Root Gels

They are not all created equal!

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Robert Cross – Arborgen, Shellman, GA

A Review of Past Coop Gel Studies

Lifting to Planting

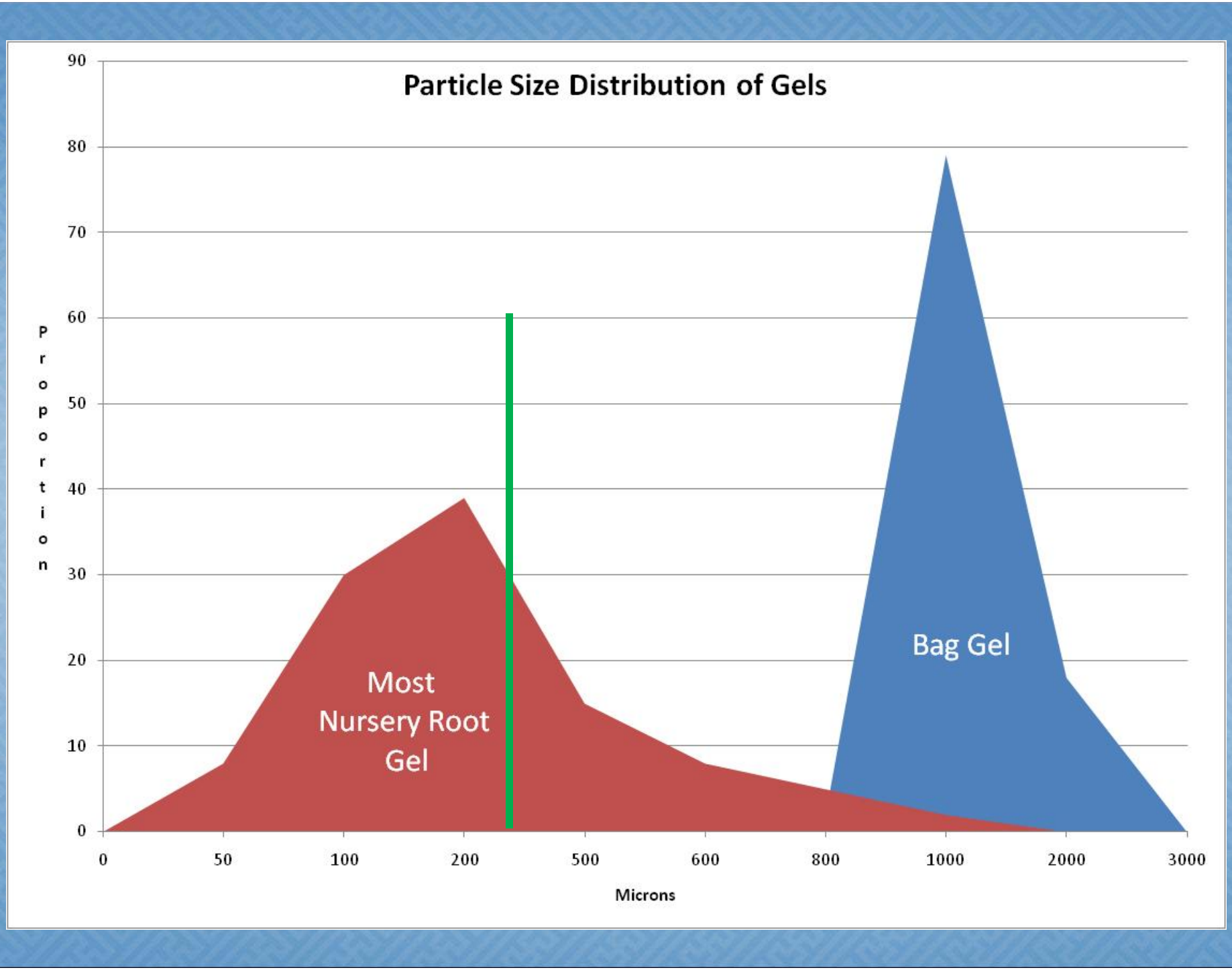
1. 2007 Root dips – protection from desiccation – Research Report 07-04.
   - ✓ Conclusion: PAM and CSB gels do protect seedlings between lifting and planting from desiccation.

After Planting

2. 2008 (a) Gel Bags – are they an option for planting holes?
3. 2008 (b) Gel bags – broken or whole do they work?

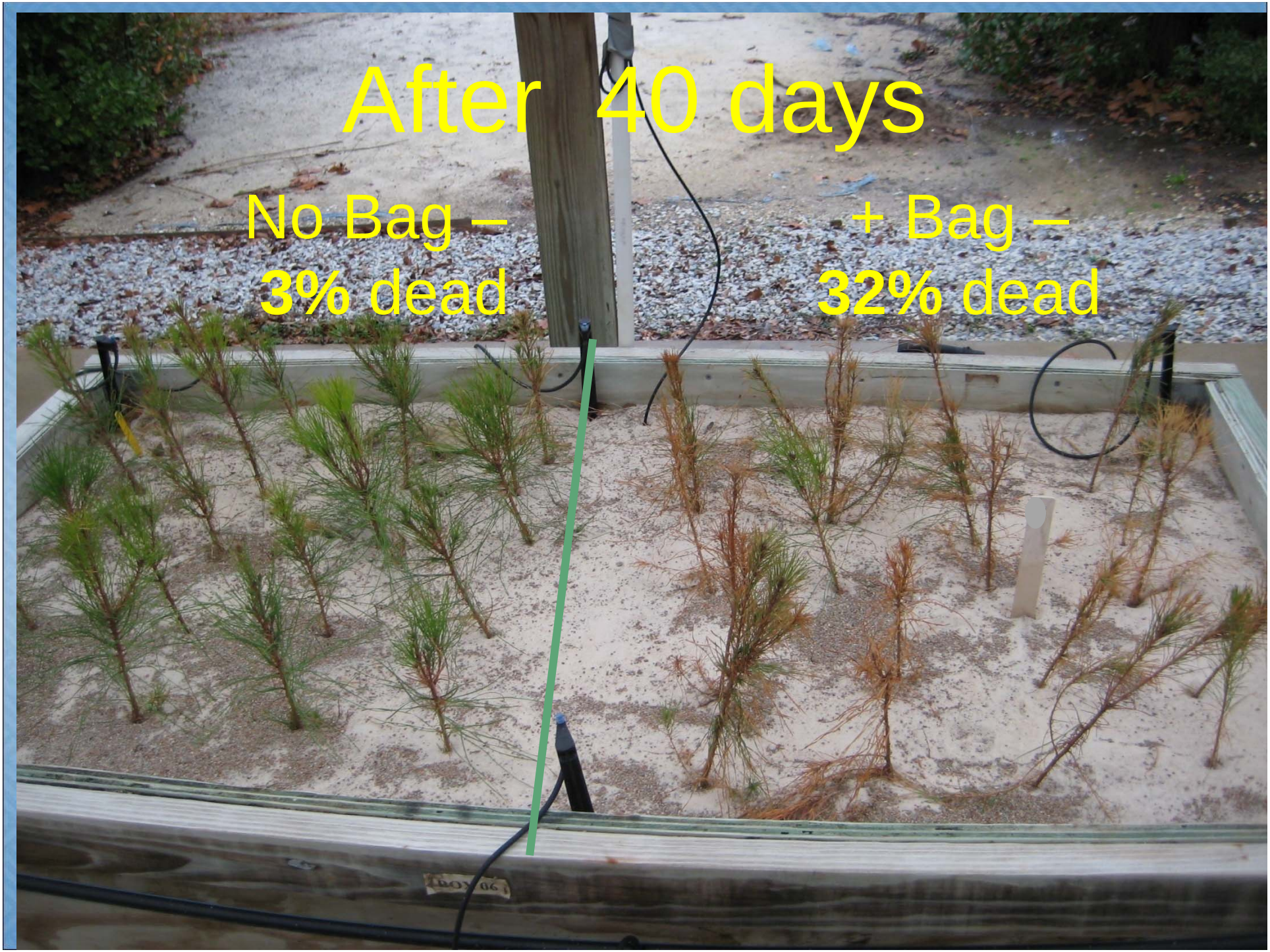
Gel Bag Study #1

- Are gel bags an option in the planting holes at the time of planting?


