

HORSERADISH

General Information

WEED RESISTANCE MANAGEMENT

SPARTAN ELITE herbicide, which contains the active ingredients sulfentrazone and S-metolachlor is a group 14 and 15 herbicide based on the mode of action classification system of the Weed Science Society of America.

Proactively implementing diversified weed control strategies to minimize selection for weed populations resistant to one or more herbicides is a best practice. A diversified weed management program may include the use of multiple herbicides with different sites of action and overlapping weed spectrum with or without tillage operations and/or other cultural practices. Research has demonstrated that using the labeled rate and directions for use is important to delay the selection for resistance.

The continued effectiveness of this product depends on the successful implementation of a weed resistance management program.

To aid in the prevention of developing weeds resistant to this product, users should:

- Scout fields before application to ensure herbicides and rates will be appropriate for the weed species and weed sizes present.
- Start with a clean field, using either a burndown herbicide application or tillage.
- Control weeds early when they are relatively small (less than 4 inches).
- Apply full rates of SPARTAN ELITE herbicide for the most difficult to control weed in the field at the specified time (correct weed size) to minimize weed escapes.
- Scout fields after application to detect weed escapes or shifts in control of weed species.
- Control weed escapes before they reproduce by seed or proliferate vegetatively.
- Report any incidence of non-performance of this product against a particular weed

to your local retailer or county extension agent.

- Contact your crop advisor or extension agent to find out if suspected resistant weeds to these MOAs have been found in your region. Do not assume that each listed weed is being controlled by multiple sites of action. Products with multiple active ingredients are intended to broaden the spectrum of weeds that are controlled. Some weeds may be controlled by only one of the active ingredient in this product.

- If resistance is suspected, treat weed escapes with an herbicide having a site of action other than Group 14 and 15 and/or use nonchemical methods to remove escapes, as practical, with the goal of preventing further seed production.

- Suspected herbicide-resistant weeds may be identified by these indicators:

- Failure to control a weed species normally controlled by the herbicide at the dose applied, especially if control is achieved on adjacent weeds;

- A spreading patch of non-controlled plants of a particular weed species; and

- Surviving plants mixed with controlled individuals of the same species.

Additionally, users should follow as many of the following herbicide resistance management practices as is practical:

- Use a broad-spectrum, soil-applied herbicide with other sites of action as a foundation in a weed control program.

- Utilize sequential applications of herbicides with alternative sites of action.

- Rotate the use of this product with non-Group 14 and 15 herbicides..

- Avoid making more than two applications of SPARTAN ELITE herbicide and any other Group 14 and 15 herbicides within a single growing season unless mixed with an herbicide with a different site of action with an overlapping spectrum for the difficult-to-control weeds.

- Incorporate non-chemical weed control practices, including mechanical cultivation, crop rotation, cover crops and weed-free crop seeds, as part of an integrated weed control program.

- Use good agronomic principles that enhance crop development and crop competitiveness.
- Thoroughly clean plant residues from equipment before leaving fields suspected to contain resistant weeds.
- Manage weeds in and around fields, during and after harvest to reduce weed seed production.

PRODUCT INFORMATION

SPARTAN ELITE herbicide is a soil-applied herbicide for the control of susceptible broadleaf, grass and sedge weeds.

If adequate moisture (1/2" to 1") from rainfall or irrigation is not received within 7 to 10 days after the SPARTAN ELITE herbicide treatment, a shallow incorporation (less than 2"), may be needed to obtain desired weed control.

When activating moisture is not received a planned post-emergence application of a labeled herbicide will be needed for optimum weed control. If an activating rainfall (1/2" to 1") is not received SPARTAN ELITE herbicide will provide a reduced level of control of susceptible germinating weeds.

Observe all instructions, crop restrictions, mixing directions, application precautions, replanting directions, rotational crop guidelines and other label information of each product when tank mixing with SPARTAN ELITE herbicide. Tank mixtures are permitted only in those states where the tank mix partner is registered.

