



# Soil Basics Products on Cotton in California

Research Summary for

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Crop Matters

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## Background

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California farmers first began cultivating cotton following World War I, and its production peaked upwards of 1.6 million acres in the 1970s. California cotton production experienced a marked decrease in recent years as a result of declining prices, stringent regulations, and water shortages. In 2018, Californian farmers harvested approximately 255,000 acres of cotton, averaging yields of 1,615 pounds per acre<sup>1</sup>. This represents a multibillion-dollar industry, which directly supports about 25,000 jobs.

Cotton farms are concentrated in the San Joaquin Valley. California only cultivates two varieties, Pima and Upland. California produces the majority of the United States' Pima cotton, but only about 5% of total production. Planting occurs in spring and the plants typically bloom 6-8 weeks later. Cotton is regularly irrigated and requires about 3 acre-feet per year. Additionally, fields receive frequent fertilizer and pesticide applications.

Once the cotton bolls burst, typically about 4 months after planting, they are harvested via either mechanical pickers or strippers. These specialized machines are comparably configured to combines. Harvested cotton is compacted and transported to gins, which separate the seed and fiber. Only about 30 cotton gins remain in California, down from their all-time high of almost 300 during the 1960s. Depending on its end use, cotton will then be transferred to mills or purifiers.

Cotton is an incredibly versatile product. The California Cotton Ginners and Growers Association claims that a 500-pound cotton lint bale can produce, "8,000 handkerchiefs, 3,400 pairs of socks, 750 shirts, 3,000 diapers, 325 pairs of jeans, or 200 full size bed sheets". The seed and linter are used for everything from animal feed to dynamite, x-ray film, and plastics.

The objective of this trial was to evaluate a Soil Basics starter program applied to cotton. Stand count and plant height were the measured variables.

<sup>1</sup>National Agricultural Statistics Service. 2018. State Agricultural Overview: California. United States Department of Agriculture.

## Materials and Methods

Two grower demonstration trials were established in Kettleman City, California, in conventional cotton fields (table 1). A 25' x 100' strip in each field was left without any starter fertility, while the remainder of the field was planted with Soil Basics starter products in the planter band. All other fertility and pest management additions were made by the collaborating grower in accordance with standard practices.

Trial Details				
<i>Field</i>	<i>Variety</i>	<i>Soil Series</i>	<i>Planting Date</i>	<i>Treatment</i>
1	Phytogen 881	Armona Loam	April 1	6 oz/ac Root Rx + 1 qt/ac Oasis Micro
2	Phytogen 841	Panoche Loam	March 29	6 oz/ac Root Rx + 1 qt/ac Oasis Micro

Table 1. For each trial site, soil details, planting date, and treatments.

Twenty stand counts were conducted in untreated and in treated areas of the fields on April 27, by counting the number of plants emerged in a 15' section of row. Plant height was measured on 50 randomly selected plants in each area weekly until May 31. Statistical analyses were performed in RStudio under *t*-tests with an alpha of 0.10.

## Results and Discussion

It was difficult to make clear visual distinctions between treatments post-emergence. However, stand counts revealed that Soil Basics treatment resulted in better plant population in both fields. The improvement was more dramatic in field 1 (10% increase over untreated) and was statistically verified, compared to the 4% numeric difference in field 2.

