**Intended Use**
For the detection and quantitation of glyphosate in water (groundwater, surface water, well water). For soil, crop, and food use contact the company for application bulletins and/or specific matrix validation guidelines.

**Principle**
The Abraxis Glyphosate Kit applies the principles of enzyme linked immunosorbent assay (ELISA) to the determination of glyphosate. The sample to be tested is derivatized and then added, along with paramagnetic particles attached with antibodies specific to glyphosate and incubated for 30 minutes. The glyphosate enzyme conjugate is then added, at this point a competitive reaction occurs between the glyphosate which may be in the sample and the enzyme labeled glyphosate analog for the antibody binding sites on the magnetic particles. The reaction is allowed to continue for thirty (30) minutes. At the end of the incubation period, a magnetic field is applied to hold in the test tube the paramagnetic particles (with glyphosate and labeled glyphosate bound to the antibodies on the particles, in proportion to their original concentration), and allow the unbound reagents to be decanted. After decanting, the particles are washed with Washing Solution.

The presence of glyphosate is detected by adding the “Color Solution”, which contains the enzyme substrate (hydrogen peroxide) and the chromogen (3,3’,5,5’-tetramethylbenzidine). The enzyme-labeled glyphosate bound to the glypahosate antibody catalyzes the conversion of the substrate/chromogen mixture to a colored product. After an incubation period, the reaction is stopped and stabilized by the addition of a diluted acid (Stopping Solution). Since the labeled glyphosate (conjugate) was in competition with the unlabeled glyphosate (sample) for the antibody sites, the color developed is inversely proportional to the concentration of glyphosate in the sample.

**Reagents**
The Abraxis Glyphosate HS Kit contains the following items:

1. **Glyphosate Antibody Coupled Paramagnetic Particles**
   Glyphosate antibody (rabbit anti-glyphosate) covalently bound to paramagnetic particles suspended in a buffered solution with preservative and stabilizers.
   120 test kit: one 65 mL vial

2. **Glyphosate Enzyme Conjugate**
   Horseradish peroxidase (HRP) labeled glyphosate analog diluted in a buffered solution with preservative and stabilizers.
   120 test kit: one 35 mL vial

3. **Glyphosate Standards**
   Four concentrations (75, 200, 750, and 4000 parts per trillion) of glyphosate standards in distilled water with preservative and stabilizers. Each vial contains 2.0 mL.

4. **Control**
   A concentration of approximately 500 ppt of glyphosate in distilled water with preservative and stabilizers. A 2.0 mL volume is supplied in one vial.

5. **Diluent/Zero Standard**
   Distilled water with preservative and stabilizers without any detectable glyphosate.
   120 test kit: one 65 mL vials

6. **Color Solution**
   A solution of hydrogen peroxide and 3,3’,5,5’-tetramethylbenzidine in an organic base.
   120 test kit: one 65 mL vial

7. **Stopping Solution**
   A solution of diluted acid.
   120 test kit: one 65 mL vial

8. **Washing Solution**
   Preserved deionized water.
   120 test kit: one 250 mL vial

9. **Test Tubes**
   Glass (36) are packaged in boxes.
   120 test kit: 4 X 36 tube boxes

The Abraxis Glyphosate HS Derivatization Kit contains the following items:

10. **Washing Solution**
    Preserved deionized water (2nd bottle)
    120 test kit: one 250 mL bottle

11. **Assay Buffer**
    Dissolved buffer salts.
    120 test kit: one 125 mL bottle

12. **Derivatization Reagent**
    120 test kit: three 100 µL vials

13. **Derivatization Reagent Diluent**
    Dimethyl Sulfoxide (DMSO)
    120 test kit: three 4 mL vials

**Reagent Storage and Stability**
Store all reagents at 2-8°C. Do not freeze. Reagents may be used until the expiration date on the box, except for derivatization reagent (use the same day as diluted). The test tubes and Washing Solution require no special storage condition and may be stored separately from the reagents to conserve refrigerator space.

The Derivatization Reagent Diluent may freeze if stored cool, thaw reagent by placing on a 37°C incubator.

