MANUAL

Umbagog Naturalist Institute • Volume I • Spring 1997

Ginseng Growers

North Eastern Panax quinquefolius

American Ginseng

Panax quinquefolius is one of many ginseng species found in North America and Asia.

History allows us a view of the importance of this plant genus by the volumes of transcripts pertaining to use and cultivation. This, the King of Herbs, has been known throughout Asia for over two thousand years. In fact, one may even find reference to this herb in the writings found in Judea. Clearly the tradition and mystery surrounding this herb was the driving force that lead two Jesuit Missionaries upon the search for a tartarian plant called "Gin-seng" in the New World.

It was during the year of 1716 that Fr. Jartoux asked a colleague living near Montreal if he could locate this mysterious plant. Surely considering the latitude and climate this plant must exist in this part of North America. It was discovered not far from Fr. Lafitau's own living quarters. Enlisting the help of the Iroquois, to whom this plant was called "Garent-Ougen", the Jesuits started the trade in North American Ginseng.

Through a period of boom and bust, ginseng has become part of North American history. In the mentioning of Sang, one finds the names of Boone, Astor and even the father of our country, George Washington.

Maine's tradition is somewhat more obscure, considering our geographic location in the heart of the original ginseng rush. A long list of circumstances had lead to our missing written history, ie. border disputes- Jusuit outposts purchasing from tribal groups who rightly know no borders. Even Maine being a portion of Massachusetts's territory may have affected our record keeping upon the trade. Yet, we can glean knowledge from many sources. Reports of Maine's Clipper captains with green gold in their pockets for personal trade in ports of the far east. 19th and 20th century ads in journals for North Eastern Ginseng. More importantly, the vestigial populations of ginseng hidden in the mountains of western Maine. This in itself tells the history of Maine's ginseng. Greed that drove men to over pick - the needs that a world wide depression created - and the relentless timber harvest brought on by the growth of the timber industry.

Now only in secluded areas of Maine can we experience what drove a major portion of the colonial economy.

Maine's Advantage

Maine is a state of vast timberlands and low population density in which the concept of multiple use forestry is beginning to enter adolescence. These factors have allowed many people to examine alternative forest crops that could become part of their individual management plans.

If one examines our climate, mountainous terrain and rich forest soils one can see why many individuals are promoting ginseng cultivation as part of their management plans. In fact Maine's growing regions are almost identical to the best growing regions found in Mancuria. Even the decaying pegmatite rocks found in our mountains are similar to those found in that part of China. Our virgin soils contain a rich potpourri of micro nutrients and minerals which when coupled with our climate promote the growth of a crop of unique quality. History has told us that our regions produced a ginseng of unequalled quality and now into late 20th century almost 300 years after its discovery we are returning as a leader in the production of North American ginseng.

Aralia nudicaulis - "False Ginseng" or "Fool's Ginseng"

Ginseng itself is an unassuming plant that can easily be mistaken for the common woodland plant wild sarsaparilla. The best way to differentiate is to examine the drawings found on this page. Please understand that there may be more than one variation of Panax quinquefolius and these variations may exhibit different leaf shapes and sizes in plants beyond 4 years of age.

Panax quinquefolius from The Report of the Commissioner of Agriculture, 1884

Cultivation Techniques have in the past been predominated by field cultivation. Man's urge to best mother nature and produce the most crop on the least amount of land. Ginseng as a crop has resisted this domestication from the beginning. From disease to lower ginsenoside content each step requiring more intervention by man and in most instances reduction in the ability of the plant to resist disease. Even the diseases are requiring more intervention with toxic agents to rebuff their resistance to chemical application and the plants ever decreasing ability to ward off pathogenic states. A second method is a compromise between field cultivation whereby we utilize the forest canopy for the necessary shade and raise beds in the woodlands and for the most part continue the processes used by the field cultivator. In this method we have saved thousands of dollars by not erecting artificial shade but are continuing the destructive practices of field cultivator, which I believe to be a COUNTER PRODUCTIVE CYCLE. **This growers manual** proposes a more natural approach to the woodland cultivation of ginseng. This approach creates an end product that closely replicates the characteristics of wild ginseng by applying a unique combination of new and old growing techniques. This wild simulated ginseng will become the wild of the future as increased pressure is exerted upon the remaining wild populations. Much of what we are doing is creating a new system of cultivation. We embrace all new technologies that will allow a more natural and less toxic approach to cultivation.

