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Novaluron as an Ovicide: A Model for Evaluation of Aerially-Applied Insecticides. Part 1 - Laboratory and Spray Table Evaluations

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Need for Evaluations

- Availability of numerous insecticides
- Variety of modes of action
- High specificity and cost of new insecticides
- Variety of formulations and concentrations
- Target variety of different pests on different crops
- Large choice of adjuvants/additives
- Minimize drift while maintaining efficacy
- What is “satisfactory” control?
- Applicability of generalizations?
- Increasing aerial application equipment and operation costs

Target of Evaluations

- Develop a series of equipment and operational guidelines that aerial applicators can use to apply active ingredient deposits on plants that optimize efficacy relative to limitations imposed on commercial operations because of practical, legal, and cost considerations.

Conceptual Model for Evaluation of Aerially-Applied Insecticides

Three Phases:

1. Laboratory Evaluations
    a. Inherent Toxicity
    b. Assessment of Mortality
2. Spray Table Evaluations
    a. Optimum Droplet Size and Density
3. Field Evaluations
    a. Verification of Optimum Coverage
    b. Equipment – cannot use spray table

Novaluron

- Diamond 0.83 EC® - Chemtura Corp.
- Insect Growth Regulator (IGR) – Selectivity
- Compatible with IPM - Conservation
- Ovicidal activity on eggs of Lepidoptera
- Larval or nymphal activity – early instars
- Corn earworm or bollworm, *Helicoverpa zea* (Boddie) – corn and cotton
- Synthetic pyrethroid resistance in bollworm on cotton after use on earlier infestations on other crops.

Objectives

Laboratory Evaluations:

1. Determine the inherent toxicity of novaluron on bollworm eggs as compared to other standard ovicides
2. Identify an appropriate measure of mortality caused by novaluron.

Spray Table Evaluations:

1. Evaluate droplet size and concentration to optimize these for efficacy.

Field Evaluations – Discussed in Part 2 by Dan Martin.

Laboratory Evaluations Methods and Materials

- Used eggs oviposited by female bollworm moths collected in blacklight traps operated in the Brazos River Valley close to College Station and by females reared in the laboratory for numerous generations
- Dipping technique – 100 % coverage (max)
- Dipped corn silks, paper toweling, and small cotton plants with eggs on them or eggs added after dipping.

Laboratory Evaluations Methods and Materials (Con't)

- All insecticides commercially formulated materials and mixed as % vol:vol or label recommended rates at 19 l/ha (2 gpa) or 47 l/ha (5 gpa)
- Eggs categorized as white or tan
- Eggs placed individually or in groups in dry cups or cups containing artificial diet for surviving larvae to feed
- Cups incubated at 27 deg. C, RH>60% and 14:10 L:D photoperiod