Consult state, local and federal regulations for proper disposal of all reagents.

**Materials Required but Not Provided**
In addition to the reagents provided, the following items are essential for the performance of the test:

- Pipets* Precision pipets capable of delivering 100, 250, 500, 750 µL, 1.0 mL repeating pipet.
- Disposable 5 mL serological pipette.
- Vortex Mixer* Thermolyne Maxi Mix, Scientific Industries Vortex Genie, or equivalent
- Disposable glass test tubes (for derivatization of standards, control, and samples)
- Magnetic Separation System
- Photometer* capable of readings at 450 nm

*Please contact Abraxis for supplier information.

**Assay Procedure**

1. **Dilute Derivatization Reagent with 3.5 mL of Derivatization Reagent Diluent** (Diluted Reagent needs to be used within 8 hours of preparation). Vortex to mix thoroughly.

2. **Label single glass test tubes for standards, control, and samples.**

3. **Pipette 250 µL of standard, control, or sample into separate disposable tubes.**

4. **Add 1.0 mL of Assay buffer, vortex to mix.**

5. **Add 100 µL of the diluted Derivatization Reagent, vortex each tube immediately after addition of reagent.** We recommend vortexing until no swirl lines are seen in the tube.

6. Incubate at room temperature for 10 minutes.

7. Proceed to Assay Procedure, Step 1. **Note: Discard derivatized standards, control, and samples after use. Do not use for re-analysis.**

**Alternative Derivatization Procedure**

Note: Performing the alternative derivatization procedure allows the user to use the same derivatization tubes in the performance of the assay, therefore eliminating the use of additional assay tubes.

1. **Dilute Derivatization Reagent with 3.5 mL of Derivatization Reagent Diluent (Diluted Reagent needs to be used within 8 hours of preparation).** Vortex to mix thoroughly.

2. **Label test tubes in duplicate for standards, control, and samples.**

3. **Pipette 50 µL of standard, control, or sample into duplicate disposable glass assay tubes.**

4. **Add 200 µL of Assay buffer, vortex to mix.**

5. **Add 20 µL of the diluted Derivatization Reagent, vortex each tube immediately after addition of reagent.** We recommend vortexing until no swirl lines are seen in the tube.

6. **Incubate at room temperature for 10 minutes.**

7. **Proceed to Assay Procedure, Step 3.**

**Procedural Notes and Precautions**

As with all immunoassays, a consistent technique is the key to optimal performance. To obtain the greatest precision, be sure to treat each tube in an identical manner.

Add reagents directly to the bottom of the tube while avoiding contact between the reagents and the pipet tip. This will help assure consistent quantities of reagent in the test mixture.

Avoid cross-contaminations and carryover of reagents by using clean pipets for each sample addition and by avoiding contact between reagent droplets on the tubes and pipet tips.

Avoid foam formation during vortexing.
The Magnetic Separation System consists of two parts: an upper rack which will securely hold the test tubes and a lower separator which contains the magnets used to attract the antibody coupled paramagnetic particles. During incubations the upper rack is removed from the lower separator so that the paramagnetic particles remain suspended during the incubation.

For separation steps (washing and decanting), the rack and the separator are combined to pull the paramagnetic particles to the sides of the tubes.

To obtain optimum assay precision, it is important to perform the separation steps carefully and consistently. Decant the Magnetic Separation System (combined rack and separator) by slowly inverting away from the operator using a smooth turning action so the liquid flows consistently along only one side of the test tube. While still inverted, place the Magnetic Separation System on an absorbent pad and allow to drain. Lifting the Magnetic Separation System and replacing gently onto the pad several times will ensure complete removal of the liquid from the rim of the tube. Do not bang or shake the Magnetic Separation System.

Mix the antibody coupled paramagnetic particles just prior to pipetting.

Do not use any reagents beyond their stated shelf life. Do not use the diluted Derivatization Reagent after 8 hours from dilution.

Avoid contact of Stopping Solution (diluted sulfuric acid) with skin and mucous membranes. If this reagent comes in contact with skin, wash with water.

