Methyl Bromide Pre-Plant Fumigation – Where Have We Been and Where are We Going?

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Verticillium


Macrophomina

Verticillium plus *Macrophomina*

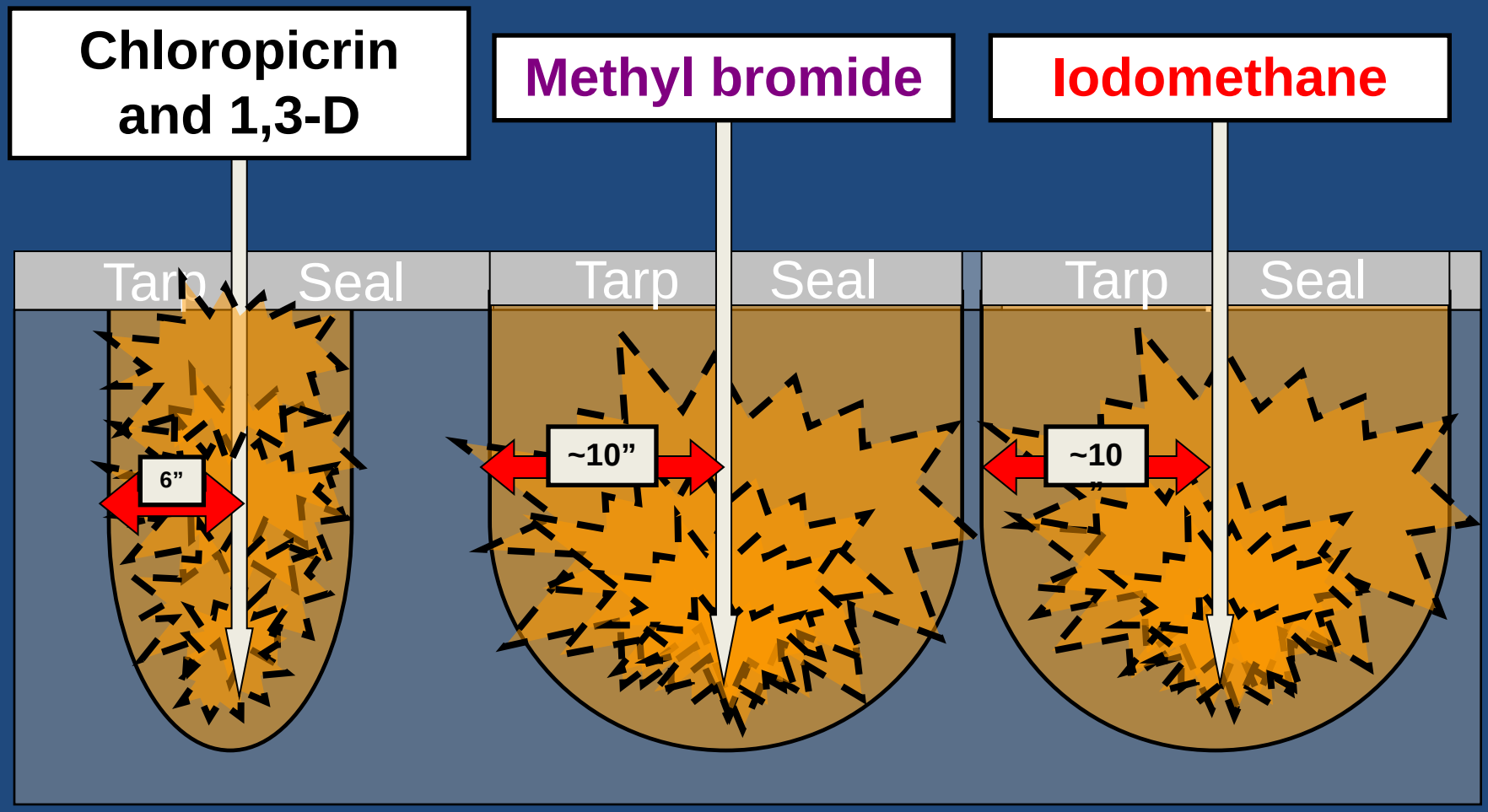
A bit of history

- Chloropicrin used to restore strawberry soils to productivity since early 1950's.
- Mixtures of chloropicrin and methyl bromide-synergism. Combination of fungicidal properties of chloropicrin + herbicidal properties of methyl bromide developed in 1957-1958.
- Outstanding control of Verticillium wilt.

