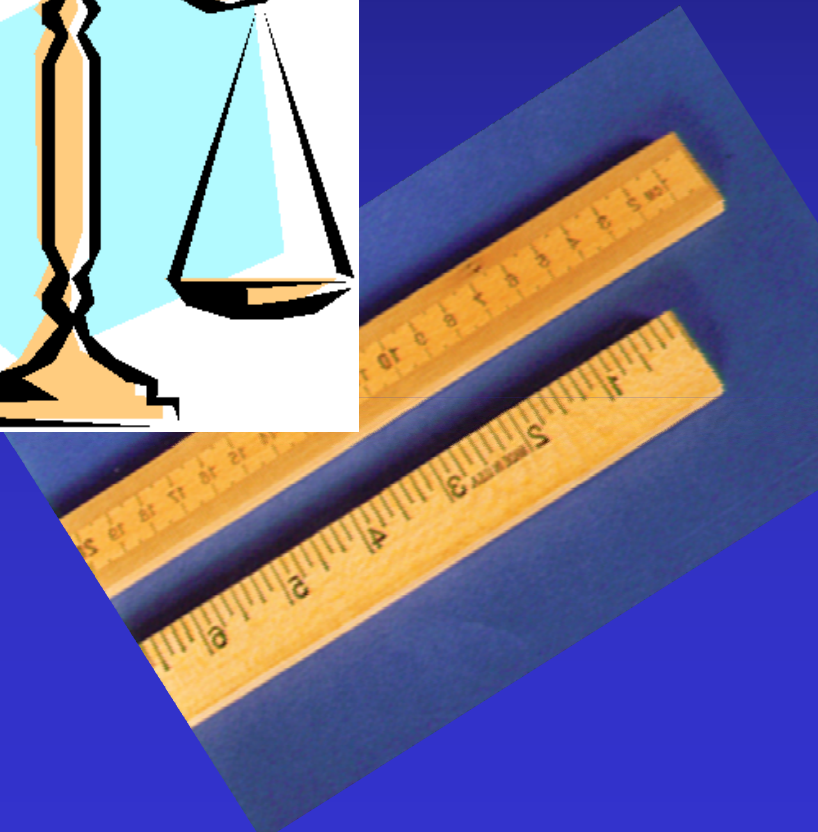


Weight, Measures, Calibration & Safety Issues



Weight and Measures

Length . Area . Volume . Mass/Weight

- **Length:** the distance A to B (or AB)
- **Area:** the product of “distance” in two dimensions
= distance (AB) x (AC) for squares or rectangles
- **Volume:** the product of “distance” in 3 dimensions
(AB)(AC)(AD)
- **Weight:** the gravitation attraction of a defined volume
- **Mass vs. Weight** is moot for earth surface nurseries

English or Metric?

- Reduction vs. Conservation
- Meter and water vs. size of thumb
- Inch, Pound, Gallon (no relationship)
- inch, hand, span, foot, yard, fathom, rod, *chain*, furlong, mile, league, acre, township, pennyweight, ounce, pound, barrel, hogshead, cord, peck, bushel, chaldron, scruple, dram, bottle, pottle, etc.

Metric to English (and vice versa)

- Inch = 2.54 cm
- Pound = 0.454 kg
- Gallon = 3.785 L
- Acre = 0.405 ha
- 1 cm = 0.3937 inches
- 1 kg = 2.205 lbs
- 1 L = 1.057 quarts
- 1 ha = 2.47 acres
- 1 lb/ac = 1.1 kg/ha
- 1 kg/ha = 0.90 lbs/ac

Metric - the basic unit

- Meter = 1/2,000,000 the distance the Pole to the equator (through Paris).
- Milli- = 0.001
- centa- = 0.01
- deci = 0.1
- kilo = 1,000
- Mega = 1,000,000

Volume

- Liter = 1,000 ml (0.001 cubic meter)
- a milliliter (ml) = 1 cc = 1 cm³

Mass

- 1 ml or 1 cc of water has a mass of 1 gram (gm)
- 1 L = 1,000 ml has a mass of 1 kilogram (Kg)

Nevertheless...

