

101
F636C
1105

SWATH DISPLACEMENT - LONG RANGE DRIFT

SCIENCE LIBRARY Drift is comprised of two components, "swath displacement" and "long range drift". Swath displacement is the lateral movement of relatively large droplets 150-200 micrometers or larger (spray droplets are measured in micrometers; 1 inch is equal to 25400 micrometers) for a short distance. Swath displacement can cause relatively high residues in nearby fields.

Long range drift is the movement of small droplets for great distances (miles from an application site) and often over a wide area. The resulting level of residue is usually very low, but can cause a problem when the chemical settles on a crop that is highly sensitive to that particular chemical.

FACTORS THAT INFLUENCE DRIFT

The primary factors that influence drift are droplet size, wind speed, humidity, formulation of the pesticide, height of emission (primarily influences swath displacement of large droplets), and the size of the area treated with the pesticide. The factor that has the greatest influence on the downwind movement is droplet size.

Droplet Size

Droplet size is the single most important factor that affects the distance that a droplet will drift from the target area. The vertical velocity (settling velocity) at which a droplet falls to the ground depends on the size of the droplet. The settling velocity varies approximately as the square of a droplet's diameter. A 400 micrometer droplet would fall 4 times as fast as a 200 micrometer droplet and would drift 1/4 as far when transported at equivalent wind speeds.

Wind Speed

Wind speed influences the drift distance of droplets, but does not have as great an influence as droplet size. The distance that a droplet drifts is approximately proportional to the wind speed. A large droplet will travel twice as far in a wind twice as fast.

Humidity

Droplets are reduced in size due to evaporation of the volatile portion of the spray. Therefore, droplets that are not particularly drift-prone during humid conditions might become small enough to drift from the target area when the humidity is low.

Sometimes applicators in the cotton growing regions of the South apply pesticides in as little as 1/2 gallon per acre of crop oils (soybean or peanut oil). Normally the pesticide might be applied in water at a higher rate per acre. The reason that some applicators give for using oil as a diluent is that it does not evaporate; and, therefore, does not pose a drift problem. This is not necessarily true because the small amount of spray applied must be highly atomized to achieve coverage and is drift-prone without the effect of evaporation.

Formulation

Aerial applicators are often called "crop dusters" because most of the pesticides applied during the early years of aerial application (late forties and fifties) were formulated as dusts. Aerial applicators are "crop dusters" in name only in today's agriculture. Most applicators switched to sprays and granular applications to reduce drift problems. Dusts are the most drift-prone pesticide formulation because the particles are very small.

Many pesticides are oil based formulations known as emulsifiable concentrates (EC) because many pesticidal chemicals are soluble in oil. These formulations form a white, milky emulsion when mixed with water. If a large droplet spectrum is used to apply the emulsion, the resulting spray is not particularly drift-prone. If the droplet spectrum produced by the nozzle is small, the water phase of the mixture can evaporate leaving nothing but a small oil droplet that is prone to drift.

Some formulations of pesticides are more volatile than others and the vapor phase of the chemical can drift and cause problems outside of the target area. The herbicide, 2,4-D, is formulated as an amine and an ester. The ester formulation is often more effective, but is more volatile. Ester formulations are banned in some areas because some broadleaf crops like tomatoes and melons are extremely sensitive to 2,4-D and even small concentrations of the chemical vapor in a distant nontarget field can cause plant injury.