

Research Update for Woolly Apple Aphid and Scale Control

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San Jose Scale

Two generations per year in NY

- Overwinter as immatures under scale covers called “black caps”; mature to adults in spring; males emerge and mate around petal fall
- Crawlers emerge about mid-June and in early August in WNY
- Can be timed by using DD accumulations:
 - 1st gen: 500 DD (base 50° F) from March 1, or 310 DD after 1st adult catch (~June 9-14)
 - 2nd gen: 1450 DD from March 1, or 400 DD after 1st adult catch (~Jul 29-Aug 4)
- Can monitor for crawlers using tape traps on scaffold branches



San Jose Scale

Treatment Considerations

- Problem populations more common in larger, poorly pruned standard size trees with inadequate spray coverage
- Early season sprays help prevent SJS establishment
 - ½-Inch Green to Tight Cluster:
 - ◆ Oil (typical ERM spray)
 - ◆ Lorsban or Supracide
 - ◆ Esteem (IGR) plus oil
 - ◆ Centaur (IGR)
- Early season pruning to remove infested branches, open up canopy for better coverage
- Well-timed summer sprays at 1st and peak (7-10 days later) crawler activity: e.g., Admire, Assail, Esteem, Centaur, Imidan, Movento



San Jose Scale Insecticides

- **AdmirePro** (imidacloprid) – neonic; replaced Provado; **moderate** efficacy against crawlers
- **Assail** (acetamiprid) – neonic; **moderate** efficacy against crawlers
- **Centaur** (buprofezin) – IGR; inhibits chitin synthesis, suppresses oviposition, reduces egg viability; **good** efficacy against all stages
- **Esteem** (pyriproxifen) – IGR; juvenile hormone analog: interferes with normal development, retards growth, causes sterility, ovicidal; **good** efficacy against all stages
- **Imidan** (phosmet) – OP; contact plus stomach poison; **moderate** efficacy against crawlers
- **Lorsban** (chlorpyrifos) – OP; contact plus stomach poison; **good** efficacy against all stages
- **Movento** (spirotetramat) – tetracyclic acid; 2-way systemic activity, moves to all areas of the plant, mode of action is lipid biosynthesis inhibitor (via ingestion), reduced fecundity and larval survival; **good** efficacy against all stages

SJS Efficacy Trials: Apples – Reissig/Combs

2009

- High pop pressure; Movento at PF + 2C numerically lowest (better than Lorsban at TC + Esteem 3C & 4C)

2010

- Moderate pop pressure; Movento at PF not different from Check, but Lorsban at TC *plus* Movento at either PF, 2C or 4C effective

2011

- Moderate pop pressure; single spray of Movento at PF, 1C or 2C all effective

2012

- Low pop pressure; best results with Movento at PF *with or without* 2nd spray at 2C

