Importance of Glyphosate Determination

Glyphosate, a broad-spectrum systemic herbicide, was introduced in 1974 by Monsanto under the trade name Roundup®. Glyphosate (N-(phosphonomethyl)glycine or 2-[(hydroxy-oxidophosphoryl)methylamino]acetic acid) is the largest selling agrochemical in the world and is marketed under dozens of trade names by many different manufacturers. Glyphosate is used for vegetation control of perennial and annual plants, broad-leaf weeds, grasses, woody plants, and aquatic weeds, as well as grain dessication to increase harvest yield. The introduction of genetically modified crops resistant to Glyphosate (i.e. Roundup Ready®) has caused an increased use of Glyphosate, allowing farmers to control weeds without harming their crops. The emergence of Glyphosate-resistant weeds has also caused increases in frequency and volume of applications of Glyphosate in combination with other herbicides. Due to its widespread use, Glyphosate has become ubiquitous in the environment and food supply.

Glyphosate can adsorb to soil and is highly water soluble, which can cause surface and ground water contamination from run-off, soil erosion, and leaching especially after heavy rainfall. The long-term impact on the environment and human health are growing concerns. In March 2015, the World Heath Organization's International Agency for Research on Cancer classified Glyphosate as "probably carcinogenic in humans" (category 2A). Some studies show a correlation between exposure to Glyphosate-based herbicides and non-Hodgkin's Lymphoma in humans and others show evidence of Glyphosate causing cancers in laboratory animals.

In the European Union, the combined maximum residue level (MRL) for Glyphosate and its relevant metabolites in drinking water is 0.1 ng/mL. In February 2016, the U.S. Food and Drug Administration announced it will be testing the US food supply for Glyphosate.

The Abraxis Glyphosate ELISA Assay can be performed in about 2 hours and requires only a few milliliters of sample.

Performance Data

Test Sensitivity: The Glyphosate ELISA has an estimated detection limit (90% B/B_0) of 0.05 ppb (µg/L). The middle of the test (50% B/B_0) is approximately 0.5 ppb. Determinations closer to the middle of the calibration curve give the most accurate results.

Test Reproducibility: Intra and inter assay: < 17%

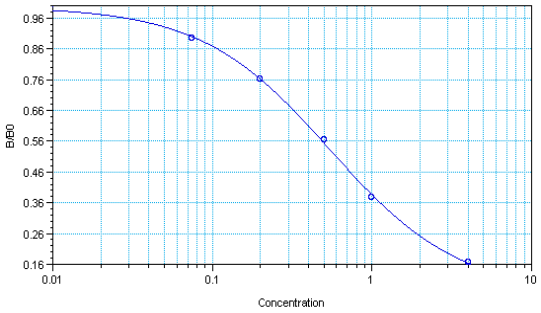
Recoveries:

Level (ppb)	% Recovery
0.25	102
0.50	105
1.00	103
2.00	106

Specificity: The cross-reactivity of the Glyphosate ELISA for various related analogues expressed as the least detectable dose (LDD) or 90% B/B_0 and as the dose required for 50% inhibition (50% B/B_0) are as follows:

Compound	LDD (ppb)	50% (ppb)
Glyphosate	0.05	0.5
Glyphosine	50	3000
Glufosinate	2000	70,000
AMPA	35,000	> 1,000,000
Glycine	> 10,000	> 1,000,000

Standard Curve:



For demonstration purposes only. Not for use in sample interpretation

Roundup® and Roundup Ready® are registered trademarks of the Monsanto Company.

For ordering or technical assistance contact:

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ABRAXIS

Glyphosate ELISA Microtiter Plate

Enzyme-Linked Immunosorbent Assay for the Determination of Glyphosate in Water Samples

Product No. 500086

1. General Description

The Abraxis Glyphosate ELISA Plate Kit is an immunoassay for the quantitative and sensitive screening of Glyphosate in water samples. This test is suitable for the quantitative and/or qualitative screening of Glyphosate in groundwater, surface water, well, and tap water samples (refer to section C, Sample Collection and Handling). For soil, crop, and food sample applications, contact Abraxis for the appropriate technical bulletin and/or matrix validation guidelines. Samples requiring regulatory action should be confirmed by HPLC, GC/MS, or other conventional methods.

2. Safety Instructions

The standard and control solutions in the test kit contain small amounts of Glyphosate. The Derivatization Reagent Diluent is Dimethyl Sulfoxide (DMSO). In addition, the substrate solution contains tetramethylbenzidine and the stop solution contains diluted sulfuric acid. Avoid contact of these solutions with skin and mucous membranes. If these reagents come in contact with skin, wash thoroughly with water.

