

Burndown Herbicides in No-Tillage Corn and Soybeans

Herbicide	Formulation	Product Rate Range
2,4-D Amine	Various	0.5 - 1 lb ai/A
2,4-D Ester	Various	0.5 - 1 lb ai/A

- Apply in fall or spring for control of emerged annual broadleaf weeds, including ragweeds, lambsquarters, mustard species, marestalk, prickly lettuce, and dandelion. Controls or suppresses perennial broadleaf weeds and legume sods (alfalfa, clover).
- Mode of action: group 4 (see pages 12-13).
- 2,4-D ester or amine can be applied preplant or preemergence to corn, but labels vary with regard to specific recommendations on timing of application. Labels for some products recommend application either 7 to 14 days before planting or 3 to 5 days after planting before the corn has emerged, while others specify application any time after planting.
- Applications of 2,4-D around the time of planting can injure corn. This is more likely to occur in coarse-textured soils with low organic matter content, and when above-average rainfall and prolonged soil moisture occur within a week after planting. When applied preemergence, 2,4-D amine is more likely to injure corn than 2,4-D ester. Labels for some products do not allow preplant or preemergence use of 2,4-D on light, sandy soils. Injury may be more severe when 2,4-D is applied with chloracetamide herbicides.
- Many 2,4-D products are labeled for use in the spring prior to no-till soybean planting. OSU and Purdue University recommend the use of only 2,4-D low-volatile ester (LVE) or similar products for this application. 2,4-D amine products are more water soluble and may leach into the seed zone. For 2,4-D LVE, rates up to 0.5 lb active ingredient per acre must be applied at least 7 days before soybean planting. Application rates of more than 0.5 lb up to 1.0 lb active ingredient per acre generally must be applied at least 30 days before planting. Several 2,4- ester products, including E-99, Salvo, and Weedone 650, can be applied at a rate of 1.0 lb ai/A up to 15 days before planting. Do not apply more than 1 lb ai per acre. Only one spring application is allowed per year.
- 2,4-D is more effective than glyphosate for control of legume sods, marestalk, dandelion, and prickly lettuce. For best control of alfalfa prior to corn planting, apply in combination with 1/2 pint of dicamba. If legume sods are cut prior to application of 2,4-D or 2,4-D plus dicamba, allow sufficient regrowth (4 to 6 inches) before herbicide application, or poor control may result.
- When applied at rate of 1 lb ai/A in the fall, 2,4-D will control mustards, marestalk, purple deadnettle, and many other broadleaf weeds. Add glyphosate for effective control of common chickweed, wild carrot, poison hemlock, cressleaf groundsel, Canada thistle, dandelion, and grasses.
- Rage D-TECH is a premix of 2,4-D and carfentrazone (Aim) that results in more rapid herbicide injury to weeds, but does not improve control compared with 2,4-D alone.

Herbicide	Formulation	Product Rate Range
Autumn	10 WDG	0.3 oz

- Autumn (iodosulfuron-methyl) can be applied in fall before corn or soybeans planting, or early spring up to 30 days before corn planting, for control of winter annual weeds and dandelion. Most effective control occurs when mixed with glyphosate or 2,4-D and applied in the fall. Apply with 2,4-D for control of ALS- or glyphosate-resistant marestalk.
- Mode of action: group 2 (see pages 12-13).
- Apply with COC (1% v/v) plus UAN (1.5 - 2 qts/A) or AMS (1.5 - 3 lbs/A).
- Do not apply to frozen ground.

