Seedling Quality and Weed Control with Dazomet, Methyl Bromide and Methyl Iodide at the Glennville Regeneration Center 2005-2006

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Why is this study important?

- **Coop has conducted small scale plots studies of alternatives to MBr that have included Methyl Iodide (MI).**
- **MI similar properties to MBr; “silver bullet” to replace MBr.**
- **Need large production scale plots to look at seedling characteristics, weed, insect or disease control**

Methyl iodide, Iodomethane, MI

- Nursery Coop began testing this compound in 2001.
- The ease of handling a liquid (MI) over a gas (MBr) might increase worker safety and application methods.
- MI decomposes in light, thus shorter residence time in the atmosphere (a few days).
- No residue of MI remains on treated crops.
- In both laboratory and field trials, MI was equal to or better than MBr in controlling soil-borne pathogens.
- Not registered for use in the United States
- Cost of the material if produced on a larger scale is unknown.
- <u>WAS</u> on fast track for registration by EPA.

s1

What went into this study?

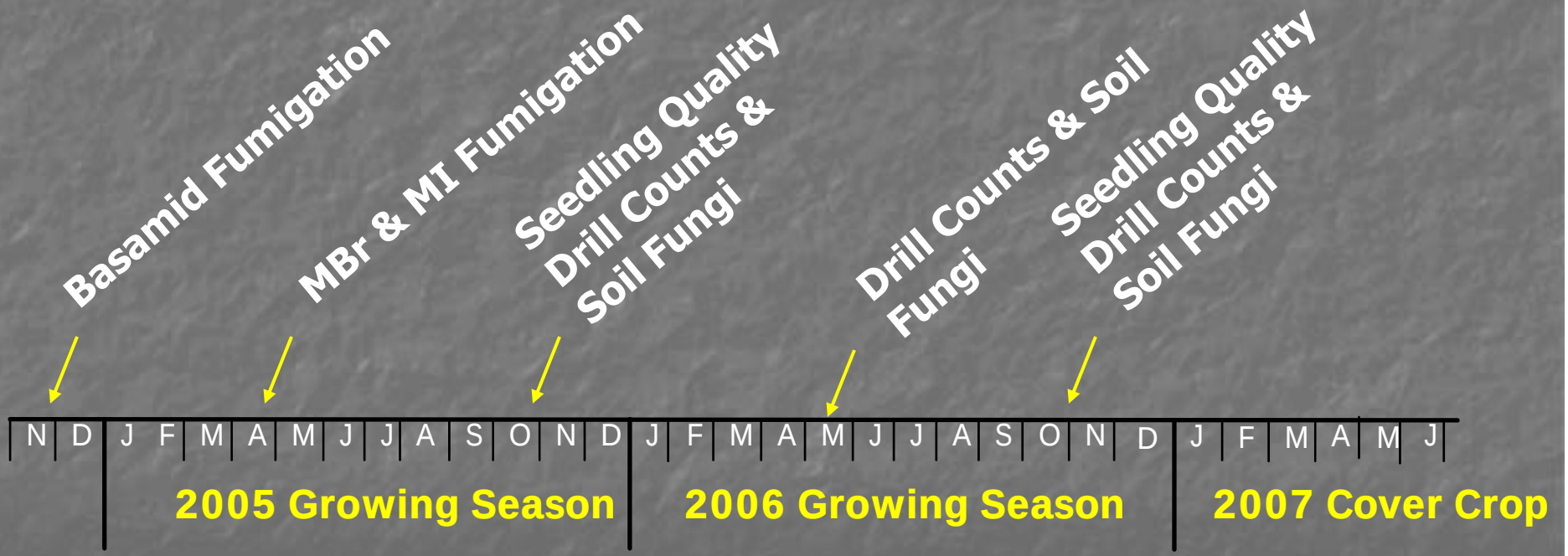
- **3 fumigants - Basamid, MBr & MI replicated 3 times in nursery sections (9 bedrows each).**
- **Two plastic types; HD, VIF.**
- **Basamid 490 lbs/acre (Nov 2004) w water seal**
- **MI:Chl (98:2) 150 lbs/acre (April 2005) w VIF**
- **MI:Chl (98:2) 150 lbs/acre (April 2005) w HD**
- **MBr:Chl (98:2) 150 lbs/acre (April 2005) w VIF**
- **MBr:Chl (98:2) 350 lbs/acre (April 2005) w HD**
- **Sown to Loblolly and Slash pine**