Properties of Soil Fumigants

Fumigant	Molecular Weight	Density at 68°F	Boiling Point	Vapor Pressure at 68°F	Solubility in Water at 68°F
	g/mol	g/cc	°F	mm Hg	%w/w
MeBr	95	1.73	39	1420	1.34
Chloropicrin	164	1.66	234	18	0.20
1,3-D cis	111	1.21	219	34	0.22
MITC	73	1.21	246	21	0.76
MeI	142	2.28	108	400	1.40

Fumigant Movement



IR- 4 Program

- Telone/Inline
- Chloropicrin alone
- Vapam/K-Pam – alone and in combination with Telone/Inline or chloropicrin
- Basamid
- Propylene oxide

IR-4 Program

- Methyl iodide (Iodomethane)

Methyl Iodide Residue Work

Further fumigants

- Sodium azide
- Propargyl bromide

Moving ahead

Non-fumigant alternatives

- Alternative fumigants
- Steam
- ASD
- Biological fungicides
- Adjustments to traditional plant culture

Theme

- Integration of methods can make up the loss of yield presented by the use of fumigants which are less effective than methyl bromide.

Fumigant comparison including mustard seed meal (MSM) and variation of chill.

- Is mustard seed beneficial to strawberry when used in combination with alternative fumigants?
- Does length of supplemental chill benefit strawberry when used in combination with alternative fumigants?
- Straight comparison of two novel fumigants with methyl bromide/chloropicrin.

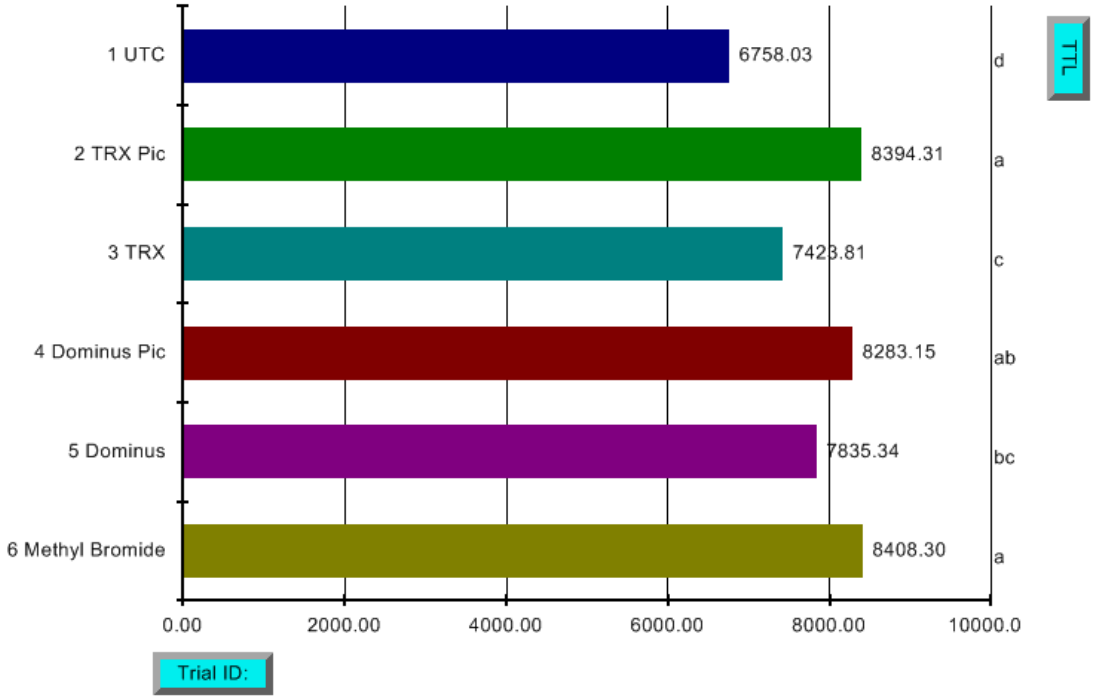
Fumigant comparison including mustard seed meal (MSM) and variation of cold conditioning length

- UTC (var. Monterey + 3, 7 and 16 days chill)
- UTC + MSM (var. Monterey + 3, 7 and 16 days chill)
- TRX- 58 (var. Monterey + 3, 7 and 16 days chill)
- TRX- 58 + MSM (var. Monterey + 3, 7 and 16 days chill)
- TRX- 58 + Pic (var. Monterey + 3, 7 and 16 days chill)
- TRX- 58 + Pic + MSM (var. Monterey + 3, 7 and 16 days chill)
- Dominus (var. Monterey + 3, 7 and 16 days chill)
- Dominus + MSM (var. Monterey + 3, 7 and 16 days chill)
- Dominus + Pic (var. Monterey + 3, 7 and 16 days chill)
- Dominus + Pic + MSM (var. Monterey + 3, 7 and 16 days chill)
- MB + Pic (var. Monterey + 3, 7 and 16 days chill)
- MB + Pic + MSM (var. Monterey + 3, 7 and 16 days chill)