- The AUSFNMC wants English
- Since as nursery operators we are mostly concerned with area, the key measure is the *chain*.
- 1 chain = 66 ft and there are 10 squared chains / ac = $(66 \times 66 \times 10) = 43,560 \text{ ft}^2$

Calibration

measure – measure - measure

- **No. 1 = Quantity and Distribution per ac**
- **Most nurserymen know how many gal/ac their favorite sprayer puts out.**
- **The variability between nozzles is more likely to be overlooked as is the effect of boom height on distribution.**
- **How often? Many books recommend calibrating every other day.**

Two Ways to Calibrate “Spray”

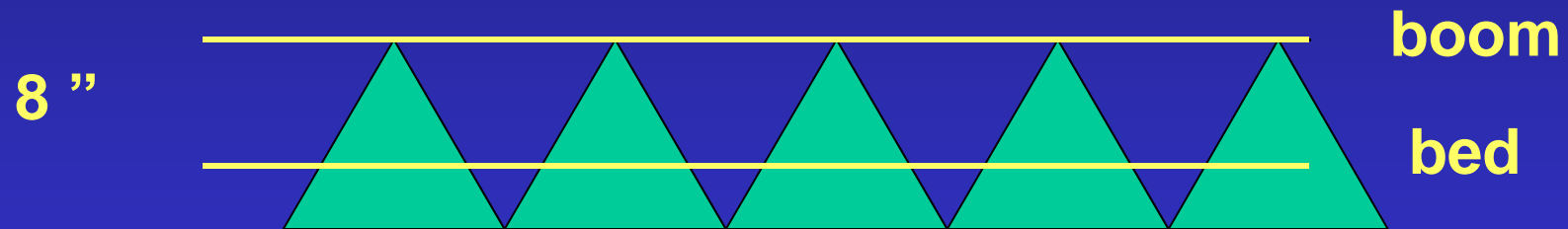
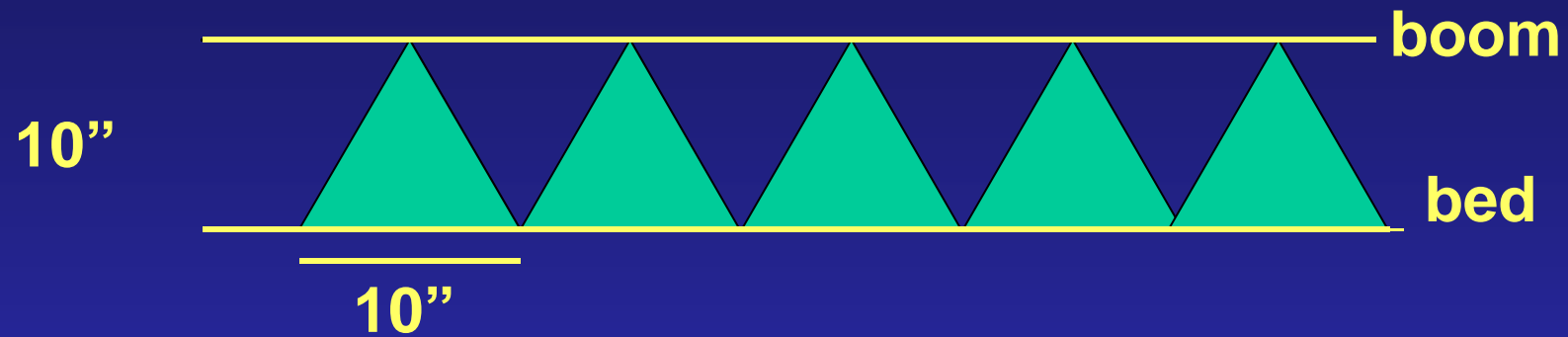
- 1 - Measure 660 ft
- 2 - Determine the spray put out in that distance at the desired speed or RPM of tractor
- Gal/ac =
$$\frac{\text{gal /660' x 66}}{\text{swath width in ft}}$$
- 1 - Fill tank and spray a known distance
- 2 - Measure amount to refill tank in Gal
- Gal/ac=
$$\frac{43,560 \times \text{gals}}{\text{swath length} \times \text{width}}$$