SPARTAN ELITE herbicide can be mixed with water, liquid fertilizer, or mixtures of water and liquid fertilizer and applied as a preplant or preemergence treatment to labeled crops. It is the pesticide user's responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mix mixture.

Under normal growing conditions, SPARTAN ELITE herbicide exhibits excellent crop safety. Soil applications of SPARTAN ELITE herbicide must be made before crop seed germination to prevent injury to the emerging crop seedlings. SPARTAN ELITE herbicide applied after crop emergence will cause severe injury to the crop. Poor

growing conditions, such as excessive soil moisture, cool temperatures, and soil compaction or the presence of various pathogens may impact seedling vigor. Under these conditions, the active ingredients in SPARTAN ELITE herbicide can contribute to crop response. Refer to the specific directions of use for a particular crop/use pattern as set forth below for additional information.

IMPORTANT PRECAUTIONS

1. Ensure the seed furrow is closed and the seed covered on acres treated with SPARTAN ELITE herbicide.
2. Soybean stunting may occur if excessive rainfall occurs after application but before soybeans emerge. Injury is more prevalent under poor drainage or compacted conditions or when soil is saturated for long periods of time. Soybeans outgrow stunting once favorable growing conditions return.
3. Do not apply if there are visible signs of cracking due to soybean emergence, or serious crop injury may result, such as but not limited to stand loss.
4. Seedling disease, nematodes, cold weather, deep planting (more than 2”), excessive moisture, high salt concentration, or drought may weaken soybean seedlings and increase the possibility of crop injury.
5. When tank mixing, follow the most restrictive use rates and precautions of the mixing partners.

Mechanism of Action

Following the application of SPARTAN ELITE herbicide to soil, germinating seeds and seedlings take up SPARTAN ELITE herbicide from the soil solution.

The amount of SPARTAN ELITE herbicide in soil solution available for weed uptake is determined primarily by soil type, soil organic matter and soil pH. Similar to other herbicides, SPARTAN ELITE herbicide adsorbs to the clay and organic matter (OM) fractions of soils; effectively limiting the amount of active ingredient immediately available to control weeds.

Influence of soil type, organic matter and pH on SPARTAN ELITE herbicide use rates and crop response Coarse textured and high pH >7.2 soils (see Table 1) will exhibit increased weed control and crop response with SPARTAN ELITE herbicide. It is important to know the soil type and soil pH levels of the field (or areas within a

field) before application to determine the proper rate of SPARTAN ELITE herbicide for the crop. Soil organic matter content and soil pH can vary widely and independently of soil type and requires an accurate analysis of representative soil samples or grids of soil samples within a specific field to determine its content.

It is important to note that irrigation with highly alkaline water (high pH) following a SPARTAN ELITE herbicide soil application can also significantly increase the amount of SPARTAN ELITE herbicide available in the soil solution. Irrigation with water having a pH greater than 7.2 could result in adverse crop response. This response will ultimately depend on initial SPARTAN ELITE herbicide application rate, timing, amount and pH of irrigation water and sensitivity of the crop and it's growth stage when irrigated. The risk of adverse crop response will lessen with the advance in growth stage among most crops.

SOIL TEXTURE CLASSIFICATION CHART

COARSE: Sand, Loamy sand, Sandy loam

MEDIUM: Sandy clay loam, Sandy clay, Loam, Silt loam, Silt

FINE: clay loam, Silty clay, Clay loam, Clay

APPLICATION INFORMATION

Ground and Aerial Application

Utilize a sprayer equipped with the appropriate nozzles providing optimum spray distribution and coverage at the appropriate operating pressures. Utilize nozzles that produce minimal amounts of fine spray droplets to avoid spray drift. Apply a minimum of 10 gallons of finished spray solution per acre by ground or 5 gallons by air. The sprayer should be properly calibrated to deliver the appropriate volume of herbicide solution. Be aware that overlaps and slower ground speeds while starting, stopping or turning while spraying may result in excessive application and subsequent crop response.

Restrictions

Do not apply when wind speed favors drift beyond the area intended for treatment.

