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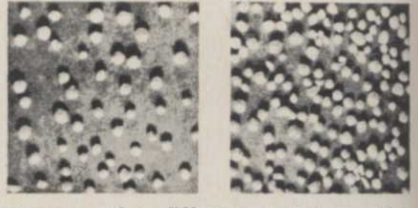
Up-date on Gran

How to Calibrate Hand-carried Truck-mounted Granular Spreaders

By
L. S. WHITCOMB
U. S. Borax & Chemical Corp.
Los Angeles, California



Compare the different rates at which granule spreaders apply pesticides from pre-set calibration trials. On the left, 25 granules were scattered at ½ lb./100 sq. ft. or 200 lbs./A. The 151 granules on the right were applied at 3 lbs./100 sq. ft. or 1,200 lbs./A. By using a maladjusted spreader that applies even ¼ lb./100 sq. ft. too much, 25 extra granules per sq. inch are spread at extra cost and where they are not needed.

CALIBRATING hand-carried or truck-mounted spreaders for granulated pesticides is similar, in principle, to the calibration of spray rigs. In both cases you measure the amount of pesticide, either weed killer or insecticide, discharged over a given area.

Manufacturers of most equipment have already calibrated their equipment and provide directions for setting their spreaders. However, often it is necessary to use equipment which is no longer new, or the manufacturer's directions have been lost, or we are using a pesticide not similar to materials for which the spreader was originally calibrated. In these cases, equipment must be adjusted to assure proper application.

Check Basic Requirements

Broadcast spreaders range from the shoulder-carried cyclone type with only one adjustable control, to truck-mounted power units with rotating disks and numerous adjustable controls. Regardless of the size or complexity of the spreader, the following approach should be used to check the usefulness of the particular spreader. First, determine the rate at which the granular pesticide is to be applied for your needs. Rates are stated on product labels along with notes stating necessary precautions for handling and applying.

Next, you must consider four characteristics of your spreader.

1. Will the spreader handle the pesticide satisfactorily; do the granules readily flow out of the hopper and through the spreader?

2. Does the discharge from the spreader fall uniformly over the ground, thus treating the area evenly.

3. Is the rate of application you desire within the limits of the spreader? Spreading capacities might be estimated at any of three rates: 50 lbs./A., 500 lbs./A., or 5000 lbs./A.

4. Is the spreader capable of applying granules in rows at widths you desire?

If the answer to any of the first three questions is "No," then consult the manufacturer's manual about adjustments, or get a spreader with greater bulk or better distribution capacities. Usually, the discharge of a large spreader can be cut down to a very small rate if granules are small enough to continue to flow out of the hopper.

Use Sack to Calibrate Hand-carried Spreaders

For calibrating hand-operated spreaders, you will need the following equipment: a measuring tape, a large cloth bag, and a set of household scales. A marking pen or crayon may also be needed if the discharge setting device is not already marked on the spreader.

The first important step is to establish a constant rate of travel for the spreader. During the first calibration trials, the walking speed should be fixed at a medium rate. Later, you may wish to increase or decrease travel speed as a method to attain the exact application rate desired.

Next, prepare to operate the spreader with pesticide in it. In order to avoid wasting the pesticide or actually treating the test area at an improper rate, tie the large cloth bag around the spreader to catch all the pesticide discharged.

Now select the appropriate quantity of chemical for a trial. This should be about 1% or 2% of the recommended quantity for one acre. If directions are stated in terms of lbs./100 sq. ft., then use enough to cover about 500 sq. ft. Make a note of the weight of the granules, put them in the spreader, and walk at a medium speed while operating

(Continued on page 26)

ar Spreaders

By
J. ROBERT WEST
O. M. Scott & Sons Co.
Marysville, Ohio

How to Adjust Granular Spreaders With V-shaped Hoppers

DRY GRANULAR herbicides, fungicides, insecticides, and fertilizers are usually applied with spreaders that meter the formulation through adjustable discharge ports in the bottom of the spreader. Although many of these spreaders give approximate settings, it is practically impossible for a manufacturer to provide accurate rate settings for products other than their own granular materials.

Applied Rates Depend on Granules

The metered application rate at any given setting will vary for different materials. Density, particle size, and flowability are common material characteristics which vary and affect the application rate. Finely powdered material that tends to pack often can be applied only with those spreading devices equipped with special agitators to maintain a steady flow. If there is a considerable variation from bag to bag in particle size and product density, or if the forward speed of the spreader changes appreciably during application, rates are apt to be affected.

