

DuPont Forestry and Vegetation Management Sulfonyleurea Herbicides

Delivering quality products, service, stewardship and solutions

Sulfonyleureas are a family of environmentally compatible herbicides that were discovered by DuPont in 1975 and first commercialized for wheat and barley crops in 1982. They have been further developed and commercialized worldwide to provide weed control in all major crops, as well as non-crop applications such as vegetation management, forestry, wildlife rehabilitation and noxious/selective weeding.

This class of compounds controls weeds by inhibiting the activity of acetolactate synthase — a key enzyme required for plant cell growth. The introduction of this unique mode of action represented a major advance in crop protection technology and helped to revolutionize weed control around the world. Today, sulfonyleurea herbicides continue to gain use because they are compatible with global trends toward low use-rate products, postemergence weed control, minimal environmental “footprints” and integrated pest management.

Benefits of DuPont Forestry and Vegetation Management Sulfonyleurea Herbicides:

DuPont™ Escort® XP, Landmark® XP, Oust® XP, Telar® XP herbicides and Lineage™ family of products.

- Superior quality aimed at ensuring both customer satisfaction and the sustainability of these important tools.
- Favorable environmental fate characteristics: Degrade in the soil by both chemical and microbial processes.
- Minimal potential for accumulation in groundwater.
- Performance via coarse spray application also helps reduce drift potential.
- Potential for vapor drift minimized due to low volatility.
- Active ingredient application reduced by 95 percent to 99 percent relative to higher use-rate products.
- Low dose benefits of reduced manufacturing and packaging waste and of easier handling, storage and transport.

Delivering products with the highest quality

Once the patent coverage for the active ingredient of a forestry or vegetation management product expires, generic products which contain that active typically begin to arrive in the marketplace. A standard business practice is to examine these generic products and compare them to the original patent holder’s product. Generally, consideration is given to the concentration of the active ingredient and the price without much regard to the quality of

the product. However, for a true comparison, one must also consider active ingredient specifications, formulation and packaging, and product measurement.

Over the past nine years, DuPont has collected and evaluated generic sulfonyleurea products from several sources and found that a substantial number contain additional process impurities and contaminants. We also found a number of generic products that have incorrect assay specifications and inadequate formulation and packaging attributes.



Manufacturing quality

The process used to make sulfonylureas can be relatively simple. However, it is extremely difficult to consistently produce pure, high-quality sulfonylurea-based herbicides. There are a series of steps common to the production of all sulfonylureas, and extreme care must be exercised throughout the process to ensure the consistency and quality of the final product. If conditions are not carefully controlled during production, for example, the manufacturer runs the risk of generating other active ingredients in the process.

To help prevent contamination between batches, bulk ingredients must be properly labeled and tracked; production equipment must be well maintained and kept clean. Computerized process controls should be utilized to maintain consistency from batch to batch and from season to season.

Active ingredient specification

The Food and Agriculture Organization (FAO) of the United Nations and the United States Environmental Protection Agency (USEPA) mandate the specifications for assay of an active ingredient in a pesticide product. The following example shows the importance of a product meeting these specifications. The example is of a generic tribenuron-methyl product whose label claims that it contains 75 percent active ingredient. FAO specifications for a 75 percent

FAO Specification Range for Labeled Assay Content

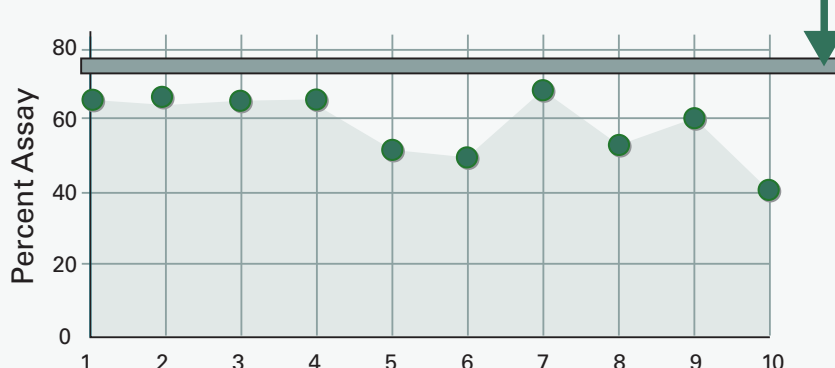


Figure 1: Active ingredient assay for 10 samples of a generic supplier's wettable granular offering of tribenuron-methyl with a stated percentage of 75% active ingredient.

formulation require that the assay of the active ingredient must fall within the range 72.5 percent to 77.5 percent. In Figure 1, none of the 10 samples of a generic product obtained and analyzed met this specification, potentially leading to inadequate product performance.

In the United States, the USEPA expects manufacturers to meet even more stringent requirements. The assay of the same 75 percent formulation would normally be expected to be within a range of only 72.7 to 77.3.