Are my woodlands suitable for the cultivation of ginseng? Ideally we are looking for a mixed hardwood forest of maple, beech and oak. We may also find an occasional birch and other hardwoods. In our region locations that contain a predominance of conifers or red oak create soils that may be too acidic. Look for wild sarsaparilla, wild gingers, false soloman's seal etc. We have eliminated jack in the pulpits and many ferns as indicator plants as these may indicate an elevated soil moisture content.

Tradition tells us to choose a north and east facing slope for planting our crops. This is less of an importance in our region. Our latitude does not allow for the elevated temperatures found in the forests of the middle Atlantic states. We are finding slope direction less of an indicator. Soil-Canopy-Airflow being some of our more important factors. When examining your location you must ask yourself the following questions.

1. Does my canopy provide 70% - 75% shade?

2. Does the ph of my soil fall within the range of 4.5-6.5?

3. Do I have the proper indicator plants?

4. Is the tree species distribution appropriate?

5. Do I have a rich humus soil with good drainage?

Do not despair if all is not perfect. You can do some modification to enhance your growing environment. Initial forest preparation reduces the amount of work needed yearly to maintain the health of your plantation. Be proactive.

Ginseng planting occurs during the fall months here in the northeast. This is usually scheduled after harvest which starts at the onset of the golden stage, for the adult ginseng plant. Simply, when the leaves of the ginseng plant start to turn a pleasant golden-yellow we start our harvest. If the plant goes completely dormant it is impossible to find and dig. Remember, part of our strategy is to simulate the growing environment of the wild. If we have no raised beds there are few points of reference for finding the elusive roots. Therefore, this will start in early September and, when all the leaves have fallen from the trees of your plantation, you will start planting. Even if you are a first time grower and have no crops to harvest, try to maintain this schedule. This will become a very important part of your yearly planning.

You have already completed your forest preparation earlier in the season and are now ready to plant. We suggest that you prepare imaginary rows up the slope of your planting areas. These rows being approximately 4 feet across and with large walk ways between each row. This allows easy access into the growing areas and well defined path ways. You can identify these rows with string for the planting season. Once planting has been completed they can be removed. If your land has small hummocks, plant on the tops and sides of these within the designated rows and in this manner avoid the low areas of poor drainage.

Planting the seedlings is reminiscent of placing conifer seedlings with a few minor variations. The seedlings are first sanitized with a solution of household chlorine bleach and water, the ratio being one part bleach to nine parts water, for no more than fifteen minutes and then flushed with fresh water. The area is raked of leaf litter and planting can proceed. A hole is made into the soil approximately the length of the seedling, allowing sufficient depth for the terminal bud to be covered with 1 1/2 inches of soil and not just leaf litter. Move 8-12 inches away from this rootlet and proceed with another. Once this area of the row is planted, cover with generous amounts of leaf litter and continue planting the row.

Important things to do after fall planting.

1. Make a map of your planting area. This is necessary to accommodate Maine statutes and will assist you in maintaining your plantations. Plant age, etc.

2. Remove marking strings and any other indicators that may in the future attract unwanted guests.

Plantation Maintenance

When compared to field-cultivation, there is little to do with your wild-simulated ginseng plantation. This does not mean that, once planted, you are able to let nature take its course and receive a substantial harvest in 6-8 years. This is not what we are proposing. In our attempt to simulate the look and quality of wild ginseng, we must maintain a balance between over-cultivation and no intervention. We maintain that a spray schedule of organic fertilizers and fungicides done at crucial points during out breaks of disease, will provide the best results.