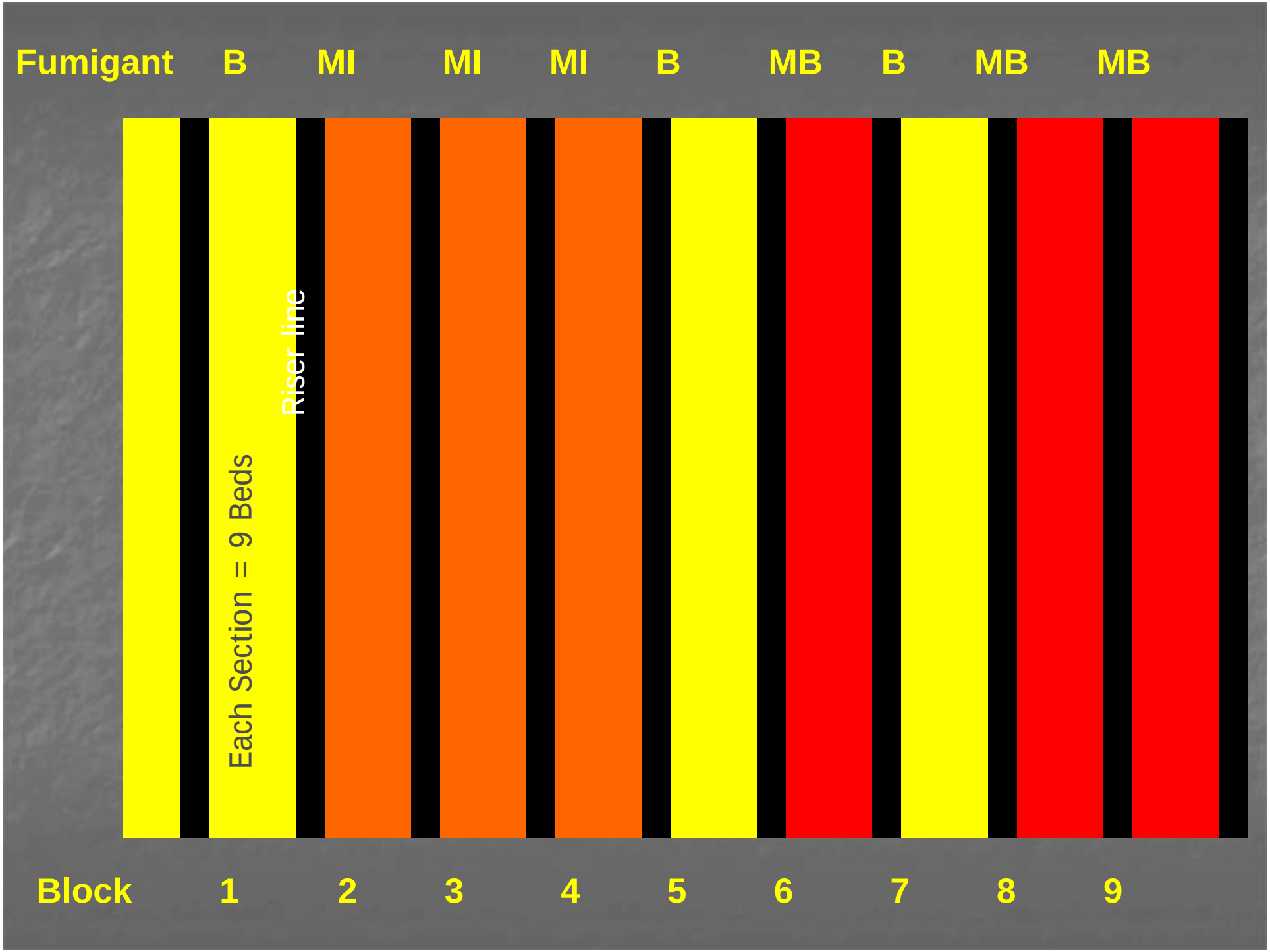
Slide 4

s1 Normal nursery practices were carried out

starkte, 6/26/2006

Time Line of Study




Fumigant
B
MI
MI
MI
B
MB
B
MB
MB
Riser line
Each Section = 9 Beds
Block
1
2
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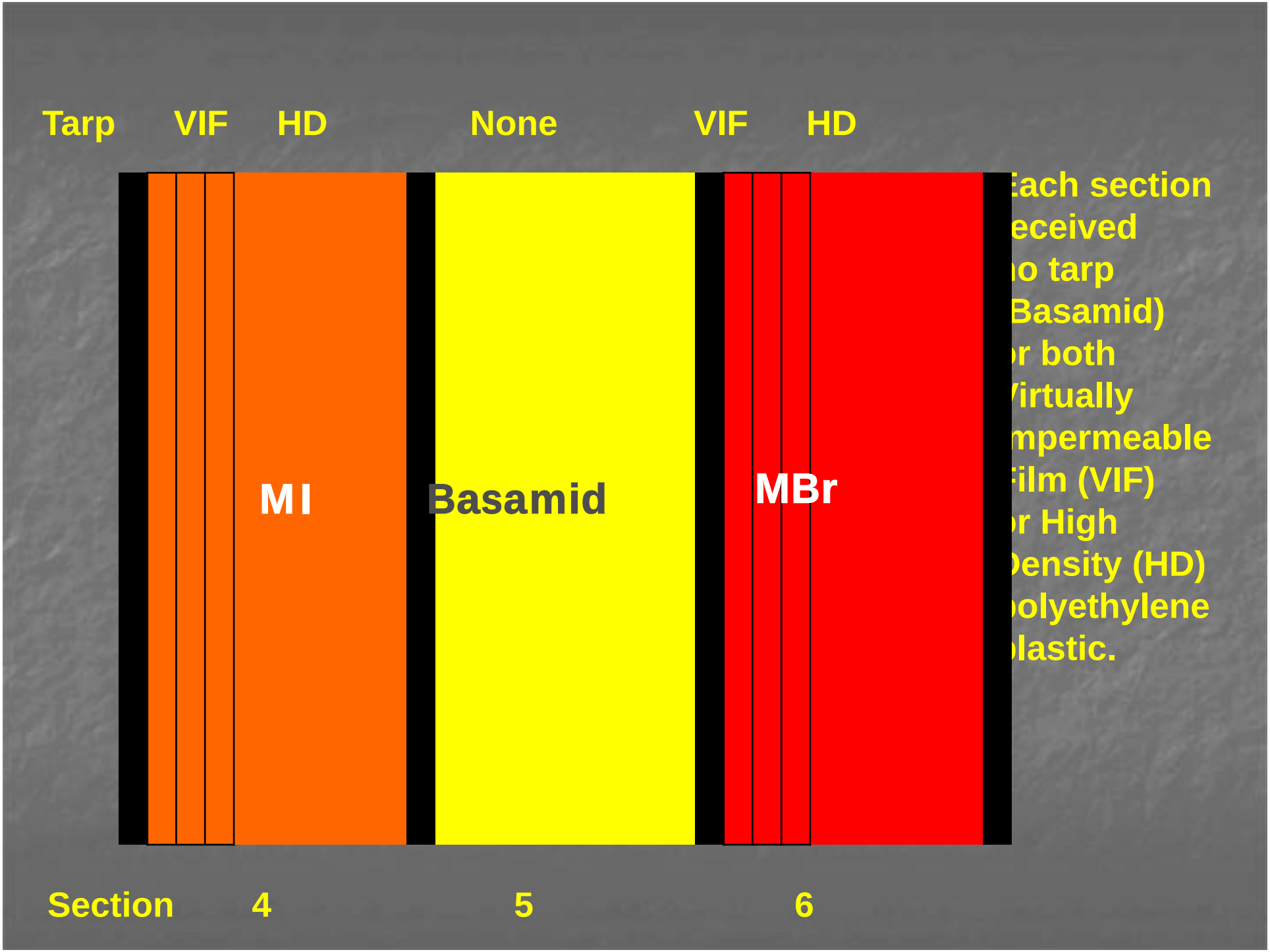
9



ach section
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o tarp
Basamid)
r both
irtually
mpermeable
ilm (VIF)
r High
ensity (HD)
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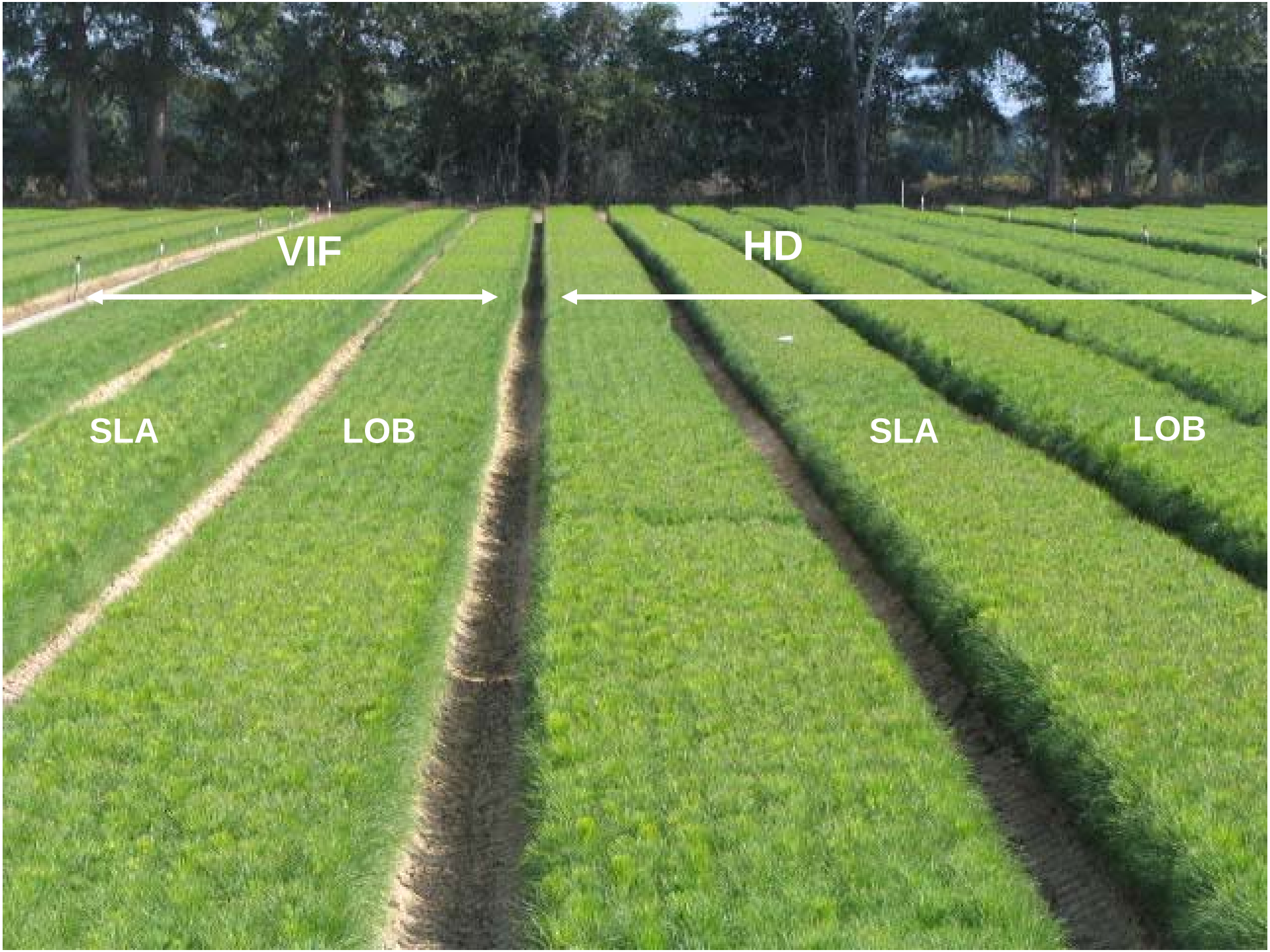
Basamid
MI - VIF
MI - HD
April, 2005


