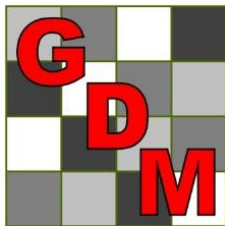


Trial Reporting Capabilities of ARM 9

See www.gdmdata.com/resources/meetings.htm
for presentation copy
(Meeting Calendar link on left navigation panel of
www.gdmdata.com)

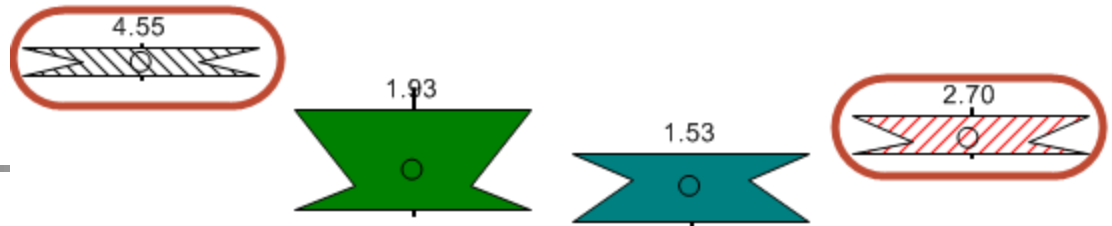


Steven R. Gylling

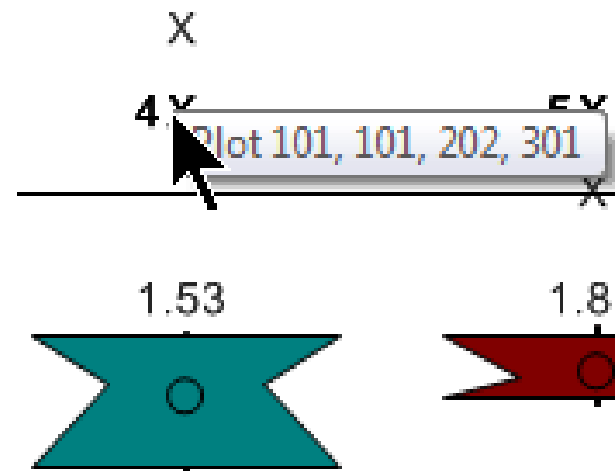
Gylling Data Management, Inc.



Graphs

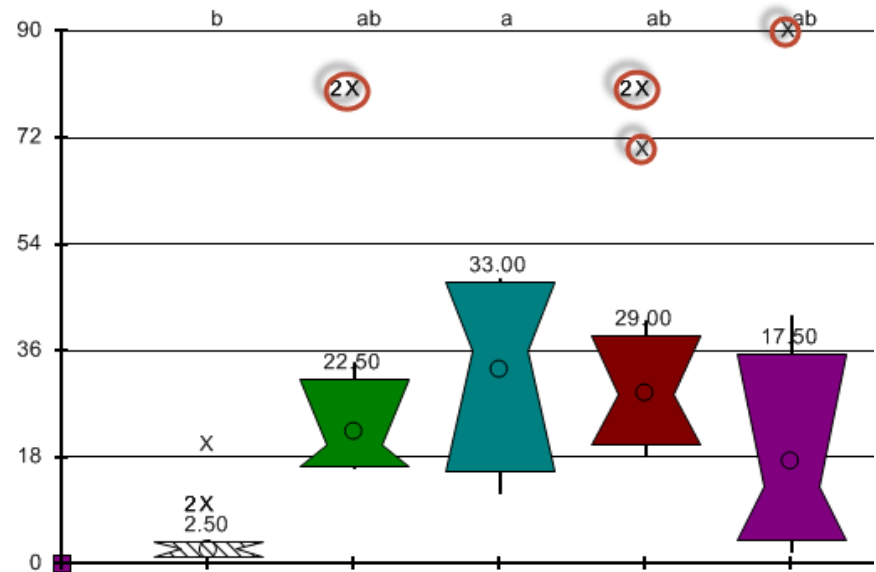


- Display untreated/check and reference treatments with special colors
- Hover mouse over outlier 'X' on box-whisker graph to show plot number(s) (especially useful with subsamples)



Graphs

- Auto-size graph title boxes in new graph to optimize using graph space
- Resize y-axis to show all outliers of box-whisker graph (previously you had to manually size)





Graph Tips

- Treatment Description on Trial Map is used for treatment labels on graph.
- Use Horizontal bar graph to better display long treatment names.
- Use Next Data/Previous Data buttons on Graph window to display the same graph for other data columns.



Graph Tips

- Use “Error Bars” tab on Graph Options to display standard deviation or standard error bars.

Note: ARM graph error bars use appropriate AOV error term for design. On many graph programs (such as Excel) error bars are only correct for Completely Random design.

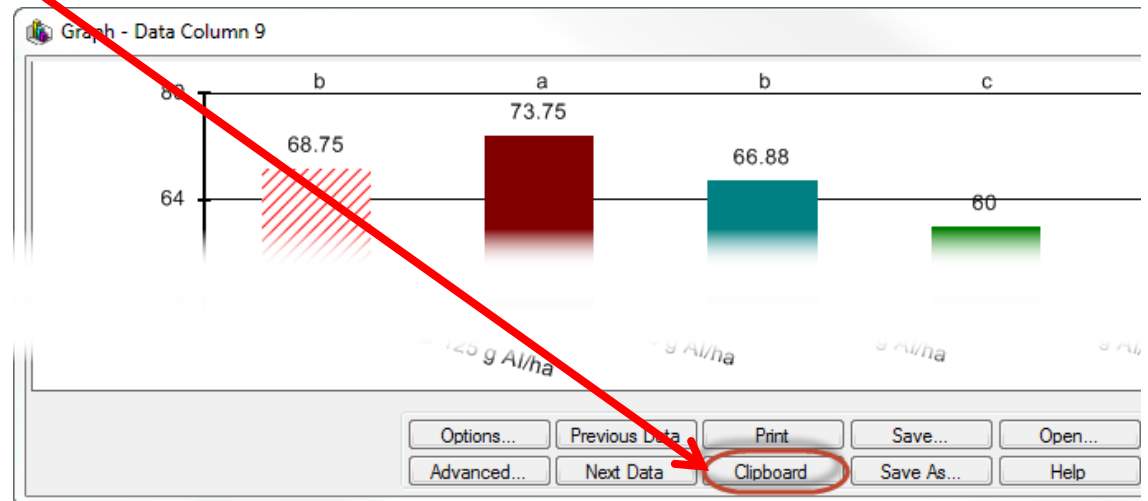


Graph Tips

- “Show data labels” on Labels tab of Graph Options shows treatment means.
- Use “Display AOV mean comparison letters” on Labels tab of Graph Options to show AOV mean comparison letters.
- Treatment selection order (e.g. 5 4 3 2 1) defines treatment order on a graph.

