The use of seed polymers and seed colorants as treatments for southern pines

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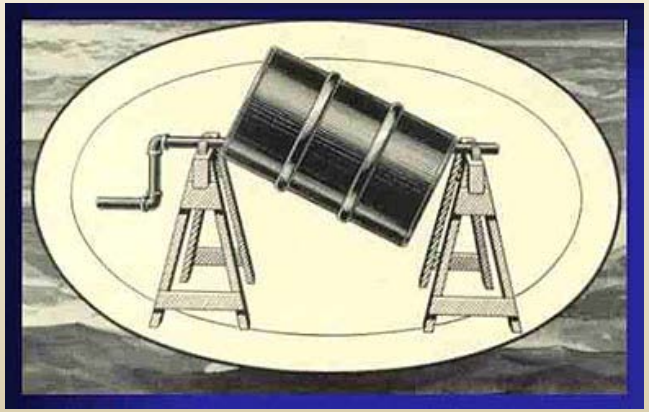


Seed Treatment of Southern Pines

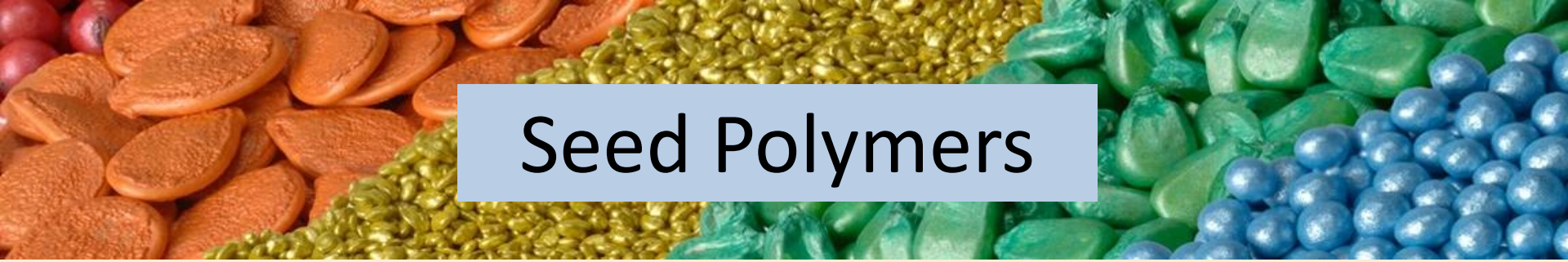
- Seed treating includes anything done to the seeds between harvest and planting to protect or enhance the vigor and productivity of the seed.
- Seed treatment chemicals include insecticides, fungicides, bactericides, repellents, fertilizers, and adjuvants

Seed Treatment of Southern Pines

- Fungicides used -Systemic and nonsystemic
  - Systemic pose the greatest risk factor since the chemical stays in the plant after germinating
- Thiram – fungicide or repellant?
- Adjuvants – compounds that are used to aid in the retention of the pesticide or lubricate seed for planting

Current use of latex

- Some concerns:
  - Finding latex – at least DOW latex
  - What is a good latex?
  - Clumping of seed after drying
  - Worker Protection concerns - “dust off” during sowing



Seed Polymers

- Last 5-10 years enormous amount of research on seed treatment in agricultural seeds
- Ability to protect seed treatments
- To reduce “dust-off” concerns (an EPA concern)
- To enhance plantability
- Desire to enhance seed appearance & ID

Seed Polymers

- “Seed polymers are a bit like force fields: You cannot always see them, but they are there to protect.”

- To protect the growing number of pesticides and biologicals being applied to the seed.

- Provides uniform coverage of other seed treatments
- Compatible with major fungicides, insecticides, inoculants and colorants

Seed Polymer

BECKER UNDERWOOD
Inventing the Future
Now part of BASF

CF CLEAR

HOME » PRODUCTS/SERVICES » SEED COATINGS » POLYMERS

Polymer seed conditioner film

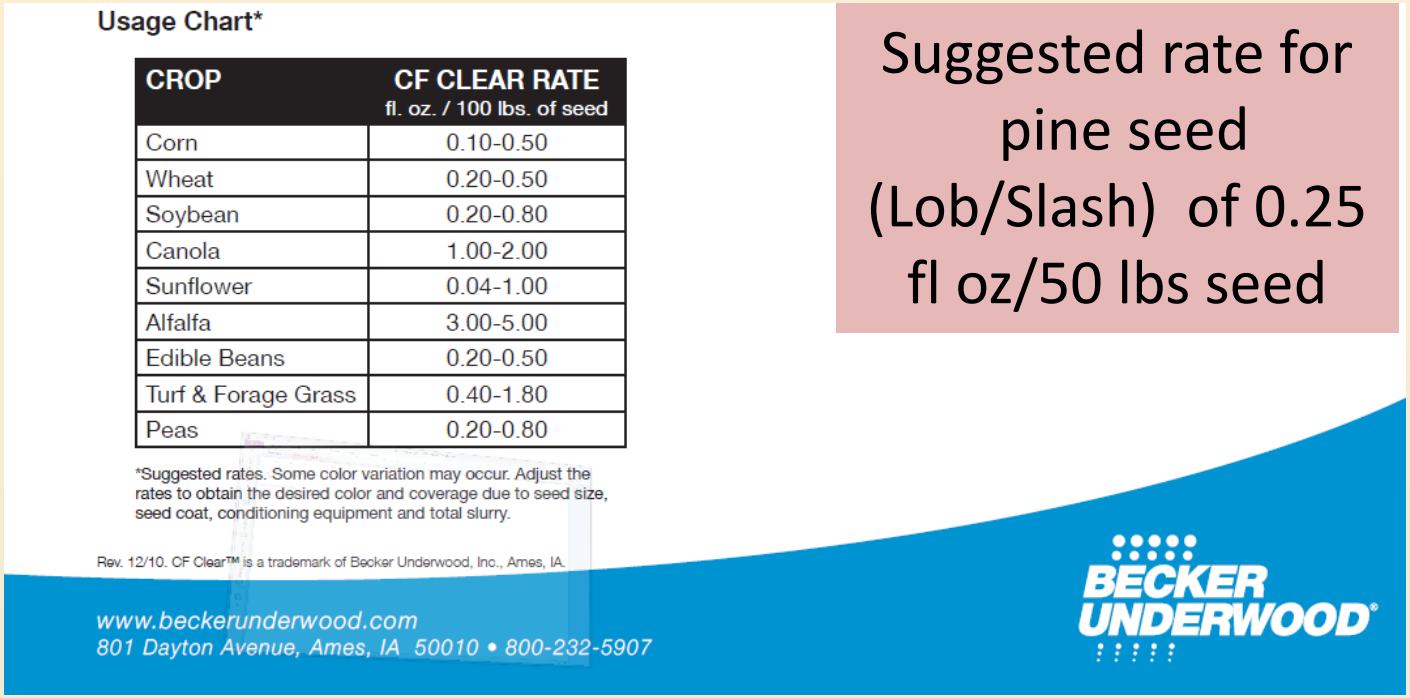
CF Clear is a water-based, low-viscosity polymer that keeps actives on the seed, controls dust-off, improves application coverage, plantability, seed flow in seed facilities, seed performance, seed appearance and seed build up, all with easy clean up.

