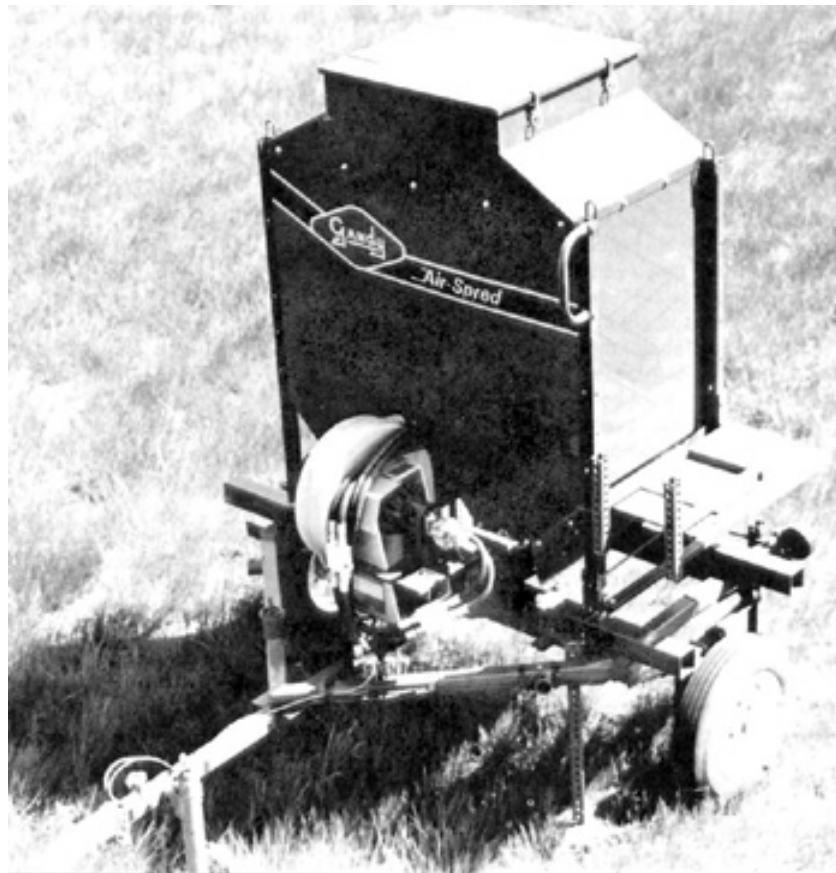


EVALUATION REPORT 368



Gandy Air-Spred Model 5516 Granular Applicator

A Co-operative Program Between



GANDY AIR-SPRED MODEL 5516 GRANULAR APPLICATOR

MANUFACTURER

Gandy Company Manufacturers
528 Gandrud Road
Owatonna, Minnesota 55060
U.S.A.

RETAIL PRICE:

\$5,805.00 (April, 1984, f.o.b. Lethbridge, Alberta).

DISTRIBUTOR

Robinson Alamo Sales Limited
- 1404 Meridian Road N.E.
Calgary, Alberta T2A 2N9
- 2412 Millar Avenue
Saskatoon, Saskatchewan S7K 3V2
- 1380 Waverley Street
Winnipeg, Manitoba R3J 0P5