Particle Size Distribution of Gels
Proportion
90
80
70
60
50
40
30
20
10
0
0
50
100
200
500
600
800
1000
2000
3000
Microns
Most Nursery Root Gel
Bag Gel

Gel Bag Study #1

- 12 boxes (replications) with treatments randomized in boxes.
- Each box = 20 trees without gel bag, 20 trees with whole bag of gel placed in planting hole.
- Each box watered to saturation for first 2 days, then no additional water for next 38 days.


After 40 days
No Bag –
3% dead
+ Bag –
32% dead

Gel Bag Study #2

1. Gel on roots @ lifting – No gel bag in planting hole
2. No Gel on roots @ lifting - No gel bag in planting hole (*designated as control*)
3. Gel on roots @ lifting plus whole gel bag in planting hole
4. Gel on roots @ lifting plus gel bag emptied into planting hole (no bag in hole)
5. No Gel on roots @ lifting plus whole gel bag in planting hole
6. No Gel on roots @ lifting plus gel bag emptied into planting hole (no bag in hole)


Proportion of Seedlings Dead
30
25
20
15
10
5
0
Gel in the hole (3,4,5,6)
No gel on roots (2)

So… Back to the first question…

Gel Bags

Are they a good option for use on dry planting sites?

A Review of the Literature….

Results of gels as soil amendments vary greatly :

- dependent on soil type,
- gel composition,
- particle size of gel,
- environmental conditions.

2008 Ideas for Future Research

- Varying particle size of root dips and gel composition (PAM vs Starch) in drought boxes.

If nurseries are wanting something to put in the planting hole:

Rate of gel mixed with organic matter as a possible amendment to planting hole

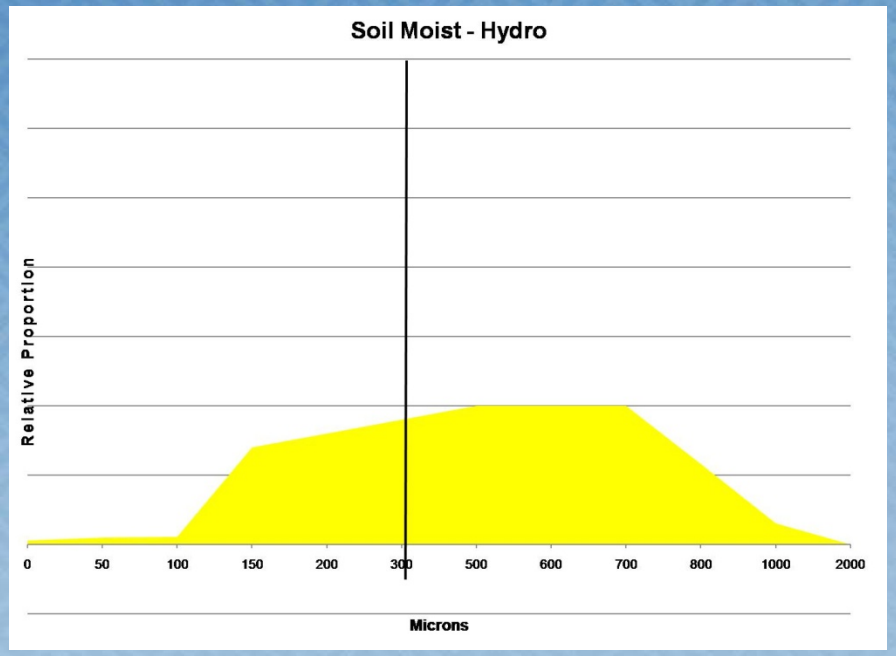
Organic matter as an amendment to planting holes.

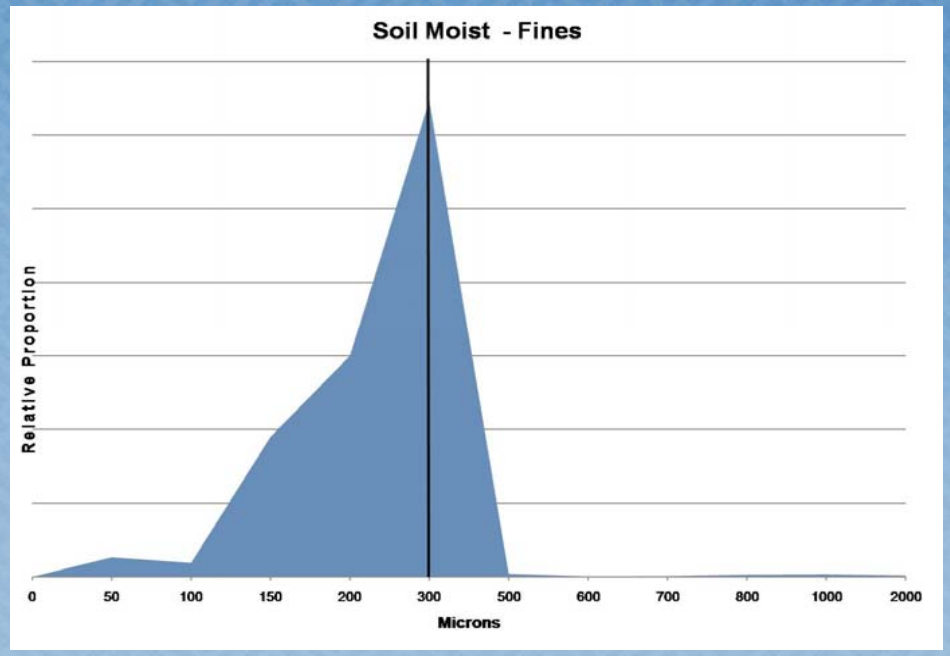
2009 Study Details

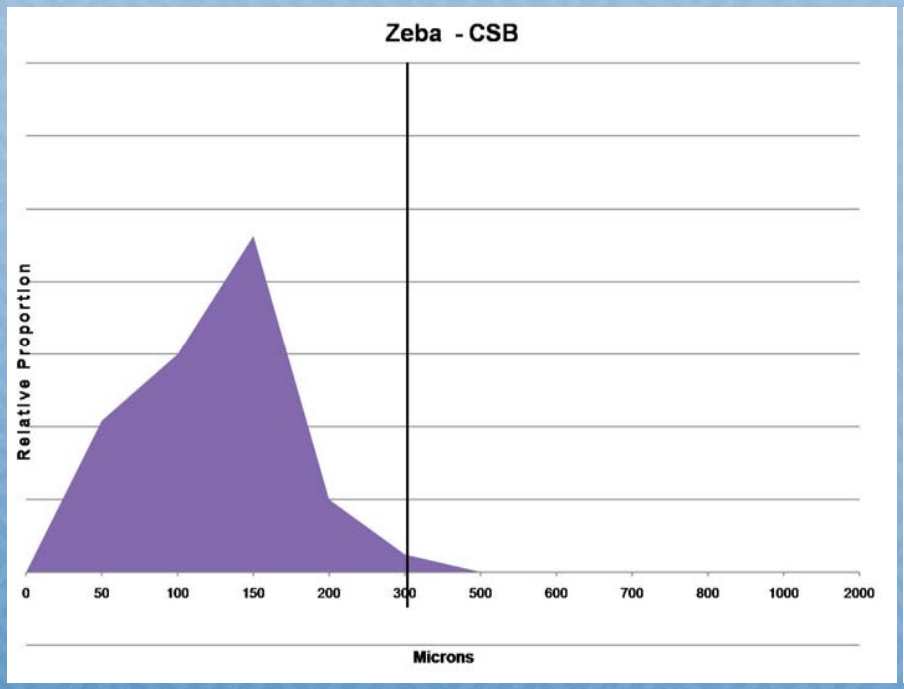
- PAM - 3 different grades were provided by JRM Chemical, Inc. Ohio (Soil Moist™)
  - Soil Moist Fines
  - Soil Moist JRM-A
  - Soil Moist Hydro
- CSB – provided by Absorbent Technologies, Inc. Oregon (Zeba®)
- Water Control