2013

- High pop pressure; lowest fruit infestation with Movento at 2C

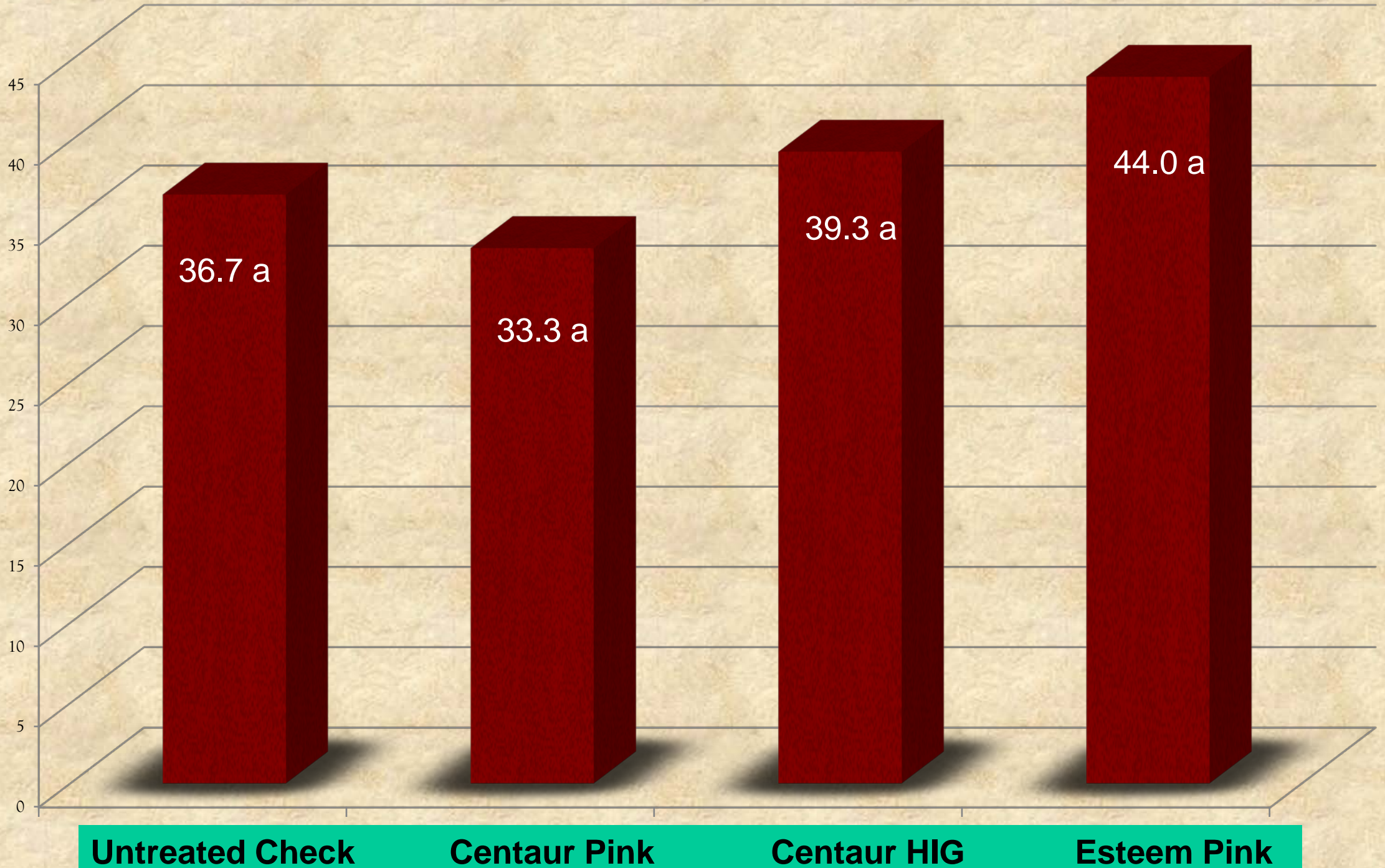
Take-home recommendation: Movento use generally most effective in 2 applications – Petal fall plus (1C or) 2C

2014 Treatments

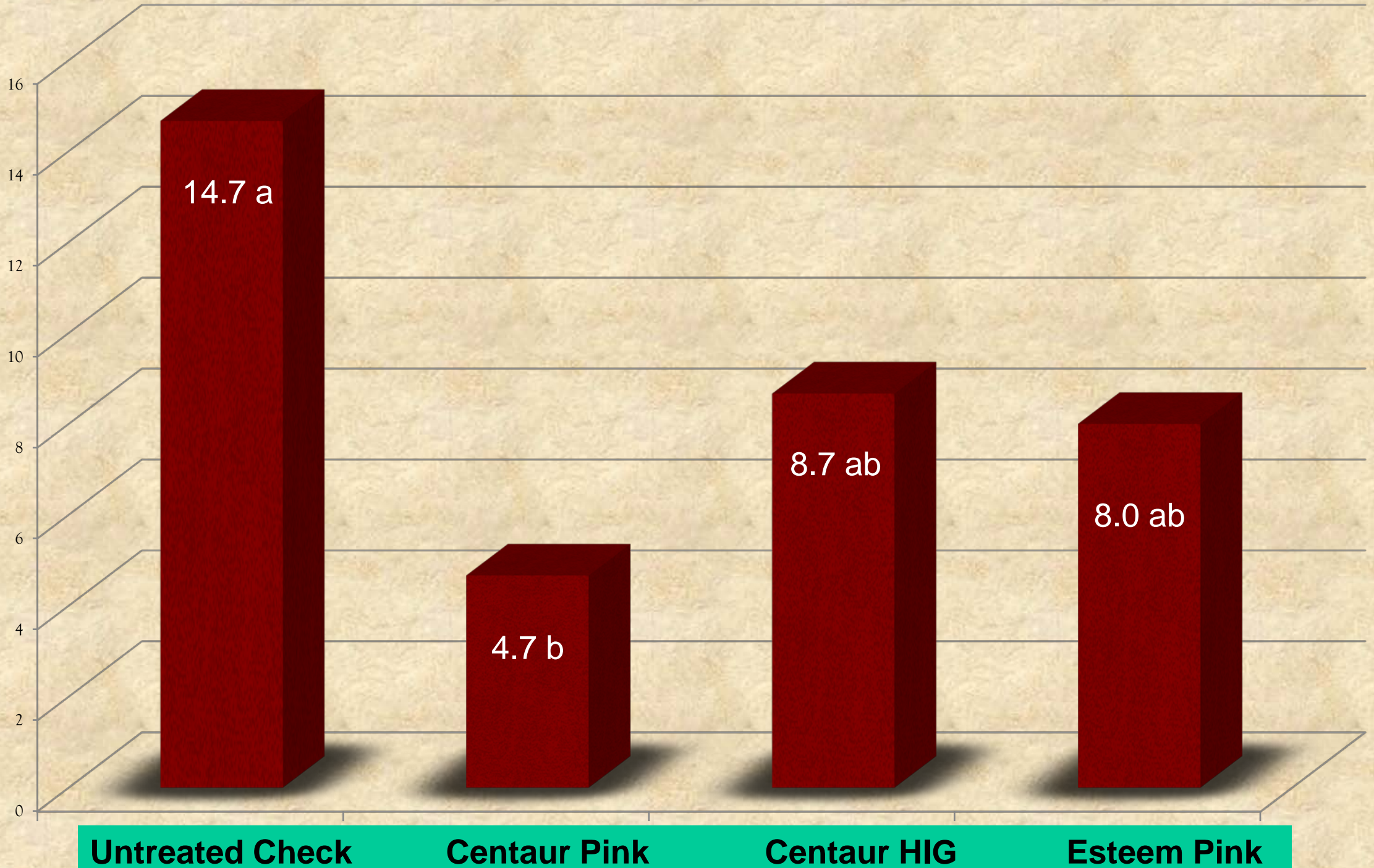
- Esteem 0.86 EC
 - Applied at 'pink' (13 May)
 - 16.0 oz/A
 - Active ingredient – Pyriproxyfen
- Centaur WDG
 - Applied at '1/2-inch green' (24 Apr) and 'pink' (13 May)
 - Both treatments 34.5 oz/A
 - Active ingredient – Buprofezin
- Untreated Check



