

Sprayers are important equipment for pesticide and nutrient applications. Proper maintenance and use of sprayers is essential for efficient, trouble-free operation. Sprayer cleaning is a critical component of maintenance that will prolong the life of the sprayer, prevent unnecessary repairs and downtime, reduce potential for contamination of surface and groundwater, and eliminate crop injury from equipment contamination.

Thorough sprayer cleanout is important following all pesticide applications, but is even more critical after use of certain herbicides because of the potential for crop injury from spray residues in subsequent applications. Growth regulator herbicides such as 2,4-D Banvel, Clarity, Crossbow, and Tordon, as well as the newer low-use rate products such as Accent, Ally, Amber, Beacon, Classic, Exceed, Glean, Peak, Pinnacle, Pursuit, Raptor, and Scepter pose a greater risk for crop injury from spray tank contamination than most other pesticides. These herbicides have systemic activity and are very selective, even at extremely low rates. Thus, serious crop injury can result from small amounts of herbicides remaining in the bottoms of sprayers, or in sprayer crevices, tank walls, or boom lines. Postemergence applications sprayed directly on the crop foliage will have greater potential for crop injury than will soil applications.

Crop injury from sprayer contamination can even occur several months after using the sprayer without proper cleanup and following several subsequent applications. Herbicide residues adhering to spray tank walls and crevices may be brought into solution by a subsequent herbicide or spray adjuvant acting as a solvent. Plastic or polyethylene tanks and hoses tend to require more extensive cleaning than stainless steel tanks.

Sprayer Cleaning Agents

Flushing and rinsing with water is sufficient to clean some herbicides from sprayers, but others require additional cleaning agents for thorough cleaning. The best cleaning agent to use depends on the herbicide and formulation. Several different materials can be used as sprayer cleaning agents, including common household chemicals and commercial sprayer cleaning products. Sprayer cleaning agents can have

several functions, including dilution, solubilization, and/or deactivation.

Rinsing with water is a form of dilution. The more times the sprayer is rinsed, the greater the dilution effect. Repeated rinsing with small quantities of water has a greater dilution and cleaning effect than a single rinse with a larger quantity of water, as long as all sprayer parts are reached with the rinse water.

Many cleaning agents improve the dilution and cleaning of a sprayer by increasing the solubility of the herbicide in the rinse solution. For example, an ammonia solution increases the pH and the solubility of sulfonylurea herbicides. Ammonia may not help decompose or deactivate the herbicides, but it is the recommended cleaning agent to remove these herbicides from the sprayer. On the other hand, chlorine bleach solution enhances decomposition of sulfonylurea and many other herbicides, but is less effective than ammonia at dissolving and removing sulfonylurea herbicide residues from the spray tank, especially from cracks and crevices.

Chlorine bleach should never be added to ammonia or liquid fertilizers containing ammonia because the two materials react to form toxic chlorine gas, which can cause eye, nose, throat, and lung irritation.

Oil-based solvents such as fuel oil are most effective for removing oil-soluble herbicides, such as ester and emulsifiable concentrates. The oil solvent should be followed with a detergent rinse to remove the oil residues.

Detergents help remove many materials, including water and oil-soluble herbicides. Commercially available sprayer cleaning agents normally perform better than household detergents for cleaning sprayers. The best source of information on cleaning agents and procedures is the herbicide label for the product used.

Activated charcoal deactivates organic herbicides. A 3 percent suspension of activated charcoal in water can be added and circulated throughout the sprayer system to tie up and deactivate any pesticide residues. The suspension should be removed and disposed of properly, and the sprayer rinsed thoroughly with water to remove the activated charcoal. Any activated charcoal remaining in the tank will deactivate a portion of the next pesticide used in the sprayer.

Procedure for Cleaning Sprayers

Sprayers should be cleaned as soon as possible after use. Herbicide residues that have dried in the sprayer are much more difficult to remove than herbicides that remain in solution. The following guidelines should be followed when cleaning a sprayer.