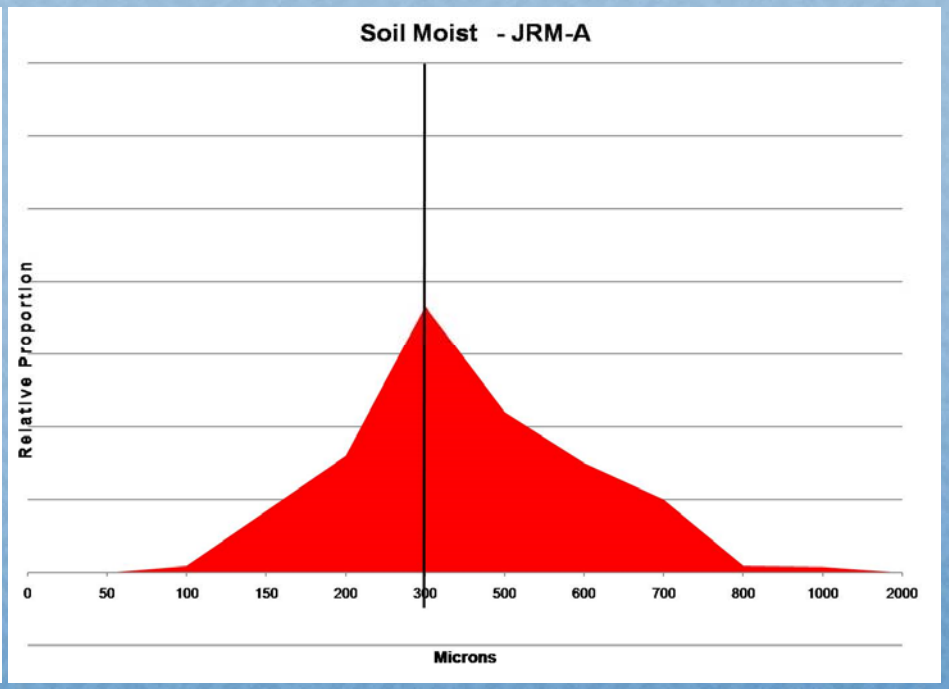
2009 Study Details

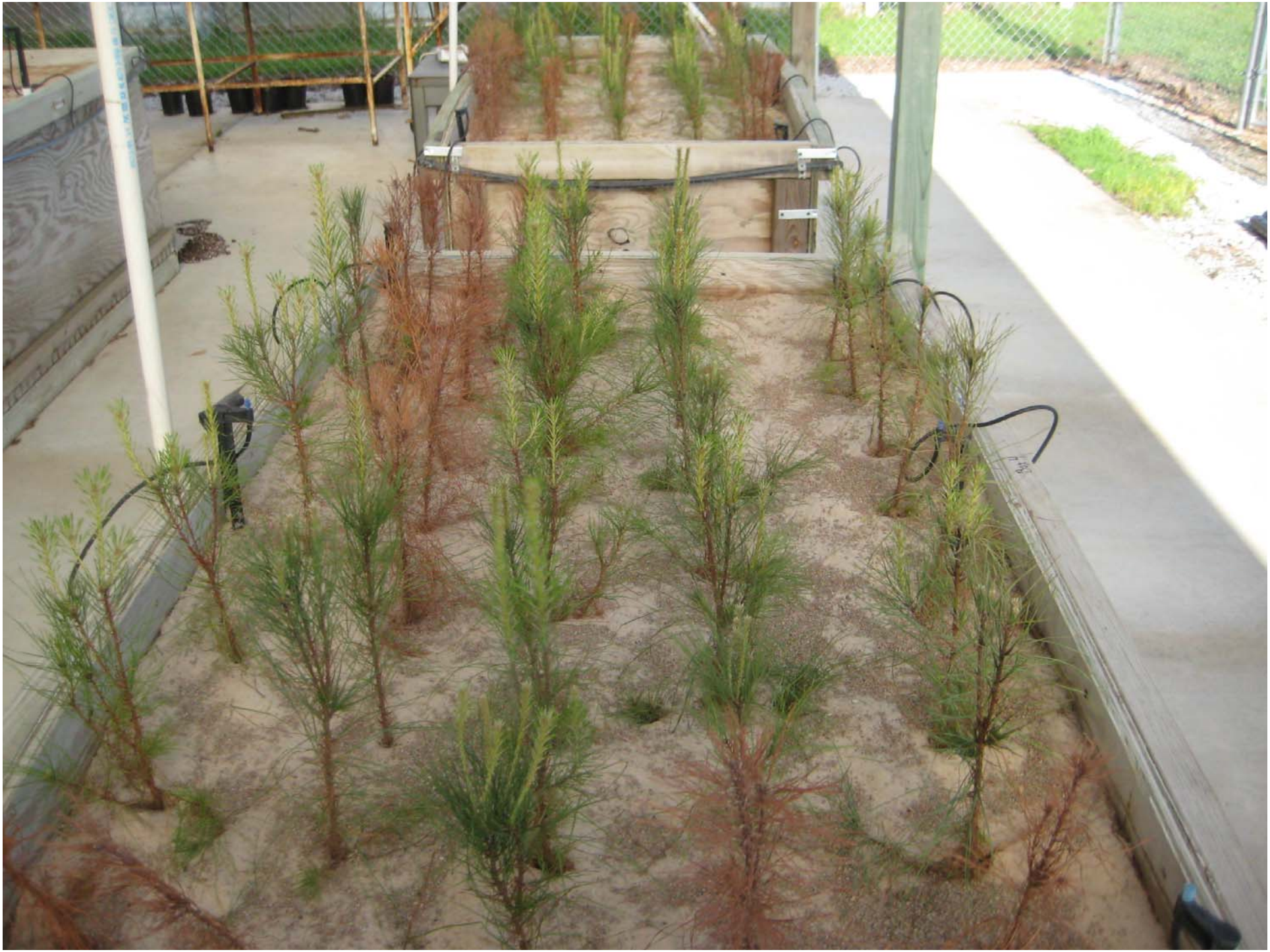
- A drought sensitive loblolly pine family was hand-lifted for this study
- Rate of Gel & CSB = 12.5 g/gallon of water
- Experimental Unit = 8 seedlings for each treatment. Replicated 8 times
- Study began Feb 6, 2009;
  concluded May 15, 2009;
  14 weeks, 98 days.
- Boxes saturated Feb 6. No further irrigation.

