temps and longer drying times. It took three days and we had to pay them for

the use of the dryer by an hourly negotiated rate(this because of the serious lack of state funding for these guys nowadays). Anyway, we ended up with thirty pounds of powder after the process. A jug of the water that came off during drying that I hoped to be able to test and some oil that was also a by product of the drying. A couple weeks later I had to give up trying to get anyone to test it as they again had no funding and were under a lot of scrutiny to justify costs etc. That jug of garlic water smelled like moonshine and cooking with the oil was outta this world! Upon final testing we gauged the moisture content of the finished powder at 3.6%. Final cost was about \$450 for all the fun times at both places to again get 30 pounds of powder. Well, a quick online search showed commercial 30 pound lots at between \$150 and \$200, so factoring in the investment in equipment alone easily determined that we would have to really push hard to make any money off the process and most small growers could not find this to be a viable option. A cooperative of growers may be an option, but since this was a fun study done on a hope and a prayer, we had a lot of good Christmas presents this year!

BELOW THE SURFACE

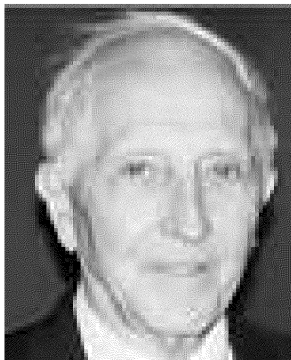
The underground network
Is long established
Before the harsher winds blow
And snows and long nights come.
The cloves roots have descended
More like capillaries
Than the river of arteries
That rush from out our hearts.
These tinier miners of minerals march
Quietly past the giant sleeping worms
Branching in form like silken webs
Yet all connected indeed
To the circle of Life itself...

On the table of the Earth
The basal plate is set
For there, is the heart of garlic
Like the moon, that fat white clove wanes
Yet even when it is gone
And all above is still
Again that plate, still full remains
As the sprout is readied
And the new bulb is defined
Moored and tied by those tiniest lines
That chase the sulfur and calcium find!

It is all a cycle
All a circle of timeless Time
Ever connected umbilically
To this sacred ground.
It holds that self same promise
That each new moon brings:
To envision its wholeness
To pattern perfection
Before the eyes can see
Or fingers feel
The emergence that is Now!

(BD)

Chester J. Cavallito



Cavallito, Chester J. CHAPEL HILL, N.C. Chester John Cavallito, 94, died on March 28, 2010, at his home in Chapel Hill. He was born May 7, 1915 in Perth Amboy, N.J. in 1936, he earned a B.Sc. in chemistry from Rutgers University followed by an M.A. and in 1940, a Ph.D. in organic and physiological chemistry from Ohio State University. From 1942 to 1950, Dr. Cavallito was a research group leader at Sterling-Winthrop Research Institute in Rensselaer, N.Y.

Cavallito is viewed by many as the “father of garlic chemistry” because of the ground-breaking research at Sterling-Winthrop in which he isolated, characterized and synthesized the organic compound allicin from garlic, and identified its antibacterial properties. His seminal 1944-1947 publications in the Journal of the American Chemical Society on this subject are still widely cited today. In 1952, Cavallito moved to Neisler Laboratories where he served as vice president and director of research. In 1966, he accepted a position as professor and chairman of medicinal chemistry in the School of Pharmacy at the University of North Carolina (UNC). Four years later, he left academia to again work in the pharmaceutical industry, this time as executive vice president of scientific affairs, Ayerst division of American Home Products, until he retired in 1978. Returning to the Chapel Hill area, he continued his love of research teaching management interests, and writing by volunteering as an adjunct professor in the UNC School of Pharmacy and as a consultant to various non-profit organizations until 1990. Dr. Cavallito is credited with more than 120 publications and 35 U.S. Patents. He was a member of Phi Beta Kappa, the American Chemical Society, the American Association for the Advancement of Science, NY Academy of Sciences, American Society of Microbiology, and American Society for Pharmacology and Experimental Therapeutics. Positions he held include past president, Academy of Pharmaceutical Sciences, A.Ph.A, past chairman, medical chemistry section of Academy of Pharmaceutical Sciences; and past secretary and chairman, division of medicinal chemistry of the American Chemical Society. Besides his professional interests, Dr. Cavallito also enjoyed collecting unusual items he found at auctions, traveling, and, most importantly, spending time with his family. He is survived by his wife of 70 years, Lucy L. Cavallito, his three children, daughter, Linda Shea of Durham, N.C., son, John Cavallito and daughter-in-law Ann Cavallito of Hillsborough, N.C., and daughter, Sandra Mays of Cheyenne, Wyo. He is also survived by his three grandchildren, Allison Shea and Lauren Lippman, both of San Francisco, Calif., and David Mays of Chicago, Ill. He has three great-grandchildren, Emma, Ana, and John Mays of Chicago.

[Published in *Albany Times Union* on May 2, 2010.]

Epigenetics: How Your Mind Can Reprogram Your Genes How Nutrition Affects Genetic Expression

Excerpted from Mercola.com article

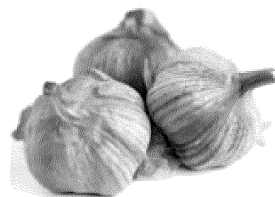
Two years ago, a study performed by the Linus Pauling Institute at Oregon State University was showcased at the annual Experimental Biology convention. The study demonstrated how “histone modifications can impact the expression of many degenerative diseases, ranging from cancer and heart disease to bipolar disorder and even aging itself. According to Rod Dashwood, a professor of environmental and molecular toxicology and head of LPf's Cancer Chemoprotection Program, as quoted in a press release:

“We believe that many diseases that have aberrant gene expression at their root can be linked to how DNA is packaged, and the actions of enzymes such as histone deacetylases, or HDACs. As recently as 10 years ago we knew almost nothing about HDAC dysregulation in cancer or other diseases, but it's now one of the most promising areas of health-related research.”

In a nutshell, we all have tumor suppressor genes, and these genes are capable of stopping cancer cells in their tracks. These genes are present in every cell in your body, but so are proteins called “histones.” As Dr. Jean-Pierre Issa at the M D Anderson Cancer Center explains, histones can ‘hug’ DNA so tightly that it becomes “hidden from view for the cell.” If a tumor suppressor gene is hidden, it cannot be utilized, and in this way too much histone will “turn off” these cancer suppressors, and allow cancer cells to proliferate.

Now here's where epigenetics comes in ... certain foods, such as broccoli and other cruciferous vegetables, garlic, and onions contain substances that act as histone inhibitors, which essentially block the histone, allowing your tumor suppressor genes to activate and fight cancer. By regularly consuming these foods, you are naturally supporting your body's ability to fight tumors.

Certain alternative oncologists also tap directly into the epigenetic mechanism, such as Dr. Nicholas Gonzalez, who uses a three-pronged approach to cancer based primarily on nutrition and detoxification, and Dr. Stanislaw Burzynski, who treats cancer with a gene-targeted approach. His treatment uses non-toxic peptides and amino acids, known as antineoplastons, which act as genetic switches that turn your tumor suppressor genes “on.”



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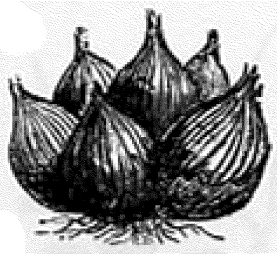
Grow Red Heirloom Garlic

By William Woys Weaver, 7/7/2011

The following is an excerpt from *Heirloom Vegetable Gardening: A Master Gardener's Guide to Planting, Seed Saving and Cultural History* by William Woys Weaver. This definitive, intriguing and educational guide features 280 heirloom vegetables Weaver has grown and saved seed from, as well as recipes, origin stories, and photographs or sketches. In *Heirloom Vegetable Gardening*, Weaver highlights the importance of plant diversity and walks gardeners through sowing, cooking recipes at harvest and saving heirloom seeds. You can order a CD-ROM of Weaver's classic book on our [Shopping page](#) at [Mother Earth News](#).

The early American attitude toward garlic may be summed up by Amelia Simmons's one-line discussion of the subject in *American Cookery* (1796, 12): "Tho' used by the French, [they] are better adapted to the uses of medicine than cookery." The discussion of American Heirloom garlic is about as long. Simply put, among Anglo-Americans

garlic was not well liked. Other ethnic groups used it – the Spanish in the Southwest, the Pennsylvania Dutch, the French in Louisiana – but the Yankee kitchen rarely smelled of garlic unless it was to fumigate for disease. I find this historical disdain contradictory, considering the old Anglo-American love of "rare-ripes," green bulbets of potato onions that were eaten raw with vinegar. This delicacy was just as pungent as garlic, and a lot harder



on the digestion. Nineteenth-century cookbook author Eliza Leslie remarked in one of her books on behavior that garlic was unbecoming because it alluded to certain unpleasant body odors. In an age when people did not bathe with regularity, this may have been the root of the old American dislike for garlic. Now that we do not stink so much, we like to eat it. Of all the alliums grown today, American gardeners are the craziest for garlic, proven medical benefits aside. What many gardeners do not realize is that the elephant garlic, which has gained in popularity recently, is not a garlic at all but rather a type of leek that forms bulbs. It does not have the medical constituents of true garlic. What constitutes a garlic then? There are essentially two types.

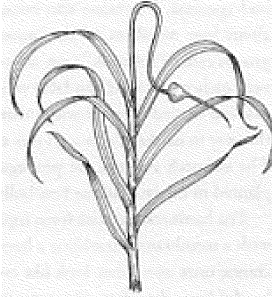
All garlic belong to the genus *Allium* and the species *sativum*; thus if they produce flowers, they will cross. Crosses will occur in the topsets that form from the flowers, not in the bulbs already underground. I mention this because during gardening workshops, many people are confused about how members of the onion family cross. The species is further divided out into two groups called "softneck" (var. *sativum*) and "hardneck" or rocombole (var. *ophioscorodon*). The soft-neck garlics are called braidable varieties because their tops are soft-stemmed and dry into a grass that can be tied together with other garlics to form them into long chains. Garlics are often sold this way in markets, although it is a waste of money if they are a variety that does not store well. The softneck varieties are propagated from bulbs reserved after harvest. All garlics should be planted in the late fall for best bulb development the following year.