Generally, it is necessary to establish a spreader setting that will apply a desired amount of granular material per square foot of soil surface, usually figured per 100 sq. ft. or per one acre. This is called "establishing the rate."

Parts of spreaders, particularly the metering mechanism, will wear. Worn mechanisms require adjustments to maintain the rate of application according to standards or tolerances set forth by the original manufacturer. This adjustment is normally referred to as "calibration" and usually can be done only by instructions from the manufacturer.

Rate Establishment Based on 100 sq. ft.

To establish the rate by which granules will spread from an applicator, equipment measurements and a treatment area (100 sq. ft.) must be determined for use as standards. First, measure the width (W) of the spreader in *feet*. Divide 100 by the width (100/W); this will give the lineal feet (F) the spreader must travel to cover 100 sq. ft., 100/W = F. Select an area of turf to be treated and mark off the lineal feet (F). As a double-check, the length of this area (F) multiplied by the width of the spreader (W) should then equal 100 sq. ft., or F x W = 100 sq. ft.

Application Rate Adjusted by Three Methods

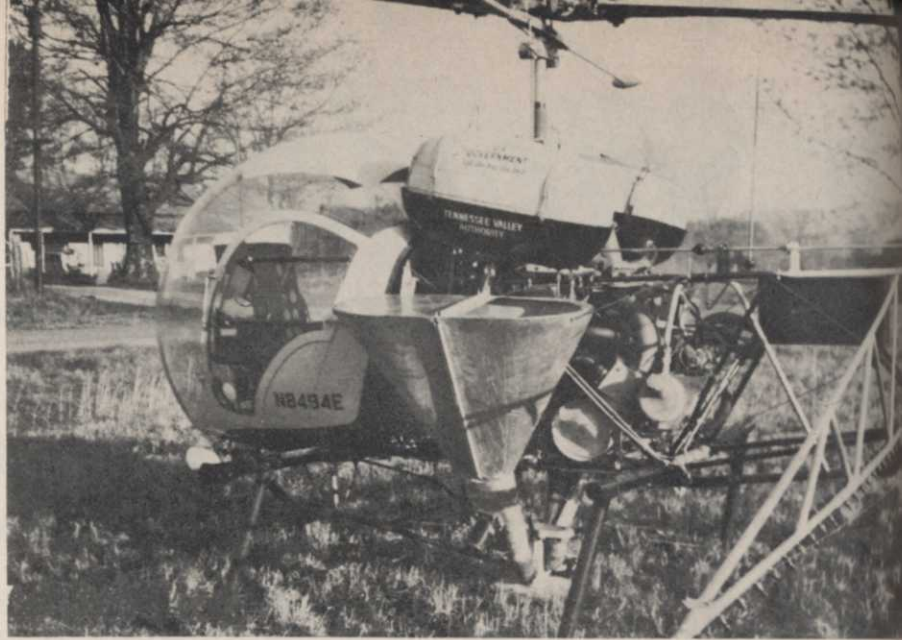
Now that a standard treatment area has been marked, the rate of discharge for V-shaped hopper spreaders may be established by any of three methods.

Method 1: Fill the spreader half full with granules. Weigh both the spreader and the granules and record their total weight. Adjust the spreader's output rate to an approximate setting and operate it over the lineal feet (F) marked for the test plot. Again, weigh the spreader and its contents. Subtract the second weighing from the first; the answer will be the number of pounds of granules you applied on 100 sq. ft. If the weight of material applied is more or less than the desired or recommended rate, readjust the spreader's output and make another test run until the correct setting is established.

Method 2: Construct a lightweight metal pan 2 inches deep, 6 inches wide, and of sufficient length to fit between the wheels of the spreader. Drill a hole in each corner of the pan and fasten a piece of wire in each hole. This pan then can be hung beneath the spreader and should catch *all* of the granules. Next, determine the desired rate of product application (from label or other recommendations) per 100 sq. ft. Fill the spreader half full of material and operate it over the lineal distance (F). Weigh the granules caught in the pan (do not include the pan's weight). If the amount of material is more or less than the recommended rate per 100 sq. ft., reset the spreader and make another test run until the correct setting is established.

