



Management of flatheaded apple tree borer in nursery production with cover crops

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The Problem

- Flatheaded appletree borer (*Chrysobothris femorata* Olivier)
- Order Coleoptera and family Buprestidae



Natasha Wright, Cook's Pest Control,
Bugwood.org



James Solomon, USDA Forest Service,
Bugwood.org

The Problem

- Distribution is ubiquitous, covering the entire continental United States and extending into Canada (Wellso and Manley 2007, Hansen et al. 2011).
- Hosts: red maple, silver maple, peach, common apricot, garden plum, apple, different species of oak, American basswood, redbud and dogwood (Paiero et al. 2012).
- Up to 50% damage on maples in nursery production (pers. observation)
- Newly transplanted/stressed trees are more susceptible
- Sun loving insect usually lay eggs on sunny side of the tree

Nature of Damage



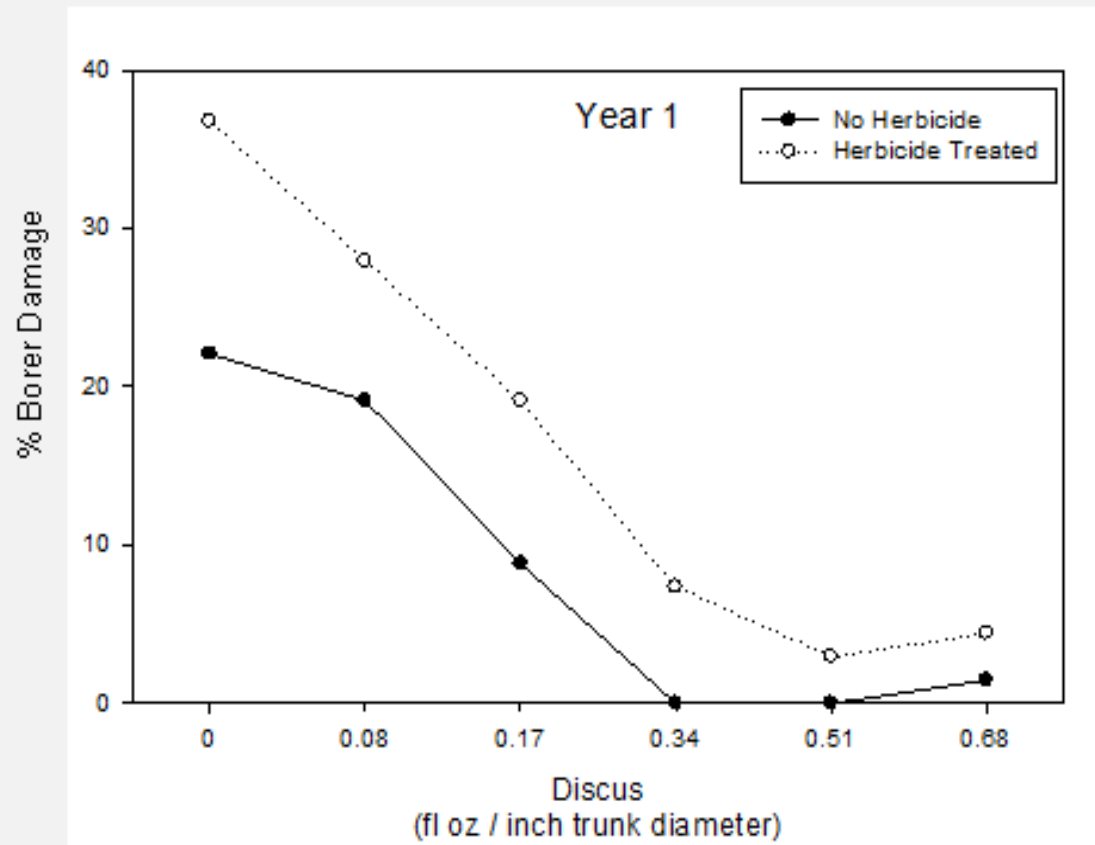


Current Methods of Control

- Imidacloprid drenches (3-year protection) or dinotefuran (1-year protection) applications
- Trunk sprays with contact pesticides (bifenthrin and chlorpyrifos) – 2x per season

Any alternatives?