3. Storage and Stability

The Glyphosate ELISA Kit should to be stored in the refrigerator (4–8°C). The solutions must be allowed to reach room temperature (20-25°C) before use. Reagents may be used until the expiration date on the box. Consult state, local, and federal regulations for the proper disposal of all reagents.

4. Test Principle

The test is a direct competitive ELISA based on the recognition of Glyphosate by polyclonal antibodies. The sample to be tested is derivatized (please refer to Section D, Test Preparation) and then added to microtiter wells coated with goat anti-rabbit antibodies. A rabbit anti-Glyphosate antibody solution is added to the wells with the derivatized samples and allowed to incubate for 30 minutes. The Glyphosate enzyme conjugate is then added and a competitive reaction occurs between the Glyphosate, which may be present in the sample, and the enzyme labeled Glyphosate for the binding sites of the rabbit anti-Glyphosate antibodies bound by the goat anti-rabbit antibodies immobilized on the microtiter plate. The reaction is allowed to continue for 60 minutes. After a washing step and addition of the substrate solution, a color signal is generated. The intensity of the blue color is inversely proportional to the concentration of Glyphosate present in the sample. The color reaction is stopped after a specified time and the color is evaluated using an ELISA reader. The concentrations of the samples are determined by interpolation using the standard curve constructed with each run.

5. Limitations of the Glyphosate ELISA, Possible Test Interference

Numerous organic and inorganic compounds commonly found in samples have been tested and found not to interfere with this test. However, due to the high variability of compounds that might be found in samples, test interferences caused by matrix effects cannot be completely excluded. The presence of the following substances up to 10,000 ppm were found to have no significant effect on the Glyphosate ELISA results: nitrate, phosphate, sulfate, sodium fluoride, calcium, magnesium, copper, zinc, iron, and sodium thiosulfate. Manganese up to 100 ppm, humic acid up to 10 ppm, and sodium chloride up to 1M also had no significant effect on the Glyphosate ELISA results.

Solvents commonly used to extract pesticides from soil or plant matrices, such as methanol and acetone, were found to be acceptable for use at concentrations up to 100% with the Glyphosate ELISA.

Samples containing gross particulate matter should be filtered (refer to Section C, Sample Collection and Handling). Samples, which have been preserved with monochloroacetic acid or other acids, should be neutralized (pH ~ 7) prior to testing.

Standards, control, and samples must be derivatized prior to each analysis with the Glyphosate ELISA kit (See Section D, Test Preparation).

Mistakes in handling the test can also cause errors. Possible sources for such errors include: inadequate storage conditions of the test kit, incorrect pipetting sequence or inaccurate volumes of the reagents, too long or too short incubation times during the immune and/or substrate reaction, exposure to direct or indirect sunlight during the substrate reaction, or extreme temperatures (lower than 10°C or higher than 30°C) during the test performance.

As with any analytical technique (GC, HPLC, etc.), positive results requiring regulatory action should be confirmed by an alternative method.

A. Reagents and Materials Provided (*Additional quantities available for purchase, contact Abraxis)

1. Microtiter plate coated with a secondary antibody (anti-rabbit), in a re-sealable aluminum pouch with desiccant.
2. Glyphosate Antibody Solution, 6 mL
3. Glyphosate Conjugate Solution, 6 mL
4. Glyphosate Standards (6): 0, 0.075, 0.20, 0.5, 1.0, 4.0 ppb, 2 mL each
5. Control at 0.75 ± 0.2 ppb, 2 mL
6 Diluent/Zero Standard (Sample Diluent)*, 30 mL
7. Wash Solution (5X) Concentrate, 100 mL, must be diluted before use, see Test Preparation (Section D)
8. Color (Substrate) Solution (TMB), 16 mL
9. Stop Solution, 12 mL (handle with care)
10. Assay Buffer*, 125 mL
11. Derivatization Reagent*, 3 vials, 100 µL each
12. Derivatization Reagent Diluent*, 3 vials, 4 mL each

B. Additional Materials (not delivered with the test kit)

1. Micro-pipettes with disposable plastic tips (10-200 and 200-1000 µL)
2. Multi-channel pipette (10-300 µL), stepper pipette (10-300 µL), or electronic repeating pipette with disposable plastic tips (capable of delivering 50-1000 µL)
3. Disposable glass test tubes
4. Parafilm or microtiter plate cover slip
5. Microtiter plate washer (optional)
6. Microtiter plate reader (wave length 450 nm)
7. Deionized or distilled water
8. Container with 500 mL capacity (for diluted 1X Wash Solution, see Test Preparation, Section D)
9. Paper towels or equivalent absorbent material
10. Timer

C. Sample Collection and Handling

Collect water samples in glass or plastic sample containers. Drinking water samples should be treated with ascorbic acid (0.1 mg/mL) immediately after collection to remove residual chlorine. Samples, which have been preserved with monochloroacetic acid or other acids, should be neutralized (pH ~ 7) prior to testing.