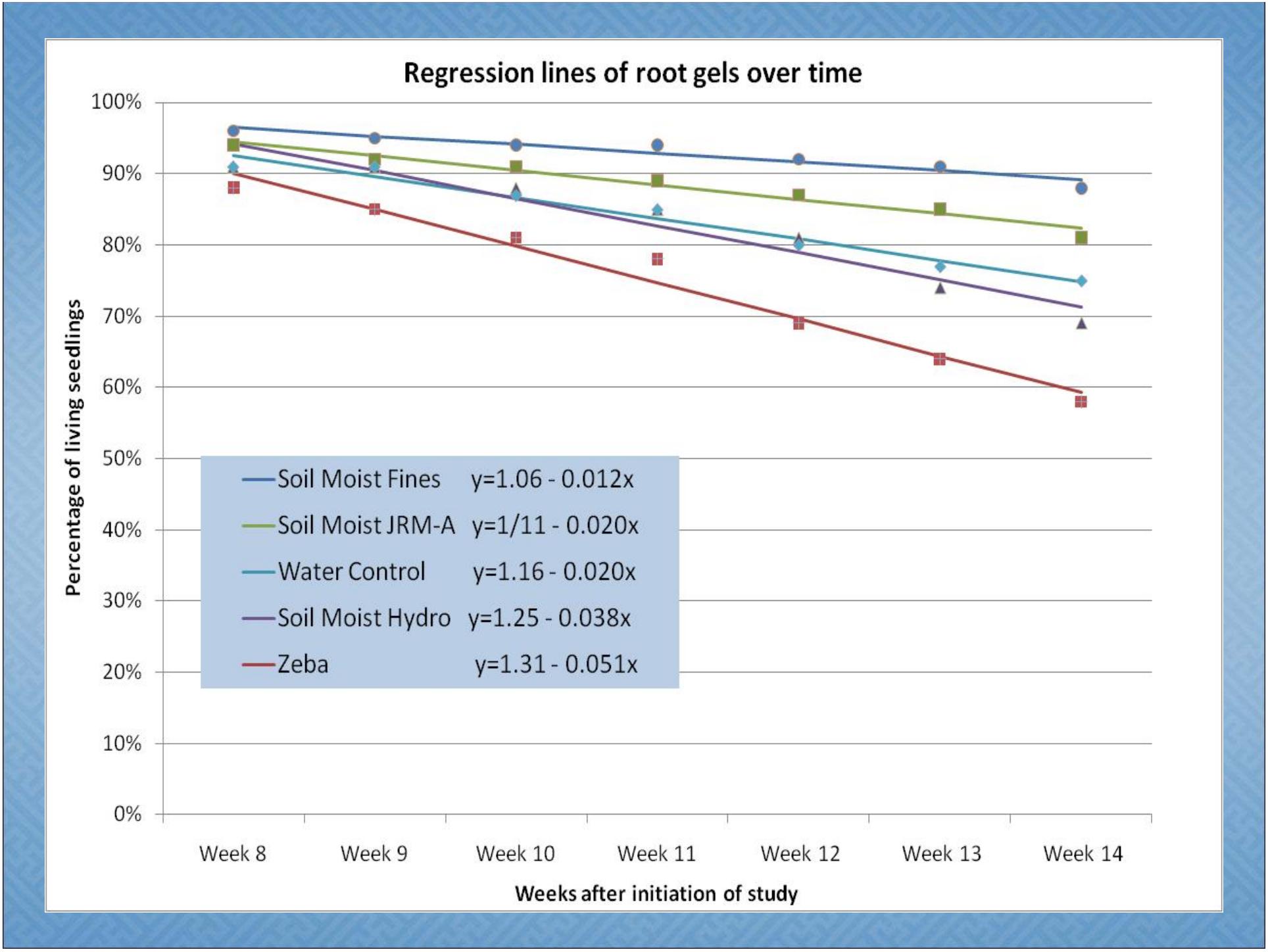

Soil Moist - Hydro
Relative Proportion
0
50
100
150
200
300
500
600
700
800
1000
2000
Microns

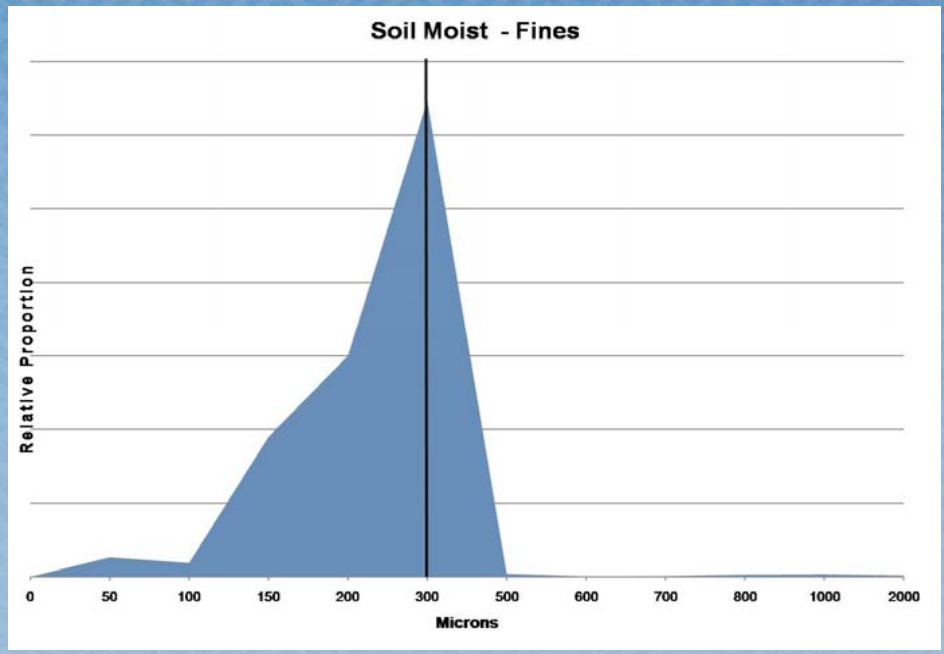

Soil Moist - Fines
Relative Proportion
0
50
100
150
200
300
500
600
700
800
1000
2000
Microns


Zeba - CSB
Relative Proportion
0
50
100
150
200
300
500
600
700
800
1000
2000
Microns


Soil Moist - JRM-A
Relative Proportion
0
50
100
150
200
300
500
600
700
800
1000
2000
Microns




