

# **AVADEx BW8 and FORTRESS® USE IN DIRECT SEEDING MONSANTO CANADA INC.**

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## **Background:**

Avadex BW, active ingredient triallate, formulated as a 10% granule (10G) and as a 400 g/l emulsifiable concentrate, has been used for over 30 years for controlling wild oats in wheat and barley. Fortress, a combination granule consisting of 10% triallate and 4% trifluralin was introduced around 10 years ago for the control of wild oat and green foxtail.

Historically, Avadex BW and Fortress have had to be incorporated twice for good weed control. With the change in agronomic practices across the West to less tillage, the demand for making these granular products fit the new practices has increased.

## **Factors affecting performance of Avadex BW and Fortress:**

### **1. Soil moisture and temperature**

Both Avadex BW and Fortress are affected by soil moisture and temperature. Both products will control wild oats over a wide range of soil moisture ranging from 5% below field capacity to 5% above permanent wilting point. Along with soil moisture, soil temperature influences activity and performance. At soil temperatures of 5 °C and higher the herbicide will start to become active or mobile in the soil atmosphere. Activity will peak and flatten out at 10-12 °C (Fig. 1). A warmer soil will increase control.

### **2. Herbicide dispersion in the soil**

When the granules are applied at a rate of 14 kg/ha of product. There are usually 13 granules in a 2.5 X 2.5 cm square of soil surface. After the granule comes in contact with soil moisture, the herbicide is displaced and moves into the soil atmosphere which it can traverse and attach to soil particles. This diffusion is usually to a maximum radius of 3 mm. As mentioned earlier, this process is moisture and temperature sensitive. This original movement is insufficient to cover the entire soil area and is why incorporation has been used. Incorporation moves the soil particles with herbicide attached to areas with no herbicide. At this new position, herbicide would be displaced and moved into the soil atmosphere and some would eventually reattach to soil particles. Eventually an equilibrium would be reached between the soil atmosphere and soil particles.

### **3. Crop residue in Direct Seeding**

Direct Seeding and other Minimum tillage systems through increased crop residue retention and soil moisture conservation are making it possible to use Avadex BW and Fortress with little or no incorporations. Due to crop residue retention in Direct Seeding, higher levels of moisture occurs at the soil surface and when the granules come in contact, herbicide diffusion process begins.

Because no or little tillage is involved, there is no mechanical movement of soil particles and granules so diffusion is the only way the herbicide can eventually create a treated layer near the soil surface. This process takes more time than if incorporated so fall or early spring applications in Direct Seeding are necessary to ensure wild oat control to allow this process to occur.

With spring applications, seeding should take place 10 days or more after spring application. This delay is critical for Avadex BW and Fortress to react with moisture in the soil and activate. Seeding too soon after application does not allow product activation and wild oat control will be reduced.

If the soil surface is extremely dry, at the time of application, Avadex BW and Fortress will not activate. A light incorporation to get the granules in contact with moisture or delaying seeding until moisture is present would be recommended.

### Research Initiatives in Fitting Avadex BW and Fortress into Direct Seeding

The first step to fit the trend of reduced tillage was the registration of a fall applications with no incorporation. Two incorporations had to be performed in the spring. The next step came when Ken Kirkland, Ag Canada, Scott, Sask. started research in fall applications to stubble fields with various levels of incorporation the next spring. The first three years work are summarized in Table 1.

Table 1. Effect of incorporation of fall applied Avadex BW and Fortress on wild oat control in barley (3 year summary). Ken Kirkland, Agriculture Canada, Scott, Sask.

Seeding system	% Wild oat control	
	Avadex BW 10G	Fortress
No incorporation	88	87
Reduced tillage -1 tillage prior to seeding	89	85
Conventional	94	88

Ref: Seeding method: hoe-drill.

Also, other ongoing research in this area has shown outstanding performance (Tables 1 & 2) with other minimum-tillage applications of Avadex BW. Currently the only registration for direct seeding systems is with avadex bw fall or spring applied using a high disturbance seeding system. Other research data presented is for information only and cannot be recommended at this time.

Table 2. Early spring applications of Avadex BW and the effect of seeding system and organic matter level on wild oat control in wheat. Monsanto and Academic Research Data (1993 & 1994).