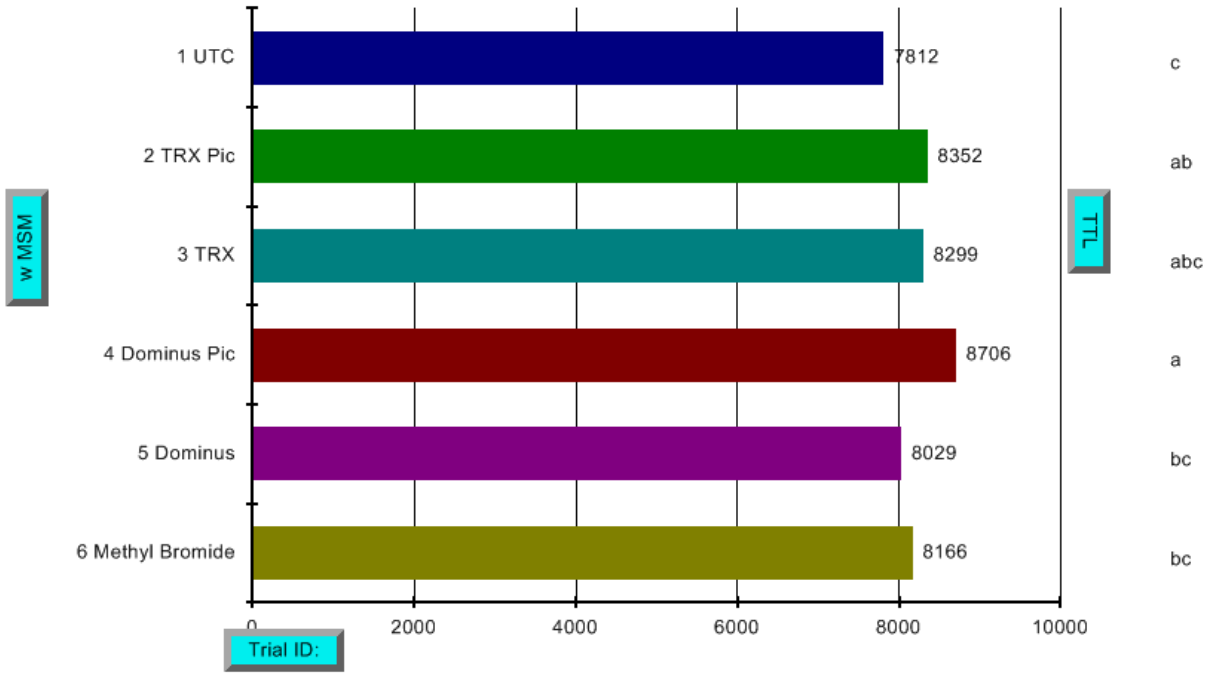
Mustard Seed Meal

- 1 ton per acre

Straight comparison of fumigants without MSM

