

II.19 Ground Application of Bran Bait Insecticides

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Aerial insecticide application methods are most appropriate when extremely rough terrain and/or extensive acreages require treatment. However, smaller, isolated grasshopper outbreaks are often managed more economically using ground application equipment and techniques. A number of different application systems are available for both bran baits and conventional liquid insecticide formulations. For help selecting the appropriate insecticide formulation (liquid *v.* bait) see chapter II.3, “Sprays *versus* Baits.”

In a 5-year cooperative effort 1987–91, several private and governmental agencies carried out field testing of bran bait application methods made modifications for improvement, and exposed farmers, ranchers, and Extension personnel in six States to these methods. Participants included Peacock Industries (Canada), the South Dakota Governor’s Office of Economic Development, South Dakota State University, and the U.S Department of Agriculture, Animal and Plant Health Inspection Service’s Plant Protection and Quarantine (USDA/APHIS/PPQ).

Bait Application Equipment

The Brie-Mar® Applicators Division of Peacock Industries (Saskatoon, SK) has developed three bran bait spreaders (models 10, 30, and 60). These spreaders are equipped with gasoline-powered pneumatic (air-driven) delivery systems that provide uniform flake distribution and can be set to deliver bran at various application rates. The spreaders have noncorrodible bran hoppers, are relatively inexpensive and easily operated, and require minimal maintenance. State and Federal cooperators in Colorado, Minnesota, Montana, North Dakota, South Dakota, and Wyoming have carried out extensive field evaluations of the units.

Model 10.—This unit is a shoulder-mounted backpack system that works well for small jobs, such as roadside ditch and yard or garden uses. It weighs 27 lb, holds 14 lb of bran, and can deliver 1.2 or 3 lb of bran per acre in 20- to 25-ft swaths with the operator walking at 3 miles per hour (mi/hour).

Model 30.—This bran spreader is designed for mounting on an all-terrain vehicle (ATV) or pickup truck, and can be used for bran applications in small and moderate-size

grasshopper outbreak areas (isolated hot-spots in rangeland and pasture, roadside ditch areas, row-crop and forage field margins, large lawns, commercial vegetable gardens, and golf courses). This applicator can be used to treat outbreaks in very rough terrain where travel with a tractor or pickup truck may be difficult or impossible. Like the model 10, this system delivers bran flakes in a 20–25-ft swath. Its two-speed feed roll can deliver either 1 or 2 lb of bran per acre at 10 mi/hour, and it is capable of holding up to 45 lb of bran at a time.

Model 60.—This applicator is a larger unit that may be used for a range of different situations. It is designed for moderate-size outbreaks in areas where aerial treatment is not economically practical (roadside ditches, row-crop and forage field margins, and small to moderate acreages of pasture, rangeland, forage, and seedling row crops). Additionally, model 60 is well suited for conditions where the model 30 can be used (provided a pickup truck or tractor can traverse the terrain where applications must be made). This unit allows the operator to apply bran at 0.9, 2.1, 3, and 4 lb/acre in 40- to 45-ft swath widths at 10 mi/hour, and its hopper can hold up to 135 lb of bran flakes. In addition, bran output is turned on and off from within the pickup or tractor cab, and swath direction can easily be switched from right to left by manually moving the output tube. Using two spreaders (each applying in opposite directions) can double the swath width. This technique has been successful in the Grasshopper Integrated Pest Management Project demonstration area in North Dakota.

Bran Bait Applicator Calibration

Effective and economical insecticide applications require careful and accurate equipment calibration, and bran bait treatments are no exception. The following steps are essential for proper calibration of an applicator for broadcasting bran bait insecticide treatments.

1. Determine Swath Width.—Bran-spreader swath width should be measured before each bait application and as conditions (wind velocity and direction, terrain, or the material to be applied) change. Wind velocity is the most critical factor affecting bran-bait swath width, and neither calibration nor bait application should be conducted if winds are in excess of 5 mi/hour. If you are using a pickup- or ATV-mounted applicator



Figure II.19-1—The Brie-Mar bran spreader fits in the back of a pickup truck and will hold up to 135 lb of bran flakes. This spreader can treat up to a 45-ft swath width. (Photos courtesy of Peacock Industries; used by permission.)



(fig. II.19–1), measure swath width while the spreader is actually mounted on the vehicle and preferably under the same conditions that you will experience during bait applications. Swath width measurement and actual bait applications should be done by traveling directly into or against the prevailing wind.

The usual measurement consists of placing collection devices (paper plates work well) at even distances apart (5 ft apart is adequate for ground-operated units) in a grid pattern over a large block (see table II.19–1). The block should be several feet larger than the maximum range specified for the particular applicator model you are

using (if using a Brie-Mar unit, refer to the “Bait Application Equipment” segment of this chapter for respective maximum swath width specifications of the different spreader models) to account for wind effects on the swath. If slight breezes exist during swath width assessment, drive a nail through the center of each paper plate and fasten it to the ground. After collection devices are in place, carry out two or three test runs to determine where bran bait distribution drops off (the drop-off point will be fairly abrupt under calm wind conditions). Count and record the bran flakes that land on plates after each test run. These counts will establish the effective bran swath width.

