

## **Using Zidua® (pyroxasulfone) for Italian ryegrass control in winter wheat in the Pacific Northwest – a report on Zidua crop safety and weed control**

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Studies were conducted near Pullman, WA from 2013 to 2015 to evaluate winter wheat and Italian ryegrass response to pyroxasulfone formulated as a dry flowable (Zidua, 85% WDG). Small-plot studies found no wheat injury caused by pyroxasulfone at the doses used (up to 1.75 oz/A). Preemergence (immediately after planting) or delayed preemergence (when 80% of coleoptiles were 1.3 cm long) applications of pyroxasulfone alone controlled more than 90% of Italian ryegrass. In general, late (early postemergence) applications of Zidua resulted in lower control of Italian ryegrass than pre-emergence applications, even when tankmixed with an herbicide with a postemergence activity such as pinoxaden.

In total, 6 studies were conducted in Pullman, WA from 2013 to 2015 on pyroxasulfone. Research objectives were to:

- 1) Evaluate winter wheat and Italian ryegrass responses to dry flowable pyroxasulfone.
- 2) Evaluate the effects of application timing.
- 3) Evaluate the effects of rainfall amounts immediately after planting.

### **Crop Safety (weed-free trial) of Zidua applied Preemergence or Early Postemergence.**

A study was established in the fall of 2013 at the Spillman Agronomy Farm near Pullman, WA. Winter wheat (variety 'ARS-Amber') was planted at a 90 lb/A rate on October 7, 2013 with a Horsch air seed drill. Treatments consisted in different Zidua rates applied alone or with different tankmix partners. One treatment consisted in Axiom® (flufenacet plus metribuzin) applied at a recommended labeled rate to compare crop responses to Zidua with response to another VLCFA inhibitor (flufenacet) labeled in winter wheat. The experimental design was a randomized complete block with 4 replications. Plots were 12 ft wide by 30 ft long. Treatment application details are presented in Table 1.1. PRE and delayed PRE applications were followed by 0.25 in of supplemental water applied through a plot-sized PVC-pipe sprinkler system. Treatments are detailed in Table 1.3. The entire study area was maintained weed-free with Discover® NG, WideMatch® and MCPA at recommended labeled rates.

The study was repeated in the fall of 2014 at the Palouse Conservation Field Station. Winter wheat (variety 'Amber') was planted with a Monosem® precision vacuum planter on October 13<sup>th</sup> 2014. Treatment application details are presented in Table 1.2. The study was maintained weed-free with MCPA plus bromoxynil (applied March 27<sup>th</sup> 2015), pyrasulfotole plus bromoxynil and clodinafop (applied April 29<sup>th</sup> 2015).

No injury was observed on winter wheat during the growing season. Head trapping, a common injury symptom with VLCFA inhibitors, was evaluated by counting the number of trapped head in 2, 2.7 ft<sup>2</sup> quadrats per plot. There were no differences in head trapping among treatments. Plots were harvested using a 5 ft header combine. Treatments did not affect wheat test weight or yield.

In 2015, there was again no differences in winter wheat stands. Observed injury from pyroxasulfone treatments ranged from 1.3% (Zidua applied alone POST) to 11.5% (Zidua applied alone, PRE). Axiom (flufenacet plus metribuzin, applied as a delayed PRE) caused the

highest level of injury (18%). We also observed activity of pyroxasulfone (60 to 95% control) on tarweed fiddleneck (*Amsinckia lycopsoides* Lehm.).

### **Crop Safety and Efficacy on Italian ryegrass of Zidua applied Preemergence or Early Postemergence.**

A study was established in the fall of 2013 at the Cook Agronomy Farm near Pullman, WA. Winter wheat (variety 'ARS-Amber') was planted at a 90 lb/A rate on October 22, 2013 with a Monosem precision vacuum planter. Treatments consisted in different Zidua rates applied alone or with different tankmix partners. One treatment consisted of Axiom applied at a recommended labeled rate to compare crop responses to Zidua, since flufenacet, a component of Axiom, is also a VLCFA inhibitor. The experimental design was a randomized complete block with 4 replications. Plots were 12 ft wide by 30 ft long. Treatment application details are presented in Table 2.1. PRE and delayed PRE applications were followed by 0.25 in of supplemental water applied through a plot-sized PVC-pipe sprinkler system. Treatments are detailed in Table 2.2. The entire study area was maintained free of broadleaf weeds by using WideMatch® and MCPA at recommended labeled rates. Wheat injury and Italian ryegrass control were visually evaluated throughout the season. Head trapping, a common injury symptom with VLCFA inhibitors, was assessed by counting the number of trapped head in 2, 2.7 ft<sup>2</sup> quadrats per plot. Plots were harvested using a 5 ft header combine.

The study was repeated in 2014-2015 at the Cook Agronomy Farm. Winter wheat (variety 'Amber') was planted with a Monosem® precision vacuum planter on October 13<sup>th</sup> 2014. The study was maintained free of broadleaf weeds with MCPA plus bromoxynil (applied March 27<sup>th</sup> 2015) and pyrasulfotole plus bromoxynil (applied on (applied on April 29<sup>th</sup> 2015).

In 2014, no significant wheat injury or head trapping was observed (data not presented). Results are presented in Table 2.2. Italian ryegrass control was significantly lower when Zidua was applied early in the spring (application C) than when Zidua was applied shortly after planting (applications A and B). Differences in weed control did not translate into wheat yield or test weight differences.