- **Based on previous observations, weedy plots have fewer FAB attacks**



Objective

- To determine whether the presence of a winter cover crop will protect red maple trees from FAB attacks the following spring

A group of people are working in a field, likely a research or agricultural site. They are surrounded by numerous young trees, each supported by a thin wooden stake. The trees are planted in rows, and the ground around them is bare soil. The people are engaged in various tasks, such as adjusting the stakes or examining the trees. The background shows a grassy field and some trees in the distance. The overall scene suggests a field experiment or a tree-planting project.

Materials and Methods

Treatments

Four treatments

a) no insecticide + herbicide★

b) insecticide (April 2016) + herbicide*

c) cover crop + insecticide (April 2016)

d) cover crop

Without cover crop

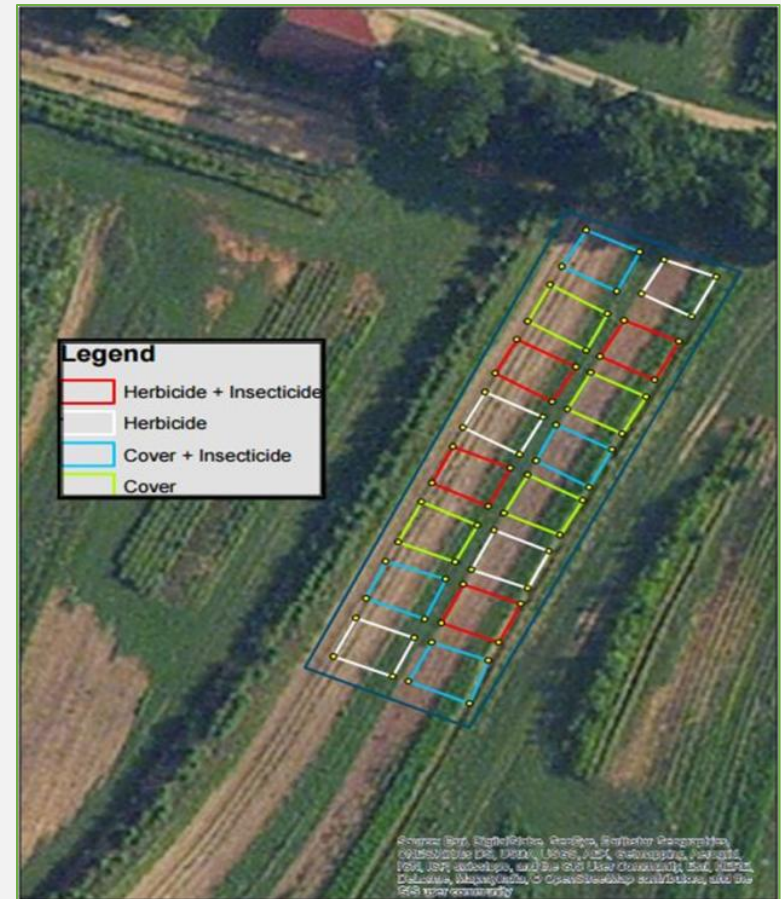
With cover crop

★ Positive Control

* Recommended Practice

Field Layout

- 100 red maple ‘Frank’s Red’ trees per treatment arranged in blocks of 25 (5 x 5)
- Tree spacing (1.8 m) and rows (2.1 m)
- Cover crop was planted in October 2015
- Trees were transplanted dormant into the cover crop in November from 3-gallon containers ~ 0.6 cm (1/4 in) diameter
- Pre-emergent herbicides were used to prevent cover crop growth in some treatments