Table II.19–1—Distribution collection devices (paper plates) for bran spreader swath width determination

Row no.	1	2	3	4	5	6	7	8	9	10
<i>Number of bran flakes collected</i>										
1	3	5	4	10	8	7	8	4	3	0
2	5	7	11	11	12	6	6	5	5	1
3	4	10	8	9	11	10	7	5	4	1
4	6	9	11	7	7	9	5	6	3	0
5	4	4	12	4	8	10	7	4	4	1
Total	22	35	46	41	46	42	33	24	19	3

Note: Data in the table represent the number of bran flakes collected on individual paper plates (1–10) within rows (1–5). In practice, the spreader should move perpendicular to the direction of the rows.

In this trial run, bran flakes were distributed well between and including plates #1 and #9. Since there is a total of eight 5-ft increments between these plates, the effective swath width of this bran spreader is $8 \times 5 = 40$ ft.

2. Measure Applicator Delivery Rate.—This process consists of running the applicator in a timed interval at the rate that will be used in the field, collecting bran output, and determining its weight as a function of time. If you are using a Brie-Mar unit, the usual practice involves filling the hopper to about 50 percent full, running the engine at full throttle, turning on the output auger, attaching one nylon pantyhose leg to the bran output tube, and collecting bran output in at least 1-minute intervals. Repeat this step several times to obtain an accurate estimate of output. Weigh samples individually to measure bran output as weight per unit time (an example of output determination appears in table II.19–2).

Table II.19–2—Weight data from five timed (1-minute) samples for estimating bran applicator output per unit time

Sample	Weight (lb)
1	0.682
2	0.655
3	0.590
4	0.724
5	0.671
Total	3.322
Average	$3.322 \text{ lb/min} \times 5 = 0.6644$

3. Determine Vehicle Speed.—Precise determination of vehicle speed may sound much easier than it is in practice. When traversing rough terrain, most vehicle speedometer needles will bounce a lot and give inaccurate readings. Under such conditions, it may be necessary to install a digital tachometer, travel in a low gear, and establish a tachometer reading to go by rather than the speedometer needle. The appropriate tachometer reading used during bait application should be established in the actual area requiring treatment. First, measure a practice path of a given distance (minimum of 100 ft) for the vehicle to pass. Then, calculate the desired time to cover the practice path. Let's say that you are trying to apply bran bait at a rate of 1.5 lb/acre. The following calculations will use the 0.6644 lb/min applicator delivery rate derived from the example in step 2 (your delivery rate will be slightly different). The following calculation will tell you how much time it should take to cover 1 acre at the 1.5-lb application rate:

$$\frac{1.5 \text{ lb}}{1 \text{ acre}} \times \frac{1 \text{ minute}}{0.6644 \text{ lb}} = \mathbf{2.258 \text{ minutes}}$$

to cover 1 acre at 1.5 lb bran per acre

The next step involves dividing the area in 1 acre (43,560 ft²) by the bran applicator's swath width derived from step 1 (40 ft in our illustration). This calculation will provide you with the number of linear feet that you should travel in the time it takes to cover 1 acre (2.258 minutes in our example) while applying bran bait at the desired application rate (1.5 lb/acre in this exercise).

$$\frac{43,560 \text{ ft}^2}{40 \text{ ft}} = \mathbf{1,089 \text{ linear feet}}$$

should be traveled in 2.258 minutes

Convert the time in minutes to seconds:

$$2.258 \text{ minutes} \times \frac{60 \text{ seconds}}{1 \text{ minute}} = \mathbf{135.48 \text{ seconds}}$$

to travel 1,089 linear ft

The target time to traverse your 100-ft test path is then calculated using cross-multiplication as follows:

$$\frac{1,089 \text{ ft}}{135.48 \text{ seconds}} = \frac{100 \text{ ft}}{X \text{ seconds}} \text{ or, } X = (135.48 \text{ seconds} \times 100 \text{ ft}) \div 1,089 \text{ ft}$$

therefore, X = **12.44 seconds** to travel 100 ft

The vehicle speed to target for traveling 100 ft in 12.44 seconds is determined using the following calculation:

$$\frac{100 \text{ ft}}{12.44 \text{ seconds}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} = \mathbf{482.32 \text{ feet per minute}}$$

Vehicle speed in ft/minute should be converted to mi/hour, which will provide a rough estimate for a speedometer reading to target when making test runs. A useful conversion factor is that for each 1 mi/hour, a vehicle travels 88 ft/minute. The target speedometer reading is calculated using cross-multiplication:

$$\frac{88 \text{ ft/minute}}{1 \text{ mi/hour}} = \frac{482.32 \text{ ft/minute}}{X \text{ mi/hour}} \text{ or, } X = (482.32 \text{ ft/minute} \times 1 \text{ mi/hour}) \div 88 \text{ ft/minute}$$

therefore, X = **5.48 mi/hour** as a target speedometer reading.

After the targeted time to travel the practice path and target speedometer reading have been calculated, use a stopwatch to time trial passes of the vehicle covering the test path and make adjustments until the desired speed and associated tachometer reading are established. Once these final steps are completed, you are ready to carry out a properly calibrated bran bait insecticide treatment using ground application equipment.