The hardneck varieties form topsets on stems that rise up like snakes. The seedhead is covered with a membrane resembling a hood. Before they open, the flowers unroll like the long beaks of cranes; once open, they

look like cobras. I trust these descriptions because they were given to me by children who often visit my garden in groups, and children have good imaginations. These hardneck or rocombole varieties are the ones depicted in medieval herbals. They are extremely hardy and may be treated as perennials. However, they thrive better in rich soil, and do better north of 37 degrees latitude. This type of garlic is propagated from its tiny topsets. They are planted in the ground like onion sets and allowed to grow for two years. After that, the bulbs may be dug and harvested. The small ones are returned to the ground and replanted along with a few new topsets. In this manner, the garlic is maintained for many years.

My burden now is to recommend some heirloom varieties that are easy to grow yet have some historical connection with our culture. We have been flooded recently with heirloom garlics from other parts of the world, and many of these are truly culinary surprises. I think, however, that I will choose three red heirlooms, since white-skinned garlics are common in supermarkets. All three of these are available from the seed houses listed at the back of this book. These firms also offer many of the Asian varieties that I have tried, so it would be worth the effort to obtain their catalogs. I think, at last check, that I have 53 different sorts of garlics, but many of them are so rare that they can only be obtained through [Seed Savers Exchange](#). Lastly, my three choices store well, which is a very important consideration. The fancy white-skinned garlics are not always good keepers, as many cooks already know.

German Red Garlic (Rocombole) *Allium sativum*, var. *ophioscorodon*



This is a medieval garlic strain that was brought here by German immigrants in the eighteenth century. It is a vigorous grower, often reaching 5 to 6 feet in height. The leaves are deep green and arranged opposite each other, as shown in the drawing at left. There are usually 10 to 15 cloves in a cluster. The flavor is robust. The Pennsylvania Dutch use the leaves of fall and spring sprouts in cabbage salads.

I will be offering through Seed Savers Exchange in 1997 or 1998 the Maxatawny Garlic, an extremely rare variety of German rocombole garlic that was brought to Pennsylvania by the Moravians in the 1740s. It originated in Silesia in what is now western Poland and was preserved by the Helfferich family for homeopathic medicines. The bulbs are bronze in color.

Inchelium Red Garlic *Allium sativum* var. *sativum*

One of the most productive of all the heirloom garlics, this softneck variety is also an artichoke type. This means that its bulbs cluster in layers like artichoke petals. The variety was discovered on the Coleville Indian Reservation at Inchelium, Washington. It has consistently won high marks (often taking first place) in garlic tastings. From a culinary standpoint, it is probably one of the best of the American heirloom red garlics.

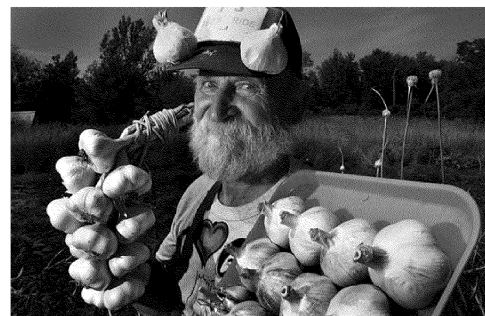
Spanish Roja Garlic (Rocombole) *Allium sativum* var. *ophioscorodon*

Introduced in the latter part of the nineteenth century, this red rocombole type has been consistently popular with kitchen gardeners. The bulbs are about 1 ½ to 2 ½ inches in diameter with 6 to 12 cloves per bulb. It is popular with many cooks because it is easy to peel. It also has a very fragrant taste, much more intense than that of many white garlics. However, it cannot be grown in areas that do not have cold winters.

Check out [Harvesting Our Heirloom History](#) by William Woys Weaver to learn how his see saving lifework began. Illustrations by Signe Sundberg-hall.

[Editors Note: David and I met Will in Tulsa at the Garlic is Life Symposium in 2001. He is a wealth of knowledge and our hats are off to the great work he does in the preservation of heirloom varieties.]

World's Top 10 Garlic Festivals



Got a penchant for the pungent? Then try a garlic festival.

Travel website "VirtualTourist.com" (www.virtualtourist.com) offers its picks for the World's Top 10 Garlic Festivals.

1. **Gilroy Garlic Festival: Gilroy, California**

Visitors to Gilroy can attest that the scent of garlic is in the air before you even get off the freeway. The grand-daddy of U.S. garlic festivals, this one has collected millions of dollars over the years for area charities and hosted over three million visitors in its over 30-year history.

2. **L'aglio di Voghiera: Voghiera, Ferrara, Italy**

Take the Italian countryside, Italian cooking, Italian music, add a little garlic and you have what might be the most blissful three days a human being could ever experience. Among the many wonderful activities this festival offers is a garlic-braiding seminar.

3. **Hudson Valley Garlic Festival: Saugerties, New York**

This festival offers no fewer than five separate experts who give on-site lectures on the topic of garlic. Aside from various food products, vendors offer nearly 70 different varieties of garlic.

4. **Isle of Wight Garlic Festival: Newchurch, Sandown, U.K.**

This festival offers garlic beer, garlic fudge, and garlic ice-cream. And they say England has a bad reputation for food.

5. **Perth Garlic Festival: Perth, Ontario**

Giant bouquets of the "Stinking Rose" are sold here the way cotton candy is sold at other festivals. The festival website even posts a recipe for garlic cough syrup.

6. **La Foire Pail Fum d'Arleux: Arleux, France**

As many as 500 exhibitors set up shop during the three days of the Arleux garlic festival. Focusing on roasted garlic, this festival names a "Best Garlic Weaver" and offers garlic soup as its signature dish.

7. **Takpr International Culture and Garlic Festival: Takpr, Turkey**

Considered the garlic capital of the country, Takpr may be a relatively small city, but it hosts one giant of a festival. Once the festival is over, be sure to explore this ancient town's fascinating history.

8. **Southern Vermont Garlic and Herb Festival: Bennington, Vermont**

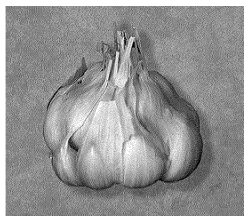
Proving that the New England State is more than just ice cream and cows, the Southern Vermont Garlic and Herb Festival celebrates the area's more flavorful side. Events include Garlic Golf (with a prize for a hole in one) and garlic balancing for children.

9. **Hills Garlic Festival: New Denver, British Columbia**

This gathering even has a garlic poem contest, so for those who have "Ode to a Clove" stuffed in a drawer, now's the time to take it out. Attendees without a gift for the written word may want to consider entering the "Heaviest Clove of Garlic" contest.

10. **Elephant Garlic Festival: North Plains, Oregon**

With a motto like "Fun Stinks" you know this has to be great. Growing from a small festival of just a few hundred people to attendances in the five-digit category, this annual event now crowns a festival king and queen and even hosts its own car show.



Garlic Seems to Ward Off the Luck of the Irish

Roth & Company, PC, March 12, 2012

Trying to make garlic affordable to the Irish proved unwise for a Dublin man last week. From *Irishtimes.com*: *The FAMILY of Dublin food importer Paul Begley, who was jailed for six years for evading tax on Chinese garlic, has expressed its devastation and shock at the severity of the sentence imposed on him.*

What's the problem with Chinese garlic, aside from being delicious?

The 46-year-old was jailed on Friday in a conviction imposed by the Dublin Circuit Criminal Court for what it called a 'grave' and 'huge' tax evasion scheme in failing to pay £1.6 million duty on more than 1,000 tonnes of garlic from China.

Chinese garlic carries a tax, imposed by the EU to protect member states' production of 232 percent, compared to just over 9 per cent on all other fruit and vegetables.

Ah, so Mr. Begley goes away for six years to protect the right of European farmers to overcharge European garlic eaters. So when you are seasoning the boiled cabbage this week, throw in a few garlic cloves for the cause of food production.

Soil Testing for White Rot Could Re-open Onion and Garlic Fields

by Lisa Lieberman, *Onion World*, February, 2012



Andre Boscaro is shown taking test samples

As most California onion growers know, white rot is becoming an ever-increasing problem—one that’s apparently not going away by itself any time soon. Researchers have tried a number of approaches, including using bio-stimulants such as Diallyl-disulfide (DADS) and other new chemicals that have recently come onto the market.

But even control rates of 95 to 98 percent, sclerotia is so damaging, that even a small amount can cause significant problems, including yield losses in the field. That’s why most Allium growers would rather switch fields than deal with this pest.

Running out of clean land

The problem, though, is that growers are running out of land to grow their crops. Eight years ago there were 8,000 acres of fields contaminated with white rot. Now, there’s well over 15,000 acres of land with white rot problems, says Tom Turini, a vegetable crop farm advisor for Fresno County. That’s why Turini, as well as several other researchers, are trying another new approach—one that might very well let onion and garlic farmers back into their fields to begin planting again.

Turini’s new research mostly revolves around mapping hot spots of white rot in garlic and onion fields, treating these specific areas and finding ways to isolate them from the rest of the field.

“If we can map the infested areas by looking at above ground symptoms and soil samplings, we can build substantial buffers around these areas and rather than treating entire fields, we can just treat the affected areas,” Turini says.

It generally costs several hundred dollars to treat an acre for white rot. So, if growers can treat 200 square feet on a 40-acre block of onions or garlic rather than the whole field, that makes much more economical sense, Turini says.

“We’re still at the very early stages of this work, but we envision that we can save whole blocks for onion growers if we can do this mapping,” Turini says.

Andre Boscaro, a farm advisor for Los Angeles and San Bernardino counties, has joined Turini in his work on mapping and studying white rot. Although Boscaro is not a plant pathologist, he has done site work, sampling alfalfa, corn, soybean and onion fields to assess their specific soil nutrient needs. The same techniques, he says, can be implemented to sample soil for sclerotia in onion and garlic fields.

