UT Extension
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Preventing Off-target Herbicide Problems in Tomato Fields

Herbicide Stewardship
Protecting Crops Environment Technology

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Introduction

Agricultural chemicals, particularly pasture and right-of-way herbicides, have the potential to cause off-target damage to tomatoes. Although these herbicides control many troublesome weeds, off-target damage to tomatoes often results in expensive fines and/or lawsuits, lost productivity for growers, and even crop rejection. Several management practices can be adopted to avoid these problems.

Herbicide Selection

Although highly effective on several broadleaf weeds in pastures and rights-of-way, the auxin or growth regulator herbicides can damage sensitive crops if not used properly. The characteristics of these herbicides determine which product to use in different situations. Under the right conditions, volatile herbicides change from a liquid to gas or vapor and move away from the target. Typically, dicamba and 2,4-D are more volatile than aminopyralid or picloram. Keep in mind that while ester formulations are more likely to volatilize than amine (salt) formulations, some salts of 2,4-D and dicamba are more volatile than others.

Fig. 1. Off-target herbicide damage to tomato.

Another factor that can affect future plans for a field is the persistence of herbicides. While dicamba and 2,4-D are highly active on tomato even in small doses, these materials are relatively nonpersistent in soil and in treated pasture grasses and hay. This is not the case with aminopyralid or picloram. Both of these herbicides can stay active in soil, pasture grass and hay for a year or longer. Furthermore, aminopyralid and picloram from treated forages are transferred into manure and urine of grazing animals. The herbicides can then be absorbed by future crops and cause injury. Also, because these herbicides are so difficult to rinse from sprayers, dedicating a sprayer to be used only on pastures and hay fields is the best way to avoid herbicide tank contamination issues on sensitive crops. **Herbicides that contain aminopyralid or picloram are for use in permanent grass pastures and grass hay fields only. They should not be used in fields that will be rotated to tomato or other broadleaf crops.**

Another characteristic to consider is water solubility. Picloram is more soluble than aminopyralid and therefore more likely to be moved off-site by runoff.

While highly active on tomato and other sensitive broadleaf crops, newer pasture and right-of-way herbicides such as aminopyralid have strong attributes in that they control some of our worst pasture and hay field weeds such as horsenettle, tall ironweed and beggarweed. Also, volatility, unlike in the case of 2,4-D, is not an issue.

Drift Prevention

The potential for herbicide drift to tomato fields, home gardens and other sensitive areas relies on several factors. Two types of drift, physical and vapor, can occur. Physical drift is the movement of liquid spray droplets away from the target, and it is influenced by spray equipment and wind. Calibrating your sprayer for low pressure (30 psi or less) and high volume (20 to 30 gallons per acre) applications will reduce the number of fine spray droplets carried by wind. Lowering spray boom height also minimizes drift, but make sure that the correct spray pattern overlap is achieved. New advances in spray tip design, such as air induction technology, have allowed for adequate spray patterns while producing large droplets. In many cases, air induction nozzles require higher operating pressures than flat fan nozzles, so be sure to check the nozzle specifications. Another rule of thumb is to spray on calm days and when wind direction is away from sensitive areas. Calm conditions are more likely to occur early or late in the day. A well-placed buffer area that is not sprayed adds distance between the herbicide and the sensitive crop. Drift reduction agents can also be used to reduce physical drift, but check the labels for compatibility.

Fig. 2. Herbicide applications made on calm days with low pressures and low boom heights can reduce the likelihood of physical drift.

Common auxin herbicides.

Common name	Chemical family	Trade names
aminopyralid	Pyridine-carboxylic acid	Milestone, ForeFront R&P, ForeFront HL, GrazonNext
picloram	Pyridine-carboxylic acid	Tordon, Surmount, Grazon P+D
2,4-D	Phenoxyacetic acid	Various names and mixtures
dicamba	Benzoic acid	Banvel, Clarity, Oracle, Rifle, Brash, Rangestar, Weedmaster

Vapor drift is the movement of spray vapor away from the target after the herbicide has been deposited on the target. It is mainly influenced by air temperature, but also by relative humidity (RH) and herbicide formulation. Some chemicals volatilize readily at warm (higher than 85 degrees F) temperatures and dry air (RH less than 40 percent) increases the likelihood of vapor drift. If sensitive crops are nearby, use the amine formulation of 2,4-D rather than the low volatile ester formulation. During late spring to summer applications, warm temperatures are likely to be encountered at or shortly after spraying. This is very important to remember, in that vapor drift will be worse under warm conditions, and that it can occur even a few days after application. Herbicides containing dicamba are also temperature sensitive (see above table). Keep in mind that drift reduction measures such as low pressure, special nozzles, drift retardants, etc. do not reduce vapor drift.

Other considerations to bear in mind are proximity to sensitive fields and timing of herbicide application. Be familiar with adjoining properties and owners. For example, check on when your neighbor plans to plant tomatoes, and which field he or she plans to use. If you are growing tomatoes, be sure that your neighbors know your plans. Try to spray at a time of year when sensitive crops are not growing. This timing is often difficult to accomplish, because the optimum time for weed control may occur when a sensitive crop is in the field. However, some weeds, such as musk thistle, may be treated after mid-October with 2,4-D. Winter annual weeds such as buttercup also can be sprayed with 2,4-D in early spring, before tomatoes are transplanted. These are good approaches to a field across the fence from your neighbor's tomato field, in that you could apply at a time of year when the crop is not susceptible to drift injury.

