

SMALL GRAIN INSECT CONTROL

David Buntin, Research/Extension Entomologist

GRAIN PRODUCTION OF WHEAT, TRITICALE, BARLEY, OATS, AND RYE

CROP/PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days) H-harvest grain G-grazing, hay	TREATMENT THRESHOLDS AND REMARKS
Insecticides and products listed are for use on all cereal grain crops for grain production including wheat, triticale, barley, oats, and rye, except where listed or noted in the insecticide column and remarks section. Products labeled for use only on wheat or wheat and triticale are <i>dimethoate</i> , Fastac CS, and Tombstone. ▶ ALL PRODUCTS LISTED IN THIS SECTION HAVE A BEE HAZARD RESTRICTION, EXCEPT FOR CHLORANTRANILIPROLE (CORAGEN, PREVATHON).						
Aphids	SEED TREATMENTS					Inspect fields 25–35 days after planting, full tiller, and heading. Yield-reducing transmission of Barley Yellow Dwarf virus can occur during first two periods; transmission at heading is too late to reduce yield. Aphid treatment thresholds are: • Seedlings (2/row ft) • 6–10 inch plants (6/row ft) • Stem elongation (2/stem) • Flag leaf (5/flag) • Heading (10/head to include flag) • Soft/Hard Dough stages (Do not treat) NOTE: OP insecticides, such as <i>dimethoate</i> , control aphids but are not effective at suppressing Barley Yellow Dwarf disease. NOTE: At labeled rates, Gaucho XT and Enhance AW also contain two fungicides. NOTE: Cruiser 5FS is available as a commercial seed treatment. Rates of CruiserMaxx Cereals and CruiserMaxx Vibrance alone are too low for effective aphid control. NOTE: NipsIt Inside may be sold as NipsIt Suite Cereals CVR that includes 2 fungicides. NOTE: Warrior II Zeon will replace Karate Zeon. NOTE: Transform wheat, triticale and barley only.
	<i>imidacloprid</i> Gaucho 600, Attendant 600 Access Gaucho XT Enhance AW Warden Cereals HR	4A	0.8 fl oz/100 lb seed 3.4 fl oz/100 lb seed 4 fl oz/100 lb 5–8 fl oz/100 lb	0.03 lb/100 lb seed 0.03 lb/100 lb seed 0.05 lb/100 lb seed 0.05–0.08 lb/100 lb seed	12 H/ 45 D	
	<i>thiamethoxam</i> Cruiser 5FS Cruiser Maxx Cereals Plus Cruiser 5FS	4A	1 fl oz/100 lb seed 5 fl oz/100 lb seed plus 0.5 fl oz/100 lb seed	0.04 lb/100 lb seed 0.04 lb/100 lb seed (total)	12 H/ 45 D	
	<i>clothianidin</i> NipsIt Inside	4A	0.75–1.79 fl oz/100 lb seed		12 H/ Not listed	
	FOLIAR TREATMENTS					
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2.4 fl oz	0.019	12 H/ H-30 D G-3 D	
	<i>dimethoate</i> (wheat only) Dimethoate 4EC, 400 Dimethoate 2.67EC	1B	0.5–0.75 pt 0.75–1 pt	0.25–0.375	48 H/ H-35 D G-35 D	
	<i>flupyradifurone</i> Sivanto Prime Sivanto HL 3.34	4D	7–10 fl oz 3.5–7.0 fl oz	0.09125–0.13 0.09125–0.1825	4 H/ H-21 D G-7 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08, Silencer, Lambda, others 1	3A	1.28–1.92 fl oz 2.56–3.84 fl oz	0.02–0.03	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> + <i>chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz/A	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
	<i>sulfoxaflor</i> Transform 50WG	4C	0.75–1.5 oz	0.023–0.046	24 H/ H-14 D G-7 D	

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Armyworm True armyworm Fall armyworm, Beet armyworm, Yellowstriped armyworm, and Cutworms	<i>alpha-cypermethrin</i> Fastac CS 0.83 (wheat, triticale only)	3A	1.8–3.8 fl oz	0.012–0.025	14 H/ H-14 D G-14 D	True armyworm usually infests wheat in late winter and spring at the boot/head stage. Treat when larval numbers exceed 4 larvae/sq ft before pollen shed and 8 larvae/sq ft after pollen shed.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.8–2.4 fl oz	0.014–0.019	12 H/ H-30 D G-3 D	Fall armyworm, beet armyworm, yellowstriped armyworm and cutworm infestations usually occur in the fall on seedling plants. Treat when larval populations of any one or any combination of these insects exceed 3 larvae (½ inch long or larger)/sq ft.
	<i>cyfluthrin</i> (wheat only) Tombstone Tombstone Helios 2	3A	1.8–2.4 fl oz	0.028–0.038	12 H/ H-30 D G-3 D	
	<i>chlorantraniliprole</i> Coragen 1.67SC Prevathon 0.43	28	3.5–5 fl oz 14–20 fl oz	0.045–0.065 0.047–0.067	4 H/ H-1 D G-1 D	NOTE: Blackhawk and Radiant are most effective against small larvae. Blackhawk is not labeled for cutworm control. Radiant is not labeled for cutworms or yellowstriped armyworms
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.28–1.54 fl oz 3.2–3.84 fl oz	0.0125–0.015	24 H/ 30 D G-7 D	NOTE: Baythroid and Tombstone products are effective against small larvae only.
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08 Silencer, Lambda, others	3A	1.6–1.92 fl oz 3.2–3.84 fl oz	0.025–0.03	24 H/ H-30 D G-7 D	NOTE: Fastac CS and Tombstone products are not labeled for use on barley, oats, or rye.
	<i>lambda cyhalothrin + chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
	<i>spinosad</i> Blackhawk (36%)	5	1.7–3.5 oz	0.038–0.075	4 H/ H-21 D G-3 D	
	<i>spinetoram</i> Radiant 1SC	5	3–6 fl oz	0.0234–0.0469	4 H/ H-21 D G-3 D	
Cereal Leaf Beetle	<i>alpha-cypermethrin</i> Fastac CS 0.83 (wheat, triticale only)	3A	1.8–3.8 fl oz	0.012–0.025	12 H/ H-14 D G-14 D	Treat when an average of 1 larva and adult/4 stems are found. Warrior II (formerly Karate), Declare and similar products can be applied at 50% egg hatch. Other materials should not be applied until after 90% egg hatch.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1–1.8 fl oz	0.008–0.014	12 H/ H-30 D G-3 D	NOTE: <i>lambda/gamma cyhalothrin</i> products applied for cereal leaf beetle also provide aphid control for the remainder of the season
	<i>cyfluthrin</i> (wheat only) Tombstone Tombstone Helios 2	3A	1–1.8 fl oz	0.016–0.028	12 H/ H-30 D G-3 D	NOTE: Fastac CS, Respect, and Tombstone products are not labeled for use on barley, oats, and rye.
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	0.77–1.54 fl oz 2.56–3.84 fl oz	0.0075–0.015 0.01–0.015	24 H/ H-30 D G-7 D	

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Cereal Leaf Beetle (continued)	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08 Silencer, Lambda, others	3A	1.28–1.92 fl oz 2.56–3.84 fl oz	0.02–0.03	24 H/ H-30 D G-7 D	Treat when an average of 1 larva and adult/4 stems are found. Warrior II (formerly Karate), Declare and similar products can be applied at 50% egg hatch. Other materials should not be applied until after 90% egg hatch. NOTE: lambda/gamma cyhalothrin products applied for cereal leaf beetle also provide aphid control for the remainder of the season NOTE: Fastac CS, Respect, and Tombstone products are not labeled for use on barley, oats, and rye.
	<i>lambda cyhalothrin + chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
	<i>malathion</i> Malathion 57EC, 5EC Malathion 8EC	1B	1.5 pt 1 pt	0.94 1	12 H/ H-7 D G-7 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	2.6–3.2 fl oz	0.015–0.02	12 H/ H-14 D G-14 D	
Grasshoppers	<i>alpha-cypermethrin</i> Fastac CS 0.83 (wheat, triticale only)	3A	3.2–3.8 fl oz	0.020–0.025	12 H/ H-14 D G-14 D	Treat when grasshoppers are causing excessive (greater than 50%) defoliation. NOTE: Fastac CS, Respect, and Tombstone are not labeled for use on barley, oats, and rye. NOTE: Prevathon for best results add, methylated seed oil (MSO) at 1 gallon per 100 gallons of spray volume (1% v/v).
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.8–2.4 fl oz	0.014–0.019	12 H/ H-30 D G-3 D	
	<i>cyfluthrin</i> (wheat only) Tombstone Tombstone Helios 2	3A	1.8–2.4 fl oz	0.028–0.038	12 H/ H-30 D G-3 D	
	<i>chlorantraniliprole</i> Coragen 1.67SC Prevathon 0.43	28	3.5–5 fl oz 14–20 fl oz	0.045–0.065 0.047–0.067	4 H/ H-1 D G-1 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.02–1.54 fl oz 2.56–3.84 fl oz	0.01–0.015	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08 Silencer, Lambda, others	3A	1.28–1.92 fl oz 2.56–3.84 fl oz	0.02–0.03	24 H/ H-30 D G-3 D	
	<i>lambda cyhalothrin + chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
	<i>malathion</i> Malathion 57EC, 5EC Malathion 8EC	1B	1.5 pt 1 pt	0.94 1	12 H/ H-7 D G-7 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	3.2–4 fl oz	0.02–0.025	12 H/ H-14 D G-14 D	