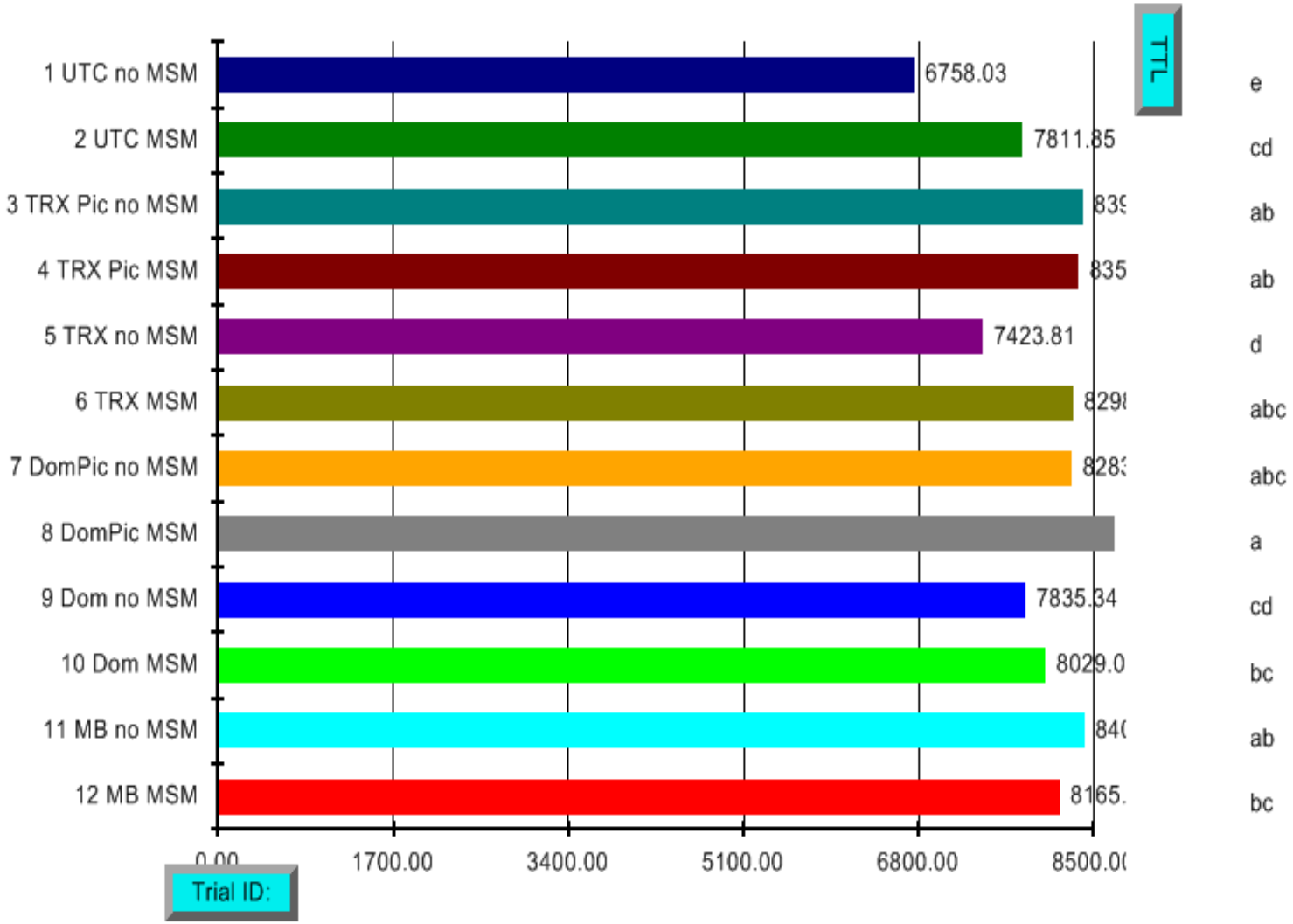


Straight comparison of fumigants with MSM



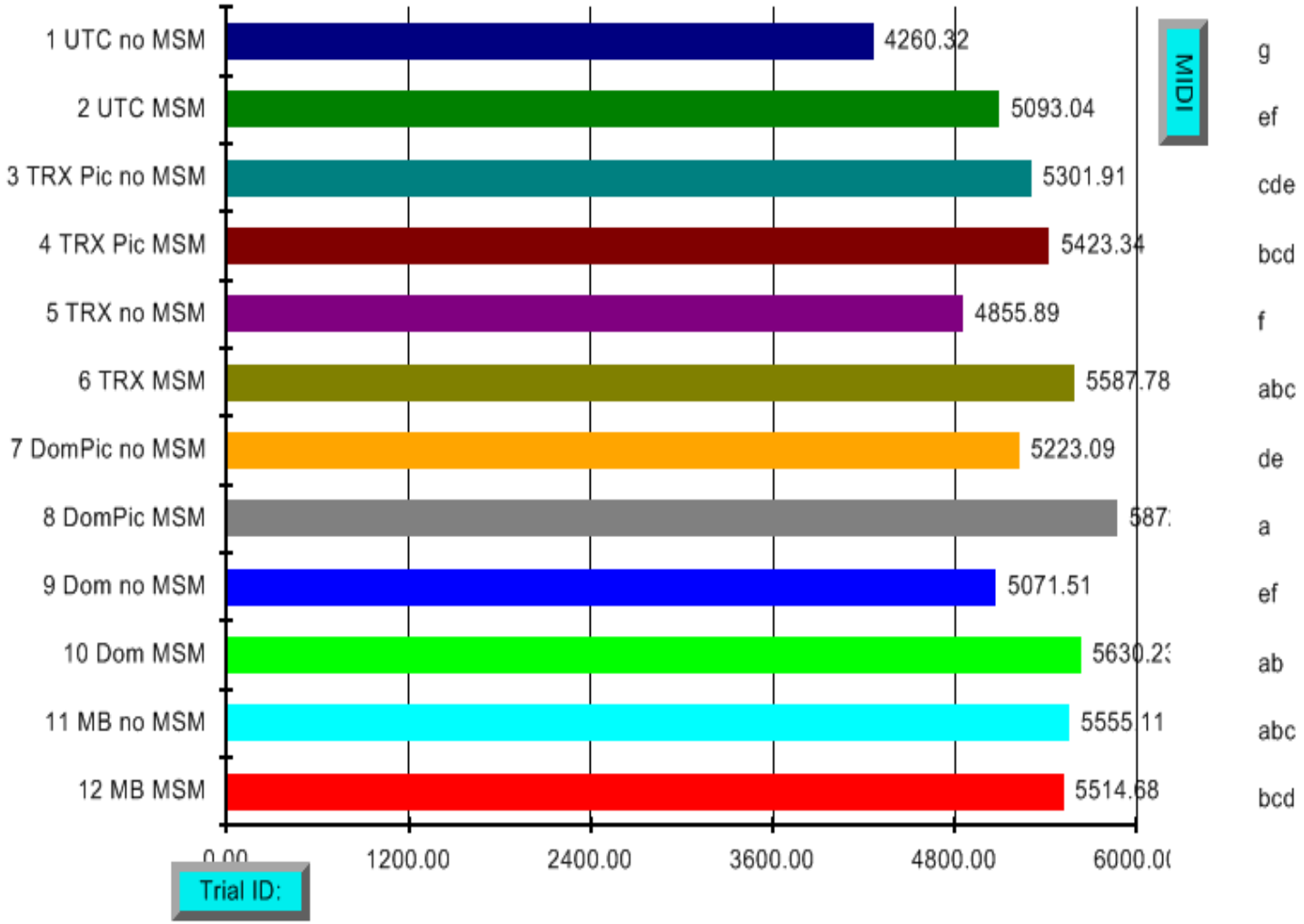
MSM - no MSM 2015 CBC