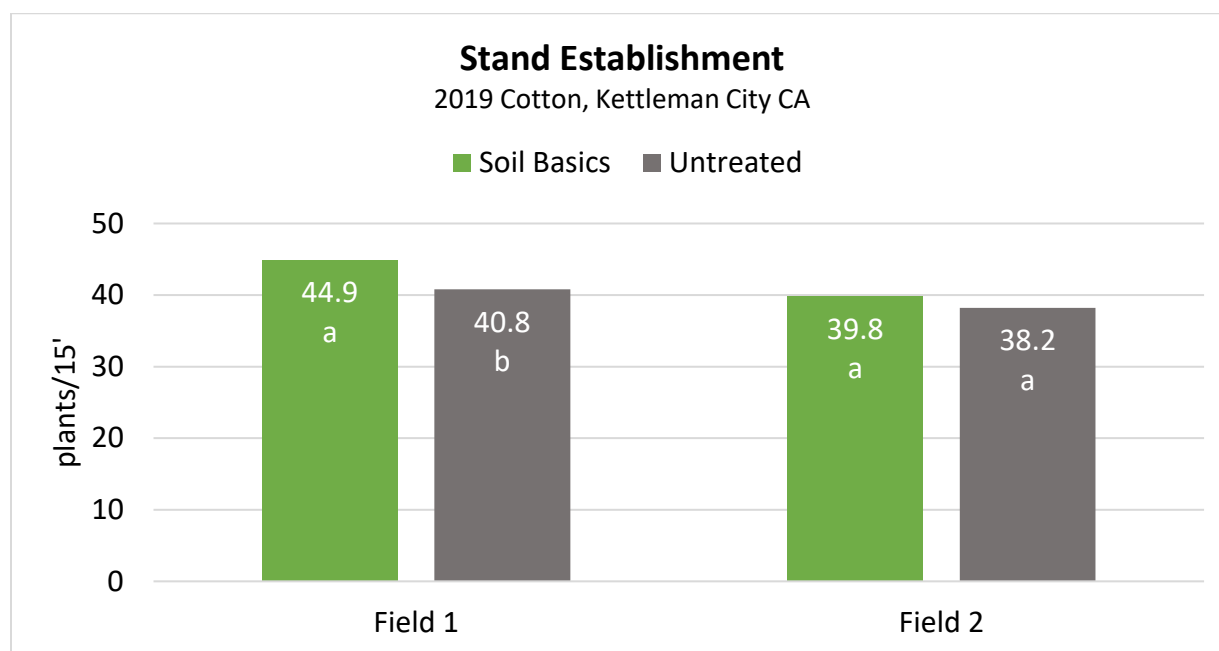


Figure 1. Average number of plants per 15' of row for each treatment in each field. Within each field, values followed by the same letter indicate no significant difference ( $t$ -test,  $\alpha = 0.10$ ).

Early season plant height followed a sigmoidal curve in field 1 (figure 2). At each measuring date, Soil Basics-treated plants were taller than untreated (table 2). The difference was greatest on May 4 (11%), while the mid-late May values were similar between treatments.

A similar growth curve was observed in field 2 (figure 3). Again, Soil Basics-treated plants were taller than untreated at each measuring date (table 2). However, values were very similar April 27 and May 4. The largest differences were noted on May 10 (10%) and May 18 (9%).

Average Plant Height (inches)					
Field 1 treatment	April 27	May 4	May 10	May 18	May 31
6 oz/ac Root Rx + 1 qt/ac Oasis Micro	3.20a	6.78a	7.73a	8.84a	12.63a
Untreated	2.79b	6.10b	7.16b	8.78a	12.22a
Field 2 treatment	April 27	May 4	May 10	May 18	May 31
6 oz/ac Root Rx + 1 qt/ac Oasis Micro	2.90a	6.14a	7.70a	9.36a	12.29a
Untreated	2.79a	5.95b	7.02b	8.56a	12.00a

Table 2. Average plant height in inches for each treatment in each field. Within each field, values followed by the same letter indicate no significant difference ( $t$ -test,  $\alpha = 0.10$ ).