CF Clear gives you . . .

- Strong bond for active onto seed
- Reduced dust-off
- Improved plantability and seed flow
- Easy clean-up
- Low viscosity
- Water based

Packaging: 4x1 gallons (36 per pallet), 2x2.5 gallons (36 per pallet), 30 gallons (5 per pallet), and 260 gallons (1 per pallet).

CF Clear – Becker Underwood



Usage Chart*

CROP	CF CLEAR RATE fl. oz. / 100 lbs. of seed
Corn	0.10-0.50
Wheat	0.20-0.50
Soybean	0.20-0.80
Canola	1.00-2.00
Sunflower	0.04-1.00
Alfalfa	3.00-5.00
Edible Beans	0.20-0.50
Turf & Forage Grass	0.40-1.80
Peas	0.20-0.80

*Suggested rates. Some color variation may occur. Adjust the rates to obtain the desired color and coverage due to seed size, seed coat, conditioning equipment and total slurry.

Rev. 12/10. CF Clear™ is a trademark of Becker Underwood, Inc., Ames, IA.

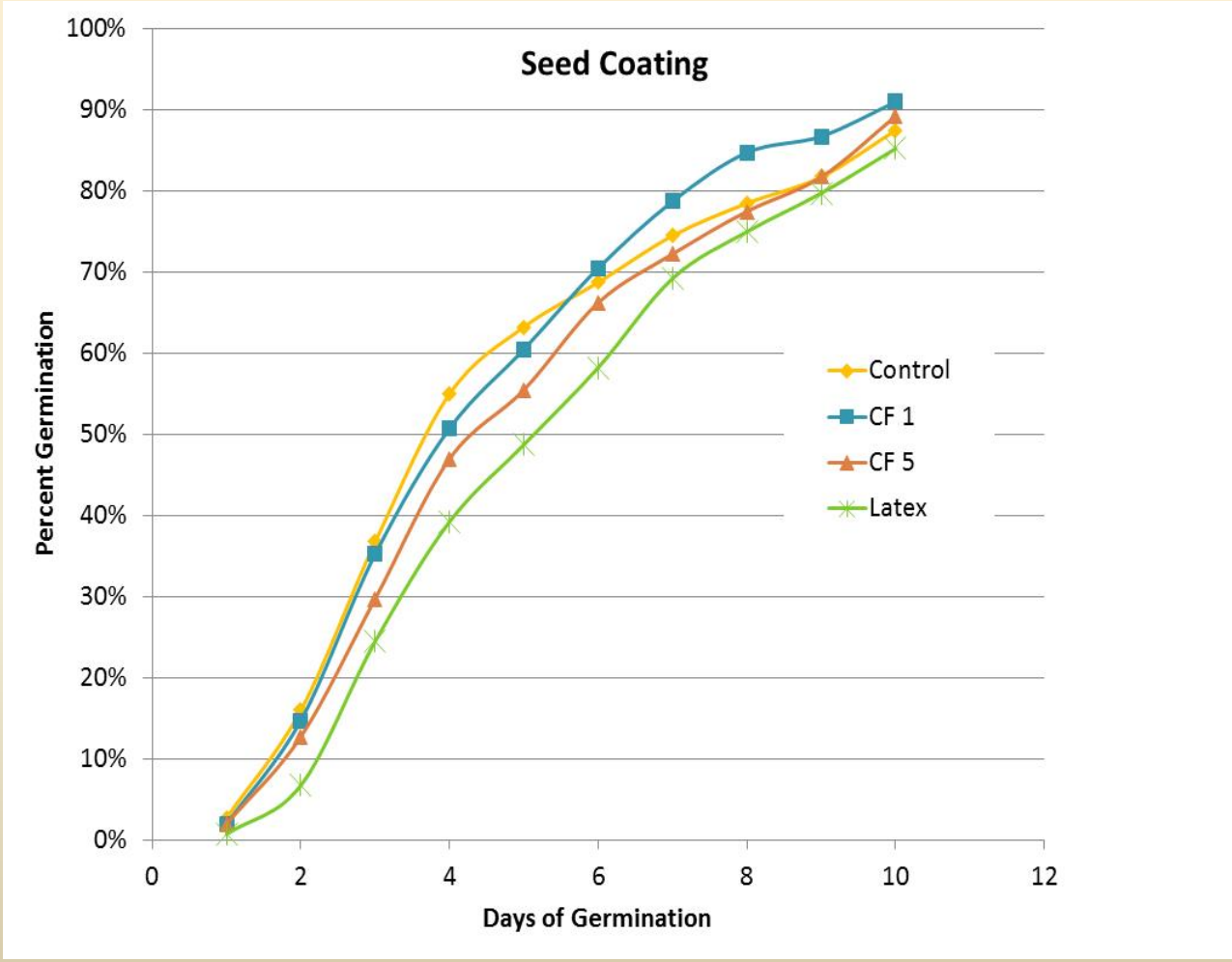
www.beckerunderwood.com
801 Dayton Avenue, Ames, IA 50010 • 800-232-5907