Graph Tips

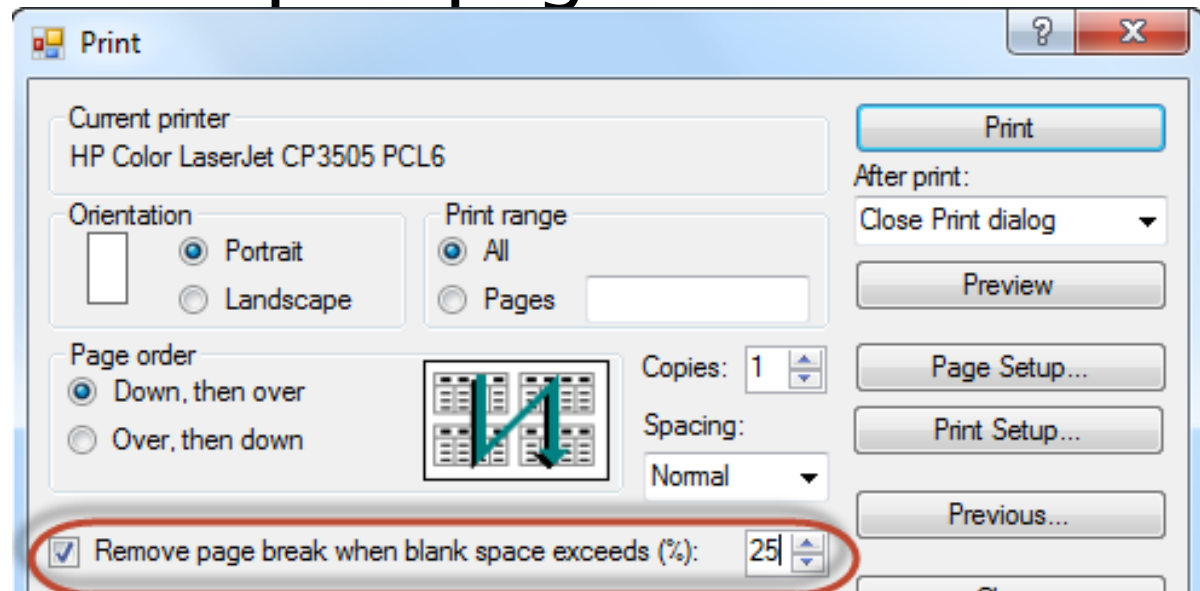
- Clipboard button is the easiest way to copy graphs to another program



- Paste in destination program to include the graph.

Print Reports: Remove page break when...

- 'Remove page break when blank space exceeds (%)' option reduces unused space on report pages



Print Reports: Remove page break when...