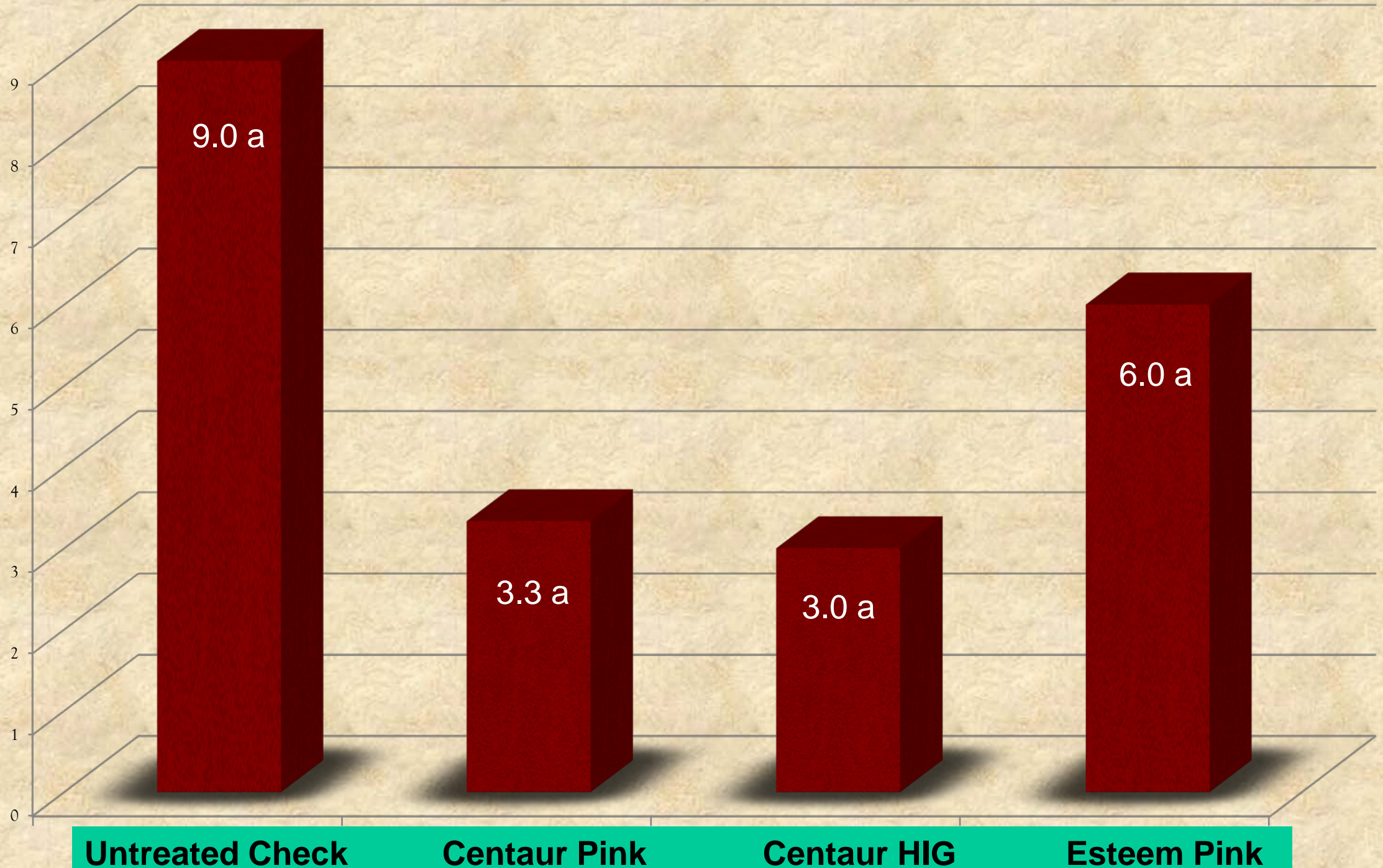
1st Yr Wood Pre-Application % SJS Overwintering Survival - 24 Apr