Red Maple 'Frank's Red' Transplant – Fall 2015



Cover Crop



2015- winter wheat and crimson clover

Winter wheat – 75 lb/acre

Crimson clover – 15 lb/acre

2016 – annual ryegrass and crimson
clover

Annual ryegrass – 30 lb/acre

Crimson clover – 15 lb/acre

Cover and No Cover Blocks



- **FAB Damage Evaluation**

- October 2016



- **Trunk Temperature**


- Bi-weekly March-June
- @ 20 cm
- SW side of trunk



- **Tree Growth Measurement**

- October 2016
- Height
- Diameter (@ 15 cm)
- Canopy Size Index (L x W x H)





Results

FHAB Attacks

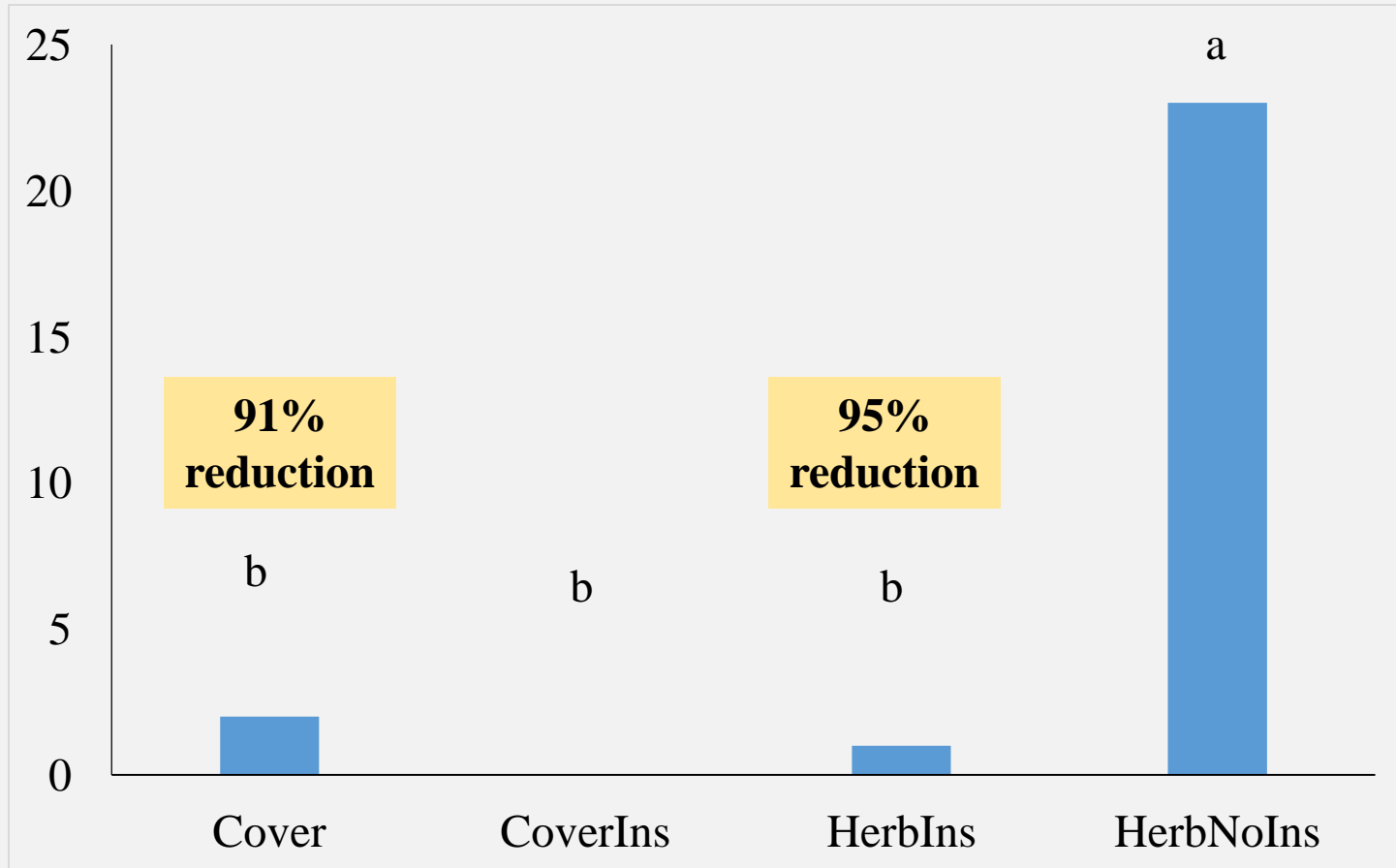
Blue = Cover + Discus
Green = Cover
Red = Herbicide + Discus
White = Herbicide