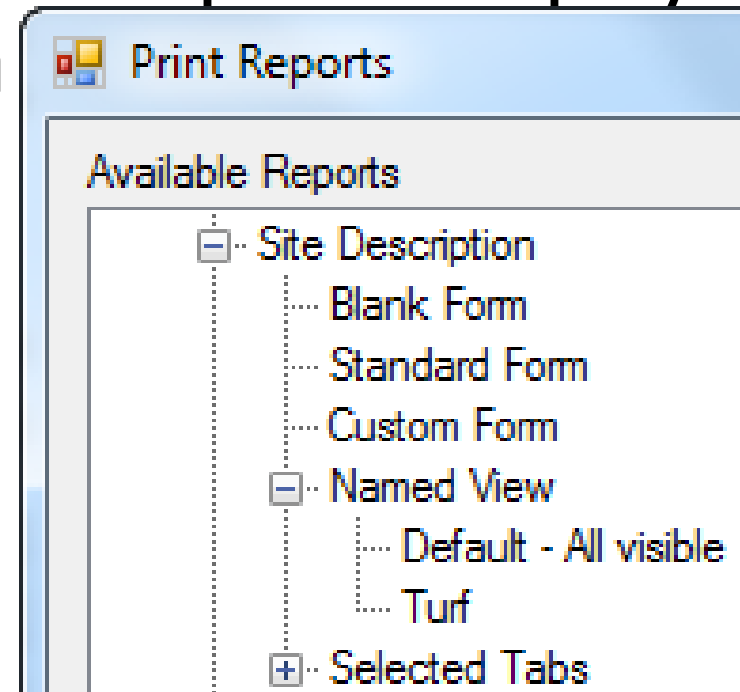
- Can shrink 4 pages to 1

Reps: 4 Appl Code: A Plots: 2.5 by 10 meters																
Spray vol: 200 L/ha Mix size: 2.15 liters (min 2.15)																
Trt No.	Treatment Name	Form Conc	Fom Unit	Fom Type	Rate	Appl Unit	Spray Code	Volume	Mix Unit	Mix Size	Amt to Measure	Product	Rep 1	2	3	4
3	TUB	250	G/L	EC	1 l/ha	ABC					10.75 ml/mx		101	202	301	402
1	Untreated Check					ABC							102	205	303	401
4	TILT 250	250	G/L	EC	0.5 l/ha	ABC					5.375 ml/mx		103	204	305	404
2	TUB	250	G/L	EC	0.5 l/ha	ABC					5.375 ml/mx		104	201	302	403
5	MICO 60	600	G/L	EC	1.5 l/ha	AB	250 L/HA	2.65	Liters		15.9 ml/mx		105	203	304	405
Reps: 4 Appl Code: B Plots: 2.5 by 10 meters																
Spray vol: 200 L/ha Mix size: 2.15 liters (min 2.15)																
Trt No.	Treatment Name	Form Conc	Fom Unit	Fom Type	Rate	Appl Unit	Spray Code	Volume	Mix Unit	Mix Size	Amt to Measure	Product	Rep 1	2	3	4
3	TUB	250	G/L	EC	1 l/ha	ABC					10.75 ml/mx		101	202	301	402
1	Untreated Check					ABC							102	205	303	401
4	TILT 250	250	G/L	EC	0.5 l/ha	ABC					5.375 ml/mx		103	204	305	404
2	TUB	250	G/L	EC	0.5 l/ha	ABC					5.375 ml/mx		104	201	302	403
5	MICO 60	600	G/L	EC	1.5 l/ha	AB	250 L/HA	2.65	Liters		15.9 ml/mx		105	203	304	405
Reps: 4 Appl Code: C Plots: 2.5 by 10 meters																
Spray vol: 200 L/ha Mix size: 2.15 liters (min 2.15)																
Trt No.	Treatment Name	Form Conc	Fom Unit	Fom Type	Rate	Appl Unit	Spray Code	Volume	Mix Unit	Mix Size	Amt to Measure	Product	Rep 1	2	3	4
3	TUB	250	G/L	EC	1 l/ha	ABC					10.75 ml/mx		101	202	301	402
1	Untreated Check					ABC							102	205	303	401
4	TILT 250	250	G/L	EC	0.5 l/ha	ABC					5.375 ml/mx		103	204	305	404
2	TUB	250	G/L	EC	0.5 l/ha	ABC					5.375 ml/mx		104	201	302	403
5	FUNGOL	200	G/L	SC	1.25 l/ha	C					13.44 ml/mx		105	203	304	405