Samples containing gross particulate matter should be filtered prior to analysis using any of the following syringe filters: Environmental Express 0.2 mm PES (PN SF020E), Pall Acrodisc® 0.2 mm PVDF (PN 4450), Whatman™ 0.2 mm Anotop™ 25 Plus (Cat. No. 6809-4022), or Environmental Express 1.2 mm Glass Fiber (PN SF012G).

Store samples refrigerated for up to 2 weeks. For storage periods greater than 2 weeks, samples should be stored frozen.

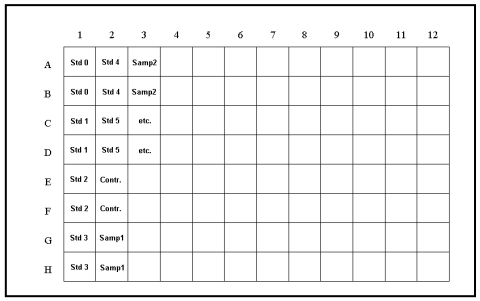
D. Test Preparation

Micro-pipetting equipment and pipette tips for pipetting the standards and the samples are necessary. A multi-channel pipette or a stepping pipette is recommended for adding the enzyme conjugate, antibody, substrate, and stop solutions in order to equalize the incubation periods across the entire microtiter plate. Please only use the reagents and standards from one package lot in one test, as they have been adjusted in combination.

1. Allow the microtiter plate, reagents, and samples to reach room temperature before use.
2. The standard solutions, control, antibody, conjugate, substrate and stop solutions are ready to use and do not require any further dilutions.
3. Dilute the Wash Solution (5X) Concentrate at a ratio of 1:5. If using the entire bottle (100 mL) add to 400 mL of deionized or distilled water.
4. The stop solution must be handled with care as it contains diluted H_2SO_4.
5. Remove the number of microtiter plate strips required from the foil bag. The remaining strips are stored in the foil bag with desiccant and zip-locked closed.
6. After analysis, store the remaining kit components in the refrigerator (4-8°C).
7. ***Standards, Control, and Samples must be derivatized prior to each analysis:***
   a. Dilute the Derivatization Reagent with 3.5 mL of Derivatization Reagent Diluent. Vortex to mix thoroughly. ***Note: Diluted Derivatization Reagent must be used within 8 hours of preparation. If additional samples are to be analyzed more than 8 hours after dilution, discard the vial, and a new vial of Derivatization Reagent should be diluted for use.***
   b. Label single disposable glass test tubes for standards, control, and samples.
   c. Pipette 250 µL of standard, control, or sample into appropriately labeled glass test tube.
   d. Add 1 mL of Assay Buffer to each test tube. Vortex to mix.
   e. Add 100 µL of the diluted derivatization reagent to each test tube. ***Vortex each tube immediately after addition of diluted reagent until no swirling lines are present.***
   f. Incubate at room temperature for 10 minutes.
   g. Derivatized standards, control, and samples are ready to be analyzed. Procede to Assay Procedure, Step 1. ***Note: Discard derivatized standards, control, and samples after use. Do not use for re-analysis.***

E. Working Scheme

The microtiter plate consists of 12 strips of 8 wells, which can be used individually for the test. The standards must be derivatized and run with each test. Never use the values of standards which have been determined in a test performed previously.



Std 0-Std5: Derivatized Standards
Contr.: Derivatized Control
Samp1, Samp2, etc: Derivatized Samples

F. Assay Procedure

1. Add **50 µL of the derivatized standard solutions, control, or samples (see Section D, Test Preparation)** into the wells of the test strips according to the working scheme given. Analysis in duplicate or triplicate is recommended.
2. Add **50 µL of the antibody solution** to the individual wells successively using a multi-channel pipette or a stepping pipette. Cover the wells with parafilm or tape and mix the contents by moving the strip holder in a circular motion on the benchtop for 60 seconds. Be careful not to spill the contents. Incubate the strips for **30 minutes** at room temperature.
3. Remove the covering and add **50 µL of the enzyme conjugate solution** to the individual wells successively using a multi-channel pipette or a stepping pipette. Cover the wells with parafilm or tape and mix the contents by moving the strip holder in a circular motion on the benchtop for 60 seconds. Be careful not to spill the contents. Incubate the strips for **60 minutes** at room temperature.
4. Remove the covering and decant the contents of the wells into a sink. Wash the strips **three times** using the 1X wash buffer solution. Please use at least a volume of **250 µL of wash buffer** for each well and each washing step. Remaining buffer in the wells should be removed by patting the plate dry on a stack of paper towels.
5. Add **150 µL of substrate (color) solution** to the individual wells successively using a multi-channel pipette or a stepping pipette. Cover the wells with parafilm or tape and mix the contents by moving the strip holder in a circular motion on the benchtop for 30 seconds. Be careful not to spill the contents. Incubate the strips for **20-30 minutes** at room temperature. Protect the strips from sunlight.
6. Add **100 µL of stop solution** to the wells in the same sequence as for the substrate (color) solution using a multi-channel pipette or a stepping pipette.
7. Read the absorbance at 450 nm using a microtiter plate ELISA photometer within 15 minutes after the addition of the stopping solution.