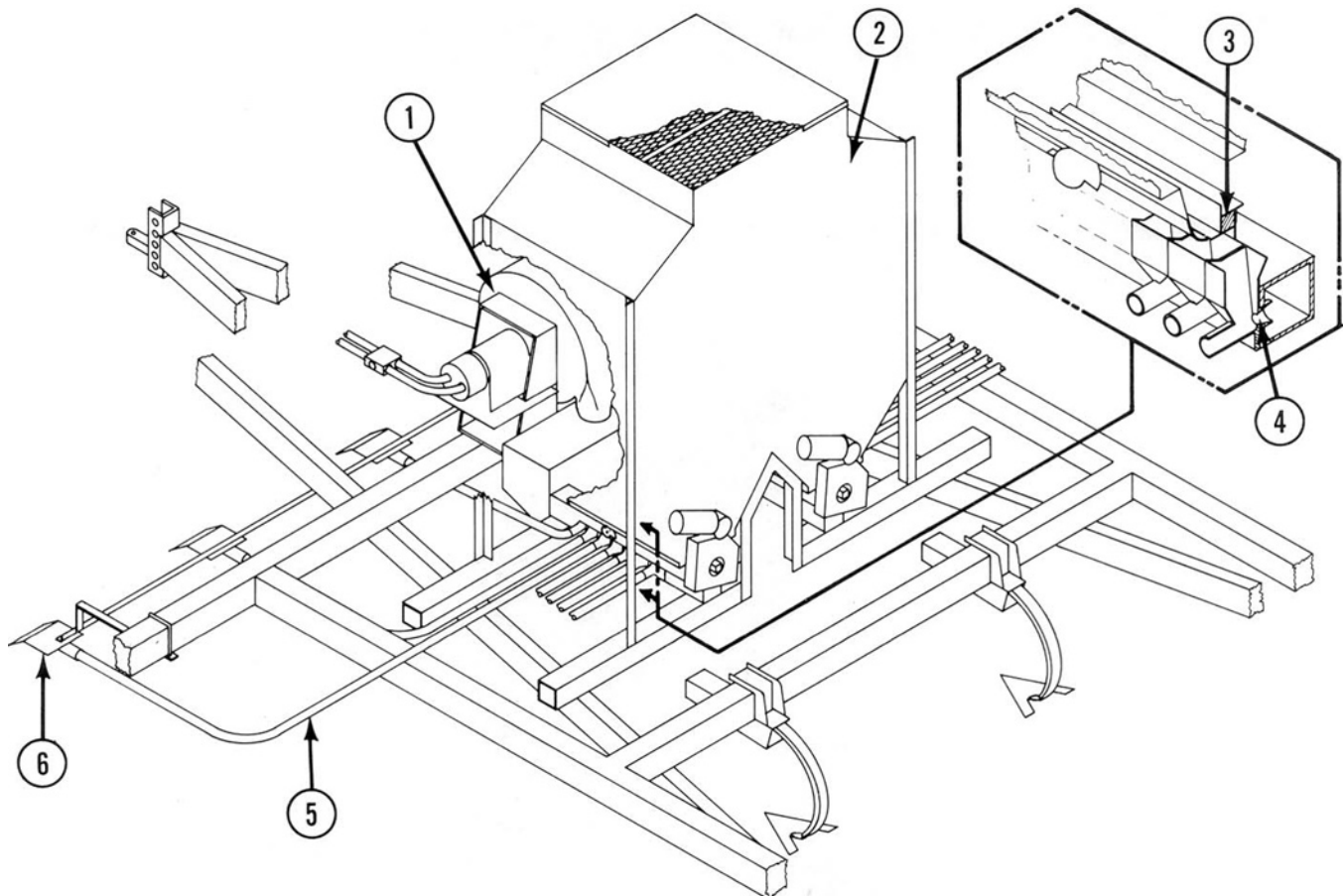


FIGURE 1. Schematic View of Gandy Air-Spred Model 5516 Granular Applicator Mounted on Cultivator: (1) Fan, (2) Hopper, (3) Meter Feed Rotor, (4) Venturi, (5) Outlet Hose (6) Deflector.

SUMMARY AND CONCLUSIONS

Functional Performance: Performance of the Gandy Air-Spred 5516 was very good.

Meter Calibration: The manufacturer's metering system calibration charts were accurate for Avadex BW and Treflan QR5. The manufacturer's calibration chart for the Heritage 5G was about 7% high over the normal range of application rates. An Eptam 10G calibration chart was not supplied.

Metering Accuracy: Delivery rates across the machine width were uniform. Delivery rate from individual metering orifices only varied from 12.4 to 13.1 lb/ac (13.9 to 14.7 kg/ha) when applying Avadex BW at 12.7 lb/ac (14.2 kg/ha) and 5 mph (8 km/h), resulting in a CV of 1.5%. The variability in delivery rates from individual orifices was similar over the normal range of application rates.

Distribution Uniformity: Distribution uniformity was acceptable for all granular products used during the test. A typical range of application rates across the width of spread was 11.0 to 14.0 lb/ac (12.3 to 15.7 kg/ha) when applying Avadex BW at 12.6 lb/ac (14.1 kg/ha) and 5 mph (8 km/h), using a 30 in (762 mm) deflector spacing and a 22 in (559 mm) discharge height. Distribution when using Treflan QR5 was similar to Avadex BW. Distribution uniformity improved at higher fan

pressures.