BECKER UNDERWOOD

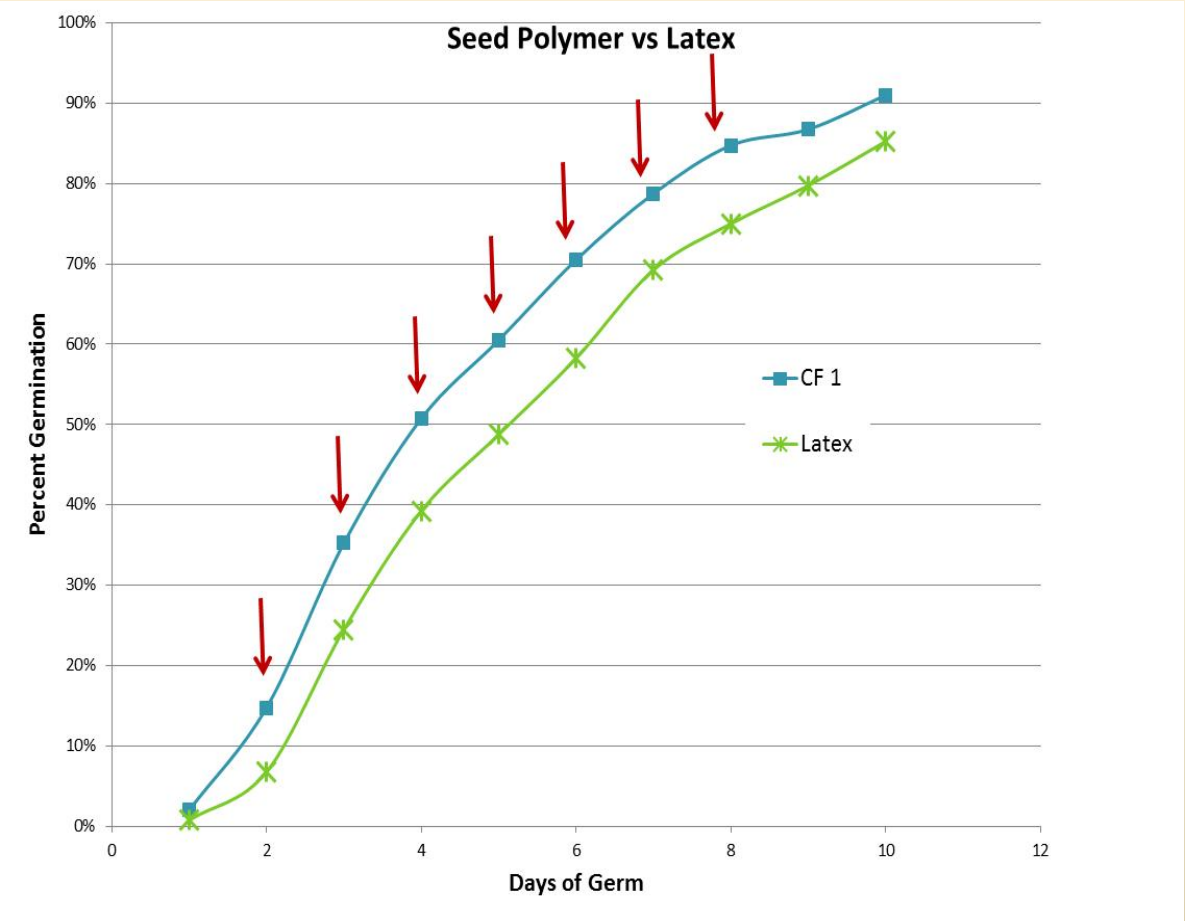
Suggested rate for pine seed (Lob/Slash) of 0.25 fl oz/50 lbs seed