Method 3: Agitators of most hand-pushed spreaders are driven by one wheel only. Find the wheel that drives the agitator and drill a ¼-inch hole near its outside edge. Fasten a ¼-inch

(Continued on page 36)

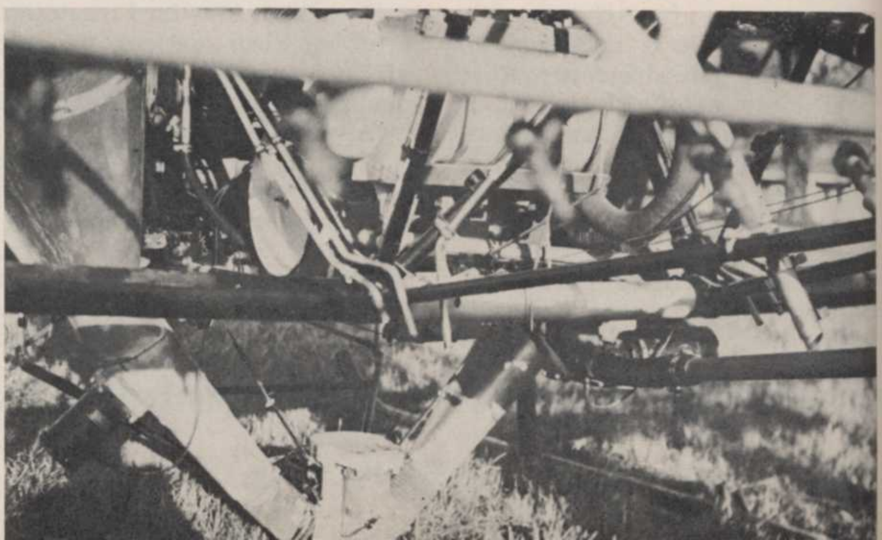


A Bell helicopter (right) is equipped with two 60-gallon bins that tote pelleted material which is fed through chutes to a centrifugal spreader.

Results of TVA Tests with Helicopters to Spread Pellets for Rights-of-way Brush

Pellets scattered (above) from the Bell helicopter fall in a rather uniform pattern. Density is compared with the 3" x 5" filing card.

Three-inch flexible chutes (right) carry granules from side bins to a centrifugal disk that spins at 225 rpm and spreads the pellets.



Helicopter crews maneuver their craft with great agility along the right-of-way of a 500-kilovolt power line near Madison, Ala.

Report by

R. A. MANN

Tennessee Valley Authority
Chattanooga, Tennessee

CAN a helicopter spread pellets in a uniform and satisfactory pattern on transmission line rights-of-way? Will the pellet material be effective for stump treatment on cleared construction and on lines where brush is established?

To answer these questions, the Tennessee Valley Authority set up 1-acre test plots. Nine plots were arranged along the right-of-way of a 500 kilovolt line under construction, and nine more were laid out along the right-of-way of a 161 kilovolt line. There was considerable brush cover under the 161-kv line even though it had been treated with chemical. The plots were established in an area between Huntsville and Scottsboro, Alabama. Pellets were applied with a Bell model 47G-3B helicopter equipped with a supercharged Lycoming engine. The helicopter was rigged with a variable speed, centrifugal disk that spread the pellets and two 60-gallon saddle-back tanks, each with 3-inch flexible chutes to the disk.

Pellets were checked for caking before loading. Then they were loaded on the helicopter by using buckets, and little time was wasted on the ground. Pellet materials used were Dybar (25% active) applied at 60, 80, and 100 lbs./A, Urab (25% active) at 60, 80, and 100 lbs./A., and Tordon 10K (10% active) applied at 80, 100, and 120 lbs./A. Approximately 14,000 pellets weigh one pound, if the pellets range from ⅛ in. to $\frac{5}{32}$ in. Applied at the rate of 100 lbs./A., about 32 pellets would be spread in each square foot. To spread pellets at a 50-foot swath, the centrifugal disk is spun at its maximum speed, 225 rounds per minute. The pilot was able to start and stop the flow of granules from the helicopter very efficiently, and the pellets were applied even up to the edges of the rights-of-way.

Ground Control Maintained

If pellets caked or clogged the disk, a ground observer told the pilot on a portable ground-to-air "walkie-talkie" system, and the pilot quickly landed and the malfunction was repaired. The radio equipment proved to be very helpful since errors and malfunctions could be discovered and corrected immediately.

The soil type of the test areas varied from red clay to gray silt loam; the terrain had rolling hills and a few limestone outcroppings. Pellets were applied on April 13 and 14, 1965. Size of the cleared plots along the 500-kv line were about 550 feet long and 150 wide. Along the 161-kv line, the plots were about 870 feet long and 100 feet wide. Rainfall for the two rights-of-way are shown in Table 1.