Herbicide	Formulation	Product Rate Range
Rimsulfuron + thifensulfuron (active ingredient)		
Basis	75DF	1/3 - 1 oz
Thifensulfuron + tribenuron (active ingredient)		
Harmony Extra	50DF	0.75 - 0.9 oz
Nimble, TNT Broadleaf	75WDG	0.5 - 0.6 oz
Tribenuron (active ingredient)		
Express	50DF	0.25 - 0.5 oz
Nuance	75WDG	1/6 - 1/3 oz

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- Tribenuron products can be applied in the fall and/or spring before planting corn or soybeans (at least 14 days before planting) for control of wild garlic and other broadleaf weeds.
- The premix of thifensulfuron and tribenuron-methyl controls wild garlic and annual broadleaf weeds, including lambsquarters, mustard species, Pennsylvania smartweed, field pennycress, and shepherd's purse. Tribenuron controls purple deadnettle, chickweed, and field pennycress, and provides partial control of shepherd's-purse and other mustard species. Apply with 2,4-D ester for best results.
- Basis is a premix of rimsulfuron plus thifensulfuron that can be applied in the fall (0.33 to 0.5 oz/A) or spring (0.3 to 1 oz/A) before planting corn for control of winter annual weeds. When mixed with 2,4-D ester, fall-applied Basis controls chickweed, deadnettle, henbit, dandelion, mustards, and other winter weeds. Spring applications with other corn herbicides (2,4-D ester, atrazine) before corn planting can provide burndown of small annual grass and broadleaf weeds, and several weeks of residual control of foxtails, lambsquarters, and pigweeds. A mixture of Basis plus atrazine has been one of the most effective burndown treatments for no-till corn in OSU research. Apply with COC (1%, v/v) and ammonium nitrogen fertilizer. Can be mixed with other herbicides approved for these uses. Do not apply in the fall or spring before soybean planting.
- Mode of action: group 2 (see pages 12-13).
- To control wild garlic, apply the higher rates of thifensulfuron+tribenuron when garlic plants are less than 12 inches tall with 2 to 4 inches of new growth. Control will be better if applied during warm weather (60 F or more) to actively growing garlic plants. Thorough spray coverage of garlic plants is essential.
- Apply with COC (1% v/v) or NIS (0.25% v/v). Use flat fan or low-volume flood nozzles for best results.

Herbicide	Formulation	Product Rate Range
Chlorimuron (active ingredient)		
Canopy/Cloak EX	29.5 DF	1.1 to 3.3 oz
Canopy/Cloak DF	75 DF	2.25 to 7 oz
Envive	41 DG	2.5 to 5 oz
Valor XLT	40 WDG	2.5 to 5 oz

- These products provide residual control of broadleaf weeds, and also help control many no-till weeds in mixtures with 2,4-D and glyphosate in preplant burndown treatments.
- Mode of action: group 2 (Canopy/Cloak EX); group 2 and 5 (Canopy/Cloak DF); group 2 and 14 (Valor XLT and Envive). See pages 12-13.
- Canopy/Cloak EX can be applied in fall or spring, with following restriction: rates of 2.2 oz or less should be applied at least 7 days before planting; rates of 2.2 to 3.3 oz should be applied at least 14 days before planting. Canopy/Cloak DF can be applied in fall or spring (up to 45 days before planting). Envive and Valor XLT can be applied anytime in fall or spring, but must be applied before soybean emergence and no later than 3 days after planting. Do not apply to frozen or snow-covered ground.
- Maximum rate on soils where the composite pH exceeds 7.0 (6.8 for Valor XLT): Canopy/Cloak EX - 1.1 oz/A; Canopy/Cloak DF - 2.25 oz/A; Valor XLT and Envive - 2.5 oz/A.
- These products can be applied to no-till or conservation tillage fields in the fall for burndown of existing vegetation and limited residual control into the following growing season. 2,4-D should be included with all fall-applied treatments. Do not apply to frozen ground.
- Canopy/Cloak EX controls common chickweed, but Canopy/Cloak DF, Envive, and Valor XLT require the addition of glyphosate or Express for chickweed control.
- Spring treatments should include 2,4-D ester and/or glyphosate for most effective control of emerged weeds. Glyphosate should be included if applied later than early April and where maretail, dandelion, and other perennials are present.
- Apply with COC (1 gallon/100 gallons spray) for best control of emerged weeds, unless glyphosate is included in the treatment.
- See descriptions of these products in "Soybean: Soil-Applied Herbicides" section for additional information.