Sort Order: Application Code, Replicate 1

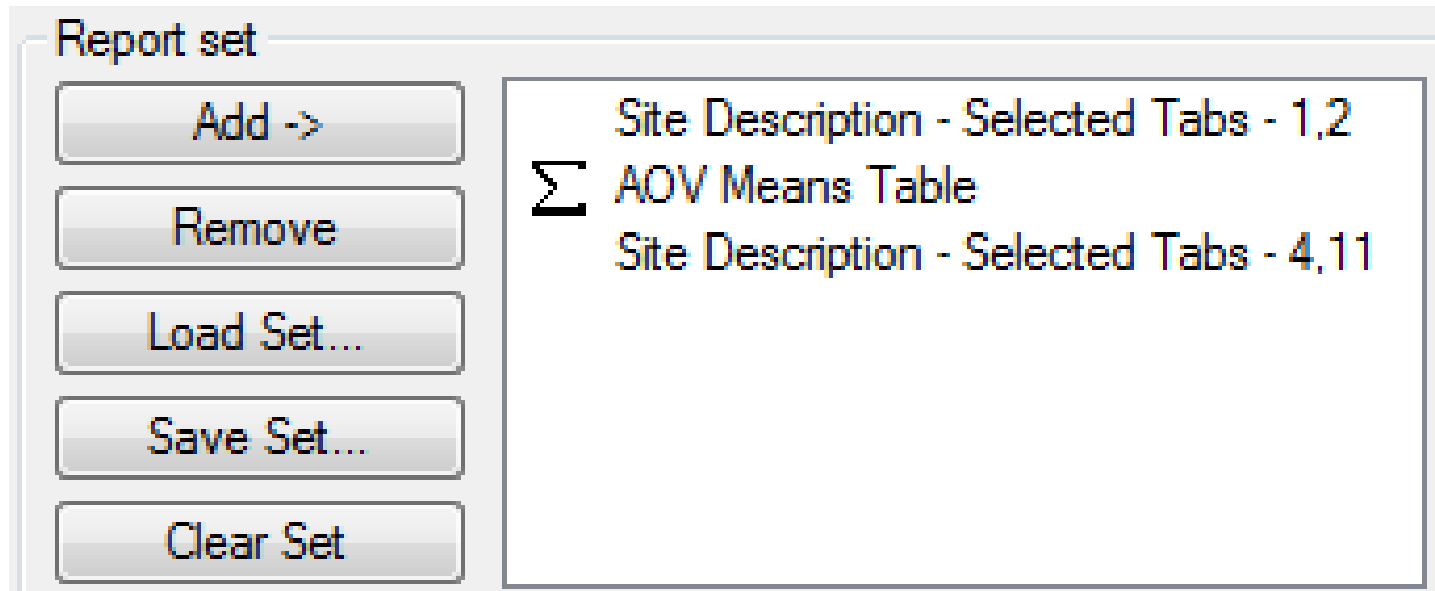
New Site Description Reports

- New Site Description reports simplify changing between common report uses



New Site Description Reports

- Allow printing several report segments



New Site Description Reports

- Allows you to create your own custom reports

General Trial Information							
Study Director: R.E. Ceatch		Title: Study Leader					
Investigator: ARM Demonstration							
Discipline: F fungicide		Trial Status: F one-year/final					
Completion Date: 08/07/08		Trial Reliability: HIGH					
Trial Location							
City: GEMBLOUX		Country: BEL Belgium					
State/Prov.: NAMUR							
Postal Code: 5030							
Latitude of LL Corner: 50°34'1" N		Longitude of LL Corner: 4°41'0" E					
Altitude of LL Corner, Unit: 152.00 M		Angle y-axis to North: 60.00					
Official Trial ID: B2007RTJ02N25							
No.	Guideline	Description					
1.	PP 1/152(3)	Design and analysis of efficacy evaluation trials					
2.	CEB 189	F : Maladies des céréales					
3.	PP 1/25(3)	Foliar diseases on cereals					
Pest Code	SEPTTR	SEPTTR	SEPTTR	ZZYYFY	TRZAW	TRZAW	
Crop Code	TRZAW	TRZAW	TRZAW	TRZAW	TRZAW	TRZAW	
Part Rated	LEAF3 P	LEAF3 P	LEAF2 P	LEAGRE P	GRAIN C	GRAIN C	
Rating Date	05/13/08	06/18/08	07/02/08	07/15/08	08/07/08	08/07/08	
Rating Type	PESSEV	PESSEV	PESSEV	AREA	YIELD	YIELD	
Rating Unit	%UNCK	%UNCK	%UNCK	%AREA	T-MET	%UNCK	
Sample Size, Unit	10 LEAF	10 LEAF	10 LEAF	5 LEAF	1 HA		
Pest Density, Unit	4.42PERCENT	8.25PERCENT	15.5PERCENT	1.75PERCENT			
Tit-Eval Interval	28 DA-A	15 DA-B	29 DA-B	11 DA-C	30 DA-C	30 DA-C	
Tit Treatment	Rate Appl						
No. Name	Rate Unit Code	4	6	8	9	12	13
1 Untreated Check	ABC	0.00 b	0.00 b	0.00 c	2.31 b	7.93 b	100.00 b
2 TUB	0.5 l/ha ABC	57.98 a	71.65 a	89.11 ab	21.58 a	8.62 a	108.68 a
3 TUB	1 l/ha ABC	67.06 a	80.07 a	96.53 a	28.98 a	8.51 a	107.51 a
4 TILT 250	0.5 l/ha ABC	59.52 a	70.60 a	86.63 ab	27.82 a	8.56 a	108.16 a
5 MICO 60 FUNGOL	1.5 l/ha AB 1.25 l/ha C	39.92 a	71.49 a	75.56 b	11.46 a	8.48 a	106.90 a
LSD (P=.05)		28.205	22.410	10.444	0.435	0.366	4.640
Footnote 1: Adjusted at 15 % Moisture							
Footnote 2: % Green Leaf Area							
Crop Description							
Crop 1: TRZAW Triticum aestivum (Winter)		Winter wheat					
Variety: RIBAND		BBCH scale: BCER					
		Planting Date: 09/30/07					
		Planting Method: DRILLE drilled					
		Harvest Date: 08/07/08					
		Harvested Vldth, Unit: 1.1 M					
		Harvested Length, Unit: 9 M					
		Harvest Equipment: COMBINE					
		% Standard Moisture: 15.0					
Crop Stage At Each Application							
		A	B	C			
Crop 1 Code, BBCH scale:	TRZAW BCER	TRZAW BCER	TRZAW BCER	TRZAW BCER	TRZAW BCER	TRZAW BCER	
Stage Scale Used:	BBCH	BBCH	BBCH	BBCH	BBCH	BBCH	
Stage Majority, Percent:	32 100	39 100	77 100				

Print Selected Replicates

- General Summary report option to exclude replicates that may be damaged

The screenshot shows a software dialog box titled "AOV Means Table Report Options". It has several tabs: "Pre-mix Ingredient", "Fields to Print", "Global - General", and "Global". The "Global - General" tab is active, showing "AOV Means Table Report Options" and "General Summary". Under "Missing data estimates", the "Yates" radio button is selected. Under "Assessment data header rows", there is a "List:" field. At the bottom, there is a checkbox labeled "Print selected replicates" which is currently unchecked and highlighted with a red oval. Above this checkbox is the text "Apply automatic transformations or treatment exclusions to data columns that violate assumptions of AOV".

Print Selected Replicates

- Similar prompting as selected data columns or header rows

+ Sub	Rp	Bk	Col	Plot	Tit	1	
1	1	1	1	101	3	0	100
1	1	1	2	102	1	0	100
1	1	1	3	103	4	0	100
1	1	1	4	104	2	0	100
1	1	1					
1	2	2					
1	2	2					
1	2	2					
1	2	2					

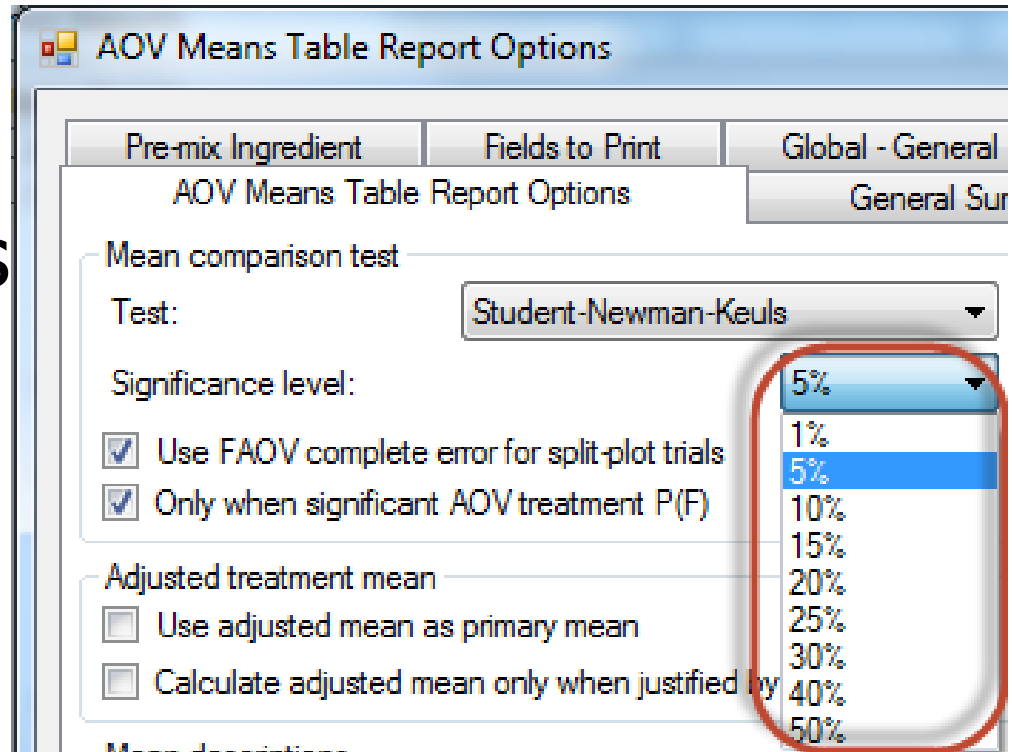
Specify replicate numbers to include in report

1 2 4

OK

AOV Means Table Report OSLs

- New significance levels for LSD, SNK, and Tukey's mean comparisons of 15, 20, 25, 30, 40, 50%





AOV Means Table Report OSLs

- Allows selecting appropriate significance levels according to 'penalty of failure' for tested treatments.