	2016
	2017
	2016 & 2017

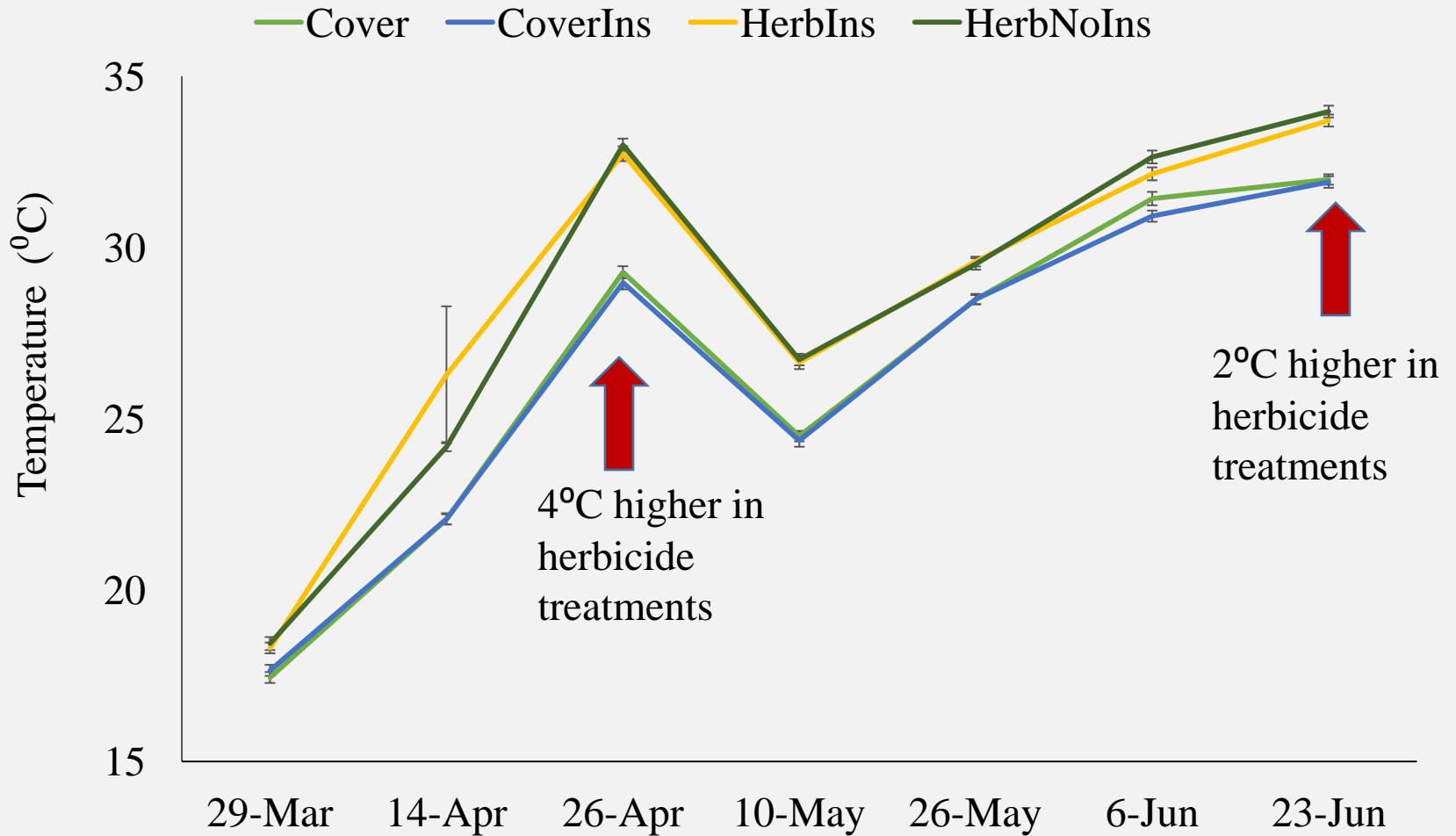
Row 1	Row 2	Row 3	Row 4	Row 5
28	49	243	22	317
103	70	258	273	296
114	151	8	249	132
66	254	368	198	277
19	149	240	147	394
403	385	334	349	118
405	399	392	373	199
363	358	331	211	166
383	376	380	398	121
406	384	351	248	39
354	184	238	266	46
275	140	64	313	306
330	2	96	102	360
280	97	56	136	350
353	201	366	362	1
272	332	224	386	181
357	202	225	346	221
297	361	381	367	395
31	407	86	372	377
365	347	336	375	251
87	101	73	154	264
6	112	14	253	252
230	355	85	35	143
24	190	107	130	119
288	152	72	138	155
21	303	276	74	172
176	234	295	222	160
281	320	180	115	133
274	50	210	137	105
203	324	312	279	25
47	389	82	45	256
36	387	78	239	374
390	400	388	404	401
298	260	391	30	215
182	48	402	167	207
99	242	259	157	68
241	217	231	247	255
164	113	219	57	153
314	284	123	150	171
250	159	245	173	60