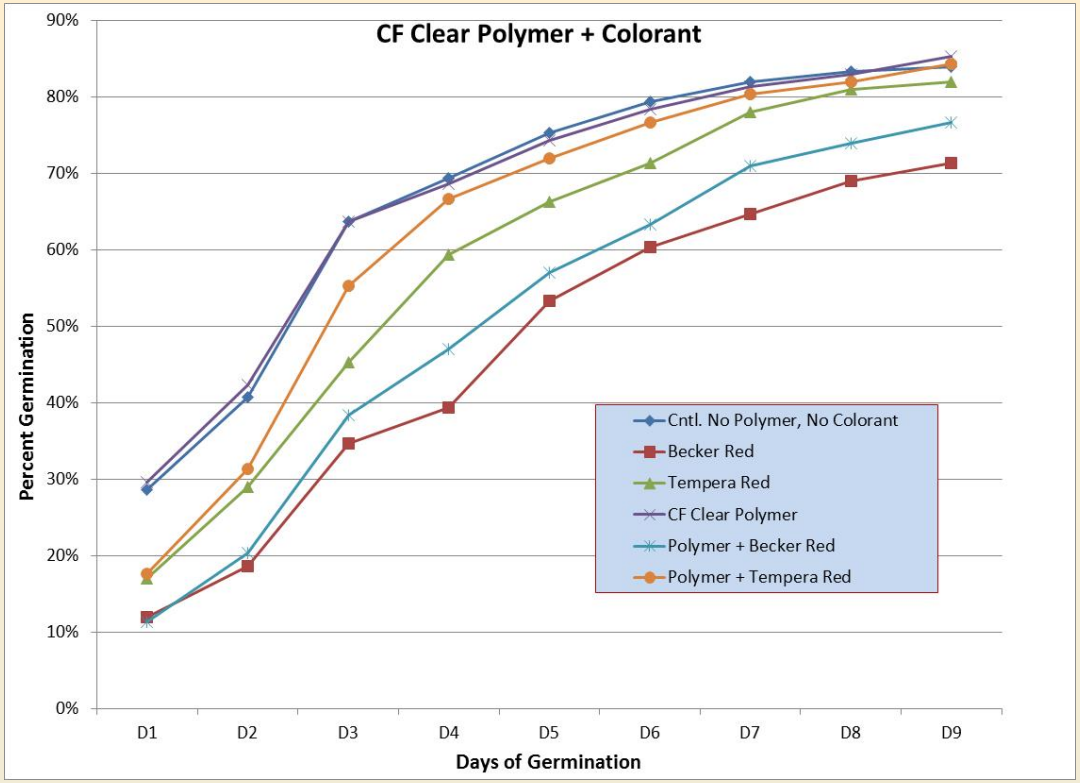
- Cost is ~ $60/gallon
- All major chemical suppliers (Helena, Greenpoint Ag, etc) can order the product.

Germination rate of two rates of CF Clear and latex on slash pine in the seedling stress facility, Auburn AL 2014.



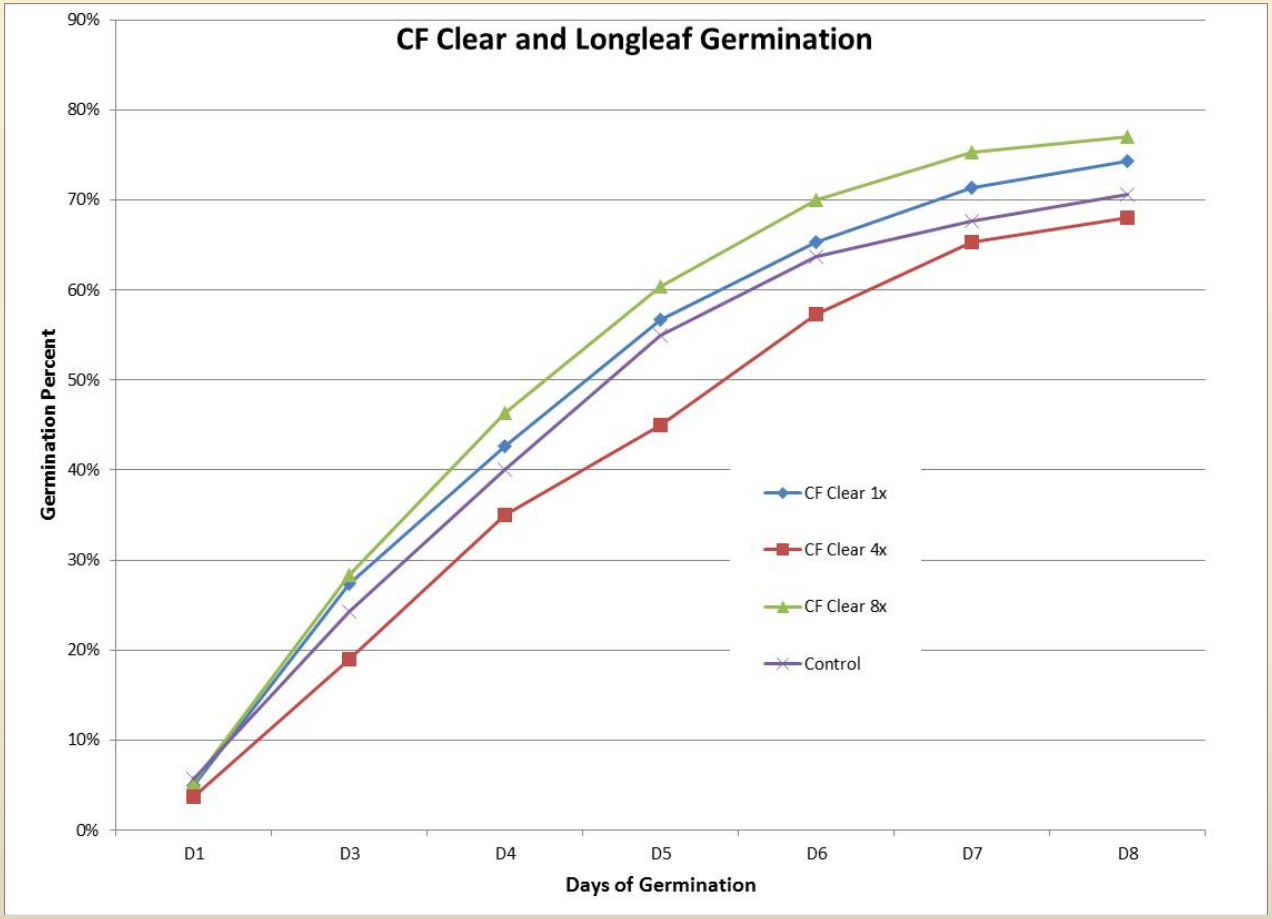
Comparison of the germination rate of CF Clear and latex on slash pine in the seedling stress facility, Auburn, AL 2014.