We also suggest that you separate all plantings. This prevents the potential contamination from new seedling locations or beds, to existing plantations. Do not smoke near plantations or seedling beds, not only is it harmful to your health, the tobacco may carry pathogens able to infect your growing areas. If you discover seriously diseased plant tops, remove from your growing areas and destroy in an appropriate manner.

Plant emergence occurs in Maine between mid-May and mid-June. This is dependent upon age of plant and geographic location. All growers should be prepared to start their spray schedules during this time period.

Predators

Other than warmblooded bipedal predators, we have but few to deal with. The deer population may, at times, find the tops of your ginseng plants a rare treat. Usually this sends your plants into dormancy and you only lose a portion of that years' growth. Control can be provided by the use of blood-meal, dried coyote urine or wolf urine placed around the perimeter of your rows. Some people place human hair in nylon bags throughout the area. I find that you can string a fine nylon fishing line around your growing areas without a lot of effort. This is placed at a height of approximately 4 feet. We have strung small metal cans on the line every 5-10 feet and these cans hold small pebbles. When animals strike these, not only are they frightened, but you also become aware of their probable movement locations by finding the damaged areas.

Basic Spray Schedule

The basic spray schedule that is recommended utilizes items that can be located at any well-stocked farm supply house. We recommend foliar spraying of a mixture that combines fish and seaweed emulsions a minimum of three times within the season. Once at plant emergence, once during flowering, and at the development of the berries. Alternaria or other fungi may become a problem during periods of excessive moisture. At this time, foliar

application of organic sulphur and copper compounds may be used.

We recommend the purchase of a good text on the diseases of ginseng. These can be recommended by us or the Maine Ginseng Growers Association.

Remember a plant with a strong immune system is able to withstand the attack of pathogens more successfully than a stressed plant. The Umbagog Naturalist Institute is available for consultations on your specific needs for optimizing your planting locations-seedling beds or advanced spraying schedules. Please contact our office for our fee schedule.

Forest preparation allows us to reduce the amount of work required to maintain our plantations in the years required to bring this crop to harvest. We have found that proper site choice and preparation reduces the amount of toxic control measures needed to maintain a healthy forest plantation with acceptable plant loses. In other words, we are dealing with an inverse ratio ie. the more work provided at the onset reduces the required work at a later date.

Ginseng thrives under a tall canopy that allows for 70% - 75% shade. This would indicate in many planting locations one may remove as much of the mid-story that would allow for the realization of the light requirements. The results of your labor will be twofold. Not only have you optimized the light requirements you have allowed an increase in the amount of airflow through your growing region. This increased airflow will assist you in disease control as an over abundance of moisture increases the ability of pathogens to multiply and overtake your plantation. Always examine your potential growing areas at different times during the summer months. Look for changes in the path of the sun remembering that these plants need a 70%-75% shade. Early or late season paths of the sun may dictate changes.

The ground cover should not be eliminated. Remember that we are trying to replicate nature as much as possible. The interrelationships between the diverse group of plants and fungi found on and in the forest soils are only now being studied. There is much to indicate that these complex relationships play an important role in the maintenance of the health within the forest community. Another important factor is the simple relationship between a monoclonal environment and the ability of a pathogen or group of pathogens to swiftly affect an entire species population. The more of a genetic and species diversity the lesser the chance of this occurring in our growing areas.

Record keeping not only allows you compliance with state regulations but is good science and therefore good agriculture. Keep a journal and record of work done on all locations with time and procedures. This includes spray schedules and other augmentations with a detailed list of materials used. This will assist decision making and the ability to gain the highest price for your future crops.

Wild ginseng Root

Seeds or Rootlets?