Do not apply under conditions which favor runoff or wind erosion of soil containing this product to non-target areas.

To prevent off-site movement due to runoff or wind erosion:

1. Avoid treating powdery dry or light sand soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.
2. Do not apply to impervious substrates, such as paved or highly compacted surfaces.
3. Do not use tailwater from the first flood or furrow irrigation of treated fields to treat non-target crops, unless at least $\frac{1}{2}$ inch of rainfall has occurred between application and the first irrigation.

Chemigation Application

Apply SPARTAN ELITE herbicide in 0.25 to 1 inch of water. Use the lower water volume on coarse textured soil and higher volume on fine textured soils.

Applying >1" of irrigation water may result in reduced weed control by moving the product below the weed germination zone in the soil. Apply immediately after planting unless specified differently in the individual crop section. SPARTAN ELITE herbicide may be applied through sprinkler irrigation systems including center pivot, lateral move, end tow, solid set, or hand move irrigation systems. Crop injury, lack of effectiveness or illegal residues on or in the crop can result from non-uniform distribution of treated water. If you have questions about calibration, you should contact State Extension Service specialists, equipment manufacturers, or other experts. A person knowledgeable of the chemigation system and responsible for its operation, or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

The system must contain a functional check valve, vacuum relief valve, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow. The pesticide injection pipeline must also contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump. The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake

side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down. The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops. The irrigation line or water pump must include a functional pressure switch, which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.

Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

SPARTAN ELITE herbicide should be metered into the irrigation system continuously for the duration of the water application. SPARTAN ELITE herbicide should be diluted in sufficient volume to insure accurate application over the area to be treated. Use the appropriate amount of water to carry the product to the soil surface. Continuous agitation is required to maintain product suspension in the solution tank. A jar test should be conducted to ensure that phase separation would not occur during dilution and application. Failure to achieve a uniform dilution throughout the time of application may result in undesirable residues or less than desirable weed control. Flush the lines at the completion of the application and then turn the water off promptly. When using water from public water systems; **DO NOT APPLY SPARTAN ELITE herbicide THROUGH ANY IRRIGATION SYSTEM PHYSICALLY CONNECTED TO A PUBLIC WATER SYSTEM.** Public water system means a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days of the year. SPARTAN ELITE herbicide may be applied through irrigation systems, which may be supplied by a public water system only if water from the water system is discharged into a reservoir tank prior to pesticide introduction. There shall be a complete physical break (air gap) between the outlet end of the fill pipe and to top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe. Before beginning chemigation, always make sure that the air gap exists and that there is no blockage of the overflow of the reservoir tank.

It is important to note that irrigation with highly alkaline water (high pH) following a SPARTAN ELITE herbicide soil application may significantly increase the amount of

sulfentrazone available in soil solution. Irrigation with water having a pH greater than 7.2 could result in adverse crop response.

Restrictions

Do not apply by chemigation if there are visible signs of cracking due to soybean emergence, or serious crop injury may result, such as but not limited to stand loss.

Do not apply this product through any other type of irrigation system.

Do not connect any irrigation system (including greenhouse systems) used for pesticide application to a public water system.

Application with Dry Fertilizers

SPARTAN ELITE herbicide may be applied impregnated on dry fertilizers. When applied as directed with adequate soil coverage, SPARTAN ELITE herbicide dry bulk fertilizer mixtures will provide satisfactory weed control.

Follow all SPARTAN ELITE herbicide label directions regarding product use rates per acre, registered crops, incorporation, special instructions and precautions. Apply SPARTAN ELITE herbicide/dry fertilizer mixtures with ground equipment only. All individual state regulations relating to dry bulk fertilizer blending, registration, labeling, and application are the responsibility of the individual and/or company preparing, storing, transporting, selling or applying the SPARTAN ELITE herbicide/dry fertilizer mixture.

Impregnation Directions

To impregnate SPARTAN ELITE herbicide on dry bulk fertilizer, use a closed rotary-drum mixer or other commonly used dry bulk fertilizer blender equipped with suitable spray equipment.

