2014

Garlic Variety Trial 2014

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URI Garlic Variety Trial

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Garlic is an integral part of many culinary traditions. It is a bulb vegetable closely related to onion and leek, but different in that it is vegetatively propagated from cloves rather than being grown from seed, and in being planted in the fall and harvested the following summer. Most garlic sold in the United States is soft neck garlic, with many small cloves and the ability to last 9-12 months in storage. In the past much of the garlic in supermarkets was grown in Gilroy, California, but now most is imported from China. Here in New England gardeners and market farmers have long grown hard neck garlic, which has a hard central stem, 4-5 very large cloves per bulb, and a storage life of about 6 months.

Hard neck garlic is traditional in New England because it is more winter-hardy than soft neck, particularly than the soft neck garlic grown in California. Soft neck garlic is preferred in commerce because of the smaller cloves, longer shelf life, and the possibility of braiding the garlic into wreaths and swags for value-added sales. Garlic has become increasingly popular among home gardeners and hobbyists, with the result that many more varieties are available today than 30 or 40 years ago. At the same time, winters have grown milder in southern New England, making soft neck garlic a real possibility. This trial was funded by a Specialty Crops Farm Viability Grant from the Rhode Island Division of Agriculture as part of a project to improve production of vegetable alliums. We compared performance of 28 varieties over 2 years, with the varieties evenly split between hard neck and soft neck types.

Trial Conditions

The garlic trials were conducted at the Greene H. Gardiner Crops Research farm in Kingston, RI in a silt loam soil. For the 2012-13 trial the field was seeded to oats in September, and the garlic was planted into the stand of oats on November 1. Planting stock for the 2012-13 trial was purchased from commercial garlic seed production farms in Washington State, Colorado, and Vermont. The garlic was planted into plots of 24 cloves, with 15 inches between rows and 4 inches between plants in the row. There were 24 varieties, each represented by 2 plots. Planting rows were covered with straw; the oats served as mulch between rows.

In the spring of 2013 the garlic field was weeded by hand to remove oats that failed to winter kill, and the chickweed and other winter annual species that grew between the oats. At this time the garlic was side-dressed with nitrogen. Data was collected in May and June, and harvest began on July 3. Marketable bulbs were cured by being tied into bunches and hung in the barn for 3 weeks. Cured bulbs were culled, topped, and stored in mesh bags until October.

The 2013-14 trial was planted October 31 into bare ground. The entire trial was heavily mulched with straw after planting. Most planting stock came from the 2012-2013 trial, but additional varieties were purchased. With more planting stock available, most of the 28 varieties in the 2013-14 trial were

Students from the Fall Vegetable Crops course at URI planting garlic stock into the trial November of 2012. Clearly visible is the winter crop of Oats that the garlic was planted into.

The garlic trial in Spring 2013 after weeding. The straw mulch remained within the planting rows of the variety 'Oregon Blue', which was the top soft-neck variety.

represented by 3 plots with 48 plants per plot. When planting stock was limited plots were seeded to 16 or 32 plants per plot. All plots had 15 inches between rows and 6 inches between plants.

2012-13 Results

Establishment was rated on May 30, and notes were taken on general growth. Scapes were removed on June 5, 10, 13, and 18. Scape duration indicates the time span over which scapes emerged, and reflects the number of times a field would need to be visited to cut scapes. A score of 0 indicates that no scapes were formed, 1 indicates that all scapes were removed on the same day, and 4 indicates that scapes were removed on all four dates. Uniformity, wind tolerance were evaluated on June 18 following a thunderstorm that caused widespread lodging of crops. Vigor was evaluated June 21. There were no significant differences in uniformity between varieties; this is to be expected in vegetatively propagated material as differences between plants of the same variety are entirely caused by environmental factors. Wind tolerance and vigor were rated on a scale of 1-4 where 4 indicates a superior variety. Harvest began June 20 and continued until July 15. Bulbs were culled at harvest, and again following curing. Most culls were bulbs that were much smaller than expected for the variety. Other reasons for culling bulbs were bulb rot, neck rot, loss of outer wrappers, and mechanical damage.