If we approached our plantings from tradition we would prepare the forest floor and broadcast stratified seed in the fall. This technique is in most instances a poor choice. Not only will you wait six to nine years (with proper spray schedules) you will incur tremendous seed loss from very poor germination and animal foraging. We believe a more successful approach depends upon a seed-rootlet development program developed by each plantation owner. The planting of 1 -2 year old rootlets each fall allows the farmers to use healthy established plants that have been nurtured in a nursery designed specifically for the development of large and healthy planting stock. In this manner the plantation owner many start harvests as soon as 4 -5 years. That is the time spent in the forest environment. The chronological age will still be between 6 - 8 years. With proper augmentation schedules any period longer than this is counterproductive for many economic and logistical reasons. We recommend starting your seed and rootlet production area with the purchase of 1,500 3 - 4 year old healthy plants that will become your permanent seed production area. This area by the fifth year may produce up to 40,000 seeds yearly. Each plant may produce about 14 berries containing 2 seeds each. We have seen many of our plants producing berries with 3 seeds each. Please do not expect the same seed production figures from your forest plantations as these will vary greatly from your permanent seed producing area. Don't be discouraged though, your woodland plantations will produce a great amount of seed and you should prepare yourself for expansion of your field based rootlet program.

Starting the plantation has already required many complex decisions. Now you must decide, "How much money am I going to spend?" We always recommended spending only as much as you can afford to lose. Remember, not only is this not a get-rich-quick scheme but we are producers of an agricultural crop. We believe with proper instruction and crop maintenance that each plantation

will be able to achieve a degree of success. What we return from all endeavors is in relation to our time spent and desires to learn from mistakes and the knowledge found around us.

We do recommend that you start with a combination of 1 - 2 year old seedlings and a number of 3 - 4 year old rootlets in your first forest plantings. This allows each plantation owner a complete inventory from young seedling to mature plant. This allows for a more intimate examination of the plant and it's growing characteristics. The institute maintains permanent and on going demonstration areas at which each grower may cross reference their experiences with our on going 10 year research project in western Maine.

Seeding Beds

Our recommendation is to develop your seedling beds and permanent seed producing area in a location that can be monitored closely. This location ideally would be in an open field close to your home. Raised beds should be 4' by 18' and 12" high. The base of each bed should contain 2" of crushed or pea rock for drainage. Close attention should be paid to your growing soil. If you cannot afford sterilized soil or cannot fumigate your soil, use soil from well under ground at an uncultivated location. We are trying to lessen the possibility of initial site contamination. The growing soils should be augmented with a small amount of well composted cow manure and powdered kelp. We also add rotted granite to replicate our wild growing areas which are nourished by the leaching of minerals found within these decomposing rocks. Plant your seed producing roots at least 12 inches apart and seeds 1" apart. The 1st year seedlings can then be thinned and replanted in new beds. It is important to place barrier boards every four feet inside your beds. This prevents water borne pathogens within the soil affecting your total bed, as these boards provide containment within a 4'x4' area. In the woodland, this does not become a worry as the water migration is quite random due to roots, rocks etc. Another potential contamination area is your choice of the needed mulch. Chopped wheat or oat straw or ground dried leaves being your best choices. These must be uncontaminated. Do not use sawdust or bark.

Of Mice and Moles

These can be a problem at times within your seedling production area and plantation sites. We recommend nonlethal traps or thumpers to control this problem. If you are not opposed, you can also use lethal traps but under no circumstances is the use of poisons acceptable as they may leach into your soils. Cut worms and other grubs can be devastating to your first year seedlings. The best prevention is the use of beneficial nematodes. Look for these at your local farm supply store. Before emergence remove the mulch from your seedling beds and apply the mixture. Remember to replace your mulch.

During the growing season slugs may become an issue in your forest plantation and seedling production areas. We have found beer placed in small cups to be an adequate control method. Please don't waste a Guiness or MacEwans on this procedure they will no appreciate these and a Bud will do . The slugs are attracted to the beer and either over consume or just drown. You may choose other control methods yet if you choose slugs pellets you will be moving away from a less toxic to more toxic control methods.

Shade is best provided with green shade cloth that provides 70% - 75% shade. This is easy to erect above your beds at the minimum height of 8" and comes close to the colour temperature of filtered sunlight in the forest environment. If your seedling production area is bothered by excessive wind provide an appropriate windbreak to protect the young plants.