Example: new 'plant health' products frequently improve yield, yet a failure loses only cost of product, so reduced significance levels are more appropriate than for crop protection products.



Heterogeneity/Skewness/ Kurtosis on Summary Reports

- ARM 9 always tests homogeneity of variance and normality for summaries
- Possible solutions are listed on Summary Report Messages:
 - Apply data correction transformation
 - Exclude check treatment
 - Exclude treatment with highest or lowest standard deviation (if either works)
 - Exclude replicate

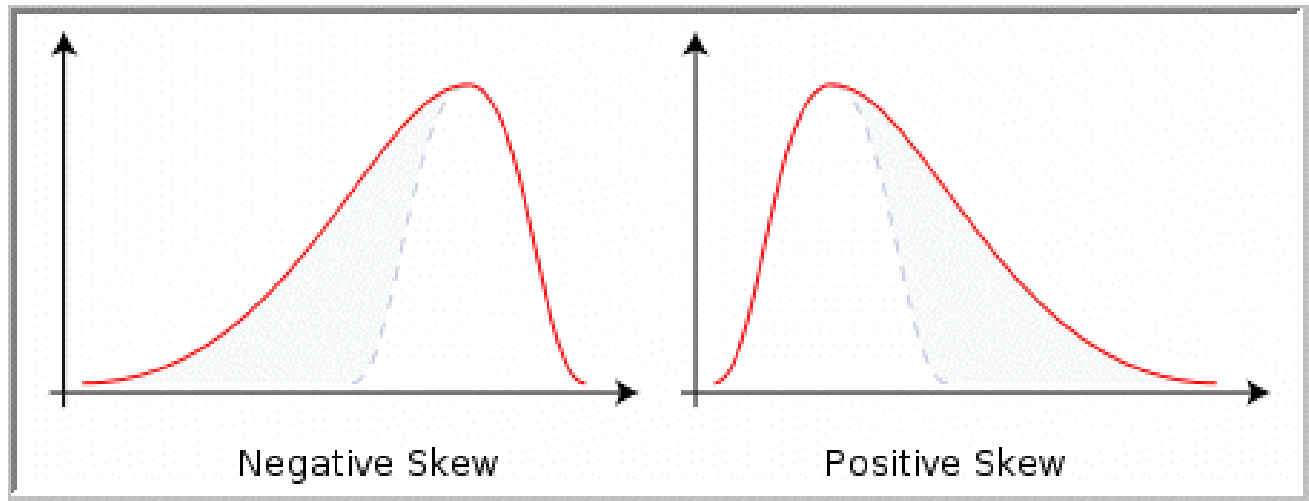


Assumptions of AOV

- Normality: distribution of observations from which samples were collected is a normal "bell" curve.
- Homogeneity of variances: different treatments do not change variability of observations.
- Additivity: observations of treatment effects are additive (linear), not multiplicative.

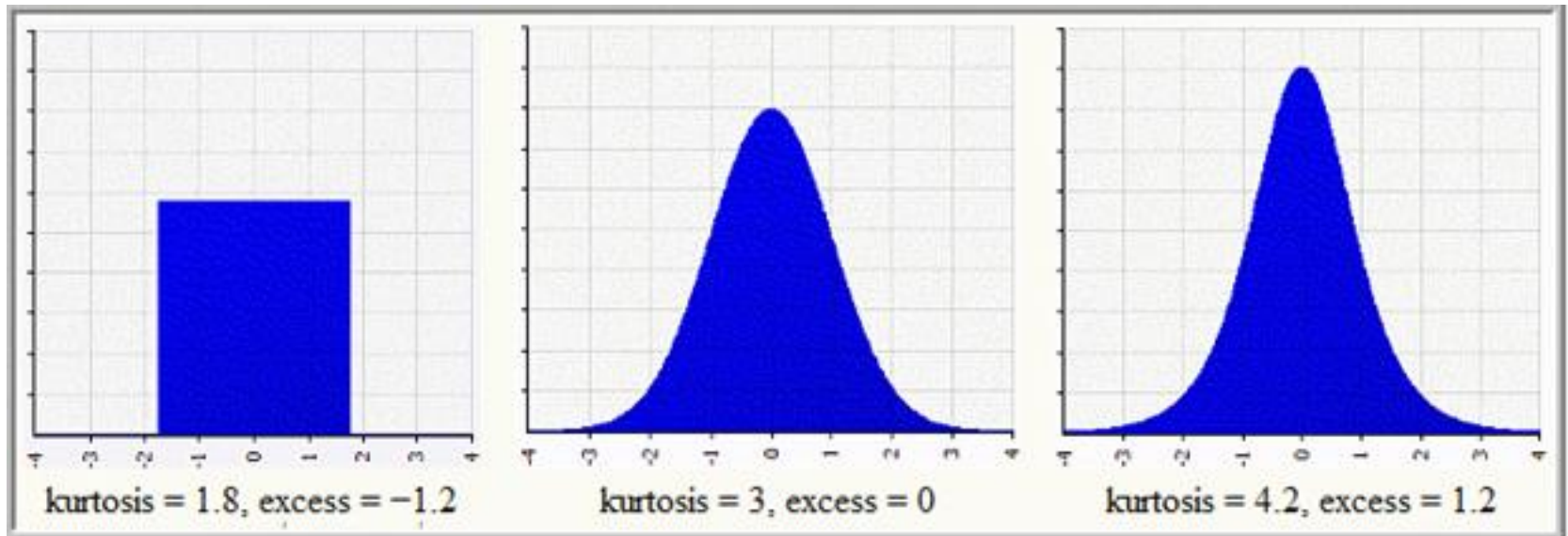
Skewness

- Skewness measures asymmetry of the data distribution: the peak on a data distribution graph is shifted either right or left