Hard Neck Garlic

Chesnock Red was the highest yielding of the hard neck varieties, averaging 18 marketable bulbs per plot. Vigor was high, with 100% establishment. Plants were tall and slender but held up well against lodging. Bulb size was slightly above median for a hard neck variety, averaging 25 grams. Culls were for

small size, and some loss of wrappers. The only real flaw found in Chesnock Red was that scapes emerged over a long period of time.

Bulb size ranged from 14 grams for Purple Glazer to 31 grams for Vietnamese Stripe. From 47% to 72% of established plants yielded marketable bulbs, with Chesnock Red and Duganski having the highest percentage yields. Establishment ranged from 35% to 100% of planted bulbs when averaged across both replications. The varieties with the lowest establishments were Romanian Red and German Extra Hardy. For both varieties one replication had no plants, so poor establishment may have been the result of a planting error. These varieties had establishments of 71% and 100%, respectively, if just the replication with plants was considered.

Seven other hard neck varieties had marketable yields similar to Chesnock Red, with 11-17 bulbs per plot. German Extra Hardy averaged 17 bulbs per plot and the bulbs were slightly larger (29 grams) so total yields by weight were greater. Vietnamese Stripe had the largest bulbs at 31 grams but bulb size was highly variable, resulting in many being unmarketably small. Other bulbs were culled because of neck rot. Duganski was similar to Chesnock Red in many ways, but had more concentrated scape production.

Purple Glazer, Romanian Red, Korean Mountain, and Aomori yielded significantly less than Chesnock Red. All four varieties had poor establishment and low vigor. Aomori had yellowish-green foliage. Purple Glazer was generally small and slender, and had problems with bulb rot. Korean Mountain and Romanian Red were highly variable in size.

2013 Hard Neck Garlic Data

Variety	Establish.	Scapes	Scape Duration	Wind	Vigor	Harvest Date	Total Bulbs	Mkt. Bulbs	Mkt. Wt. (Kg)	Size (g)
Aomori	83%	71%	1.0	2.5	1	20-Jun	20	10.5	0.215	20
Chesnock Red	100%	94%	4.0	4	3	5-Jul	25	18	0.465	25
Duganski	94%	100%	2.5	4	3	3-Jul	22	15.5	0.405	26
Georgia Fire	94%	96%	3.0	2.5	2.5	2-Jul	22.5	12.5	0.3	24
German Extra Hardy*	52%	96%	3.0	3	3	3-Jul	25	17	0.5	29
Khabar	88%	100%	3.0	4	2.5	5-Jul	20.5	11	0.25	24
Korean Mountain	67%	91%	2.5	2	1.5	2-Jul	15.5	10	0.205	20
Polish Hardneck	98%	100%	3.5	2.5	2	3-Jul	19.5	13	0.21	16
Purple Glazer	73%	83%	3.0	4	1.5	2-Jul	14.5	8	0.11	14
Romanian Red*	35%	100%	2.0	2	2	3-Jul	16	10	0.22	22
Siberian	96%	100%	2.5	3.5	2	2-Jul	21.5	11	0.22	21
Vietnamese Stripe	83%	90%	3.0	4	3	7-Jul	20	12	0.37	31
LSD	*18*	*34*	*0.7*	*1.2*	*1*		*7*	*7.5*	*0.36*	*15*

*These varieties failed completely in one replication. For the other replication establishment was 100% for German Extra Hardy and 71% for Romanian Red.

Soft Neck Garlic

Oregon Blue was the highest yielding soft neck variety, averaging 18 marketable bulbs per plot. The bulbs averaged 52 grams. Establishment was high at 98%, and the plants were very vigorous and resistant to lodging. Culls were due to small size, with no rot problems.

Bulb size in the soft neck garlic varieties ranged from 18 grams for Western Rose to 54 grams for Susanville. Establishment was generally good, except for Chinese Pink. Percentage yields ranged from 8% for Chinese Pink to 76% for Oregon Blue. Culls were due to small size and to rot, with neck rot being a more serious problem than with the hard neck varieties.