Each fall inspect the roots of your permanent seed producing plants and discard any that show signs of disease.

Remember that you can raise 6,000 seedlings for each 396 square feet of space and your plants may produce up to 6,000 seeds per pound....

Seed stratification is not really a difficult task. Each fall pick your seeds as they become ripe. It is important to do so before individuals of the flying variety and small mammals arrive on the scene. It may be prudent to cover each head of green seed with cheese cloth to prevent this from happening. De-pulp the ripe seed and keep moist in the refrigerator until finished with entire seed crop. If they dry out, you have essentially lost all seed viability. These are then mixed with moist sand placed in nylon mesh bags and buried several feet underground. Mark your burial location and remove the following fall and plant in your seedling beds.

Many individuals pick the emerging flowers of the adult ginseng plants in the early spring. This allows for an increase in the growth of the root at a sacrifice of seed production. We do recommend this during the two years preceding your plantations harvest. Please make allowance for seed production from your plantations in your seedling production area.

Potential Production Per Acre

A conservative figure would indicate one could expect 20,000 plants per half acre. In Maine, when harvesting 6 - 8 year olds, we are finding 65 - 95 roots per wet/lb or 190 - 285 per dry/lb.

These figures are only accurate for plantations that are using a seedling program.

If you started your plantation by purchasing 1 year rootlets at .18 each you would have invested $3,600.00 plus fertilizer , fungicides and time spent. Fall 1996 saw wild-simulated selling for about $195.00 per lb. If you take a liberal loss rate of 20% and a mean size of 240 rootlets per dry/lb. the gross profit is $12,999.00 per half-acre. This is only an estimate of potential, not a warranty of income. We, at the Umbagog Naturalist Institute, do believe that wild-simulated ginseng is an excellent augmentation to your forest management plan.

International Market

Ginseng continues to be an important commodity in the Pacific Rim countries. We have seen in the past few years a decrease in the price of field-cultivated ginseng from the United States and Canada. This could be expected with the large commercial plantings in North America and the severe competition amongst the growers. This is further exacerbated by the cultivation of Panax quinquefolius on mainland China and the relentless production of inferior products. Our advantage is the decline in wild ginseng and this gap being replaced with quality wild-simulated root. This will provide an eager market for Maine's quality northern root. We have already seen the interest swell for our future crop from many corners of the globe. We, at Umbagog, are ready to consult and provide you the finest planting and seed stock available. Good luck.

Aralia Quinquefolia, Gray.

To Sell or Not to Sell

If you are intending to sell your future crops you must be licensed in the state of Maine. Please contact:

Maine Dept. of Agriculture, and Food, and Rural Services
Division of Plant Industry
Station #28
Augusta, Maine 04333

These people are very helpful and will send you the proper forms in an expedient manner. The fee is a small price to pay for the services rendered. You may also want to become a member of the Maine Ginseng Growers Association, a nonprofit organization dedicated to research, cooperative learning, and education and marketing of ginseng. This group's focus is upon wood-grown ginseng becoming part of an eco-management approach to forest use.

Maine Ginseng Growers Assoc.
PO Box 382
Andover, Maine 04216

Umbagog Trading Co., Inc.
27 Granite St.
Mexico, Maine 04257

MAINE GINSENG GROWERS ASSOCIATION

Seedling Production Program

Flyer #2

Dr. Michael P. DuBois
Consultant

If you have not yet recieved the Ginseng Growers Manual and/or Flyer #1 "Disease & Animal Control Measures" please let us know & we will forward it to you.

Maine Ginseng Growers Association
PO Box 382
Andover, Maine 04216

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STEVE DRANE
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AUBURN ME 04210

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Seedling Development Program

A properly developed seedling program is the central point of a profitable forest plantation. Its primary goals being to reduce the dependency on outside seedling and seed sources and to develope a ready supply of healthy seedlings for each planting season. In this manner it is possible to increase the scope of ones holdings with the use of only increased person hours (politically correct) and without extensive monetary outlay.