Effect of Field Variables: Field bounce, field side slopes and level of material in the hopper did not affect metering rates. Application rate varied about 3% in fore and aft field slopes of 10%. Application rate was dependent on forward speed. Increasing forward speed decreased the application rate.

Mounting on Tillage Tool: The Air-Spred 5516 mounted easily on an International Harvester 645 vibra-chisel cultivator. It took 2 people about 4 hours to initially mount the Air-Spred. Only slight modifications to the deflector mounting bars were needed to attach the deflectors to the cultivator. No problems occurred when transporting the cultivator and Air-Spred.

Hopper: The hopper was convenient to fill with an auger. Manual loading was inconvenient. The hopper held about 1290 lb (587 kg) of Avadex BW. The hopper emptied uniformly but was inconvenient to clean. The hopper was weathertight. No moisture entered the hopper during the test.

Ease of Operation and Adjustment: Application rate was easily set by adjusting a cam gauge on each meter. The meters could be controlled from the tractor cab. There was no meter rotation indicator. The fan speed could be adjusted by adjusting the hydraulic oil flow rate. The air pressure gauge indicated fan operation.

Operator Safety: The Air-Spred was safe to operate provided normal safety procedures were followed. All moving parts were well shielded.

Operator's Manual: The operator's manual clearly outlined applicator operating, maintenance and set up instructions and contained a well-illustrated comprehensive parts list. All calibration charts supplied were in SI (Metric) units of measure.

Mechanical Problems: No mechanical problems occurred during the 53 hours of testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying an Eptam 10G meter calibration chart.
2. Modifications to provide convenient hopper clean out.
3. Modifications to make application rate independent of forward speed.
4. Providing a feed rotor shaft rotation indicator.

Senior Engineer: E.H. Wiens

Project Engineer: L.J. de Boer

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. We presently do have available calibration charts for Eptam 10G, as well as charts for other chemicals.
2. The plugs in the sides and bottoms of the hopper are sized to permit a substantial flow of granules that can be caught in a chemical bag or pan without spilling and yet be readily stopped when the catch receptacle becomes full.
3. A ground speed compensated model is available through our distributor.
4. An optional electronic monitor is available that monitors up to four rotors, ground speed, area covered, air pressure, chemical in the hopper, and turns the electric motors on and off.

GENERAL DESCRIPTION

The Gandy Air-Spred model 5516 is an implement mounted granular applicator designed for tillage implements ranging in width from 32 to 40 feet (9.8 to 12.2 m). Granules are metered from a 29.6 ft³ (0.84 m³) hopper into 16 venturi assemblies by two feed rotors and 16 adjustable orifices located at the bottom of the hopper. A hydraulically driven fan at the front of the hopper provides air which pneumatically conveys granules from the venturies to 16 outlet hoses. Granules from each hose are spread by deflectors located across the width of the implement. The deflectors can be spaced at 24, 27 or 30 in (610, 685 or 762 mm), resulting in spreading widths of 32, 36 or 40 ft (9.8, 11.0 or 12.2 m).

Application rate is controlled by adjusting the orifice opening or the forward speed. Orifice opening size is set with a cam gauge located on each side of the hopper. Two 12 volt electric motors located on each side of the hopper bottom drive the feed rotors. Stopping the rotors stops the application. Fan speed is controlled by a hydraulic flow control valve.

The test machine was mounted on a 37 ft (11.3 m) International Harvester model 645 vibra-chisel cultivator using 27 in (685 mm) deflector spacing.

FIGURE 1 shows a schematic view of the hopper while detailed specifications are given in APPENDIX 1.

SCOPE OF TEST

The Gandy Air-Spred 5516 applicator was operated for 53 hours while spreading Avadex BW on 240 ac (79 ha), Treflan QR5

on 275 ac (111 ha), and a combination of Avadex and Treflan on 420 ac (170 ha) at field speeds of about 6 mph (10 km/h).

The applicator was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety and suitability of the operator's manual. Metering and distribution accuracy were evaluated in the laboratory. Standard test procedures¹ were used to determine the effect of field and machine variables on metering and distribution.