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Herbicide	Formulation
Corvus	2.63SC

- Corvus is a premix of isoxaflutole and cyprosulfamide (Balance Flexx) and thienencarbazone-methyl. See Corvus description in "Corn: Soil-applied Herbicides" section for more information.
- Preplant application of Corvus can control small, emerged annual weeds (6 inches or less) in no-till, especially when combined with atrazine. Apply with COC or MSO. Can be mixed with 2,4-D, Gramoxone, or glyphosate for improved burndown activity on larger weeds or weeds not controlled by Corvus and atrazine.
- See description of this product in "Corn Soil-Applied Herbicides" section for additional information.

Herbicide	Formulation	Product Rate Range
Dicamba	4L	1/2 - 1 pt
Distinct	76.4DF	2 - 3 oz

- Dicamba is sold under a number of trade names, including Banvel, Clarity, Sterling Blue, and Oracle. Dicamba is a translocated herbicide that can be applied before, during, or after no-till corn planting for control of emerged broadleaf weeds.
- Mode of action: group 4 (see pages 12-13).
- Use 1/2 pint on coarse-textured soils, and 1 pint on medium- or fine-textured soils containing at least 2 percent organic matter.
- Dicamba is more effective than glyphosate for control of legume sods, especially when applied in combination with 2,4-D. When planting into a legume sod, apply dicamba after regrowth of 4 to 6 inches has occurred.
- The addition of crop oil, surfactant, or fluid fertilizer may improve control of emerged weeds. Do not apply with crop oil when corn is more than 5 inches tall.
- Corn should be planted at least 1 1/2 inches deep with good-seed furrow closure. May injure corn if recommended rates are exceeded, application is not uniform, or corn is planted too shallow.
- The 1 pint rate provides limited residual control of small-seeded, annual broadleaf weeds.
- Some dicamba products are labeled for application in the spring prior to soybean planting. The Clarity label allows soybeans to be planted 14 days after application of 8 oz/A, and 28 days after application of 16 oz/A, as long as one inch of rainfall has occurred between application and planting.
- Distinct is a premix of dicamba and diflufenzopyr, and is more active than dicamba on a number of weeds. Distinct rates: corn - 2 to 3 oz/A applied at least 14 days before planting; soybeans - 2 to 4 oz/A, at least 30 days and 1 inch of rain must occur between application and soybean planting.

Herbicide	Formulation	Product Rate Range
Dicamba + 2,4-D premix	3.87L	0.5 - 6 pts

- This product is available from various manufacturers, and product names and rates vary. It controls emerged weeds in the fall after corn or soybean harvest, or in the summer or fall after wheat harvest. Similar products are available from other manufacturers.
- Mode of action: group 4 (see pages 12-13).
- Controls mustards, maretail, cressleaf groundsel, dandelion and some other winter annual weeds, but is weak on purple dead-nettle and common chickweed.
- Apply when annual weeds are less than 6 inches tall, when biennials are in the rosette stage, and when perennials are at least 6 inches tall or in the bud to bloom stage.
- Any crop can be planted 120 days after application of rates up to 6 pints per acre.
- Can be applied prior to wheat planting, but allow an additional 10 days between application and planting for each pint applied (e.g. for a 2 pint rate allow 20 days).
- The standard adjuvant recommendation is 2 to 4 pints of NIS per 100 gallons of spray solution.