Kurtosis

- Kurtosis measures “peakedness” of data distribution: the peak is either flatter or sharper than a normal distribution



Correcting Heterogeneity of Variance

- Data Correction Transform
- Eliminate 'different' treatment (often the check)

Rating Type ARM Action Codes		COUINS APC	COUINS EC APC	COUINS TL[1] APC	COUINS TS[1] APC
Trt Treatment No. Name	Rate Rate Unit	1	2	3	4
1 Untreated Check		106.3 a (0.0%)	106.3 (0.0%)	105.5 a (0.0%)	105.9 a (0.0%)
2 Sure Kill NIS	250 g ai/ha 0.5 % v/v	13.5 bc (87.3%)	13.5 b (87.3%)	12.6 cd (88.1%)	13.0 cd (87.7%)
3 Super Stomp NIS	250 g ai/ha 0.5 % v/v	17.0 bc (84.0%)	17.0 b (84.0%)	17.0 bc (83.9%)	17.0 c (84.0%)
4 Sure Kill NIS	375 g ai/ha 0.5 % v/v	9.5 c (91.1%)	9.5 b (91.1%)	9.0 d (91.4%)	9.2 d (91.3%)
5 Super Stomp NIS	375 g ai/ha 0.5 % v/v	24.0 b (77.4%)	24.0 a (77.4%)	22.8 b (78.3%)	23.4 b (77.9%)
LSD (P=.05)		8.93	6.15	0.14t	0.62t
Standard Deviation		5.80	3.84	0.09t	0.40t
CV		17.03	24.03	6.52	7.73
Bartlett's X2		12.244	6.488	7.706	5.596
P(Bartlett's X2)		0.016*	0.09	0.103	0.231
Skewness		1.6078*	0.677	0.8784	1.34*
Kurtosis		1.0506	-0.0687	-0.2758	0.399

Heterogeneity/Skewness/ Kurtosis on Summary Reports

- Apply automatic transformations or treatment exclusions to data columns that violate assumptions of AOV:

Prompt

Yes

No

AOV Means Table Report Options

Pre-mix Ingredient Fields to Print Global - General Global - Page Heading

AOV Means Table Report Options General Summary General :

Missing data estimates Assessment data header rows

Yates List:

Identify when selected treatments are summarized

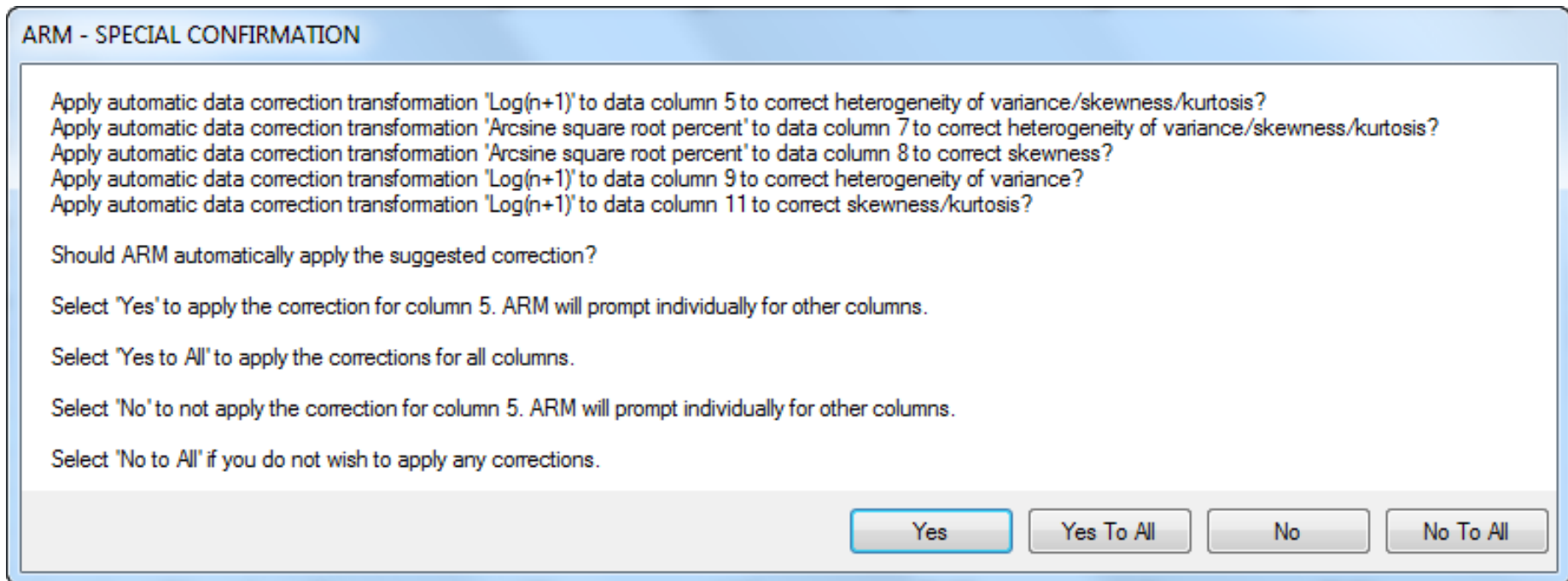
Fields To Print...