RESULTS AND DISCUSSION

QUALITY OF WORK

Calibration Chart Accuracy: The metering system was calibrated in the laboratory with Avadex BW, Treflan QR5, Heritage 5G and Eptam 10G. The manufacturer's calibration charts were accurate for Avadex BW and Treflan QR5. The manufacturer's calibration for Heritage 5G was about 7% high over the normal range of application rates.

The manufacturer did not supply a meter calibration chart for Eptam 10G. FIGURE 2 shows the Eptam 10G calibration curve obtained in the laboratory for a 24 in (685 mm) deflector spacing and a speed of 5 mph (8 km/h). It is recommended that the manufacturer supply a meter calibration chart for Eptam 10G.

Application rates were not seriously affected by field roughness, level of material in the hopper, or side slopes. Application rates varied by about 3% at field fore and aft slopes of 10%.

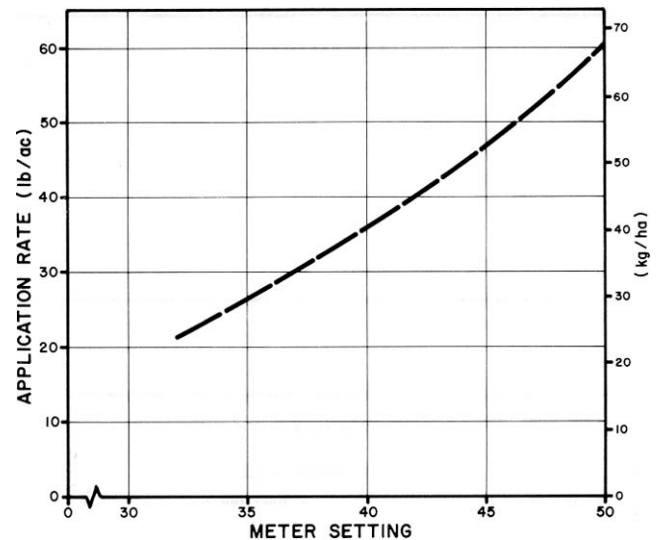


FIGURE 2. Eptam 10G Meter Calibration for a 24 in (685 mm) Deflector Spacing and a Speed of 5 mph (8 km/h).

Forward speed affected application rates since delivery from the orifices was constant for a given cam gauge setting. Higher application occurred at low speeds and lower application occurred at high speeds. Constant ground speed was necessary for uniform application.

Metering accuracy: Delivery rates across the width of the machine were uniform for all granular materials used throughout the test. FIGURE 3 shows typical delivery rates from 16 metering orifices while applying 12.7 lb/ac (14.2 kg/ha) of Avadex BW at 5 mph (8 km/h). Application rates from individual orifices only varied from 12.4 to 13.1 lb/ac (13.9 to 14.7 kg/ha), resulting in a coefficient of variation² of 1.5%. The variability in delivery rates from individual orifices was similar over the normal range of application rates.

¹PAMI T772-R78. Detailed Test Procedures for Granular Applicators.

²The coefficient of variation (CV) is the standard deviation of the application rates expressed as a per cent of the mean application rate. The low CV represents uniform application whereas a high CV indicates non-uniform application. One granular herbicide manufacturer has suggested that the CV should be no greater than 10%.

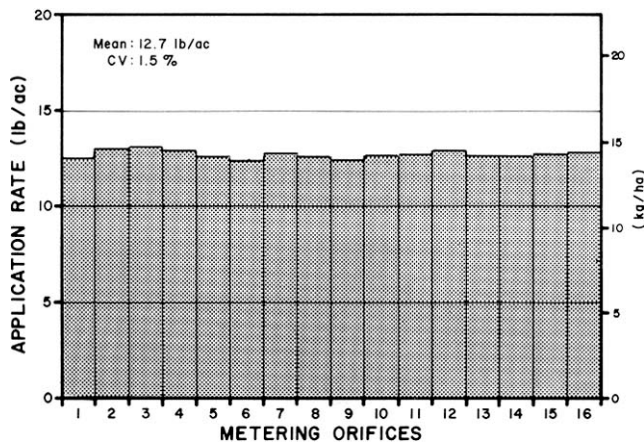


FIGURE 3. Typical Variation in Delivery Rates from Individual Orifices when Applying Avadex BW at 12.7 lb/ac (14.2 kg/ha) and 5 mph (8 km/h).

