AN IMPROVED DEVICE FOR MAKING PAPER POTS

E. W. Johnson and G. G. Vanderslice

Horticulturist & Ag. Aid, U.S. Southern Great Plains Field Station, A. R. S.
Woodward, Oklahoma

An improved machine for making pots from common roofing paper_ was devised at the U. S. Southern Great Plains Field Station in 1954 to replace a simple hand-operated machine that had been in use since 1936.[1/] The principal parts (Figure 1) are a common paper cutter, a modified roller (Figure 2) on a discarded washing machine, and a paper stapler. The 3foot roofing paper is cut into 1-foot rolls with a power saw at a local lumber yard. The 1-foot roll is mounted at one end of a frame built around an ordinary 12-inch paper cutter. The frame has a guide and a backstop so that the paper can be cut into 12- by 12-inch pieces. The pieces are then run-through the modified wringer to form the 4 creases shown in Figure 4. The creased paper is then stapled (Figure 3). The bottom of the pot is formed by making at one end cuts of suitable length with a small rose clipper and then interlacing the 4 tabs (Figure 5).

Figure]. Equipment used in making pots. The backstop on the cutting frame shown is set to cut 12- x 12-inch pieces. It can be adjusted to cut paper of various lengths for pots of the desired heights.

1. A Simple Device for Making Paper Pots, Tree Planters' Notes, No. 20, June 1955.

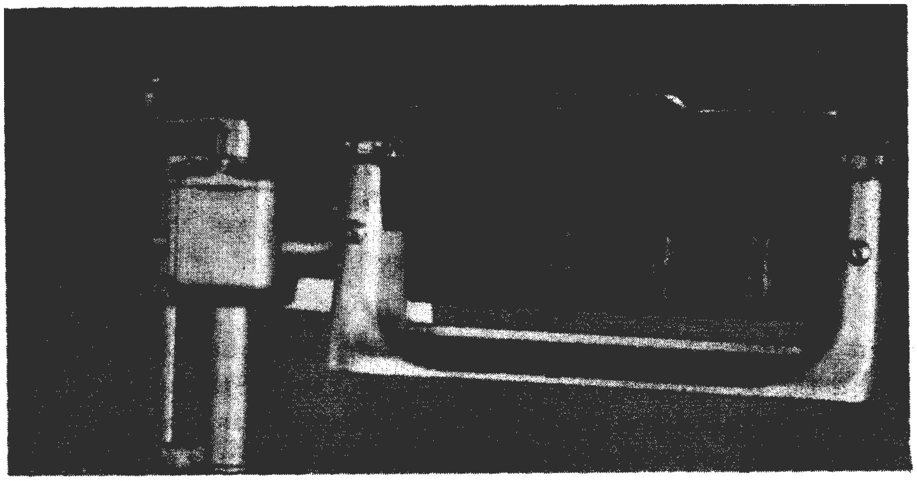

Figure 2. Close up of the modified lower roller of the creasing machine. The lower rubber roller was removed and replaced with a wooden roller of the same dimensions as the upper roller except that 4 ridges 5/32 inch wide by 1/8 inch high were left on the roller. The outer ridges are 1-7/8 inches from the ends of the roller., and the other three intervals are 2-3/4 inches. Measurements are at the center of each ridge.

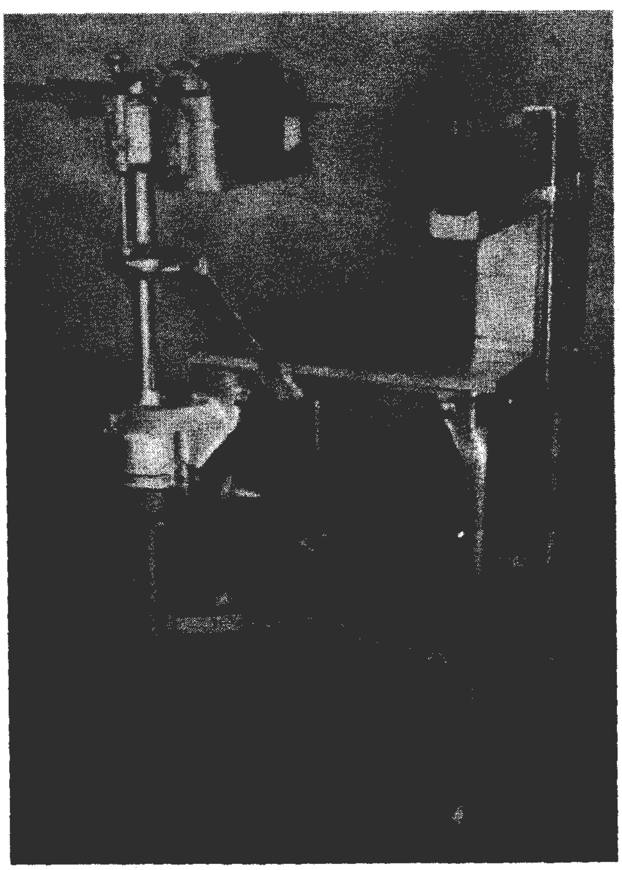

Figure 3, A 12 X 12-inch paper part way through the creasing device. The rollers can crease paper of various thicknesses if the tension is adjusted. A small platform just ahead of the roller was made to serve as a guide for starting the paper between the rollers. The stapling machine mounted on the right side of the old washing machine frame is simply a standard, deep-throated stapler modified so that the foot lever actuates the stapler. This leaves both hands of the operator free to hold the creased paper in position while stapling it.