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Chinch bug	<i>alpha-cypermethrin</i> Fastac CS 0.83 (wheat, triticale only)	3A	3.8 fl oz	0.025	12 H/ H-14 D G-14 D	Treat during the seedling stage when an average of 1 adult/2 plants are found. On larger plants treat when 1 adult/stem or 50% of the plants are infested. Gaucho, Attendant, and Cruiser seed treatments may provide control for a few weeks after planting. Chinch bugs are difficult to control in headed wheat. NOTE: Fastac CS, Respect, and Tombstone are not labeled for use on barley, oats, and rye.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2.4 fl oz	0.019	12 H/ H-30 D G-3 D	
	<i>cyfluthrin</i> (wheat only) Tombstone Tombstone Helios 2	3A	2.4 fl oz	0.038	12 H/ H-30 D G-3 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08, Silencer, Lambda, others	3A	1.92 fl oz 3.84 fl oz	0.03	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> + <i>chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	4 fl oz	0.025	12 H/ H-14 D G-14 D	
Hessian fly	SEED TREATMENTS					Plant Hessian fly-resistant wheat varieties. Systemic insecticide seed treatments are recommended for susceptible cultivars. Systemic seed treatments may need highest rates for effective suppression. Gaucho XT alone may not provide effective control. Rate of CruiserMaxx Cereals or Cruiser Maxx Vibrance alone is too low for effective Hessian fly control. NOTE: Barley is tolerant. Damage only occurs under severe infestations. Rye is highly resistant and oats are immune to Hessian fly. NOTE: Apply Warrior II (formerly Karate) or Declare when adults are actively laying eggs. Apply based on egg sampling for best results.
	<i>imidacloprid</i> Gaucho 600, Attendant 600 Access Gaucho XT plus Gaucho 600	4A	1.6–2.4 fl oz/100 lb seed 3.4 fl oz/100 lb seed plus 1 fl oz/100 lb seed	0.0625–0.094 lb/ 100 lb seed Combined: 0.0675lb/ 100 lb seed	12 H/ 45 D	
	<i>thiamethoxam</i> Cruiser 5FS Cruiser Maxx Cereals Plus Cruiser 5FS	4A	1.33 fl oz/100 lb seed 5 fl oz/100 lb seed plus 0.5 fl oz/100 lb seed	0.06 lb/100 lb seed 0.06 lb/100 lb seed (total)	12 H/ 45 D	
	<i>clothianidin</i> NipsIt Inside	4A	1.79 fl oz/ 100 lb seed	—	12 H/ Not listed	
	FOLIAR TREATMENTS					
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08, Silencer, Lambda, others	3A	1.92 fl oz 3.84 fl oz	0.03	24 H/ H-30 D G-7 D	

CROP/PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days) H-harvest grain G-grazing, hay	TREATMENT THRESHOLDS AND REMARKS
Hessian fly (continued)	FOLIAR TREATMENTS (continued)					
	<i>lambda cyhalothrin</i> + <i>chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
Mites/Winter grain mite	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015	24 H/ H-30 D G-2 D	Treat when infestations are causing leaf discoloration in large areas of a field and mites are present. Infestations are usually associated with application of cattle manure or chicken litter.
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08 Silencer, Lambda, others	3A	1.92 fl oz 3.84 fl oz	0.03	24 H/ H-30 D G-7 D	NOTE: Warrior II (formerly Karate) and Declare only provide mite suppression.
	<i>lambda cyhalothrin</i> + <i>chlorantraniliprole</i> Besiege	3 + 28	5–10 fl oz	0.02–0.03 + 0.04–0.06	24 H/ H-30 D G-7 D	
Stink bugs	<i>alpha-cypermethrin</i> Fastac CS 0.83 (wheat, triticale only)	3A	3.2–3.8 fl oz	0.020–0.025	12 H/ H-14 D G-14 D	Stink bugs rarely reach levels needing control in wheat. Treat if stink bugs exceed 1 bug/sq ft at milk stage. Control during medium-hard dough stages is not justified, except to prevent movement of bugs to susceptible crops in nearby fields as wheat matures.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.8–2.4 fl oz	0.014–0.019	12 H/ H-30 D G-7 D	NOTE: Fastac CS, Respect, and Tombstone are not labeled for use on barley, oats, and rye.
	<i>cyfluthrin</i> (wheat only) Tombstone Tombstone Helios 2	3A	1.8–2.4 fl oz	0.028–0.038	12 H/ H-30 D G-3 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.02–1.54 fl oz 2.56–3.84 fl oz	0.01–0.015	24 H/ H-30 D G-7 D	
	<i>lambda cyhalothrin</i> Warrior II Zeon 2.08 Silencer, Lambda, others	3A	1.28–1.92 fl oz 2.56–3.84 fl oz	0.02–0.03	24 H/ H-30 D G-7 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	3.2–4 fl oz	0.02–0.025	12 H/ H-14 D G-14 D	

SMALL GRAIN FUNGICIDE SEED TREATMENTS

Alfredo Martinez-Espinoza, Extension Plant Pathologist

WHEAT, OATS, BARLEY, RYE, SORGHUM

FUNGICIDE	CROP	RATE/100 LB SEED	REMARKS
<i>azoxystrobin</i> Dynasty	Wheat and Barley	0.153–0.882 fl oz	For protection against common bunt and partial control of dwarf bunt. Where appropriate use in combination with Dividend extreme.
<i>captan</i> Captan 400	Wheat, Barley, Oats, Rye	See label	Controls seedling blights. Does not control smuts.
<i>carboxin</i> + <i>captan</i> Enhance	Wheat, Barley, Oats	4 oz	Controls loose smut, common and kernel bunt, seed rots, and seedling diseases.
<i>carboxin</i> + <i>ipconazole</i> Rancona V100	Wheat, Barley, Oats, Rye	0.9–1.5 fl oz	For control of seedborne and soilborne fungi.
<i>carboxin</i> + <i>thiram</i> Vitavax 200 RTU-Vitavax-Thiram	Wheat, Barley, Oats, Triticale Wheat, Oats, Barley	2 oz 2–4 oz	Controls loose smut and stinking smut. Controls seedling blights. See label for specific rate for grains.
<i>carboxin</i> + <i>PCNB</i> + <i>metalaxyl</i> Prevail	Wheat, Oats, Barley	2.5–5 oz (wheat) 1.6–3.3 oz (oats)	Controls loose smut, common and kernel bunt, seed rots, and seedling diseases from <i>Pythium</i> and <i>Rhizoctonia</i> .
<i>difenoconazole</i> Dividend	Wheat	0.5–1 oz	Controls loose smut and stinking smut.
<i>difenoconazole</i> + <i>mefenoxam</i> Dividend XL RTA Dividend XL Dividend Extreme	Wheat Wheat Wheat	5–10 oz 1–2 oz 0.5–1 oz	Controls loose smut, stinking smut, and <i>Pythium</i> damping-off. Grower and commercially applied.
<i>fludioxonil</i> Maxim 4FS	Barley, Millet, Oats, Rye, Sorghum, Triticale, Wheat	0.08–0.16 fl oz	Controls <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Helminthosporium</i> and weakly pathogenic fungi such <i>Aspergillus</i> and <i>Penicillium</i> .
<i>ipconazole</i> Rancona 3.8 FS Rancona Apex Vortex	Wheat, Barley, Oats, Rye	0.051–0.085 fl oz (3.8 FS) 5–8.3 fl oz (Apex)	Controls loose smut, common and kernel bunt, seed rots, and seedling diseases.
<i>Ipconazole</i> + <i>metalaxyl</i> Rancona Pinnacle	Wheat, Barley, Oats, Rye	5.0–8.33 fl oz	Controls seed rot, damping off seed and soil borne fungi, loose smut, common and kernel bunt.
<i>mefenoxam</i> Apron XL Apron XL-LS	Wheat, Barley, Millet, Oats, Rye, Sorghum, Triticale	0.042–0.08	Controls <i>Pythium</i> damping-off. Does not control smuts.
<i>metalaxyl</i> Allegiance Sebring Dyna-shield Belmont	Wheat, Barley, Millet, Oats, Rye, Sorghum, Triticale	See label	Controls <i>Pythium</i> damping-off. Does not control smuts.

For information on CruiserMaxx Cereals (*thiamethoxam* + *mefenoxam* + *difenoconazole*), CruiserMaxx Vibrance Cereals (*sedaxane* + *thiamethoxam* + *mefenoxam* + *difenoconazole*), Cruiser Vibrance Quattro (*thiamethoxam* + *mefenoxam* + *difenoconazole* + *sedaxane* + *fludioxonil*), and Gaucho XT (*imidacloprid* + *metalaxyl* + *tebuconazole*), See the Insect Management Section of this guide. Commercial treatment of small grain seed is preferred, but a drill box treatment can be used with many formulations. Drill-box treatment may not give control equal to commercial treatment.

FUNGICIDE	CROP	RATE/100 LB SEED	REMARKS
<i>metalaxyl + metconazole + clothianidin</i> NipsIt SUITE	Wheat, Oats, Barley	5–7.5 fl oz	Controls common smut, flag smut, loose smut, seed decay fungi, Fusarium seed scab, Pythium seed rot and seedling diseases. Early season Fusarium seedling dieback, early season Rhizoctonia root rot, and early season common rot.
<i>penflufen</i> Evergol Prime	Wheat, Oats, Barley	0.32 fl oz	Controls loose smut, common and kernel bunt, seed rots, and seedling diseases.
<i>prothioconazole + penflufen + metalaxyl</i> Evergol Energy	Wheat, Oats, Barley	1 fl oz	Controls loose smut, common and kernel bunt, seed rots, and seedling diseases along with early suppression of powdery mildew, rust, and glume/leaf blotch.
<i>sedaxane</i> Vibrance	Wheat, Barley, Oats, Rye, Triticale	0.08–0.16 fl oz	Controls loose smut, seed decay seedling blight and damping-off caused by Rhizoctonia solani.
<i>sedaxane + difenconazole + mefenoxam</i> Vibrance Extreme	Wheat, Barley, Oats, Rye, Triticale	2.8–5.6 fl oz	Controls smuts and bunts, general seed rot, seedling blight, root rot, and damping-off caused by seed or soilborne Fusarium spp or Rhizoctonia spp, Seedling blight, and root rot, and damping-off caused by Pythium spp, seed borne Septoria, Septoria leaf blotch, and Fusarium seed scab.
<i>sedaxane + difenconazole + fludioxonil + mefenoxam</i> Vibrance Quattro	Wheat, Barley, Oats, Rye, Triticale	5 fl oz	Controls smuts and bunts, general seed rot, seedling blight, root rot, and damping-off caused by seed or soilborne Fusarium spp or Rhizoctonia spp, Seedling blight and root rot, and damping-off caused by Pythium spp, seed borne Septoria, Septoria leaf blotch, and Fusarium seed scab.
<i>tebuconazole</i> Raxil (in various combinations with other fungicides)	Wheat, Oats, Barley	3.5–4.6 fl oz	Controls loose smut and stinking smut. Controls seedling blights. Commercially-applied and drill-box formulations available.
Thiram	Wheat, Barley, Rye	See label	Controls seedling blights. Does not control smuts. Can be used for drill-box treatment.
<i>triadimenol</i> Baytan 30 RTU Baytan-Thiram	Wheat, Barley, Oats, Rye All	0.75–1.5 oz 4.5–9 oz	Controls loose smut and stinking smut. Controls smuts and seedling blights.
<i>triticonazole + metconazole</i> Charter F	Wheat, Barley, Oats, Rye	5.4 fl oz	Controls loose smut, common and kernel bunt, seed rots, and seedling diseases.