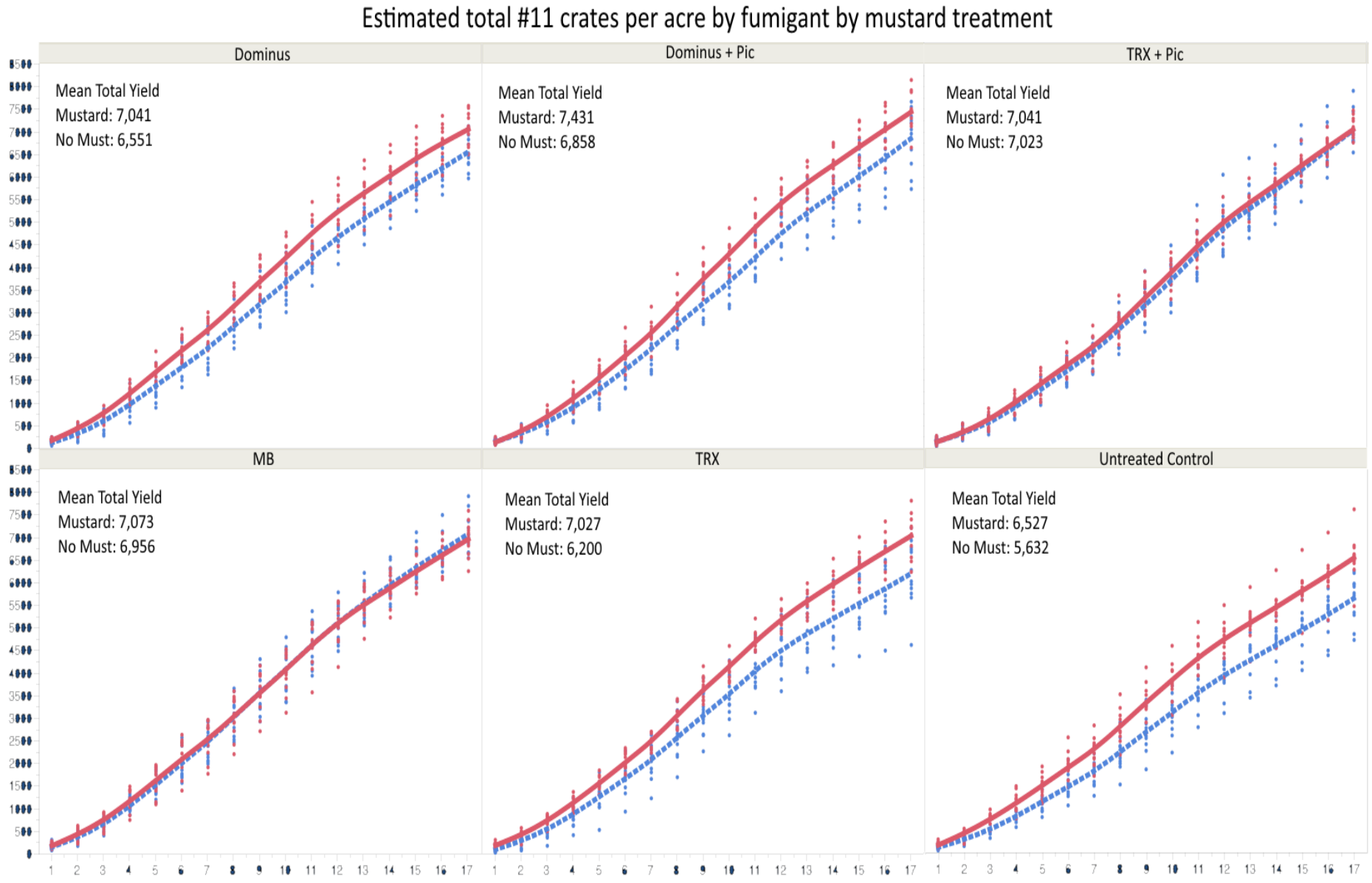
MSM is additive to weaker treatments, note DomPic + MSM is SIG higher than MB