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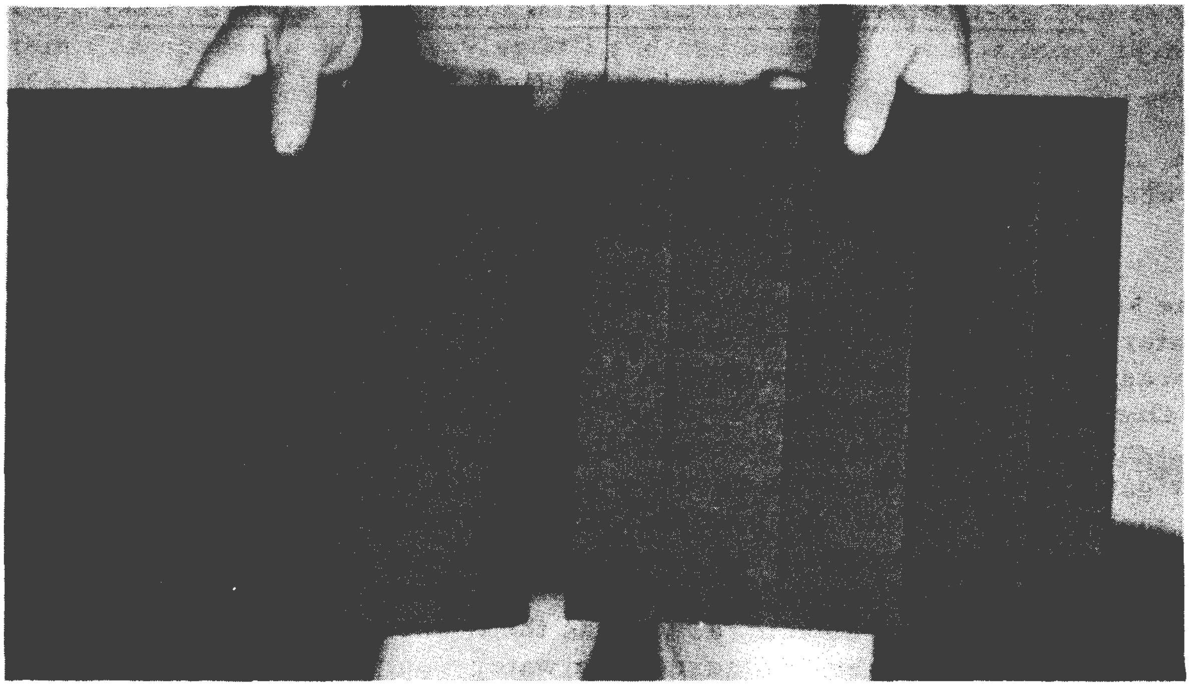


Figure 4. Roofing paper before and after being creased.

Figure 5. After the edges of the folded paper are stapled, a small rose clipper, having a 1-1/4-inch cutting blade, is used to make the cuts at one end of the paper form to permit folding to make the base of the pot. Finished pots shown are 2-3/4 x 2-3/4 x 10-3/4 inches.