The number of plants, counted from Nov. 29 through Dec. 1, 1965, in the plots varied from a high of 35,432 to a low of 1,234 stems per acre. Weeds controlled are listed in Table 2. Chemicals applied at the high rates completely eradicated most species, and chemicals applied at low rates resulted in high stem counts. These plots will be evaluated again late in 1966 and in 1967, if necessary, to determine the effectiveness of the various rates and whether they will be economical for brush control.

Let's consider the advantages and disadvantages of applying pellets for brush control by helicopter. Since no special ground

Table 1. Rainfall data taken along two rights-of-way from December 1964 to November 1965.

Pellet Plots on Widows Creek—Huntsville 161-Kv Line

	Scottsboro	Hytop	Paint Rock	AVERAGE
December 1964	4.40	5.09	4.27	4.58
January 1965	3.71	4.85	4.03	4.20
February	6.32	9.35	6.97	7.55
March	13.27	11.58	10.84	11.90
April	3.39	3.80	2.60	3.26
May	1.29	4.10	5.08	3.49
June	8.17	6.54	4.45	6.38
July	5.93	8.91	5.19	6.67
August	4.15	4.81	2.83	3.93
September	5.10	2.37	2.62	3.36
October	0.73	2.85	1.82	1.80
November	1.32	0.97	1.34	1.21
TOTAL	57.78	65.22	52.04	58.35

Pellet Plots on Widows Creek—Madison 500-Kv Line

	New Market	Monte Sano	Bingham Mt.	AVERAGE
December 1964	3.43	4.35	4.81	4.20
January 1965	3.11	4.37	4.58	4.02
February	5.06	6.75	7.20	6.34
March	9.06	10.89	11.66	10.54
April	4.37	2.62	3.60	3.53
May	2.96	1.21	2.77	2.31
June	5.40	5.79	5.18	5.46
July	6.43	5.33	6.80	6.19
August	2.63	1.83	3.00	2.49
September	3.30	3.52	2.33	3.05
October	1.91	2.69	1.98	2.19
November	1.46	1.19	0.96	1.20
TOTAL	49.12	50.54	54.87	51.51

equipment is required to service the helicopter, the first advantage is that the overall equipment cost is relatively low. Pellets can be applied during the entire day in winds of up to 12 miles per hour. The pelleted material is nonvolatile and can be applied in rough or in inaccessible areas. Pellets can be applied from a helicopter before it is needed for the work during the foliage spray season.

On the other hand, some of the disadvantages of applying pellets by helicopter begin with cost. At the present time, pellets are more expensive than liquid materials for equivalent brush control. There is minor kill of brush off of the right-of-way, because the chemical released from the granules affects the roots of plants that extend within the right-of-way. Also, in order for the chemical to be washed from the granules onto the plants, adequate rainfall is a necessity. A higher and heavier pellet application rate would be required for heavy soil than that required for porous, sandy, well-drained soil, since the active ingredients must penetrate the soil and be absorbed through the roots. Two or three years are required for kill of some species. However, there is no need for a quick kill of brush, because the growth of most species is retarded, and the plants are ultimately killed.

Pellets were applied evenly, and we believe that helicopter application will do an excellent job at a reasonable cost if pellets can be formulated at a cost comparable to the liquid ester formulation for an equal kill. Pellet application by helicopter will be a valuable tool for brush control work.

Table 2. Weeds controlled (%) by Dybar, Urab, and Tordon 10K, applied at three different rates.

Plot No. 25-B: Dybar 60 pounds per acre. Acid 15 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Paulownia	2			1		3	109	67			33	
Winged Elm	12	1			1	14	508	86	7			7
Cedar	8	1	4		8	21	762	38	5	19		38
Persimmon	8				16	24	871	33				67
Ash	13					13	472	100				
Quince		1				1	36		100			
Sumac	17				8	25	908	68				32
French Mulberry	21					21	762	100				
American Elm	1				2	3	109	33				67
Red Oak	3					3	109	100				
Hickory	1					1	36	100				
Redbud	4					4	145	100				
Hackberry	1					1	36	100				
TOTAL	91	3	4	1	35	134	4863					