Predicting where the white rot will be

“We’re trying to come up with some methods that can predict where the white rot will occur during the season. This is based on samplings from the early season and previous seasons, and then using that to predict what will happen in future seasons,” Boscaro says.

Boscaro believes that gridding parts of an onion or garlic field could also help predict which general direction the pest is spreading.

“If you have a 160-acre field, and you take one sample for every acre, if the pest has a northwestern attack pattern, you can predict where the disease might show up. Then, you can treat 40 acres instead of the whole 160. The savings you pay for the gridding could make up for the actual treatments in the field,” Boscaro says.

At the moment, no one is sure of exactly how much testing per acre would be necessary to predict such outbreaks.

“We have no idea how many samples we need to collect or how close the samples need to be to each other for an acceptable margin of error,” Boscaro says.

In his nutrient testing, Boscaro might, for example, collect 10 samples per acre on a 160-acre field.

“That’s 1,600 samples and you can find out a lot from that,” Boscaro says. Boscaro has done as many as 12 samples per acre in soybean and corn field to test for nutritional needs of different parts of the field.

In California, many growers will only take one or two samples in a 160-acre block to test for nutrients in the soil.

“But there’s so much variability in the fields. If you look at crops like corn and soybeans in the Midwest, technology has taken off so tremendously that you can do things like monitor yields and measure the flow of grains,” Boscaro says. “You can do positioning tests to investigate why different parts of the field might be producing three times more than other parts.”

Using GPS systems to sync

The information from various machines using GPS systems can then be synced to the fertilizer spreader, which can, for instance, know when to spread 150 pounds of fertilizer versus 250 pounds in different parts of the field.

As a result of his previous work for nutrient sampling in fields, Boscaro says he can do something similar with onions.

“Since we’re collecting the data for sclerotia in onion fields, we can also analyze soil texture for nutrients and the (efficacy of) pre-emergent herbicides,” Boscaro says.

Although the GPS mapping system may sound complicated to some growers who believe they are not Internet savvy, these types of mapping systems have become much simpler and easier to use. They can also help growers increase their profit margins, Boscaro asserts.

California vegetable crops have a high value, so there are many possible applications for GPS mapping. Growers could, for instance, map many types of diseases in different row crops, Boscaro says. This can help them determine where and when to apply expensive pesticides.

As for dealing with the specific issue of white rot, growers could use GPS mapping systems to treat both those specific parts of the fields afflicted with the pest and to isolate or even grow cover crops on these sections to improve the soil.

“If you know where the disease has occurred, you could use that information for soil preparation. You also could even wash the equipment that goes around those areas so you won’t spread the disease in other parts of that field or move it into different fields,” Boscaro says.

Total phenolic levels in diverse garlics (*Allium sativum* L.)

By GAYLE M. VOLK^{1*}, ANN M. CASPERSEN^{1,2} and DAVID STERN³

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CONSUMERS are increasingly interested in the antioxidant content in various foods. Antioxidants may reduce the cellular damage caused by the presence of free radicals. In garlic, the chemical compounds alliin, allicin, allyl disulfide, and allyl cysteine all function as antioxidant protective compounds (Chung, 2006). Alliin is the main sulfur compound in raw garlic and garlic powder (Rahman, 2007).

Ten garlic cultivars (Ajo Rojo, Chesnok Red, German White, Inchelium, Purple Glazer, Red Janice, Sakura, Siberian, Silverwhite, Spanish Roja), representing 10 diverse garlic types (Creole, Purple Stripe, Porcelain, Artichoke, Glazed Purple Stripe, Turban, Asiatic, Marble purple stripe, Silverskin, Rocamboles, respectively) were selected for study (Volk et al., 2004). In 2005, garlic bulbs were obtained for the project from producers in Washington State and were provided to growers in Arkansas, Colorado, Kentucky, Maryland, Minnesota, Nevada, New York, Pennsylvania, Vermont, and Washington. Participants planted the garlic in three replicate plots of 16 plants each, in the fall of 2005 and harvested in the summer of 2006. Morphological characteristics of the garlic produced in this project were published by Volk and Stern (2009). Softneck garlic was also purchased at two local grocery stores in the winter of 2006. Cloves from bulbs were freeze dried and ground as previously described. Purchased granulated garlic (Tone's Spices, Ankeny, IA) and garlic powder (Tone's Spices, Ankeny, IA) were used directly in the total phenolics assay.

The total phenolic content was determined using the Folin-Ciocalteu assay, which measures total phenolic content. The assay measures all compounds readily oxidizable under the reaction conditions (Singleton et al., 1999; Spanos and Wrolstad, 1990). Although results may be affected by interfering substances, it remains the most common method to determine total phenolics in natural products (Singleton et al., 1999).

Although there are some concerns as to how well the total phenolics level estimates the antioxidant capacity, there are many examples of correspondence, and the measurements of total phenolics are perhaps most valuable when used in a comparative manner.

Total phenolics levels ranged nearly six-fold, between 0.40 mg GAE g DW⁻¹ (0.17 mg GAE g FW⁻¹, Silverwhite in MN) to 2.36 mg GAE g DW⁻¹ (0.97 mg GAE g FW⁻¹, Siberian in NV). The overall average level of total phenolics across all garlic samples was 1.02 ± 0.06 mg GAE g DW⁻¹ (0.39 ± 0.03 mg GAE g FW⁻¹). Washington, Nevada, and Colorado had on average the highest levels of total phenolics (across all cultivars) and garlic grown in New York, Vermont, and Minnesota had on average lower levels of total phenolics (TABLE I, II).

The average level of total phenolics ranged from a low of 0.86 mg GAE g DW⁻¹ (0.32 mg GAE g FW⁻¹) for Silverwhite to a high of 1.48 mg GAE g DW⁻¹ (0.61 mg GAE g FW⁻¹) for Purple Glazer (TABLE I, II). Cultivars Ajo Rojo, Chesnok Red, German White, Inchelium, Purple Glazer, and Spanish Roja exhibited no significant differences among locations when the level of total phenolics was calculated on a dry weight basis. Inchelium had an average total phenolic level of 1.07 ± 0.11 mg GAE g DW⁻¹. This value was not significantly different than the fresh garlic values of 1.19 ± 0.41 and 1.00 ± 0.33 mg GAE g DW⁻¹ for the purchased garlic bulbs. The total phenolics level of purchased, processed powdered garlic and processed granulated garlic was 1.07 and 0.64 mg GAE g DW⁻¹, respectively (TABLE III).

Our results suggest that both growth conditions and cultivar type affect the level of total phenolics in garlic. Organosulfur compounds are thought to provide most of the antioxidant properties to garlic bulbs (Okada et al., 2005). The level of organosulfur compounds in garlic is dependent upon cultivar and sulfur fertility (Huchette et al., 2007). Soil amendments varied among the field sites, which may have affected the levels of total phenolics among locations. Our results suggest that higher total phenolic levels are found in some garlic cultivars, such as Purple Glazer and Siberian, regardless of production location.

Although there was a nearly 6-fold difference among total phenolics levels measured for garlic, the values for garlic are lower than those measured for fruits such as plums (3.68 mg GAE g FW⁻¹) and strawberries (2.25 mg GAE g FW⁻¹) (Chun et al., 2005). The results also suggest that the level of total phenolics in purchased garlic powder tends to be lower than that in freshly harvested garlic that was subsequently freeze-dried.

We thank garlic growers Dr. Deborah Allan (Minnesota), Janet Bachman (Arkansas), Eugenie Doyle (Vermont), Noah Gress (Pennsylvania), Leo and Jean Pitches Keene (Kentucky), Shane LaBrake (Maryland), Dr. Walt Lyons (Colorado), Dr. Angela O'Callaghan (Nevada), Frank Parente (Washington), Dr. Carl Rosen (Minnesota), and David Stern (New York) for participation in this project. This project was partially supported by the USDA-CSREES Northeast Sustainable Agriculture Research and Education Program, grant number #LNE05-231. Any mention of trade names of commercial products in this article is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture.

REFERENCES

- CHUNG, L. Y. (2006). The antioxidant properties of garlic compounds: Allyl cysteine, alliin, allicin, and allyl disulfide. *J. Medicinal Food* **9**, 205-213.
- HUCHETTE, O., ARNAULT, I., BELLAMY, C., TRUEMAN, L., THOMAS, B., OCHATT, S.J. and KAHANE, R. (2007). Genotype, nitrogen fertility and sulphur availability interact to affect flavour in garlic (*Allium sativum* L.). *J. Hort. Sci. Biotechnol.* **82**, 79-88.
- OKADA, Y., TANAKA, K., FUJITA, I., SATO, E., and OKAJIMA, H. (2005). Antioxidant activity of thiosulfates derived from garlic. *Redox Report* **10**, 96-102.
- RAHMAN, M. S. (2007). Allicin and other functional active components in garlic: Health benefits and bioavailability. *Int. J. Food Properties* **10**, 245-268.
- SINGLETON, V. L., ORTHOFER, R. and LAMUELA-RAVENTOS, R. M. (1999). Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent. In: *Methods in Enzymology. Oxidants and Antioxidants*, Part A, Lester Packer, ed. 299, 152-178.
- SPANOS, G. A. and WROLSTAD, R. E. (1990). Influence of processing and storage on the phenolic composition of Thompson seedless grape juice. *J. Agric. Food Chem.* **38**, 1565-1571.
- VOLK, G. M., HENK, A. D. and RICHARDS, C. M. (2004). Genetic diversity among U.S. garlic clones as detected using AFLP methods. *J. Amer. Soc. Hort. Sci.* **129**, 559-569.
- VOLK, G. M. and STERN, D. (2009). Phenotypic characteristics of ten garlic cultivars grown at different North American locations. *HortScience* **44**, 1-10.