SELF-CLEANING SCREEN FOR WATER SUPPLY SYSTEMS

Charles A. Rindt

Forester, Timber Management, Region 6, U. S. F. S. Portland, Oregon

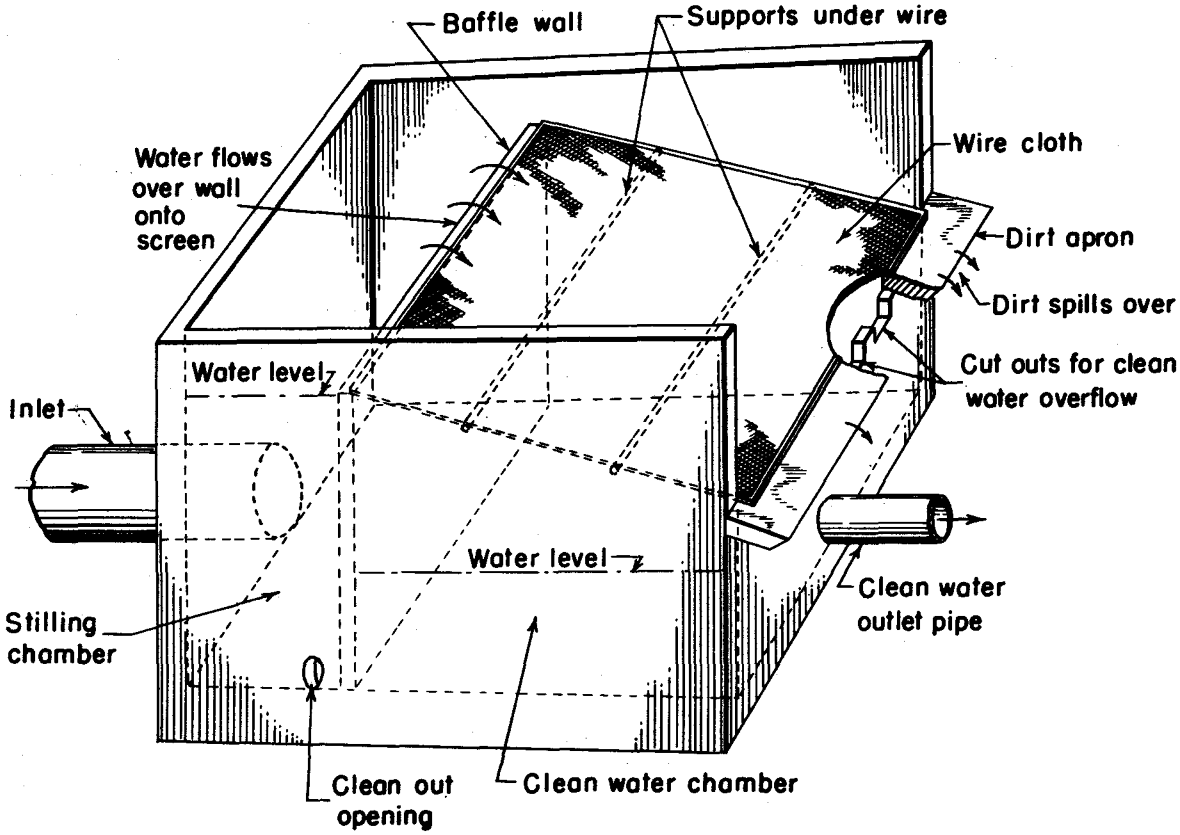
The screening device described below was developed to remove foreign material from the irrigation water going into the overhead lines at the Forest Service nurseries in Region 6 (Wind River in Washington and Bend in Oregon). The water at both places would be unusable for overhead irrigation without screening of filtering. At Bend it is taken from an irrigation ditch and carries weed seeds, algae and other debris common to such ditches. At Wind River it is taken from a stream that has a great variation of flow between low water and flood and carries a variety of material from silt and algae to sticks and leaves. Here the nursery line also serves a community as well as the nursery and for years prior to the installation of the new screen the water was put through a large and expensive filter bed. This filter, however, was so unsatisfactory and allowed so much dirt to_ get into the pipes that at times the water was unusable for either purpose.

In its simplest form, the new screening device consists of a concrete or plank box covered with Fourdrinier wire, which we bought at junk copper prices from a paper mill. Fourdrinier wire is flat-faced copper wire cloth, 60 mesh (3600 holes per square inch). We placed it smooth side up in the box at a slope of 15 to 20 degrees with suitable supports to prevent sagging. The mesh is so fine and the surface so smooth that no foreign material can catch on it. The action of the water continually washes it clean so that it never becomes clogged. Dirt and excess water pass on over it and nothing but clean water passes through it. Incoming water enters through an inlet into the bottom of the stilling chamber at the back of the box. The clean water outlet is through a pipe line at the bottom of the front wall of the box. Operation of the screen is not affected by the amount of water entering the stilling chamber or the amount of water passing out through the clean water outlet. It can be wide open or entirely closed. When the clean water outlet is closed, all water passes through the waste water outlet. Dirt and debris on the surface of the screen is continually washed down and over the water apron.

The screen at Bend has given satisfactory. and care free operation for seven years and the one at Wind River has replaced the filter bed and given carefree service for three years.

The measurable saving in cost at Wind River has been about 1, 000 man hours per year on service to the overhead lines alone. Two or more men were needed to keep the spray nozzles open whenever the irrigation system was operating. The saving at Bend has been as much or more than at Wind River.

It is suggested that the same principle could be used at the headworks of campground water systems. It might also serve to remove weed seeds from water distributed in open irrigation ditches to farm fields.



SELF CLEANING SCREEN
FOR PIPED WATER SUPPLY SYSTEM

DELAWARE NURSERY CART

W. S. Taber

Delaware State Forester Dover, Delaware

Editor's Notes: The Delaware State Nursery has devised the cart shown in the picture to carry such things as the chemical barrel, shade frames, etc. It is very light, strong, and easily pushed. State Forester W. S. Taber furnished the following description when it was pointed out that other nurseries might find such a device useful and might want to build one at some local shop.