Regression lines of root gels over time
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage of living seedlings
Soil Moist Fines y=1.06 - 0.012x
Soil Moist JRM-A y=1/11 - 0.020x
Water Control y=1.16 - 0.020x
Soil Moist Hydro y=1.25 - 0.038x
Zeba y=1.31 - 0.051x
Week 8
Week 9
Week 10
Week 11
Week 12
Week 13
Week 14
Weeks after initiation of study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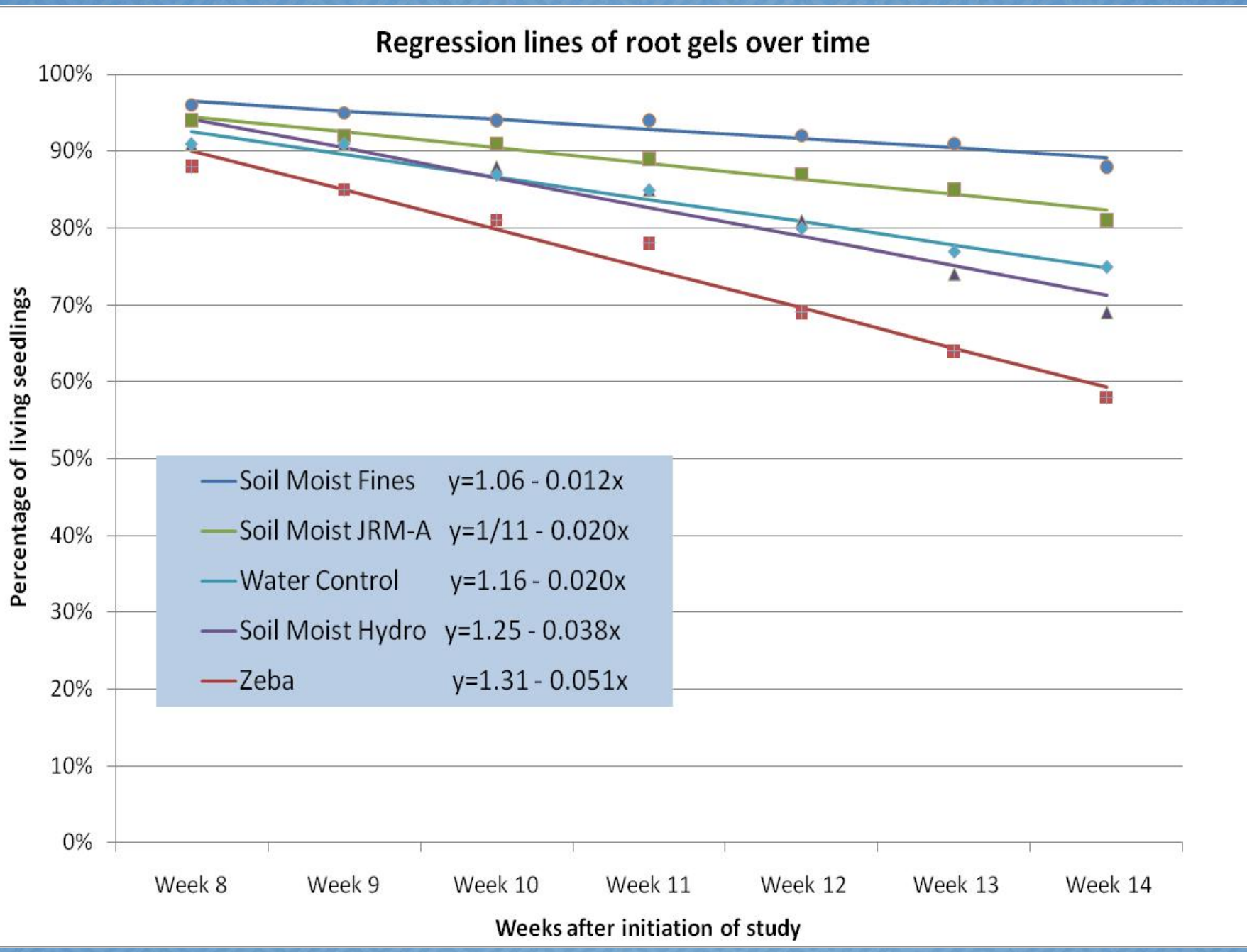
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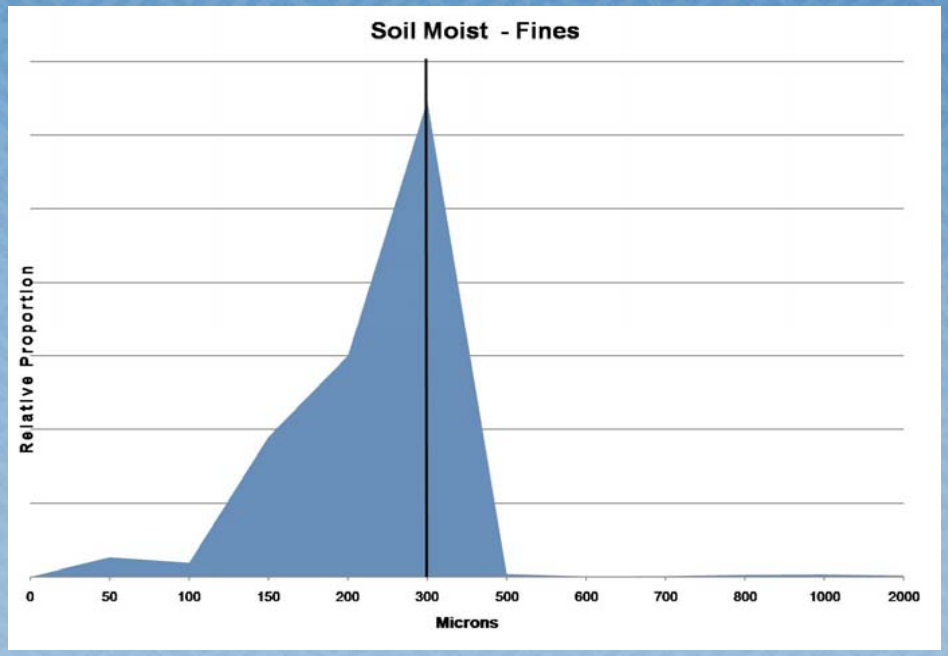
