HERBICIDE SYMPTOMS, CLASSIFICATION BY MODE OF ACTION

by

Barry Tickes, Dave Cudney, and Clyde Elmore

Herbicides are applied with the goal of injuring or killing unwanted plants. Many of the herbicides used in California are selective in that they injure weeds and cause minimal disruption of desirable plants. Occasionally, however, desirable plants are injured. This can happen through soil residues of herbicides from applications in previous crops, from spray drift of herbicides moving "off target", or from mistakes in application rates or improper herbicide choice. Crop injury can be caused by many factors and may not be due to herbicides. Nutrient deficiencies, salinity, drought, insect, disease, and nematode injury can all produce crop symptoms that can be mistaken for herbicide damage. It would be helpful to know what types of injury to expect from the herbicides that are most commonly used.

The following project was established in order to capture pictorial evidence of the symptoms produced by the most common herbicides. These herbicides were grouped into ten categories or "families" based on their modes of action. Seven crops were selected and treated with levels of herbicides sufficient to produce symptoms characteristic of their "herbicide family". The seven crops were: bean, tomato, sugarbeet, cotton, corn, wheat, and woody plants. Approximately 25 herbicides were grouped into the ten "families". Both pot studies and field studies were used to produce the herbicide symptoms. The goals of the project are: 1) to produce a slide set which would be useful to weed scientists and others who work with herbicides, 2) to produce a book with descriptions and pictures of herbicide symptoms which would be a useful reference to those trying to discern herbicide injury form other crop injury symptoms. The ten herbicide "families" grouped by mode of action consisted of:

1. The Growth Regulator Herbicides (2,4-D, MCPP, Banvel, and Turfion). These are mostly foliar applied herbicides which are systemic and translocate in both the xylem and phloem of the plant. They mimic natural plant auxins causing abnormal growth and disruption of the conductive tissues of the plant. The injury from this family of herbicides consists of twisted, mal-formed leaves and stems.

2. The inhibitors of amino acid synthesis (Roundup, Pursuit, Touchdown, Glean, and Oust). Both foliar and soil applied herbicides are in this family. Roundup and Touchdown translocate in the phloem with photosyntheate produced in the leaves. Others in this family move readily after root or foliar absorption. These herbicides inhibit certain enzymes critical to the production of amino acids. Amino acids are the building blocks of proteins. Once protein production stops, growth stops. Symptoms are stunting and symptoms associated with lack of critical proteins.