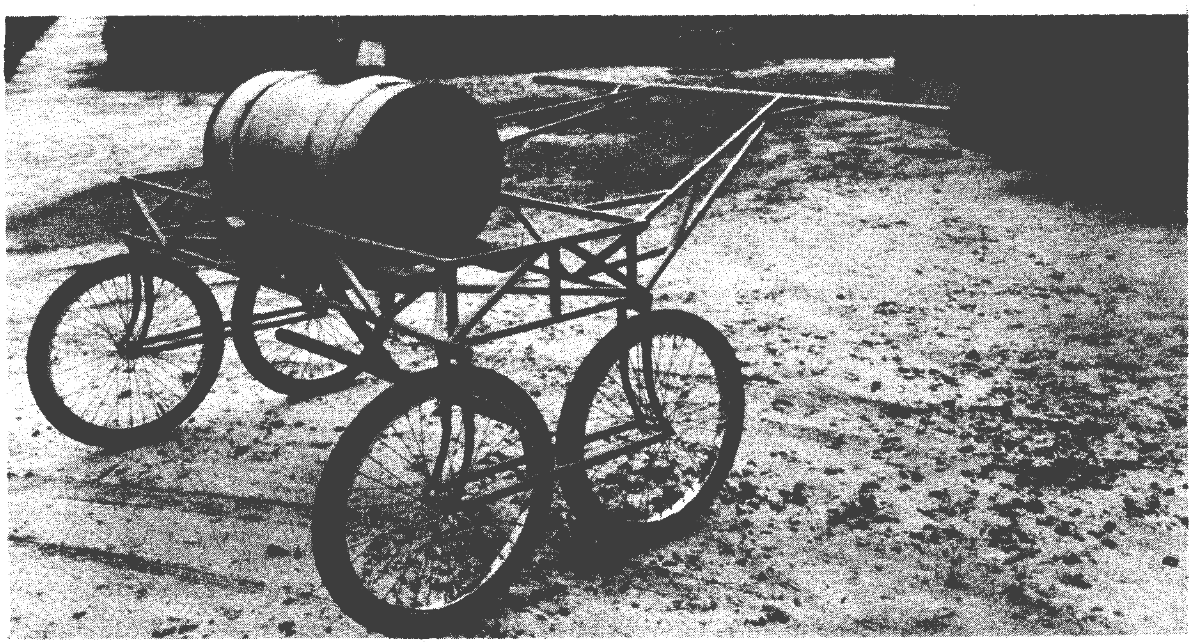
Description: Frame of 3/4" square tubular 1020 steel, welded. Balloon tired 26" bicycle front forks and chrome plated wheels, welded to frame.

Top plane of tongue should be level with top of frame to support shade lath.

Formaldehyde barrel, 32 gal. stainless steel. Sprinkler pipe 1-1/2" copper tube, 1/16" drip holes spaced 2" apart, valve-home made-stem lift type as in gas engines, all brass, in barrel outlet.

Sprinkler assembly is a complete unit that is not fastened at any point to frame and can be lifted out.

Note diamond in middle of bed fabrication to permit sprinkler T to come through.



USE OF A POTATO DIGGER FOR LIFTING NURSERY STOCK

Edward D. Clifford

Nurseryman, Chittenden Nursery, U. S. F. S.
Wellston, Michigan

The most costly project in the operation of a nursery is the lifting and packing of the stock. It sometimes costs more to lift and pack the stock than it does to grow it for 2 or 3 years in the seedbeds. Some improvements have been made in the past in the method of lifting the trees, but it is still a slow hard job which in 3-0 stock requires considerable energy to pull and shake the stock to remove the soil from the roots.

During World War II the author was on the Emergency Rubber project, and when field planting of the Guayule was stopped the seedlings remaining in the seedbeds were lifted, baled and sent to the mills for extraction of the rubber. Inasmuch as the roots were also used, it was necessary to lift the plants with about 6-8 inches of the roots. The lifter used in nursery operations did not lift the plants free of the soil so they could be baled. A 2-row potato digger was secured and did the job in a fine manner. However, this type of digger was not suitable for lifting seedlings in that it had a divider that ran down the middle of the machine and caused the plants from the middle of the bed to turn over.

About 1952 the Pennsylvania Forest Service tried out a double row potato digger made by the John Deere Company that did not have this divider down the middle. They found that this machine, with a few minor changes, did a very good job of lifting conifer seedlings and transplants in their nurseries.

In the Chittenden Nursery a large amount of 3-0 red pine stock is raised, and this has been very hard to lift. The roots are so interlaced and heavy that it is hard to shake off the soil. An agitator was tried on the lifter but could not handle the job.

A 2-row potato digger was secured, and with a few minor adjustments and additions did a very good job on 2-0 and 3-0 seedlings. It shakes more of the soil from the roots and what remains falls off with a shake or two. The potato digger was also tried on 2-1 transplants but could not be used for lifting them. All the soil falls off the roots of this class of trees as soon as they start up the shaker chain, and the trees become hopelessly jumbled. However, it does work on 2-2 transplants where the root systems are more matted. With a few changes, as perhaps by using a link belt on the shaker chain, it is believed that the potato digger can be used on the 1st year transplants from light, sandy soils such as are found in the Chittenden Nursery.