Ingredient per Acre

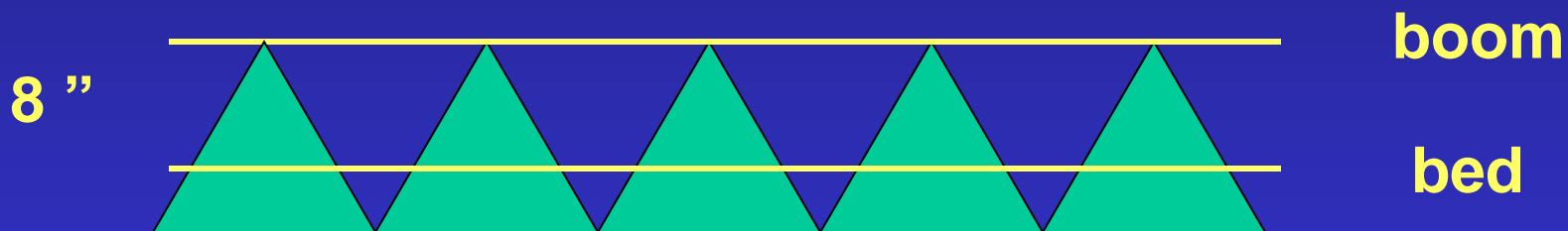
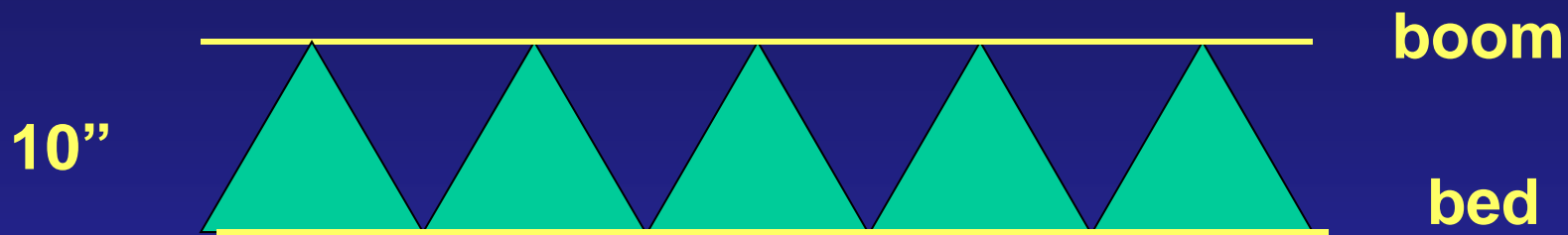
- You have determined the gal/ac that your spray-rig delivers to be “X”.
- You want to spray 2 lbs ai/ac
- Just make sure that for every “X” gallons of spray there is 2 lbs ai of the product you want.

Spray the nursery or just the bed surface?

- Some products should be applied to bed surface (fertilizer, most insecticides and fungicides) and some to beds, riser-lines and tractor paths (fumigants, herbicides).
- In most nurseries risers are 58' apart with nine, 4 ft-wide beds between. So bed surface is $36/58$ or about 62% of each ac.



If the 10" boom delivers 100 gal / ac
what does the 8" deliver?



- The top figure covers 50" of bed and the lower covers 40" so it treats with 20% more concentrated product per acre.
- Where 10" put out 100 gal/ac, 8" puts out 120 gal/ac.

Worker Protection or Applicator Safety Issues

- Active Ingredient - ai's
- Personal Protective Equipment - PPE
- LD 50's
- Signal Words
- Re-entry Interval – REI
- Restrictive Use Pesticide



Worker Protection or Applicator Safety Issues

“Familiarity breeds contempt”

Aesop - 600 BC



Worker Protection or Applicator Safety Issues

- Restrictive Use Pesticide – Indicates that the pesticide is for retail sale and application is to be done only by certified applicators or persons under direct supervision by a certified applicator.
- Some of the pesticides used are both restrictive & non-restrictive. Designation will be listed on the LABEL and you must know the difference.



Active Ingredient By Wt. 23.2%
Lactofen
Other Ingredients 76.8%
*1-(carboethoxy) ethyl 5-[2-chloro-4-(tri-fluoromethyl) phenoxy]-2-nitrobenzoate
Contains 2 lbs. active ingredient per gallon
Do not apply this product through any type of irrigation system.

KEEP OUT OF REACH OF CHILDREN

ANGER — PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail).