**Limitations**
The Abraxis Glyphosate Assay will detect glyphosate. Refer to specificity table for data on several of related compounds. The Abraxis Glyphosate Assay kit provides screening results. As with any analytical technique (GC, HPLC, etc...) positive results requiring so alternative method.

The specificity table for data on several of related compounds.

**Quality Control**
A control solution at approximately 500 ppt of Glyphosate is provided with the Abraxis Glyphosate HS Assay kit. It is recommended that it be included in every run and treated in the same manner as unknown samples. Acceptable limits should be established by each laboratory.

**Assay Procedure**
Read Reagent Preparation, Procedural Notes and Precautions before proceeding.

1. **Label test tubes for standards, control, and samples.**
2. **Add 300 µL of the appropriate derivatized standard, control, or sample.**
3. **Mix the Glyphosate Antibody Coupled Paramagnetic Particles thoroughly and add 500 µL to each tube.**
4. **Vortex for 1 to 2 seconds minimizing foaming.**
5. **Incubate for 30 minutes at room temperature.**
6. **Add 250 µL of Glyphosate Enzyme Conjugate to each tube.**
7. **Vortex for 1 to 2 seconds minimizing foaming.**
8. **Incubate for 30 minutes at room temperature.**
9. **Separate in the Magnetic Separation System for two (2) minutes.**
10. **Decant and gently blot all tubes briefly in a consistent manner.**
11. **Add 1 mL of Washing Solution to each tube and allow them to remain in the magnetic separation unit for two (2) minutes.**
12. **Decant and gently blot all tubes briefly in a consistent manner.**
13. **Repeat Steps 11 and 12 two (2) additional times.**
14. **Remove the rack from the separator and add 500 µL of Color Solution to each tube.**
15. **Vortex for 1 to 2 seconds minimizing foaming.**
16. **Incubate for 20 minutes at room temperature.**
17. **Add 500 µL of Stopping Solution to each tube.**
18. **Add 1 mL Washing Solution to a clean test tube. Use as blank in Step 19.**
19. **Read results at 450 nm within 15 minutes after adding the Stopping Solution.**

**Results**
**Manual Calculations**
1. Calculate the mean absorbance value for each of the standards.
2. Calculate the %B/Bo for each standard by dividing the mean absorbance value for the standard by the mean absorbance value for the Diluent/Zero Standard.
3. Construct a standard curve by plotting the %B/Bo for each standard on vertical linear (Y) axis versus the corresponding glyphosate concentration on horizontal log (X) axis on the graph paper provided.
4. %B/Bo for controls and samples will then yield levels in ppb of glyphosate by interpolation using the standard curve.

**Photometric Analyzer**
(Contact Abraxis for detailed application information on specific photometers.)

Some instrument manufacturers make available photometers allowing for calibration curves to be automatically calculated and stored. Refer to instrument operating manual for detailed instructions. To obtain results for the Abraxis Glyphosate HS Assay on instruments allowing data transformation the following parameter settings are recommended:

<table>
<thead>
<tr>
<th><strong>Data Reduction</strong></th>
<th><strong>Lin. Regression</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Xformation</strong></td>
<td><strong>Lin/Ln</strong></td>
</tr>
<tr>
<td><strong>Read Mode</strong></td>
<td><strong>Absorbance</strong></td>
</tr>
<tr>
<td><strong>Wavelength</strong></td>
<td><strong>450 nm</strong></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td><strong>PPT</strong></td>
</tr>
<tr>
<td><strong># Rep Blk</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

**Calibrators:**
- # of Cals: 5
- # of Reps: 2

**Concentrations:**
- #1: 0.00 PPT
- #2: 75 PPT
- #3: 200 PPT
- #4: 750 PPT
- #5: 4000 PPT

**Range:** 75 - 4000

**Correlation:** 0.980

**Rep. %CV:** 15%

**NOTE:** Any results obtained with a calculated glyphosate concentration of less than 50 ppt on the print out should be assumed to be below the detection limit of the assay.

