

## **AG: 335: CROP HEALTH AND PEST MANAGEMENT.**(Huntington University)

### Introduction

Healthy crops constitute the foundation of food security and the key to sustain life on earth. Crop health refers to any harmful factor biological, chemical or physical that may affect plants physiology and crop performance. Specific method of crop protection vary from farm to farm based on regional climate and specific crops such as weeds, pests invasive species. Protecting our food supply starts with protecting crops while they are still in the ground or the tree vines

### **1. WEEDS AND WEED CONTROL**

#### **a) weeds**

A **weed** is a plant considered undesirable in a particular situation, "a plant in the wrong place". Examples commonly are plants unwanted in human-controlled settings, such as farm fields, gardens, lawns, and parks. Taxonomically, the term "weed" has no botanical significance, because a plant that is a weed in one context is *not* a weed when growing in a situation where it *is* in fact wanted, and where one species of plant is a valuable crop plant, another species in the same genus might be a serious weed, such as a wild *Amaranthus* plants species growing among cultivated maize plants. Many plants that people widely regard as weeds also are intentionally grown in gardens and other cultivated settings, in which case they are sometimes called beneficial weeds. The term *weed* also is applied to any plant that grows or reproduces aggressively, or is invasive outside its native habitat. More broadly "weed" occasionally is applied pejoratively to species outside the plant kingdom, species that can survive in diverse environments and reproduce quickly; in this sense it has even been applied to humans

A number of native or non-native plants are unwanted in a specific location for a number of reasons. An important one is that they interfere with food and fiber production in agriculture wherein they must be controlled in order to prevent lost or diminished crop yields. Other important reasons are that they interfere with other cosmetic, decorative, or recreational goals, such as in lawns, landscape architecture, playing fields, and golf courses. Similarly, they can be of concern for environmental reasons whereby introduced species out-compete for resources or space with desired endemic plants. For all these reasons; horticulture, both functional and cosmetic, and environmental, - weeds interfere by:

- competing with the desired plants for the resources that a plant typically needs, namely, direct sunlight, soil nutrients, water, and (to a lesser extent) space for growth;
- providing hosts and vectors for plant pathogens, giving them greater opportunity to infect and degrade the quality of the desired plants;

common way of controlling many moth pests, such as moths. Spraying pesticides by planes trucks or by hand is a common method of pest control. Crop dusters commonly fly over farmland and spray pesticides to kill off pests that would threaten the crops. However, some pesticides may cause cancer and other health problems, as well as harming wildlife.

#### **h. Space fumigation**

A project that involves a structure be covered or sealed airtight followed by the introduction of a penetrating, deadly gas at a killing concentration a long period of time (24-72hrs.). Although expensive, space fumigation targets all life stages of pests.

#### **i. Space treatment**

A long term project involving fogging or misting type applicators. Liquid insecticide is dispersed in the atmosphere within a structure. Treatments do not require the evacuation or airtight sealing of a building, allowing most work within the building to continue but at the cost of the penetrating effects. Contact insecticides are generally used, minimizing the long lasting residual effects. On August 10, 1973, the Federal Register printed the definition of Space treatment as defined by the U.S. Environmental Protection Agency (EPA):

#### **j. Sterilization**

Laboratory studies conducted with U-5897 (3-chloro-1,2-propanediol) were attempted in the early 1970s although these proved unsuccessful. Research into sterilization bait is ongoing. In 2013, New York City tested sterilization traps in a \$1.1 million study. The result was a 43% reduction in rat populations. The Chicago Transit Authority plans to test sterilization control in spring 2015. The sterilization method doesn't poison the rats or humans The product Contra Pest was approved for the sterilization of rodents by the United States Environmental Protection Agency in August 2016.<sup>[16]</sup>

#### **k. Destruction of infected plants**

Forest services sometimes destroy all the trees in an area where some are infected with insects, if seen as necessary to prevent the insect species from spreading. Farms infested with certain insects, have been burned entirely, to prevent the pest from spreading elsewhere.

#### **l. Natural rodent control**

Several wildlife rehabilitation organizations encourage natural form of rodent control through exclusion and predator support and preventing secondary poisoning altogether.