Prepare a slurry of SPARTAN ELITE herbicide in a clean container using clear water. Slowly add the SPARTAN ELITE herbicide/water slurry to the impregnation spray tank and finish filling as needed with clear water. Spray nozzles must be placed to provide uniform coverage of SPARTAN ELITE herbicide onto the fertilizer during mixing.

Refer to the SPRAYER EQUIPMENT CLEAN-OUT section for directions for cleaning impregnation equipment, transport equipment, loading equipment and application equipment.

Apply the SPARTAN ELITE herbicide dry bulk fertilizer with an accurately calibrated dry fertilizer spreader. The SPARTAN ELITE herbicide dry bulk fertilizer mixture must be spread uniformly on the soil surface. Uneven spreading leaving untreated areas can cause poor weed control or overlapping areas with potential increased SPARTAN ELITE herbicide use rates could result in possible crop response.

A minimum of 200 pounds of dry bulk fertilizer impregnated with the listed amount of SPARTAN ELITE herbicide must be applied per acre to achieve adequate soil coverage for satisfactory weed control.

Refer to the appropriate crop section of the SPARTAN ELITE herbicide label to determine the rate of SPARTAN ELITE herbicide to be applied per acre.

Use the following table to determine the amount of SPARTAN ELITE herbicide to be impregnated on a ton (2000 pounds) of dry bulk fertilizer based on the rate of fertilizer that will be applied per acre.

Restrictions

DO NOT impregnate SPARTAN ELITE herbicide onto coated on ammonium nitrate, potassium nitrate, or sodium nitrate either alone or in blends with other fertilizers because these materials will not absorb the herbicide.

Do not use SPARTAN ELITE herbicide alone or in mixtures on straight limestone, since absorption will not be achieved. Fertilizer blends containing limestone can be impregnated.

To avoid crop injury, do not use the herbicide/fertilizer mixture on crops where bedding occurs.

Application with Liquid Fertilizer

SPARTAN ELITE herbicide may be applied using liquid fertilizer or fertilizer and water mixtures as the carrier. Adequate soil coverage is essential to achieve acceptable levels of weed control.

Herbicide mixing, solution stability and/or compatibility problems may occur when

liquid fertilizers are used as a carrier. Compatibility tests must be conducted prior to mixing to insure tank mixture compatibility and stability. The use of compatibility agents may be beneficial to achieve and maintain a homogenous solution.

Mixing Instructions for Liquid Fertilizer Applications

Fill the clean spray tank to one half of the total volume with the fertilizer solution. Start the spray tank agitation system. Pre slurry SPARTAN ELITE herbicide with water prior to adding to the spray tank. Carefully rinse the empty container, adding the rinsate to the spray tank.

Complete filling the spray tank to the desired level. Sufficient and continuous spray tank agitation is required at all times to maintain a homogenous spray solution. The spray system must be designed such that there is sufficient flow capacity to uniformly apply the spray mixture and maintain adequate tank agitation. Some systems may require separate pumps to simultaneously supply the spray system and the spray tank agitation system. Insure the SPARTAN ELITE herbicide slurry is thoroughly mixed before application.

For tank mixtures with other herbicide(s), a compatibility test must be conducted to insure product compatibility before mixing. Read and follow all the directions, precautions and restrictions of the tank mixture products prior to mixing.

Apply the SPARTAN ELITE herbicide spray mixture immediately after mixing. It is not recommended to store the sprayer overnight or for any extended period of time with the SPARTAN ELITE herbicide spray mixture remaining in the tank. Thoroughly re-agitate spray mixture if product is left sitting in the tank for extended period of time.

If SPARTAN ELITE herbicide is mixed and loaded in nurse tanks, thorough agitation of spray solution is required prior to off-loading and application.

Follow all SPARTAN ELITE herbicide label directions regarding product use rates per acre, registered crops, application instructions, incorporation directions, special instructions and all precautions.