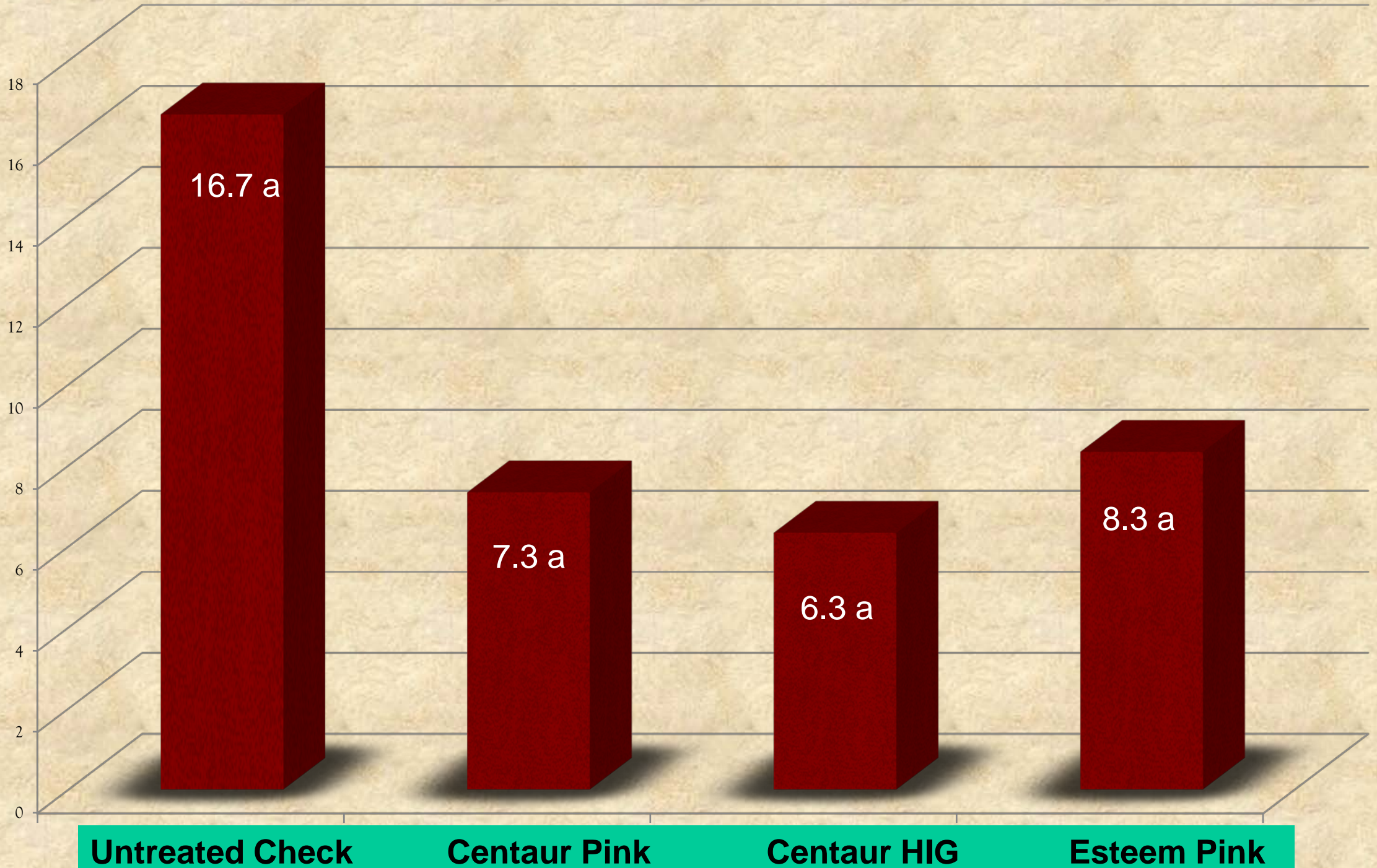
1st Yr Wood Post application % SJS Survival - 21 May