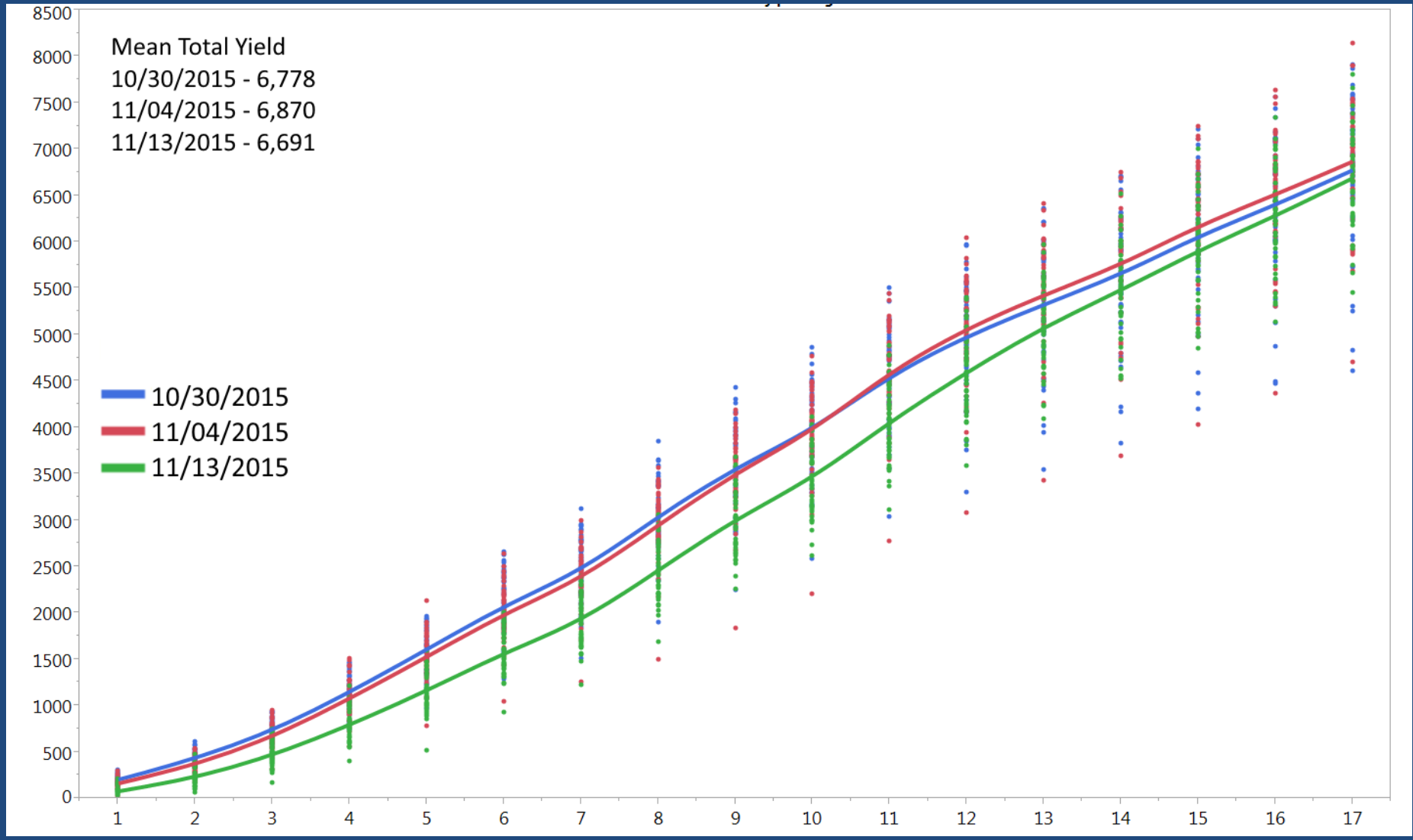
MSM - no MSM 2015 CBC

Trend to earliness





Look at it another way


Mean Total Yield
10/30/2015 - 6,778
11/04/2015 - 6,870
11/13/2015 - 6,691
10/30/2015
11/04/2015