For information on CruiserMaxx Cereals (*thiamethoxam + mefenoxam + difenconazole*), CruiserMaxx Vibrance Cereals (*sedaxane + thiamethoxam + mefenoxam + difenconazole*), Cruiser Vibrance Quattro (*thiamethoxam + mefenoxam + difenconazole + sedaxane + fludioxonil*), and Gaucho XT (*imidacloprid + metalaxyl + tebuconazole*), See the Insect Management Section of this guide. Commercial treatment of small grain seed is preferred, but a drill box treatment can be used with many formulations. Drill-box treatment may not give control equal to commercial treatment.

WHEAT DISEASE CONTROL

Alfredo Martinez-Espinoza, Extension Plant Pathologist

DISEASE	CHEMICAL	MOA	RATE PER ACRE	REI (Hours)	REMARKS AND PRECAUTIONS
Stagonospora Leaf and Glume Blotch, Leaf Rust, Stripe Rust, Powdery Mildew, Tan Spot	<i>azoxystrobin</i> Quadris, Equation, Satori	11	6.2–10.8 oz 4–12 fl oz	4 H	Apply after Feekes 6 but not later than Feekes 10.5. Do not harvest treated wheat for forage. A crop oil concentrate adjuvant may be added at 1% v/v to optimize efficacy.
	<i>azoxystrobin + cyproconazole</i> Azure Xtra	11 + 3	3.5–6.8 fl oz	12 H	Apply product at 3.5 oz/A in the spring at Feekes 5. Apply 5–6.8 fl oz/A between Feekes 8–10.5.1.
	<i>azoxystrobin + propiconazole</i> Quilt, QuiltXcel, Avaris, Trivapro B	11 + 3	7–14 oz	12 H	Applications may be made no closer than a 14-day interval. Quilt and QuiltXcel can be applied up to Feekes growth stage 10.5. QuiltXcel has a higher rate of <i>azoxystrobin</i> . Low rates of Quilt and QuiltXcel are used for spring suppression of early season diseases, 10.5 fl oz and above are used for flag leaf protection and maximizing yield potential. Trivapro A + Trivapro B = Trivapro co-pack. Do not apply more than 28 fl oz/A of Trivapro B per year.
	<i>azoxystrobin + tebuconazole</i> Custodia	11 + 3	6.4–8.6 fl oz	12 H	Should be applied prior to disease development up to late head emergence (Feekes 10.5). Do not apply after this stage.
	<i>azoxystrobin + flutriafol</i> Topguard EQ	3 + 11	4.0–7.0 fl oz	12 H	Apply preventatively or when conditions are favorable for disease development. Repeat as necessary if conditions are favorable for disease development. Do not apply past Feekes 10.54. An adjuvant may be added at recommended rates.
	<i>benzovindiflupyr</i> Trivapro A	7	4 fl oz	12 H	Combining Trivapro A and Trivapro B co-pack: Apply in spring for early disease control or Feekes 8 through Feekes 10.5.4 for disease control on flag leaf. Make applications no closer than 14 days apart. Do not apply more than 14 fl oz/A of Trivapro A per year.
	<i>benzovindiflupyr + azoxystrobin + propiconazole</i> Trivapro SE	7 + 11 + 3	9.4–13.7 fl oz	12 H	For disease control on the flag leaf, apply from Feekes 8 (Zadoks 37) through Feekes 10 (Zadoks 45). Protecting the flag leaf is important for maximizing the potential yield. Highest yields are normally obtained when Trivapro fungicide is applied when the flag leaf is 50% to fully emerged. Trivapro fungicide can be applied through full head emergence (Feekes growth stage 10.5.4).
	<i>fluoxapyroxad + pyraclostrobin</i> Priaxor	7 + 11	4–8 fl oz	12 H	Apply no later than the beginning of flowering (Feekes 10.5 Zadok's 59). Maximum number of applications per season is 2.
	<i>fluoxapyroxad + pyraclostrobin + propiconazole</i> Nexicor	7 + 11 + 3	7–13 fl oz	12 H	For optimal disease control, begin applications of Nexicor prior to disease development. To maximize yield potential, it is important to protect the flag leaf. Apply Nexicor immediately after flag leaf emergence, no later than the beginning of flowering (Feekes 10.5, Zadok's 59).
	<i>fluoxastrobin</i> Evito	11	2–4 fl oz	12 H	For optimum results, begin applications preventatively and continue on a 14–21 day interval. Do not make more than 2 sequential applications. Apply prior to disease development from Feekes 5 (Zadok's 31) up to late head emergence at Feekes 10.5 (Zadok's 59).
	<i>fluoxastrobin + tebuconazole</i> Evito T	11 + 3	4–6 fl oz	12 H	Apply a maximum of 2 applications per season Apply no later than Feekes 10.5. For optimum results, apply the first application at shooting-pseudostem erected (approximately Feekes 5, Zadok's 31) and a second application no later than heading completed (Feekes 10.5, Zadok's 54).
	<i>fluoxastrobin + flutriafol</i> Fortix Preemptor SC	11 + 3	2–3 fl oz 4–6 fl oz	12 H	For early season control. Apply Fortix when flag leaf is 50% to fully emerged. Apply preventative when conditions for disease are favorable for development.
<i>metconazole</i> Caramba	3	10–14 oz	12 H	Maximum number of applications per season is 2. Minimum time from application to harvest is 30 days.	
<i>picoxystrobin</i> Approach	11	3–4 fl oz 6–12 fl oz	12 H	For early season preventive disease control. Begin applications of Approach prior to disease development and continue on a 7–14 day interval, depending on the targeted disease. Use higher rate and shorter interval when disease pressure is high.	

DISEASE	CHEMICAL	MOA	RATE PER ACRE	REI (Hours)	REMARKS AND PRECAUTIONS
Stagonospora Leaf and Glume Blotch, Leaf Rust, Stripe Rust, Powdery Mildew, Tan Spot (continued)	<i>picoxystrobin + cyproconazole</i> Approach Prima SC	11 + 3	3.4–6.8 fl oz	12 H	For early season preventive disease control. Begin applications of Approach Prima prior to disease development and continue on a 7–14-day interval, depending on the targeted disease. Use higher rate and shorter interval when disease pressure is high.
	<i>pydiflumetofen + propiconazole</i> Miravis Ace	7 + 3	13.7 fl oz	12 H	
	<i>propiconazole</i> Tilt, Propimax	3	4 oz	12 H	Tilt can be applied until heading stage (Feekes 10.5). Do not apply Tilt after this growth stage to avoid possible illegal residues.
	<i>propiconazole + trifloxystrobin</i> Stratego	3 + 11	10 oz	12 H	Do not apply more than 2 applications of Stratego per season. Do not apply after Feekes 10.5.
	<i>prothioconazole</i> Proline	3	4.3–5 fl oz	12 H	For optimum disease control, the lowest labeled rate of a spray surfactant should be tank mixed with Proline. Up to 2 applications of Proline may be made per year.
	<i>prothioconazole + tebuconazole</i> Prosaro	3 + 3	6.5–8.2 fl oz	12 H	Begin applications of Prosaro preventively when conditions are favorable for disease development. For optimum disease control, the lowest labeled rate of a spray surfactant should be tank mixed with Prosaro.
	<i>prothioconazole + trifloxystrobin</i> Stratego YLD Delaro 325 SC	3 + 11	4 fl oz	12 H	Begin applications preventatively when conditions are favorable for disease development. Do not make more than 2 applications/season. Do not apply after Feekes 10.5. Do not apply within 35 days of harvest.
	<i>pyraclostrobin</i> Headline	11	6–9 oz	12 H	Apply no later than Feekes 10.5.
	<i>pyraclostrobin + metconazole</i> Twinline Multiva	11 + 3	7–9 fl oz	12 H	Do not apply more than 2 applications/season. Do not apply after Feekes 10.5.
	<i>tebuconazole</i> Folicur Several others products have <i>tebuconazole</i> as the active ingredient. Check label of specific products.	3	4 fl oz	12 H	Folicur is no longer manufactured (2009). No end-user restrictions for disease control. Use until supply is exhausted. Not labeled for powdery mildew control. For all <i>tebuconazole</i> products, a maximum of 4 fl oz/A/season may be applied.
<i>tebuconazole + trifloxystrobin</i> Absolute Maxx SC	3 + 11	3–5 fl oz	12 H	Begin applications preventatively when conditions are favorable for disease development. For optimum disease control apply 5 fl oz at flag leaf stage (Feekes 8–9). For early season suppression of Tan Spot, Leaf Blight and Powdery Mildew, apply at 3–4 oz. Do not apply more than 5 fl oz/season. Do not apply after Feekes growth stage 10.5.2. Do not apply within 35 days of harvest. Do not use with adjuvants.	

Economic yield response to control wheat diseases is most likely to occur in fields with yield potentials of more than 50 bu/A and varieties with fair to poor resistance. Always follow label instructions, recommendations and restrictions.

■ WHEAT DISEASE CONTROL

DISEASE	CHEMICAL	MOA	RATE PER ACRE	REI/PHI (Hours or Days)	EFFICACY
Fusarium Head Blight (SCAB)	metconazole 8.6% Caramba 0.75 SL	3	13.5–17	12 H/ 30 D	G
	propiconazole 41.8% Tilt 3.6 EC	3	4	12 H/ Apply at 50% flowering	P
	prothioconazole 41% Proline 480 SC	3	5–5.7	12 H/ 30 D	G
	pydiflumetofen + propiconazole Miravis Ace	7 + 3	13.7 fl oz	12 H/	G
	*tebuconazole 38.7% Folicur 3.6 F	3	4	12 H/ 30 D	F
	prothioconazole 19% + tebuconazole 19% Prosaro 421 SC	3 + 3	6.5–8.2	12 H/ 30 D	G

Efficacy categories: P—Poor; F—Fair; G—Good; VG—Very Good; E—Excellent. Timing of fungicide application is crucial for the control of FHB. Research indicates that products within the triazole class of fungicides are most effective if applied at early flowering (Feekes 10.5.1). *Strobilurin* fungicides are not recommended for management of FHB. *Strobilurin* fungicides can increase the DON content of FHB-infected grain.