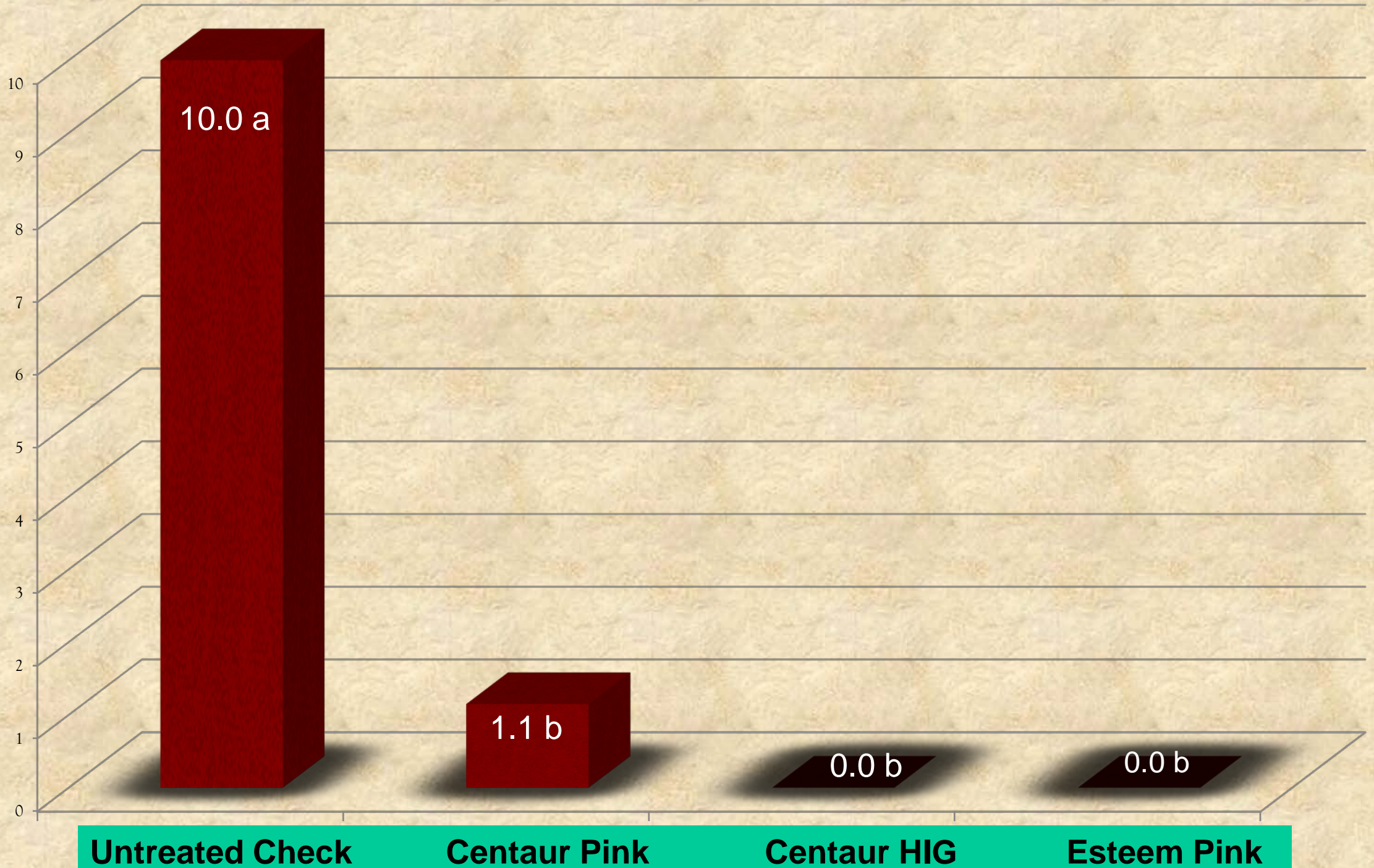
1st Yr Wood Post Application % SJS Survival - 29 May