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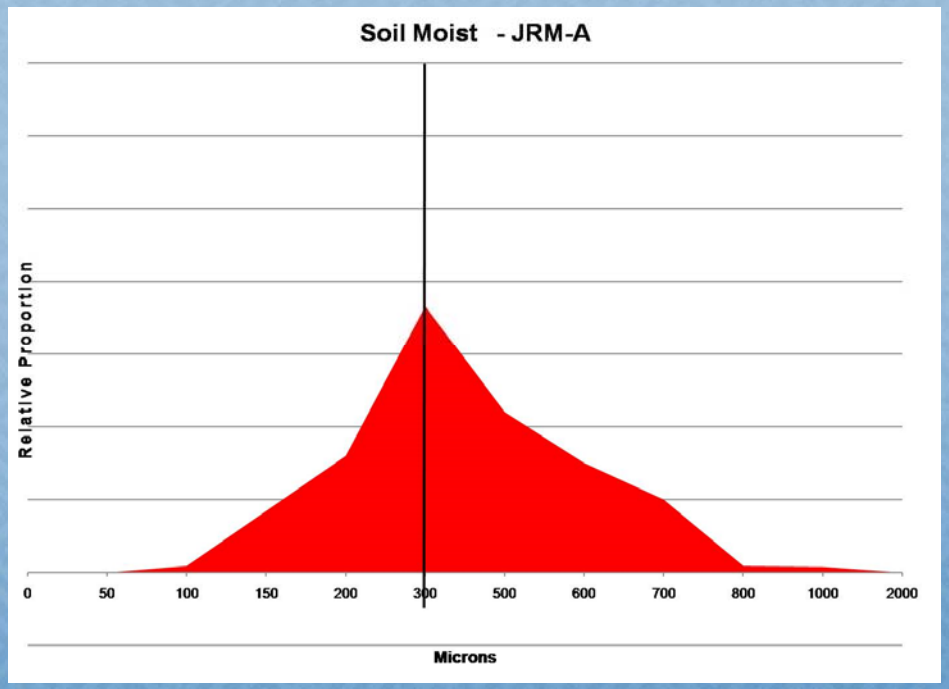
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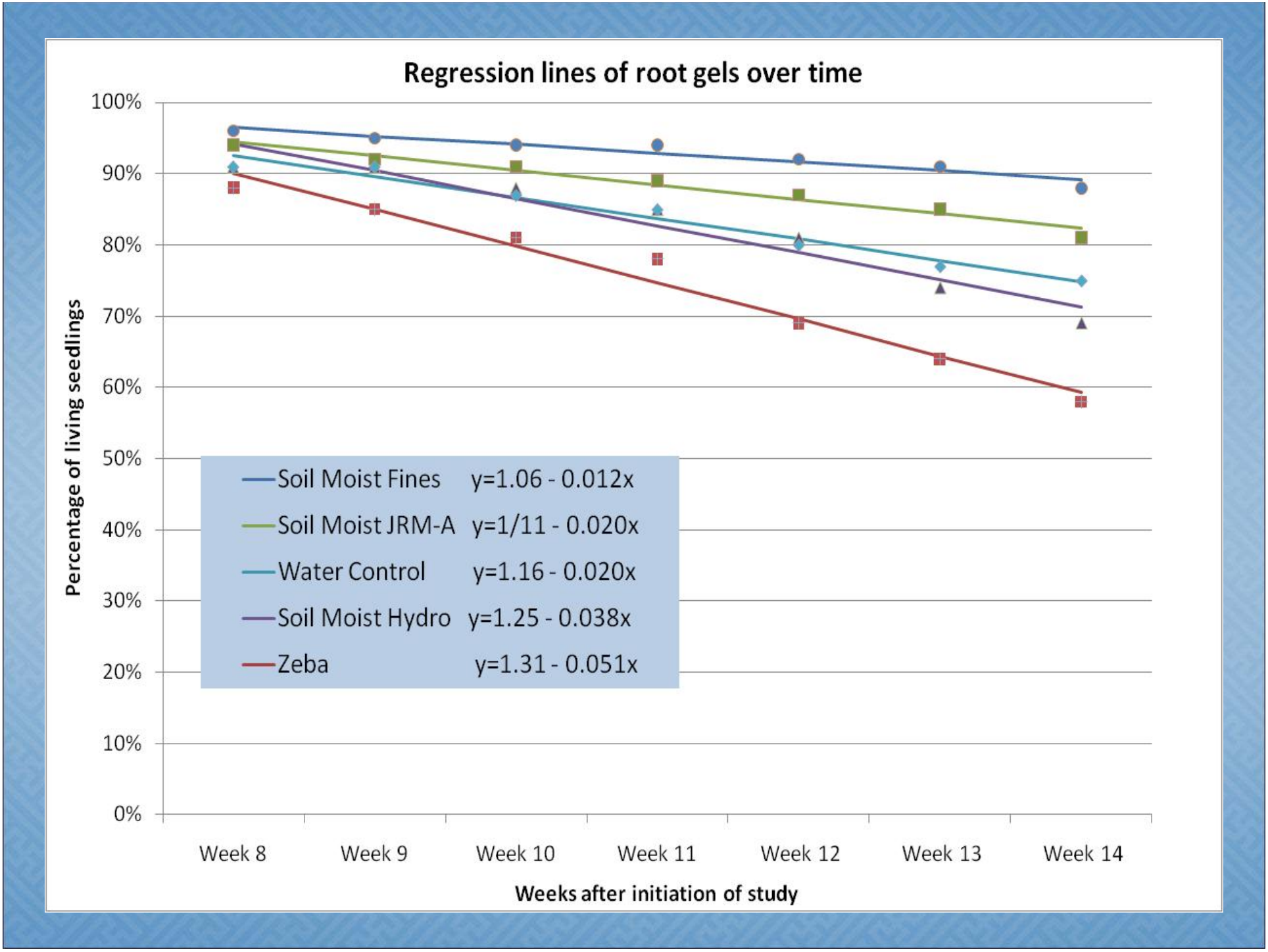
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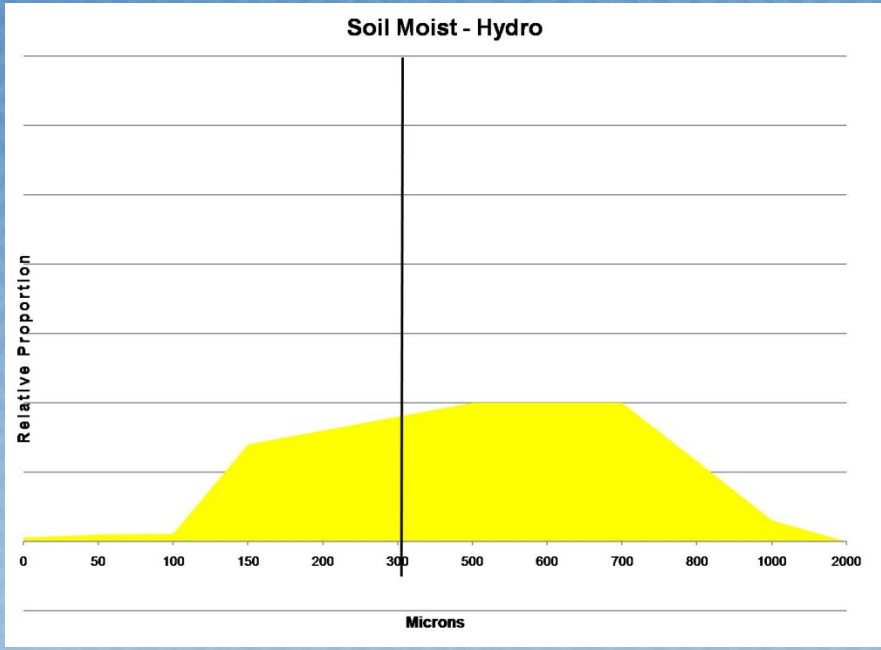
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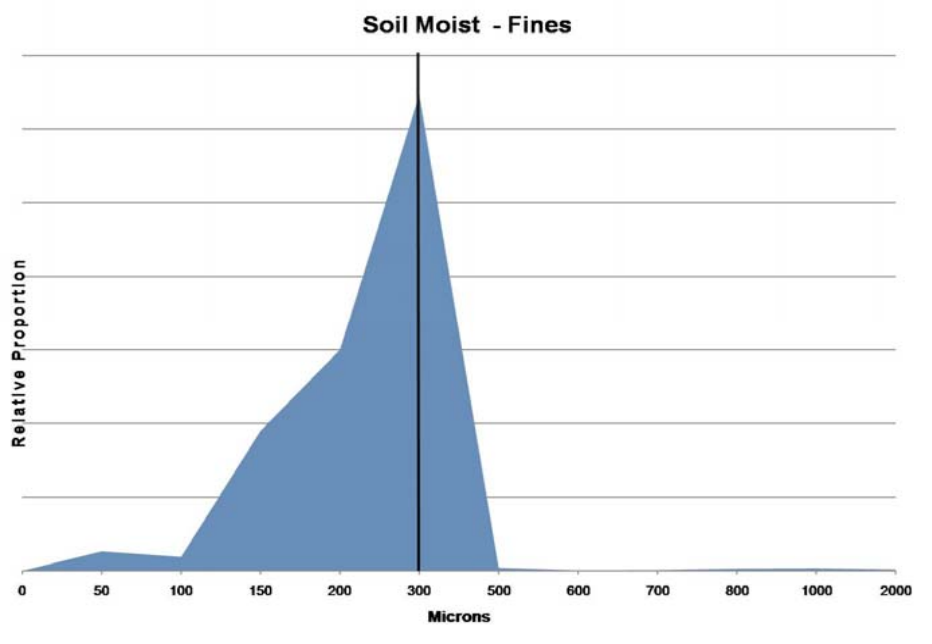
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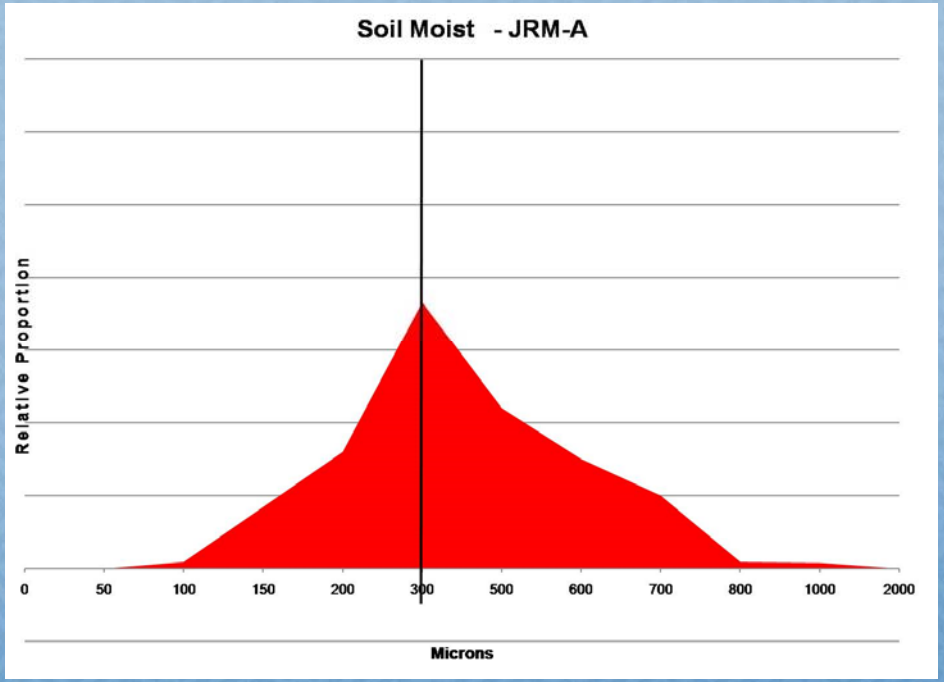
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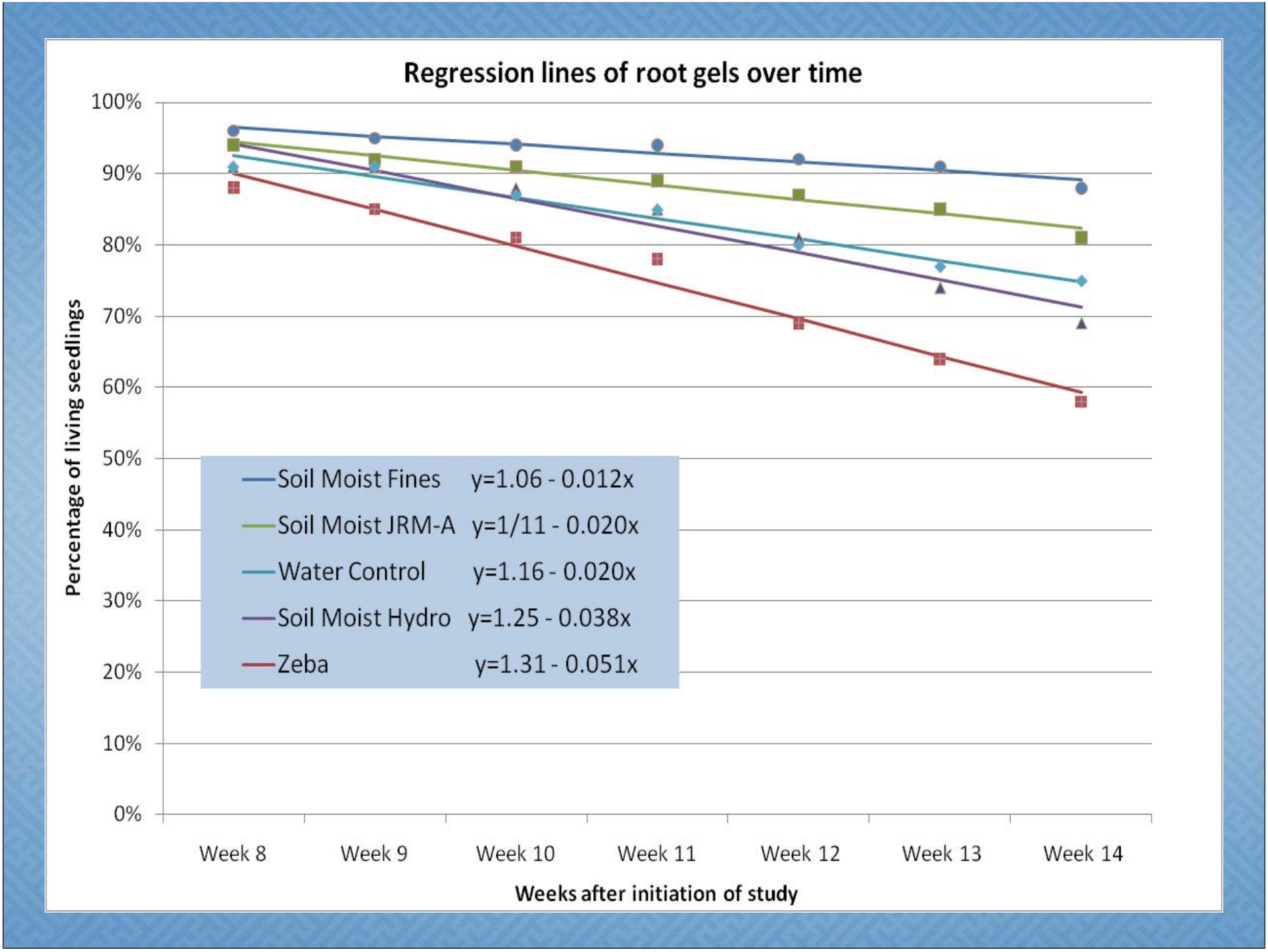