Treatment	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
CF Clear Polymer	30% A	42% A	64% A	69% A	74% A	78% A	81% A	83% A	85% A
Control	29% AB	41% A	64% A	69% A	75% A	79% A	82% A	83% A	84% A
CF Clear + Tempera Red	18% ABC	31% AB	55% AB	67% A	72% A	77% A	80% AB	82% AB	84% A
Tempera Red	17% BC	29% AB	45% AB	59% A	66% AB	71% AB	78% AB	81% AB	82% A
CF Clear + Becker Red	12% C	20% B	38% C	47% B	57% B	63% BC	71% BC	74% CB	77% AB
Becker Red	11% C	19% B	35% C	39% B	53% B	60% C	65% C	69% C	71% B
lsd 0.05	12%	14%	13%	11%	12%	9%	9%	8%	8%

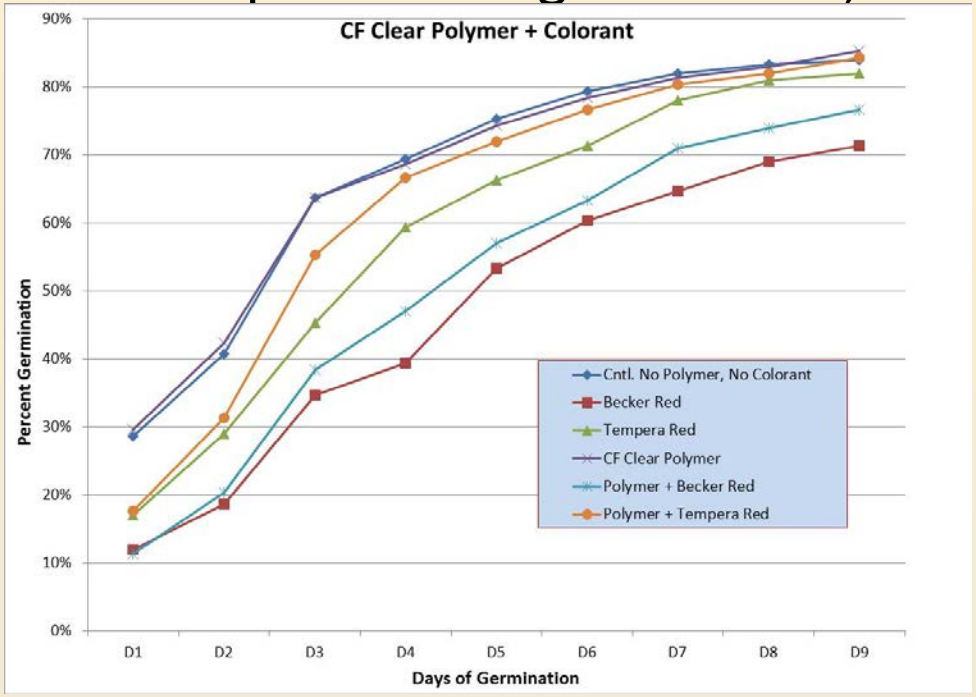
Germination rates of three rates of CF Clear on longleaf pine in the greenhouse, Auburn, AL, 2014.



What about seed colorants?

- Never assume any seed treatment will not effect seed germination. Test all additives.
- Seed colorants aid the sowing operation by increasing seed visibility during the sowing and later during sowing checks/history plots.
- Potential problem with Becker Underwood red first noticed by a nursery manager.

Comparison of the germination rates of CF Clear and two seed colorants on slash pine in the greenhouse, Auburn, AL, 2104.



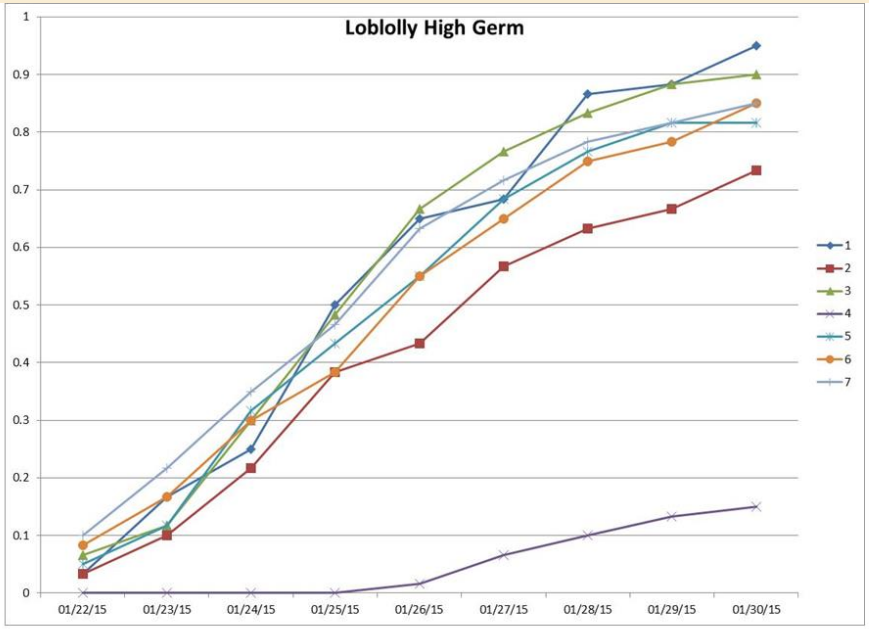
Treatment	Day 1	Day 3	Day 5	Day 7	Day 9
CF Clear Polymer	30% A	64% A	74% A	81% A	85% A
Control	29% AB	64% A	75% A	82% A	84% A
CF Clear + Tempera Red	18% ABC	55% AB	72% A	80% AB	84% A
Tempera Red	17% BC	45% AB	66% AB	78% AB	82% A
CF Clear + Becker Red	12% C	38% C	57% B	71% BC	77% AB
Becker Red	11% C	35% C	53% B	65% C	71% B
lsd 0.05	12%	13%	12%	9%	8%