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS & DOMESTIC ANIMALS

DANGER

Corrosive. Causes skin burns and irreversible eye damage. Harmful if swallowed, inhaled or absorbed through skin. Do not get in eyes or on skin or clothing. Avoid breathing vapor or spray mist.

This product contains lactofen, which has been determined to cause tumors in laboratory animals (mouse, rat). Risks can be reduced by closely following use directions and precautions, and by wearing the protective clothing specified elsewhere on this label.

STATEMENT OF PRACTICAL TREATMENT

If in eyes: Flush with plenty of water for at least 15 minutes. Get medical attention immediately.
If swallowed: DO NOT INDUCE VOMITING. Drink promptly a large quantity of milk, egg whites, gelatin solution, or if these are not available, large quantities of water. Avoid alcohol. Get medical attention immediately.
If on skin: Wash with plenty of soap and water. Get medical attention.
If inhaled: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.
Note to Physicians: Emergency Information - call 1-800-892-0099.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category G on an EPA chemical resistance category selection chart.

Applicators and other handlers must wear: coveralls over long-sleeved shirt and long pants, chemical-resistant gloves, such as Barrier Laminate or Viton \geq 14 mils, chemical-resistant footwear plus socks, protective eyewear, chemical-resistant headgear for overhead exposure, and chemical-resistant apron when cleaning equipment, mixing or loading.

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water by cleaning of equipment or disposal of waste. Do not apply when weather conditions favor drift from target area.

PHYSICAL OR CHEMICAL HAZARDS

Do not use or store near heat or open flame.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL AND PAMPHLET. USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND DIRECTIONS AND WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification and emergency assistance. It also contains specific statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is: coveralls over long-sleeved shirt and long pants, chemical-resistant gloves, such as Barrier Laminate or Viton \geq 14 mils, chemical-resistant footwear plus socks, protective eyewear, and chemical-resistant headgear for overhead exposure.

Specimen Label

Dow AgroSciences



™Trademark of Dow AgroSciences LLC

Use Directions For: artichokes (globe), broccoli/cabbage/cauliflower, cacao, citrus (nonbearing), coffee, conifer (seedbeds, transplants, container stock) and selected deciduous trees, cotton, cottonwood, eucalyptus, fallow bed, (cotton/soybeans), garbanzo beans, garlic, guava (Hawaii only), horseradish, jojoba, mint, onions, onions grown for seed, papaya (Hawaii only), taro, treefruit/nut/vine

Active Ingredient

oxyfluorfen: 2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)	41%
Inert Ingredients	59%
Total	100%

Contains 4 pounds active ingredient per gallon.

Shake Well Before Using

EPA Reg. No. 62719-447

Keep Out of Reach of Children

CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Precautionary Statements

Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Avoid contact with skin or clothing. Wash thoroughly with soap and water after handling.

Personal Protective Equipment (PPE):

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical resistance category selection chart.

Applicators and other handlers must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant footwear plus socks
- Chemical-resistant gloves made of any waterproof material ($>$ 14 mils) such as: Barrier Laminate, Butyl Rubber, Nitrile Rubber, Neoprene Rubber, Natural Rubber, Polyethylene, Polyvinyl Chloride (PVC), or Viton
- Chemical-resistant headgear for overhead exposure
- Chemical-resistant apron when cleaning equipment, mixing or loading

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove contaminated clothing and wash clothing before reuse.

Environmental Hazards

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of equipment washwaters. This product is highly toxic to aquatic invertebrates, aquatic plants, wildlife and fish. Use with care when applying in areas frequented by wildlife or adjacent to any body of water or wetland area. Do not apply when weather conditions favor drift or erosion from target areas. Runoff may be hazardous to aquatic organisms in neighboring areas.

Notice: Read the entire label. Use only according to label directions.

Before using this product, read Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Label - The legal document between the Producer, the EPA and the User

Worker Protection or Applicator Safety Issues

- Active Ingredient - ai's

The amount in % of the actual compound that is responsible for the pest control.

The amount of ai per acre will change with the pesticide used. Even the same chemical may have different ai's.

READ and UNDERSTAND the LABEL!



Worker Protection or Applicator Safety Issues

Formulations: Pesticides come in different forms and/or carriers. This determines how they can be applied.