11/13/2015
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1
2
3
4
5
6
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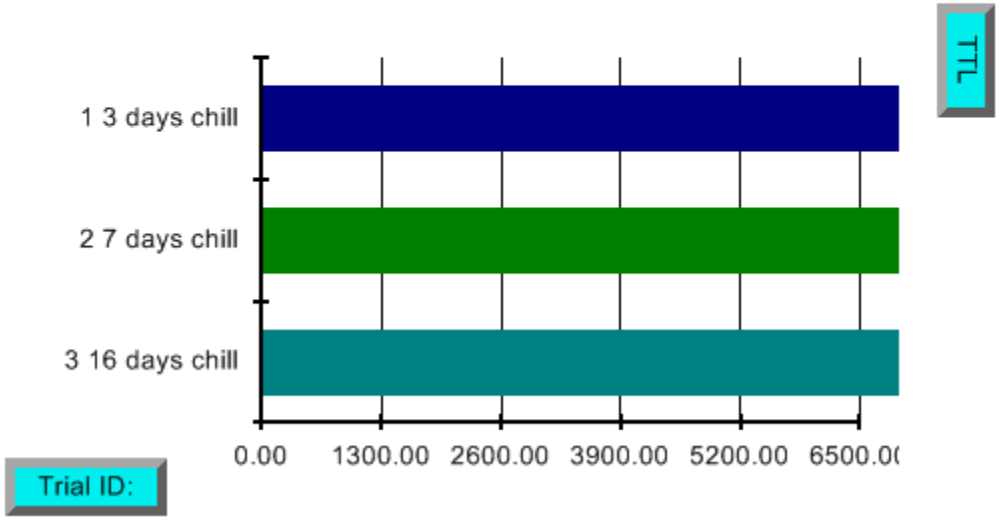
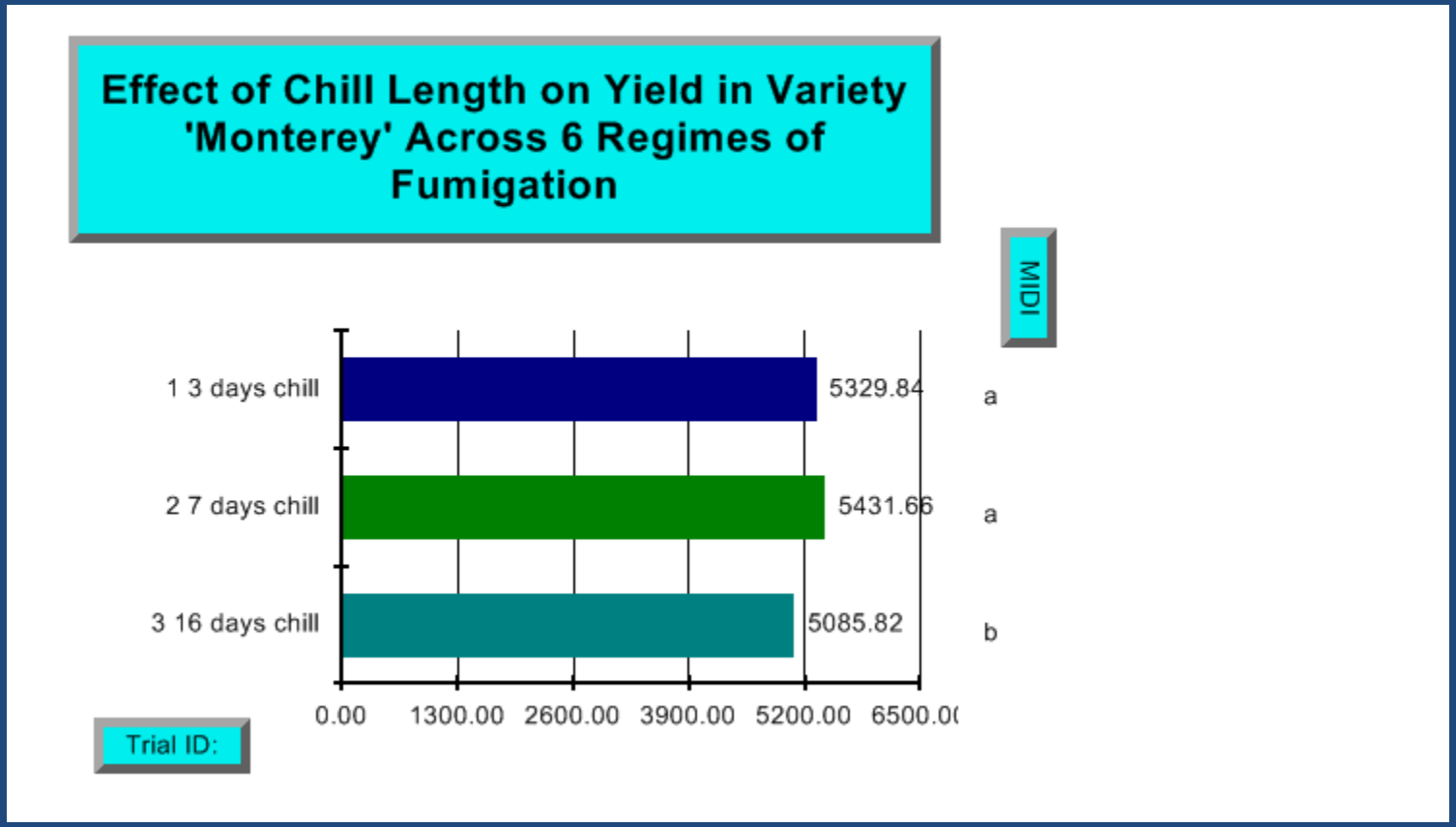
17

