Peanut In-Service Training Session

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Topics

APRES (July 12-16)

Field Days (CHROME June 30, NE Ag Expo July 29, Lewiston Sep 9, Whiteville Sep 14, PVQE ?)

In-Service Training (Late-season disease Sep 22 PM)

Pod Maturity Clinics

On-Farm Trials

Details

Thrips Management

Disease Management

Tank Mixtures

Light Green Peanuts

Variable Rate Gypsum Applications

Risk Tool (Data Collection)

https://peanut.ces.ncsu.edu/peanut-risk-tool-and-field-log/

Herbicide Selector Tool

https://cropmanagement.cals.ncsu.edu/weeds/herbicideselect.aspx

Trials in B9 (Nozzles, Paraquat plus Basagran plus residuals, Paraquat plus Storm plus residuals, Clethodim plus Storm plus residuals, FMC, Cereal rye, Cotton/Soybean/Enlist in 2019/Peanut in 2021

Bailey II, Emery, Sullivan

Admire Pro versus Velum Total (Rotation Trials)

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An Experiment is:

A planned inquiry to obtain new facts or to confirm or deny results of previous experiments (Steele and Torrie, 1980)

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Experiments vs. Observational Studies

Controlled Experiment: *Experimental Units* (treatments) are assigned randomly under controlled conditions in a manner to define cause and effect relationships in order to keep factors other than treatments constant

Observational Study: Observe a selected population and record what you see

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Agricultural Applications of Statistical Analysis

The basic purpose of statistical analysis is to measure variability in observations across an experiment and to assign that variability to known effects (treatment and replication) and unknown effects (error)

A high ratio of variability from known sources to unknown sources is required to conclude that observed differences are due to treatments and not some other uncontrolled or unknown effects

This process allows the researcher to have confidence that the differences observed are due to treatment and not due to environment or other unknown causes

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Separating (Partitioning) Variability into Known and Unknown Sources

A common procedure used to determine the causes of observed variability is called the Analysis of Variance (ANOVA).

The ANOVA determines if a significant portion of the observed variation is due to treatment. But, the general ANOVA does not determine differences among treatments.

Multiple comparison procedures, contrasts, and regression are used to separate differences among treatments.

Often times more can be concluded from the ANOVA table than from a table of means or a graph (relationships are important).

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Simple ANOVA

Source of variation	df	Sum of Squares	Mean square	F Ratio	P > F
Treatment (known)	3	500	167	23.8	<0.0001
Error (unknown)	140	1000	7	-	-

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Hypothesis Testing: Statistician Terms

-*Null hypothesis* – no difference in populations
-If reject *null hypothesis*, then a difference exists among at least two of the populations being compared

What really happens (but we can only estimate this using statistics)	**Accept *Null hypothesis***	**Reject *Null hypothesis***
TRUE (No differences in populations)	No error	Type I error
FALSE (Differences exist in populations)	Type III error	No error

A probability level of making Type I or Type III errors is set based on test statistics with acceptable risk (*F statistics* and *P values* are used as indicators of experimental error and variance that can affect confidence in making statements about the comparison.) These values are generally set at 20%, 10%, 5%, or 1% (p = 0.20, p = 0.10, p = 0.05, p = 0.01). For a p = 0.05, the statistician, scientist, and practitioner accepts that 5% of the time a Type I or Type III error will be made (95% of the time a mistake will not be made) based on random error. 5% is very conservative in protecting against the Type I or III error, and many scientists are now "relaxing" that constraint.

The F Statistic and ANOVA

Biological systems are inherently variable

$$\frac{\text{Variation from Known Effects}}{\text{Variation from Unknown Effects}}$$

The researcher or someone reading the results from research may decide to make a recommendation to a practitioner. How is that done given the variation in biology?