VIF
HD
SLA
LOB
SLA
LOB

Seedling characteristics by species and soil fumigation - 2005 Glennville, GA

	Loblolly Pine			Slash Pine		
	MB[1]	MI	BAS	MB	MI	BAS
Density (ft^2)	21.6	22.9	20.3	20.6	20.0	18.5
RCD (mm)	4.9 a	4.7 a	4.3 b	5.3	5.2	5.4
Height (in)	12.6 a	12.2 a	9.3 b	12.0 a	11.9 a	10.7 b
Root Bio (g)	0.65	0.65	0.61	0.64	0.66	0.78
Shoot Bio (g)	4.3 a	4.2 a	3.3 b	5.0 a	5.3 a	5.9 b

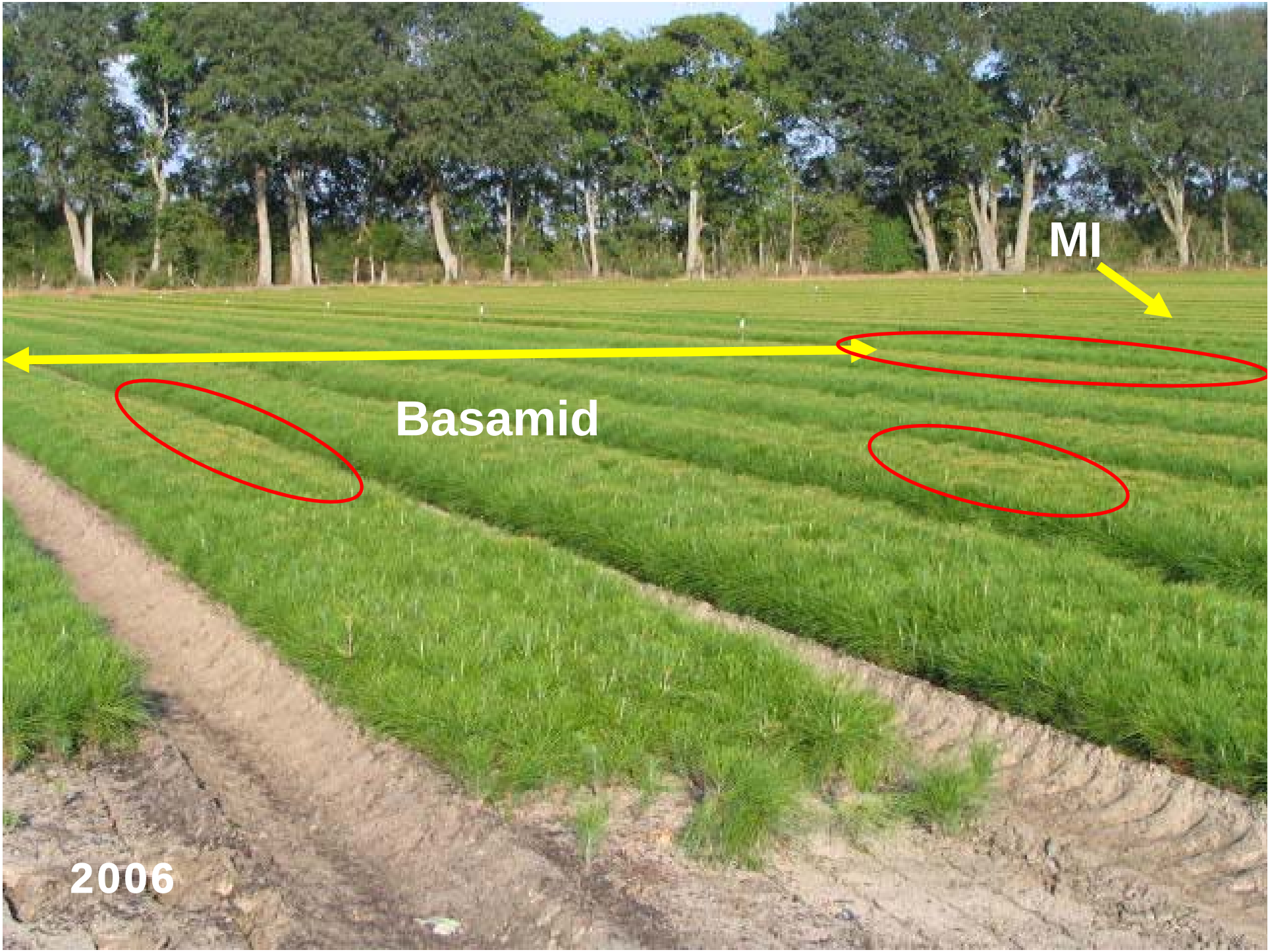
1 Letters within a row and species indicate significant differences at the 0.05 level.


MI
Basamid
2005

Seedling characteristics by species and soil fumigation - 2006 Glennville, GA

	Loblolly Pine			Slash Pine		
	MB[1]	MI	BAS	MB	MI	BAS
Density (ft^2)	15.0	15.4	14.8	18.7	16.9	17.6
RCD (mm)	4.3 a	4.0 b	3.6 c	4.1 b	4.7 a	4.2 b
Height (in)	9.9 a	8.5 b	7.8 b	9.2 bc	10.1 a	9.6 a b
Root Bio (g)	0.55 a	0.54 ab	0.47 bc	0.50 b	0.61 a	0.45 b
Shoot Bio (g)	3.6 a	2.9 b	2.4 c	3.2 bc	4.2 a	3.7 ab

[1] Letters within a row and species indicate significant differences at the 0.05 level.