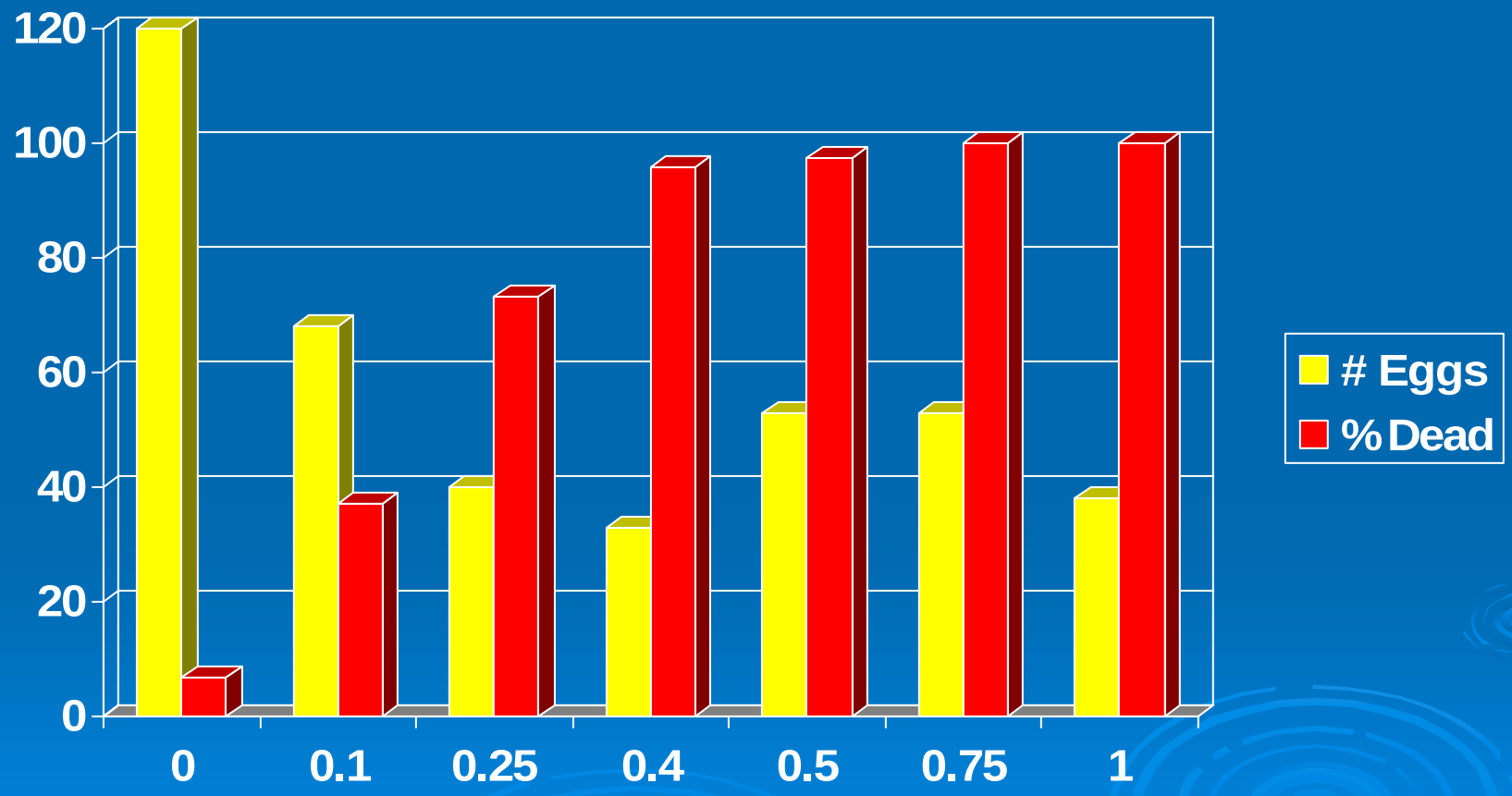
Laboratory Evaluations Methods and Materials (Con't)

Eggs categorized unhatched, larva hatched dead, or larva hatched alive.