All individual state regulations relating to liquid fertilizer blending, storage, transportation, registration, labeling, and application are the responsibility of the individual and/or company preparing, selling or applying the SPARTAN ELITE herbicide and fertilizer mixture.

CROP ROTATIONAL RESTRICTIONS

The following Table 4 in the label shows the minimum interval in months from the time of the last SPARTAN ELITE herbicide application until SPARTAN ELITE herbicide treated soil can be replanted to the crops listed. Cover crops for soil health and erosion control can be planted at any time after an application of SPARTAN ELITE herbicide, but do not use cover crops for food or feed. Consult your local University extension service for cover crop sensitivity to SPARTAN ELITE herbicide. When SPARTAN ELITE herbicide is tank mixed with another herbicide, refer to the partner label for re-cropping instructions, following the directions that are most restrictive.

Some crops have rotational intervals greater than 12 months after a SPARTAN ELITE herbicide application due to potential crop injury. A representative bioassay of the field shall be completed with the rotational crop to accurately determine the planned crop's sensitivity to SPARTAN ELITE herbicide.

RESTRICTION: Do not rotate to food or feed crops other than those listed on the label.

REPLANTING INSTRUCTIONS

If initial planting of labeled crops fails to produce a stand, only crops labeled for SPARTAN ELITE herbicide or the tank mix partner; whichever is most restrictive, may be planted based on the amount of product initially applied. When replanting use minimum soil tillage to preserve the herbicide barrier and achieve maximum weed control.

RESTRICTIONS:

Do not retreat field with SPARTAN ELITE herbicide or other herbicide containing sulfentrazone and S-metolachlor. Do not plant treated fields to any crop at intervals that are inconsistent with the Rotational Crop Guidelines on this label.

BAND TREATMENT APPLICATIONS

For band treatments, apply the broadcast equivalent rate and volume per acre.

MIXING AND LOADING INSTRUCTIONS

SPARTAN ELITE herbicide may be applied alone, or in tank mixtures with other labeled herbicides for the control of additional weed species. Mixtures with some other pesticides have not been tested. Conduct appropriate compatibility tests prior to tank mixing with other pesticides. It is the pesticide user's responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

It is important that spray equipment is clean and free of existing pesticide residues before preparing SPARTAN ELITE herbicide spray mixtures. For all tanks containing spray solution follow the spray tank clean out procedures specified on the label of the product or products previously applied.

For best results fill spray tank with one half of the volume of clean water needed for the field to be treated. Start agitation system. Slowly add the SPARTAN ELITE herbicide to the spray tank. Carefully rinse the empty container, adding the rinsate to the spray tank. Complete filling the spray tank to the desired level. Continuous spray tank agitation is required at all times to maintain a uniform spray solution. Make sure SPARTAN ELITE herbicide is thoroughly mixed before application.

Use the SPARTAN ELITE herbicide spray mixture immediately after mixing. Avoid storing the sprayer overnight or for any extended period of time with the SPARTAN ELITE herbicide spray mixture remaining in the tank.

If SPARTAN ELITE herbicide is tank mixed with other labeled herbicides, it is the pesticide user's responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

SPRAYER EQUIPMENT CLEAN-OUT

As soon as possible after spraying SPARTAN ELITE herbicide and before using sprayer equipment for any other applications, the sprayer must be thoroughly cleaned to avoid potential crop effects using the following procedure. Residues left in mixing equipment, spray tanks, hoses, spray booms and nozzles can cause crop effects if they are not properly cleaned. In addition, users must take appropriate steps to ensure proper equipment clean-out for any other products mixed with

SPARTAN ELITE herbicide as required on the other product labels. More complete cleaning can be achieved if the spray system is cleaned immediately following the application.

