TECHNICAL NOTES

A LEAF FEEDING BEETLE FOUND ON THREETIP SAGEBRUSH[1]

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In a recent article in this Journal, Pringle (1960) described the defoliation of big sagebrush (*Artemisia tridentata* Nutt.) over a large area of range in British Columbia by a Chrysomelid beetle (*Trirhabda pilosa* Blake). Two issues later, Massey and Pierce (1960) reported on the heavy defoliation of rubber rabbitbrush (*Chrysothamnus nauseosus* (Pall.) Britt.) in New Mexico resulting from the larval feeding of *Trirhabda nitidicollis* Lec.[2] A similar occurrence was noted near Thermopolis, Wyoming, in late July 1960, where a member of the same genus, *Trirhabda attenuata* (Say)[3], had infested threetip sagebrush (*Artemisia tripartita* Rydb. subsp. *rupicola* Beetle) in epidemic numbers.

Trirhabda attenuata (Say) was originally described by Say (1824) as *Galleruca attenuata*. In 1865, LeConte erected the genus *Trirhabda* and placed *T. attenuata* in it. The larva was described by Boving (1929) as being dark bronze dorsally and dark ochreous ventrally, from specimens collected on *Artemisia* spp. in California. Blake (1931) stated that this species fed both on goldenrod and sagebrush and had a range from the Great Plains to Alberta and throughout the northern Rocky Mountain Region in the United States.

In the case reported here it was estimated that 2,000 acres of a threetip sagebrush community were infested with *T. attenuata*. The area was located at an elevation of 6,000 feet on the north slope of the Owl Creek Mountains near Thermopolis, Wyoming. Associated plant species included *Agropyron spicatum* (Pursh) Scribn. and Smith, *Poa secunda* Presl, *Poa fendleriana* (Steud.) Vasey, *Phlox hoodii* Rich., and *Lupinus L.* spp. Total vegetation cover occupied 35 percent of the soil surface. Of this total, threetip sagebrush contributed 70 percent, grasses 25 percent, and miscellaneous forbs and shrubs 5 percent.

Infested threetip sagebrush plants exhibited a dull grey-brown aspect which contrasted sharply with the normal silver-green. Only portions of individual leaves had been damaged. However, the areas surrounding these injuries were discolored. Adult beetles were observed feeding on the plants, but, since discoloration was so extensive as to give the entire community a brownish aspect, it is probable that the damage resulted from the combined feeding of both the larval and adult stages of the beetle. In addition, seedheads were not present on infested plants.

In the approximate center of the beetle infestation, 460 adults were collected in 100 sweeps of a standard 15″ diameter insect net. Near the perimeter of the defoliated area only 16 adults were collected per 100 sweeps. The beetles were present on all plant species of the community except *Artemisia ludoviciana* Nutt. Pringle (1960) noted that adults of *T. pilosa* failed to infest plants growing in proximity to anthills. Such was also found to be the case with the adults of *T. attenuata*.

Further studies will be conducted during future field seasons to determine the life cycle,

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[2] *It should be noted that Figure 1 of Pringle (1960) is identical to Figure 2 of Masey and Pierce (1960). Upon close inspection of the photographs and associated captions, it appears that an erroneous picture was inadvertently inserted into Pringle's article.*

[3] *Specimens were determined by Mr. D. M. Weisman, U. S. Department of Agriculture, Washington, D. C.*

food preferences, and other related facts concerning this beetle.

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MOISTURE LOSSES FROM SOIL SAMPLES AFFECTED BY CONTAINERS, TIME, AND PLACE OF STORAGE

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Though many ways have been devised to follow soil moisture trends, the gravimetric method is still very popular because it is accurate and inexpensive. Occasionally it may be necessary for research workers to take soil moisture samples on areas a great distance from their laboratory. As much as four or even eight hours may elapse before the samples can be weighed. A review of literature in this field failed to show any work on this subject so a study was initiated to determine how long soil samples could be exposed to drying in different containers without losing a significant amount of moisture before they were weighed.

Methods

Moisture losses from samples of clay loam soil of uniform moisture content were measured in six types of containers exposed to three periods of drying under two storage conditions. The types of containers were as follows: (1) large cans measuring 3.75 inches OD by 2.75 inches in height without masking tape, (2) large cans with masking tape, (3) small aluminum cans measuring 2.50 inches OD by 1.75 inches without masking tape, (4) small cans with tape and (5) quart jars filled one-third full. Large cans and jars contained approximately 200 grams of soil while the small cans held about 50 grams. The sixth type of container was a check sample included with each group of containers which was taken at the same time as the others but weighed immediately. The others were allowed to dry for 4, 8 and 24 hours. One group was left in the field and the other stored in a building for the drying period.

Each container type was replicated five times. With six types of containers, three periods of drying and two places of storage, there was a total of 180 samples. All samples were weighed in their respective containers except the jars. These samples were removed and placed in cans for weighing. Air temperature was recorded at both places of storage during the test period. All data were analyzed using analysis of variance with significant means separated by Duncan's Method (Le Clerg, 1957).

Results

Soil samples in small cans and jars had the greatest loss in moisture during the period tested as shown in Table 1.

There was a highly significant difference (.01 level) between the periods exposed to drying, the place of storage and containers. There was a highly significant interaction between containers and hours indicating that some containers were better than others when exposed to periods of drying. The analysis of variance and separation of means is shown in Table 2.

Table 2. Analysis of Variance Showing Separation of Significant Means

Source	D.F.	S.S.	M.S.
Total	179	759.85	
Storing	1	18.09	18.09**
Containers	5	264.87	52.97**
S X C	5	6.81	1.36
Hours	2	89.53	44.76**
S X H	2	0.35	0.17
C X H	10	83.04	8.30**
Reps	4	3.95	0.99
R X S	4	8.84	2.21
R X C	20	40.34	2.02
R X H	8	11.03	1.38
Error	118	233.00	1.97

** Significant at the .01 level.

Since air temperatures have a great deal to do with moisture loss, the temperatures were recorded at both places of storage, inside and outside. These data are presented in Table 3.

Table 1. Mean Soil Moisture Percentage by Place of Storage, Type of Container and Time Exposed to Drying.

Place of storage	Containers	4 hours	8 hours	24 hours	Means	Storage means
Inside house	Check	23.88	23.01	23.65	23.51	22.67
	Large cans	23.62	23.72	21.64	22.94	
	Large & tape	23.63	24.72	21.75	23.36	
	Small cans	18.58	21.91	21.42	20.64	
	Small & tape	24.45	25.25	21.70	23.80	
	Jars	21.30	22.45	20.46	21.40	
Outside house	Check	23.88	23.01	23.65	23.51	21.98
	Large cans	22.66	22.20	21.33	22.06	
	Large & tape	23.56	23.14	21.74	22.80	
	Small cans	19.75	22.29	18.81	20.28	
	Small & tape	22.08	25.03	21.59	22.90	
	Jars	20.26	21.13	19.42	20.27	