

**NORTHEAST SARE FARMER/RANCHER GRANT FNE03-498:
'GROWING NATIVE GINSENG FOR CONSERVATION AND PROFIT'**

INTERIM PROJECT REPORT DECEMBER 2005

A collaborative project between SARE, the Pennsylvania State University School of Forest Resources and Pennsylvania private forestland-owners

Principle Investigators

David Thompson, Pennsylvania forest landowner and ginseng grower
Eric P. Burkhardt, School of Forest Resources, Penn State University

Project Location

Cambria County, Pennsylvania

SUMMARY

SARE funds received for this project were used to cover labor costs associated with establishment of a privately-owned ginseng seed nursery (incorporated December 2003 as '*Pennsylvania Mountain Ginseng*' or PMG). Funds have also been used to pay for costs associated with hosting three outreach events to date.

At the time of this report (December 2005), the PMG forest nursery consists of nine raised beds containing approximately 3,000 ginseng plants. Additionally, several acres of forest with minimum site alteration/preparation contain an additional 7,000 plants. This collection comprises 30 accessions from 8 counties in Pennsylvania, with the bulk of the accessions coming from Central Pennsylvania forestlands.

Observations of transplant success, growth and seed yield were made during 2003-05. To date, these observations suggest that while seed production may be enhanced through use of raised beds and soil amendments, these methods also tend to promote disease and pestilence resulting in significant losses overall.

Ginseng planted in un-altered forest conditions has tended to produce seed more reliably, primarily through minimizing disease and pest problems, than plants grown in beds with amendments. Based on these results, those who would like to grow ginseng for seed are advised to either follow a minimal habitat alteration production method OR be able and willing to deal with pestilence (which will likely involve the use of pesticides).

BACKGROUND

The Thompson homestead has been in the family for over 50 years and includes twelve acres of woodland. The landowner, David, started “growing” wild ginseng twenty years ago on a very limited scale by planting seeds from local plants in small plots on his forestland. He has collected ginseng his whole life. For the past decade, he has continued to expand the amount of ginseng grown and harvested on this acreage to supplement off-farm income. With several acres of ginseng planted in his forest, it continues to be his primary crop.

The forestlands on his farm are typical of the region which is characterized by rolling hills covered by deciduous forest. Much of this land is too marginal for row-crop agriculture and so the application of *agroforestry* practices, such as ginseng cultivation, represents a good land use option. The fact that ginseng grows, or used to grow, throughout much of his region (including his farm) also supports forest cultivation of ginseng as a viable land-use option.

David is concerned that wild Pennsylvania ginseng is being over-collected in his area since it is becoming more difficult to find on local wild lands. He would like to conserve any “wild” Pennsylvania ginseng genetic stock for those interested in planting and tending ginseng on their own forestlands. There are presently no commercial scale ginseng seed growers in Pennsylvania despite strong public interest in planting and tending ginseng. Most seed planted on Pennsylvania forestlands is imported from adjacent states and the central United States (Wisconsin). David will retire in a few years and would like to make ginseng farming, particularly for seed production, his principle retirement activity and source of supplemental income.

MATERIALS AND METHODS

In 2002, David began to set-aside a ‘ginseng nursery area’ on his forestlands and wild-collected ginseng plants were transplanted into this area beginning in 2003 to monitor growth and document seed yield. Two types of planting arrangements are being attempted in the nursery:

1. Altered local forest conditions consisting of raised beds amended with local compost or rotted sawdust (*woods-cultivated* method)
2. Un-altered local forest conditions (*wild-simulated* method)

David is collecting the following information for this SARE project:

- Transplant survival and growth
- Fruit and seed production
- Pest observations

-Time spent in activities associated with nursery operation

RESULTS AND OBSERVATIONS

Observations made during this project are divided in the following pages into two categories: (1) plant growth and seed production; and (2) pest management considerations.

1. Plant growth and seed production

- Transplant survival

In spring 2004, it was observed that approximately 500 plants were above soil/mulch line as a result of bed settling (subsidence) over the winter months. These transplants were evidently not planted deep enough to account for settlement of soil and mulch and were exposed during the winter months. All exposed plants were clearly rotten and thus culled.

The incident suggests that when transplanting ginseng into forest beds:

- 1- Beds should be pre-made to allow settlement prior to planting.
- 2- Roots should be planted at least 2-3 inches below the surface of the soil or mulch line after settlement.
- 3- Beds should be checked for additional soil settling and frost heaving during the first winter after transplanting to ensure that transplants have not been exposed.

- Reversion of ginseng stage-classes

Ginseng is known to proceed through a sequence of vegetative forms, or *stage classes*, as the species develops from juvenile to reproductive adulthood. In 2002, all of the transplants were either *three- or four-prongs*. In 2003, roughly 10% of these plants came up as *two-prongs*. This reversion of stage classes might have been caused by physiological stress associated with transplantation.

- Pollinators of ginseng in Pennsylvania

Pollinators of ginseng have been reported from several States in eastern North America. However, there has never been an investigation of ginseng pollinators in Pennsylvania.

During 2003-05, insect visitors to ginseng flowers have been observed. Small bees have been the most commonly observed floral visitor. We are seeking to

better sample and identify floral visitors in the final year of this project by bringing an entomologist on-board.