Apply automatic transformations or treatment exclusions to data columns that violate assumptions of AOV Prompt

Print selected replicates

Heterogeneity/Skewness/ Kurtosis on Summary Reports

- When 'Prompt' a confirmation dialog identifies violation(s) and asks:



ARM - SPECIAL CONFIRMATION

Apply automatic data correction transformation 'Log(n+1)' to data column 5 to correct heterogeneity of variance/skewness/kurtosis?
Apply automatic data correction transformation 'Arcsine square root percent' to data column 7 to correct heterogeneity of variance/skewness/kurtosis?
Apply automatic data correction transformation 'Arcsine square root percent' to data column 8 to correct skewness?
Apply automatic data correction transformation 'Log(n+1)' to data column 9 to correct heterogeneity of variance?
Apply automatic data correction transformation 'Log(n+1)' to data column 11 to correct skewness/kurtosis?

Should ARM automatically apply the suggested correction?

Select 'Yes' to apply the correction for column 5. ARM will prompt individually for other columns.

Select 'Yes to All' to apply the corrections for all columns.

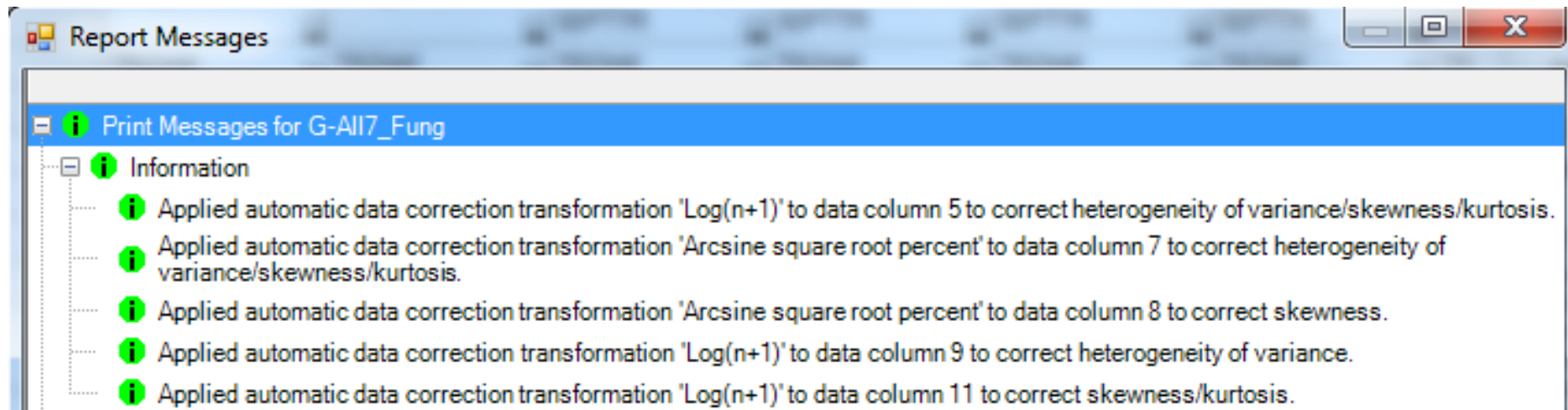
Select 'No' to not apply the correction for column 5. ARM will prompt individually for other columns.

Select 'No to All' if you do not wish to apply any corrections.

Yes Yes To All No No To All

Heterogeneity/Skewness/ Kurtosis on Summary Reports

- When 'Yes' or 'Prompt' the applied actions are listed in Report Messages



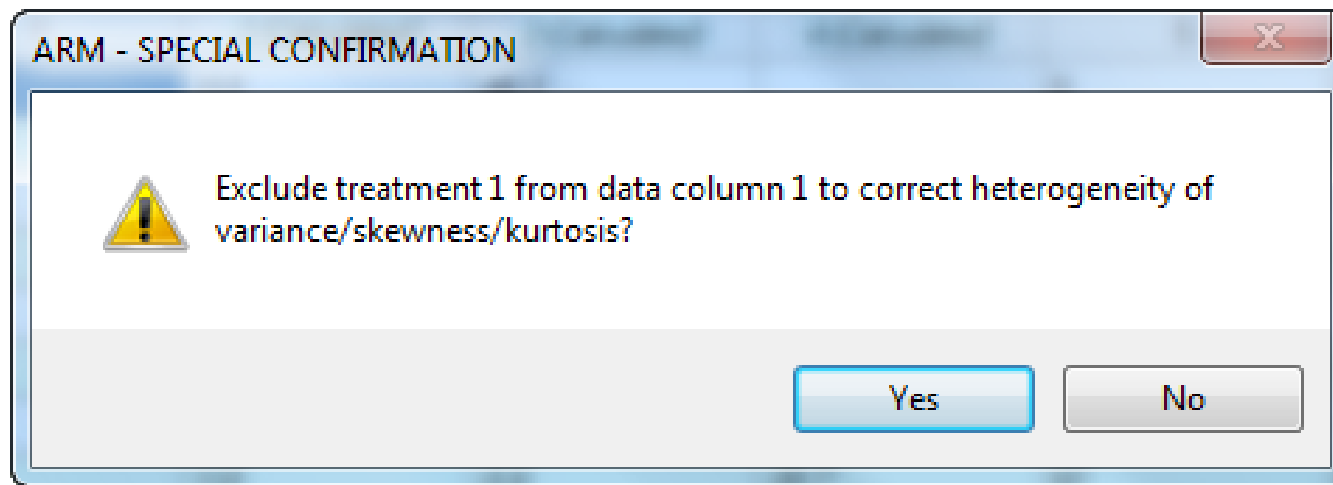
Heterogeneity/Skewness/ Kurtosis on Summary Reports

- Corrections added to ARM Action Codes
 - AL=Automatic Log
 - AA=Automatic Arcsine Square Root Percent (only tested for 0-100 data)
 - AS=Automatic Square Root

15 DA-B AL 2	15 DA-B TAB[5] 2	29 DA-B AA AA 2	29 DA-B TAB[7] 2	11 DA-C AL 2
5	6	7	8	9
7.82 a	0.00 b	15.28 a	0.00 c	2.31 b

Heterogeneity/Skewness/ Kurtosis on Summary Reports

- Exclude check treatment
 - EC=Exclude Check



4 DE-1
EC
1
962.8
30.8 a
30.8 a
36.3 a
34.5 a



Heterogeneity/Skewness/ Kurtosis on Summary Reports

- ARM cannot automatically exclude a non-check treatment number, since there is no special ARM Action Code defined for this task
- GDM plans to define a 'ETn' code, such as ET8 to exclude treatment number 8, so non-check treatments can also be automatically excluded

Report Sets

- Report set = selected reports plus all options for those reports





Report Sets

- Report sets save your preferred options to easily use again later.
- Can standardize reports in your group.
- Save report Set to keep your options.
- Load Set to use these options later.
- Recommend creating sets for each part of research season (map, spray/seeding plan, labels, tour report, summary, etc.)