Can I directly seed my forest plantation? Yes this method is used in some areas of the United States and Canada for woodland-cultivated ginseng and in some instances wild-simulated plantations. Be aware there are serious limitations to this protocol that will influence the time that your crop must stay within the forest environment and the total weight of your crop.

A. *Poor germination rate of seeds directly sown in to the forest environment.*
B. *Predation from a myriad of feathered and fur bearing friends.*
C. *Low root weight in 1st and 2nd year seedlings.*

I understand the poor germination rate and the animal issue but why are we concerned with root weight? Live ginseng roots may double and triple their root weight during the first few years. During the rest of their life they may only gain twenty percent per year. Seedlings produced in controlled production areas are 50% larger than their forest counterparts. It is with these seedlings that we are able to harvest out forest plantations within a 6 - 8 year period as opposed to the 8 - 10 year period required for direct seeded locations. Our protocols require a less intensely planted region that in many instances will produce an equal profit margin with less plants that are healthy and physically larger than their forest seeded counterparts.

Forest Seedling		**Program Seedling**	
1st year	2 grams	1st year	4 grams
2nd year	4 grams	2nd year	8 grams
3rd year	8 grams	3rd year	16 grams
4th year	9.6 grams	4th year	19.20 grams
5th year	11.52 grams	5th year	23.04 grams
6th year	13.824 grams	6th year	27.64 grams
7th year	16.58 grams		
8th year	19.89 grams		
9th year	23.86 grams		
10th year	28.63 grams		

This is only an example and to be used as a conceptual guide. It will take four years longer for the direct seeded plants to acquire the weight of our program roots grown in the forest environment. The protocols outlined in our growers manual and leaflets establish a protocol that reduces capital outlay, enhances

Please develop a written three year plan for your forest plantation and your seedling production program. I have always found that using this acronym keeps me on target for goal development.

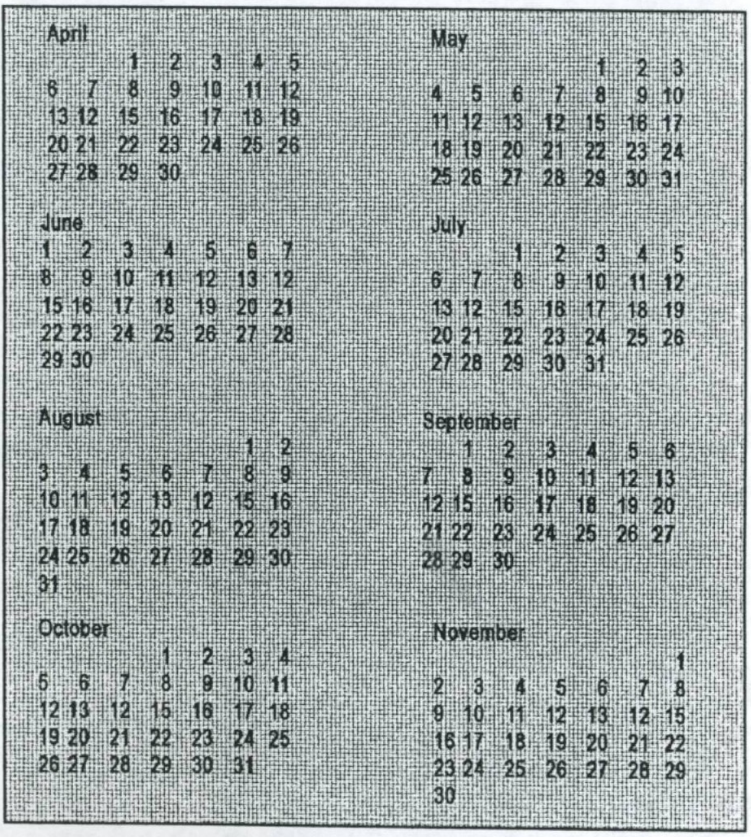
ASK YOURSELF IF YOUR GOALS ARE:

S *pecific*
M *easureable*
A *ttainable*
R *elevant*
T *ime Oriented*

ROCKET FUEL

1 Liter water
7ML Willard's Water Concentrate
16 Drops 35% food grade hydrogen peroxide
36 Drops AGRI 2 or other similar agent
5ML Nitrozyme
30ML Fish and seaweed hydrolysate

MAINE GINSENG GROWERS ASSOCIATION



April						
		1	2	3	4	5
6	7	8	9	10	11	12
13	12	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

May						
				1	2	3
4	5	6	7	8	9	10
11	12	13	12	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

June						
1	2	3	4	5	6	7
8	9	10	11	12	13	12
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

July						
		1	2	3	4	5
6	7	8	9	10	11	12
13	12	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

August						
				1	2	
3	4	5	6	7	8	9
10	11	12	13	12	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September						
	1	2	3	4	5	6
7	8	9	10	11	12	13
12	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October						
		1	2	3	4	
5	6	7	8	9	10	11
12	13	12	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November						
						1
2	3	4	5	6	7	8
9	10	11	12	13	12	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

IT IS IMPORTANT TO LIST ALL SPRAYS AND SOIL ADDITONS USED BEFORE AND DURING EACH GROWING SEASON.THESE MAY BE COPIED AS TO AFFORD A READY SUPPLY OF UNIFORM REPORTING RECORDS FOR GROWERS. GOOD RECORD KEEPING IS GOOD SCIENCE AND THEREFORE GOOD AGRICULTURE.

production, reduces disease issues, is pro organic and will increase the profitability for the plantation owner.

Program Design

The seedling program should be developed away from your forest plantation in an area that is easily maintained and can be observed on a daily basis. This location has the largest saturation of plants in smallest physical area. Therefore,you must be able to conveniently institute a rigorous spray schedule and be on guard to protect the location from physical, environmental and disease events. A minimum 20'x40' area could provide the seedlings for a yearly planting of .5 acres of forest. This location would contain a small permanent seed producing area and bed space for growing your 1 year old seedlings. You also locate your stratification storage facility within the confines of this location. We recommend using a shade cloth that restricts 70 - 75% of the sunlight entering the location. Here in the northeast the damage of increasing temperature under the cloth as opposed to a cooler environment under lath is a moot point. Not only is the cloth easier to erect, it affords protection from hail and driving rain. Always provide a barrier from the prevailing wind as this stresses your plants and do not forget to protect from excessive light entering the sides of your production area. A concern that is easily forgotten but potentially catastrophic is the effects of small animals digging or dogs running through your seedling bed. Thousands of plants can be lost within minutes. We now suggest that your areas be surrounded with fencing appropriate for maintaining security from small animals i.e. skunks, raccoons, and dogs yet this may also deter deer and heaven forbid at least slow down a wandering moose.

The shade cloth should be erected at about 6' above the ground as this maximizes the diffusion effect of the cloth and allows easy access under your production area.

Bed designs are varied and you can refer to our growers manual for these basic designs and various soil compositions. Our most successful bed design starts with a children's wadding pool. These come in two sizes and a multitude of unique color patterns (the ducks are my favorite). These are self-contained micro-growing environments. The conversion from pool to growing container is a complex procedure. One must puncture the bottom of the pool. Once this has been carefully accomplished place a 2 inch layer of pea-stone in the bottom and you are ready to continue. Our current growing mixture is a blend of composted manure or seafood, topsoil and peat. Always check you ph as you want in this instance to be near the ideal 5.5 ph. Please take the time to adjust the seedling beds ph as you are trying to maximize your growth rate. The pools are then filled to a depth of approx. 6" with this mixture. This should be done at the beginning of September as to reduce any potential contamination. When your seeds arrive in the fall they are placed on the surface of the growing mixture after being disinfected and soaked in a solution containing growth hormone or a fish-seaweed hydrolysate (please refer to manufacturers instruction) and covered with .5 inch

of growing mix. This is then covered with a thick layer of wheat-straw. It is also important to mulch the sides of the growing container.