- Fruit and seed yields

Fruit collection occurred during August and September in each year.

In 2003, fruit and seed were collected from 2002 accessions and stratified following industry standards. 5,242 fruit were harvested from bed-raised ginseng, yielding 4,236 seeds.

There was no fruit and seed yield in 2004 since *Alternaria* blight caused all plants to die-back prematurely or abort reproduction. This was a huge loss and would need to be aggressively thwarted by those interested in growing ginseng for seed production. It would likely require application of fungicides.

In 2005, 3,900 seeds were gathered from plants grown under un-altered local forest conditions (wild-simulated) versus 3,600 from altered conditions (woods-cultivated). From these results, David believes that while better seed yields are possible from bed-raised ginseng, there is also greater disease and pestilence to contend with. He therefore cautions those who become involved in growing ginseng for seed that there may be trade-offs with regard to yields and labor.

2. Pest and management considerations

- Wireworms

In May 2003, root damage to a large number of transplants was observed. This damage consisted of small root holes which in most cases were noted by the stunted or odd appearance of plants. In most cases, damaged roots led to plant death.

E. Burkhart (Penn State) suspected that nematodes were responsible and root samples were collected and sent to the Pennsylvania State University Nematode Diagnostic Laboratory. No plant parasitic nematodes were found. The staff entomologist suggested wireworm (the larval stage of click-beetles) might be the problem. There has been no confirmation of this.

It is believed that the wireworms were introduced into the nursery through the use of poorly manufactured municipal compost added to several beds in late 2002. The compost was not used on other beds in the nursery and similar damage was not observed in these. Approximately 250 plants were lost to wireworms in 2003. No further problems were observed during 2004-05.

- Jumping plant-lice

During 2003-05, white aphid-like insects were observed aggregating on the inflorescence stalks (peduncles) of a number of ginseng plants throughout the nursery beds. Samples were collected for positive identification and E. Burkhart has determined that they were jumping plant lice (also known as Psyllids).

The occurrence of jumping plant lice on ginseng is potentially problematic because, like aphids, these insects remove sap from plants. For seed growers, aggregation on the inflorescence has the potential to result in fruit and seed losses through abortion.

This is the first known reporting of the potential for jumping plant-lice as pests on ginseng in Pennsylvania. E. Burkhart has been able to locate only one other mention of jumping plant lice on ginseng in eastern North America (Kentucky). These insects have also been observed on wild plants state-wide by E. Burkhart during on-going ginseng habitat field research 2003-05.

- Slugs

Slugs were one of the worst pests observed at the nursery during this project. In 2004, damage to plants (e.g., defoliation) was significant and so attempts were made to control slug numbers. For slug control, both “beer traps” (i.e., buried cups with beer in them) and “slug bait” (i.e., pesticide pellets) were used and did manage to help prevent defoliation of entire plants.

In 2005, slug poison pellets were applied ahead of anticipated problems; there were few problems with slugs during this year, presumably as a result.

- *Alternaria* foliar blight (*Alternaria panax*)

Foliar blight caused by *Alternaria panax* was a major problem during 2004. Initial spacing of plantings on 12-18 inch centers in nursery beds was intended to discourage the development of this fungal pathogen.

The rapid development and spread of *Alternaria* blight in 2004 caused seed crop failure. In 2005, fungicide applications were made every 10 days for 3 total applications to prevent such losses from recurring, which they did.

- Voles

During 2005, there were major problems with voles channeling through raised beds amended with sawdust. David estimates that voles consumed

approximately 50% of the ginseng plants, with 3,000 of the original 6,000 plants remaining.

Once the problem was identified, poison bait was placed in vole channels but the degree to which this helped is not yet certain. This is one of the first documented cases of voles as a major pest in forest-planted ginseng in Pennsylvania. Previous reports come from more southern states (e.g., WV, NC, KY).

CONCLUSION

Accomplishments in 2005

1. Nursery expansion

In 2005, all ginseng accessions (about 1,000 plants) were transplanted into un-altered local forest sites only. The approximate area of this unaltered nursery component is 3-4 acres, with a total of about 7,000 plants. The altered nursery component, by contrast, is about 1-2 acres with 3,000 plants.

2. Collection activities

Accessions continued to be made from central Pennsylvania. In all, a total of approximately 1,000 plants were transplanted for propagation. These accessions were made from locations in three counties: Centre, Cambria and Clearfield.

Goals for 2006 (The final year for this SARE project funding)

1. Documentation activities

We will continue to seek to improve documentation of the following:

- floral visitors
- seed yields per plant (altered versus un-altered site conditions)
- pest problems
- time spent in key activities associated with operation of a seed nursery

2. Education and outreach

Two educational events will be held on-site in 2006 for the public. One of these will be a formal field-day, held in cooperation with regional

organizations/agencies. The second event will be held for Penn State students enrolled in an agroforestry course taught by E. Burkhart and M. Jacobson during spring 2006.

3. Cooperation on an extension publication

David will work with Penn State in late 2006 to produce an extension bulletin on seed production, based in-part on the observations made during this cooperative project. This bulletin will therefore be aimed at encouraging and assisting landowners to grow ginseng as a "seed crop" in Pennsylvania, with an emphasis on attention to local genetic characteristics, integrated pest management and cultural options.