Plot No. 26-B: Dybar 80 pounds per acre. Acid 20 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
French Mulberry	7					7	254	100				
Redbud	8			2	6	16	581	50			13	37
Ailanthus	8	1	1		4	14	508	57	7	7		29
American Elm					5	5	182					100
Cedar	7	2	1		3	13	472	54	15	8		23
Cherry	1		1		4	6	218	17		17		66
Sassafras	7					7	254	100				
Winged Elm	5				12	17	617	29				71
Sugar Maple	2		1		32	35	1271	6		3		91
Ash	17					17	617	100				
Unidentified	1				7	8	290	13				87
Chestnut Oak	1	1		3		5	182	20	20		60	
Sumac	4				14	18	653	22				78
Hackberry	4	2			5	11	399	36	18			46
Red Oak	1				1	2	73	50				50
Beautyberry	2					2	73	100				
Persimmon	1				1	2	73	50				50
Hickory	3				1	4	145	75				25
TOTAL	79	6	4	5	95	189	6862					

Plot No. 27-B: Dybar 100 pounds per acre. Acid 25 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Chestnut Oak	4				4	8	290	50				50
Sugar Maple	3	2			39	44	1597	7	5			88
Redbud	1				11	12	436	8				92
Cedar	5				2	7	254	71				29
Ash	3					3	109	100				
Euonymus	2					2	73	100				
Sumac	1				22	23	835	4				96
Winged Elm					7	7	254					100
Hackberry	1				1	2	73	50				50
American Elm					6	6	218					100
Ailanthus		1				1	36		100			
Walnut			1			1	36			100		
Mulberry	2					2	73	100				
Persimmon					5	5	182					100
Poison Oak	3					3	109	100				
Red Oak					2	2	73					100
TOTAL	25	3	1	-	99	128	4648					

Plot No. 28-B: Urab 60 pounds per acre. Acid 15 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Sumac	1				7	8	290	13				87
Mulberry		1	1		1	3	109		33	33		34
Redbud	39		5		5	49	1779	80		10		10
Paulownia	2					2	73	100				
Sugar Maple	1				1	2	73	50				50
Chestnut Oak		4	6			10	363		40	60		
Winged Elm	11	1			2	14	508	79	7			14
French Mulberry	1					1	36	100				
Hackberry	16					16	581	100				
Cedar	4				1	5	182	80				20
Persimmon					2	2	73					100
Red Oak					1	1	36					100
American Elm	7					7	254	100				
Ash	2					2	73	100				
White Oak		1				1	36		100			
Crab	6					6	218	100				
TOTAL	90	7	12	-	20	129	4684					

Plot No. 29-B: Urab 80 pounds per acre. Acid 20 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Winged Elm	9	3			6	18	653	50	17			33
Ash	6		2			8	290	75		25		
Redbud	77		2		4	83	3,013	93		2		5
Red Oak	1		3		1	5	182	20		60		20
Chestnut Oak	3	1	3			7	254	43	14	43		
Sugar Maple	1					1	36	100				
Cedar	2					2	73	100				
White Oak			1			1	36			100		
American Elm	6					6	218	100				
Persimmon	1				3	4	145	25				75
Hickory	2					2	73	100				
Mulberry	4					4	145	100				
TOTAL	112	4	11	-	14	141	5,118					

Plot No. 30-B: Urab 100 pounds per acre. Acid 25 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Redbud	63		5	3	48	119	4,320	53		4	3	40
Winged Elm	4		4		13	21	762	19		19		62
Mulberry	2					2	73	100				
Ash	5					5	182	100				
Cedar	3				1	4	145	75				25
Paulownia	4					4	145	100				
TOTAL	81	-	9	3	62	155	5,627					

Plot No. 31-B: Tordon 10K 80 pounds per acre. Acid 8 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Winged Elm			1		13	14	508			7		93
Redbud					201	201	7296					100
Ash	5	1			2	8	290	63	13			24
Cedar					2	2	73					100
White Oak					3	3	109					100
Red Oak	2					2	73	100				
Sugar Maple					1	1	36					100
Hackberry					9	9	327					100
Chestnut Oak		1	6			7	254		14	86		
American Elm		2			2	4	145		50			50
TOTAL	7	4	7	-	233	251	9111					

Plot No. 32-B: Tordon 10K 100 pounds per acre. Acid 10 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Redbud					50	50	1815					100
Winged Elm					41	41	1488					100
Sugar Maple					24	24	871					100
Chestnut Oak			1			1	36			100		
White Oak			4		3	7	254			57		43
Ash	1					1	36	100				
Ailanthus					25	25	908					100
Sassafras					2	2	73					100
Sumac					2	2	73					100
Cedar					3	3	109					100
Prickly Ash					1	1	36					100
American Elm					3	3	109					100
TOTAL	1	-	5	-	154	160	5808					

Plot No. 33-B: Tordon 10K 120 pounds per acre. Acid 12 pounds per acre.