Table I. Level of total phenolics in garlic bulbs of 10 cultivars produced in plots located in 10 states. Total phenolics are presented as milligrams of gallic acid equivalents per gram of bulb dry matter. Within each cultivar, significant differences across locations are noted by different lowercase letters (a-c). Among cultivars and among locations, significant differences are independently noted by different lowercase letters (v-z).

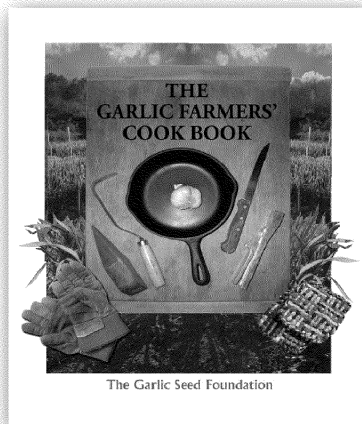
Source	Ajo Rojo	C. Red	G. White	Inchelium	P. Glazer	Red Janice	Sakura	Siberian	Silverwhite	Spanish Roja	Avg.
AR	0.97±0.19a	0.96±0.15a	0.75±0.12a	1.42±0.26a	0.99±0.18a	1.05±0.11ab	n/a	0.96±0.26bc	0.91±0.02ab	0.96±0.10a	1.00±0.06xyz
CO	1.16±0.29a	1.20±0.19a	1.07±0.24a	1.01±0.24a	1.62±0.36a	1.20±0.30ab	1.36±0.19ab	1.25±0.36abc	0.86±0.29ab	1.27±0.31a	1.20±0.06vwxy
KY	0.99±0.16a	1.74±0.20a	1.14±0.40a	1.14±0.40a	1.66±0.33a	1.29±0.24ab	0.77±0.32bc	2.00±0.37ab	0.73±0.20ab	0.87±0.23a	1.24±0.14vw
MD	1.24±0.13a	1.44±0.20a	1.15±0.17a	1.15±0.17a	1.55±0.11a	1.28±0.09ab	1.42±0.15ab	1.54±0.17abc	0.94±0.02ab	1.09±0.15a	1.27±0.07vw
MN	0.76±0.32a	0.84±0.03a	0.59±0.02a	0.59±0.02a	1.05±0.03a	0.78±0.04ab	0.52±0.06bc	0.52±0.01c	0.40±0.04b	0.62±0.03a	0.67±0.06z
NV	1.28±0.08a	1.22±0.06a	1.32±0.07a	1.32±0.07a	1.83±0.05a	1.80±0.10a	1.30±0.04ab	2.36±0.07a	0.97±0.01ab	1.58±0.12a	1.49±0.13v
NY	1.20±0.31a	1.53±0.30a	0.76±0.13a	0.76±0.13a	1.23±0.24a	0.79±0.13b	0.70±0.03c	0.97±0.04bc	0.67±0.04b	0.83±0.10a	0.96±0.09wxyz
PA	0.79±0.17a	0.81±0.22a	1.33±0.27a	1.33±0.27a	1.40±0.33a	1.00±0.28ab	0.90±0.17abc	0.91±0.0bc22	0.60±0.17b	1.25±0.29a	0.98±0.08wxyz
VT	0.89±0.24a	1.05±0.23a	0.48±0.14a	0.48±0.14a	1.30±0.23a	0.80±0.22b	0.78±0.19bc	0.83±0.24c	0.62±0.17b	0.99±0.23a	0.86±0.07yz
WA	1.11±0.21a	0.80±0.08a	1.53±0.27a	1.53±0.27a	2.19±0.65a	1.56±0.29ab	2.15±0.92a	1.57±0.52abc	1.86±0.15a	1.30±0.13a	1.50±0.15v
Avg.	1.04±0.06yz	1.16±0.10xyz	1.07±0.11yz	1.07±0.11a	1.48±0.111a	1.16±0.10xyz	1.10±0.15yz	1.29±0.17xy	0.86±0.12z	1.08±0.08xyz	1.02±0.06

Table II. Level of total phenolics in garlic bulbs of 10 cultivars produced in plots located in 10 states. Total phenolics are presented as milligrams of gallic acid equivalents per gram fresh weight of garlic bulbs. Within each cultivar, significant differences across locations are noted by different lowercase letters (a-c). Among cultivars and among locations, significant differences are independently noted by different lowercase letters (v-z).

Source	Ajo Rojo	C. Red	G. White	Inchelium	P. Glazer	Red Janice	Sakura	Siberian	Silverwhite	Spanish Roja	Avg.
AR	0.35±0.07a	0.40±0.06a	0.36±0.05ab	0.55±0.11ab	0.49±0.08a	0.36±0.05ab	n/a	0.40±0.11b	0.34±0.01ab	0.44±0.04b	0.41±0.02xyz
CO	0.43±0.11a	0.52±0.08a	0.62±0.14ab	0.37±0.09ab	0.83±0.18a	0.41±0.10ab	0.80±0.11a	0.52±0.15ab	0.41±0.14ab	0.54±0.13ab	0.55±0.05wx
KY	0.30±0.05a	0.64±0.07a	0.44±0.06ab	0.32±0.11ab	0.56±0.11a	0.41±0.08ab	0.26±0.11bc	0.56±0.10ab	0.26±0.07b	0.26±0.07b	0.40±0.05xyz
MD	0.34±0.03a	0.46±0.06a	0.43±0.09ab	0.39±0.06ab	0.56±0.04a	0.43±0.03ab	0.58±0.06abc	0.60±0.07ab	0.35±0.01ab	0.46±0.06b	0.46±0.03xy
MN	0.28±0.12a	0.33±0.01a	0.24±0.01b	0.22±0.01ab	0.42±0.01a	0.27±0.01ab	0.20±0.02c	0.21±0.01b	0.17±0.02b	0.27±0.01b	0.26±0.02z
NV	0.41±0.03a	0.49±0.02a	0.71±0.01a	0.49±0.02ab	0.84±0.02a	0.61±0.03a	0.49±0.02abc	0.97±0.03a	0.37±0.01ab	0.87±0.06a	0.63±0.07w
NY	0.43±0.11a	0.55±0.11a	0.38±0.08ab	0.27±0.04ab	0.42±0.08a	0.26±0.04b	0.24±0.01c	0.34±0.01b	0.24±0.02b	0.32±0.04b	0.35±0.03yz
PA	0.29±0.06a	0.36±0.09a	0.38±0.10ab	0.62±0.11a	0.60±0.14a	0.39±0.11ab	0.33±0.06abc	0.36±0.09b	0.24±0.07b	0.59±0.14ab	0.42±0.04xyz
VT	0.33±0.09a	0.46±0.10a	0.37±0.09ab	0.19±0.05b	0.56±0.10a	0.31±0.09ab	0.29±0.07bc	0.33±0.09b	0.25±0.07b	0.47±0.11b	0.36±0.04yz
WA	0.34±0.07a	0.33±0.03a	0.33±0.04ab	0.43±0.08ab	0.83±0.25a	0.48±0.09ab	0.75±0.32ab	0.56±0.19ab	0.58±0.05a	0.53±0.05ab	0.52±0.05wx
Avg.	0.35±0.02yz	0.45±0.03xy	0.43±0.04yz	0.39±0.04yz	0.61±0.05x	0.39±0.03yz	0.44±0.07yz	0.49±0.06xy	0.32±0.04z	0.48±0.05xy	0.39±0.03

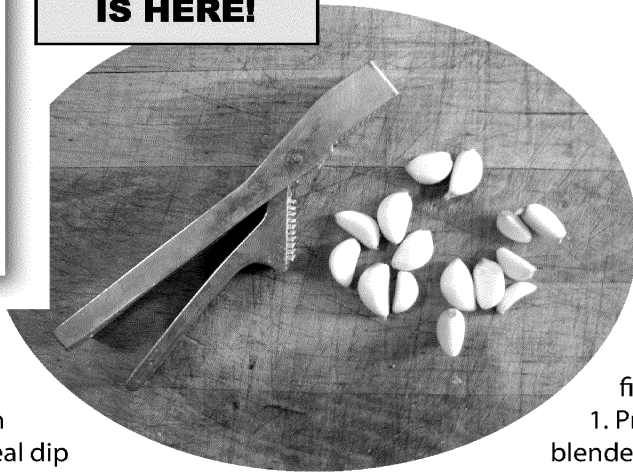
Table III. Level of total phenolics in purchased garlic bulbs and dried spices. No significant differences were detected.

Source	Total phenolics mg GAE/g DW ⁻¹
Fresh garlic store #1	1.19±0.41 a
Fresh garlic store #2	1.00±0.33 a
Powdered garlic	1.07±0.71 a
Granulated garlic	0.64±0.12 a



**FINALLY
OUR
COOKBOOK
IS HERE!**

DIPS, DRESSINGS AND SAUCES



AIOLI--1

This famous garlic mayonnaise comes from Provence in the southern part of France. It is an ideal dip for raw vegetables or can be used as a sauce for fish or steamed vegetables. There is also a Provençal tradition that drafts, germinating garlic or unfaithful wives all cause aioli to fail. So, beware, you are warned!

- 1 tablespoon lemon juice, freshly squeezed
- 1/4 cup salt
- 1 teaspoon Dijon mustard
- 4 to 6 cloves garlic, peeled and crushed
- 1 whole egg
- 3/4 cup olive oil

1. Blend all ingredients except oil in blender until thoroughly mixed
2. With blender running, slowly drizzle in oil in a steady flow until it is all incorporated and mixture is thick
3. If the aioli separates, let it stand for a few minutes, then stir
4. If it curdles, add a little more lemon juice

NOTE: A close relative is aillade, which omits the egg and mustard and adds 2 teaspoons chopped parsley and 2 teaspoons vinegar to the same recipe.

Makes 1 cup

AIOLI--2

This is a simpler version of the Provençal classic.

The egg whites can be used to make meringues for dessert.