Emulsifiable Concentrates (EC): non soluble in water, but are dissolved in non-polar liquids (emulsifiers) that can be suspended in water. Some emulsifiers can be phytotoxic.

Wettable Powder (WP)

Soluble Powder (SP)

Dusts (D)

Granular (G)

Worker Protection or Applicator Safety Issues

- LD 50's Indicates the lethal dose of the pesticide in milligrams per kilogram (mg/kg) of test animal that resulted in the death of 50% of test animals. Can be either dermal or oral.
- The smaller the number, the more dangerous the pesticide.
- Know your LD 50 level!



LD 50's mg/kg (1000 mg = 1 g)

Salt	12,350	Bayleton	1000
Sucrose	29,700	Glyphosate	10,000
Nicotine	50	Asana	325
Alcohol	5600	Chloropicrin	250
Theobromine	50	Goal	10,000
Vinegar	3300	Thiram	5000
DEET	2200	Diazinon	350
Caffeine	200	Stinger	5000
Aspirin	1240	Reflex	8000
Gasoline	4300	Manage	2600

Worker Protection or Applicator Safety Issues

- Signal Words: Gives an insight into the toxicity of the product. Will be **PROMINENTLY** displayed on the product label.

DANGER = very toxic, LD 50s = 0-50 mg/kg

WARNING = moderately toxic, LD 50s = 50-500 mg/kg

CAUTION = slightly toxic, LD 50s = 505-5000 mg/kg



Worker Protection or Applicator Safety Issues

- Personal Protective Equipment - PPE

Each pesticide has listed the minimal amount of protective equipment that the applicator must wear to use the material. This is listed on the label and usually includes long-sleeved shirts, long pants, chemically resistant gloves, foot wear, protective eyewear, etc...



Worker Protection or Applicator Safety Issues

- Re-entry Interval – REI

This is the time period between application and when non-protected workers can “re-enter” the treated field.

Depending upon the pesticide, this can be anywhere from 12 hours up to 72 hours for some compounds.

Treated fields need to be posted as such to keep uninformed personnel out of the area.

Category I, II & III = 48, 24, 12 hrs



HAZARD

Hazard – Estimates of hazard are based on observed acute dermal, and to a lesser extent oral, LD50's and, when available, use experience. You can probably think of many qualifiers.

Relative Coop Hazard - a number that compares application hazard among the 25 pesticides applied to pine seedlings. It is equal to dermal LD50/use rate in lbs ai / 100.

Estimated relative acute toxic hazards to users/applicators (Ware 94)

Most Dangerous	Dangerous	Less Dangerous	Least Dangerous
Parathion	Bifenthrin (Talstar)	Diazinon	Captan
	Clopyrialid (Stinger)	Dimethoate (Cygon)	Chlorpyrifos (Dursban)
		Esfenvalerate (Asana)	Malathion
		Oxamyl (Vydate)	Permethrin (Pounce/Ambush)
			Triadimefon (Bayleton)

RELATIVE PESTICIDE HAZARD TO COOPERATIVE USERS

<i>Product</i>	<i>LD 50</i>	<i>Use Rate</i>	<i>RCH</i>
Pounce EPA Label	4000	0.10	400
Pounce 24 C Label	4000	10	4
Stinger	2000	1.0	20
Goal	10,000	0.05	200

IPM in Theory and Practice

Immediately after WWII it seemed for awhile that insect problems would be solved by a weekly (wash-day) application of DDT.

IPM was the idea that came from the “ashes” of that approach to insect control.

In simple terms, there are applications we should skip and some we can't.

IPM and Pine Seedlings

90% of herbicides and insecticides are applied to three crops (cotton, corn, soybeans) at the per acre value. With these crops, IPM works fine.

At the per acre values of pine seedlings, some IPM guides have to be abandoned.

IPM AND PESTICIDE USE IN THE NURSERY COOP

IPM - once an idea to coordinate pesticide use for maximum efficiency, to some it is now just to reduce use.

Economic Threshold (ET) - The point at which it is cost effective to apply pesticide. N/A in forest tree nurseries due to crop values per acre.

Key Pest – The pest that is the main target of treatments. Other pests are usually controlled as a side benefit. Lygus bugs and LCB's are key pests.