SPECIES	1	2	3	4	5	TOTAL STEMS PER PLOT	TOTAL STEMS PER ACRE	PERCENT EACH CODE NUMBER 1	2	3	4	5
Winged Elm					15	15	1089					100
Sugar Maple					37	37	2686					100
Ailanthus					10	10	726					100
American Elm					16	16	1161					100
Redbud					27	27	1960					100
TOTAL	-	-	-	-	105	105	7622					

Explanation of Code Numbers:

No. 1—Little or no chemical effects.

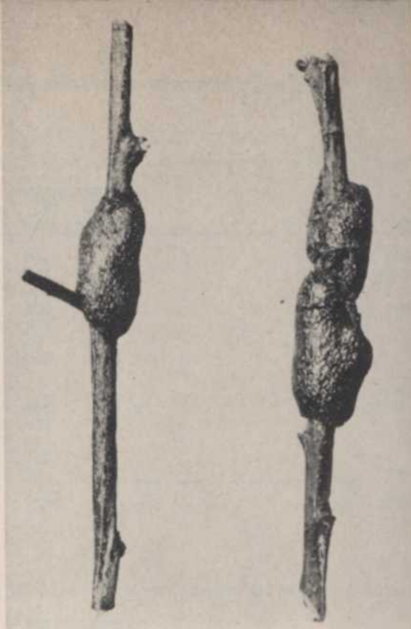
No. 2—About one-half of the canopy showing chemical effects.

No. 3—Chemical effects on all the canopy, but still some green.

No. 4—All leaves dead and stem dead to ground line; however, resprouting from root collar or ground line.

No. 5—Dead to ground line with no resprouts.

Tent of the eastern tent caterpillar is stretched from branch to branch within the fork of a wild cherry tree. Seven hundred or more gregarious larvae may retreat into a single nest.



Bandlike collars around branches and twigs of host plants are formed by egg masses of the eastern tent caterpillar. Each mass is laid by the female moth as a flowing packet of from 150 to 350 eggs, and later the egg mass becomes solid.

Meet Those Webbing Defoliators of Trees and Flowering Plants

Eastern Tent Caterpillars

EASTERN tent caterpillars, *Malacosoma americanum* (Fabricius), have plagued U. S. greenery since 1646 and periodically, every 10 years or so, become so abundant that they completely defoliate unsprayed orchard and shade trees and other flowering plants. Leaves of wild cherry and apple trees are most favored, but other plants such as roses, pear, plum, peach, and shade trees are ravaged particularly when the favored food supply is exhausted.

Damage by these gregarious beasts weakens trees, and repeated defoliation along with other stresses ultimately kills the plant host.

Twig Collars Hold Moth's Eggs

This insect passes the winter in egg masses that form bandlike collars around the twigs or branches of the host. Egg masses are about ¾ inch long and contain from 150 to 350 eggs. In the spring when small, tender leaves begin to unfold, larvae hatch from the eggs and crawl to a nearby tree crotch. There, a larval colony is formed and is often composed of the young from several egg masses.

Soon larvae construct a tent of silk enlarging it as they grow. The tent is used for a retreat at night and during rainy or cool weather. From their nest, the larvae sally forth on the tender, spring foliage and feed at regular intervals trailing threads of silk along their path. Branches between the tent and feeding sites frequently are incased by silken strands left along trails of the busy caterpillars.