- 2 egg yolks
- 3 to 4 tablespoons fresh lemon juice

- 2 cups mild olive oil
- 1 tablespoon chopped fine garlic

1. Process egg yolks in a blender or food processor until blended; add lemon juice

2. With the machine running, gradually add olive oil
 3. The sauce should be thick and emulsified
 4. Stir in garlic
 5. Goes with everything
 6. Add a roasted red pepper, sun dried tomatoes, chopped fresh herbs, or a boiled mash potato
 7. You can also prepare it by hand with a whisk
- Makes 2 cups

BAGNA CAUDA WITH VEGETABLES

This anchovy and garlic dip comes from the Piedmontese region of Italy. Bagna cauda means "hot bath" and is the dip into which raw vegetables are placed.

BAGNA CAUDA:

- 2 cups heavy or whipping cream (or 3/4 cup olive or salad oil, for a lighter dip)
- 3 tablespoons butter
- 3 to 4 (or more) cloves garlic, minced
- 1 (2 ounce) can anchovy fillets, drained and mashed
- 1 teaspoon salt
- 1 teaspoon thyme leaves
- 1 teaspoon oregano leaves
- 1/8 teaspoon pepper

VEGETABLES:

- 1 medium head romaine lettuce
- 1 medium bunch celery, separated into stalks
- 3 medium red peppers, cut into thick strips

APPETIZERS



ALMOND DEVEILED EGGS

- 6 hard cooked eggs
 - 1/4 cup mayonnaise
 - 1 teaspoon Dijon mustard
 - 1 clove garlic, minced
 - 3 tablespoons finely chopped almonds
 - 12 whole roasted almonds
 - Fresh parsley
1. Slice eggs in half lengthwise; remove yolk; set whites aside
 2. In bowl, mash together egg yolks, mayonnaise, mustard, garlic and chopped almonds
 3. Evenly fill the egg whites
 4. Garnish with whole almonds and parsley
 5. Chill until ready to serve
- Makes 6 servings

ARTICHOKE HEARTS À LA GRECQUE

- 1 (18 ounce) package frozen artichoke hearts
 - 1/3 cup olive oil
 - 2 tablespoons lemon juice
 - 1 small clove garlic, crushed
 - 1 small bay leaf
 - 1/2 teaspoon salt
 - 1/8 teaspoon crushed thyme
 - 1/8 teaspoon powdered coriander
 - Dash pepper
1. Cook artichoke hearts according to package directions
 2. Drain and place in small bowl
 3. Meanwhile, in small saucepan, blend olive oil, lemon juice, garlic, bay leaf, salt, thyme, coriander and pepper,
 4. Heat until very hot; be careful not to burn
 5. Pour over artichoke hearts; marinate 10 minutes
 6. Serve warm or chilled
- Makes 6 hors d'oeuvre servings

ARTICHOKE HEARTS WITH PARSLEY

- 1 (18 ounce) package frozen artichoke hearts
- 3 large tomatoes, peeled and chopped

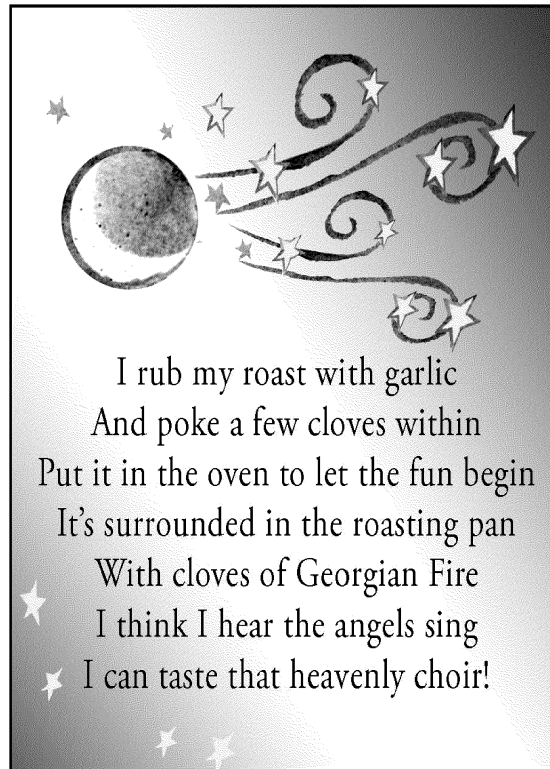
- 1 clove garlic, crushed
- 1/2 teaspoon paprika
- 1/2 teaspoon salt
- 1/2 teaspoon pepper
- 2 cups soft bread crumbs
- For garnish: chopped parsley

1. Cook artichokes according to package directions; drain and chill
 2. Sauté tomatoes, garlic and seasoning in butter 10 minutes, or until thick
 3. Stir in bread crumbs to coat
 4. Cool
 5. Spoon mixture over artichokes and sprinkle with parsley to serve
- Makes 6 to 8 servings

ARTICHOKE SQUARES

- 2 (6-ounce) jars marinated artichokes
 - 1 onion, chopped
 - 1 clove garlic, minced
 - 4 eggs
 - 1/4 cup bread crumbs
 - 1/2 teaspoon oregano
 - Dash hot pepper sauce
 - Salt and pepper
 - 2/3 cup grated Cheddar cheese
 - 2/3 cup grated Swiss cheese
 - 2/3 cup grated Parmesan cheese
1. Drain juice from one jar of artichokes into a skillet
 2. Sauté onion and garlic in juice
 3. Drain second jar, discard juice
 4. Chop all artichokes
 5. In bowl, beat eggs; add bread crumbs, oregano, hot pepper sauce, salt and pepper
 6. Stir in onion, garlic, artichokes and cheeses
 7. Mix well
 8. Bake in greased 9 x 12-inch pan for 30 minutes at 325 degrees
 9. Cut into squares and serve hot
- Makes 108 one-inch squares or 12 three-inch squares

ENTREES & SIDES



AMARANTH STIR-FRY

- 2 tablespoons oil (for example, canola oil)
 - 1 stalk celery, sliced
 - 1 cup mushrooms, sliced
 - 1 carrot, sliced
 - 1 onion, chopped
 - 3 cloves garlic, chopped fine
 - 1/2 cup almonds, chopped
 - 1/4 cup sunflower seeds
 - 2 tablespoons soy sauce
 - 1 teaspoon seasoning or herbs of your choice
 - 2 cups amaranth (or quinoa), cooked
1. Sauté in oil, celery, mushrooms, carrot, onion, garlic, almonds and sunflower seeds until vegetables are tender crisp
 2. Add soy sauce and amaranth
 3. Mix well until warm through
- Makes 4 to 6 servings

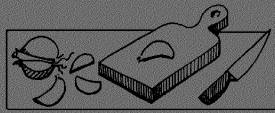
ARROZ CALDO FILIPINO

There are many variations of Arroz Caldo throughout the Philippines. Some use pork, seafood, chicken, sausage, or a combination of these. The name of the dish in Spanish means "Hot Rice."

- 1 chicken, about 3 pounds, cut into small pieces
- 1/2 cup, plus 2 tablespoons olive oil
- 1/2 cup rum

- 3 ounces shrimps, shelled and deveined
- 15 cloves garlic, sliced
- 2 onions, diced
- 3 cups rice, uncooked
- 1 (10 ounce) can Italian tomato paste
- Salt and pepper
- 6 cups water
- 1 pound white fleshed fish such as cod
- 4 ounces chorizo sausage, sliced
- 1 (10 ounce) package frozen peas, thawed and drained

1. Brown and sauté chicken in 2 tablespoons olive oil for about 10 minutes
 2. Drain off excess fat and set aside
 3. Steam shrimp in rum for about 5 minutes
 4. Set aside
 5. In large, deep frying pan, heat half-cup olive oil
 6. Add garlic and onions
 7. Sauté for 2 minutes
 8. Add rice and stir to cover kernels with oil
 9. Add tomato paste, salt, pepper, liquid from steamed shrimp and water
 10. Cover pan and bring to boil
 11. Reduce heat
 12. Add chicken, fish, chorizo and shrimp
 13. Cover and continue simmering until chicken is tender
 14. Just before serving, add thawed peas and allow them to warm up in mix
- Makes 6 to 8 servings



RECIPES

Seasoned Mushroom & Garlic Sauté

From Ilyan Balicki, Culinary Enthusiast

(Makes 4 side-dish servings)

Almost any meal would be well-complemented by a mushroom sauté, especially when cooking with garlic! Using locally-grown, in-season ingredients, try this simple summer dish with your next meal. Note: In late summer, when garlic greens and scapes are no longer in season, many varieties of fresh garlic are available. Substitute the greens or scapes with an equal quantity of leeks (white and light green parts only) and three or four minced garlic cloves.

- 2 ½ tbsp unsalted butter or extra-virgin olive oil
- 1 medium red onion, halved and thinly sliced (optional)
- 1 cup thinly sliced garlic greens or garlic scapes
(See note above)

- 1 lb oyster mushroom, cut into 1-inch pieces
- Salt and freshly ground black pepper, to taste
- 2 tsp apple cider vinegar or white wine
- 1 ½ tbsp minced fresh sage leaves
- 2 tbsp minced fresh thyme leaves
- 2 tbsp minced fresh oregano leaves

In a large sauté pan or skillet, melt butter over medium heat. Add the onion and garlic greens and cook, stirring occasionally until softened, about 5 minutes. Increase the heat to medium high, add the mushrooms, salt and pepper and cook, stirring frequently until the mushrooms are almost cooked through, 3 to 4 minutes. Stir in the vinegar and cook for 1 minute. Stir in the sage, thyme and oregano and cook, stirring occasionally until mushrooms are tender but still firm, about 2 minutes. Serve hot and enjoy!

Five-Ingredient Spaghetti Sauce

from Peter McClusky, Garlic Grower

(Makes 4 Servings)

Since the garlic flavour will diminish with cooking, you can add more garlic just before serving. This has another advantage, since garlic that's not heated for too long retains more of its medicinal properties. (If desired, a bell pepper blackened on the grill or under the broiler, seeded and chopped and then added to the pan with the tomatoes, will impart a sweet, smoky flavour.) I could tell you how good this tastes ... but I'll let you find out for yourself.