MI
Basamid
2006

Hand weeding time and weed biomass by soil fumigation – 2005 and 2006

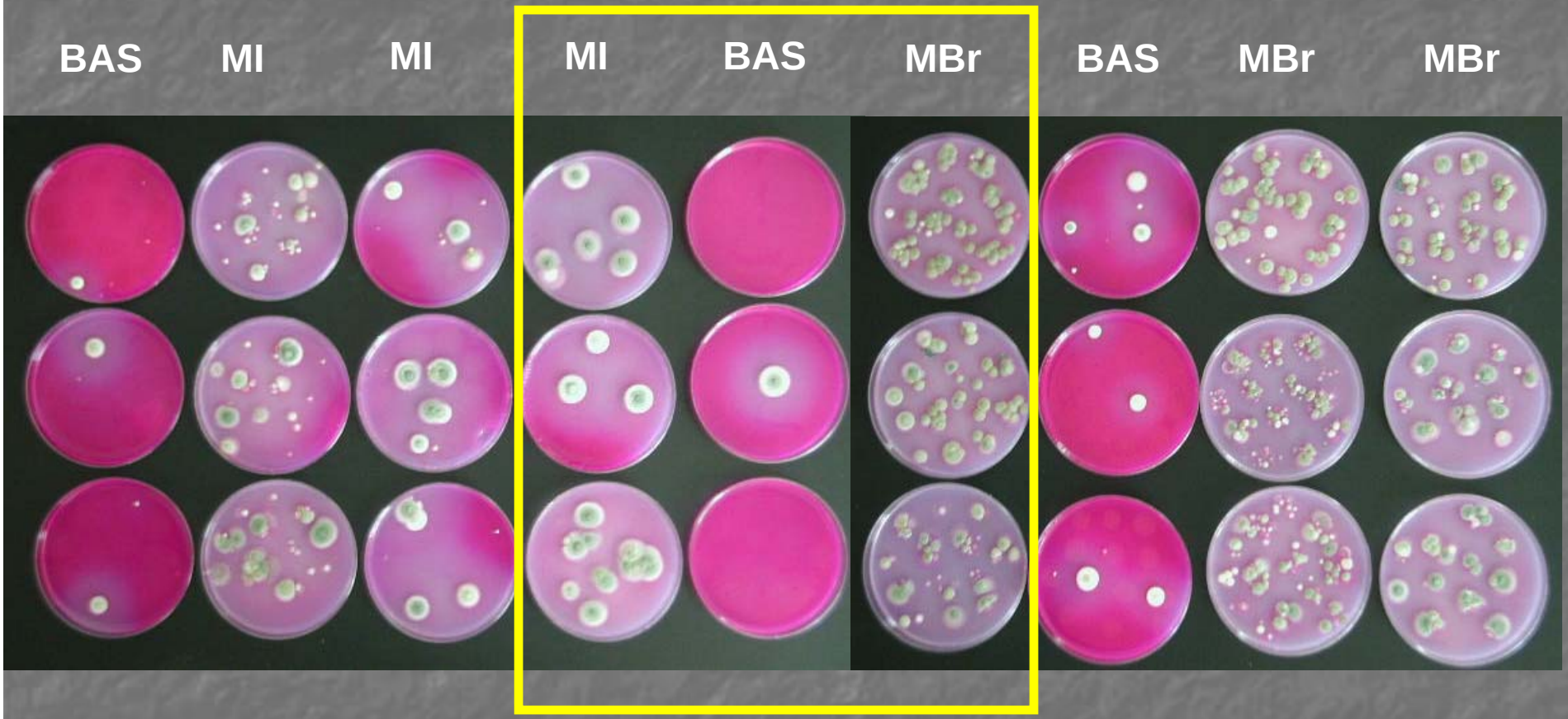
		Fumigation		
Year	Weeds	BAS [1]	MB	MI
2005	Weight (g/riser)[2]	12.0 a	14.0 a	20.9 b
2005	Time (seconds/riser)	39.1 a	35.2 a	59.3 b
2006	Weight (g/riser)[2]	133.4 a	86.7 a	169.7 a
2006	Time (seconds/riser)	60.7 a	60.3 a	61.2 a

[1] Letters within a row indicate significant differences at the 0.05 level.

[2] Riser = 40’ sections between sprinkler heads

s3

Year 1 - Trichoderma dilution plates 1st seedling crop & 11 months after Basamid fumigation, (10/05)



Block 1

Block 9

Slide 15

s3 starkte 6/26/2006

This is similar to whjat Bill had reported in a previous study

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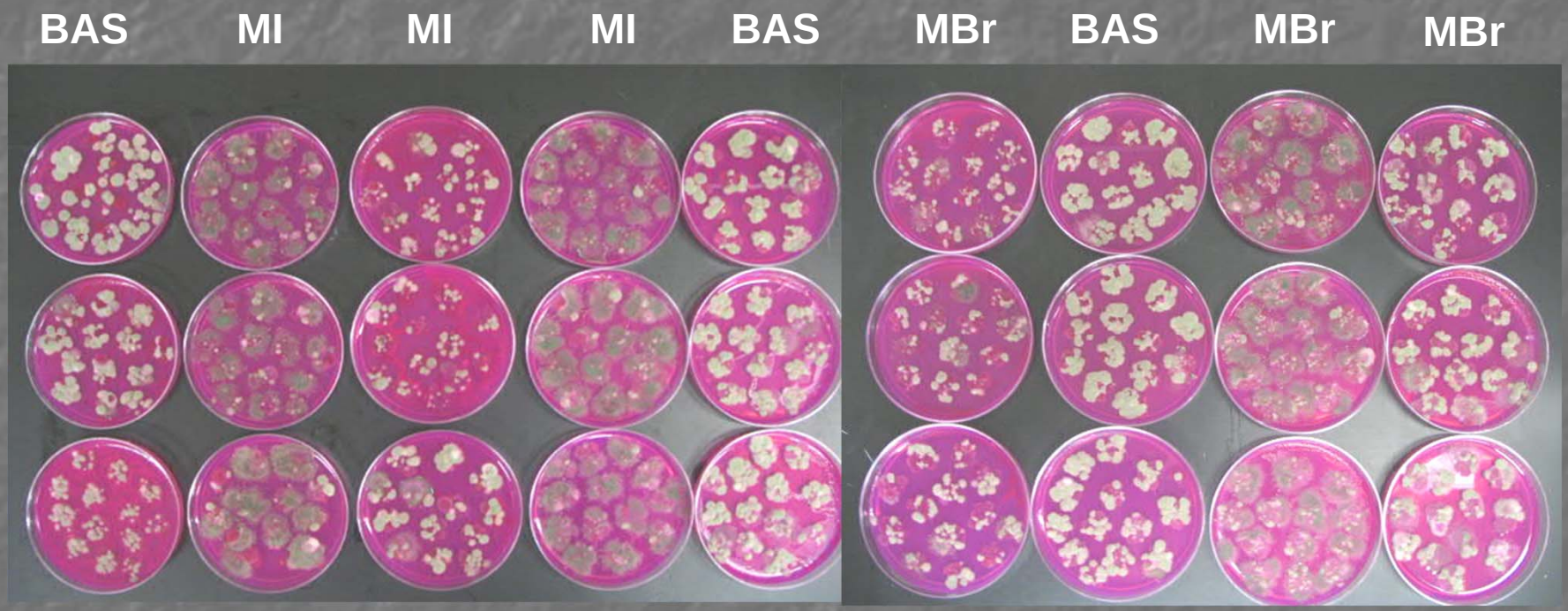
s4

Year 2 - Trichoderma dilution plates
18 months after Basamid fumigation (5/06)



Block 1 **Block 9**

Slide 16

s4 There were actually 4 plates per trt. Only 3 are shown so it is camparabe lto last year

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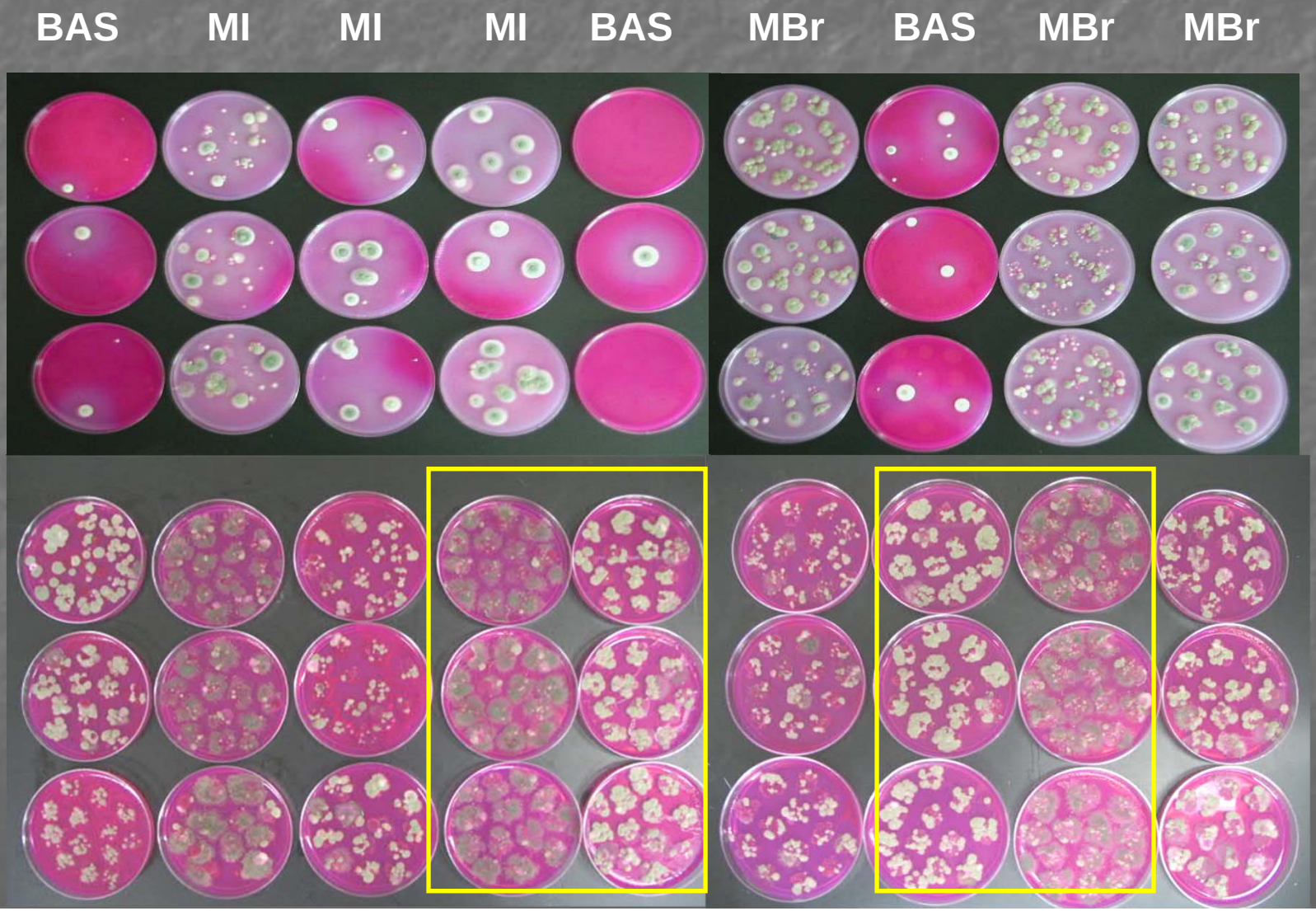
Year 1 & Year 2
Trichoderma dilution plates - Glennville GA