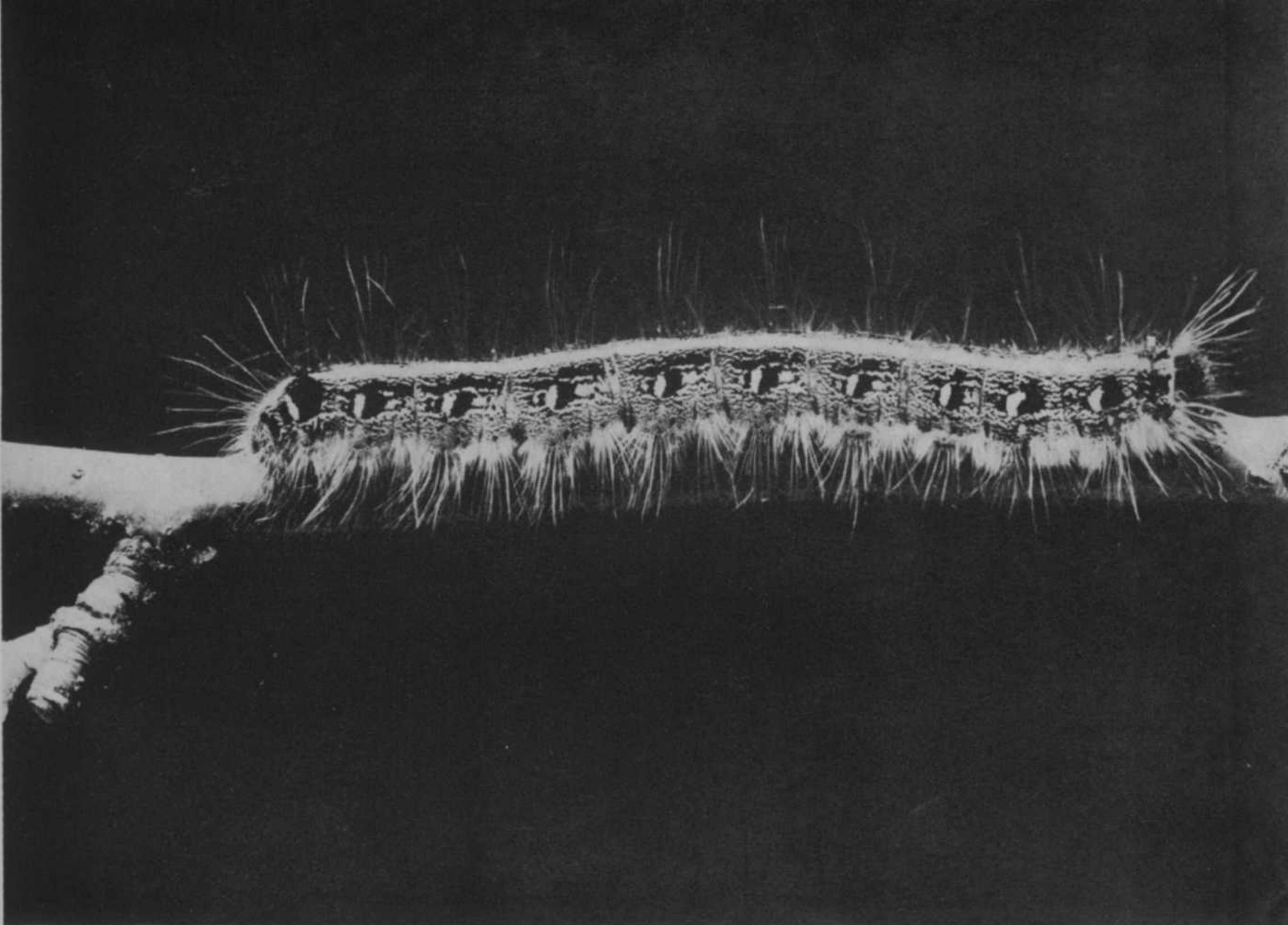
The fuzzy larvae are fully grown in about six weeks and quit the community habit. At this time they are about 2 inches long with a white stripe down the back bordered by reddish-brown patches and blue spots on the sides. Larvae scatter from the tree nest and spin white cocoons in which they transform to brown pupae. Cocoons are about 1 inch long and are usually found on the tree trunk or some nearby object.

Ten days to three weeks after pupation, adult moths emerge from cocoons. Adults are light, reddish brown with two white stripes across each forewing. In early summer, females lay eggs on twigs and branches for the next season's generation which remains in the egg stage for about nine months.

Kill Winter Eggs Or Summer Larvae

Eastern tent caterpillars often are abundant each year in one or more localities which frequently cover considerable territory. Several methods of control are recommended. Egg clusters are easily seen and can be pruned out and burned in the winter. In early summer, nests are removed from trees and burned by winding them up on the brushy tip of a pole and putting them into a fire.