Seed colorant, type, form and manufactures used in the study

Dye (TRT) Number	Name	Company	Form
1	FD&C Red #40	Organic Dyestuffs	Powder
2	Orcobrite Pigment Red Bryn 6002	Organic Dyestuffs	Liquid
3	Prism Scarlet	Precision Lab	Liquid
4	Chromatint Red X_3353 Dispersion	Chromatech	Liquid
5	FD&C Red 40 Dustmaster 2000	Chromatech	Powder
6	Becker Underwood Red	Becker Underwood	Liquid
7	CONTROL		

Loblolly- high germination seedlot,
Loblolly- low germination seedlot,
Slash,
Shortleaf
Longleaf pine

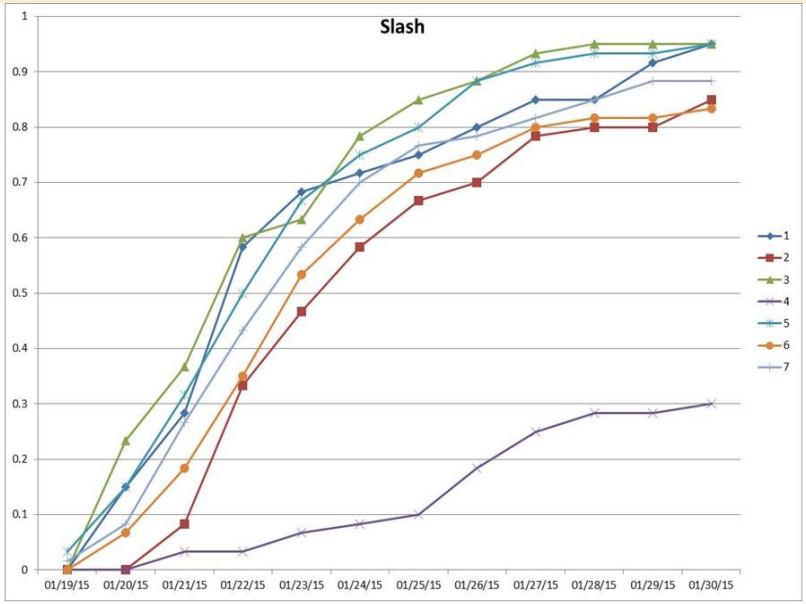
Germination rate for the seven seed colorant treatments for loblolly pine. In the accompanying table, treatments followed by the same letter within a column are not significantly different.

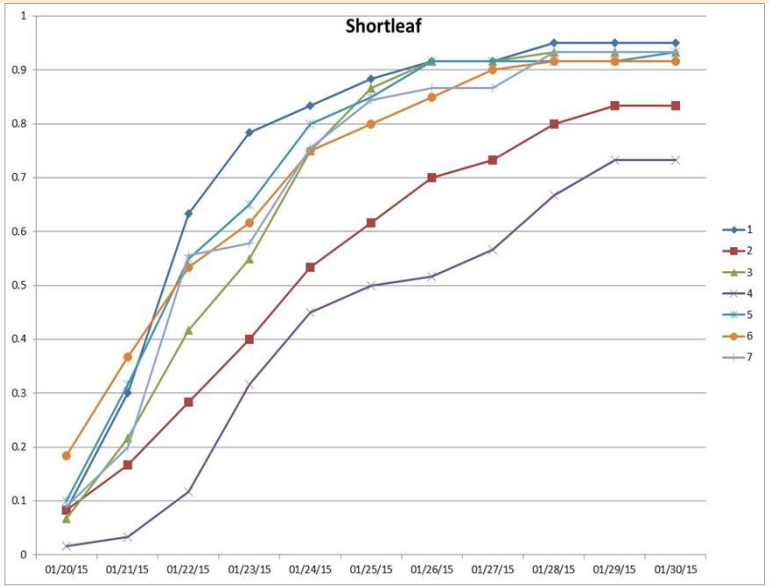


LobHi	TRT	D1	D2	D3	D4	D5	D6	D7	D8	D9
LobHi	1	A	A	A	A	A	A	A	A	A
LobHi	2	A	A	A	A	B	A	B	B	B
LobHi	3	A	A	A	A	A	A	A	A	A
LobHi	4	A	A	B	B	C	B	C	C	C
LobHi	5	A	A	A	A	AB	A	AB	AB	AB
LobHi	6	A	A	A	A	AB	A	AB	AB	AB
LobHi	7	A	A	A	A	A	A	AB	AB	AB

LobLow	TRT	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
LobLow	1	A	A	AB	AB	AB	AB	AB	A	A	AB
LobLow	2	A	AB	AB	AB	BC	BC	BC	B	B	C
LobLow	3	A	AB	A	A	A	A	A	A	A	A
LobLow	4	A	B	B	B	C	C	C	B	B	D
LobLow	5	A	AB	AB	AB	AB	ABC	AB	A	A	B
LobLow	6	A	AB	A	A	AB	AB	A	A	A	AB
LobLow	7	A	AB	AB	A	A	AB	AB	A	A	AB

Germination rate for the seven seed colorant treatments for slash and shortleaf pine. In the accompanying table, treatments followed by the same letter within a column are not significantly different.