- 2 tbsp extra virgin olive oil
- 1 green pepper, finely chopped, preferably plum or other not-too-juicy variety, chopped
- 1 bulb (head) garlic (yes, a whole bulb!)
Broken up into cloves, and each clove minced
- 2 tbsp minced fresh thyme leaves
- 1 tsp kosher salt and freshly ground black pepper, to taste

Drunk Scapes & Beans

From Carole Ferrari at The Bus Kitchen, Toronto

(Makes 4 side-dish servings)

The beans drink up the wine (or balsamic vinegar) in the cooking, turning them deep red. Using a white bean shows off the red, but you could use red kidney beans instead. This is peasant food, to be eaten in a bowl with crusty bread or on top of a simply cooked grain, polenta or buttery rice. If scapes are out of season, replace with one bulb (head) of garlic.

- 1 cup navy beans (or any white bean or kidney bean)
soaked overnight in cold water.
- ¼ cup extra virgin olive oil
- 1 Spanish onion, halved and thinly sliced.
- 1 lb garlic scapes, washed and roughly chopped
- 1 28-oz. can whole tomatoes (or 2 lbs fresh tomatoes)
- 2 cups vegetable broth
- 1 cup dry red wine or ½ cup balsamic vinegar
- 2 bay leaves
- 1 sprig rosemary
- 1 tsp dried oregano
- ¼ cup chopped parsley
- Salt and freshly ground black pepper, to taste
- Granulated sugar (optional), to taste

Drain the beans, set aside. In a heavy-bottomed pot or Dutch oven, heat the oil over medium-high heat. Add the onion and garlic scapes and cook, stirring occasionally, until the onions begin to caramelize, about 4 minutes. Stir in the beans, tomatoes, broth, wine, bay leaves, rosemary and oregano. Bring to a boil. Lower the heat to a simmer, cover pot, and cook for 30 minutes.

Removed the lid from the pot and continue to simmer until the beans are very soft, about 1 hour or longer. This is a good time to read a book or clean the kitchen, or cook something else. When the beans are done, remove the bay leaves and rosemary. Stir in the parsley. Add salt and pepper to taste. If you find the dish to be too acidic, add a little sugar (but not too much). It's a good idea to let everything sit for 30 minutes, and this dish will taste even better the next day.

In a large saucepan, heat the oil over medium heat. Add the green pepper and cook, stirring occasionally until soft, about 3 minutes. Stir in the tomatoes, garlic, thyme, salt and pepper. Bring to the boil, reduce the heat, and simmer for at least 10 minutes or up to 1 hour (the longer it cooks, the thicker it gets). Serve over pasta with fresh mozzarella or other cheese of your liking.

(And for the hearty breakfast-eater, I recommend recklessly dripping leftover sauce on a poached egg or two.)

How to Make Garlic Butter - a Simple Garlic Butter Recipe

.all4natural health.com

Are you looking for steps on how to make garlic butter? Here is a simple garlic butter recipe to set you on your way. Nothing complicated – there are no detailed cooking recipes contained here – just a simple garlic butter sauce recipe to give us another way to reap the amazing health benefits of garlic.

Ingredients Required

- ½ cup unsalted butter
- ⅓ cup extra virgin olive oil
- 3-4 cloves of garlic (the amount of garlic used can be varied according to one's taste and preference for intensity. You may want to start slow, say with 2 cloves, and slowly work your way up.
- 1 teaspoon of dried basil
- 1 teaspoon of dried oregano

Preparation Steps

- Using an adequate container melt the butter in the oven (Personally, I do not recommend using the microwave oven as that changes the nature of foods and makes them potentially harmful to our bodies.)
- An alternative to melting the butter in the oven is to work it on a plate using a knife or a spoon until it becomes slightly soft.
- Crush and mince the garlic cloves into a fine paste.
- Mix the melted or soft butter and garlic paste to make a spread or mixture.
- Add the basil and oregano to this spread or mixture.
- Whisk thoroughly with the olive oil until the mixture is smooth.
- Add salt as per your requirement and taste preference.

Alternative choices – how to make garlic butter a little differently

- Many garlic butter recipes actually do not contain olive oil, so this is a personal preference.
- Some recipes contain lemon juice instead. This tastes good when the garlic butter is used for fish, green beans, or any other foods which go well with lemon juice. 1 teaspoon of lemon juice could be added – this is optional.
- The herbs used could be varied – for example, 2 teaspoons of finely minced parsley could be used instead of the basil and oregano. Chives could also be used.
- Some people also add pepper or Parmesan cheese; again, this is according to personal preference.

I hope this simple garlic butter recipe has given you an idea of how to make garlic butter. Garlic butter can be great with fish as well as steamed vegetables.

All in all, garlic butter is a simple addition to your recipes which can help you reap the amazing health benefits of garlic.

Heavy Metal Detox Pesto Recipe

Add more parsley and Cilantro (Coriander) to your Diet: Parsley and cilantro are very powerful natural green plant foods for getting heavy metals out of your body. Add these amazing herbs to juices, salads, and soups.

- 3 Cloves garlic
 - 1/3 cup Brazil nuts (selenium source) or Macadamia nuts
 - 1/3 cup Sunflower seeds (cysteine source)
 - 1/3 cup Pumpkin seeds (zinc, magnesium sources)
 - 1 cup fresh Cilantro (coriander)
 - 1 cup Parsley
 - 2/3 cup cold pressed olive oil
 - 4 tablespoons lemon juice (Vitamin C source)
 - Big pinch of sea salt and or dulse flakes to flavor.
- Soak the seeds and nuts overnight to release the enzyme exhibitors. Process the parsley, cilantro and olive oil in a blender until chopped. Add the garlic, nuts, salt/dulse and lemon juice and mix until the mixture is finely blended into a paste. Place in a dark glass jar. It freezes well also if need be. Enjoy!

How to Make a Garlic Ointment

Although not commonly used externally, garlic is as effective externally as it is internally. Externally applied garlic in the form of an ointment, for example, can be used to treat bites, cuts and wounds. This post will focus on how to make a garlic ointment.

The ingredients that you may need to make a garlic ointment are:

- 1 ½ cups or 350 mls of olive oil
- 8 oz. of dried and powdered garlic
- ¼ oz. of beeswax

How to make the garlic ointment:

- First pour the olive oil over the garlic powder and mix together in a heatproof covered container.
- Put the mixture in a preheated oven at 104 degrees Fahrenheit for an hour.
- Take out the mixture from the oven and let stand in the sun or a warm place for a week. Once in a while stir the contents with a fork.
- Leave the mixture to macerate for another week. Heat again the contents and pass through a large colander lined with cheesecloth or jelly bag.
- Get the beeswax and melt by heating in a saucepan at very low temperature and then add the garlic olive oil mixture you prepared earlier. Place the resulting in a dark glass jar to check for consistency. Then place in a refrigerator for two minutes until it solidifies to a consistency of a cold cream and put into dark glass jars and label the jars.

Lebanese Garlic Sauce

This recipe is a great way to include garlic in your meals on a regular basis. It works as a salad dressing on raw or cooked vegetables and as a dip for fried foods. And how about on grilled or roasted meat, fish, chicken or lamb? You can even use it as a substitute for regular mayonnaise on a sandwich, or simply on french bread. The consistency varies from creamy, paste-like, to thinned out mayonnaise. It depends on how you pour the oil during the making, and how the garlic and oil emulsify or don't. There are a number of variations on the making of Lebanese Garlic Sauce. Some recipes call for yogurt, some for mint, a pinch or two of white bread for a fluffier texture, boiling hot water, egg whites or even a bit of mayonnaise. But, basically, there are only four main ingredients: garlic, salt, lemon and oil. A lighter oil, such as canola is preferable: some use olive oil, but usually in combination with another oil.

Ingredients

- 4-5 cloves of garlic
- ¼ cup vegetable oil
- 1 lemon, juiced
- ¼ tsp. Salt (or to taste)

Peel and crush the garlic. Place into food processor with the salt. Pulse until smooth. Very slowly add the oil, allowing the mixture to take on a creamy texture. Finally, add the lemon juice and mix well.

The traditional Lebanese garlic sauce, "toum bi zeit," or garlic with oil, was made with a mortar and pestle, and certainly today results will vary, when using a blender or a food professor. But whether the consistency is thicker or thinner, it's always tangy, garlicky, and delicious.



Health Section

Health Truth Revealed.com

By Mark Sircus, in *Crusader*, 6/28/11

The American Food and Drug Administration, asleep at the switch as usual, has not assigned a minimum daily requirement (MDR) for sulfur. One consequence of sulfur's limbo nutritional status is that it is omitted from the long list of supplements that are commonly artificially added to popular foods like cereal.

Dr. Gabriela Segura posted an important page on the Internet that introduces something I overlooked in my first report on how to protect oneself from radiation as well as how to treat radiation sickness. We need extra sulfur in our systems to help protect and treat radiation contamination. Segura published that, "Sulfur has a long history of use as an antidote for acute exposure to radioactive material."

I could probably write a book on sulfur like I did on magnesium, iodine and sodium bicarbonate. Sulfur takes us, like these other basic minerals, down to the very basic structure of life. When we use these common substances as medicines we are treating and addressing the foundations of healthy cell physiology.

In my book *New Paradigms in Diabetes*, I carefully address the issue of disulfide bonds because mercury and other heavy metals like uranium and lead attack these sensitive sulfur bonds. Disulfides dissolved in water are very sensitive to radiation damage. Mercury, in its various forms, all of which have been studied in universities around the world, has shown a great affinity for certain minerals, as well as protein and non-protein molecules in the body.