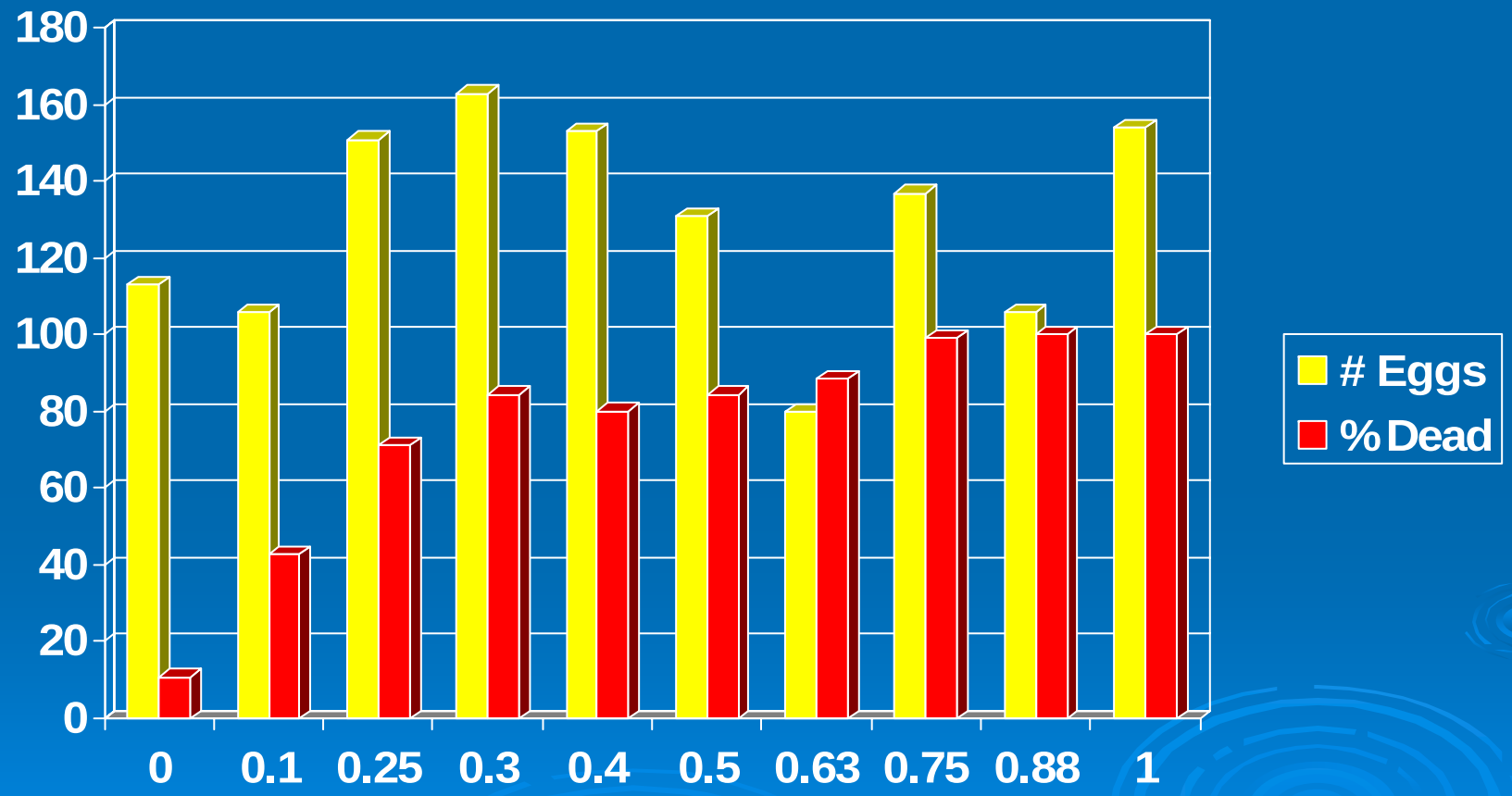

LUMAX.
syngenta


LUMAX

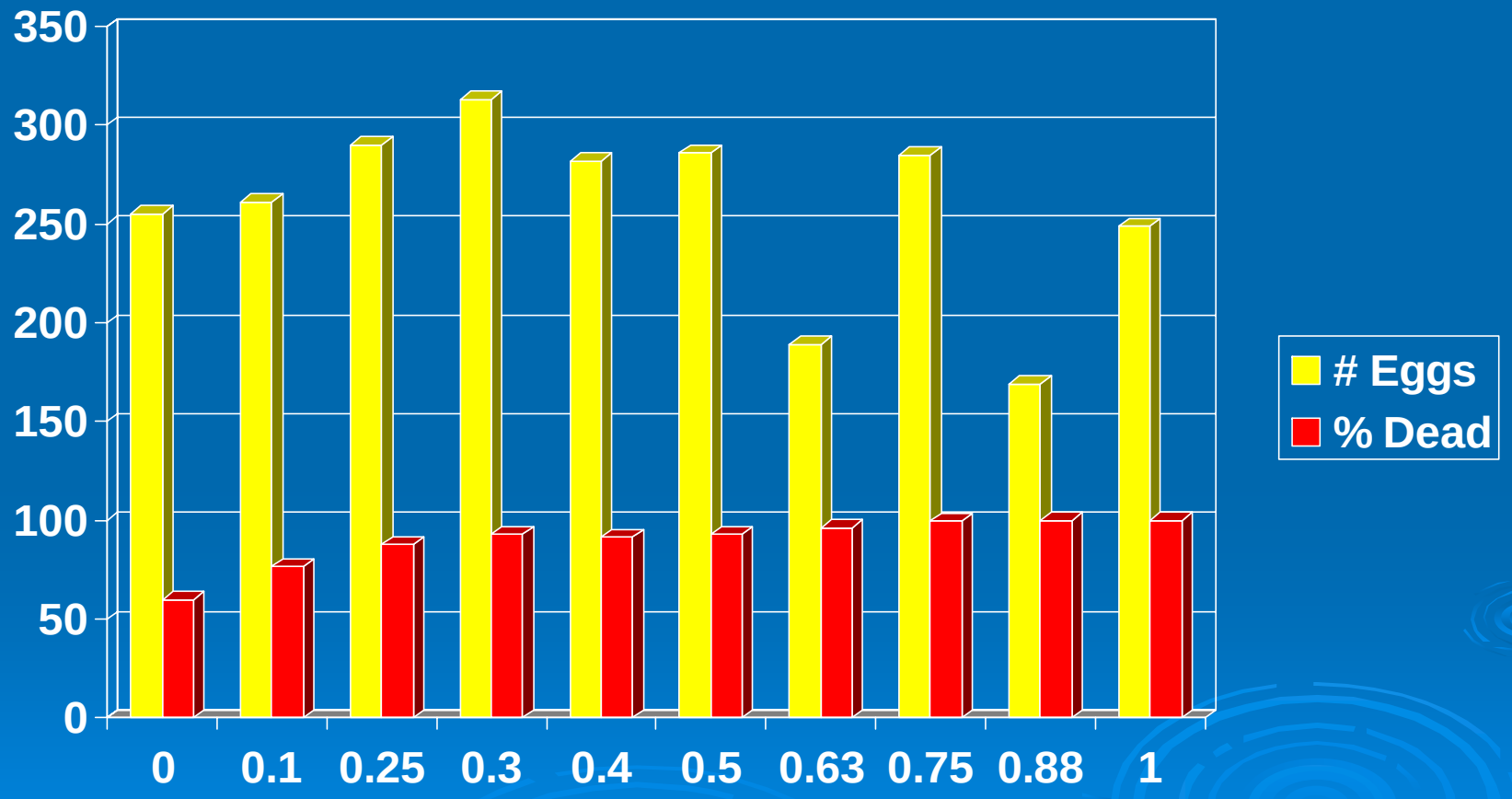
Field Eggs – Novaluron (%vol:vol)



Tan Lab Eggs – Novaluron (%vol:vol)



White Lab Eggs – Novaluron (%vol:vol)



Comparison of Lethal Concentrations

LC %(v:v)	Source	% Conc. (v:v)	95% CL
10	Field	0.063	0.040-0.084
	Lab	0.044	0.009-0.086
50	Field	0.153	0.122-0.183
	Lab	0.148	0.070-0.212
90	Field	0.369	0.304-0.486
	Lab	0.500	0.376-0.786

Novaluron 9 or 12 oz; 2,5,10 GPA

No. oz.	GPA	No. Eggs	%Mortality[1]
9	2	52	95.4a
	5	43	100.0a
	10	48	97.9a
12	2	39	97.5a
	5	50	100.0a
	10	43	97.4a