In 2015, there were again no differences in winter wheat stands. Observed injury from pyroxasulfone treatments ranged from 0% (Zidua applied with Axial POST) to 18% (Zidua applied with metribuzin as a delayed PRE). Axiom (flufenacet plus metribuzin, applied as a delayed PRE) caused the highest level of injury (26%). Control of Italian ryegrass was reduced compared to 2014, but the trends were similar. Zidua plus metribuzin provided the greatest numerical control of Italian ryegrass, but treatments were statistically similar.

In general, late (early post-emergence) applications of Zidua resulted in lower control of Italian ryegrass than pre-emergence applications, even when tankmixed with an herbicide with a postemergence activity such as Axial XL.

The greatest numerical levels of Italian ryegrass control were achieved by Zidua applied with metribuzin as a delayed preemergence treatment (note that use of metribuzin as a delayed preemergence treatment is not permitted by the label). Zidua plus metribuzin provided over 90% control of Italian ryegrass (with Zidua applied either at 1.25 or 1.5 oz/A).

Table 1.1. Treatment application details for the trials conducted at the Spillman Agronomy Farm in 2013-2014, and the Palouse Conservation Field Station in 2014-2015.

Application timing (2013-2014)	October 8, 2013	October 23, 2013	April 2, 2014
Application volume (GPA)	10	10	15
Crop Stage	Preemergence	Delayed preemergence (80% of coleoptiles >0.4 in)	2 to 4 leaves, pre- tillering
Air temperature (°F)	45	55	39
Soil temperature (°F)	46	49	45
Wind velocity (mph)	4.3	5	4.6
Cloud cover (%)	90	0	50
Application timing (2014-2015)	October 14, 2014	October 18, 2014	March 30, 2015
Application volume (GPA)	10	10	15
Crop Stage	Preemergence	Delayed preemergence (80% of coleoptiles >0.4 in)	2 to 4 leaves, pre- tillering
Air temperature (°F)	63	60	57
Soil temperature (°F)	59	54	43
Wind velocity (mph)	3.5	2.4	2.4
Cloud cover (%)	20	0	30

Table 1.2. Winter wheat injury and yield in response to Zidua treatments at the Spillman Agronomy Farm in 2013-2014, and at the Palouse Conservation Field Station in 2014-2015.

Treatment	Simulated rainfall	Application code	Rate	Injury		Wheat yield	
				2014	2015	bu/A	
			lb ai/A		%		
Zidua	1/3 Inch	A	0.027	3	6	5	70 64
Zidua	1/3 Inch	A	0.032	2	12	10	81 61
Zidua		B	0.027	5	5	0	86 82
Zidua		B	0.032	4	9	4	88 68
Zidua + Metribuzin		B	0.027+0.028	4	5	0	71 59
Zidua + Metribuzin		B	0.032+0.028	3	8	5	91 71
Axiom		B	0.137 (fluthiacet) + 0.035 (metribuzin)	5	18	13	72 48
Zidua		C	0.043	-	1	0	85 66
Axial XL		C	0.021	-	8	2.5	95 71
Zidua + Axial XL		C	0.043+0.021	-	4.5	6	83 54
Nontreated				0	0	0	79 48
LSD				-	-	-	- -

Table 2.1. Treatment application details for the trials conducted at the Cook Agronomy Farm in 2013-2015.

Application code	A	B	C
Application timing (2013-2014)	October 24, 2013	November 6, 2013	April 16, 2014
Application volume (GPA)	10	10	15
Crop Stage	Preemergence	Delayed preemergence (80% of coleoptiles >0.4 in)	2 to 4 leaves, pre-tillering
Air temperature (°F)	54	43	46
Soil temperature (°F)	49	43	43
Wind velocity (mph)	4.3	3	6
Cloud cover (%)	0	99	100
Application timing (2014-2015)	October 14, 2014	October 18, 2014	March 30, 2015
Application volume (GPA)	10	10	15
Crop Stage	Preemergence	Delayed preemergence (80% of coleoptiles >0.4 in)	2 to 4 leaves, pre-tillering
Air temperature (°F)	63	60	57
Soil temperature (°F)	59	54	43
Wind velocity (mph)	3.5	2.4	2.4
Cloud cover (%)	20	0	30

Table 2.2. Italian ryegrass control and winter wheat yield for two trials conducted at the Cook Agronomy Farm in 2013-2015.

Treatment	Simulated rainfall	Application code	Rate	Injury		Italian ryegrass		Wheat yield	
				2014	2015	2014	2015	2014	2015
			lb ai/A	%		% control		bu/A	
Zidua	1/3 Inch	A	0.027	3	10	86	74	55	84
Zidua	1/3 Inch	A	0.032	2	9	95	65	56	81
Zidua		B	0.027	5	5	93	81	55	90
Zidua		B	0.032	4	14	95	86	55	87
Zidua + Metribuzin		B	0.027+0.028	4	6	90	78	56	88
Zidua + Metribuzin		B	0.032+0.028	3	13	94	90	56	90
Axiom		B	0.137 (fluthiacet) + 0.035 (metribuzin)	5	23	93	64	55	82
Zidua		C	0.043	0	4	20	34	55	92
Axial XL		C	0.021	0	10	53	59	55	86
Zidua + Axial XL		C	0.043+0.021	0	5	21	40	55	91
Nontreated				0	0	0	0	56	78
LSD				-	-	18	17	-	-

### Disclaimer

**Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.**