*A maximum of 4 fl. oz. of *tebuconazole*-containing products may be applied per acre per crop season. Table modified from 2018 fungicide table produced by “The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184)”.

SMALL GRAIN WEED CONTROL

A. Stanley Culpepper and Hannah Wright, Extension Weed Scientists

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
WHEAT: PRE-PLANT NO-TILL						
Emerged annual weeds, volunteer corn	<i>paraquat</i> Gramoxone 2 SL Firestorm, Parazone 3 SL	22	2–4 pt 1.33–2.7 pt	0.5–1	24 H/ N/A	U.S. EPA has restricted the use of <i>paraquat</i> to certified applicators ONLY and applicators must take a specialized training before use. Apply before crop emerges. Add nonionic surfactant at 2 pt/100 gal of spray or crop oil concentrate at 1 gal/100 gal of spray. Control of 12" corn at 1.5 pt/A is about 80% but may provide acceptable control until frost.
Emerged annual weeds, control or suppression of perennial weeds	<i>glyphosate</i> 3.57 SL (3 lb ae) 4 SL (3 lb ae) 5 SL (3.7 lb a.e) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	32 to 48 fl oz 24 to 36 fl oz 23 to 34 fl oz 22 to 32 fl oz 19 to 29 fl oz	0.75 to 1.13	4 H/ N/A	Apply before crop emerges; suggest 3 or more days before emergence. Adjuvant recommendation varies by glyphosate brand used. Cool temperatures, including at night, may slow or even reduce the level of control observed. Use the full rate for ryegrass!
Controls most weeds; use full <i>glyphosate</i> rate for ryegrass	<i>glyphosate</i> + 2,4-D amine (3.8 L)	9 + 4	see <i>glyphosate</i> + 12–16 fl oz	0.75 to 1.13 + 0.36 to 0.48	48 H/ N/A	Check brand of 2,4-D used as some labels prohibit planting within 29 days of application. Research suggests plantback intervals of 24 days and 1 inch of rain between application and planting may be needed. Without required rainfall, serious injury can occur.
Summer and winter annual weeds including wild radish, henbit, chickweed; use full <i>glyphosate</i> rate for ryegrass	<i>glyphosate</i> + <i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i> (Harmony Extra SG with Total Sol) 50 SG	9 + 2 + 2	see <i>glyphosate</i> + 0.45–0.9 oz	0.75 to 1.13 + 0.0094 to 0.0187 + 0.0047 to 0.0094	12 H/ N/A	May be used as a burndown treatment prior to or shortly after planting, but prior to wheat emergence (suggest at least 3 days before emergence).
Volunteer Roundup Ready Corn and ryegrass; use full rates for ryegrass	<i>glyphosate</i> + <i>clethodim</i> (Select) 2 EC (Select Max) 0.97 EC	9 + 1	see <i>glyphosate</i> + 4 to 8 fl oz 6 to 9 fl oz	0.75 to 1.13 + 0.06 to 0.12 0.05 to 0.07	24 H/ N/A	Do not plant for 30 days after applying clethodim. Rainfall after application and before planting of 0.5" or more advised. Corn < 12 inch: Select 4 to 6 oz; Select Max 6 oz. Corn 12-24 inch: Select 6 to 8 oz; Select Max 9 oz.
Residual wild radish, henbit, chickweed control and ryegrass suppression from Valor	<i>glyphosate</i> + <i>flumioxazin</i> (Valor SX) 51 WDG	9 + 14	see <i>glyphosate</i> + 1–2 oz	0.75 to 1.13 + 0.032 to 0.063	12 H/ N/A	A minimum of 30 days must pass and 1 inch of rainfall/irrigation must occur between application and planting. Significant injury is likely if required rainfall does not occur. On sands, a plant back interval of 40 days is suggested.
Common chickweed, C. geranium, henbit, horseweed, soybean, wild radish; use full <i>glyphosate</i> rate for ryegrass	<i>glyphosate</i> + <i>halauxifen-methyl</i> + <i>florasulam</i> (Quelex) 0.2 WG	9 + 4 + 2	see <i>glyphosate</i> + 0.75 oz	0.75 to 1.13 + 0.0048 0.0047	12 H/ N/A	Apply as a preplant burndown treatment prior to, or shortly after planting prior to emergence; suggest at least 3 days before emergence. Weeds should be less than 4". Label requires addition of non-ionic surfactant or crop oil concentrate. An application of Quelex can be made for burndown and again in-crop, rotation to cotton and soybean is 3 months. UGA research shows excellent crop tolerance with 2 years of data.

Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

SMALL GRAIN WEED CONTROL

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
WHEAT: PRE-EMERGENCE						
Annual ryegrass suppression and annual broadleaf weeds	<i>chlorsulfuron</i> + <i>metsulfuron-methyl</i> Finesse 75 WDG	2 + 2	0.5 oz	0.0195 + 0.0039	4 H/ N/A	Plant seed at least 1" deep; may stunt wheat on sandy soils. Do not use where a later application of Osprey or PowerFlex is anticipated. Plant only STS soybeans following wheat harvest. Crop injury may result if an organophosphate is used. See label for rotational restrictions. A lower rate may be used for weeds other than ryegrass, see label.
WHEAT: DELAYED PRE-EMERGENCE						
Ideal use is for residual control of ryegrass resistant to POST herbicides; must be activated prior to weed emergence	<i>pyroxasulfone</i> Zidua 85 WG	15	0.7–1 oz	0.037–0.053	12 H/ N/A	Plant seed 0.75–1.25" deep. Cannot apply to broadcast seedings. Seed must be uniformly covered without furrows to avoid injury. Apply Zidua when 80% of germinated wheat seeds have a shoot at least 0.5" long up through wheat spiking. Use 0.7–1 oz/A on coarse soils; rate can be increased to 1.25 oz/A on medium soils. Label restricts irrigation until wheat is emerged. Avoid application if a long period of rain is expected during wheat emergence. To minimize resistance: <i>If treating a field with either Zidua or Fierce this year, do not apply either product on that field next year.</i>
WHEAT: POST-EMERGENCE SPIKE THROUGH EARLY POST (FOR USE IN FIELDS WITH RYEGRASS RESISTANT TO POST HERBICIDES)						
Ideal use is for residual control of ryegrass resistant to POST herbicides, helps on radish and henbit	<i>flufenacet</i> + <i>metribuzin</i> Axiom 68 WDG	15 + 5	4–8 oz	0.136–0.027 + 0.34–0.068	12 H/ N/A	Plant seed at least 1" deep. Apply to wheat between spike and 2 leaf. Must be activated prior to weed emergence for effective weed control. Pre-emergence applications can cause severe injury on light soils. For most GA soils, < 6 oz/A of product is ideal. Heavy rains following application may cause wheat stunting. Rotations: soybean 0 months, cotton 8 months, many other crops 18 months.
Ideal use is for residual control of ryegrass resistant to POST herbicides; must be activated prior to weed emergence	<i>pyroxasulfone</i> Zidua 85 WG	15	0.7–1.5 oz	0.037–0.079	12 H/ N/A	Apply to wheat (drilled or broadcast) between spiking and 4 tiller. May mix with Axial XL and apply between 2 leaf and 4 tiller wheat to control emerged ryegrass plants (those not resistant to Axial) and provide residual control. <i>Sequential applications may be made as to not exceed 2.5 oz/A per crop.</i> To minimize resistance: <i>If treating a field with either Zidua or Fierce this year, do not apply either product on that field next year.</i>
Residual control of annual ryegrass, wild radish, and other weeds; must be activated prior to weeds reaching 0.25" for control	<i>pyroxasulfone</i> + <i>flumioxazin</i> Fierce 76 WDG	15 + 14	1.5 oz	0.04 + 0.031	12 H/ N/A	Plant seed 1 to 1.5" deep; cannot treat broadcast seedings. Apply to wheat from spike through the 2-leaf stage; DO NOT APPLY PRE-EMERGENCE. Apply only in water; no additives. Visual leaf tip burn and chlorosis is expected. Ideally, Fierce is activated after wheat is up but before weed emergence. No rotational concerns for corn, cotton, peanut or soybean. To minimize resistance: <i>If treating a field with either Zidua or Fierce this year, do not apply either product on that field next year.</i>
WHEAT: POST-EMERGENCE						
Non-resistant emerged annual ryegrass	<i>diclofop-methyl</i> Hoelon 3 EC	1	1.33–2.67 pt	0.5–1	24 H/ 77 D	Product availability is a concern. Apply before wheat joints; 1.33 pt/A on 2-leaf ryegrass, 2 pt/A on 2-leaf to 1 tiller ryegrass, and 2.67 pt/A on 1-tiller ryegrass. Do not mix with other herbicides or nitrogen.
Common chickweed, C. geranium, henbit, horseweed, soybean, small wild radish	<i>halauxifen-methyl</i> + <i>florasulam</i> (Quelex) 0.2 WG	4 + 2	0.75 oz	0.0048 + 0.0047	12 H/ 60 D	Apply to wheat between 2-leaf and flag leaf. Weeds should be less than 4"; stressed weeds may not be controlled. Add crop oil concentrate (0.5 to 1% v/v). Rotation of 3 months for cotton, corn, soybean and 9 months for peanut. See label about mixing with liquid nitrogen. UGA research shows excellent control of small radish but less effective on larger plants.