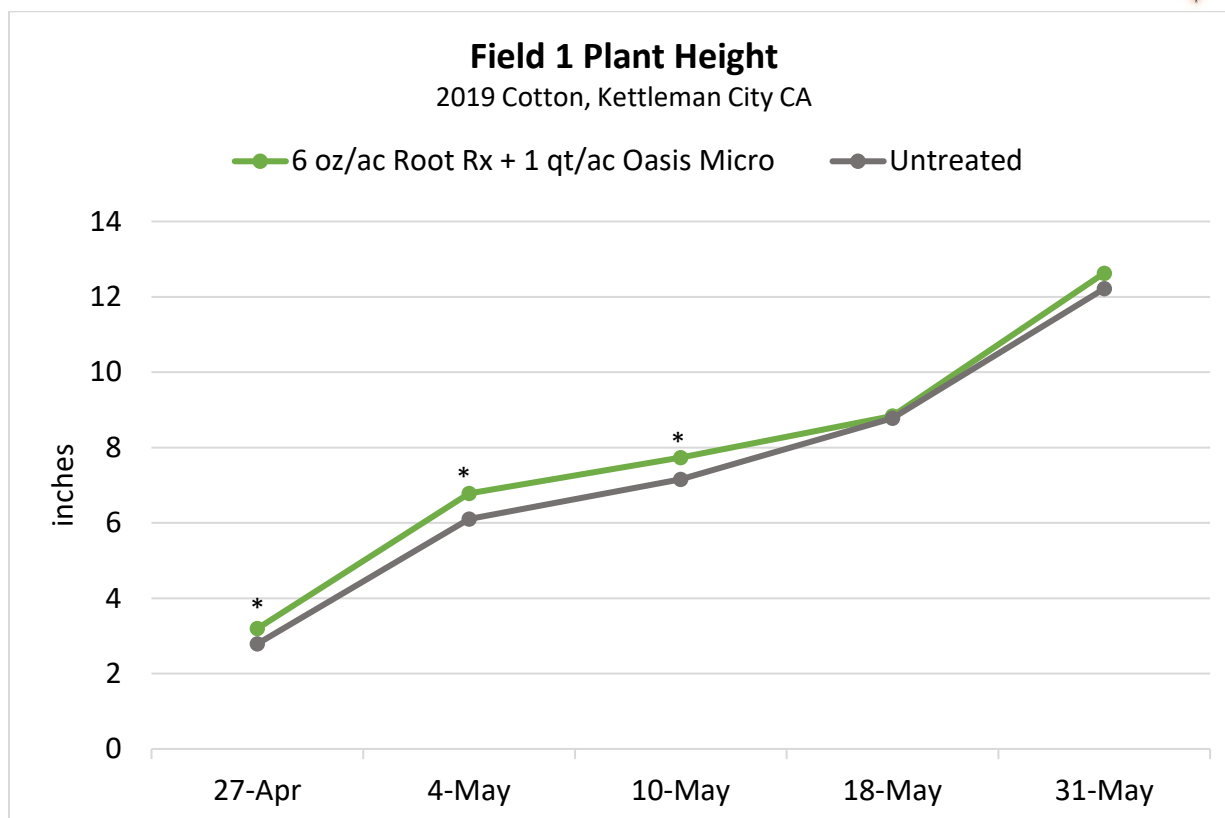


Figure 2. Average plant height in inches for each treatment at several dates. Asterisk denotes statistical separation.