s5

The effect of fumigant type on number of fungal colonies

Fumigant	Mean cfu/g [1] soil of *Trichoderma* **10/05** [2]	Mean cfu/g soil of Total Fungi **5/06**	Mean cfu/g soil of Total Fungi **10/06**
MBr	155.6 a	140.2 a	111.5 b
MI	32.6 b	106.4 b	100.0 b
Dazomet	15.3 b	142.6 a	162.7 a

[1] cfu/g = colony forming units per gram

[2] Numbers in column followed by the same letter are not significantly different at ¯ = 0.05.

Slide 18

s5 Last year, Bas was almost 0 colonies. This year, big jump in fungi - but what type? As it turns out, it was a large jump in Penicilium sp. Not the most desirable

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s6

Percentage of dilution spots with fungal genera present for fumigants

5/06	*Penicillium* sp. [1]	*Trichoderma* sp.	Other
MBr	98.4% a	47.7% a	0.08% a
MI	83.8% b	69.2% a	0.09% a
Dazomet	100% a	0.1% b	0.09% a

10/06	*Penicillium* sp. [1]	*Trichoderma* sp.	Other
MBr	19.4% b	99.0% a	12.0% b
MI	41.8% a	91.0% b	23.4% a
Dazomet	23.7% b	100% a	5.1% c

[1] Numbers in column for each year followed by the same letter are not significantly different at ¯ = 0.05.

Slide 19

s6 Important point - trichoderma is a much more desireable fungus in a nursery bed than Pen.

Tri was high last year - other 2 low - MB does not destroy the beneficial fungi.

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Percentage of dilution spots with fungal genera present for tarp type

5/06	*Penicillium* sp. [1]	*Trichoderma* sp.	Other
HD	91.5% a	61.5% a	0.1% a
VIF	90.8% a	55.4% a	0.1% a

Note: at this sampling time VIF had significantly less total fungi than HD

10/06	*Penicillium* sp. [1]	*Trichoderma* sp.	Other
HD	26.0% a	96.3% a	19.1% a
VIF	35.2% a	93.6% a	16.4% a

[1] Numbers in column for each year followed by the same letter are not significantly different at ¯ = 0.05.

Key Study Summary Points

- Methyl Bromide and Methyl Iodide produced better quality, more shippable seedlings than Basamid.
- Methyl Iodide was not an effective fumigant for weed control at 150 lbs/acre.
- *Trichoderma* levels in the soil were significantly lower up to 18 months following fumigation with Basamid compared to MBr or MI.

Key Study Summary Points

- At 23 months following Basamid fumigation, *Trichoderma* soil levels significantly increased which may explain the increase in seedling quality characteristics at the end of the second growing season.

Key Study Summary Points

- VIF tarping significantly reduced the recovery of total fungal colonies up to 12 months when compared to HD.
- VIF tarping with MBr @ 150 lbs/acre produced seedlings similar to 300 lbs/acre MBr under HD tarp.
- There is still no operational method for gluing VIF in broadcast (flat tarp) systems.

EPA Drops Plan to Approve Pesticide

By Marla Cone, Times Staff Writer
April 27, 2006

The U.S. Environmental Protection Agency has withdrawn its plan to approve a highly toxic fumigant for strawberries and other high-value crops after California officials, labor unions, environmentalists and others objected that nearby residents and farmworkers could be in danger.

The new pesticide, methyl iodide, is designed to replace methyl bromide, which is banned under an international treaty because it damages the Earth's ozone layer. Strawberry growers, concentrated mostly in Ventura and Santa Cruz counties, have been searching for nearly 15 years for a fumigant to replace methyl bromide, which they have been phasing out but are still using under exemptions granted by the United Nations. Facing criticism that it was substituting one dangerous chemical for another, the EPA decided not to register methyl iodide, also known as iodomethane. It will reevaluate the pesticide next year.

"EPA's refusal to automatically approve the use of another dangerous chemical as an alternative to methyl bromide is encouraging," said Susan Kegley, senior scientist at the environmental group Pesticide Action Network North America. "They didn't knock it out for good, but it's a good sign that they are holding off."

But, that’s not all the story...


BASAMID
Rest in Peace

Still to do....

- We will be sampling the soil to monitor population levels of beneficial soil fungi during our mid summer seedling evaluation survey.
- Write a Research Report to complete this study.