Spring and Summer Chores

In May remove the straw mulch and treat with beneficial nematodes even though it is doubtful that these will be a problem in our grow mix. The only possible contamination would be a topsoil from an unknown location that has not been heat processed. Even before emergence spray soil with a mixture that is called rocket fuel (formula found in insert). Once emergence has subsided place a chopped hardwood leaf mulch on the beds. This is made up of a blend of dried hardwood leaves collected and stored in an area to prevent excessive molding. Do not use with a blend of predominance of oak leaves as this will adversely effect your soils ph. Straying will continue on a weekly basis with the rocket fuel through out the season.

It is necessary to develop a prophylactic spray schedule of antifungal agents through the growing season. Please refer to flyer #1 for information on applicable agents. There may be an increase of disease during damp seasons. One way to reduce the affects of the season is to place over your growing areas a tarp during rainy days. This will help you control the moisture levels within the growing containers with a very simple procedure.

Three year plans may have been eliminated in the former Soviet Union yet they are a necessity for your program. Your plan takes into consideration the purchase of seed and 1 -3 year old seedling for three consecutive years allowing for the development of seed production that will supply your seed beds. Even though you will be producing seed in your second growing season this must be stratified before it will germinate in the seed production areas. Continued purchase of stratified seed for these three years will assure a sufficient quantity until your forest plantations and seed producing area can be replace and fill your needs. Your purchase of 1 -3 year old seedling allows for continuing harvest every year within three tree years after the start of your program. In regards to planting 3 year old stock, there have been concerns as to whether they will acquire the characteristics of wood grown roots within three years. not only will they develop the necks and root characteristics of woods grown roots they will produce sizable seed crops in the seasons directly following their plantings.

To calculate your exact needs refer to the growers manual for specifics regarding seed production and forest plantation densities.

Seedling harvest is easily accomplished in September to accommodate seedling needs. To replicate mother nature we remove the shade cloth which forces the plants into the golden stage and die back. Once this has occurred we simply sift the soil to remove the seedlings. They are rinsed and refrigerated until planting. The soil in the growing containers is discarded or used for other purposed and the containers disinfected before we prepare for the next cycle. This system will consistently produce a high quality seedling for each forest plantation.

SUPPLIERS

Gardens Alive
5100 Schneley Place
Lawrenceburg, IN 470235
Tel: 812-537-8650

Bordeaux, Organic Sulfur and Copper sprays, Nematodes,Crab and Kelp blends etc. Growth hormone blends.

Neptune Harvest
88 Commercial St.
Glouster, MA 01930
Tel: 1-800-281-1414

Organic liquid fish and Sea-weed plant food.

Atlantic Laboratories
41 Cross St.
Waldoboro, ME 04572

Nitozyme plant growth regulator.

Umbagog Trading Co., Inc.
27 Grainite St.
Mexico, ME 04257
Tel: 207-364-8632

Ginseng seedlings, seeds, goldenseal, shade cloth, consultations, etc.

Worm's Way
7850 North Highway 37
Bloomington, In 47404
Tel: 1-800-274-9676

Wide range of supplies including a beneficial bacteria that may control soil borne fungi in seedling beds. Diseases of cultivated ginseng.

Agricultural Bulletin Building
30 North Murray St.
Madison, WI 53706
Tel: 608-262-3346

Excellent brochure on diseases of ginseng.

Johnny's Selected Seeds
Foss Hill Road
Albion, ME 04910

Ginseng seeds, seedlings, etc.

Willard's Water
St. Clair Industries, Inc.
PO Box 11811
Fort Lauderdale, FL 33339

Also found in health food stores.

Hay's Farm Supply
Minot Avenue
Auburn, ME 04210

Sunrise Sea Food Compost
East Batson Rd., Rte. 1
Addison, ME 04606

Excellent soil additive.