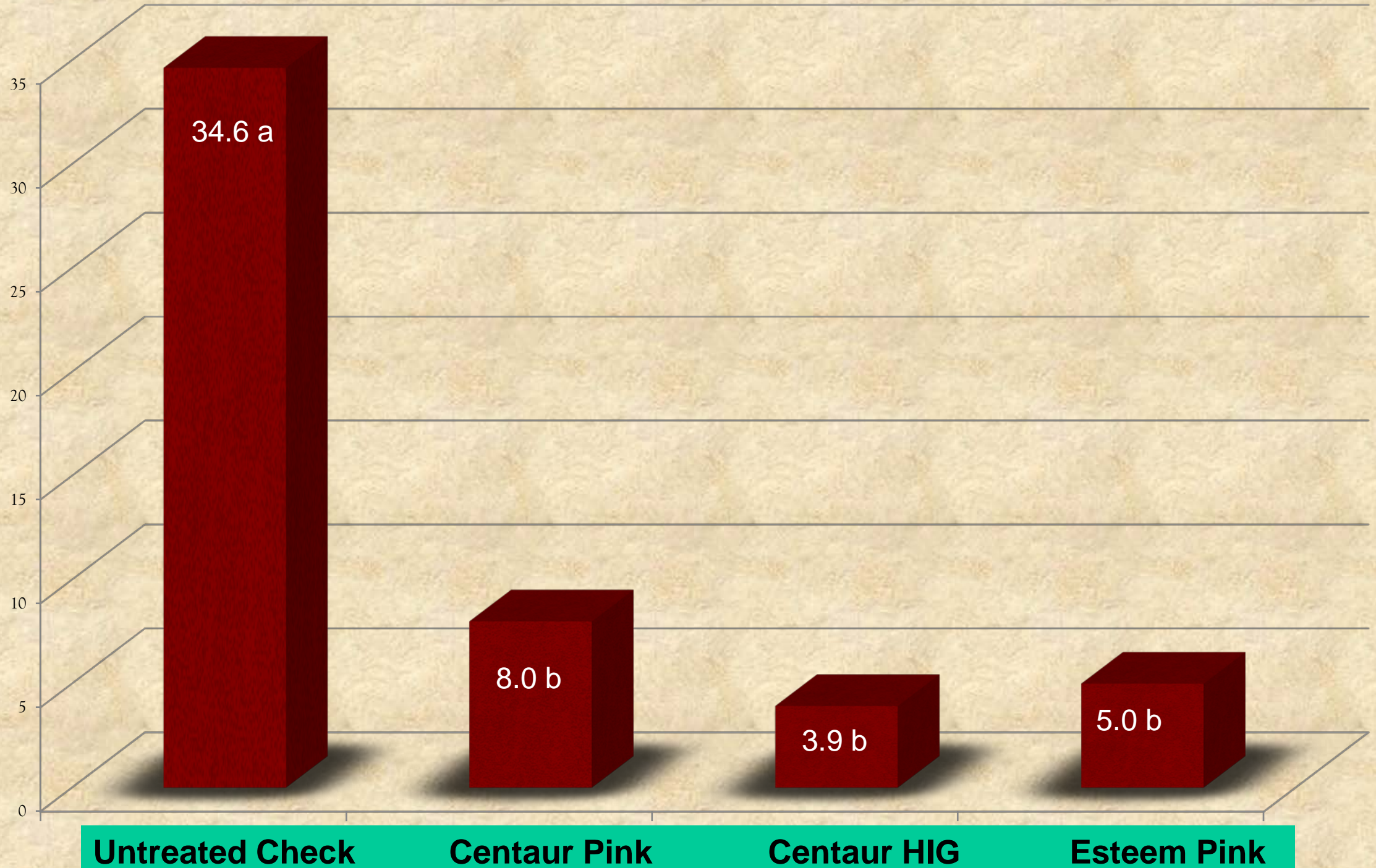
1st Yr Wood Post Application % SJS Survival - 4 Jun