Reasons Why the F Ratio Might be Low or High

Low F Value

Response to the treatments being compared vary by a “small” degree that may not be measurable using the experimental approach (numerator is “small”)

Response to the treatments being compared vary by a “large” degree but too much “experimental error” or “uncontrolled variation” existed with the experimental approach (denominator is “large”)

High F Value

Variation of treatments (known effects) is large enough (numerator) to “overcome” large variation in experimental error (unknown effects) (denominator)

Variation of treatments (known effects) is “large” and variation in experimental error (unknown effects) is “small”

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Experimental Design

Randomization: All plots have an equal chance of being assigned a given treatment and are assured unbiased estimates of treatment means and experimental error

Replication: Improves precision of treatment means and is a measure of consistency of response (repeatability)

- More replication = greater precision
- Is the difference biologically significant? [good question, but statistics are "blind" to that question]

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Experimental Design

Local Control (Blocking): Plots are grouped into blocks with similar features (soil type, texture, organic matter, slope), but features between blocks are often different thereby improving precision by accounting for a portion of the variation

The need for blocking can also occur in greenhouse research (light, shade, drafts)

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Precision of Comparisons Versus Logistical Constraints

Randomized Complete Block Designs
Split Plot Designs
Splitting Fields in Half (Strips)
Comparing Different Fields

Partitioning experimental error and treatment effects – how can this be achieved given logistical constraints?

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Use of Statistics in Pest Management

Using statistics to make valid comparisons that can be extrapolated to other circumstances

The most predictable and dependable recommendations include conclusions drawn from appropriately designed, repeated and analyzed experiments (regardless of the preconceived or expected outcome)

Examples

Mean separation
Correlations
Regression

Table 1. Analysis of variance visual injury caused by tobacco thrips and peanut pod yield as influenced by systemic insecticide applied in the seed furrow at planting and acephate applied postemergence 3 weeks after planting.[a]

	Visual injury caused by tobacco thrips		Peanut pod yield	
Source of variation	F ratio	P > F	F ratio	P > F
In-furrow insecticide	99.3	≤0.0001	2.4	0.0690
Acephate postemergence	146.9	≤0.0001	1.2	0.2713
In-furrow insecticide × Acephate postemergence	17.1	≤0.0001	2.0	0.1116

[a]Data are pooled over 16 trials from 2014 through 2020.

Table 2. Visual injury caused by tobacco thrips as influenced by systemic insecticide applied in the seed furrow at planting and acephate applied postemergence 3 weeks after planting.[a]

In-furrow insecticide[b]	Acephate[c]	Visual injury caused by tobacco thrips[d]
		Scale 0 to 5
No	No	3.1 a
No	Yes	1.8 b
Imidacloprid plus fluopyram	No	1.8 b
Imidacloprid plus fluopyram	Yes	0.8 de
Imidacloprid	No	1.4 c
Imidacloprid	Yes	0.9 de
Phorate	No	1.1 d
Phorate	Yes	0.8 e

[a]Means followed by the same letter are not significantly different at $\alpha = 0.10$. Data are pooled over 16 trials from 2014 through 2020.

[b]Imidacloprid, fluopyram, and phorate applied at 0.31 lbs/acre, 0.21 lbs/acre, 0.50 lbs/acre, respectively.

[c]Acephate applied at 0.5 lbs/acre 3 weeks after planting.

[d]Visual estimates of thrips injury were recorded on an ordinal scale of 0 to 5 (0 = no damage, 1 = noticeable feeding but no stunting, 2 = noticeable feeding and 25% stunting, 3 = feeding with blackened terminals and 50% stunting, 4 = severe feeding and 75% stunting, and 5 = severe feeding and 90% stunting) 10 to 15 days after acephate was applied.

Table 3. Peanut pod yield as influenced by the main effect of systemic insecticide applied in the seed furrow at planting and the main effect of acephate applied to peanut foliage.

Insecticide treatment	Insecticide rate	Pod yield
	lbs/acre	
Systemic insecticide		
No insecticide	0	4,740 b
Imidacloprid plus fluopyram	0.31 plus 0.21	4,930 a
Imidacloprid	0.31	4,910 a
Phorate	0.5	4,850 a
Acephate applied to peanut foliage		
No acephate	0	4,830 a
Acephate	0.5	4,890 a

[a]Means followed by the same letter are not significantly different at $\alpha = 0.10$. Data are pooled over 16 trials from 2014 through 2020 and levels of the other treatment factor.