G. Evaluation

The evaluation of the ELISA can be performed using commercial ELISA evaluation programs (4-Parameter (preferred) or Logit/Log). For a manual evaluation, calculate the mean absorbance value for each of the standards. Calculate the $\%B/B_0$ for each standard by dividing the mean absorbance value for each standard by the Zero Standard (Standard 0) mean absorbance. Construct a standard curve by plotting the $\%B/B_0$ for each standard on the vertical linear (y) axis versus the corresponding Glyphosate concentration on the horizontal logarithmic (x) axis on graph paper. $\%B/B_0$ for the control and samples will then yield levels in ppb of Glyphosate by interpolation using the standard curve. Results can also be determined using a spreadsheet macro available from Abraxis upon request.

The concentrations of the samples are determined using the standard curve run with each test. Samples showing a lower concentration of Glyphosate than standard 1 (0.075 ppb) should be reported as containing < 0.075 ppb of Glyphosate. Samples showing a higher concentration than standard 5 (4.0 ppb) should be reported as containing > 4.0 ppb of Glyphosate or must be diluted using Diluent/Zero Standard (Sample Diluent) and re-analyzed to obtain accurate results. The concentration of the positive control provided should be 0.75 ± 0.2 ppb.

Semi-quantitative results can be derived by simple comparison of the sample absorbances to the absorbances of the standards. Samples with lower absorbances than a standard will have concentrations of Glyphosate greater than that standard. Samples with higher absorbances than a standard will have concentrations of Glyphosate less than that standard.

As with any analytical technique (GC, HPLC, etc.), positive results requiring regulatory action should be confirmed by an alternative method.

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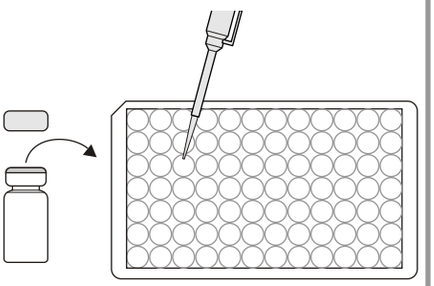
Glyphosate Plate, Detailed ELISA Procedure

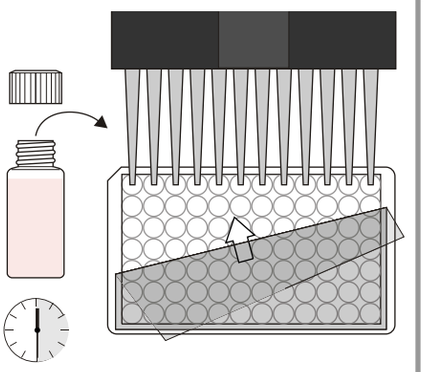
1. Addition of Standards, Samples

Add 50 uL of the derivatized standard solutions, control, or samples into the wells of the test strips according to the working scheme given. We recommend using duplicates or triplicates.



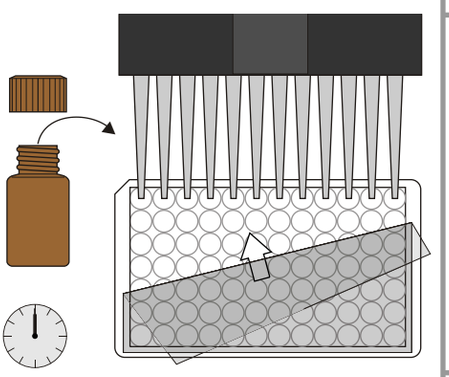
2. Addition of Antibody Solution

Add 50 uL of the anti-Glyphosate Antibody Solution into the wells of the test strips according to the working scheme given. We recommend using duplicates or triplicates. Cover the wells with parafilm or tape and mix the contents by moving the strip holder in a rapid circular motion on the benchtop for 30 seconds. Incubate for 30 minutes.