2007 Contact Meeting

Indian Mound, Texas Fumigation Study - First Year Data

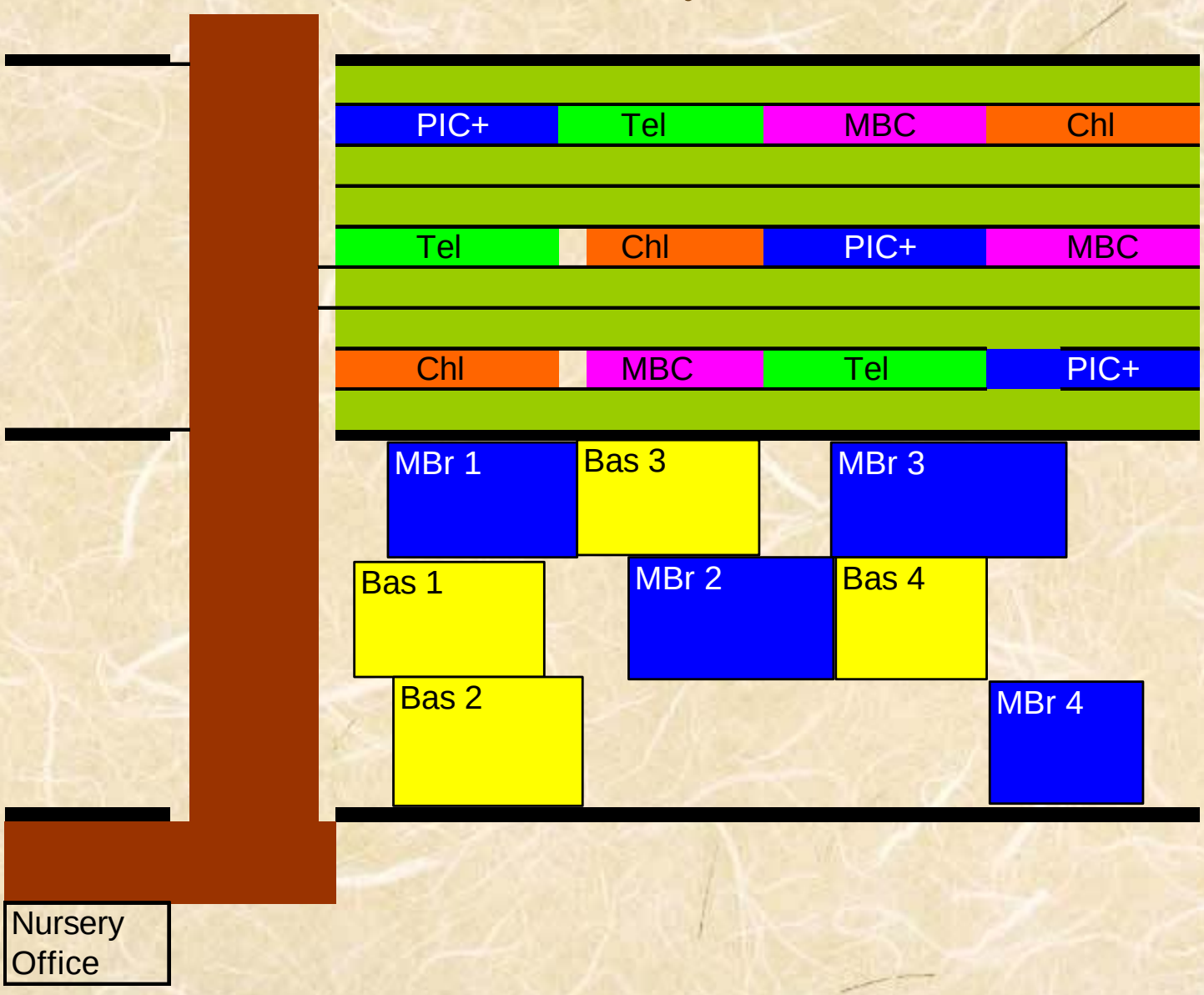
Scott Enebak
Tom Starkey
Auburn Univ. Forest Nursery Coop

Harry Vanderveer
Texas Forest Service, Alto, TX

Indian Mound Study I

- Located near Nursery Office
- 1st section treatments - 3 bed rows, ~100' long, 4 replicates
  - MBr (98/2) @350 lbs/a (Nov. 2005)
  - Basamid @ 450 lbs/a (Oct. 2005)
- 2nd section treatments – 3 bed rows, 120' long 3 replicates
  - Chloropicrin 60 (60% Chl. + 40% Telone) @ 300 lbs/a (Nov. 2005)
  - PIC+ (85% Chl. + 15% Solvent) @ 300 lbs/a (Nov. 2005)
  - MBC 70/30 (70% 98/2 (MBr/Chl) + 30% Solvent @ 350 lbs/a (Nov. 2005)
  - Telone C35 (65% Chl. + 35% Telone) @330 lbs/a (Nov. 2005)
  - Control – non-treated bedrows within section