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Herbicide	Formulation	Product Rate Range
Dicamba + atrazine premix	3.2L	2 - 3 1/2 pt

- Dicamba plus atrazine is sold under a number of trade names, including Marksman, Sterling Plus, Banvel-K+atrazine, and Stratos. These products control most emerged annual broadleaf weeds, and suppress or control perennial broadleaf weeds, and provide some residual control of broadleaf weeds.
- Mode of action: group 5 (atrazine), group 4 (dicamba). See pages 12-13.
- Can be applied before, during, or after planting to emerged, actively growing weeds. Apply 2 pints on coarse soils with at least 2 percent organic matter, and 3 1/2 pints on medium- or fine-textured soils with at least 2 percent organic matter.
- The addition of crop oil, surfactant, or fluid fertilizer may improve control of emerged weeds. Do not apply with crop oil after corn is 5 inches tall.
- When planting into a legume sod, apply after regrowth of 4 to 6 inches has occurred.
- Corn should be planted at least 1 1/2 inches deep with good seed-furrow closure. May injure corn if recommended rates are exceeded, application is not uniform, or corn is planted too shallow.

Herbicide	Formulation
Expert	4.88L

- Expert is a premix of glyphosate, s-metolachlor (Dual II Magnum), and atrazine for burndown and residual control of grass and broadleaf weeds in no-till and conservation tillage corn. See descriptions of glyphosate and metolachlor/s-metolachlor plus atrazine for more information on these herbicides.
- Mode of action: group 9 (glyphosate), group 5 (atrazine), group 15 (s-metolachlor). See pages 12-13.
- Use rates provide the equivalent of 0.4 to 0.75 lbs of glyphosate acid and 1.75 to 2.6 quarts/A of Bicep II Magnum. Use rate ranges from 2.5 to 3.75 qts/A on coarse-textured soils with less than 3% organic matter, and from 3 to 3.75 on all other soils.
- Apply before, during, or after planting but before crop emergence.
- Can be applied postemergence to glyphosate-resistant corn. Use water as the spray carrier for postemergence applications.
- Can be applied in water or UAN (28% or 32% only). Control of emerged weeds, especially perennial and large annual weeds, may be reduced if fertilizer is used as the carrier.
- The addition of AMS (17 lbs/100 gallons) can improve control of emerged annual weeds under cool or dry conditions.

Herbicide	Formulation	Product Rate Range
Glyphosate	Various	0.75 - 1.5 lbs acid/A

- Do not apply broadcast after the crop has emerged, unless the crop has resistance to glyphosate (Roundup Ready, Agrisure GT, etc).
- To reduce the risk of developing glyphosate-resistant weed populations, OSU and Purdue University recommend application of glyphosate with 2,4-D ester wherever practical, including preplant applications to no-till corn and soybeans, in the summer/fall following wheat harvest, and in the fall for control of winter annuals and dandelion. An exception to this occurs when Canada thistle is the primary weed target for a fall application, in which case the 2,4-D ester should be omitted.
- Glyphosate is a nonselective, translocated herbicide that controls emerged annual and perennial grass and broadleaf weeds, volunteer cereals, and grass cover crops. Table 24 contains a list of some currently available glyphosate products. Application rates, adjuvant recommendations, and other guidelines for use vary among glyphosate products, and users should consult labels and local product use guides for more specific information. The following comments are meant as general guidelines for the use of glyphosate.
- Mode of action: group 9 (see pages 12-13).
- The minimum glyphosate rate for most situations where weeds are no more than about 6 inches tall should be 0.75 lbs of glyphosate acid/A. Rates should be increased accordingly as weeds become taller. Pennsylvania smartweed, atriplex, giant ragweed, crabgrass, fall panicum, barnyardgrass, marestail, dandelion, and a number of winter annual weeds can be difficult to control, and should be as small as possible at the time of application. A mixture of glyphosate plus 2,4-D ester (0.5 - 1 lb ai/A) will improve control of most broadleaf weeds.