- Mix only the amount of pesticide required, and apply the entire contents on the field as directed on the label. Dispose of any excess spray by applying it to an approved crop according to label directions.
- Thoroughly rinse sprayer tank with water, circulate the water through the sprayer system and, if possible, apply rinsate on the treated field.

To avoid contamination of wells and groundwater, do not flush and drain rinsate at a common location such as near the mixing and loading site. Most detections of pesticides in Kansas wells are believed to be the result of improper sprayer mixing and cleanout.

- Fill the sprayer tank half full of water and add the recommended cleaning agent as directed on the

herbicide label. If no agent is recommended on the label, add a mixture of water and detergent. Circulate the cleaning solution through the agitation system and spray boom for several minutes. Be sure that the walls of the sprayer tank are thoroughly rinsed. Allow the spray solution to sit in the sprayer several hours—preferably overnight. Then, pump the solution out of the sprayer system, and properly dispose of the rinsate.

- Rinse the entire spray system with fresh water. Be sure that all cleaning agent residues are out of the system, including the spray boom.
- Remove and clean nozzles, tips, and screens with cleaning solution and rinse with water. Store extra or unused tips in a clean, dry container that will protect the nozzle tips from physical damage.

Refer to the herbicide label for specific information on the recommended cleaning agent, protective clothing required, and cleaning procedures. The following table lists the recommended cleaning agents and sensitive crops following the use of certain herbicides.

Recommended cleaning agents and sensitive crops following the use of certain herbicides.

Herbicide	Recommended cleaning solution*	Sensitive crops
Accent	1% household ammonia or approved cleaning agent	Sorghum, sunflowers, canola, alfalfa
Accent Gold	1% household ammonia or approved cleaning agent	Sorghum and most broadleaf crops
Ally	1% household ammonia or approved cleaning agent	Corn and most broadleaf crops
Amber	1% household ammonia or commercial tank cleaner	Corn, sunflowers, soybeans, canola, cotton, alfalfa
Assure II	Detergent and water	Corn, sorghum, wheat, and other grasses
Atrazine	Detergent and water	Sunflowers, soybeans, canola, wheat, cotton
Authority Broadleaf	1% household ammonia or approved cleaning agent	Corn, sorghum, sunflower, canola, cotton, alfalfa
Banvel	1% household ammonia	All broadleaf crops
Basagran	Detergent and water	Cotton
Basis Gold	1% household ammonia	Sorghum, wheat, and most broadleaf crops
Beacon	2% household ammonia	Sorghum and most broadleaf crops
Blazer	Commercial tank cleaning agent	-
Broadstrike+Dual	Detergent and water	Sunflowers, sorghum, canola, cotton, alfalfa
Broadstrike+Treflan	Detergent and water	Sunflowers, sorghum, canola, cotton, alfalfa
Buctril	Detergent and water	Cotton
Canopy	1% household ammonia or approved cleaning agent	Corn, sorghum, sunflower, canola, cotton, alfalfa
Canopy XL	1% household ammonia or approved cleaning agent	Corn, sorghum, sunflower, canola, cotton, alfalfa
Clarity	1% household ammonia	All broadleaf crops
Classic	1% household ammonia or approved cleaning agent	Corn, sorghum, sunflowers, canola, cotton, alfalfa
Cobra	Detergent and water	-
Command	Detergent and water	Corn, sorghum, wheat, oats
Commence	1% bleach and 0.5% detergent	Corn, sorghum, wheat, oats