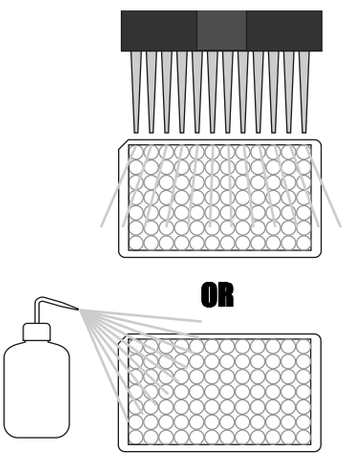
3. Addition of Enzyme Conjugate

Add 50 uL of the enzyme conjugate to the individual wells successively using a multi-channel pipette or a stepping pipette. Cover the wells with parafilm or tape and mix the contents by moving the strip holder in a rapid circular motion on the benchtop for 30 seconds. Be careful not to spill contents. Incubate for 60 minutes at room temperature.



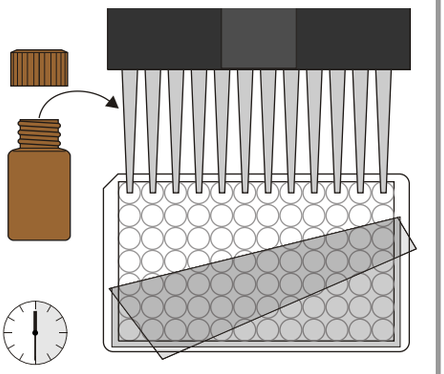
4. Washing of Plates

After incubation, remove the covering and vigorously shake the contents of the wells into a sink. Wash the strips three times with a multi-channel pipette or wash bottle using the 1X washing buffer solution. Please use at least a volume of 250 uL of washing buffer for each well and each washing step. Remaining buffer in the wells should be removed by patting the plate dry on a stack of paper towels.



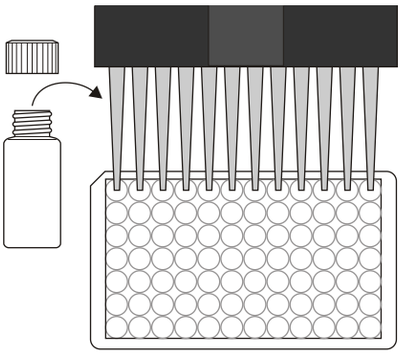
5. Addition of Substrate/Color Solution

Add 150 uL of substrate/color solution to the individual wells successively using a multi-channel pipette or a stepping pipette. cover the wells with parafilm or tape and mix the contents by moving the strip holder in a rapid circular motion on the benchtop. Be careful not to spill contents. Incubate the strips for 20-30 minutes at room temperature.



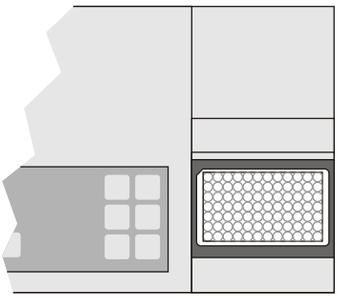
6. Addition of Stopping Solution

Add 100 uL of stop solution to the wells in the same sequence as for the substrate solution using a multi-channel pipette or a stepping pipette.



7. Measurement of Color

Read the absorbance at 450nm using a microplate ELISA reader. Calculate the results.



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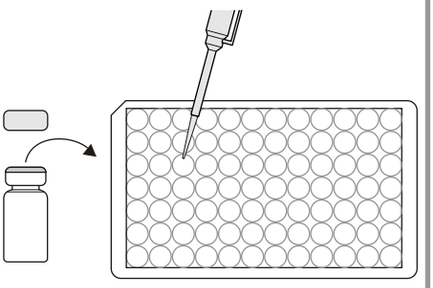
Glyphosate Plate, Concise ELISA Procedure

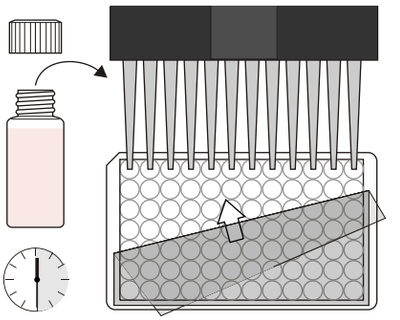
1. Addition of Standards, Samples

Add 50 uL of the derivatized standard solutions, control, or samples.