**Expected Results**
In a study with water samples from various locations, the Abraxis Glyphosate HS Assay was shown to correlate well with another analytical technique.

**Performance Data**
**Precision**
The following results were obtained:

<table>
<thead>
<tr>
<th><strong>Control</strong></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replicates</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Days</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>n</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Mean (ppb)</td>
<td>0.98</td>
<td>2.82</td>
<td>5.80</td>
</tr>
<tr>
<td>% CV (within assay)</td>
<td>6.0</td>
<td>3.5</td>
<td>6.9</td>
</tr>
<tr>
<td>% CV (between assay)</td>
<td>15.5</td>
<td>11.6</td>
<td>9.5</td>
</tr>
</tbody>
</table>

**Sensitivity**
The Abraxis Glyphosate HS Assay has an estimated minimum detectable concentration based on a 90% B/Bo of 50 parts per trillion (ppt).

**Recovery**
Five (5) groundwater samples, were spiked with various levels of glyphosate and then assayed using the Abraxis Glyphosate HS Assay. The following results were obtained:

<table>
<thead>
<tr>
<th><strong>Glyphosate Added (ppb)</strong></th>
<th><strong>Mean (ppb)</strong></th>
<th><strong>S.D. (ppb)</strong></th>
<th><strong>%</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>0.47</td>
<td>0.09</td>
<td>95</td>
</tr>
<tr>
<td>1.0</td>
<td>1.04</td>
<td>0.13</td>
<td>104</td>
</tr>
<tr>
<td>2.5</td>
<td>2.70</td>
<td>0.41</td>
<td>108</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td>102</td>
</tr>
</tbody>
</table>

**Specificity**
The cross-reactivity of the Abraxis Glyphosate HS Assay for various related analogues can be expressed as the least detectable dose (LDD) which is estimated at 90% B/Bo, or as the dose required for 50% absorbance inhibition (50% B/Bo).

<table>
<thead>
<tr>
<th><strong>B/Bo Compound</strong></th>
<th><strong>LDD (ppb)</strong></th>
<th><strong>50% B/Bo (ppb)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>0.05</td>
<td>2.40</td>
</tr>
<tr>
<td>Glyphosine</td>
<td>50</td>
<td>3.00</td>
</tr>
<tr>
<td>Glufosinate</td>
<td>2000</td>
<td>70.00</td>
</tr>
<tr>
<td>AMPA</td>
<td>35,000</td>
<td>&gt;1,000,000</td>
</tr>
<tr>
<td>Glycine</td>
<td>&gt;10,000</td>
<td>&gt;1,000,000</td>
</tr>
</tbody>
</table>

The following compounds demonstrated no reactivity in the Abraxis Glyphosate Assay at concentrations up to 1000 ppb: aldicarb, aldicarb sulf oxide, aldicarb sulfone, acetochlor, alachlor, atrazine, ametryn, benomyl, butylate, captan, carbaryl, carbendazim, carboxuran, cyanazine, 2,4-D, 1,3-dichloropropene, dinoseb, MCPA, metolachlor, metribuzin, pentachlorophenol, picloram, propazine, simazine, terbutol, thiabendazole, and thiophanate-methyl.

**Ordering Information**
Abraaxis Glyphosate HS Assay Kit 120T PN 500081
Sample Diluent PN 500082
Glyphosate HS Derivatization Kit PN 500084
High Sensitivity Standard Set PN 500085

**Assistance**
For ordering or technical assistance contact:

Abraaxis, Inc.
124 Railroad Drive
Warminster, Pennsylvania, 18974

Phone: (215) 357-3911
Fax: (215) 357-5232
Email: info@abraxiskits.com
WEB: www.abraxiskits.com

**General Limited Warranty**
Abraaxis, Inc. warrants the products manufactured by the Company, against defects and workmanship when used in accordance with the applicable instructions for a period not to extend beyond the product's printed expiration date. Abraaxis makes no other warranty, expressed or implied. There is no warranty of merchantability or fitness for a particular purpose.

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