The changes and additions that were or are being made on. the potato digger are rather minor. A sheet metal apron was attached at the rear to catch the trees as they came off the shaker chain and permit them to slide down to the ground in an upright position. The blade was moved in about four inches on each side so that the soil in the paths was not disturbed so much. This eliminated the trouble caused by light soil sometimes allowing one side of the machine to settle and run too deeply. Also it was found that some of the trees on the outside rows of the bed were having the roots split due to their long root systems extending out into the path.. It is planned to place two coulters on the digger so that these roots will be pruned off at a length of about 6-8 inches. It is hoped that this will prevent this difficulty.

Our use of the potato digger has reduced the time required to lift and pack a thousand trees. With the old digger it required 75 minutes to dig, pack and store a thousand trees. (This included time to haul moss, paper, put trees into storage, and otherwise serve a complete operation.) In the Fall of 1955 the same operation with the potato digger on the 2-0 and 3-0 stock required only 50 minutes per thousand. The use of the digger has made the lifting job much easier. The daily production was increased and the employees were not as tired at the end of the day.

SEEDBED ROOT PRUNER

Edward D. Clifford

Nurseryman, Chittenden Nursery, U.S. F. S.
Wellston, Michigan

It has been the practice at the Chittenden Nursery to root prune any seedlings being carried over for the third year in the seedbeds. This, for the most part, has been red pine stock. The usual practice in root pruning has been to run a pruning blade under the bed at a depth of 5 to 6 inches thus cutting off all of the vertical roots extending to that depth. This has resulted in the development of a fairly well balanced seedling, but it was believed that if some of the side roots could be pruned, a better root system and a better top-root ratio would be obtained. Examination of the seedlings after they had been root pruned on the bottom showed that only about 20% of the roots were vertical roots and had been pruned.

To do this side root pruning a machine was developed, consisting of a series of rolling coulters mounted on an axle and spaced so they would fit between each row of trees. The axle ways suspended on a frame to which a 3-point hitch was attached so that the coulter could be raised and lowered by the hydraulic lift on a Ford or similar tractor. The coulters were 18 inches in diameter and permitted the pruning of the roots to a depth of 5 to 6 inches.

Due to delays in getting the root pruner properly adjusted, it was early. June before the root pruning of the side roots was completed. Two weeks after the side roots had been pruned the bottom roots were pruned, as in the past. The seedlings started to develop 2 or more roots at the point where they were cut within 2 weeks. The development of rootlets along the pruned roots seemed to be stimulated. Approximately fifty percent of the main horizontal roots were pruned. By fall the pruned roots had developed several roots at the point of pruning, and appeared to have more rootlets than the unpruned trees. The top-root ratio was not determined, as no unpruned stock was available for comparison.

Over five million red pine seedlings were thus root pruned in the spring of 1955 with a resulting loss of only a few seedlings which were injured in the initial trials before the machine was properly adjusted.

To see if root pruning late in the fall of the second season or pruning early in the spring before root growth starts would give a still better root development a few beds were side pruned in the fall of 1955, and most of the remaining beds will be pruned as soon as possible in the spring.

When the root pruned trees were lifted in the fall of 1955 it was found that their roots were not interlaced with those of the trees in the adjacent row and could be separated easier, resulting in less damage to the root system.

Plans for this root pruner are being prepared.

NURSERY CONTROL OF FUSIFORM RUST DEMANDS CAREFUL SPRAYING

A. A. Foster and B. W. Henry Southeastern and Southern Forest Experiment

Stations, U. S. F. S.

Fusiform rust in southern pine nurseries is caused by a highly specialized organism which demands a set of exact conditions before it can infect pines. In the absence of these conditions some nurseries escape serious infection every year and all nurseries may escape serious infection some years. Consequently, many nurserymen who spray carelessly appear to get satisfactory disease control much of the time. However, if they are in the range of potentially heavy rust occurrence, they are taking a gamble they are certain to lose with disastrous results in the occasional severe rust years.

The cycle of infection with fusiform rust begins in winter or early spring when the orange, powdery spore masses break through the bark of cankers on pine trees. These spores are carried by the wind to new leaves of oaks which they infect, causing yellowish, irregular spots. From these spots, brown, hair-like protuberances grow on the under side of the oak leaves The spores that cause new infections on the pines are produced on these protuberances. Periods of 18 hours or more of saturated atmosphere and temperatures between 60° and 79° Fahrenheit are necessary for these spores to ripen and be blown to and infect the pines. [1,2] Under such conditions, the only way to protect pine seedlings is to have them covered with a film of fungicide. Ferbam is currently in use, although ziram and zineb are also recommended.[3]

In experimental work which demonstrated the effectiveness of ferbam, Siggers [4] accomplished this protective coverage by drenching the plants with an excessive dose of fungicide (5. 5 pounds of ferbam in 270 gallons of water per acre).

1/ Siggers, P. V. 1947. Temperature requirements for germination of spores of Cronartium fusiforme. Phytopathology 37: 855-864.