The science of mercury toxicity shows us that mercurials have a great attraction to the *sulfhydryls* or *thiols*. The mercury atom or molecule will tend to bind with any molecule present that has sulfur or a sulfur-hydrogen combination in its structure. A thiol is any organic compound containing a *univalent radical* called a *sulfhydryl* and identified by the symbol -SH (sulfur-hydrogen). A thiol can attract one atom of mercury in the ionized form and have it combine with itself. Because it is a radical, it can enter into or leave this combination without any change. Mercury and lead both have a great affinity for sulfur and *sulfhydryls* and are capable of affecting the *transsulfuration pathways* in the body. Uranium would be included here because it has the same chemical properties of lead.

The most common mode of breakdown is the sulfur-sulfur bonds. Organic sulfur is an acid-forming mineral that is part of the chemical structure of the amino acids methionine, cysteine, taurine, and glutathione. Sulfur disinfects the blood, helps the body to resist bacteria, and protects the protoplasm of cells. It aids in necessary oxidation reactions in the body, stimulates bile secretion, and protects against the harmful effects of radiation and pollution. It is found in hemoglobin and in all body tissues, and is needed for the synthesis of collagen, a principal protein that gives the skin its structural integrity.

I wrote all about this in *New Paradigms in Diabetes* because insulin has three sulfur-containing cross-linkages and the insulin receptor has a tyrosine-kinase-containing sulfur bond, which are the preferred targets for binding by mercury, lead and uranium. Should any of these heavy metals attach to one of these three sulfur bonds it will interfere with the normal biological function

of the insulin molecule.

The average adult inhales thousands of trillions of mercury atoms a day from a mouth full of amalgam, fish provide trillions more, the air more, and in children, vaccines provide one-day surges of trillions of mercury molecules in the form of ethylmercury, which is vastly more toxic than metallic mercury. Insulin molecules are directly assaulted as are insulin receptor sites.

If we do not get the correct amount of organic sulfur, or it's weakened through bonding, it cannot do these four crucial things: (1) facilitate the detoxification of heavy metals, (2) effectively enable the transport of oxygen across the cell membrane, (3) foster healthy cell regeneration, or (4) act as the key agent in the effective utilization of amino acids. Four of the more crucial amino acids, methionine, cystine, cysteine, and taurine, cannot effectively function without organic sulfur.

Garlic more effective than antibiotics against food poisoning bacteria

by D. Holt, *Natural News*

If you feel ill because of food poisoning, you may not feel like eating it, but garlic has been proven to be more effective than antibiotics in fighting the effects of food poisoning bugs. The active compound, diallyl sulphide, is able to breach the membranes on many bacteria that make them harder to destroy.

Research published in the *Journal of Antimicrobial Chemotherapy* claims that not only is garlic more effective than ciprofloxacin and erythromycin, it also takes a fraction of the time to work. The research was based on tests on the common food poisoning bacteria, *Campylobacter*. Further research in the *African Journal of Biotechnology* also concluded that raw garlic was effective against *Staphylococcus aureus*, another common food poisoning bacteria.

Throughout many cultures over many years, garlic has been used to treat a variety of conditions such as stomach upsets, skin problems and infertility. Along with ginger, garlic has long been associated with promoting a healthy digestive system, preventing and treating heart disease and acne, and antioxidant anti-aging effects.

What about garlic breath?

The main reason why most people would not eat raw garlic is garlic breath. Two of the best ways around this issue is to take an odorless capsule, or more favorably to eat a couple of teaspoons of fresh parsley with the garlic. Not only does parsley have positive effects on garlic breath, it also has health benefits of its own such as neutralizing carcinogens and boosting health of the nervous and immune systems.

Garlic has no medical side effects, unlike the comparable antibiotics such as ciprofloxacin and erythromycin whose side effects include diarrhea, abdominal pain, liver damage, muscle weakness, tendon rupture and difficulty breathing. It seems that a little garlic breath is a small price to pay for a natural drug that is not only more effective but far safer too.

The pharmaceutical industry has a long history of producing drugs that fight infections or conditions but have side effects that cause conditions as bad or worse than the original illness. The practice of using natural substances to cure illnesses is consistently under pressure from lobby groups infiltrated by the drug companies. These groups use misinformation and so-called experts to argue that natural substances and their derivatives are ineffective and should be banned or tightly regulated. These experts, usually doctors paid

by the pharmaceutical companies, often argue that the use of natural medicines is preventing people from taking real medicines that are more effective.

This is obviously a lie in the case of garlic and many other natural plant drugs. Any doctor that claims that natural substances have no effect on human physiology need look no further than garlic, opium, aspirin (derived from spirea ulmaria), caffeine, codeine (Papaver somniferous), quinine (Cinchona ledgeriana), THC, etc. In fact, a very quick Google search points to over 300 important drugs from natural sources.

Is it easy to spot an expert paid by the drug companies? The answer is yes, the ones who claim that plants have no benefits to health whilst the drug companies use plants to isolate drugs to make huge profits.

Garlic oil compound found to offer heart protection

by Jonathan Benson, staff writer, *Natural News*, 11/23/11

Researchers from the Emory University (EU) School of Medicine in Atlanta, BA, have discovered a natural compound derived from garlic oil, known as diallyl trisulfide, that protects against heart damage. When taken after a heart attack, during cardiac surgery, or as a treatment of heart failure, this powerful compound was found to reduce tissue damage by 61 percent.

David Lefter, PhD, professor of surgery at EU and director of the school's Cardiothoracic Surgery Research Laboratory, and postdoctoral fellow Benjamin Predmore tested the effects of diallyl trisulfide on a group of mice. The duo deliberately blocked the coronary arteries of the mice for 45 minutes in order to simulate a heart attack.

Just as they were about to release the blockages, the team administered diallyl sulfide to some of the mice. After the compound was administered, the team observed a reduction in the proportion of heart tissue damage by 61 percent compared to mice that did not receive the compound.

"Interruption of oxygen and blood flow damages mitochondria, and loss of mitochondrial integrity can lead to cell death," said Lefter. "We see that diallyl sulfide can temporarily turn down the function of mitochondria, preserving them and lowering the production of reactive oxygen species."

The findings are noteworthy because, currently, doctors typically inject hydrogen sulfide-producing drugs directly into heart patients. In high doses, hydrogen sulfide is a highly-toxic chemical gas that, according to the World Health Organization (WHO), can cause respiratory, immunological, lymphoreticular, cardiovascular, and neurological damage, as well as death, when inhaled (<http://www.who.int/lpcs/publication...>).

Diallyl sulfide, on the other hand, is simply a natural organosulfur compound in garlic oil that naturally produces small amounts of hydrogen sulfide gas. This method appears to be safer and come with less side effects than the synthetic drug-based versions.

The diallyl sulfides in garlic are also linked to the production of ferroportin. Ferroportin facilitates the release of stored iron in the body at times when it is needed, which is essential for the transport of oxygen from the lungs to bodily tissue, as well as for other functions.

[Source: http://www.eurekalert.org/pub_relea...]

Medicinal Properties of Garlic Against Microbes, Harmful Organisms, Bacteria, Fungi, Parasites and Viruses.

(www.all4naturalhealth.com)

- **Cold Symptom Treatment** www.ColdEEZE.com/Flu
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The medicinal properties of garlic against harmful and disease-causing microbes and organisms make garlic truly a wonder herb.

Garlic is an astonishingly effective antibacterial, antifungal, and anti-parasitic and antiviral agent. It literally destroys many of these unwanted and harmful microorganisms, thereby getting rid of the diseases and conditions which they cause. This is probably one of the best known and most potent garlic health benefits.

The compound allicin in garlic is not just an excellent antibacterial, antifungal, anti-parasitic and antiviral substance, but it is also effective at killing off harmful microorganisms which have become drug-resistant. It is usual for microbes to mutate and become resistant to pharmaceutical drugs.

Better still, garlic is broad-based, meaning it is effective against a wide range of these microorganisms. The medicinal properties of garlic are thus totally unlike those of chemical drugs, which usually only target one or a selected group of enemies. And, compared to drugs, garlic practically has no side effects.

And, even better still, garlic selectively destroys harmful and bad organisms, leaving the good ones untouched. In fact, garlic even promotes their growth. Again, this is a great advantage over chemical drugs, which ends up destroying a lot of the good and friendly bacteria in the body.

This is a very important difference because prescribed drug antibiotics, by wiping out a lot of the good bacteria in the body, causes a person to become susceptible to issues such as digestive ailments, infections, candida albicans overgrowth, etc.

Its ability to destroy microorganisms makes garlic an excellent remedy for various health ailments, including the common cold, coughs and sore throats. For these purposes, garlic syrup can be prepared and consumed. Garlic syrup is made by boiling cloves of garlic in water for about half a day.

The health benefits of garlic also extend to being an expectorant remedy for respiratory conditions and infections.

Because of the medicinal properties of garlic against harmful microbes and organisms, it is able to regulate the overgrowth of candida albicans in the body. It also destroys viral infections such as chicken pox, measles, mumps, rabies and scarlet fever.

Further, garlic has proven useful for helping to deal with some serious microorganism-related conditions, such as cholera, dysentery, intestinal worms, smallpox, tetanus, tuberculosis and typhoid fever.

Make no mistake, this is one of the most powerful health medicinal benefits of garlic, the amazing herb. Often, you will find that garlic cures and treats many stubborn and serious diseases which are caused by strong and resistant harmful organisms.

A closer look at garlic health benefits and medicinal properties of garlic against harmful organisms. So how do the health and medicinal properties of garlic against microbes actually work? A study published in the American Society for Microbiology's *Antimicrobial Agents and Chemotherapy* might give us an idea.

The study explained how allicin, one of the foremost compounds in garlic, fights infection. The study also supported the fact that garlic can be used to deal with a very wide array of different infectious organisms.

The research found that allicin disables amoebas which cause dysentery by blocking two groups of enzymes, namely cysteine proteinases and alcohol dehydrogenases. The former group is one of the main culprits in infections, as they provide infectious organisms with the means to invade tissues and cause damage to them. The latter group, on the other hand, plays a big part in the metabolism and survival of these organisms.

Garlic the broad-spectrum natural antibiotic. As these enzymes are found in a large variety of different infectious organisms, including bacteria, viruses and fungi, it becomes clear why allicin is such a broad-spectrum microbial agent which is capable of treating so many kinds of infections.