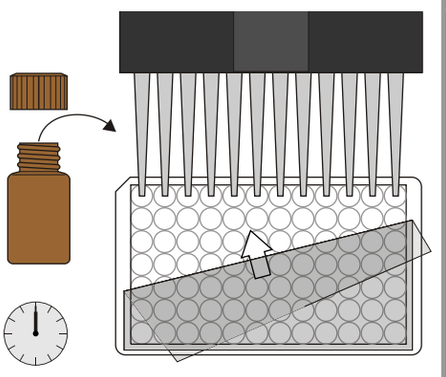
2. Addition of Antibody Solution

Add 50 uL of the anti-Glyphosate Antibody Solution. Cover and mix for 30 seconds. Incubate for 30 minutes at room temperature.



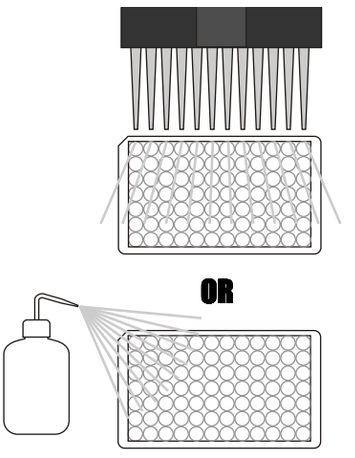
3. Addition of Enzyme Conjugate

Add 50 uL of the enzyme conjugate. Cover and mix for 30 seconds. Incubate for 60 minutes at room temperature.



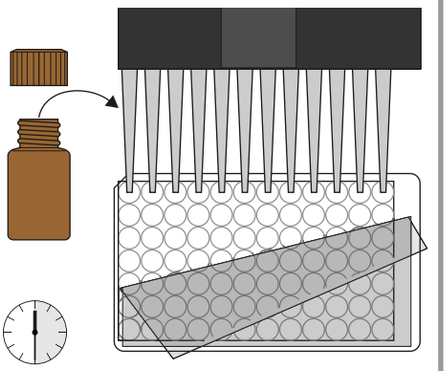
4. Washing of Plates

Wash the plates three times with 250 uL of 1X washing buffer.



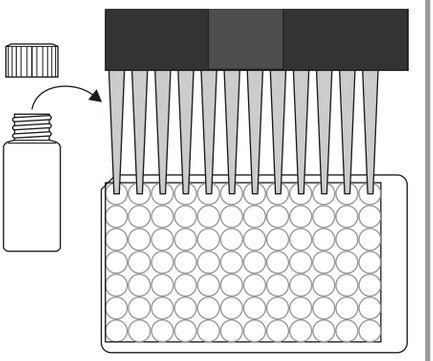
5. Addition of Substrate/Color Solution

Add 150 uL of substrate/color solution. Incubate the strips for 20-30 minutes at room temperature and away from direct sunlight.



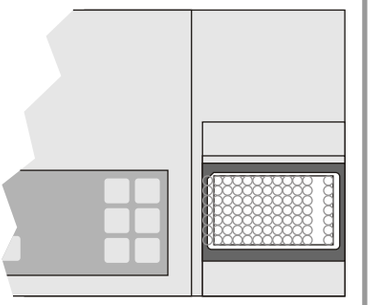
6. Addition of Stopping Solution

Add 100 uL of stop solution.



7. Measurement of Color

Read the absorbance at 450nm using a microplate ELISA reader. Calculate the results.



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Safety Data Sheet

Section 1: Product and Company Identification

1.1 Product Identifiers:
Product Name: Glyphosate Magnetic Particle Kit, Glyphosate Plate Kit
Product Code: 500081, 500086
1.2 Identified Use: Determination of Glyphosate in samples. **Restrictions on Use:** For research use only.
1.3 Company: Abraxis, Inc.**,** 124 Railroad Drive**,** Warminster, PA 18974 USA**,** info@abraxiskits.com +1(215) 357-3911, FAX +1(215) 357-5232
1.4 Emergency Telephone Number: +1(215) 357-3911

Section 2: Hazard(s) Identification

2.1 Classification of the mixture:
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 4), H227 Combustible liquid
HMIS Rating: Dimethyl sulfoxide, CAS No. 67-68-5: Health hazard: 0, Chronic Health Hazard: *, Flammability: 2, Physical Hazard 0
NFPA Rating: Dimethyl sulfoxide, CAS No. 67-68-5: Health hazard: 0, Fire Hazard: 2, Reactivity Hazard: 0
2.2 GHS Label elements, including precautionary statements:
Pictogram(s): none
Signal word(s): Warning
Hazard statement(s):
H227 Combustible liquid.
Precautionary statement(s):
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P280 Wear protective gloves/eye protection/face protection.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235 Store in a well-ventilated place. Keep cool.
P501 Dispose of contents/ container to an approved waste disposal plant.
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS: Readily absorbed through skin
2.4 Unknown acute toxicity: None known.