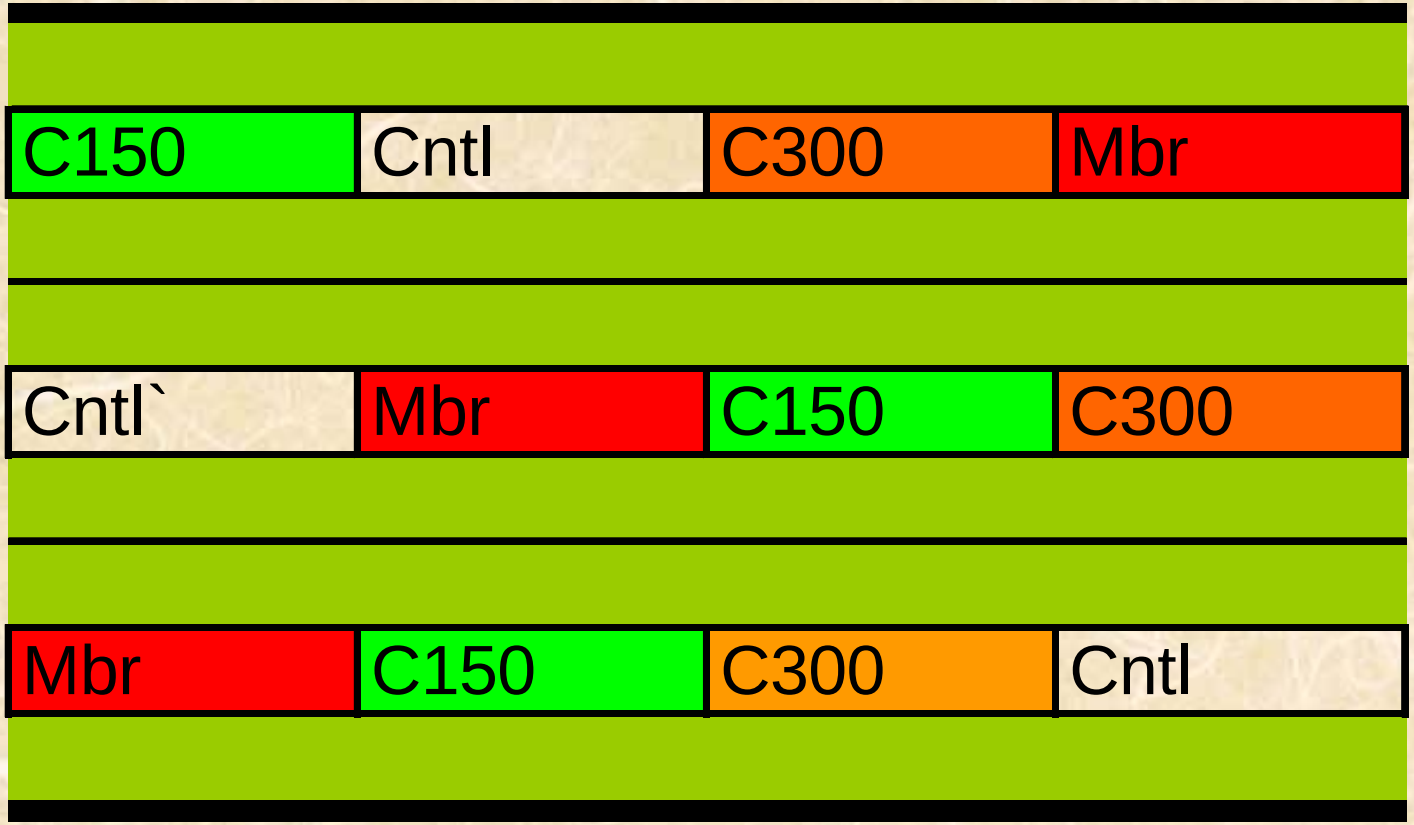
Study I

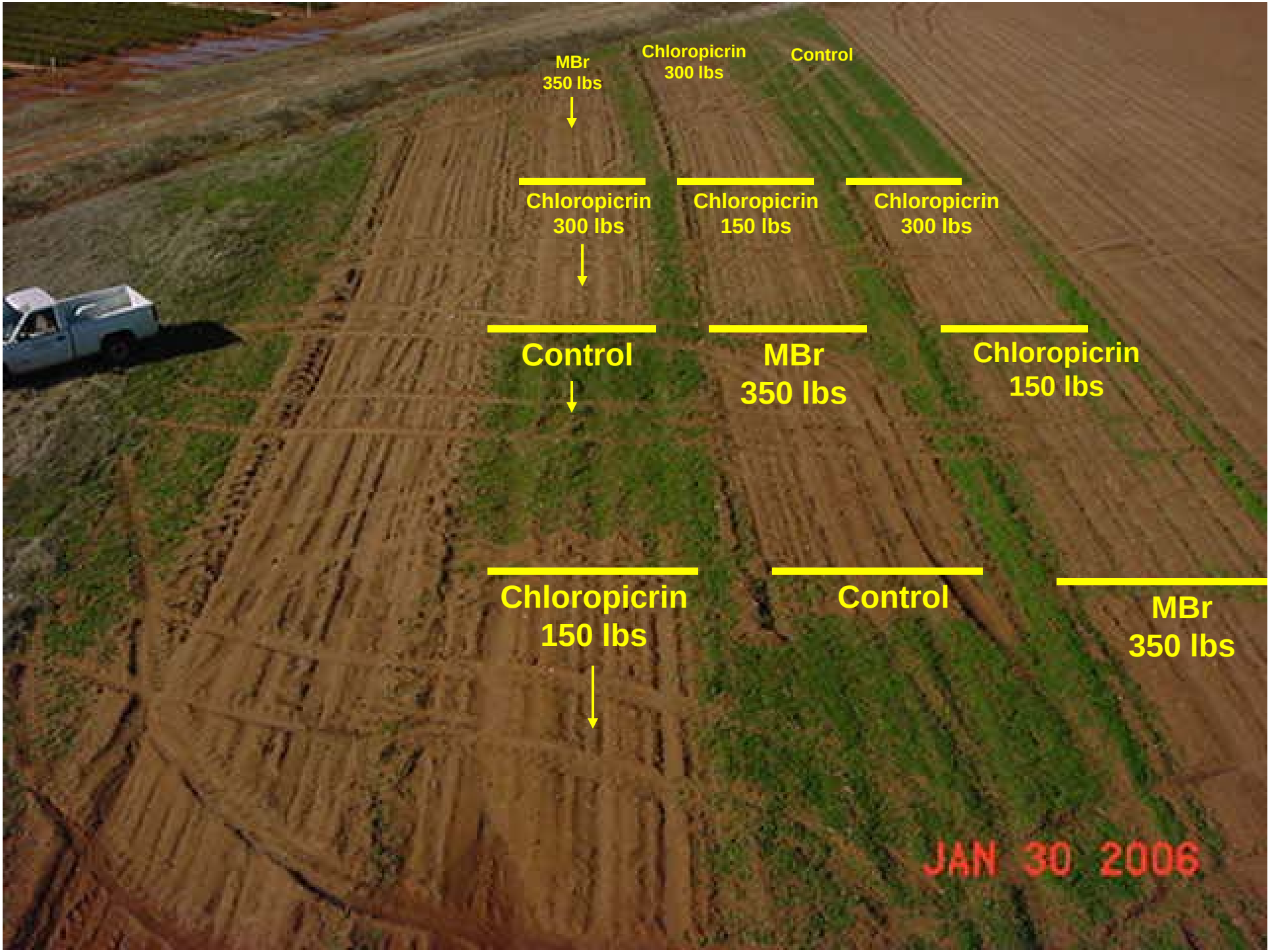

PIC+
Tel
MBC
Chl
Tel
Chl
PIC+
MBC
Chl
MBC
Tel
PIC+
MBr 1
Bas 3
MBr 3
Bas 1
MBr 2
Bas 4
Bas 2
MBr 4
Nursery
Office

Indian Mound Study II

- Located across road
- All treatments in 1 section. Each treatment 3 bedrows, 40' long, 3 replicates
  - Chloropicrin @ 150 lbs/a (Nov. 2005)
  - Chloropicrin @ 300 lbs/a (Nov. 2005)
  - MBr 98/2 @ 350 lbs/a (Nov. 2005)
  - Control

Study II




MBr
350 lbs
Chloropicrin
300 lbs
Control
Chloropicrin
300 lbs
Chloropicrin
150 lbs
Chloropicrin
300 lbs
Control
MBr
350 lbs
Chloropicrin
150 lbs
Chloropicrin
150 lbs
Control
MBr
350 lbs
JAN 30 2006

Data collected to date

- Data collected July Contact meeting
- Preliminary – Wow!
- Seedling quality & soil data collected early January 2007.

Study 1 (July 2006)

TRT	*Height (in)*	*RCD (mm)*	*Total Dry Wt (gms)*	*Seedling Counts (per sq ft)*
Bas	5.7 a	2.4 a	0.9 a	19.8 b
Mbr	6.2 b	2.5 bc	0.9 a	22.1 b
Telone 35	6.3 b	2.5 bc	1.0 ab	20.0 b
CNTRL	6.3 b	2.4 ab	0.9 a	13.9 a
MBC 70/30	6.5 b	2.6 c	1.0 ab	19.1 b
C-60	6.8 c	2.7 d	1.2 c	19.6 b
PIC+	7.5 d	2.8 d	1.3 c	23.9 b

Within columns, means followed by same letter are not significantly different at 0.05 level.

Study II (July 2006)

TRT	*Height (in)*	*RCD (mm)*	*Total Dry Wt (gms)*	*Seedling Counts (per sq ft)*
CNTRL	**5.0 a**	**2.5 a**	**0.7 a**	**17.5 a**
Ch150	**5.9 b**	**2.4 a**	**1.1 b**	**17.1 a**
MBr	**6.7 c**	**2.7 b**	**1.3 bc**	**20.9 a**
Ch300	**7.2 d**	**2.7 b**	**1.4 c**	**16.1 a**

Table 1: Study 1 Seedling quality characteristics – January 2007

TRT	*Height (in)*	*RCD (mm)*	*Shoot Dry Wt (gms)*	*Seedling Counts (per sq ft) and Std Error*	*Shoot Wt (per sq ft)*
Bas	10.4 ab	5.0 a	4.1 a	18.9 b (1.20)	75.0 b
Mbr	11.2 ab	5.3 a	4.5 a	21.1 ab (0.74)	92.5 a
TC35	10.5 ab	5.1 a	4.1 a	20.7 ab (0.95)	85.0 ab
CNTRL	10.2 b	5.1 a	4.2 a	20.9 ab (0.86)	85.0 ab
MBC70/30	11.3 a	5.4 a	4.6 a	19.5 ab (1.09)	90.0 ab
C-60	11.1 ab	5.2 a	4.2 a	22.7 a (1.63)	95.0 a
PIC+	10.8 ab	5.0 a	4.0 a	22.0 ab (0.26)	87.5 ab
lsd	1.2	0.5	0.8	3.8	19.5

Within columns, means followed by same letter are not significantly different at 0.05 level.