2/Siggers, P. V. 1949. Weather and outbreaks of the fusiform rust of southern pines. Journal of Forestry 47: 802-806.

3/Siggers, P.V. 1955. Control of the fusiform rust of southern pines. Journal of Forestry 53: 442-446.

4/Siggers, P.V. .1951 . Spray control of the fusiform rust in forest-tree nurseries. Journal of Forestry 49: 350-352.

With the great expansion in nursery production, the need for mechanizing the spray program increases. It is possible with present equipment to cover an acre of pine seedlings with 2 pounds of ferbam in 75 gallons of water. To do this, however, it is necessary to reduce droplet size to a minimum, and to spread the fungicide film thinly and evenly.

A given amount of liquid dispersed in small droplets gives more effective coverage than in large droplets. Small droplets are produced in three ways. Nozzles may be revolved at high speeds as in some European sprayers. Large volumes of air may be moved at high velocity over a small stream of liquid as in concentrate sprayers and mist blowers. The third method of reducing droplet size is to pass a liquid at a minimum pressure of 300 pounds per square inch through a hole no more than 1/32 inch in diameter (#2 nozzle disc.). This latter is the method in common use in southern forest nurseries. It fails, however, when the holes in the nozzles become worn or when the spray-pump pressure falls below 300 pounds per square inch. Either of these conditions causes large droplets, and hence the fungicide covers only a small percentage of its potential area of protection.

The second essential for efficient application of the fungicide is to spread it in a thin layer over the plant. Pine tree shoots and needles are covered with a waxy "bloom" which prevents water droplets from flattening. If a surface-active agent is added to the spray, the droplets will flatten as they touch the tree. Although any detergent will do this, a more satisfactory job can be obtained by using commercial spreader-sticker which also contains an adhesive material.[5]

The third factor necessary for efficient coverage is uniform distribution. Number 2 nozzles spaced 10 inches apart, and 18 inches above the seedlings, moved over the beds at 3 miles per hour will apply 75 gallons per, acre uniformly. Sprayers may be calibrated from the information given in table 1.

About 1 hour after spraying by the method shown in table 1, on a sunny day, the film of ferbam is dry enough to stick to the plant. Heavy rains and irrigation will gradually wash it off, and as the plant grows it puts out unprotected tissue. Consequently, it is necessary under ordinary conditions to repeat spraying at weekly intervals. In some areas, sprays are applied twice a week for the first 3 weeks.

5/ Some commercial materials and rates in common use are: Dupont Spreader-Sticker (E.I. duPont ,de Nemours) 5 to 8 ounces per 100 gallons; B1956 (Rohm & Haas)--5 to 8 ounces per 100 gallons; and Santomerse S (Monsanto Chemical Company)-1 pint per 100 gallons.

Usually the spray program should begin when the spring-sown slash-or loblolly seeds begin to germinate and should be continued until mid-June.

Future research may find some material more effective than ferbam, or types of machinery more efficient than our high-pressure sprayers. Nevertheless, the present methods, if carefully practiced, will keep the .incidence of fusiform rust below one-half of one percent under most conditions.

Table 1.--Calibration of sprayers to deliver 75 gallons per acre

Distance between nozzles	Tractor speeds of 2 m.p.h.	3 m.p.h.	4 m.p.h.	5 m.p.h.
(Inches)	(Quarts delivered per minute per nozzle)			
6	0.6	0.9	1.2	1.5
8	0.8	1.2	1.6	2.0
10	1.0	1.5	2.0	2.5
12	1.2	1.8	2.4	3.0

BASAL BRANCHES NO SYMPTOM OF FUSIFORM RUST ON SLASH PINE SEEDLINGS

Berch W. Henry

Southern Institute of Forest Genetics, Gulfport, Miss.
Southern, Forest Experiment Station, U. S. F. S.

A test established in 1937 by Howard Lambi [1/] appears to demonstrate definitely that basal branching of slash pine [2/] nursery seedlings is not in itself a symptom of infection by the southern fusiform rust.[3/] The test clears up a point that has sometimes troubled southern nurserymen.

Five hundred slash pine seedlings in each of the following 3 categories were obtained from the W. W. Ashe Nursery, Brooklyn, Mississippi: diseased, i.e., with a pronounced swelling of the stem; doubtful, i. e. , with basal branches but no pronounced swelling; and healthy, i.e., with no pronounced swelling or basal branches.

The seedlings were planted on the Harrison Experimental Forest in southern Mississippi. Planting was done in rows of 50 seedlings each, the rows being arranged in a fixed sequence: row 1--doubtful, row 2--diseased, row 3--healthy, row 4--doubtful, etc.

Had the doubtful seedlings been rust-infected in the nursery they would have survived in the field no better than those known to be diseased.[4/] However, the survival percentages for the diseased, doubtful, and healthy, respectively, were 27, 79, and 55 after 1 year; and 3, 60, and 47 after 14 years. Thus, from the criterion of survival, there was no indication that the basal-branched seedlings were rust-infected. Furthermore, no typical fusiform swellings developed at the point of origin of the branches.