Herbicide	Recommended cleaning solution*	Sensitive crops
Contour	Detergent and water	Sunflowers, sorghum, soybeans, wheat, canola, cotton
Crossbow	Detergent and water	All broadleaf crops
Dual II	Detergent and water	-
Exceed	2% household ammonia	Sorghum and most broadleaf crops
Fallow Master	1% household ammonia	Most agronomic and horticultural crops
Finesse	1% household ammonia or approved cleaning agent	Corn and most broadleaf crops
FirstRate	1% household ammonia	Sunflowers, sorghum, corn, canola, alfalfa, cotton
Fusilade DX	Water and commercial cleaning agent	Corn, sorghum, wheat, and other grasses
Fusion	Water and commercial cleaning agent	Corn, sorghum, wheat, and other grasses
Glean	1% household ammonia	Corn and most broadleaf crops
Gramoxone Extra	Detergent and water	All crops
Harmony Extra	1% household ammonia or approved cleaning agent	Corn and most broadleaf crops
Harness	Detergent and water	-
Hornet	Detergent and water	Sorghum and most broadleaf crops
Laddok	Detergent and water	Wheat, sunflower, soybean, cotton
Lasso	Detergent and water	-
Landmaster BW	1% household ammonia	Most agronomic and horticultural crops
Lexone	Detergent and water	-
Liberty	Commercial tank cleaner	All crops except Liberty Link
Lightning	Detergent and water	All crops except IMI hybrids
Marksman	Water and commercial cleaning agent	All broadleaf crops
Matador	Detergent and water	Corn, sorghum, wheat, and other grasses
MCPA amine	1% household ammonia	All broadleaf crops
MCPA ester	1% kerosene or diesel followed by 1% household ammonia	All broadleaf crops
MicroTech	Detergent and water	-
Option II	Detergent and water	Corn, sorghum, wheat, and other grasses
Oust	1% household ammonia or approved cleaning agent	Most agronomic and horticultural crops
Partner	Detergent and water	-
Passport	Detergent and water	Sunflowers, sorghum, canola, cotton
Peak	2% household ammonia	Most broadleaf crops
Permit	2% household ammonia	Sunflowers, canola, cotton
Pinnacle	1% household ammonia or approved cleaning agent	Sunflowers, canola
Poast, Poast Plus	1% household ammonia, detergent, or commercial cleaning agent	Corn, sorghum, wheat, and other grasses
Prestige	1% household ammonia, detergent, or commercial cleaning agent	Corn, sorghum, wheat, and other grasses
Prowl	Detergent and water	-
Pursuit	Detergent and water	Sunflowers, sorghum, canola, cotton
Pursuit Plus	Detergent and water	Sunflowers, sorghum, canola, cotton
Python	Detergent and water	Sunflowers, sorghum, canola, cotton
Raptor	Detergent and water	Sunflowers, sorghum, canola, cotton
Remedy	Detergent and water	All broadleaf crops
Resolve	1% household ammonia	Sorghum and all broadleaf crops
Roundup Ultra	Detergent and water	All crops except Roundup Ready

Herbicide	Recommended cleaning solution*	Sensitive crops
Scepter	Detergent and water	Sunflowers, corn, canola, cotton
Scorpion III	Detergent and water	Sorghum and most broadleaf crops
Select	Detergent and water	Corn, sorghum, wheat, and all grasses
Sencor	Detergent and water	-
Shotgun	Detergent and water	All broadleaf crops
Skirmish	1% household ammonia or approved cleaning agent	Corn, sorghum, sunflowers, canola, cotton, alfalfa
Spirit	2% household ammonia	Sorghum and most broadleaf crops
Squadron	Detergent and water	Sunflower, corn, canola, cotton
Status	Commercial tank cleaning agent	-
Steel	Detergent and water	Sunflowers, sorghum, corn, canola, cotton
Stinger	1% household ammonia	Sunflowers, soybean, cotton, alfalfa
Synchrony STS	1% household ammonia or approved cleaning agent	Sunflowers, sorghum, corn, canola, cotton, alfalfa
Tordon	1% household ammonia	All broadleaf crops
Touchdown	Approved cleaning agent	All crops except glyphosate resistant
Treflan	Detergent and water	-
Tri-Scept	Detergent and water	Sunflowers, corn, canola, cotton
Zorial	Detergent and water	Corn, sorghum, wheat
2,4-D amine	1% household ammonia	All broadleaf crops
2,4-D ester	1% kerosene or diesel followed by 1% household ammonia	All broadleaf crops
All other herbicides	Detergent and water	

* % refers to volume cleaning agent/volume water: 1% = 1 gallon of cleaning agent per 100 gallons of water.

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