1. Drain sprayer tank, hoses, spray boom and spray nozzles. Use a high-pressure detergent wash to remove physical sediment and residues from the inside of the sprayer tank and thoroughly rinse. Then, thoroughly flush sprayer hoses, spray boom and spray nozzles with a clean water rinse. Remove and clean spray tips and all filters and screens (tank, spray hose and spray tips) separately in the ammonia solution of Step 2.
2. Next, prepare a sprayer cleaning solution by adding three gallons of ammonia (containing at least 3% active) per 100 gallons of clean water. Prepare sufficient cleaning solution to allow the operation of the spray system for a minimum of 15 minutes to thoroughly flush hoses, spray boom and spray nozzles.
3. Convenient and thorough cleaning of the sprayer can be achieved if the ammonia solution or fresh water is left in the spray tank, hoses, spray booms and spray nozzles overnight or during storage.
4. Before using the sprayer, completely drain the sprayer system. Rinse the tank with clean water and flush through the hoses, spray boom, and spray nozzles with clean water. Remove and clean spray tips and all filters and screens (tank, spray hose and spray tip) separately in an ammonia solution.
5. Properly dispose of all cleaning solution and rinsate in accordance with Federal, State, and local regulations and guidelines.

Do not apply sprayer cleaning solutions or rinsate to sensitive crops.

Do not store the sprayer overnight or for any extended period of time with SPARTAN ELITE herbicide solution remaining in the tank, spray lines, spray boom plumbing, spray nozzles or strainers. If the sprayer has been stored or idle, purge the spray boom and nozzles with clean water before beginning any application.

Should small quantities of SPARTAN ELITE herbicide remain in inadequately cleaned mixing, loading and/or spray equipment, they may be released during subsequent applications potentially causing effects to certain crops and other vegetation. FMC accepts no liability for any effects due to inadequately cleaned equipment.

Do not drain or flush equipment on or near desirable trees or plants.

Do not contaminate any body of water including irrigation water that may be used on other crops.

Limitations, Restrictions, and Exceptions

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Apply a single application of SPARTAN ELITE herbicide at a broadcast rate of 19-25 fluid ounces per acre to the soil surface after planting but before weed or crop emergence. Use listed lower rates on soils relatively coarse-textured and listed higher rates on fine textured soils.

Apply in at least 10 gallons per acre finished spray solution by ground.

Following the application of SPARTAN ELITE herbicide to soil, germinating seeds and seedlings take up SPARTAN ELITE herbicide from the soil solution.

The amount of SPARTAN ELITE herbicide in soil solution available for weed uptake is determined primarily by soil type, soil organic matter and soil pH.

Similar to other herbicides, SPARTAN ELITE herbicide adsorbs to the clay and organic matter (OM) fractions of soils; effectively limiting the amount of active ingredient immediately available to control weeds. Adequate moisture is required for herbicide activation (1/2" to 1" of rainfall or irrigation). If an activating rainfall (1/2" to 1") is not received SPARTAN ELITE herbicide will provide a reduced level of control of susceptible germinating weeds.

Weeds Controlled

The following is a general list of weeds for which SPARTAN ELITE herbicide has shown control or suppression. The level of control will vary per use rate, cropping system, environmental conditions, moisture levels and soil type. SPARTAN ELITE herbicide may not control all of the weeds listed under all crop conditions. For crops where lower use rates are needed for crop tolerance refer to their specific weed list.

Restrictions

- Do not exceed 25 fluid ounces per acre per cropping season.
- Do not use on soils classified as sand, which have less than 1% organic matter.
- Do not apply directly on the crop after the crop emerges or if the seedling sprouts are close to the soil surface.
- Harvest horseradish at normal timing.

Method

[Broadcast/Foliar Air](#)

[Broadcast/Foliar Ground](#)

[Broadcast/Foliar Air](#)

[Broadcast/Foliar Ground](#)

[Broadcast/Foliar Air](#)

[Broadcast/Foliar Ground](#)

Restricted Entry Interval

24 hours

Exception: if the product is soil-incorporated, the Worker Protection Standard, under certain circumstances, allows workers to enter the treated area if there will be no contact with anything that has been treated.

Timings

[Preemergence \(Crop\)](#)

[Preemergence \(Weed\)](#)

[Postplant](#)