Seeding system	Wild oat control	
	1400 g/ha < 4% O.m.	1700 g/ha > 4% O.m.
* Low Disturbance Seeding	89 %	86 %
** High Disturbance Seeding	92 %	87 %

\* Low Disturbance Seeding - only minimal soil disturbance at seeding. Example seeding implements may be air drills, hoe drills or zero till drills. **Unregistered as of Feb. 20/95.**

\*\* High Disturbance Seeding - 1 incorporation either at seeding or with some other implement before or after seeding (ie. heavy or rotary harrow). Example seeding implements may be air seeders (sweeps & harrows), hoe drills with tillage or harrowing prior to seeding.  
**Registered**

Table 3. Early spring applications of Fortress and the effect of seeding system and organic matter level on wild oat control in wheat. Monsanto and Academic Research Data (1993 & 1994).

Seeding system	Wild oat control	
	< 4% O.m. 1540 g/ha	> 4% O.m. 1960 g/ha
* Low Disturbance Seeding	87 %	84 %
** High Disturbance Seeding	92 %	83 %

\* Low Disturbance Seeding - only minimal soil disturbance at seeding. Example seeding implements may be air drills, hoe drills or zero till drills. **Unregistered as of Feb. 20/95.**

\*\* High Disturbance Seeding - 1 incorporation either at seeding or with some other implement before or after seeding (ie. heavy or rotary harrow). Example seeding implements may be air seeders (sweeps & harrows), hoe drills with tillage or harrowing prior to seeding. **Unregistered as of Feb. 20/95.**

### **New Registration for Avadex BW for Min Till/Direct Seed High Disturbance Seeding Systems:**

Based on the work done at Scott, Monsanto initiated a research program in 1993 examining field scale and small plot research. Since then, Monsanto has conducted over 50 field scale research trials in Western Canada and over 40 small plot research trials. This combined with research trials with Ag Canada and Independent Research Companies has resulted in Avadex BW fitting into reduced tillage systems and the new registration for Avadex BW for min till/direct seed high disturbance seeding systems.

### **USE TIPS:**

#### **1. Residue management**

At application, granule to soil contact is necessary for good activity. To ensure this, fields with high crop residues may require a harrowing or other light incorporation. Avadex BW and Fortress can be applied to soils with 75 to 90 per cent residue cover if straw and chaff are spread uniformly.

#### **2. Rate of application**

Choose the rate that matches crop, soil conditions and time of application and seeding system listed on the label.

#### **3. Soil temperature**

Avadex BW and Fortress starts to become active in a moist soil at a temperature of 5°C. Wild oats germinate at lower temperatures and can break through the treated field. A tillage or pre-seeding burn-off will be needed to control emerged wild oats and allow the Avadex BW to control new wild oat growth.

For optimum results with Avadex BW and Fortress minimum tillage treatments, seed when wild oat growth is noticeable in the field. This will ensure that the soil is warm enough for activation of Avadex BW and Fortress. Table 4 demonstrates how early seeding and cooler soils can cause lower control than later seeded plots which usually have warmer soils.

Table 4. Early vs late seeding from fall and spring Avadex BW applications and the effect on wild oat control in wheat. Monsanto Research Data (1993).

Seeding system	---- % wild oat control ----	
	EARLY	LATE
Low Disturbance Seeding	84	88
High Disturbance Seeding	89	96

#### 4. Seeding and Incorporation

Incorporation will take place at seeding with this new registration. A high disturbance incorporation can be conducted prior to seeding or as part of the seeding operation. High disturbance may be caused by the seed drill-cultivator or with harrows following the seed drill, or both. Levelling the soil at or after seeding with harrows will ensure uniform product coverage and best results.

#### 5. Fall and Spring Applications

Spring applications should be made early ensuring that the time between application and final incorporation at seeding is 10 days or more.

Fall applications can be made after October 1 when soil temperatures at the 5 cm depth is 4°C or less. Fields should have enough residue to prevent soil movement.

Avadex **BW**® and Fortress® is a registered trademark of, and used under licence from Monsanto Company; Monsanto Canada is a registered user, Monsanto Company 1995.

**For more information** on wild oat and green foxtail control refer to the Avadex BW and Fortress label and to the guide “Avadex BW and Fortress Min-Till Guide, A Farmer’s Guide For Controlling Wild oats and Millet in Reduced Tillage”.

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