## Temperature and moisture

Temperature and moisture are determining factors in accelerating or delaying the complex phenomena of the biochemical transformation (especially the "breathing" of the grain) that are at the origin of grain degradation. Furthermore, they have a direct influence on the speed of development of insects and microorganisms (moulds, yeasts and bacteria), and on the premature and unseasonal germination of grain. In the general diagram of conservation designed by Burges and Burrel, the relationship between temperature and moisture content is established in order to determine the area of influence of certain important degradation phenomena, such as: the development of insects and moulds, and the germination of grain. It is easy to observe that the higher the temperature, the lower must be the moisture of the grain in order to ensure good conservation of the products. As an example, the preceding table shows the recommended durations of warehousing, according to the temperature and moisture content of the grain. The temperature depends not only on climatic conditions but also on the biochemical changes that are produced inside a grain mass, provoking undesirable natural heating of the stored products.

**The following table shows the moisture content recommended for long-term storage in hot regions of various sorts of grain.**

<b>GRAIN</b>	<b>MOISTURE</b>	<b>GRAIN</b>	<b>MOISTURE</b>
Paddy	14.0%	Sunflower	9.0%
Rice	13.0%	Wheat	13.0%
Maize	13.0%	Millet	16.0%
Sorghum	12.5 %	Coffee	13.0%
Beans	15.0%	Cocoa	7.0%
Groundnut	7.0 %	Copra	7.0 %

## Agents causing deterioration of stored grain

### Micro-organisms

Micro-organisms (moulds, yeasts, bacteria) are biological agents present in the soil which, when transported by air or water, can contaminate products before, during and after the harvest. Their presence and growth cause severe changes in the nutritive value and the organoleptic features of grain (taste, smell, aspect). Furthermore, they are responsible for the alteration of important germinative properties of seeds (vigour and capacity to germinate) and, in the case of moulds, for the potential formation of dangerous poisons (mycotoxins). Impurities, and cracked or broken grains, foster the development of micro-organisms. Furthermore, temperature and humidity have a determining influence on the growth rate of these degradation agents. It has been observed that

Pesticides and herbicides are applied to agricultural land to control pests that disrupt crop production. Soil contamination can occur when pesticides persist and accumulate in soils, which can alter microbial processes, increase plant uptake of the chemical, and also cause toxicity to soil organisms. The extent to which the pesticides and herbicides persist depends on the compound's unique chemistry, which affects sorption dynamics and resulting fate and transport in the soil environment. Pesticides can also accumulate in animals that eat contaminated pests and soil organisms. In addition, pesticides can be more harmful to beneficial insects, such as pollinators, and to natural enemies of pests than they are to the target pests themselves

### **Pesticide leaching**

Pesticide leaching occurs when pesticides mix with water and move through the soil, ultimately contaminating groundwater. The amount of leaching is correlated with particular soil and pesticide characteristics and the degree of rainfall and irrigation. Leaching is most likely to happen if using a water-soluble pesticide, when the soil tends to be sandy in texture, if excessive watering occurs just after pesticide application, if the adsorption ability of the pesticide to the soil is low. Leaching may not only originate from treated fields, but also from pesticide mixing areas, pesticide application machinery washing sites, or disposal areas.<sup>[3]</sup>

### **Fertilizers**

Only a fraction of the nitrogen-based fertilizers is converted to produce and other plant matter. The remainder accumulates in the soil or lost as runoff. High application rates of nitrogen-containing fertilizers combined with the high water-solubility of nitrate leads to increased runoff] into surface water as well as leaching into groundwater, thereby causing groundwater pollution. The excessive use of nitrogen-containing fertilizers (be they synthetic or natural) is particularly damaging, as much of the nitrogen that is not taken up by plants is transformed into nitrate which is easily leached. Nitrate levels above 10 mg/L (10 ppm) in groundwater can cause "blue baby syndrome" (acquired methemoglobinemia). The nutrients, especially nitrates, in fertilizers can cause problems for natural habitats and for human health if they are washed off soil into watercourses or leached through soil into groundwater.

### **Cadmium**

The concentration of cadmium in phosphorus-containing fertilizers varies considerably and can be problematic Continuous use of high-cadmium fertilizer can contaminate soil and plants. Limits to the cadmium content of phosphate fertilizers has been considered by the European Commission. Producers of phosphorus-containing fertilizers now select phosphate rock based on the cadmium content.

### **Fluoride**