1 Corrected for check mortality (16.25%).

Concentration (v:v) Novaluron Label Rates

Fluid oz./acre	GPA	% Conc
9	2	3.5
	5	1.4
	10	0.7
12	2	4.7
	5	1.9
	10	0.9

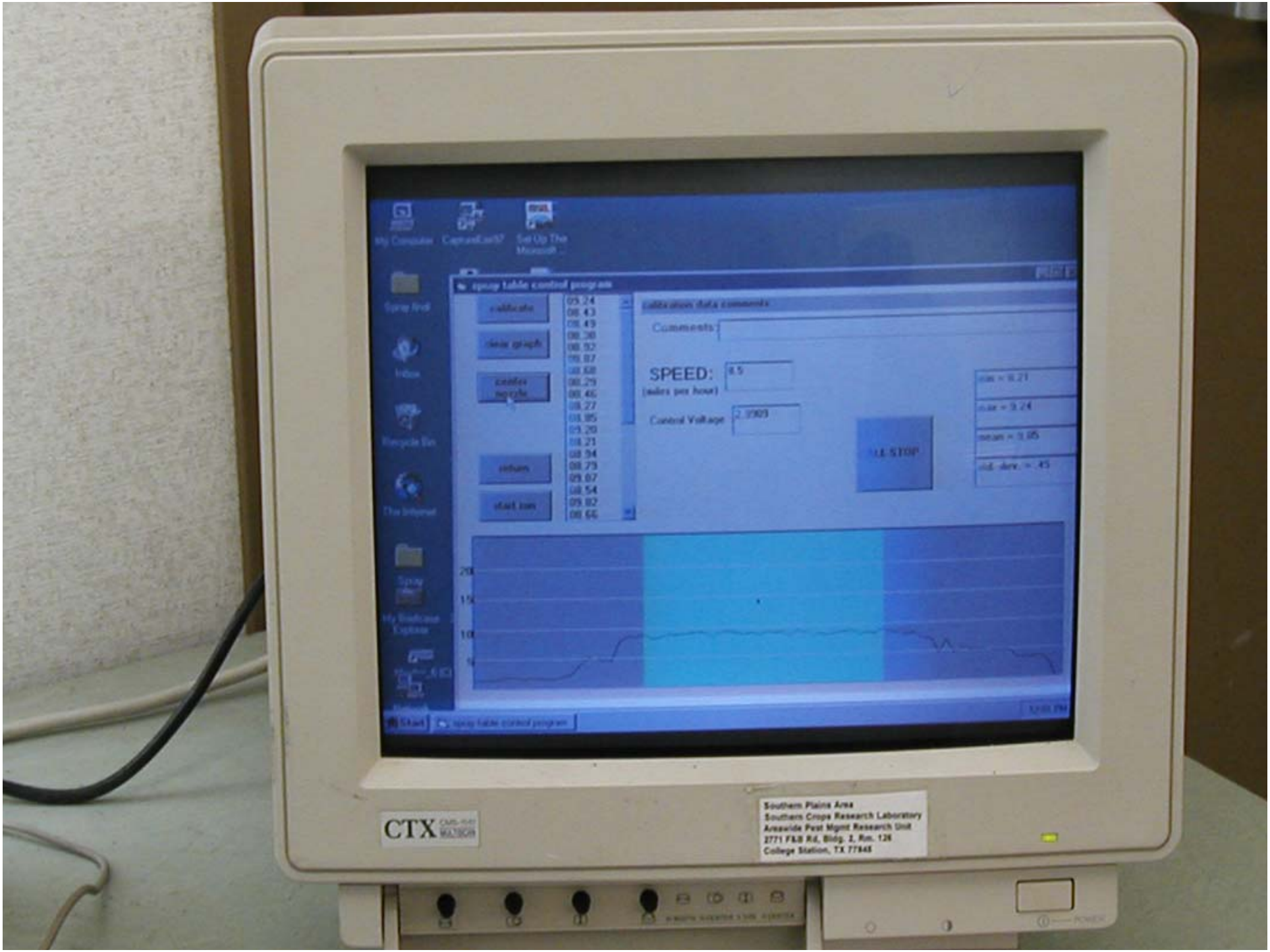
Comparison of Ovicides

Insecticide	GPA	No. Eggs	%Mortality[1]
Novaluron	2	29	100.0a
	5	56	98.0a
Methomyl	2	46	93.6a
	5	45	100.0a
Thiodicarb	2	36	100.0a
	5	50	97.3a
Amitraz	2	50	95.5a
	5	53	97.8a
Profenofos	2	45	100.0a
	5	44	100.0a

1 Corrected for check mortality (25.5%).

Spray Table Evaluations

- Limited research with novaluron.
- Primarily similar droplet sizes at 2 and 5 gpa – results not satisfactory.
- Past year evaluated many different nozzles at different speed and pressure settings.
- Droplet Scan™ Software for deposition.
- Data available to select specific test deposits on plants.


Comments:
SPEED:
(miles per hour)
Control Voltage
CTX
Southern Plains Area
Southern Crops Research Laboratory
Areawide Pest Mgmt Research Unit
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College Station, TX 77845

Conclusions – Part 1

- Novaluron is a highly effective ovicide for bollworm/corn earworm.
- Use tan eggs to determine mortality caused by novaluron, but need to see what effects it has on white eggs.
- Ready to start intensive spray table evaluations of novaluron to determine optimum drops size and concentration for efficacy.