Row 6	Row 7	Row 8	Row 9	Row 10
214	216	76	223	174
257	265	301	200	141
261	12	4	193	131
204	227	32	124	196
206	293	80	75	58
236	237	23	300	326
304	179	108	287	109
267	290	120	61	67
322	270	27	26	93
316	13	43	186	71
321	104	165	156	192
307	79	20	161	305
197	187	83	283	278
106	55	146	92	292
77	299	129	168	282
271	100	51	310	205
232	91	117	110	229
175	18	178	144	228
170	188	128	309	34
235	135	5	328	268
356	189	127	17	339
148	111	340	116	44
285	342	122	139	341
158	329	344	88	343
289	81	16	142	333
233	98	15	209	89
220	194	145	40	218
7	11	325	126	38
315	302	95	177	262
335	311	134	41	3
163	208	42	9	183
29	90	33	308	53
318	162	291	348	226
65	212	191	244	327
286	10	195	125	59
294	63	359	352	213
246	69	84	94	169
323	338	319	185	52
379	62	337	378	364
269	263	37	54	345

FHAB Attacks



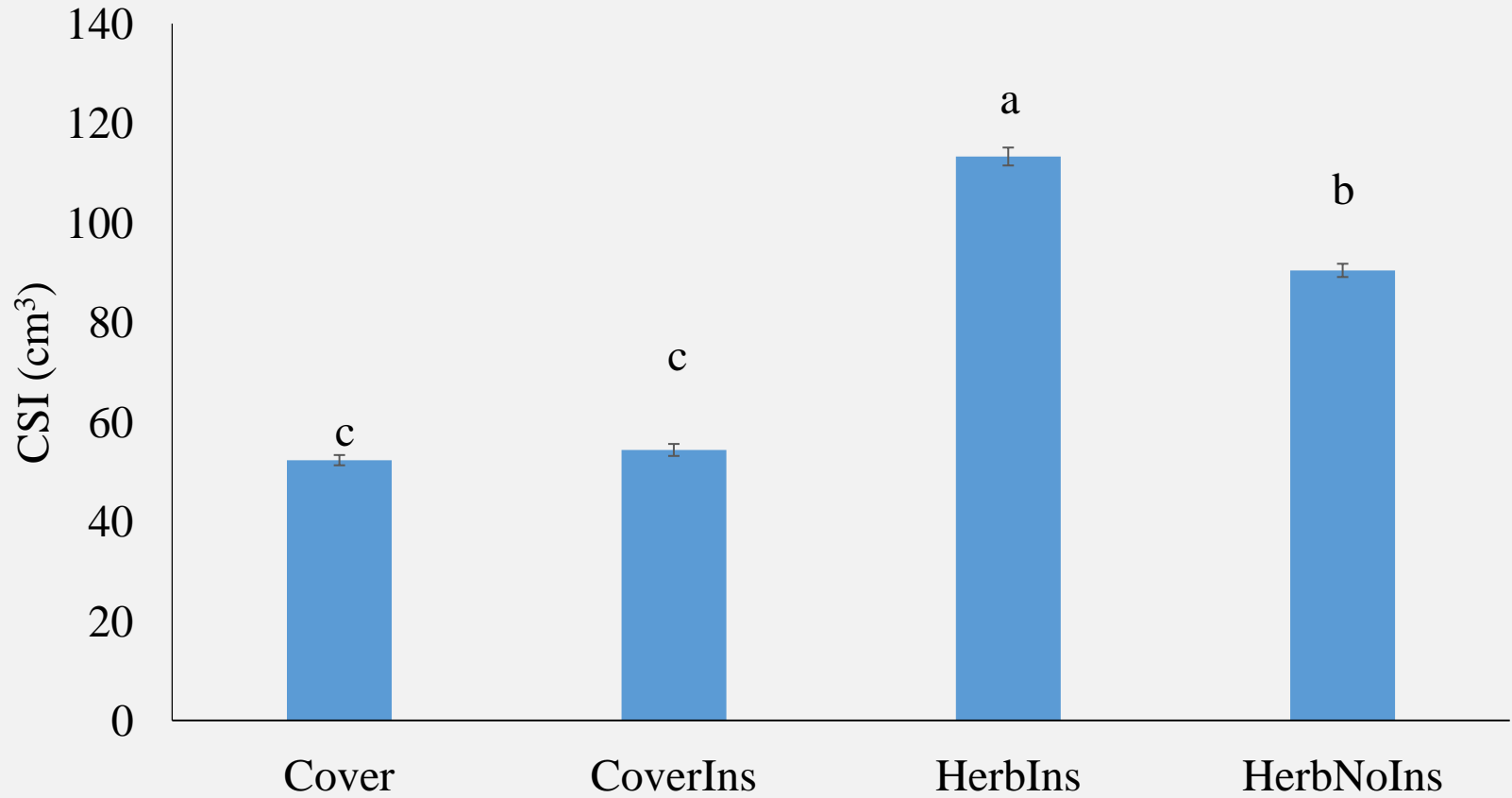
Bi-Weekly Trunk Temperature Evaluation



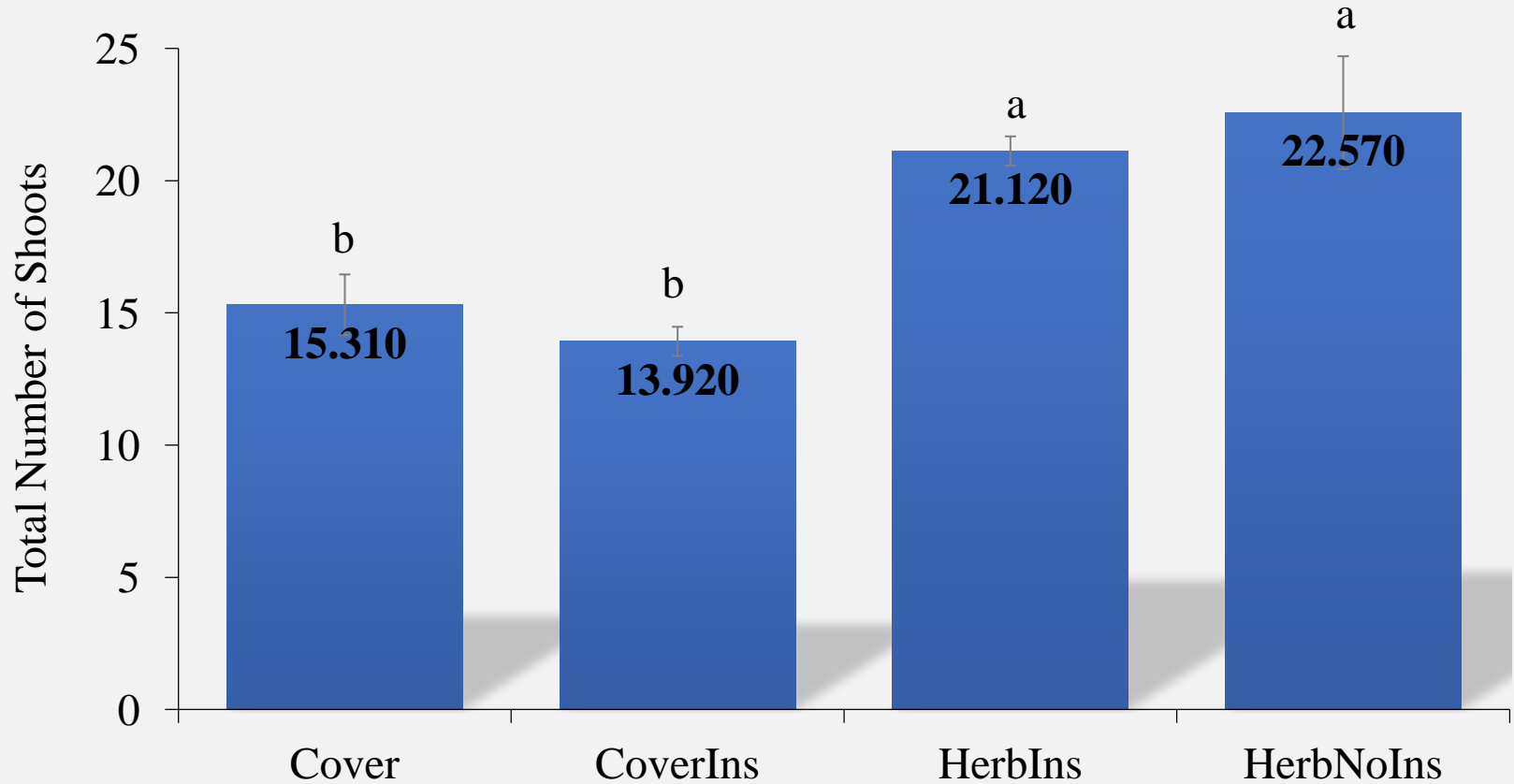
Tree Growth – Year 1

Treatments	Height Growth (cm)	Trunk Diameter Growth (cm)
Cover	8.26 ± 1.18c	0.41 ± 0.10c
CoverIns	10.59 ± 1.45c	0.31 ± 0.01c
HerbIns	65.28 ± 1.84a	1.43 ± 0.03a
HerbNoIns	40.60 ± 2.92b	1.17 ± 0.03b