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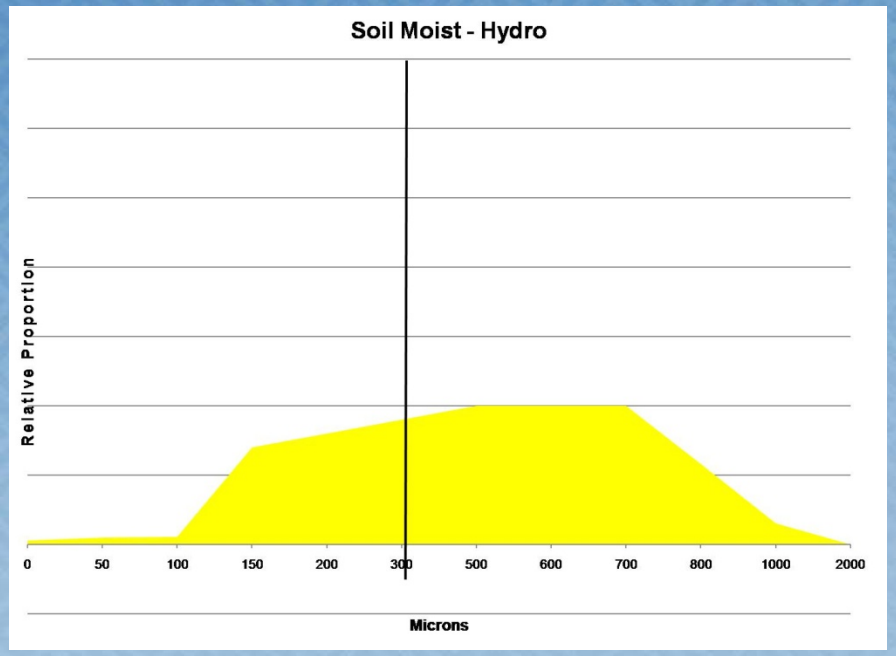
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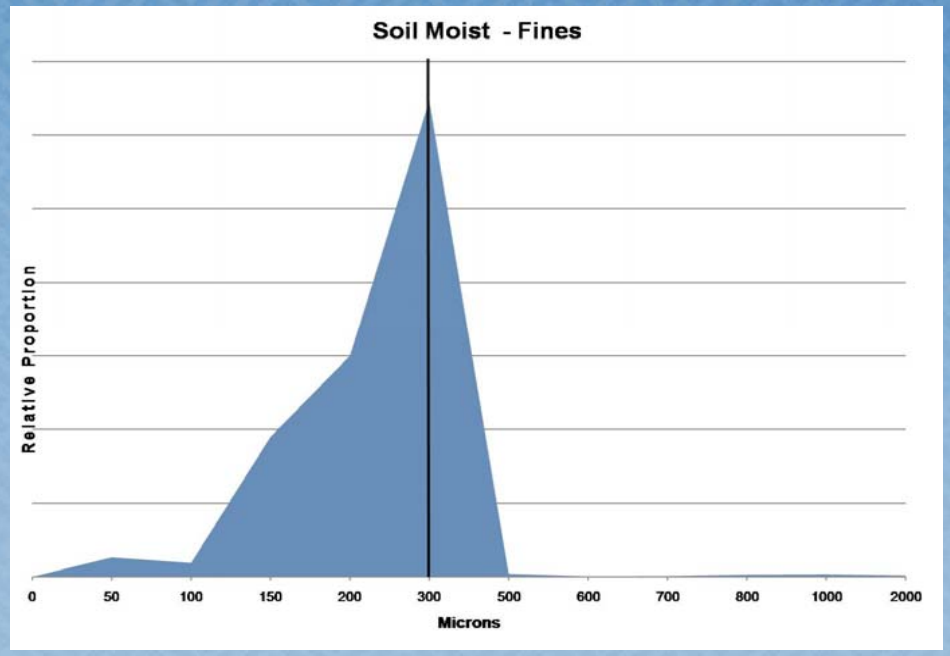
Soil Moist - Fines
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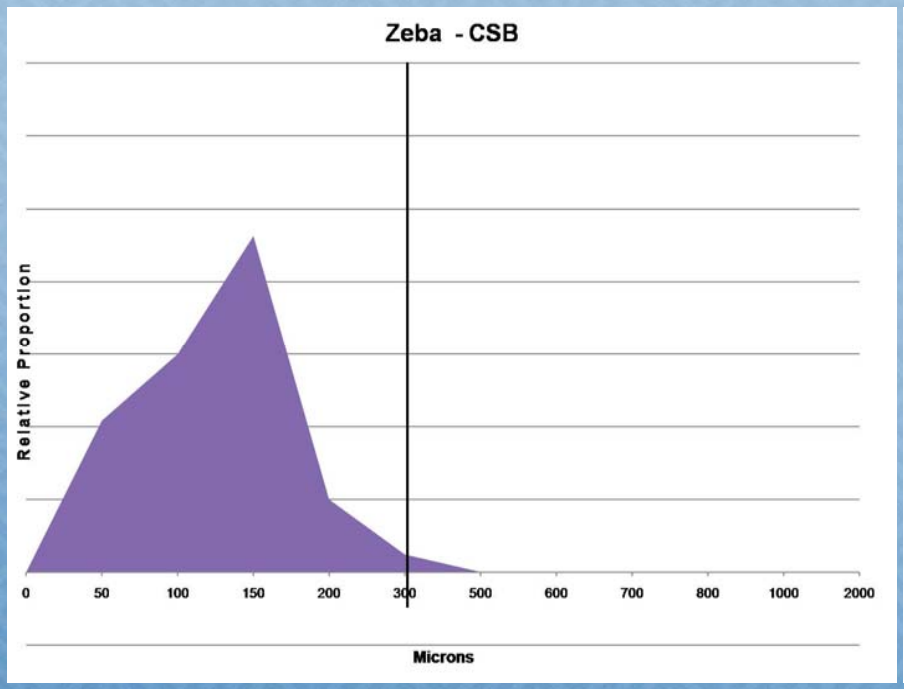
Zeba - CSB
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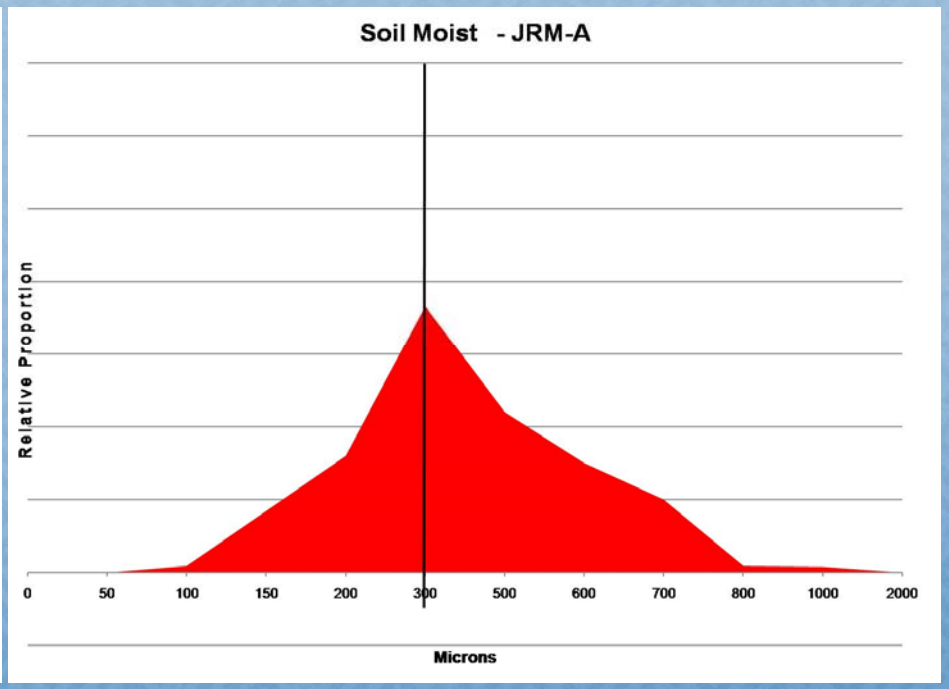
Soil Moist - JRM-A
Relative Proportion
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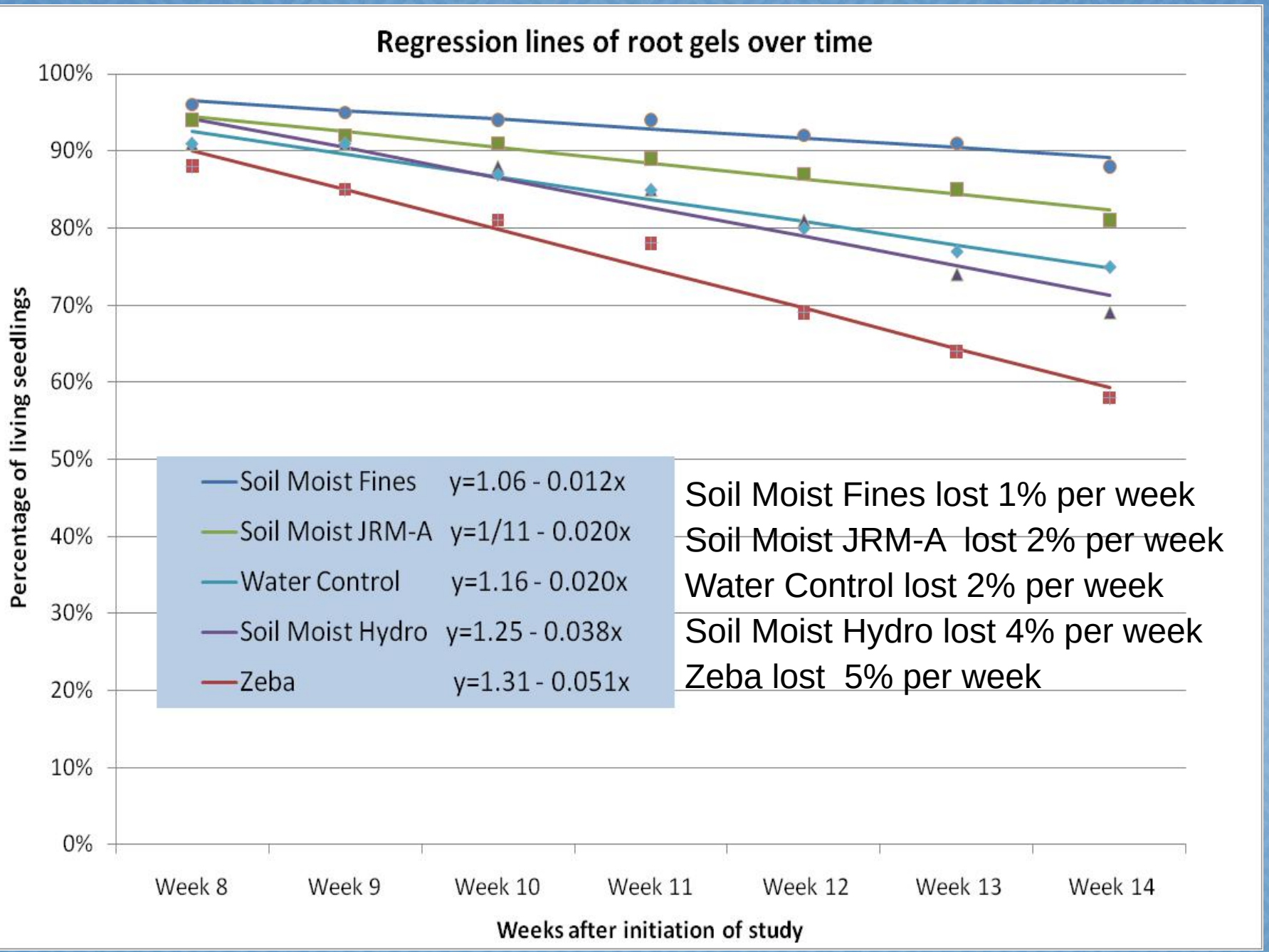
Microns