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
WHEAT: POST-EMERGENCE (continued)						
Non-resistant emerged annual ryegrass; small wild radish, henbit and chickweed Very effective on annual bluegrass	<i>mesosulfuron-methyl</i> Osprey 4.5 WDG	2	4.75 oz	0.013	4 H/ 60 D	Apply to wheat between emergence and jointing to control ryegrass with less than 2 tillers. Add a nonionic surfactant (at least 80% active) at 2 qts/100 gal spray solution plus <i>ammonium nitrogen</i> fertilizer (28-0-0, 30-0-0, 32-0-0) at 1-2 qt/A. DO NOT topdress within 14 days of application or mix with 2,4-D or MCPA. Do not use liquid <i>nitrogen</i> as the carrier. May mix Osprey with Harmony Extra. Cotton/soybean can be planted 90 days after application. To minimize resistance: <i>If treating a field with either Osprey or PowerFlex this year, do not apply either product on that field next year.</i>
Non-resistant emerged annual ryegrass	<i>pinoxaden</i> Axial XL 0.42 EC	1	16.4 fl oz	0.053	48 H/ 60 D	Apply to wheat between 2 leaf and pre-boot to control ryegrass with less than 2 tillers. No adjuvant required. Mixtures with Harmony Extra will offer broadleaf control. UGA suggests not mixing with <i>nitrogen</i> but label allows water/ <i>nitrogen</i> mixtures containing up to 50% liquid <i>nitrogen</i> by volume. Add water to tank, then add Axial; then mix thoroughly and add <i>nitrogen</i> . May mix with Zidua for residual control. One application per crop and any crop can be planted 90 days later. To minimize resistance: <i>If treating a field with either Axial or Hoelon this year, do not apply either product on that field next year.</i>
Non-resistant emerged annual ryegrass	<i>pinoxaden</i> + <i>fenoxaprop-p-ethyl</i> Axial Bold 0.685 EC	1	15 fl oz	0.054 + 0.027	48 H/ 70 D	Apply to wheat between emergence and pre-boot to control ryegrass with less than 2 tillers. No adjuvant mentioned on label. Mixtures with Harmony Extra will offer broadleaf control. UGA suggests not mixing with <i>nitrogen</i> but label allows water/ <i>nitrogen</i> mixtures containing up to 50% liquid <i>nitrogen</i> by volume. Add water to tank, then add Axial; then mix thoroughly and add <i>nitrogen</i> . One application per crop and any crop can be planted 90 days later. To minimize resistance: <i>If treating a field with either Axial or Hoelon this year, do not apply either product on that field next year.</i>
Non-resistant emerged annual ryegrass and wild radish	<i>pyroxsulam</i> PowerFlex HL 13.13 WDG	2	2 oz	0.0164	12 H/ 60 D	Apply to wheat between 3 leaf and jointing to control ryegrass with less than 2 tillers. Add crop oil concentrate at 1-1.25% v/v (1-1.25 gal/ 100 gal spray solution). Can tank mix with Harmony Extra. UGA suggests not mixing with <i>nitrogen</i> but label allows water- <i>nitrogen</i> mixture containing up to 50% liquid <i>nitrogen</i> by volume (< 30 lb/A of nitrogen). If applying in liquid <i>nitrogen</i> , use a nonionic surfactant at 0.25% v/v, instead of crop oil. An independent liquid <i>ammonium nitrogen</i> fertilizer application should not be made within 7 days of application; also, do not apply organophosphates within 5 days of PowerFlex. Soybeans or cotton can be planted after April assuming application was made before February. To minimize resistance: <i>If treating a field with either Osprey or PowerFlex this year, do not apply either product on that field next year.</i>

Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

SMALL GRAIN WEED CONTROL

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
WHEAT: POST-EMERGENCE (continued)						
Fair residual control of annual ryegrass; if activated	<i>pendimethalin</i> Prowl H20 3.8 AS	3	1.5–2.5 pt	0.71–1.19	24 H/ 60 D	Apply to wheat between 1 leaf and flag leaf. Prowl will not control emerged weeds and must be activated prior to weed emergence. May tank mix with any post-emergence herbicide labeled for use in wheat. Zidua is more effective on ryegrass.
Wild garlic, curly dock, many other winter annual broadleaf weeds; will not control primrose and wild radish must be < 1"	<i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i>	2 + 2		0.0094–0.0187 + 0.0047–0.0094	12 H/ 45 D	Apply to wheat between 2 leaf and flag leaf. Most winter annuals can be controlled with 0.75 oz/A of Harmony Extra 50SG; however, 0.75–0.9 oz/A is recommended for controlling wild garlic or wild radish. Apply to non-stressed weeds with less than 4 leaves when temperatures are above 50° F. Garlic should be less than 12" and should have 2–4" of new growth. Make no more than 2 applications per year applying a max of 1.5 oz/A of Harmony Extra Total Sol or equivalent active ingredient with other products. A nonionic surfactant at the rate of 1 qt/100 gal of spray solution is recommended when applied in water. Liquid <i>nitrogen</i> may be used as the carrier; in this case, premix the herbicide in water and add the mixture to <i>nitrogen</i> with agitation; add 0.5–1 pt nonionic surfactant to 100 gal spray solution. For radish , tank mix with 0.375–0.5 lb active ingredient of <i>MCPA</i> or <i>2,4-D</i> (12–16 oz/A of 3.8 lb ai/A material). Add 0.5–1 pt nonionic surfactant/100 gal spray solution. If mixing <i>2,4-D</i> or <i>MCPA</i> with Harmony Extra and using <i>nitrogen</i> as carrier, eliminate surfactant. Follow wheat stage of growth restrictions for <i>2,4-D</i> or <i>MCPA</i> .
	Harmony Extra SG with TotalSol 50 SG		0.45–0.9 oz			
	Harmony Extra, Nimble, others 75 WDG		0.3–0.6 oz			
Partial control of wild garlic, henbit and wild radish Harmony Extra is usually much more effective	<i>tribenuron-methyl</i>	2		0.008–0.0155	12 H/ 45 D	Apply to wheat between 2 leaf and flag leaf. Add 1 qt of nonionic surfactant/100 gal of spray solution. Suggest mixtures with 0.375–0.5 lb active ingredient of <i>2,4-D</i> or <i>MCPA</i> for improved control of wild radish (add 0.5–1 pt nonionic surfactant/100 gal spray solution). If mixing <i>2,4-D</i> or <i>MCPA</i> with Express and using <i>nitrogen</i> as the carrier, use at most 0.5 pt of nonionic surfactant/100 gal of spray solution. Follow wheat stage of growth restrictions for <i>MCPA</i> or <i>2,4-D</i> when using these mixtures.
	Express SG with TotalSol 50 SG		0.25–0.5 oz			
	Express 75 WDG		0.167–0.33 oz			
Most winter annual broadleaf weeds except chickweed, henbit, geranium, clover, red sorrel and knawel	<i>2,4-D amine</i> various brands 3.8 L	4	1–1.25 pt	0.48–0.6	48 H/ 14 D	Apply to fully tillered wheat only. Spraying wheat too young or after jointing may reduce yields. Better results obtained when daytime temperatures are above 50° F. Increase rate by 50% to control corn cockle. For wild onion or wild garlic, increase rate according to respective labels for better control. Injury is increased when using liquid <i>nitrogen</i> as the carrier. Ester formulations can be added directly into <i>nitrogen</i> . If using amine formulation, premix in water (1 part <i>2,4-D</i> to 4 parts water) and add mixture to <i>nitrogen</i> with strong agitation. Amine formulations give less burn than ester formulations in <i>nitrogen</i> . Ester formulations may be more effective on weeds in very cold conditions. Amine formulations are recommended to minimize off-target movement. STRONGLY SUGGEST mixtures with Harmony Extra as noted above. One application in-season only.
	<i>2,4-D ester</i> various brands 3.8 L		1–1.25 pt	0.48–0.6		
	<i>2,4-D ester</i> various brands 5.7 L		0.67–0.84 pt	0.48–0.6		

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
WHEAT: POST-EMERGENCE (continued)						
Most winter annual broadleaf weeds except chickweed, henbit, geranium, clover, red sorrel and knawel	<i>MCPA</i> various brands 4 SL various brands 3.7 SL	4	12–20 fl oz 12–20 fl oz	0.375–0.625 0.347–0.58	48 H/ —	Apply 12–16 oz/A when wheat has at least 2 tillers and 16–20 oz/A when fully tillered. Safer on the crop than 2,4-D; slightly less effective on larger weeds when applied alone. No spray additive needed. STRONGLY suggest mixtures with Harmony Extra as noted on previous page. <i>Amine</i> formulations are recommended to minimize off-target movement.
WHEAT: PRE-HARVEST						
Annual broadleaf and grass weeds, suppression of perennial weeds	<i>glyphosate</i> 3.57 SL (3 lb ae) 4 SL (3 lb ae) 5 SL (3.7 lb a.e) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	2.6 pt 2 pt 1.6 pt 22 fl oz 20 fl oz	0.75 (lb ae)	4 H/ 7 D	Apply after hard dough stage of grain (30% or less grain moisture) but at least 7 days before harvest. Do not apply to wheat grown for seed. Awiper application could be used for only rope/sponge applicators (33–75% of solution with water) or a panel applicator (33–100% solution with water). PHI = 35 days.
Annual broadleaf weeds	<i>2,4-D amine</i> various brands 3.8 SL	4	1 pt	0.48	48 H/ 14 D	Apply when grain is in the hard dough stage (30% or less grain moisture) or later. Use only amine formulations to reduce volatility as sensitive crops are likely nearby during this time of year. DO NOT allow drift to any sensitive crop!
BARLEY: PRE-PLANT NO-TILL						
Emerged annual weeds, volunteer corn	<i>paraquat</i> Gramoxone 2 SL Firestorm, Parazone 3 SL	22	2–4 pt 1.3–2.7 pt	0.5–1	24 H/ N/A	U.S. EPA has restricted the use of paraquat to certified applicators ONLY and applicators must take a specialized training before use. Apply before crop emerges. Add nonionic surfactant at 2 pt/100 gal of solution or crop oil concentrate at 1 gal/100 gal of solution. Control of 12" corn at 1.5 pt/A is about 80% but may provide acceptable control until frost; see label.
Emerged annual weeds, control or suppression of perennial weeds; use full rate for ryegrass	<i>glyphosate</i> 3.57 SL (3 lb ae) 4 SL (3 lb ae) 5 SL (3.7 lb ae) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	32 to 48 fl oz 24 to 36 fl oz 23 to 34 fl oz 22 to 32 fl oz 19 to 29 fl oz	0.75–1.13	4 H/ N/A	Apply before crop emerges; suggest 3 or more days before emergence. Adjuvant recommendation varies by <i>glyphosate</i> brand used. Cool temps, including at night, may slow or even reduce the level of control observed.
Control of most winter weeds; use full glyphosate rate for ryegrass	<i>glyphosate</i> + <i>2,4-D amine</i> (3.8 SL)	9 + 4	see <i>glyphosate</i> + 12–16 fl oz	0.75–1.13 + 0.36–0.48	48 H/ N/A	Check brand of 2,4-D used as some labels prohibit planting within 29 days of application. Research suggests plantback intervals of 24 days and 1 inch of rain between application and planting may be needed. Without required rainfall, serious injury can occur.
Summer and winter annual weeds including wild radish, henbit, chickweed, ryegrass	<i>glyphosate</i> + <i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i> (Harmony Extra SG with Total Sol) 50 SG	9 + 2 + 2	see <i>glyphosate</i> + 0.45–0.9 oz	0.75–1.13 + 0.0094–0.0188 + 0.0047–0.0094	12 H/ N/A	May be used as a burndown treatment prior to or shortly after planting, but prior to wheat emergence (suggest at least 3 days before emergence). Use full <i>glyphosate</i> rate for ryegrass!

Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

SMALL GRAIN WEED CONTROL

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
BARLEY: PRE-PLANT NO-TILL (continued)						
Volunteer Roundup Ready Corn and ryegrass; use full rates for ryegrass	<i>glyphosate</i> + <i>clethodim</i> (Select) 2 EC (Select Max) 0.97 EC	9 + 1	see <i>glyphosate</i> + 4 to 8 fl oz 6 to 9 fl oz	0.75–1.13 + 0.063–0.13 0.05–0.07	24 H/ N/A	Do not plant for 30 days after applying clethodim. Rainfall after application and before planting of 0.5" or more advised. Corn < 12 inch: Select 4 to 6 oz; Select Max 6 oz. Corn 12-24 inch: Select 6 to 8 oz; Select Max 9 oz.
Common chickweed, C. geranium, henbit, horseweed, soybean, wild radish; use full glyphosate rate for ryegrass	<i>glyphosate</i> + <i>halauxifen-methyl</i> + <i>florasulam</i> (Quelex) 0.2 WG	9 + 4 + 2	see <i>glyphosate</i> + 0.75 oz	0.75–1.13 + 0.0048 + 0.0047	12 H/ N/A	Apply as a preplant burndown treatment prior to, or shortly after planting prior to emergence; suggest at least 3 days before emergence. Label requires addition of non-ionic surfactant or crop oil concentrate. An application of Quelex can be made for burndown and again in-crop, rotation to cotton and soybean is 3 months. UGA research has only been conducted in wheat.
BARLEY: POST-EMERGENCE						
Non-resistant emerged annual ryegrass	<i>diclofop-methyl</i> Hoelon 3 EC	1	1.33–2.67 pt	0.5–1	24 H/ 66 D	Product availability is a concern. Apply to barley after tiller initiation but before jointing when ryegrass has less than 4 leaves. Consider 1.33 pt/A on 2-leaf ryegrass and 2 pt/A on 4-leaf ryegrass. Do not mix with other herbicides or nitrogen. Do not add crop oil.
	<i>pinoxaden</i> Axial XL 0.42 EC	1	16.4 fl oz	0.053	48 H/ 60 D	Apply to barley between 2 leaf and pre-boot to control ryegrass with less than 2 tillers. No adjuvant required. Mixtures with Harmony Extra will offer broad-leaf control. Strongly encourage not mixing with <i>nitrogen</i> but label allows water/ <i>nitrogen</i> mixture containing up to 50% <i>nitrogen</i> . Add water to tank, then add Axial, then mix thoroughly and add the <i>nitrogen</i> . To minimize resistance: <i>If treating a field with either Axial or Hoelon this year, do not apply either product on that field next year.</i>
	<i>pinoxaden</i> + <i>fenoxaprop-p-ethyl</i> Axial Bold 0.685 EC	1	15 fl oz	0.054 + 0.027	48 H/ 70 D	Apply to barley from emergence up to just before jointing to control ryegrass with less than 2 tillers. No adjuvant mentioned on label. Mixtures with Harmony Extra will offer broadleaf control. UGA suggests not mixing with <i>nitrogen</i> but label allows water/ <i>nitrogen</i> mixtures containing up to 50% liquid <i>nitrogen</i> by volume. Add water to tank, then add Axial; then mix thoroughly and add <i>nitrogen</i> . One application per crop and any crop can be planted 90 days later. To minimize resistance: <i>If treating a field with either Axial or Hoelon this year, do not apply either product on that field next year.</i>
Common chickweed, C. geranium, henbit, horseweed, soybean, small wild radish	<i>halauxifen-methyl</i> + <i>florasulam</i> (Quelex) 0.2 WG	4 + 2	0.75 oz	0.0048 + 0.0047	12 H/ 60 D	Apply to barley between 2 leaf and flag leaf. Weeds should be less than 4" and not stressed. Add non-ionic surfactant (0.2–0.5% v/v) or crop oil concentrate (0.5 to 1% v/v). Rotation of 3 months for cotton, corn, and soybean, and 9 months for peanut. See label about mixing with liquid <i>nitrogen</i> . UGA research has occurred only in wheat and rye!

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
BARLEY: POST-EMERGENCE (continued)						
Wild garlic, curly dock, many other winter annual broadleaf weeds; Will not control primrose and wild radish must be < 1"	<i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i>	2 + 2		0.0094–0.0187 + 0.0047–0.0094	12 H/ 45 D	Apply to barely between 2 leaf and flag leaf. Most winter annuals can be controlled with 0.75 oz/A of Harmony Extra 50 SG with TotalSol; however, 0.75–0.9 oz/A is recommended for wild garlic or small wild radish. Add 1 qt of nonionic surfactant/100 gal of spray solution. Apply to non-stressed weeds with less than 4 leaves when temperatures are above 50F. Garlic should be less than 12" tall with 2–4" of new growth. Liquid <i>nitrogen</i> may be used as the carrier. In this case, premix the herbicide in water and add the mixture to <i>nitrogen</i> with agitation; reduce surfactant rate to 0.5–1 pt/100 gal of solution. For radish , tank mix with 0.375–0.5 lb ai of 2,4-D or MCPA (12–16 fl oz/A of 3.8 lb material). Do not use surfactant if applying with 2,4-D or MCPA in <i>nitrogen</i> . Follow barley stage of growth restrictions for 2,4-D or MCPA with mixtures.
	Harmony Extra SG with TotalSol 50 SG		0.45–0.9 oz			
	Harmony Extra, Nimble 75 WDG		0.3–0.6 oz			
Partial control of wild garlic, henbit and wild radish Harmony Extra is usually a more effective option	<i>tribenuron-methyl</i>	2		0.0078–0.0155	12 H/ 45 D	Apply to barely between 2 leaf and flag leaf. Add 1 qt of nonionic surfactant/100 gal of spray solution. Suggest mixing with 0.375–0.5 lb active ingredient of MCPA or 2,4-D (12–16 fl oz of 3.8 lb ai material) for improved control of wild radish and other broadleaf weeds. If applying with 2,4-D or MCPA, follow growth restrictions for these herbicides.
	Express SG TotalSol 50 SG		0.25–0.5 oz			
	Express 75 WDG		0.167–0.33 oz			
Most winter annual broadleaf weeds except chickweed, henbit, geranium, red sorrel, clover and knawel	MCPA various brands 4 SL various brands 3.7 SL	4	12–20 fl oz 12–20 fl oz	0.375–0.625 0.347–0.58	48 H/ —	Apply 12–16 oz/A to barley with at least 2 tillers and 16–20 oz/A when fully tillered. Safer on crop than 2,4-D; slightly less effective on large weeds when applied alone. <i>Amine</i> formulation suggested to help minimize drift. No spray additive needed. STRONGLY suggest mixtures with Harmony Extra, as noted on previous page.
	2,4-D <i>amine</i> various brands 3.8 SL	4	1–1.25 pt	0.48–0.6	48 H/ 14 D	
	2,4-D <i>ester</i> various brands 3.8 SL		1–1.25 pt	0.48–0.6		
	2,4-D <i>ester</i> various brands 5.7 SL		0.67–0.84 pt	0.48–0.6		

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SMALL GRAIN WEED CONTROL

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
BARLEY: PRE-HARVEST						
Annual broadleaf weeds	<i>2,4-D amine</i> various brands 3.8 SL	4	1 pt	0.48	48 H/ 14 D	Apply when grain is in hard dough stage or later. Do not allow drift to any sensitive crop!!!! Apply only labeled AMINE formulations to reduce volatility.
Annual weeds, suppression of perennials	<i>glyphosate</i> Roundup WeatherMax 5.5 SL (4.5 lb ae)	9	11–22 fl oz	0.39–0.747	4 H/ 7 D	FEED BARLEY ONLY. Apply after the hard-dough stage and when the grain contains 20% moisture or less. Stubble may be grazed immediately after harvest. Do not apply on barley grown for seed! Apply at least 7 days prior to harvest.
OATS: PRE-PLANT NO-TILL						
Emerged annual weeds, control or suppression of perennial weeds	<i>glyphosate</i> 3.57 SL (3 lb ae) 4 SL (3 lb ae) 5 SL (3.7 lb ae) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	32–48 fl oz 24–36 fl oz 23–34 fl oz 22–32 fl oz 19–29 fl oz	0.75–1.13	4 H/ N/A	Apply before crop emerges; suggest 3 or more days before emergence. Adjuvant recommendation varies by glyphosate brand used. Cool temperatures, including at night, may slow or even reduce the level of control observed. Use maximum rate for ryegrass!
Control of most winter weeds; use full glyphosate rate for ryegrass	<i>glyphosate</i> + <i>2,4-D amine</i> (3.8 SL)	9 + 4	see <i>glyphosate</i> + 12–16 fl oz	0.75 to 1.13 + 0.36 to 0.48	48 H/ N/A	Check brand of 2,4-D used as some labels prohibit planting within 29 days of application. Research suggests plantback intervals of 24 days and 1 inch of rain between application and planting may be needed. Without required rainfall, serious injury can occur.
Volunteer Roundup Ready Corn and ryegrass; use full rates for ryegrass	<i>glyphosate</i> + <i>clethodim</i> (Select) 2 EC (Select Max) 0.97 EC	9 + 1	see <i>glyphosate</i> + 4–8 fl oz 6–9 fl oz	0.75 to 1.13 + 0.063 to 0.13 0.05 to 0.07	24 H/ N/A	Do not plant for 30 days after applying clethodim. Rainfall after application and before planting of 0.5" or more advised. Corn < 12 inch: Select 4 to 6 oz; Select Max 6 oz. Corn 12-24 inch: Select 6 to 8 oz; Select Max 9 oz.
OATS: POST-EMERGENCE						
Wild garlic, curly dock, many other winter annual broadleaf weeds; will not control primrose and wild radish must be < 1"	<i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i> Harmony Extra SG with TotalSol 50 SG Harmony Extra, Nimble 75 WDG	2 + 2	0.45–0.6 oz 0.3–0.4 oz	0.0094–0.0125 + 0.0047–0.0063	12 H/ 45 D	Apply to oats between 2 leaf and jointing. Apply to non-stressed weeds with less than 4 leaves when temperatures are above 50F. Garlic should be less than 12" tall with 2–4" of new growth. Add 1 qt of nonionic surfactant/100 gal of spray solution. See label for varietal restrictions. Liquid nitrogen may be used as the carrier. In this case, premix the herbicide in water and add the mixture to nitrogen with agitation; reduce surfactant rate to 0.5–1 pt/100 gal of solution (burn may still be noted). Suggest mixing with 0.375 to 0.5 lb ai of 2,4-D or MCPA (12–16 fl oz/A of 3.8 L product) to control wild radish. Do not use surfactant if applying with 2,4-D or MCPA in nitrogen. Mixtures with MCPA or 2,4-D must be applied to fully tillered oats only.
Most winter annual broadleaf weeds except chickweed, henbit, geranium, red sorrel, clover and knawel	<i>MCPA</i> various brands 4 SL various brands 3.7 SL	4	12–16 fl oz 12–16 fl oz	0.375–0.5 0.347–0.46	12 H/ —	Apply up to 16 fl oz/A when oat is fully tillered. Safer on oats than 2,4-D; slightly less effective on larger weeds when applied alone. No spray additive needed. Mixtures of MCPA with Harmony Extra are far more effective.