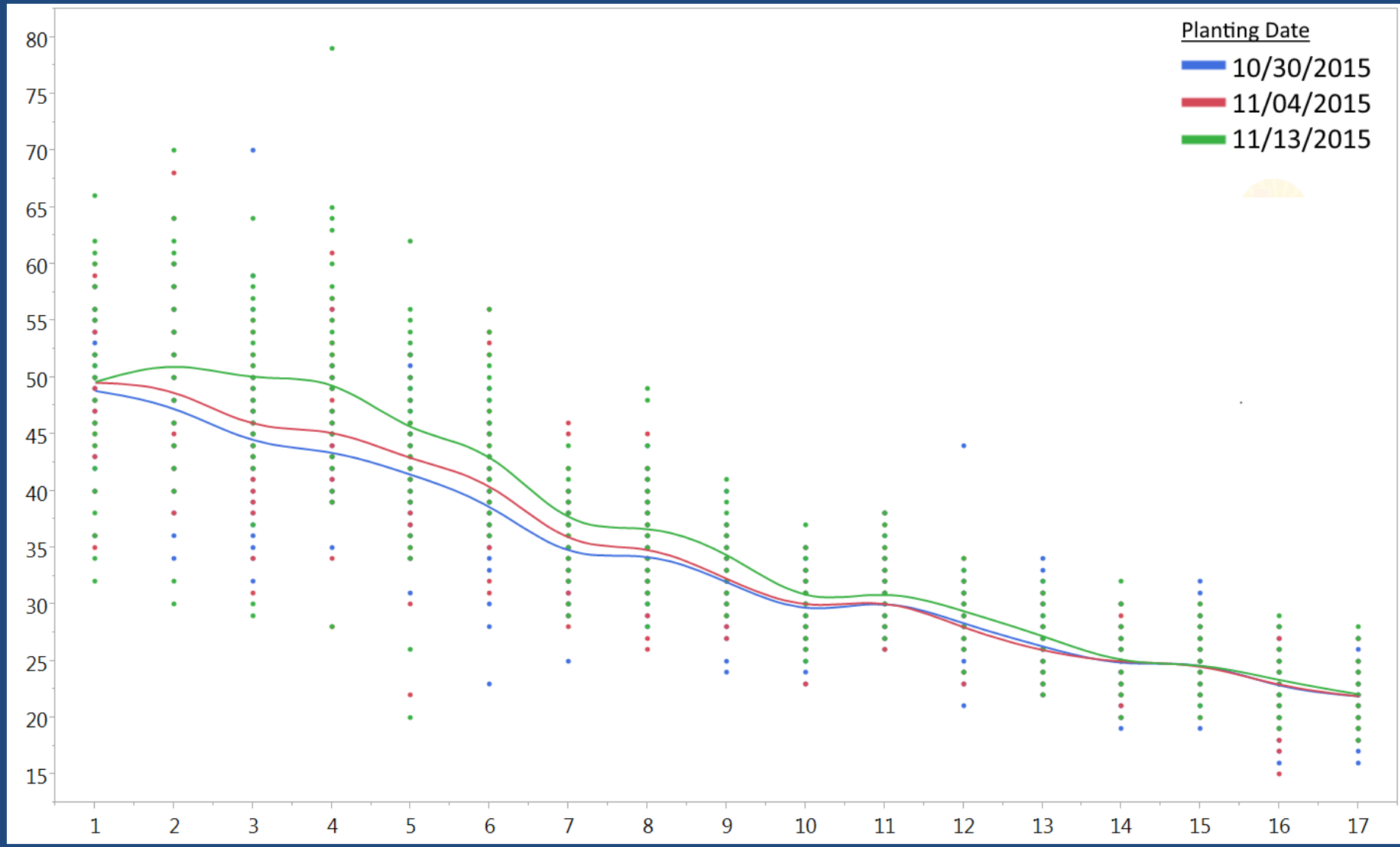
Effect of Chill Length on Yield in Variety 'Monterey' Across 6 Regimes of Fumigation



Strawberry Yield through June



Average fruit weight over time by planting date



November 18, 2014 soil sample

	No MSM	MSM
NO-3-N	6.6*	32.7*
Olsen P	51	56
X-K	145	168
pH	7.0**	6.7**

* = Averages are significantly different at the 0.05 level (p=0.03)
**= Averages are very significantly different at 0.05 level (p=0.004)

2015-2018 CDPR Study

- **Integration of strawberry plant horticulture to maximize performance of the methyl bromide alternative fumigants and methods steam, ASD, chloropicrin and Dominus.**