Formulation

In some instances, generic products fail to meet minimum industry standards defined by the Collaborative International Pesticides Analytical Council (CIPAC). Products that fail to meet these specifications often perform poorly in the field. The comparison in Figure 2 shows the 75 micron (200 mesh) wet sieve retains (i.e., undispersed materials that can contain active and/or

formulation ingredients) of a generic chloresulfuron wettable powder formulation (shown on left in Figure 2) and DuPont chloresulfuron wettable powder formulation (DuPont™ Telar® DF herbicide shown on right in Figure 2) using CIPAC method MT182. The retains remaining on the sieve after a two-minute rinse are then quantified as a percentage of the original sample weight. In this case, the generic chloresulfuron wettable powder had retains of 7 percent, far in excess of the 2 percent maximum allowed by CIPAC, while the DuPont chloresulfuron wettable powder gave retains of only 0.1 percent. Failure to meet the 2 percent specification for 75 micron (200 mesh) wet sieve retains can result in clogged sprayer nozzles and in-line filters, solids that rapidly settle on the tank bottom, difficulty cleaning out the spray tank and inconsistent or uneven application of the spray solution.



Figure 2: 75 micron (200 mesh) wet sieve retains. The diameter of the sieve is 10 cm (4 in). Generic chlorsulfuron (left). DuPont™ Telar® DF herbicide [chlorsulfuron] (right).

Packaging and product measurement

Packaging is another important attribute to consider. Poorly packaged product can lead to customer concerns. Figure 3 provides an example of inconsistency in package weight. In this case, 11 commercially produced pouches of a generic product were collected and the net weight of each was determined. Results indicated that 18 percent (2 out of 11) of the packages were underweight, and by as much as 20 percent. As a result, customers are paying for product they did not receive.

Quality products supported by DuPont

In the short term, buying a generic product may save money, but you are likely to get less than what you bargained for. As the exhibits in this brochure illustrate, you may not get the total amount of the active ingredient(s) or the full weight of the product as listed on the package. And, perhaps most importantly, you will not get the service and support that satisfied customers and partners have come to expect from DuPont.

The DuPont Company recently marked its 200th year in business. It has been a trusted source of Forestry and Vegetation Management products and solutions for more than 50 of those years. And you can rest assured that the company will continue to be there — season after season — with products, innovations, service and support to help meet your needs.

New XP formulation technology

The application of XP formulation technology to DuPont Forestry and Vegetation Management products sets an even higher standard for quality, consistency and performance. This proprietary process creates an end-use product that is uniform in size for improved solubility and easier measuring. The key benefit is that XP formulation technology improves the way products mix in the tank, which results in more uniform spray coverage for more consistent weed control.

Experience in the field

The DuPont sales and technical service representatives are among the most knowledgeable in the industry. On average, each representative has more than 25 years experience in the marketplace.

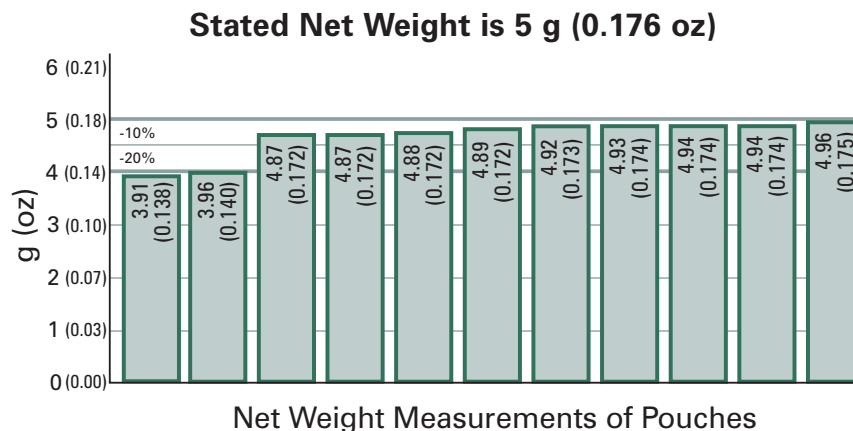


Figure 3: Inconsistent package weights from 11 pouches of a generic product. Pouch weights at or below the -20% line are significantly underweight.

More miracles of science

DuPont researchers are continually working to develop new products and improve existing offerings to bring new solutions to an ever-changing marketplace. The new XP formulations are just one example of this commitment. In addition, significant capital investments have already been made at key production facilities across the United States and its territories. Now, DuPont will be able to bring customer and segment specific products to market more quickly than ever before.

Conclusion

Quality is likely to vary between products produced by different manufacturers. These differences in quality may include active ingredient specifications, formulations and packaging. Inconsistencies in any of these attributes may affect the performance of a product as well as the ability to get that product registered.

Regulatory agencies throughout the world are responsible for ensuring that herbicides and pest control products meet the appropriate standards. DuPont fully supports regulatory efforts to sample commercially available products and to monitor quality against registration requirements.

The DuPont family of sulfonylurea herbicides has been adapted to the broadest possible agricultural systems and conditions throughout the world. To date, sulfonylurea herbicides have been registered for major uses in 50 countries. DuPont is committed to providing products with superior quality aimed at ensuring both customer satisfaction and the sustainability of these important tools.

For more information

To learn more about the benefits of DuPont Forestry and Vegetation Management Sulfonylurea herbicides, contact your local Service Center or DuPont representative. And visit us on the Web at vm.dupont.com.

This reference guide is not intended as a substitute for the product label for the product(s) referenced herein. Product labels for the above product(s) contain important precautions, directions for use and product warranty and liability limitations that must be read before using the product. Applicators must be in possession of the product label(s) at the time of application. Always read and follow all label directions and precautions for use.

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