Spreading Accuracy: Granules delivered by the 16 diamond-shaped orifices were pneumatically conveyed across the width of the machine and were discharged onto deflector plates (FIGURE 4). The deflector plates could be spaced at 24, 27 or 30 in (610, 685 or 762 mm) intervals, depending on the width of the tillage implement. Recommended deflector plate discharge height depended on deflector plate spacing. For deflector spacings of 24 in (610 mm), the manufacturer recommended a deflector discharge height of between 14 and 18 in (356 and 457 mm). For deflector spacings of 27 or 30 in (685 or 782 mm), the manufacturer recommended a deflector discharge height of at least 18 in (457 mm).

Air pressure to the distribution system was adjusted by controlling the oil flow to the hydraulically driven fan. The manufacturer recommended that flow be adjusted to obtain air pressures between 8 and 9 oz/in² (3.4 and 3.9 kPa) as measured on the pressure gauge located on the hopper. Pressures of up to 10 oz/in² (4.3 kPa) could be obtained without exceeding the maximum rated fan speed.

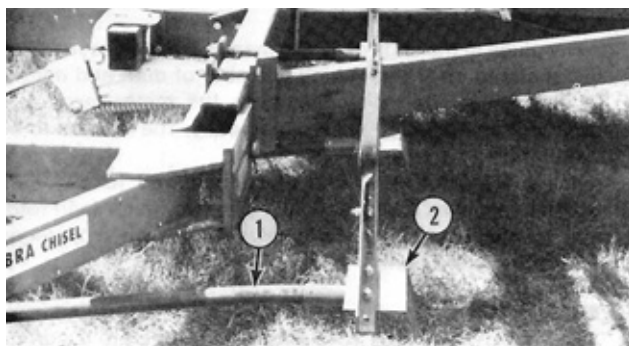


FIGURE 4. Distribution System: (1) Outlet Hose, (2) Deflector Plate.

The deflector discharge height, deflector spacing and air pressure affected the distribution pattern. Increasing air pressure and discharge height tended to improve distribution uniformity. At a 24 in (610 mm) deflector spacing and 14 to 18 in (356 to 457 mm) discharge height, at least 9 oz/in² (3.9 kPa) of air pressure was required to obtain satisfactory distribution uniformity. At a 30 in (762 mm) deflector spacing and an 18 to 20 in (457 to 508 mm) discharge height, about 9 oz/in² (3.9 kPa) provided satisfactory distribution uniformity. At discharge heights above 20 in (508 mm), adequate distribution uniformity could be obtained with pressures above 8 oz/in² (3.4 kPa).

FIGURE 5 shows a typical distribution of Avadex BW when applying 12.6 lb/ac (14.1 kg/ha) at 5 mph (8 km/h) using a 30 in

(762 mm) deflector spacing and a 22 in (559 mm) discharge height. Application rates varied from 11.0 to 14.0 lb/ac (12.3 to 15.7 kg/ha) across the spreading width, resulting in a CV of 5.8%. Spreading uniformity of Avadex BW was not influenced by the application rates over the normal range of application rates.

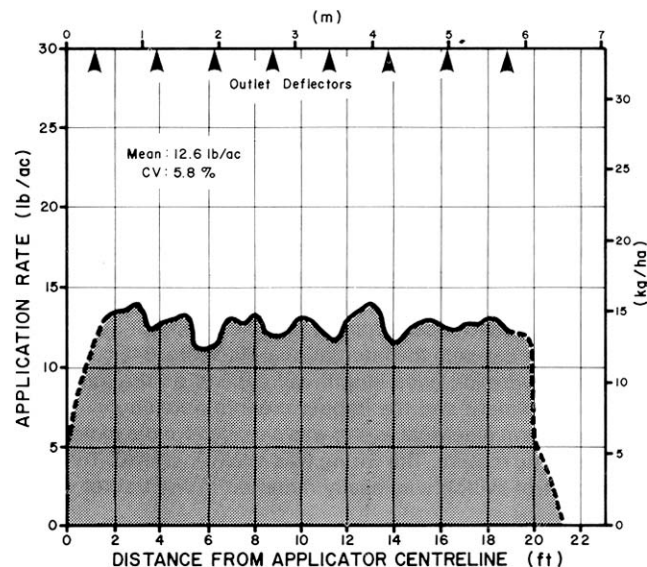


FIGURE 5. Typical Distribution Pattern when Applying 12.6 lb/ac (14.1 kg/ha) of Avadex BW at 5 mph (8 km/h) using 30 in (762 mm) Deflector Spacing and a 22 in (559 mm) Deflector Discharge Height.