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- Glyphosate resistance has developed in populations of marestail and common and giant ragweed in Ohio and Indiana, and some lambsquarters populations appear to have become less sensitive to glyphosate. To improve control of these populations and reduce the risk of resistance, apply a mixture of glyphosate plus 2,4-D ester at least 7 days before soybean planting, and include preemergence herbicides that have residual activity on these weeds (e.g. Valor, metribuzin, Gangster). Avoid use of herbicide programs in glyphosate-resistant crops consisting solely of multiple glyphosate applications. See the "Problem Weeds" section of this guide for additional information on management of these weeds.
- For control of rye or overwintered wheat, apply in a spray volume of 10 gpa or less and use the appropriate rate for small grain size. Wheat should be treated before reaching a height of 18 inches.
- A number of glyphosate products can be applied immediately prior to alfalfa harvest in spring or fall, and the treated alfalfa then harvested and fed to livestock. This application is useful where corn will be planted immediately after alfalfa harvest, since it provides more effective alfalfa and perennial grass control, compared to application after harvest. Allow a minimum of 36 hours between application and harvest. Alfalfa should be harvested 3 to 7 days after application to avoid loss of quality and maximize perennial control. The preemergence herbicide program for corn should include atrazine at a rate of 1 1/4 to 1 1/2 quarts (or the equivalent amount in a premix).
- Glyphosate activity will be maximized when applied in water in a spray volume of 10 gpa or less. When mixing with residual herbicides, apply in 10 or more gallons of water or UAN per acre.
- Glyphosate activity on perennial and large annual weeds may be reduced when mixing with residual herbicides or applying in UAN. Residual herbicides most likely to reduce activity include Bullet and MicroTech, and herbicides with contact activity on emerged weeds (Valor, metribuzin, atrazine, etc). Consult labels for rates and precautions when mixing with residual herbicides.
- Recommendations for the use of AMS (17 lbs/100 gallons of water) with glyphosate vary among products. Addition of AMS may improve control, and is recommended under the following conditions: when mixing with residual corn or soybean herbicides, when air temperature is 55 degrees or less, or when hard or high pH water is used as the carrier.

Herbicide	Formulation	Product Rate Range
Gramoxone Inteon	2L	2 - 4 pts
Parazone	3SL	1.3 - 2.7 pts

- Do not apply broadcast after the crop has emerged.
- Gramoxone Inteon and Parazone contain paraquat, a nonselective contact herbicide that controls emerged annual grass and broadleaf weeds. Paraquat usually provides acceptable control of a rye cover, but is less effective than glyphosate for control of forage grasses such as orchardgrass and tall fescue. Paraquat is not effective for control of perennial broadleaf weeds, legume sods, perennial grass sods, or volunteer wheat although some suppression of these may occur.
- Mode of action: group 22 (see pages 12-13).
- May not control marestail and prickly lettuce. May not control smartweed, giant ragweed, and fall panicum that are more than 4 to 6 inches tall. Control of these and many other weeds will be improved when paraquat is mixed with photosynthetic inhibitor herbicides (atrazine, metribuzin, and Lorox). Paraquat should generally be applied with a metribuzin-containing product and 2,4-D ester in no-till soybeans.
- Application rates for Gramoxone Inteon: 2 to 2.5 pints for 1- to 3-inch weeds; 2.5 to 3 pints for 3- to 6-inch weeds; and 3 to 4 pints for weeds more than 6 inches tall. Application rates for Parazone: 1.3 to 1.7 pints for 1- to 3-inch weeds; 1.7 to 2 pints for 3- to 6-inch weeds; and 2 to 2.7 pints for weeds more than 6 inches tall
- Apply with COC (1 gallon/100 gallons spray) or NIS (1 quart/100 gallons). COC is the preferred spray adjuvant, especially when mixing with other herbicides.
- When using flat fan nozzles spaced at 20 inches or less, apply in a spray volume of at least 10 gpa with a pressure of at least 30 psi. Increase spray volume to at least 15 to 20 gpa if weeds are more than 3 inches tall. For large spray equipment with flood type nozzles, use a spray volume of at least 20 gpa with a pressure of at least 30 psi.
- Allow 30 minutes between application and rainfall.
- Do not apply with suspension or high-phosphate liquid fertilizers.