Section 3: Composition / Information on Ingredients

3.2 Mixtures: Mixture(s) of the hazardous substance(s) listed below, with nonhazardous additions.
Hazardous component(s):
Name and Synonym(s): DMSO, Dimethyl sulfoxide, Methyl sulfoxide Formula: C_2H_6OS Molecular weight: 78.13 g/mol
CAS No.: 67-68-5 EC-No.: 200-664-3
Classification: Flammable Liquid 4; H227
Percentage in Mixture: 1.91-3.81 %
For full text of H-Statements mentioned in this Section, see Section 2.

Section 4: First Aid Measures

4.1 Description of first aid measures: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.
If inhaled: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
In case of skin contact: Wash off with soap and plenty of water. Consult a physician.
In case of eye contact: Rinse thoroughly with plenty of water as a precaution.
If swallowed: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
4.2 Most important symptoms and effects, both acute and delayed: The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
4.3 Indication of any immediate medical attention and special treatment needed: No data available. Treat symptomatically.

Section 5: Fire-fighting Measures

5.1 Suitable extinguishing media: Water spray, alcohol-resistant foam, dry chemical or carbon dioxide
5.2 Special hazards arising from the substance or mixture: Carbon oxides, Sulfur oxides
5.3 Advice for firefighters: Wear self-contained breathing apparatus for fire-fighting if necessary.
5.4 Further information: Use water spray to cool unopened containers.

Section 6: Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures: Use personal protective equipment (see section 8). Avoid dust formation. Avoid breathing vapors, mist, dust, or gas. Ensure adequate ventilation. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. Remove all sources of ignition. Evacuate personnel to safe areas.
6.2 Environmental precautions: Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
6.3 Methods and materials for containment and cleaning up: Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations. Keep in suitable, closed containers for disposal.
6.4 Reference to other sections: For information on safe handling see section 7. For information on personal protection see section 8. For information on disposal see section 13.

Section 7: Handling and Storage

7.1 Precautions for safe handling: See section 2. Avoid inhalation of vapor or mist. Keep away from sources of ignition. No smoking. Take measures to prevent the buildup of electrostatic charge.
7.2 Precautions for safe storage: Keep container(s) tightly closed in a dry, well-ventilated place. Store under inert gas. Hygroscopic. See label or product insert for appropriate storage temperature and additional specific information. Storage class (TRGS 510): Combustible liquids.
7.3 Specific end use(s): Other than use(s) specified in section 1, no other uses are stipulated.

Section 8: Exposure Controls / Personal Protection

8.1 Control parameters:
Component(s) with workplace control parameters
Dimethyl sulfoxide, CAS No. 67-68-5

Value	Control parameters	Basis
TWA	250.000000 ppm	USA. Workplace Environmental Exposure Levels (WEEL)

8.2 Exposure controls:
Appropriate engineering controls: Provide adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. Keep away from food and beverages.
Personal protective equipment
Eye protection: Use equipment for eye protection with side shields tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).
Skin protection: Handle with chemical resistant gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
Respiratory protection: Do not breathe vapors. Use a chemical fume hood or approved respiratory protection equipment.
Body protection: Lightweight, protective clothing to prevent skin exposure.

Section 9: Physical and Chemical Properties

9.1 Information on basic physical and chemical properties of mixture
Appearance: Multiple
Odor: Characteristic
Odor Threshold: No data available
pH: Multiple
Melting point/freezing point: No data available
Initial boiling point and boiling range: No data available
Flash point: No data available
Evaporation rate: No data available
Flammability (solid, gas): No data available
Upper/lower flammability or explosive limits No data available
Vapor pressure: No data available
Vapor density: No data available
Relative density: No data available
Water solubility: Various
Partition coefficient: n-octanol/water: No data available
Auto-ignition temperature: Not applicable

Decomposition temperature: No data available
Viscosity: No data available
Explosive properties: No data available
Oxidizing properties: No data available
9.2 Other information: No data available

Section 10: Stability and Reactivity

10.1 Reactivity: No data available
10.2 Chemical stability: Stable under recommended storage conditions.
10.3 Possibility of hazardous reactions: No data available
10.4 Conditions to avoid: Keep away from open flame, hot surfaces, heat sources, and sources of ignition.
10.5 Incompatible materials: Acid chlorides, phosphorus halides, strong acids, strong oxidizing agents, strong reducing agents
10.6 Hazardous decomposition products: No data available. In the event of fire: see section 5.