FIGURE 6 shows a typical distribution pattern of Treflan QR5 when applying 21.5 lb/ac (24.1 kg/ha) at 5 mph (8 km/h) using a 30 in (762 mm) deflector spacing and 22 in (559 mm) deflector discharge height. Application rates varied from 16.7 to 24.0 lb/ac (18.7 to 26.9 kg/ha) across the spreading width, resulting in a CV of 7.4%. Distribution uniformity was not influenced by the application rate over the normal range of application rates.

The distribution patterns shown in FIGURES 5 and 6 represent operation on smooth level fields on calm days. High winds could result in patterns different than those shown. Deflector height variation due to rough fields was not a problem with the cultivator mounted applicator.

Distribution in the direction of travel was uniform with no detectable surging.

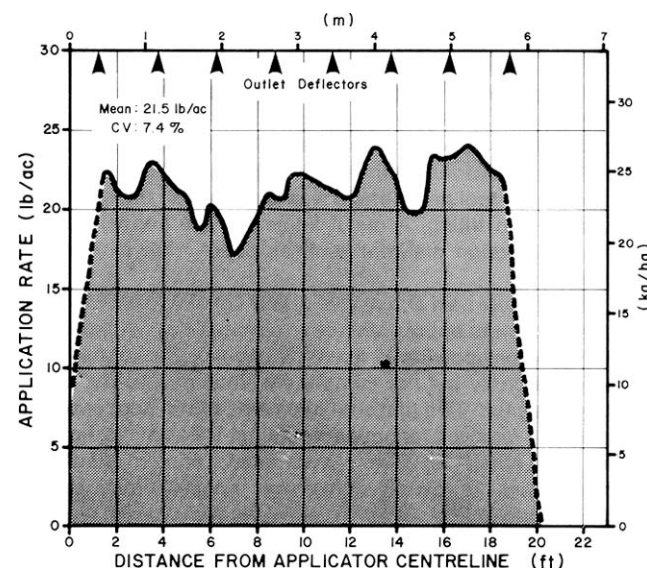


FIGURE 6. Typical Distribution Pattern when Applying 21.5 lb/ac (24.1 kg/ha) of Treflan QR5 at 5 mph (8 km/h) using a 30 in (762 mm) Deflector Spacing and a 22 in (559 mm) Deflector Discharge Height.

EASE OF OPERATION

Mounting the Applicator: Mounting the Gandy Air-Spred 5516 on an International Harvester 645 vibra-chisel cultivator (FIGURE 7) took 2 people about 4 hours. Removal and subsequent mounting would take less time. The applicator was easily mounted using the bar clamps provided. The deflectors were spaced at 27 in (685 mm) and at a 20 in (510 mm) discharge height resulting in a 36 ft (10.9 m) spreading width. Although 5 deflector mounting bars were provided, only 4 were required. The deflector bars were mounting using the hanger straps and bar clamps provided. Slight modifications to the deflector bars were required to properly mount the bars on the International Harvester 645 cultivator. Additional mounting supports were required.

The manufacturer supplied 600 ft (181 m) of black plastic distribution tubing. This was ample to mount the Gandy Air-Spred on the International Harvester 645 cultivator. Distribution tubes were secured to the deflectors with Phillips screws.

The hydraulic hoses supplied with the Gandy Air-Spred were too short for use with the International Harvester 645 cultivator. Required hydraulic hose length will depend on the particular tillage implement and the hopper mounting location.

Sufficient electrical wiring was supplied for the meter feed rotor electric motors. The wiring was easily installed. The feed rotor control switch was easily mounted in the tractor cab.