These results were confirmed by a 1949 installation on the same forest in which 100 slash pine seedlings with basal branches but no swellings survived as well after 3-1/2 years as a similar lot of seedlings without basal branches.

It thus appears that nurserymen need not cull slash pine seedlings that have basal branches. Such seedlings should be regarded as rust-infected only if they also have pronounced globular or fusiform swellings on the stem.

1/ Then Junior Pathologist, Civilian Conservation Corps.
2/ *Pinus elliottii* var. *elliottii* (Engelm.) Little and Dorman.

3/ *Cronartium fusiforme* (Arth. and Kern) Hedgc. and Hunt.

4/ Siggers, P. V. Mortality in slash pine from planting seedlings with fusiform rust cankers. Miss. Farm Res. 12(9): 1. 1949.

FUNGACIDAL CONTROL OF RHIZOCTONIA DAMPING-OFF

W. H. Cram

Plant Breeder, Forest Nursery Station, Canada Dept. Agri. Indian Head, Saskatchewan

One approach to the control of damping-off diseases in forest tree nurseries is by the repeated application of fungicides to the seedbeds. This paper reports the effectiveness of two fungicides in the control of Rhizoctonia damping-off of tree seedlings. It tells of the 1954 results from one of three co-operative projects on damping-off diseases cared on at the Forest Nursery Station by the author and Dr. O. Vaartaja.[1]

Seed from two seed trees of Colorado spruce (Picea pungens Engelm.), Scotch pine (Pinus sylvestris L.) and Caragana (C. arborescens Lam.) was utilized. All seed was surface sterlized, stratified and then sown on September 28 in flats containing a 1:1 mixture of seedbed soil and sand. Inoculum of the Rhizoctonia culture, which proved (2) the most virulent damping-off isolate, was applied to the surface of the germination medium immediately following the sowing of the seed. Two fungicides, Captan and Tersan, which were previously found (1) to be non-toxic to tree seeds, were applied as water suspensions at five concentrations and at nine weekly intervals starting on October 1. Records for emergence, losses and stand were taken every second day from October 3 to December 10. Results for seedling stand of the three tree species 74 days after sowing of the seed, have been summarized in Table 1 at the end of this article.

Conclusions from this study were as follows:

1. Pre-emergent losses, emergence, post-emergent losses and final stand varied from tree to tree within species as well as between species.

2. The average pre-emergent losses for the three tree species under the check treatment was equivalent to 30% of the seed sown.

3. Emergence of tree seedlings was increased 11% on the average by application of, a 0. 1 grams per square foot suspension of either fungicide.

4. Post-emergent losses were reduced 35% by the application of the lowest concentration of either fungicide.

[1]~ Forest Pathologist, Forest Biology Laboratory, Saskatoon, Sask.

5. Average stand of tree. seedlings was increased from 40% to 65%, and from 40% to 76%, respectively by light applications of Captan and Tersan.

6. Further study is required to determine concentrations and procedures to obtain complete stands in Rhizoctonia infected soil.

References

Table 1.--Stand of seedlings (%)[1/] for three tree species in Rhizoctonia inoculated seedbed soil under 5 concentrations of 2 fungicides.

(Means for 3 replications)

Fungicide & Concentration[2/]		Tree Species & Seedling Stand: Picea pungens	Pinus sylvestris	Caragana arborescens	Mean for conc.
Captan	check	21.4	27.3	67.3	38.7
	0.1	39.3	69.3*	86.7*	65.1*
	0.5	29.6	60.6	95.2*	61.8*
	2.5	18.5	53.3	79.1	50.3
	10.0	3.3	8.6	87.3	33.1
Tersan	check	21.3	33.4	67.7	40.8
	0.1	58.7*	75.3*	93.3*	75.8*
	0.5	46.6	73.3	96.0*	72.0*
	2.5	46.0	53.3	89.8	63.1*
	10.0	44.0	46.8	91.3	60.7*

1/ Seedling stand in 74 days as a percentage of the stratified seed sown
2/ Fungicide concentration in grams per sq. ft. applied at 9 weekly intervals
* Significantly greater than check

1. Cram, W. H. and 0. Vaartaja. Toxicity of eight pesticides to Spruce and Caragana Seed. Forestry Chronicle: 31:247-249. 1955.

2. Vaartaja 0. and W. H. Cram. Damping-off pathogens of conifers and Caragana. (In press for Phytopathology 1955).

GROWING GREEN MANURE CROPS AT A FOREST NURSERY

H. Knight

Research Division, British Columbia Forest Service
Victoria, British Columbia

In 1950 the British Columbia Forest Service established a nursery near Cranbrook, B . C . , in the southeastern part of the province (el. 3013). This region is semi-arid. The annual precipitation averages about 15 inches. The climatic data is shown in Table 1.

Table 1.*--44 year average monthly temperature and precipitation, and monthly extremes of temperature of 1953.