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Herbicide	Formulation	Product Rate Range
Ignite 280 SL	2.34L	29 - 36 oz

- Ignite (glufosinate) is a contact herbicide that controls small, annual grass and broadleaf weeds, and suppresses some perennials.
- Mode of action: group 10 (see pages 12-13).
- Application of Ignite alone may not provide adequate control in a typical no-till burndown situation in Ohio or Indiana. Apply in combination with a metribuzin-containing herbicide (at least 0.38 lb ai metribuzin) for most effective control, and include 2,4-D ester whenever possible.
- Do not apply Ignite postemergence to Liberty Link corn or soybeans where it has been used in a preplant burndown treatment.
- Apply in a minimum spray volume of 15 gpa, and use 20 to 40 gpa in dense weed canopies. Apply using nozzles and spray pressures that result in medium-size spray droplets (250 to 350 microns). Control can be reduced when nozzles and pressure result in coarse droplets.
- Control can be reduced when applied to weeds under stress from drought or cold conditions.

Herbicide	Formulation
Lumax	4L
Lexar	3.7L

- Lumax and Lexar are premixes of atrazine plus s-metolachlor (Dual II Magnum) plus mesotrione (Callisto). A use rate of Lexar contains a higher amount of atrazine per acre, compared with Lumax, and a lower amount of s-metolachlor.
- Mode of action: group 5 (atrazine); group 15 (s-metolachlor); group 13 (mesotrione). See pages 12-13.
- Lexar and Lumax have been among the most effective preplant burndown treatments for no-till corn in OSU and Purdue University research, for control of dandelion and most winter annual weeds. These products also provide residual control of annual grass and broadleaf weeds. See descriptions of these products in the corn herbicide section for more information.
- Lexar use rates: soils with less than 3% organic matter - 3 qts/A; soils with more than 3% organic matter - 3.5 qts/A. Lumax use rates: soils with less than 3% organic matter - 2.5 qts/A; soils with more than 3% organic matter - 3.0 qts/A.
- See descriptions of these products in "Corn: Soil-Applied Herbicides" section for additional information.

Herbicide	Formulation	Product Rate
Prequel	45WDG	1.66 oz

- Prequel is premix of isoxaflutole (Balance Pro) and rimsulfuron that provides residual control of grass and broadleaf weeds, and also controls some small (less than 3 inches), emerged weeds in no-till burndown situations. See Prequel description in "Corn: Soil-applied Herbicides" section for more information.
- Control of emerged weeds can be improved with the addition of one or more of the following: 2,4-D, atrazine, glyphosate, or paraquat. Control of emerged weeds requires the addition of NIS or COC plus AMS or UAN. When mixed with Ignite or a glyphosate product that contains adjuvants, no additional NIS or COC is needed.
- See description of this product in "Corn: Soil-Applied Herbicides" section for additional information.

Herbicide	Formulation	Product Rate
Sharpen (corn or soybeans)	2.85SC	1 oz
Optill (soybeans)	68 WDG	2 oz.
Integrity (corn)	5.57 EC	10-16 oz.

- These products contain saflufenacil, which can help control emerged weeds in no-till, especially marestalk. Sharpen and Optill should generally be combined with glyphosate or Ignite for broad-spectrum burndown. The combination of Integrity and atrazine may provide adequate burndown of small weeds in no-till corn, but glyphosate should be added when weeds are more than about 4 inches tall, and for weeds Integrity does not control (see label). For more information on these products, see descriptions of Sharpen and Optill in "Soybeans: Soil-applied Herbicides" and description of Integrity in "Corn: Soil-applied Herbicides".
- Burndown activity requires the addition of MSO or COC (1% v/v) plus either AMS (8.5 to 17 lbs/100 gallons) or UAN (1.25 to 2.5% v/v).