Chemicals are applied in the spring as soon as nests are large enough to be seen. Wettable powder DDT, methoxychlor, chlordane, carbaryl (Sevin) or malathion at 1 lb., or toxaphene at 1.2 lbs. per 100 gals. of spray or 3 lbs. of lead arsenate with 3 lbs. of hydrated lime to 100 gals. of spray will give satisfactory control. If infestations are heavy, wild cherry should not be allowed to grow within a quarter-mile of protected plants.

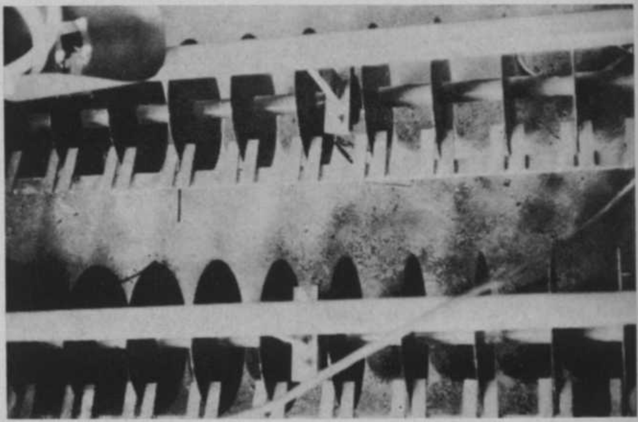


Spotted markings on the side of the larva and a white stripe on its back identify the eastern tent caterpillar.

Tree entirely stripped of foliage supports only the silken tent of eastern tent caterpillars since they have moved on to ravage the leaves of another tree nearby.

Threads of spun silk stretched along trunk of wild cherry tree show paths of tent caterpillars from community tent nest to feeding sites in upper branches.

Fully automatic turf planter, used for golf course fairways and other large turf areas, scatter sprigs uniformly and is self-feeding.



Inside view of the automatic, self-feeding planter shows two sets of disks that slice the soil and press sprigs into a groove.

Automatic Machines, Efficiency, Good Turf Practices Combine to Overcome Rising Costs

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Nearly all progress in the field of planting grass in the South has been initiated with new hybrid bermudagrasses. Due to higher labor costs and customer demands for better results, improved methods have become a necessity. New planting techniques have reduced planting costs, given better stands, and accelerated turf coverage. Even though bermudagrass is still considered the workhorse of southern turf grasses, many of the methods used to plant it can be used also to plant other stoloniferous grasses.

New Automatic Planter Feeds Itself

The newest development in fairway planting is a fully automatic, self-feeding machine. It has made planting golf course fairways and large turf areas much easier. Sod fed from a tray and rotating cylinder eliminates hand broadcasting, and the planter scatters sprigs uniformly over the soil. Sprigs are pressed in the soil by two sets of disks, and then the soil is packed by a heavy roller before the sprigs are exposed to the sun and dry weather. Track marks are almost nonexistent, since the machine is supported constantly by disks and rollers except during turns. Its hopper has the rather large capacity to hold 100 bushels of sprigs, thus time consumed by reloading is shortened. Two good operators can plant up to 15 acres per day.

Many relatively small areas such as football fields, lawns, and tees are still planted by the unit commonly known as the Tifton Turf Planter. This is simply a tractor-drawn, straight disk-type planter that has two sets of 12-inch disks welded 4 inches apart to a 6-foot wide shaft. One set of disks is offset and trails the other. A flat roller is attached and follows to firm the soil around the freshly planted stolons. These units have been used to plant considerable amounts of grass.

The Tifton Turf Planter method, though much faster than older methods, still has the disadvantage of requiring hand labor to broadcast stolons. Also, the planter is not heavy enough to completely obliterate impressions left by the tractor wheels. This is important where close mowing is required and where golf cart traffic is expected.

Two-row Planter Inserts New Bermudagrasses

For introducing improved hybrid bermudagrasses into existing bermuda or weedy sods, a modified planter is presently the best available. Originally it was designed to plant coastal bermudagrass pastures. This machine is semi-automatic. It plants grass rows by splitting the old sod or grass surface with a coulter disk and winged-shoe. Stolons fall into the opened furrows which are then closed by slanted tires and pressed with rollers. A two-row planter of this type will cover up to six acres per day installing grass at 12-inch centers. Stands are somewhat more erratic than those planted by straight disk machines, and coverage in unprepared seedbeds is slower. The semi-automatic planter offers the direct advantage of allowing the fairway to remain in play. Also costs are reduced because the necessity for reworking old seedbeds is eliminated.

Newly planted hybrids become the dominant species within one to three years depending