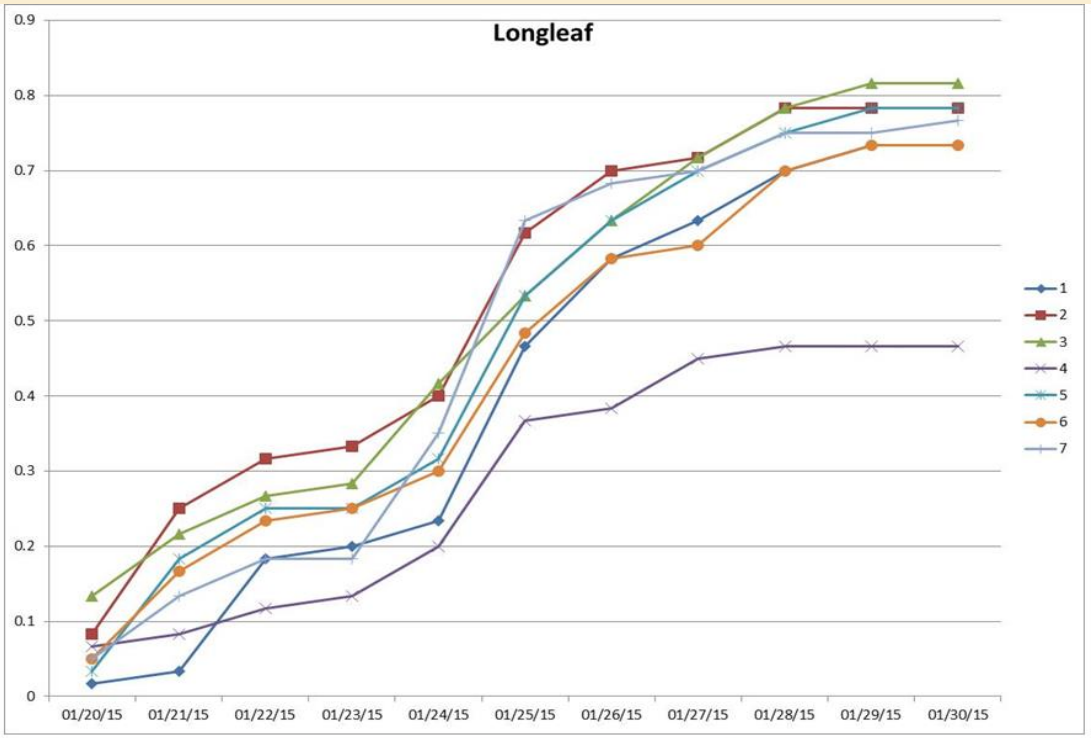




Slash	TRT	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
Slash	1	A	AB	AB	A	A	AB	AB	AB	AB	AB	AB	A
Slash	2	A	C	BC	B	A	B	B	B	B	B	C	B
Slash	3	A	A	A	A	A	A	A	A	A	A	A	A
Slash	4	A	C	C	C	B	C	C	C	C	C	D	C
Slash	5	A	AB	A	AB	A	AB	AB	A	AB	AB	A	A
Slash	6	A	BC	ABC	B	A	AB	AB	AB	AB	AB	BC	B
Slash	7	A	BC	AB	AB	A	AB	AB	AB	AB	AB	ABC	AB

Shortleaf	TRT	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
Shortleaf	1	AB	AB	A	A	A	A	A	A	A	A	A
Shortleaf	2	AB	AB	AB	AB	B	BC	B	B	B	AB	AB
Shortleaf	3	AB	AB	AB	ABC	A	A	A	A	A	A	A
Shortleaf	4	B	C	C	C	B	C	C	C	C	B	B
Shortleaf	5	AB	AB	AB	AB	A	A	A	A	AB	A	A
Shortleaf	6	A	A	AB	AB	A	AB	A	A	AB	A	A
Shortleaf	7	AB	ABC	AB	ABC	A	A	A	A	A	A	A

Germination rate for the seven seed colorant treatments for longleaf pine. In the accompanying table, treatments followed by the same letter within a column are not significantly different.



Longleaf	TRT	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
Longleaf	1	B	B	A	A	A	A	AB	A	A	A	A
Longleaf	2	AB	A	A	A	A	A	A	A	A	A	A
Longleaf	3	A	AB	A	A	A	A	AB	A	A	A	A
Longleaf	4	AB	AB	A	A	A	A	B	A	A	A	A
Longleaf	5	B	AB	A	A	A	A	AB	A	A	A	A
Longleaf	6	B	AB	A	A	A	A	AB	A	A	A	A
Longleaf	7	B	AB	A	A	A	A	A	A	B	B	B

Comparison of germination rates for seed colorant study for five pine seedlots.

Treatment #	Dye	Lob High	Lob Low	Slash	Shortleaf	Longleaf
1	FD&C Red #40					
2	Orcobrite Pigment Red Bryn 6002					
3	Prism Scarlet					
4	Chromatint Red X_3353 Dispersion					
5	FD&C Red 40 Dustmaster 2000					
6	Becker Underwood Red					
7	CONTROL					