Five other varieties were statistically similar to Oregon Blue with regards to the number of marketable bulbs. Of these, Inchelium Red, Silverwhite, and Susanville were also similar in bulb size. All three varieties were vigorous, with tall, thick-necked plants that stood well against the wind. However, Inchelium Red and Susanville had problems with bulb rot leading to culls. The other varieties in the top group for marketable yield were Idaho Silver and Transylvania. Idaho Silver had very small bulbs, averaging only 19 grams, and many bulbs were culled because they were rotting. Marketable bulbs of Transylvania averaged 35 grams.

Six varieties yielded significantly less than Oregon Blue. Chinese Pink was generally poor, with low establishment, poor vigor, and small bulbs. It was the only soft neck variety to produce any scapes. Red Toch also produced a lot of very small bulbs, and had poor uniformity. Lorz Italian and St. Helen's Red lost a lot of bulbs to neck rot. S&H Silver and Western Rose were slender varieties with lower vigor and smaller bulbs.

2013 Soft Neck Garlic Data

Variety	Establish.	Wind	Vigor	Harvest Date	Total Bulbs	Mkt. Bulbs	Mkt. Wt. (Kg)	Size (g)	% Mkt.
Chinese Pink	33%	2	1	20-Jun	2.5	2	0.04	20	8%
Idaho Silver	96%	4	3	14-Jul	20.5	15.5	0.29	19	67%
Inchelium Red	98%	3.5	3.5	7-Jul	21.5	15.5	0.715	46	66%
Lorz Italian	94%	3	2	5-Jul	20	9	0.275	29	40%
Oregon Blue	98%	3.5	4	7-Jul	23.5	18	0.93	52	76%
Red Toch	98%	3.5	3.5	10-Jul	22.5	4.5	0.23	51	20%
S&H Silver	83%	2.5	3	14-Jul	15.5	10	0.29	29	50%
Silverwhite	100%	3	4	14-Jul	24	17.5	0.73	42	73%
St. Helens Red	83%	3	3	10-Jul	17	9	0.39	42	45%
Susanville	94%	3.5	3.5	14-Jul	20.5	12	0.675	54	53%
Transylvania	98%	3.5	3	5-Jul	21	13	0.475	35	55%
Western Rose	92%	3.5	3	8-Jul	17	10	0.18	18	45%
LSD	*18*	*1.2*	*1*		*7*	*7.5*	*0.36*	*15*	

Conclusions

Based on the 2012-13 results, soft neck garlic is a viable crop for southern New England. The best varieties did as well as the best hard neck varieties. For both types of garlic approximately ¼ of the bulbs were culled because of insufficient size. The cause of the small bulbs is unclear; they may have been due to competition from the oats that failed to winter kill, or they may have been because the planting stock had not adapted to our conditions. Bulb rot is more of a problem with soft neck garlic, but appears to be controllable with careful selection of varieties. The larger trial and colder winter in 2013-14 should provide more information on the suitability of soft neck garlic.

Garlic has been shown to develop strong epigenetic adaptation, such that saved "seed" will out-perform seed that is new to the field. However, saving garlic planting stock from year to year runs the risk of carrying along diseases and pests such as garlic bloat nematode and garlic mite. For this reason it is preferable to purchase certified disease-free "seed" from a reputable garlic "seed" producer. There are no producers of certified garlic planting stock in southern New England, and very few in New England. Purchasing garlic planting stock from a local farmer has the benefit that the "seed" is already epigenetically adapted to local conditions, but growers should exercise caution to avoid introducing pests and pathogens to their fields.

Garlic Varieties and Suppliers

Supplier	Varieties
Green Mountain Garlic, Vermont	Georgia Fire, German Extra Hardy, Romanian Red
Filaree Garlic Farm, Washington	Silver White, Inchelium Red, Red Toch, Idaho Silver, S&H Silver, Susanville, Transylvanian, Oregon Blue, Khabar, Korean Mountain, Aomori
Territorial Seed Company, Oregon	Purple Glazer, Duganski, Vietnamese Stripe, Chinese Pink, Lorz Italian, St. Helen's Red, Western Rose
Potato Garden, Colorado	Chesnock Red, Polish Hardneck, Siberian

These are the suppliers we purchased planting stock from. They are not the only suppliers for these varieties, nor are these the only varieties they sell. In general quality is higher for western-grown garlic seed because the dry summers reduce fungal growth.