

Background:

- The Colombian government estimates that between 1988 and 2008, about 5.4 million acres—an area roughly the size of the state of New Jersey—were lost to drug production.
- The Columbian government uses planes to spray the herbicide glyphosate over the cocoa plants, attempting to destroy the plants.
- Glyphosate ($C_3H_8NO_5P$), so it is a nitrogen-carbon bond. It is a weak, organic acid.
- It is the EPA Toxicity Class of III (on a I to IV scale, where IV is least dangerous) for oral and inhalation exposure.
- Product containing Glyphosate come in various forms: powders, aerosols and granules.
- Two separate studies in Sweden have linked exposure to Glyphosate to Hairy Cell Leukemia and Non Hodgkins Lymphoma.
- Glyphosate kills plants by interfering with the synthesis of the amino acids phenylalanine, tyrosine and tryptophan.
- Its half-life in pond water ranges from 12 days to 10 weeks.
- Glyphosate is supplied in many different formations:
 - Ammonium salt
 - Isopropyl amine salt.
 - Glyphosate acid
 - Potassium salt



Chemistry:

- Glyphosate is inactivated when it comes into contact with soil since it is adsorbed onto soil particles.
 - Glyphosate binds to soil in the same way as inorganic phosphates. Un-bound glyphosate is rapidly degraded by microbial activity to carbon dioxide, and bound glyphosate is degraded more slowly
- CO₂ and sunlight are main breakdown products
- Glyphosate in the atmosphere decreases with the more precipitation that occurs, it can “rainout”
 - it is estimated that an average of 97% of the glyphosate in the air is removed by a weekly rainfall ≥ 30 mm.
- Levels of glyphosate have been found in acid rain.
- When airborne it tends to partition in water versus air and is readily adsorbed onto soil particles
- It does not bioaccumulate, and breaks down rapidly in the environment.

Reactions Steps:

- $R + O_2 \rightarrow RO_2$
- $RO_2 + NO \rightarrow RO + NO_2$
- $RO \rightarrow R' + R''CHO$
- $RO + O_2 \rightarrow R'R''CO + HO_2$