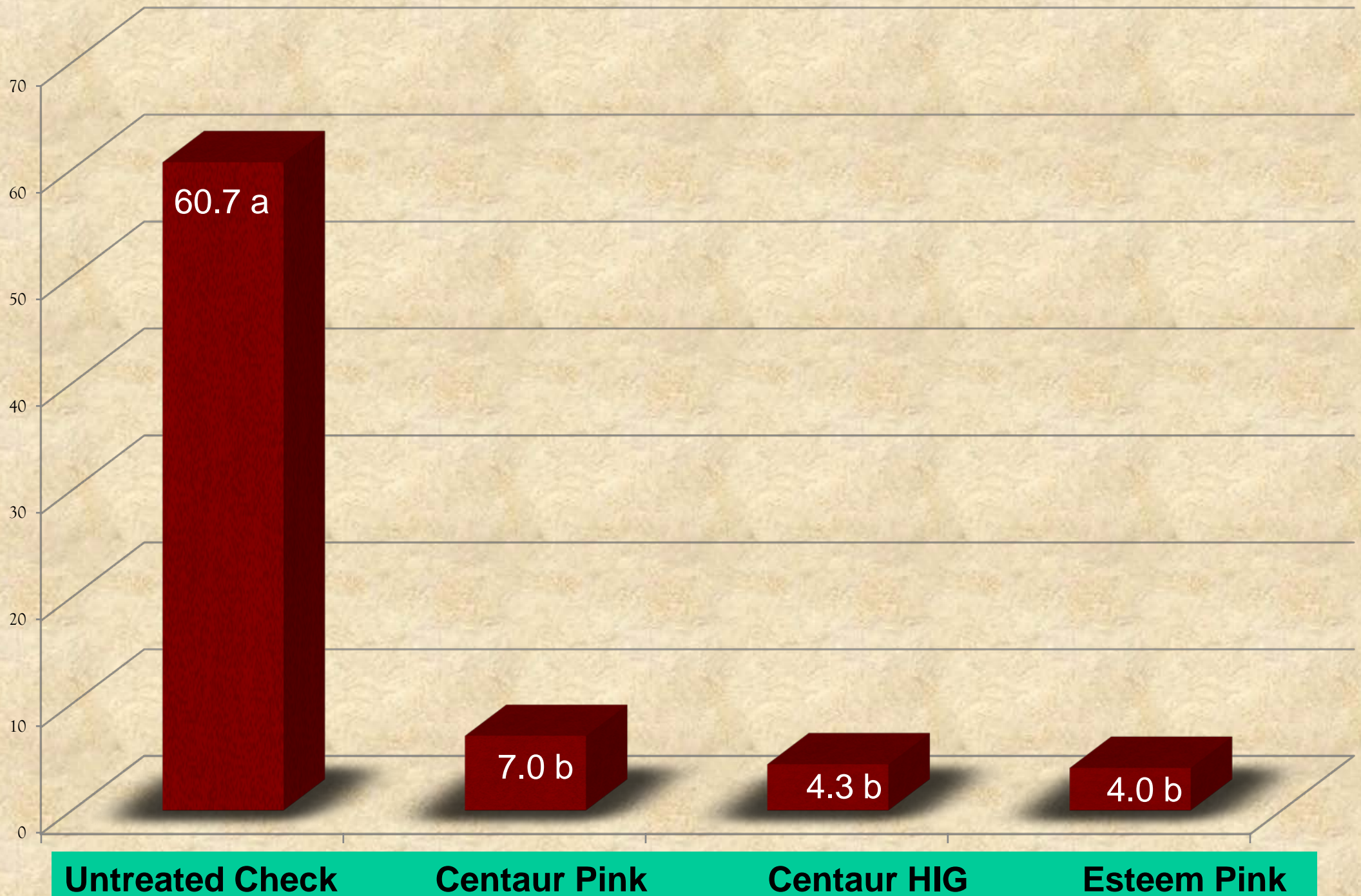
1st Generation % SJS Fruit Damage - 27 Jun



2nd Generation % SJS Fruit Damage - 29 Jul



% SJS Fruit Damage at Harvest



San Jose Scale Treatment Options

Crop	Admire	Assail	Centaur	Esteem	Imidan	Leverage	Lorsban	Movento
Apples								
<i>Prebloom</i>								
<i>Summer</i>								
Cherries								
<i>Prebloom</i>								
<i>Summer</i>								
Peaches								
<i>Prebloom</i>								
<i>Summer</i>								
Apricots								
<i>Prebloom</i>								
<i>Summer</i>								
Plums								
<i>Prebloom</i>								
<i>Summer</i>								

Woolly Apple Aphid Natural History

- Hosts include plantain, apple, hawthorn, mountain ash, cotoneaster, elm
- Overwinter as eggs in bark cracks and crevices, or as nymphs on roots underground and in various protected locations on trees
- In spring, nymphs migrate up to apple shoots and tender bark areas
- Attracted to the base of root suckers and around pruning wounds and cankers on limbs and trunks
- In tree canopy, unmated females give birth to dark reddish-brown nymphs with a bluish-white waxy covering; several generations occur
- The nymphs migrate up or down the trunk of infested trees during summer and fall.



Woolly Apple Aphid Damage

- The main injury to young and mature trees is stunting due to the formation of **root or twig galls**.
- If populations are high, honeydew and sooty mold will also be a problem.



- Aphids may also enter the calyx end of the fruit.
- Can transmit perennial apple canker.

Woolly Apple Aphid Damage

Aerial colonies are found most frequently on succulent tissue, such as:

- current season's growth
- base of water sprouts growing from the tree crown
- unhealed pruning wounds
- cankers



Biological Control of WAA

- *Aphelinus mali* is a parasitic wasp that can completely control aerial colonies.
- Parasitized aphids appear as black mummies in the colony.
- It does not provide sufficient control in commercial orchards because of its sensitivity to many commonly used insecticides.



Parasitized WAA “Mummies”



Resistant Varieties

- Winter Banana is one of the most susceptible varieties to aerial galls.
- The Malling rootstock series with numbers **over 100** are generally **resistant** (MM.106, MM.111, also G.41 & G.202).
- Susceptible rootstocks include:
 - M.9, M.26,
 - M.7, Mark,
 - G.65, G.16,
 - G.11, G.935
- Resistance is not passed on to scion.