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
OATS: POST-EMERGENCE (continued)						
Most winter annual broadleaf weeds except chickweed, henbit, geranium, red sorrel, clover and knawel	<i>2,4-D amine</i> various brands 3.8 SL	4	12–16 fl oz	0.36–0.48	48 H/ 14 D	Apply to fully tillered oats only. Spraying oats too young or after jointing may reduce yields. Oats are less tolerant of <i>2,4-D</i> than wheat. Better results are obtained when day-time temperatures are above 50°F. Liquid <i>nitrogen</i> may be used as a carrier for <i>2,4-D</i> . Premix in water (1 part <i>2,4-D</i> to 4 parts water) and add mixture to <i>nitrogen</i> with strong agitation. Notice only an <i>amine</i> formulation of <i>2,4-D</i> is recommended due to crop response. Mixtures of 2,4-D with Harmony Extra are more effective. One application in-season only.
OATS: PRE-HARVEST						
Annual broadleaf weeds	<i>2,4-D amine</i> various brands 3.8 SL	4	1 pt	0.48	48 H/ 14 D	Apply when grain is in hard dough stage or later. Do not allow drift to any sensitive crops. Apply only labeled AMINE formulations to reduce volatility and off-target movement.
RYE: PRE-PLANT						
Emerged annual weeds, control or suppression of perennial weeds	<i>glyphosate</i> 3.57 SL (3 lb ae) 4 SL (3 lb ae) 5 SL (3.7 lb a.e) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	32–48 fl oz 24–36 fl oz 23–34 fl oz 22–32 fl oz 19–29 fl oz	0.75–1.13	4 H/ N/A	Apply before crop emerges; suggest 3 or more days before emergence. Adjuvant recommendation varies by <i>glyphosate</i> brand used. Cool temperatures, including at night, may slow or even reduce the level of control observed. Use maximum rate for ryegrass!
Control of most winter weeds; use full <i>glyphosate</i> rate for ryegrass	<i>glyphosate</i> + <i>2,4-D amine</i> (3.8 SL)	9 + 4	see <i>glyphosate</i> + 12–16 fl oz	0.75 to 1.13 + 0.36 to 0.48	48 H/ N/A	Check brand of 2,4-D used as some labels prohibit planting within 29 days of application. Research suggests plantback intervals of 24 days and 1 inch of rain between application and planting may be needed. Without required rainfall, serious injury can occur.
Volunteer Roundup Ready Corn and ryegrass; use full rates for ryegrass	<i>glyphosate</i> + <i>clethodim</i> (Select) 2 EC (Select Max) 0.97 EC	9 + 1	see <i>glyphosate</i> + 4–8 fl oz 6–9 fl oz	0.75 to 1.13 + 0.063 to 0.13 0.05 to 0.07	24 H/ N/A	Do not plant for 30 days after applying clethodim. Rainfall after application and before planting of 0.5" or more advised. Corn < 12 inch: Select 4 to 6 oz; Select Max 6 oz. Corn 12-24 inch: Select 6 to 8 oz; Select Max 9 oz.
RYE: POST-EMERGENCE						
Most winter annual broadleaf weeds except chickweed, henbit, geranium, red sorrel, clover and knawel	<i>MCPA</i> 4 SL 3.7 SL	4	12–20 oz 12–20 oz	0.375–0.625 0.347–0.58	48 H/	Apply 12–16 fl oz/A when rye has at least 2 tillers and 16–20 fl oz/A when fully tillered. Safer than <i>2,4-D</i> on crop; slightly less effective on larger weeds when applied alone. No spray additive needed.
	<i>2,4-D amine</i> various brands 3.8 SL	4	1 pt	0.48	48 H/ 14 D	Apply to fully tillered rye only. Spraying rye too young or after jointing can reduce yields. Better results are obtained when day-time temperatures are above 50°F. Liquid <i>nitrogen</i> may be used as a carrier for <i>2,4-D</i> . Ester formulations can be added directly into <i>nitrogen</i> . If using <i>amine</i> formulation, premix in water (1 part <i>2,4-D</i> to 4 parts water) and add mixture to <i>nitrogen</i> with strong agitation. <i>Amine</i> formulations give less burn than ester formulations in <i>nitrogen</i> . Ester may be more effective in cold conditions. Only in-season application only.
	<i>2,4-D ester</i> various brands 3.8 SL		1 pt	0.48		
	<i>2,4-D ester</i> various brands 5.7 SL		0.67 pt			

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WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
RYE: PRE-HARVEST						
Annual broadleaf weeds	<i>2,4-D amine</i> various brands 3.8 SL	4	1 pt	0.48	48 H/ 14 D	Apply when grain is in the hard dough stage or later. Do not allow drift to sensitive crops, especially cotton and tobacco. Apply only labeled AMINE formulations during this time of year.
TRITICALE: PRE-PLANT						
Emerged annual weeds, control or suppression of perennials	<i>glyphosate</i> 3.57 SL (3 lb ae) 4 SL (3 lb ae) 5 SL (3.7 lb ae) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	32–48 fl oz 24–36 fl oz 23–34 fl oz 22–32 fl oz 19–29 fl oz	0.75–1.13	4 H/ N/A	Apply before crop emerges; suggest 3 or more days before emergence. Adjuvant recommendation varies by glyphosate brand used. Cool temperatures, including at night, may slow or even reduce the level of control observed. Use full rate for ryegrass!
Summer and winter annual weeds including wild radish, henbit, chickweed; use full <i>glyphosate</i> rate for ryegrass	<i>glyphosate</i> + <i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i> (Harmony Extra SG with Total Sol) 50 SG	9 + 2 + 2	see <i>glyphosate</i> + 0.45–0.9 oz	0.75–1.13 + 0.0094–0.0187 + 0.0047–0.0094	12 H/ N/A	May be used as a burndown treatment prior to or shortly after planting, but prior to emergence (suggest at least 3 days before emergence).
Volunteer Roundup Ready Corn and ryegrass; use full rates for ryegrass	<i>glyphosate</i> + <i>clethodim</i> (Select) 2 EC (Select Max) 0.97 EC	9 + 1	see <i>glyphosate</i> + 4–8 fl oz 6–9 fl oz	0.75–1.13 + 0.063–0.13 0.05–0.07	24 H/ N/A	Do not plant for 30 days after applying clethodim. Rainfall after application and before planting of 0.5" or more advised. Corn < 12 inch: Select 4 to 6 oz; Select Max 6 oz. Corn 12-24 inch: Select 6 to 8 oz; Select Max 9 oz.
Common chickweed, C. geranium, henbit, horseweed, soybean, wild radish; use full <i>glyphosate</i> rate for ryegrass	<i>glyphosate</i> + <i>halauxifen-methyl</i> + <i>florasulam</i> (Quelex) 0.2 WG	9 + 4 + 2	see <i>glyphosate</i> + 0.75 oz	0.75–1.13 + 0.0048 + 0.0047	12 H/ N/A	Apply as a preplant burndown treatment prior to, or shortly after planting prior to emergence; suggest at least 3 days before emergence. Label requires addition of non-ionic surfactant or crop oil concentrate. An application can be made for burndown and again in-crop, rotation to cotton and soybean is 3 months. UGA research has only studied wheat.
TRITICALE: POST-EMERGENCE SPIKE THROUGH EARLY POST						
Ideal use is for residual control of ryegrass resistant to POST herbicides; helps on radish and henbit	<i>flufenacet</i> + <i>metribuzin</i> Axiom 68 WDG	15 + 5	4–8 oz	0.136–0.027 + 0.34–0.068	12 H/ N/A	Triticale seed should be planted at least 1" deep. Apply to triticale between spike and 2 leaf. Must be activated prior to weed emergence for effective weed control. Pre-emergence applications can cause severe injury on light soils. For most Georgia soils, < 6 oz/A of product is ideal. Heavy rains following application may cause stunting. Avoid application if wet conditions after application are expected for a week. Rotation to soybean is 0 months, cotton 8 months, many other crops 18 months.

WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
TRITICALE: POST-EMERGENCE						
Most winter annual broadleaf weeds except chickweed, henbit, geranium, red sorrel, clover and knawel	<i>2,4-D amine</i> various brands 3.8 SL	4	12–16 oz	0.36–0.48	48 H/ 14 D	Many 2,4-D products do not list triticale on their label; Amine 4 from Loveland has a label at time of edits. Apply to fully tilled triticale only. Spraying when too young or after jointing can reduce seed yields. Better results are obtained when day-time temperatures are above 50°F. Liquid nitrogen may be used as a carrier for 2,4-D. If using amine formulation, premix in water (1 part 2,4-D to 4 parts water) and add mixture to nitrogen with strong agitation. Only 1 application of 2,4-D in crop allowed. Mixtures with Harmony Extra suggested, see below
A few annual broadleaf weeds; often less effective than Harmony Extra	<i>bromoxynil</i> Buctril 2 EC Buctril 4 EC	6	2 pt 1 pt	0.5	96 H/ 45 D	Apply to triticale between emergence and boot stage. Controls 1–2" wild mustard, wild radish, swinecress, shepherdspurse, field pennycress, Virginia pepperweed, and knawel. Does not control wild garlic, chickweed, or henbit.
Annual broadleaf weeds and ryegrass suppression	<i>chlorsulfuron</i> + <i>metsulfuron methyl</i> Finesse 75 WDG	2 + 2	0.2–0.4 oz	0.008 + 0.0016 to 0.016 + 0.0031	4 H/ —	Apply to triticale between 2 leaf and flag leaf. See label for weeds controlled, application rates, and use of surfactant. Plant only STS soybeans following harvest. Early application necessary for ryegrass suppression. See comments under wheat.
Common chickweed, C. geranium, henbit, horseweed, soybean, small wild radish	<i>halauxifen-methyl</i> + <i>florasulam</i> (Quelex) 0.2 WG	4 + 2	0.75 oz	0.0048 + 0.0047	12H/ 60 D	Apply to triticale between 2 leaf and flag leaf. Weeds should be less than 4" and not stressed. Add nonionic surfactant (0.2–0.5% v/v) or crop oil concentrate (0.5 to 1% v/v). Rotation of 3 months for cotton, corn, and soybean, and 9 months for peanut. See label about mixing with liquid <i>nitrogen</i> . UGA research shows excellent control of small radish but less effective on larger plants.
Non-resistant emerged annual ryegrass, small wild radish, henbit, and chickweed Very effective on annual bluegrass	<i>mesosulfuron-methyl</i> Osprey 4.5 WDG	2	4.75 oz	0.013	4 H/ 60 D	For fall sown crop only. Apply to triticale between emergence and jointing to control ryegrass with less than 2 tiller. Add a nonionic surfactant (at least 80% active) at 2 qts/100 gal spray solution plus <i>ammonium nitrogen</i> fertilizer (28-0-0, 30-0-0, 32-0-0) at 1–2 qt/A. DO NOT topdress within 14 days of application. Do not use liquid nitrogen as the carrier. May mix with Harmony Extra. Cotton/soybean can be planted 90 days after application. To minimize resistance: <i>If treating a field with either Osprey or PowerFlex this year, do not apply either product on that field next year.</i>

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WEEDS CONTROLLED	HERBICIDE	MOA	AMOUNT OF FORMULATION (Broadcast Rate/Acre)	LBS ACTIVE INGREDIENT (Broadcast Rate/Acre)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS (READ ALL LABELS)
TRITICALE: POST-EMERGENCE (continued)						
Non-resistant emerged annual Ryegrass, also very effective on wild radish and several other broadleaf weeds	<i>pyroxsulam</i> PowerFlex HL 13.13 WDG	2	2 oz	0.0163	12 H/ 60 D	Apply to triticale between 3 leaf and jointing to control ryegrass with less than 2 tillers. Add crop oil concentrate at 1-1.25% v/v (1-1.25 gal/100 gal spray solution). May tank mix with Harmony Extra. UGA suggests not mixing with <i>nitrogen</i> but label allows water- <i>nitrogen</i> mixture containing up to 50% liquid <i>nitrogen</i> by volume (< 30 lb/A of nitrogen). If applying in liquid <i>nitrogen</i> , use a nonionic surfactant at 0.25% v/v, instead of crop oil. An independent liquid <i>ammonium nitrogen</i> fertilizer application should not be made within 7 days of application; also do not apply organophosphates within 5 days of PowerFlex. Soybeans and cotton can be planted after April assuming application was made before February. To minimize resistance: <i>If treating a field with either Osprey or PowerFlex this year, do not apply either product on that field next year.</i>
Wild garlic, curly dock, many other winter annual broadleaf weeds; will not control primrose and wild radish should be < 1"	<i>thifensulfuron-methyl</i> + <i>tribenuron-methyl</i> Harmony Extra SG with TotalSol 50 SG Harmony Extra, Nimble 75 WDG	2 + 2	0.45-0.9 oz 0.3-0.6 oz	0.0094-0.0187 + 0.0047-0.0094	12 H/ 45 D	Apply to triticale between 2 leaf and flag leaf. Most winter annuals can be controlled with 0.75 oz/A of Harmony Extra 50 SG; however, 0.75-0.9 oz/A is recommended for controlling wild garlic or small wild radish. Add 1 qt of nonionic surfactant/100 gal of spray solution. Apply to non-stressed weeds with less than 4 leaves when temperatures are above 50° F. Garlic should be less than 12" tall and should have 2-4" of new growth. Liquid <i>nitrogen</i> may be used as the carrier. When using <i>nitrogen</i> as the carrier, reduce surfactant rate to 0.5-1 pt/100 gal of solution (burn may still be noted). Tank mix with 0.375 to 0.5 lb active ingredient of 2,4-D (12-16 fl oz/A of 3.8 L product) for control of wild radish. Do not use surfactant if applying with 2,4-D in <i>nitrogen</i> . Mixtures with 2,4-D must be applied to fully tillered triticale only
TRITICALE: PRE-HARVEST						
Annual broadleaf weeds	2,4-D amine various brands 3.8 SL	4	1 pt	0.48	48 H/ 14 D	Most 2,4-D products do not list triticale on their label; Amine 4 from Loveland has a label at time of edits. Apply when grain is in the hard dough stage or later. Do not allow drift to ANY sensitive crop. Apply only labeled AMINE formulations to reduce volatility.

Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

SMALL GRAIN WEED RESPONSE TO HERBICIDES

A. Stanley Culpepper, Extension Weed Scientist

WEEDS	2,4-D ¹	MCPA ¹	EXPRESS ¹	QUELEX ¹	EXPRESS + MCPA ¹ OR 2,4-D	BUCTRIL ¹	HARMONY EXTRA ¹	HARMONY EXTRA + MCPA OR 2,4-D ¹	PEAK ¹	FINESSE ²
annual bluegrass	N	N	N		N	N	N	N	N	N
annual ryegrass	N	N	N	N	N	N	N	N	N	F
buttercup	G						G	G-E		G
common chickweed	P	P	G	G-E	G-E	P-F	G	G-E		G
common ragweed	G	F				E	P-F	F-G	E	
cornflower	G					G-E	P	F		F
cudweed	G-E	G-E			E	G	E	E		
curly dock	P	P			P	P-F	E	E		
dandelion	E	E			E	E		G-E		
dogfennel	G	F				G-E	E	E		
evening primrose	E	E			E	F-G	F	E	F-G	
field pennycress	G					G	G	G-E		G
geranium	F	F		G			F-G	G-E		
goldenrod	F	G				F				
hairy vetch	F	F				F	F-G	G-E		
henbit	P	P	F	G-E	G	F	G	G-E	F-G	G
horsenettle	F	F				F				
horseweed	F-G	F				F	F-G	F-G		
knawel	P					P	G	G		
lambsquarters	G	G				E	E	E	G	
plantains	E	E			E	E	E	E		
shepherd's-purse	G-E	G-E			E	G	E	E	G	G
swinecress	G	G			G-E	G-E	E	E		
thistles	G	G				G	F-G	G	F-G	
vetch	G					F	P			
Virginia pepperweed	E				E	F-G	G	E		
wild garlic	F	P				P	G-E	G-E	E	P
wild mustard	E	G-E	F		E	F-G	F-G	E	G	G
wild radish	E	G-E	F	G-E ³	E	F-G	F-G ³	E	G	G

E—excellent control, 90% or better
 G—good control, 80–90%
 F—fair control, 60–80%
 P—poor control, 30–60%
 N—no control, less than 30%

1. Timely post-emergence application.
2. Applied pre-emergence.
3. Must be less than 2 inches.

■ **SMALL GRAIN WEED RESPONSE TO HERBICIDES**

WEEDS	AXIAL XL ¹	AXIOM ²	ZIDUA ²	FIERCE ²	HOELON ¹	OSPREY ¹	POWERFLEX ¹
annual bluegrass	N	G			N	G-E	P-F
annual ryegrass	G-E ³	P-G ⁴	G-E ⁵	G-E ⁵	G-E ⁶	G-E ⁷	G-E ⁷
buttercup	N				N		
common chickweed	N			G-E	N	F-G ⁸	F-G ⁸
common ragweed	N				N		
cornflower	N				N	P	
cudweed	N				N		
curly dock	N				N	P	
dandelion	N				N		
dogfennel	N				N		
evening primrose	N			E	N	P	P
field pennycress	N				N		
geranium	N	G		G	N		
goldenrod	N				N		
hairy vetch	N				N		
henbit	N	G-E	P-F	G-E	N	G-E	G
horsenettle	N				N		
horseweed	N			G-E	N		
knawel	N				N		
lambsquarters	N			E	N		
plantains	N				N		
shepherd's-purse	N				N		
swinecress	N			G-E	N	E	
thistles	N				N		
vetch	N				N	P-F ⁸	
Virginia pepperweed	N				N		
wild garlic	N				N	P	
wild mustard	N	G-E	P-F	G-E	N	G	G-E
wild radish	N	G-E	P-F	G-E	N	G	G-E

<p>E—excellent control, 90% or better G—good control, 80–90% F—fair control, 60–80% P—poor control, 30–60% N—no control, less than 30%</p>	<ol style="list-style-type: none"> Timely post-emergence application. Applied spike to wheat but PRE to weeds. Axial and Hoelon have a similar mode of action. Axial controls about 85% of the Hoelon-resistant populations studied in GA. Provides good control if Axiom is activated prior to ryegrass germination. Poor control if ryegrass emerges prior to Axiom activation. For this level of control, Zidua must be activated prior to ryegrass emergence. For Fierce, ryegrass must be less than 0.25" when activated. Will not control Hoelon-resistant ryegrass. Will not control ALS-resistant ryegrass. Weeds must not be larger than 2" at time of application.
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