	J	F	M	A	M	J	J	A	S	O	N	D
	Temperature — degrees F.											
Months	16	21	32	43	51	58	63	62	52	42	29	20
	Extremes of Temperature for 1953 — degrees F.											
Max.	50	50	60	64	81	76	100	92	84	73	52	42
Min.	1	0	-5	15	25	34	35	39	25	21	13	5
TOTAL	Precipitation — inches											
14.57	1.48	1.14	.85	.68	1.24	1.92	1.09	1.02	1.11	1.03	1.34	1.67

*Climate of British Columbia, Report for 1953. British Columbia Department of Agriculture, Victoria, B.C.

The soil of the nursery area is alluvial in origin and is derived from limestones of the Rocky Mountains, and from acidic argillites and quartzite of the Selkirk Range. It is a typical, young alluvial soil that shows little or no profile development. The soil characteristics are determined primarily by the chemical composition, texture,. and climate, and to a lesser extent vegetation. The soil pH varies from 6.2 to 7.2 near the surface to over 9.0 in some sub-soil horizons. The organic matter content is low.

No information was available on suitable green manure crops for this region, and as organic matter maintenance is very important, trials were initiated in 1953 to determine a suitable crop.

EXPERIMENTAL

(a) Vegetation Analysis

On May 21, 1953, barley, millet, rape, rye, and Sudan grass were sown each to a 0. 34 acre plot. All crops except barley received 3.2 inches of water by means of a sprinkler system, barley received only 2.4 inches as it was the first to be ploughed in. For the dry weight determination the entire plant was sampled from four, 2 feet by 2 feet areas of each plot, while the crop was still in flower. The samples were oven dried for 48 hours at 75° C to obtain the dry matter per acre and the dry weight top to root ratio. The results appear in Table 2.

(b) Soil Analysis

Table 2.--Rate of seeding, date of sampling and ploughing in of each crop, its dry weight per acre and top to root ratio.

Crop	Rate of seeding lbs/acre	Date of sampling and ploughing-in	Dry Wt. lbs/acre	Top-root ratio dry weight
Barley	100	July 14	4190	11.9
Millet	25	August 28	7950	9.2
Rape	24	" "	5990	3.5
Rye	100	" "	5310	4.3
Sudan Grass	25	" 10	5110	4.7

In order to obtain information about time in relation to decomposition of the green manure crops, each crop area was divided into two parts. Soil samples were taken from Part I or two-thirds of each plot in May, 1953 before the crops were sown and again in May 1954, 9-10 months after the crops were ploughed-in. Soil samples were taken from Part II or the remaining third of each plot in May 1953 and again in September 1954, 14-15 months after the crops were ploughed-in. The "before" and "after" in Table 3 refer to results of the analysis of soils sampled at these times. The "change" in each part gives the change in percent organic matter, and pH for the 9-10 month and 14-15 month periods. The soil analysis is based on an average of eleven composite samples for each crop area in Part I and 5 composite samples for each crop area in Part II.

Table 3.--Results of organic matter and pH determinations of soils from each crop area.

Crop	PART I					
	Percent Organic Matter			pH		
	Before	After	Change in 9-10 months	Before	After	Change in 9-10 months
Barley	1.57	1.46	-0.11	7.1	7.5	+0.4
Millet	1.53	1.45	-0.08	7.3	7.7	+0.4
Rape	1.44	1.10	-0.34	7.0	7.0	0.0
Rye	1.38	1.28	-0.10	6.8	6.6	-0.2
Sudan Grass	1.12	1.07	-0.05	7.2	7.6	+0.4

Soil profile from nursery area showing little organic material or profile development. The surface 2 to 3 feet are very fine sandy loam underlain by coarse sand and gravel. These thicknesses and textures vary throughout the nursery. The shovel is four feet high.

Table 3.--(Cont.)

PART II						
			in 14-15 months			in 14-15 months
Barley	2.25	1.70	-0.55	6.9	7.1	+0.2
Millet	2.46	2.32	-0.14	7.3	7.8	+0.5
Rape	1.42	1.88	+0.46	7.7	7.7	0.0
Rye	2.16	2.03	-0.13	7.2	7.3	+0.1
Sudan Grass	1.93	1.96	+0.03	7.0	7.0	0.0

DISCUSSION

The results show that millet was outstanding in adding dry matter to the soil, followed by rape, rye, Sudan grass, and barley. However, the barley was ploughed-in six weeks, and Sudan grass 18 days before the top three. These two crops had matured the earliest and had to be ploughed-in so that they would not create a weed problem the following year.

During the 9-10 month period a small reduction in organic matter is general. The 14-15 month period indicates some additions of organic matter. The large decrease in the barley plot might indicate that this crop was decomposing more rapidly than the rest, and had reached a more advanced stage of decomposition.

The top to root ratio indicated barley and millet consisted mostly of foliage, while rape, rye, and Sudan grass produced much more root growth.

It is doubtful if there is any practical change in pH that can be attributed to the green manure crops.

The reader is reminded that all analyses represents one season's results, and that the findings of other trials now in progress are necessary before reliable conclusions can be made.