Steps to Save Report Set

- Select report components to include.
- Set desired options for each report in set, such as whether to print only completed fields (hide blank fields).
- Arrange reports in desired order in set (highlight a report, press and hold Shift, press up/down arrow to move report).
- Select Save Set button.



Use Views with Reports

- All Summary reports include options to use “Current View”
 - Select for data columns and/or data header rows as desired.
 - Use “View” button in Summary Report options to display current Assessment Data View dialog settings.



Apply Sort to Data Columns

- Sort data columns by applying sorts on View Options. For example, to sort by Pest then Date within Pest:
 - Click Clear button below Sort column.
 - Enter 1 in Sort column of Pest Code.
 - Enter 2 in Sort column of Rating Date.
 - Select “Display sort as tabs” to have each Pest Code on separate tab in editor.

Apply Sort to Data Columns

- Results in sorted tabs:

Assessment Data - Line 1							
Column Number	1		6				
Pest Type	W	Weed	W	Weed			
Pest Code	CHEAL		CHEAL				
Pest Name	Common lambsque		Common lambsque				
+ Sub	Rp	Bk	Col	Plot Δ	Tit	1	6
1	1	1	1	101	2	60.0	75
	1	1	2	102	5	78.0	85
<div style="display: flex; align-items: center;"> ◀ <div style="border: 1px solid gray; padding: 2px 10px;"> </div> </div>							
<div style="display: flex; align-items: center; gap: 5px;"> <div style="border: 1px solid gray; padding: 2px 5px;">◀</div> <div style="border: 1px solid gray; padding: 2px 5px;">▶</div> <div style="border: 1px solid gray; padding: 2px 5px;">◀</div> <div style="border: 1px solid gray; padding: 2px 5px;">▶</div> <div style="border: 1px solid gray; padding: 2px 5px;">(Blank)</div> <div style="border: 1px solid gray; padding: 2px 5px;">AMARE</div> <div style="border: 1px solid gray; padding: 2px 5px;">CHEAL</div> <div style="border: 1px solid gray; padding: 2px 5px;">ECHCX</div> <div style="border: 1px solid gray; padding: 2px 5px;">KCHSC</div> <div style="border: 1px solid gray; padding: 2px 5px;">SETVI</div> <div style="border: 1px solid gray; padding: 2px 5px;">SOLNI</div> </div>							



Apply Sort to Data Columns

- ARM supports defining any number of sort fields (continue entering sort priority number).
- To define an arbitrary sort order:
 - Enter terms to sort by in “Sort Order for View” header field.
 - Define “Sort Order for View” as sort field 1.

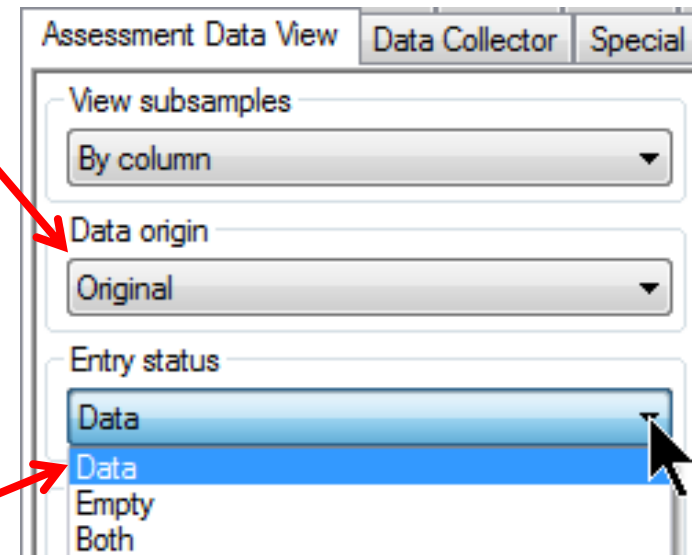
Assessment Data View Options

- Display only data columns that contain a desired field entry by defining Match in View Options.
 - Click into Match column, select term to match from dropdown.

Prompt	Match	Sort
Rating Date	(None)	
Rating Type	(None)	
Rating Unit	4/18/2009	
Sample Size, Unit	4/24/2009	
	5/10/2009	
	7/8/2009	
	4/11/2009	

Assessment Data View Options

- Use “Data origin” to show only Original or Calculated columns.



- Use “Entry status” to show only columns with Data.

“Current View” on Summaries

- All Summary reports have “Current View” for data columns, header rows.
- “View” button changes current view.

The screenshot shows the 'AOV Means Table Report Options' dialog box with two tabs: 'General Summary' and 'General'. The 'General Summary' tab is active. The 'Missing data estimates' section has 'Yates' selected. The 'Assessment data columns' section has 'Current view' selected. The 'Assessment data header rows' section has 'Current view' selected. The 'List validation comments' dropdown is set to 'Comment 1'. The 'List comments in table format', 'Include transformation equations', 'Include footnotes', and 'Include column number' checkboxes are checked. The 'Print data headers once per column' checkbox is unchecked. The 'View...' button is highlighted with a red oval.

AOV Means Table Report Options

General Summary

Genera

Missing data estimates

Yates

Average

Assessment data columns

All

Selected

Automatic

Current view

Paginate to keep together each sort section

Assessment data header rows

List:

All

Selected

Current view

Automatic

List validation comments

Comment 1

List comments in table format

Include transformation equations

Include footnotes

Include column number

Print data headers once per column

View...