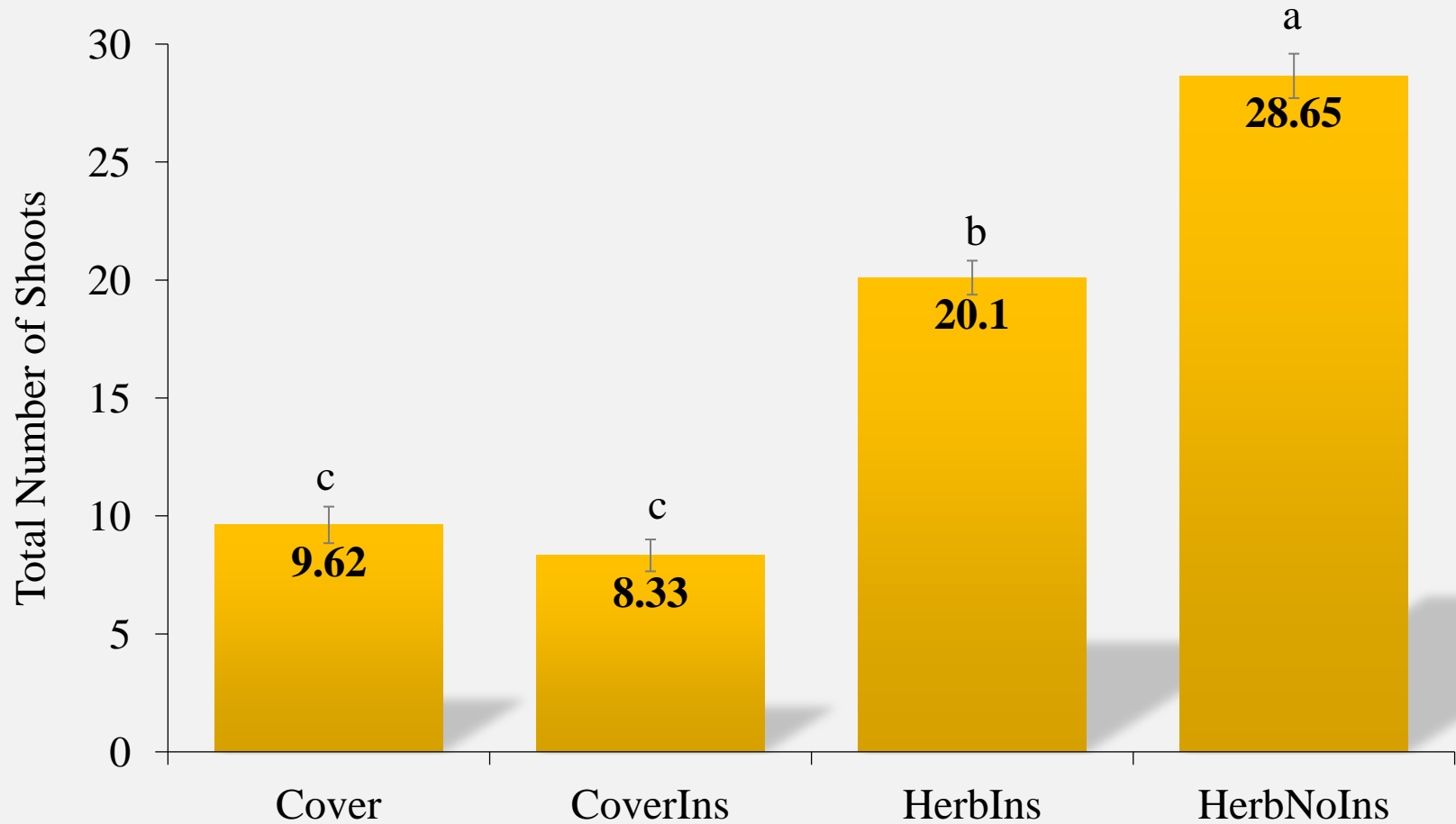
Canopy Size Index (CSI)



New Shoots in May



New Shoots in July



Conclusions

- The major positive impact of the cover crop is suppression of FAB attacks (95% reduction)
- The major negative impact of the cover crop is reduction in tree growth
- Imidacloprid for FAB protection is unnecessary when using a cover crop that covers at least first 60 cm of the trunk beginning in early May.
- Management of cover crops will likely be necessary to minimize competition between the cover and the trees
- Additional cover crop species must be identified that can germinate without tilling/drilling for Year 2+ to prevent damage to the root zones of trees

Ongoing Work

- Do smaller trees ‘catch up’ to larger trees in years 3-4 once established in cover crop?
- Can cover crop management be optimized to minimize growth differences?
- What is the total cost of each management method? (insecticide, herbicide, cover crop seed, labor)
- Is there a demand for ‘bee friendly’ trees that would offset potential financial loss due to size (premium pricing)?

Acknowledgements

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