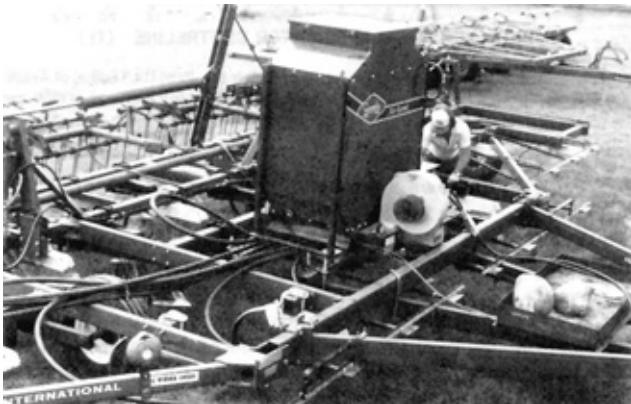


FIGURE 7. Gandy Air-Spred 5516 Mounted on an International 645 Vibra-Chisel Cultivator.

Transporting: The Gandy Air-Spred 5516 could be easily folded into transport or unfolded into field position. Care had to be taken during initial mounting and assembly to eliminate any interference between the implement and discharge tubing. When mounted on the International Harvester 645 cultivator, a rubber strap was required to hold the distribution tubing away from the cultivator tires while in field position.

Hopper: The hopper was convenient to fill with an auger. Loading by hand was inconvenient. The operator had to walk over the frame of the cultivator. A step was provided to mount on the tillage tool and a stand was mounted on the side of the hopper to aid filling. A mesh screen in the hopper opening prevented foreign material such as paper from entering the hopper.

The hopper held about 1290 lb (587 kg) of Avadex BW which was sufficient to apply granules to about 108 ac (44 ha), before refilling, when applying 12 lb/ac (13.5 kg/ha). The hopper would empty uniformly but not completely since part of the hopper bottom was flat. Two plugs on each side of the hopper bottom were easily removed for hopper cleaning. These plugs, however, were too small to permit convenient hopper clean out. Modifications to permit convenient hopper clean out are recommended.

The hopper lid was weathertight. No leakage of rain into the hopper occurred during the test.

Setting the Application Rate: The application rate was adjusted by either the cam gauge setting or by the ground speed. The precise forward speed had to be determined and the

appropriate cam gauge setting selected to match the desired application rate. Changing the ground speed changed the application rate. Ground speed had to remain constant to ensure a uniform application rate. It is recommended that the manufacturer consider modifications to make application rate independent of forward speed.

The cam gauge was conveniently adjusted without tools. The windshield (FIGURE 8) had to be lifted to set the cam gauge.

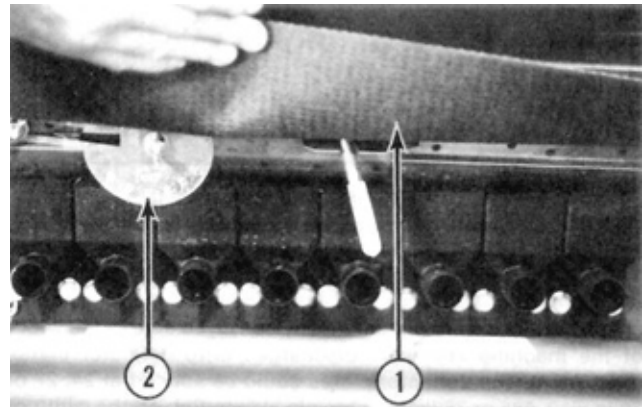


FIGURE 8. Windshield (1) and Cam Gauge (2).

Field Operation: The Gandy Air-Spred 5516 performed well in all field conditions. The deflector bars remained stable throughout the test with little movement due to field vibration.

Each half of the applicator could be conveniently stopped or started by using the feed rotor control switch located in the tractor cab. This was useful to avoid double application when finishing fields or turning on headlands. Neither the granules falling from the deflectors or the feed rotors were visible from the tractor cab. It is recommended that the manufacturer provide a meter feed rotor shaft rotation indicator as a convenient field check on applicator operation.