Consider before you spray:

- *Herbicide label instructions.*
- *Proximity of sensitive crops.*
- *Potential volatility of the herbicide you choose.*
- *Future plans for the field.*
- *Current and forecast weather.*
- *Sprayer calibration and adjustment to minimize drift.*
- *Potential runoff into sensitive areas or irrigation waters.*
- *Inform your neighbors of your plans.*

Field Selection

The location, characteristics and history of a field influence future management strategies. A proper risk assessment should be performed before spraying a pasture with some of these herbicides. Rains can wash certain herbicides downhill to sensitive areas. Applications of picloram should not be made on sites with steep slopes and bare soils. It is also important to avoid situations where herbicide runoff can contaminate streams or reservoirs that may be used to irrigate tomatoes or other sensitive crops. Vegetated buffer strips around ponds can help to reduce herbicide surface movement.

Before planting tomatoes, one should research the history of the field to see if it has been treated with any persistent herbicides in the past three years. Farm managers should keep up-to-date records of what has been sprayed in each field because it affects if and when tomatoes can be planted. Also, treated bales should not be stored on land where tomatoes will be planted, as herbicides can leach into the ground and injure the next crop.

Movement of Cattle and Handling of Manure

It is important to monitor cattle that have grazed on pastures treated with persistent herbicides (aminopyralid and picloram). These herbicides remain intact in treated pasture grasses or hay, and when these forages are consumed by animals, the chemicals pass through their digestive and urinary systems without change and into the manure and urine. It takes several days for aminopyralid and picloram to pass through the digestive and urinary systems of an animal. Suppose a producer treats a pasture with picloram, grazes cattle in that pasture a few weeks later and then moves the cattle directly to a field of tall fescue. If that field is destined for rotation to tomatoes the following year, then herbicides can be carried over from manure and urine in sufficient concentration to produce noticeable injury to transplants. Producers should handle manure so that placement will not affect future production.

Fig. 3. Movement of cattle should be carefully managed because some pasture herbicides can remain active in manure and urine.

Cattle should be removed from a treated pasture for a period of three days for aminopyralid and seven days for picloram before manure can be used to fertilize tomatoes or other sensitive crops. If rotating cattle to a field that is destined for rotation to tomatoes, the same periods apply and cattle should be moved to an untreated holding area first. Manure from animals that have recently grazed a treated pasture should not be used in home gardens.

According to the manufacturer, breakdown of aminopyralid in manure is more rapid under warm, moist soil conditions and may be accelerated by supplemental irrigation. Also, aminopyralid residues in manure will degrade faster if incorporated into the soil. Residues will break down much slower if manure is stored in a heap. Manure collected from animals that grazed treated forage or consumed hay harvested from treated areas should be stored away from other manure and properly labeled. Manure with aminopyralid residues can only be used to fertilize rangeland, permanent pastures, wheat and corn.

Consider before you plant:

- *What was sprayed in this field over the last three years?*
- *If manure was spread, what was its origin?*
- *Was treated hay stored in this field?*
- *Were cattle moved here from a pasture treated with aminopyralid or picloram?*
- *Can herbicides move into this field?*

Handling of Treated Hay

Producers should know the origin of purchased hay and whether it was treated with persistent pasture herbicides. Hay of unknown origin should be used with caution if animals are located in a field that may be rotated to tomatoes. It is a good idea to tag treated bales in order to keep track of which animals have been fed treated hay. Untreated hay bales should be kept separate from treated bales. Also, treated bales should not be stored on land where tomatoes will be planted, as herbicides can leach into the ground and injure the next crop. Similarly, treated hay should not be used as mulch for tomatoes or other crops in home gardens and landscapes.

Cattle should be taken off hay for three days if treated with aminopyralid and seven days for picloram before they are moved to a sensitive area. Hay feeding areas should not be rotated to tomatoes or other sensitive broadleaf crops.

Monitoring Results

Producers are encouraged to assess the performance of herbicides in pastures and hay fields. Tracking results will guide future decisions for weed control. It is important to keep a log of all applications with dates, products, field locations and weather conditions. (This log is required by law for picloram, as it is a restricted use pesticide.) Also, cattle producers should keep records of which animals have grazed treated areas or have been fed treated hay and for how long. Adequate records will help producers keep herbicides contained within the target area, thereby reducing negative impacts to other farm operations and ensuring the availability of these important tools for the foreseeable future.

Consider after you spray:

- *Documenting date, rate and location of herbicide application.*
- *Holding area for cattle that have grazed treated pasture or have been fed treated hay.*
- *Waiting period before cattle can be moved to an area destined for rotation to tomatoes.*
- *Tagging and separate storage of treated hay.*

References

Anonymous. 2012. Aminopyralid Stewardship Sheet. Dow AgroSciences. Available online at http://www.dowagro.com/range/products/milestone.htm

Anonymous. 2012. Milestone herbicide label. Dow AgroSciences.

Jordan, Tom, Glenn Nice, Bill Johnson and Tom Bauman. 2011. Reducing Spray Drift from Glyphosate and Growth Regulator Herbicide Drift Caution. Pest&Crop No. 6. Purdue Cooperative Extension Service.

Picture Credits

Fig. 2. Boom sprayer. Digital image. Accessed 21 Apr. 2012. Available online at http://gilmerdairy.blogspot.com/2011/06/weed-zappin.html.

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