WAA Management

- No chemical control for underground infestations
- For aerial colonies, monitor rootsuckers and pruning cuts between petal fall and 1st cover
- Cultural controls:
 - Remove root suckers to eliminate early colonization sites
 - Remove water sprouts on major scaffold limbs early in the season (June)
 - Paint large pruning cuts to discourage aphid colonies
 - Summer pruning in August can remove larger colonies
- Insecticide sprays when aerial colonies start to appear (could be early summer)



WAA Control Trial - 2010

(Mac & Red Del; Reissig/Combs)

WAA Treatment	Rate/acre	% Infestation 14 July	% Infestation 2 Aug
Diazinon 50WP	2.0 lb	0.3 a	0.0 a
Diazinon 50WP	4.0 lb	1.3 a	0.0 a
Movento 240SC	9.0 oz	1.0 a	0.3 a
Assail 70WP	1.5 oz	5.3 b	3.0 b
Thionex 50WP	3.0 lb	0.7 a	0.0 a
Untreated Check	—	14.3 b	3.3 b

Treatments applied 25 June & 8 July (25% inf. pre-treatment)

WAA Control Trial - 2011

(Mac & Red Del; Reissig/Combs)

WAA Treatment	Rate/acre	% Infestation 13 July	% Infestation 2 Aug
Closer 240SC	2.85 oz	6.0 ab	1.0 a
Closer 240SC + MSO	2.85 oz + 32 oz	8.3 ab	2.0 a
Closer 240SC + MSO	4.28 oz + 32 oz	3.3 b	4.7a
Closer 240SC + MSO	5.7 oz + 32 oz	6.0 ab	1.7 a
Movento 240SC + MSO	9.0 oz + 32 oz	7.0 ab	4.3 a
Untreated Check	—	14.3 a	7.7 a

Treatments applied 7 July (40% inf. pre-treatment)

WAA Control Trial - 2012

(Mac & Red Del; Reissig/Combs)

WAA Treatment	Rate/acre	% Infestation 30 July	% Infestation 27 Aug
Closer 240SC + LI700	3.0 oz + 32 oz	9.25	0.0
Closer 240SC + LI700	3.0 oz + 32 oz	11.5	0.0
Closer 240SC + LI700	4.0 oz + 32 oz	6.3	0.8
Movento 240SC + LI700	9.0 oz + 32 oz	17.8	1.0
Diazinon 50WP	2.0 lb	1.5	0.0
Untreated Check	—	58.8	7.3

Treatments applied 25 July + 7 Aug or + 13 Aug (30% inf. pre-treatment)

WAA Control Trial - 2013

(Mac & Red Del; Reissig/Combs)

WAA Treatment	Rate/acre	% Infestation 17 July	% Infestation 12 Aug
Sivanto + LI700	3.0 oz + 32 oz	3.7 b	0.0 b
Movento 240SC + LI700	3.0 oz + 32 oz	2.3 b	0.0 b
Diazinon 50WP	4.0 oz + 32 oz	0.7 b	0.0 b
Untreated Check	—	24.6 a	1.0 a

Treatments applied 3 July or 9 July (30% inf. pre-treatment)

WAA Control Trial - 2014

(Mac & Red Del; Agnello/Combs)

WAA Treatment	Rate/acre	% Infestation 8 July	% Infestation 5 Aug
Sivanto + LI700	14.0 oz + 32 oz	5.7 b	0.3 b
Movento + LI700	9.0 oz + 32 oz	1.7 cd	0.0 b
Movento+Choice WM	9.0 oz + 3 pts	3.0 bc	0.3 b
Movento+LI700+Choice	9.0 oz+32 oz+3 pts	0.0 d	0.0 b
Untreated Check	—	19.0 a	3.3 a

Treatments applied 2 July (13% infestation pre-treatment)

WAA Insecticide Recommendations

- **Pennsylvania:**
 - Diazinon (excellent)
 - Movento (excellent)
 - **Mid-Atlantic States (VA, WV, NC, MD):**
 - Diazinon (good)
 - Movento (good)
 - Thionex (good)
 - **Washington:**
 - Diazinon (excellent)
 - Thionex (excellent)
 - Ultor (Movento) (good-excellent, especially at PF)
 - **New York:**
 - Diazinon
 - Movento
 - Thionex (until 7/31)
 - Admire Pro
 - Assail (high rate)
- decreasing effectiveness*
- ↓
- [Lorsban trunk spray for borers]



Woolly Apple Aphid Management Guidelines

- Be aware of rootstock susceptibility; MM series is more resistant
- Use of older broad-spectrum insecticides (OPs, carbamates, pyrethroids) will have a negative impact on biocontrol agents
- June: begin periodic inspection of pruning scars, water sprouts, and cankers for first occurrence of aerial (cottony white) colonies
- Insecticide treatments are more effective the earlier they are applied:
 - capable of decreasing the population before it becomes widespread
 - insects' waxy covering is less extensive earlier in the season
- Insecticide efficacy is improved when applied in higher-volume sprays
- Continue inspections for infestations in mid- and late summer, even if a treatment was applied earlier