Figure 1: Grade 1, Grade 2 and Cull seedlings from Study 1 - Texas

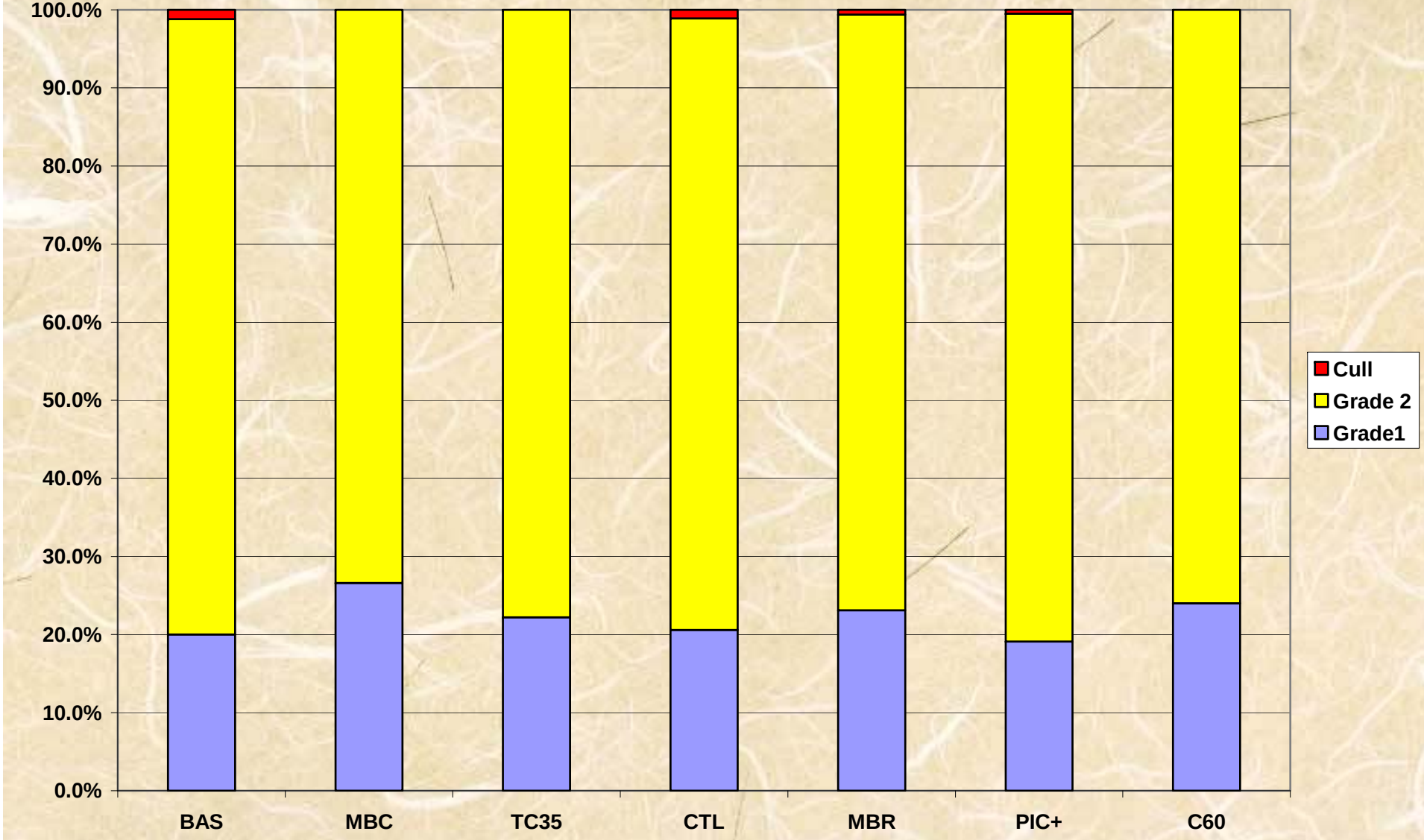


Table 2: Study 1 Soil Fungi and *Trichoderma* data – January 2007

TRT	*Total Count*	*Percent Trichoderma*
Bas	64.3 c	15.5 e
Mbr	66.2 c	23.6 d
TC35	160.5 a	49.5 b
CNTRL	68.3 c	24.8 d
MBC70/30	78.4 c	46.1 bc
C-60	127.8 b	64.3 a
PIC+	180.7 a	40.6 c
lsd	44.5	11.6

Within columns, means followed by same letter are not significantly

Total Count are the number of Colony forming units per Petri plate.

Percent *Trichoderma* is percentage of total colonies that were *Trichoderma*.

Table 3: Study 2 Seedling quality characteristics – January 2007

TRT	*Height (in)*	*RCD (mm)*	*Shoot Dry Wt (gms)*	*Seedling Counts (per sq ft)*	*Shoot Wt (per sq ft)*
CNTRL	10.4 a	5.2 a	4.3 a	18.0 a	77.5 a
Ch150	10.7 a	5.5 a	4.7 a	16.0 a	72.5 a
MBr	10.7 a	5.2 a	4.4 a	18.0 a	80.0 a
Ch300	11.0 a	5.5 a	5.3 a	15.9 a	82.5 a
lsd	2.1	1	1.8	5.4	30.9

Within columns, means followed by same letter are not significantly different at 0.05 level.

Figure 2: Grade 1, Grade 2 and Cull seedlings from Study 2 - Texas

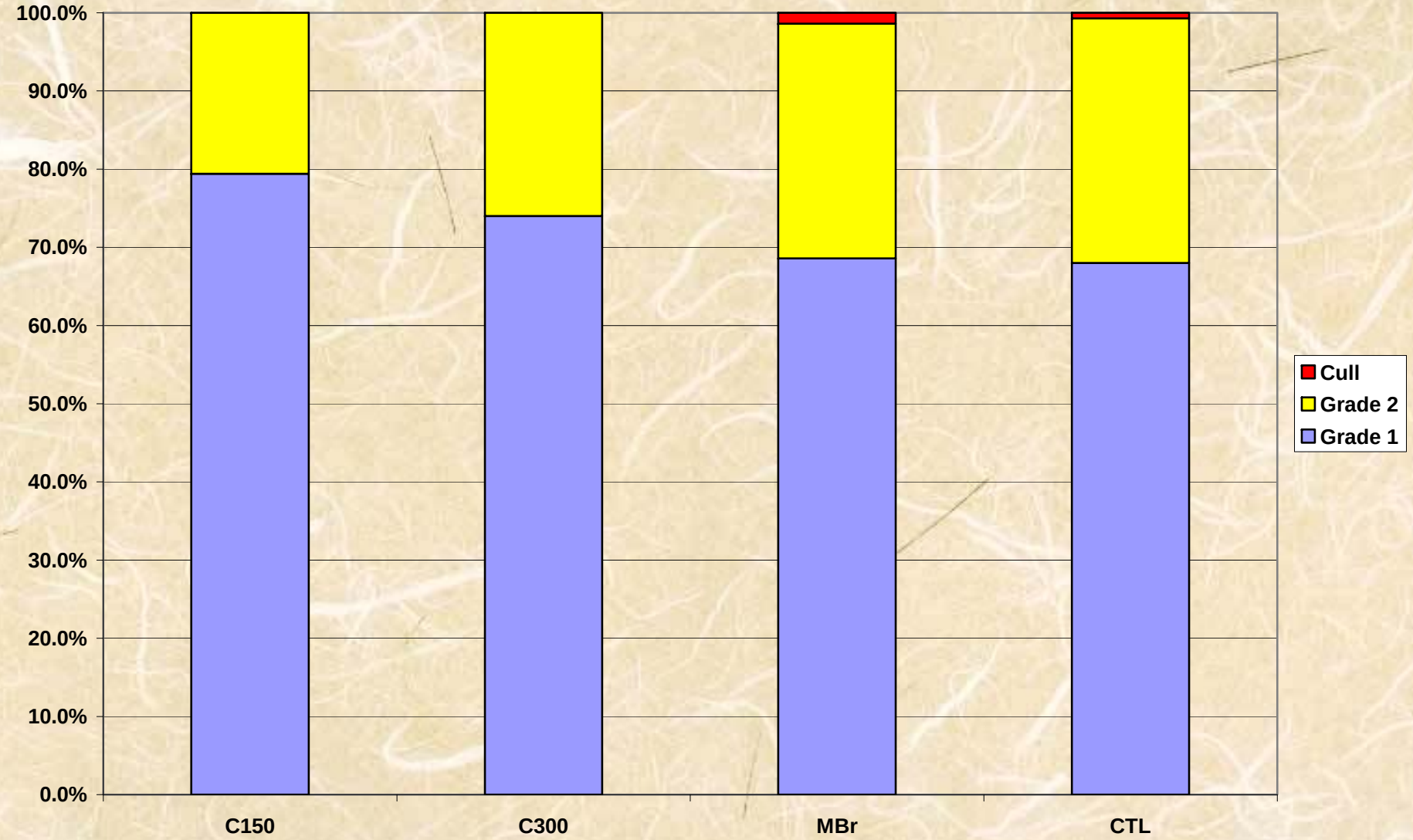


Table 4: Study 2 Soil Fungi and Trichoderma data – January 2007

TRT	*Total Count*	*Percent Trichoderma*
CNTRL	143.6 a	12.0 d
Ch150	162.9 a	50.9 b
MBr	113.3 b	29.9 c
Ch300	149.3 a	60.2 a
lsd	55.5	12.9

Within columns, means followed by same letter are not significantly different at 0.05 level.

Total Count are the number of Colony forming units per Petri plate.

Percent *Trichoderma* is percentage of total colonies that were *Trichoderma*.