Section 11: Toxicological Information

11.1 Information on toxicological effects
To the best of our knowledge, the chemical, physical, and toxicological properties of this product have not been thoroughly investigated.
Acute toxicity *(Dimethyl sulfoxide, CAS No. 67-68-5)***:**

Inhalation LC50 Inhalation - Rat - 4 h – 40250 ppm
Ingestion LD50 Oral - Rat – 14,500 mg/kg
Skin contact LD50 Dermal - Rabbit - > 5,000 mg/kg; mild skin irritation; **Eye contact** No data available
Respiratory or skin sensitization No data available; **Aspiration hazard** No data available

Mutagenicity *(Dimethyl sulfoxide, CAS No. 67-68-5)***:** Cytogenetic analysis (Mouse lymphocyte, Rat)--Result: mutation, DNA damage in mammalian somatic cells
Carcinogenicity:
(Dimethyl sulfoxide, CAS No. 67-68-5): Rat (oral)—Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors. Mouse (oral)--Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Leukemia Skin and Appendages: Other: Tumors.
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
Teratogenicity: No data available
Reproductive/fertility toxicity:
(Dimethyl sulfoxide, CAS No. 67-68-5): Reproductive toxicity (Rat, intraperitoneal and subcutaneous)--Effects on Fertility: Abortion; post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants); litter size (e.g.; # fetuses per litter; measured before birth).
Reproductive toxicity (Mouse, oral)--Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.
Developmental Toxicity (Mouse, intraperitoneal)--Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.
Specific target organ toxicity, single exposure *(Dimethyl sulfoxide, CAS No. 67-68-5)*: No data available
Specific target organ toxicity, repeated exposure: The substance or mixture is not classified as specific target organ toxicant, repeated exposure.
Additional information *(Dimethyl sulfoxide, CAS No. 67-68-5)*: RTECS: PV6210000 Exposure to large amounts can cause redness of skin, itching, burning, sedation, headache, nausea, dizziness. Eyes - Eye disease - Based on Human Evidence

Section 12: Ecological Information

12.1 Toxicity: *(Dimethyl sulfoxide, CAS No. 67-68-5)* Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 34,000 mg/l - 96 h; LC50 - Oncorhynchus mykiss (rainbow trout) - 35,000 mg/l - 96 h. Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 24,600 mg/l - 48 h (OECD Test Guideline 202). Toxicity to algae EC50 - Pseudokirchneriella subcapitata (green algae) - 17,000 mg/l - 72 h (OECD Test Guideline 201)
12.2 Persistence and degradability: Dimethyl sulfoxide result: 31 %, not readily biodegradable (OECD Test Guideline 301D)
12.3 Bioaccumulative potential: No data available
12.4 Mobility in soil: No data available

12.5 Results of PBT and vPvB assessment: No data available
12.6 Other adverse effects: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Section 13: Disposal Considerations

13.1 Waste treatment methods
Product: All waste must be handled and disposed according to local, state, and federal regulations. Avoid disposing large volumes in sewer.
Contaminated packaging: All waste must be handled and disposed according to local, state, and federal regulations.
Refer to sections 7 and 8 for safe handling guidance.

Section 14: Transport Information

DOT, Land Transport ADR/RID (cross-border), Maritime Transport IMDG, Air Transport ICAO-TI and IATA-DGR
UN Number: 3316
UN Proper shipping name: Chemical Kit, (contains DMSO)
Transport hazard class(es): 9
Packing group: III
Environmental hazard: See section 12
Bulk transport: Excepted/Limited quantity
Special considerations: See section 7 for handling

Section 15: Regulatory Information

EU Regulations, Hazard Symbol(s): Dimethyl sulfoxide: Xi (Irritant)
Safety Phrases: Dimethyl sulfoxide: S 24/25 Avoid contact with skin and eyes
SARA Title III, Section 302 Components: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA Title III, Section 313 Components: This material does not contain any chemical components with known CAS numbers that exceed the threshold (DeMinimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards: Dimethyl sulfoxide, CAS No. 67-68-5: Fire Hazard, Chronic Health Hazard
State Right-to-Know
Massachusetts: No components are subject to the Massachusetts Right to Know Act.
Pennsylvania: Dimethyl sulfoxide, CAS No. 67-68-5
New Jersey: Dimethyl sulfoxide, CAS No. 67-68-5
California Prop. 65 Components: This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

Section 16: Other information

This information is based on our present knowledge. While Abraxis , INC. believes that the data contained herein are factual and the opinions expressed represent a best effort to present accurate information, the data are not to be taken as a warranty or representation for which Abraxis , INC. assumes legal responsibility. The information shall not be taken as being all-inclusive and is to be used only as a guide. The data are offered solely for the user's consideration, investigation, and verification. These suggestions should not be confused with either state, municipal, or insurance requirements, or with national safety codes and constitute no warranty. Any use of these data and information must be determined by the user to be in accordance with applicable federal, state, and local regulations.

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Changes from previous version: Abraxis, LLC changed to Abraxis, Inc.