The authors of the study stated that "it has long been argued that garlic can fight a wide range of infections and now we have provided biochemical evidence for this claim." Indeed, it has been known for centuries that the medicinal properties of garlic extend to a wide range of infectious organisms.

Harmful and infectious organisms do not become resistant or immune to garlic. The study also found that allicin blocks the two groups of enzymes by reacting with sulfhydryl (SH) groups, or thiols, which is an important compound of these enzymes.

And, because the organisms are unlikely to change or modify the enzymes which play a critical part in their activity, it is thus very unlikely that they would become resistant to allicin; this is a big problem with harmful and infectious organisms adapting and mutating to become drug-resistant, dangerous strains which do even more damage to us and animals.

Conclusion. This piece of research reported in *Antimicrobial Agents and Chemotherapy* certainly provides some interesting insights into the health medicinal benefits of garlic against microbes and organisms.

Over the coming years, I am sure more information regarding the medicinal properties of garlic against harmful and infectious organisms will surface. In the meantime, garlic, both for culinary and medicinal purpose, makes a wonder food and herb, and at the same time also acts as a natural antibiotic against illnesses.

{Source's note about this article} "Herbs are God and nature's gifts to us. While the use of herbs and herb remedies has brought excellent results for many people, do note that their health benefits may be limited when they are used in isolation. However, when combined with some basic dietary and lifestyle good health habits, such as a full body detox and a proper understanding and application of nutrition, the impact on one's health will

be greatly magnified.

"In natural health and healing, we believe that the body has the ability to heal itself of any disease, even supposedly incurable diseases. We also believe in Holistic health and healing, as we realize that different parts of the human body are highly interlinked, often beyond Man's understanding. It is thus a good idea to apply these fundamental health steps no matter how remote or unrelated a health condition may seem."

Garlic Doesn't Just Repel Vampires

ScienceDaily, Aug. 15, 2011

The folk wisdom that eating garlic fights illness is ancient. In these more modern times, fruit and vegetable extracts that can inhibit the growth of pathogenic and spoilage microorganisms are actually being evaluated as food preservatives, in part because consumers are demanding fewer synthetic chemical food preservatives. Now, a team led by researchers from Washington State University, Pullman, has found, contrary to expectations, that a group of garlic-derived organosulfur compounds has greater antimicrobial activity than garlic-derived phenolic compounds.

The research is published in the August 2011 issue of the journal *Applied and Environmental Microbiology*.

"The novelty of this paper is that we found that diallyl sulfides contribute more to antimicrobial activity of garlic extract than do phenolic compounds," says coauthor Xiaoman Lu. "We used biophysical techniques, namely infrared and Raman spectroscopy, to demonstrate that diallyl sulfide can freely penetrate bacterial membranes and combine with sulfur containing proteins and enzymes, which is the major antimicrobial mechanism of these organosulfur compounds."

Garlic Oil Component May Form Treatment to Protect Heart

Jennifer Johnson, <http://shared.web.emory.edu>, 12/12/2011

ORLANDO – A potent-smelling component of garlic oil may help release protective compounds to the heart after heart attack, during cardiac surgery, or as a treatment for heart failure.

At low concentrations, hydrogen sulfide gas has been found to protect the heart from damage. However, this unstable and volatile compound has been difficult to deliver as therapy.

Now researchers at Emory University School of Medicine have turned to diallyl trisulfide, a garlic oil component, as a way to deliver the benefits of hydrogen sulfide to the heart. Their findings suggest that doctors could use diallyl trisulfide in many of the situations where researchers have proposed using hydrogen sulfide.

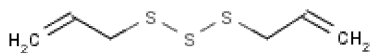
The data was presented Wednesday, Nov. 16 at the American Heart Association (AHA) Scientific Sessions conference in Orlando.

"We are now performing studies with orally active drugs that release hydrogen sulfide," says David Lefer, PhD, professor of surgery at Emory University School of Medicine and director of the Cardiothoracic Surgery Research Laboratory at Emory University Hospital, Midtown. "This could avoid the need to inject sulfide-delivery drugs outside of an emergency situation."

Working with Lefer, postdoctoral fellow Benjamin Predmore blocked the coronary arteries of mice for 45 minutes, simulating a heart attack, and gave them diallyl sulfide just before blood flow was restored. The compound reduced the proportion of damaged heart tissue in the area at risk by 61 percent, compared with untreated animals.

“Interruption of oxygen and blood flow damages mitochondria, and loss of mitochondrial integrity can lead to cell death,” he says. “We see the diallyl sulfide can temporarily turn down the function of mitochondria, preserving them and lowering the production of reactive oxygen species.”

Postdoctoral fellow Kazuhisa Kondo presented additional data on diallyl trisulfide in a mouse model of heart failure. Transverse aortic constriction results in enlargement of the heart and is a model of heart failure. Diallyl sulfide twice daily, given after aortic constriction, could reduce heart enlargement, Kondo found.



Structure of diallyl trisulfide

New Testing Method Hints at Garlic's Cancer-Fighting Potential

by Emily Caldwell, caldwell.151@osu.edu

COLUMBUS, Ohio – Researchers have designed a urine test that can simultaneously measure the extent of a potential carcinogenic process and a marker of garlic consumption in humans.

In a small pilot study, the test suggested that the more garlic people consumed, the lower the levels of the potential carcinogenic process were.

The research is all about body processes associated with nitrogen-containing compounds, scientists say. These processes include nitrosation, or the conversion of some substances found in foods or contaminated water into carcinogens.

“What we were after was developing a method where we could measure in urine two different compounds, one related to the risk for cancer, and the other, which indicates the extent of consumption of garlic,” said Earl Harrison, Dean’s Distinguished Professor of Human Nutrition at Ohio State, an investigator in *Ohio State University’s Comprehensive Cancer Center*, and senior author of the study.

“Our results showed that those were inversely related to one another – meaning that the more we had the marker for garlic consumption, the less there was of the marker for the risk of cancer.”

Ultimately, the scientists hope to find that nutritional intervention could be a way to stop the process that develops these carcinogens. This process is most commonly initiated by exposure to substances called **nitrates** from certain processed meats or high-heat food preparation practices, or to water contaminated by industry or agricultural runoff.

About 20 percent of nitrates that are consumed convert to nitrites. A cascade of events can convert these compounds into what are called nitrosamines, and many, but not all, nitrosamines are linked to cancer.

Vegetables also contain nitrates, but previous research has suggested that the vitamin C in vegetables lowers the risk that those nitrates will convert to something toxic. Researchers suspected that nutrients in garlic could have similar antioxidant effects as vitamin

The study is published in a recent issue of the journal *Analytical Biochemistry*.

The research began with the small human study based at Penn State University. Researchers there fed participants a week long diet lacking any nitrates or garlic. They then gave the participants a dose of sodium nitrate – in a formulation that would not become toxic, but which would show a marker in the urine of the potentially toxic

process.

Groups were then treated with capsules containing varying levels of garlic: 1, 3 or 5 grams of fresh garlic, or 3 grams of an aged garlic extract. A separate group received 500 milligrams of ascorbic acid, or vitamin C.

Both the nitrate formula and treatments were given for seven days. Urine samples were collected from all of the participants every other day for seven days.

That research team then turned to Harrison and colleagues, who explored the methods required to precisely quantify biomarkers in urine for both the garlic consumption and the presence of nitrosoproline, the indicator that nitrosation has occurred.

Harrison’s group developed the urine test using a method called gas chromatography-mass spectrometry.

Gas chromatography separates components of a mixture to detect specific substances, and has been used previously to quantify nitrosoproline. The addition of mass spectrometry to the analysis allowed for determination of the chemical structures of molecules in the sample – in this case, the presence of a specific compound that is released in urine after garlic is eaten.

When the test was used on the urine samples from the pilot garlic study, it showed that the participants who had taken garlic had lower concentrations of the marker for nitrosation than did those who took no garlic. Though the differences were slight, the consumption of 5 grams of garlic per day was associated with the lowest level of the marker for potential carcinogens. A single garlic clove typically can weigh between 1 and 5 grams.

Vitamin C had a similar effect in lowering the marker for nitrosation.

Harrison, also an investigator in the Center for Advanced Functional Foods Research and Entrepreneurship at the Ohio Agricultural Research and Development Center, noted that previous research has suggested that garlic and other plants with sulfur-containing compounds offer a variety of potential health benefits. Many questions remain about exactly what those benefits are and precisely how garlic works as a nutritional intervention.

“The precise mechanism by which garlic and other compounds affect nitrosation is under extensive investigation, but is not clear at this time,” he said.

“What this research does suggest, however, is that garlic may play some role in inhibiting formation of these nitrogen-based toxic substances. This was [a] very small pilot study, so it’s also possible that the more garlic you have, the better it would be.

“So if you like garlic and you like garlic-containing foods, go out and have as much as you want. There’s no indication it’s going to hurt you, and it may well help you.”

The research was supported by grants from the National Institutes of Health and an Interagency Cooperative Agreement between the National Cancer Institute and the U.S. Department of Agriculture.

Harrison co-authored the study with former colleagues from the U.S. Department of Agriculture’s Human Nutrition Research Center in Beltsville, MD, including Keary Cope, a postdoctoral fellow, and Rebecca Seifried, a student, as well as Harold Seifried, John Milner and Penny Kris-Etherton. Harold Seifried and Milner are in the Nutritional Science Research Group in the National Cancer Institute’s Division of Cancer Prevention. Kris-Etherton and Milner conducted the human feeding study as faculty members at Penn State University.

[contact: Earl Harrison, harrison.304@osu.edu]



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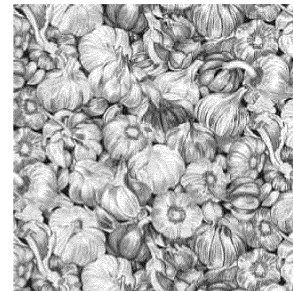
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