= Top three graph lines

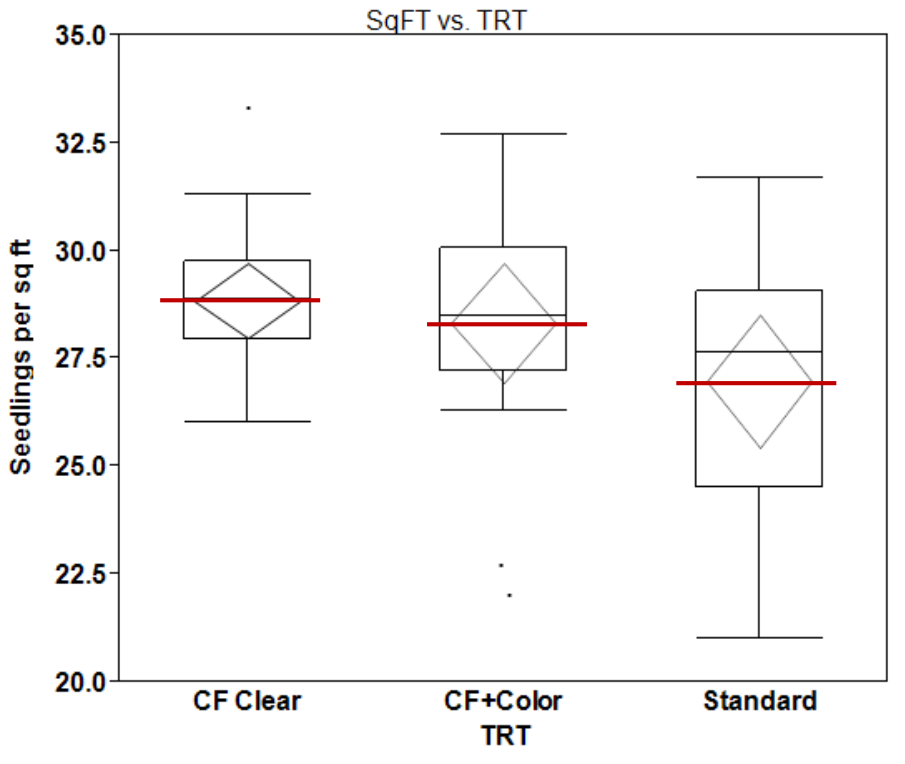
= Bottom four graph lines

Precision Laboratories – Dye # 3 Prism Scarlet
1429 S. Shields Drive
Waukegan, IL 60085
800-323-6280
http://www.precisionlab.com/agriculture/products/seed-enhancements-treatment/prism-scarlet-seed-colorant

= Average

2015 Nursery Study

5/28/15



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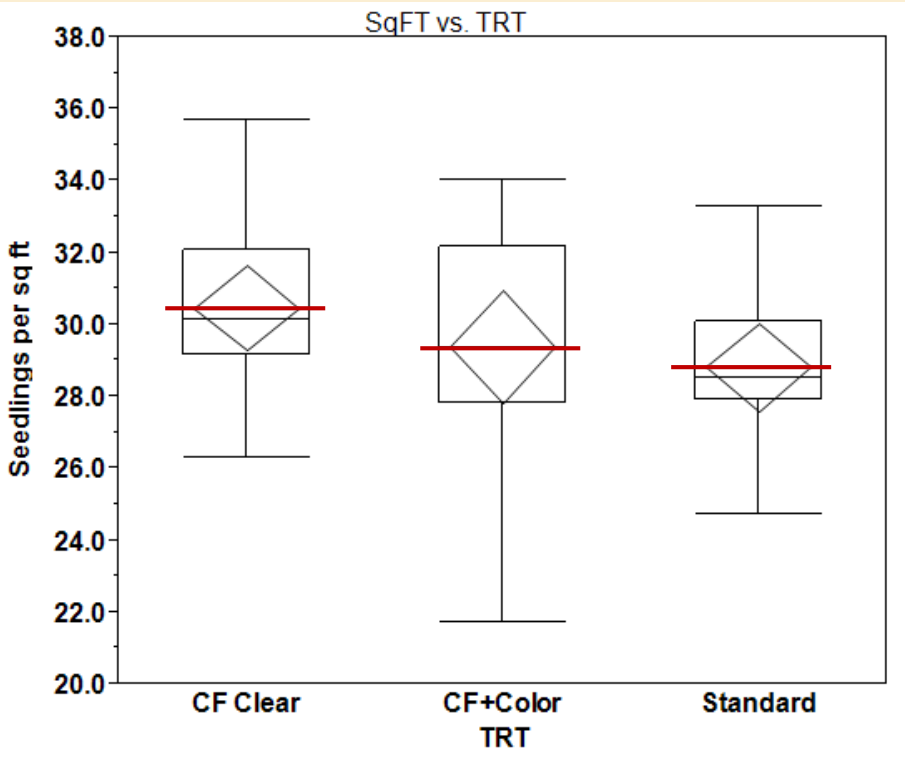

18 random counts /trt

TRT	Mean	Lower CI	High CI
CF Clear	**28.8 A**	28	29.7
CF + Color	28.3 AB	27	29.7
Standard	**26.9 B**	25.4	28.5

TRT	Mean	Lower CI	High CI
CF Clear	**30.5 A**	29.3	31.6
CF + Color	29.4 A	30.9	27.8
Standard	**28.8 A**	27.6	30.0

MANAGEMENT IMPLICATIONS

- CF Clear has not negatively impacted germination. The use of a seed polymer as a seed coat during the treatment process, such as CF Clear, offers some distinct advantages over latex.
- Latex is a paint, not formulated for seed and thereby potential ingredients that may inhibit seed germination or not protect seed treatments.
- Seed polymers are formulated to adhere to seed and protect other seed treatments that have been applied. Seed polymers are widely used in agriculture and could find their place in forest seed nurseries over latex paint or Dow Latex.

A working hypothesis as to why seed colorant may impact the germination of forest nursery seed:

- When dyes are used on agricultural seeds the internal moisture of the seed is less than 10%. Agricultural seeds are not commonly stratified (soaked and stored) prior to sowing. In our industry, seed, (which is also less than 10% moisture), is soaked in water from 4 to 24+ hours raising the internal moisture >30% , and placed in a refrigerator for up to 45 days during which time the internal biochemical and physiological process necessary for germination begin. Then prior to sowing, the seed is treated with fungicides, maybe a repellant, seed dye and a coating agent (polymer or latex)
- It is possible that the dye may be absorbed into the seed coat and thus interfere with the ongoing germination process. One seed specialist suggested acetic acid used in the manufacture of certain dyes as a possible culprit of reduced germination.

A working hypothesis as to why seed colorant may impact the germination of forest nursery seed:

- Realize that anything added to stratified seed may potentially alter germination
- Another situation which may negatively impact germination is treated seed that remains in the cooler longer than necessary due to weather delays or equipment problems in sowing. These delays may result in seeds cracking prior to sowing or longer time for the seed treatments to be absorbed into the seed coat