Soil Moist Fines lost 1% per week

Soil Moist JRM-A lost 2% per week

Water Control lost 2% per week

Soil Moist Hydro lost 4% per week

Zeba lost 5% per week

Root Gel Seedling Quality

Treatments	Percentage of Living Seedlings @ Week 14	Root Dry Wt (g)	Root Morphology				
			Length (cm)	Area (cm^2)	Diameter (mm)	Volume (cm^3)	Tips
Soil Moist - Fines	88% a	3.16 a	578.25 a	143.73 a	0.776 a	2.88 a	1241 ab
Soil Moist - JRMA	82% a	2.48 a	555.73 a	122.90 a	0.706 bc	2.19 a	1232 ab
Water Control	75% ab	2.24 a	614.55 a	129.33 a	0.669 c	2.18 a	1286 a
Soil Moist - Hydro	69% ab	2.63 a	525.81 a	118.79 a	0.719 b	2.16 a	1216 ab
Zeba	58% b	*2.74 a*	487.70 a	117.43 a	0.751 ab	2.31 a	978 b
lsd	*21*	*0.77*	*120.5*	*30.68*	*0.045*	*0.665*	*248*

Take Home Message….

- What are you trying to accomplish by applying root gels at lifting?

Take Home Message….

- What factor(s) determine what grade of gel you use?

Possible answers:

1. We have always used the grade we are using.
2. My choice is based upon price.
3. My choice is based upon what is best for seedling survival.
4. My choice is based upon what my customers want to see.

Summary thoughts….

- Gel composition does matter.
- Gel particle size does matter.
- A higher proportion of gel particles 100 – 500 microns are more beneficial than larger gel particles.
- You need to think how you will educate your customers.