The pressure gauge on the air manifold provided an adequate check on fan operation. Fan speed was easily adjusted with the hydraulic flow control valve when used with an open center hydraulic system. When using a closed center hydraulic system it was necessary to close the valve and use the tractor flow control to adjust the fan speed. Fan speed had to be adjusted throughout the day to compensate for changes in hydraulic oil temperature.

The plugs in the ends of the air manifold had to be removed occasionally to clear the mixing chamber of dust and debris.

Lubrication: The roller chains on the meter feed rotor electric motors had to be oiled periodically. The fan had to be greased once a year.

Power Requirements: The power required to drive the distribution fan was 3.5 hp (2.6 kW). The two meter feed rotor electric motors required approximately 6.5 amps when operating under normal conditions.

OPERATOR SAFETY

The Gandy Air-Spred 5516 was safe to operate if normal safety procedures were followed. All moving parts were adequately shielded. The shields were easily removed and installed.

OPERATOR'S MANUAL

The operator's manual clearly outlined operating, maintenance and set up instructions and contained a well-illustrated comprehensive parts list.

Calibration charts were provided for Avadex BW, Treflan QR5 and Heritage 5G for the three widths of spread. All calibration charts were in SI (Metric) units of measure.

DURABILITY RESULTS

The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted. No mechanical problems occurred during 53 hours of operation.

APPENDIX I
SPECIFICATIONS

MAKE:	Gandy Air-Spred Granular Applicator	
MODEL:	5516	
SERIAL NUMBER:	867545	
OVERALL DIMENSIONS:		
Hopper - height	63 in	(1600 mm)
- width	75.5 in	(1918 mm)
- length	52.5 in	(1334 mm)
METERING SYSTEM:		
- type	variable orifice fed by rotor chain from electric motors	
- drive	orifice size	
- adjustment	pneumatic nozzles with deflectors	
- transfer to ground	16	
- number of discharge tubes	24, 27 or 30 in (610, 685 or 762 mm)	
- deflector spacing	variable	
- deflector height	32, 36 or 40 ft (9.8, 11.0 or 12.2 m)	
- effective spreading width		
WEIGHTS:		
- hopper	620 lbs	(282 kg)
- hopper with accessories	770 lbs	(350 kg)
HOPPER CAPACITY:	29.6 ft ³ (0.84 m ³)	
NUMBER OF LUBRICATION POINTS:	1	

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

- Excellent
- Very Good
- Good
- Fair
- Poor
- Unsatisfactory

APPENDIX III
CONVERSION TABLE

acres (ac) x 0.40	= hectares (ha)
bushels (bu) x 36.4	= litres (L)
feet (ft) x 0.305	= metres (m)
horsepower (hp) x 0.75	= kilowatts (kW)
inches (in) x 25.4	= millimetres (mm)
miles/hour (mph) x 1.61	= kilometres/hour (km/h)
pounds (lb) x 0.45	= kilograms (kg)
pounds/bushel (lb/bu) x 1.25	= kilograms/hectolitre (kg/hL)
pounds force (lb) x 4.45	= newtons (N)
pounds force/foot (lb/ft) x 0.015	= kilonewtons/metre (kN/m)

SUMMARY CHART
GANDY AIR-SPRED MODEL 5516
GRANULAR APPLICATOR

RETAIL PRICE:	\$5805.00 (April, 1984, f.o.b. Lethbridge)
METER CALIBRATION:	- Avadex BW - accurate - Treflan QR5 - accurate - Heritage 5G - 7% high over normal range - Eptam 10G - not supplied
METER ACCURACY:	- CV = 1.5% when applying Avadex BW at 12.7 lb/ac (14.2 kg/ha) and 5 mph (8 km/h)
DISTRIBUTION UNIFORMITY:	- acceptable for all granular products tested
EFFECT OF FIELD VARIABLES ON METER RATES:	- bounce - no effect - level of material in hopper - no effect - side slopes - no effect - fore and aft slopes - 3% variation - ground speed - increased speed decreased application rate
MOUNTING ON TILLAGE TOOL:	- 2 people about 4 hours
HOPPER:	- conveniently filled with auger - weathertight - emptied uniformly
EASE OF OPERATION AND ADJUSTMENT:	- application rate was easily adjusted
OPERATOR SAFETY:	- all parts were well shielded
OPERATOR'S MANUAL:	- complete and informative



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