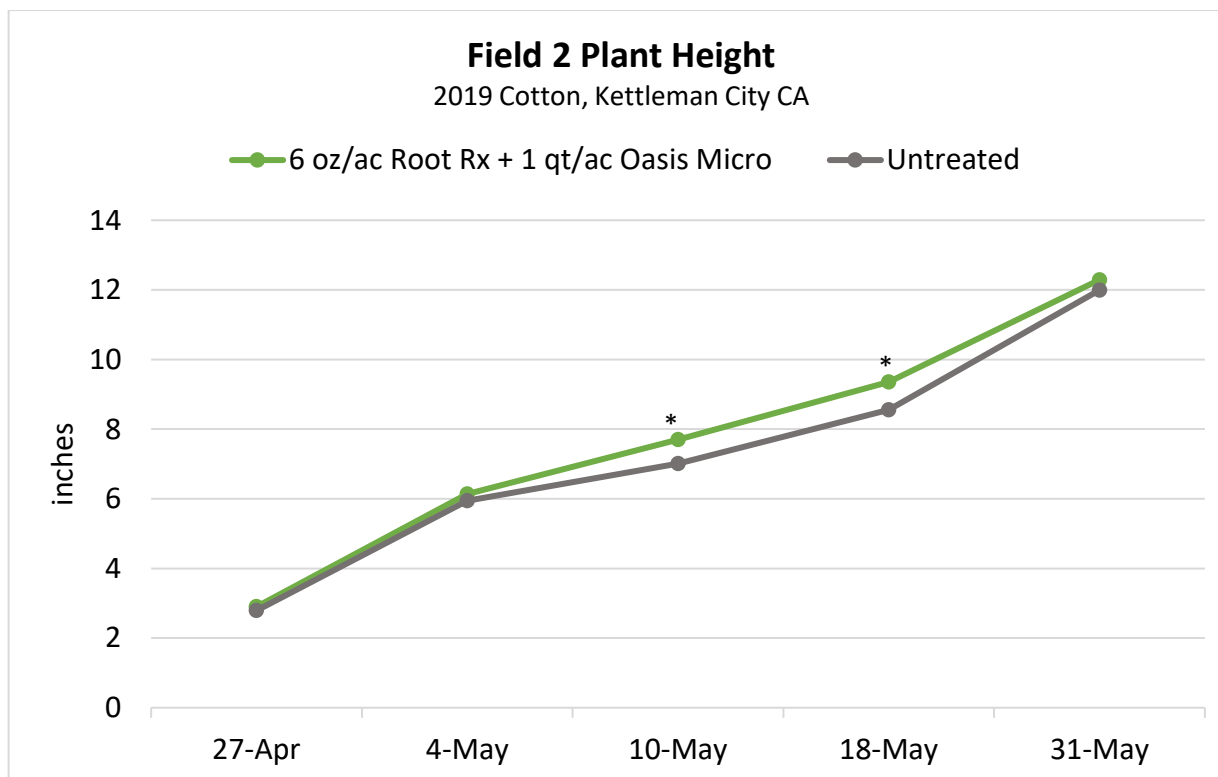


Figure 3. Average plant height in inches for each treatment at several dates. Asterisk denotes statistical separation.



## Conclusions

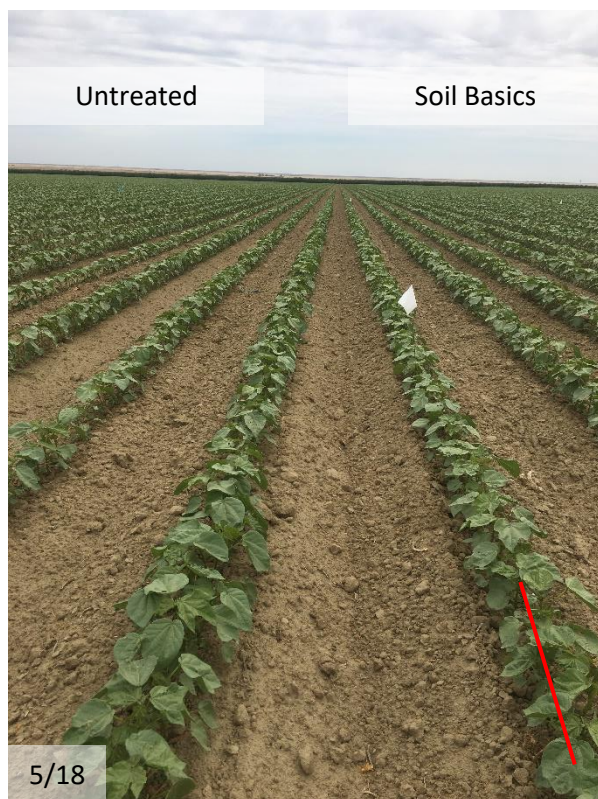
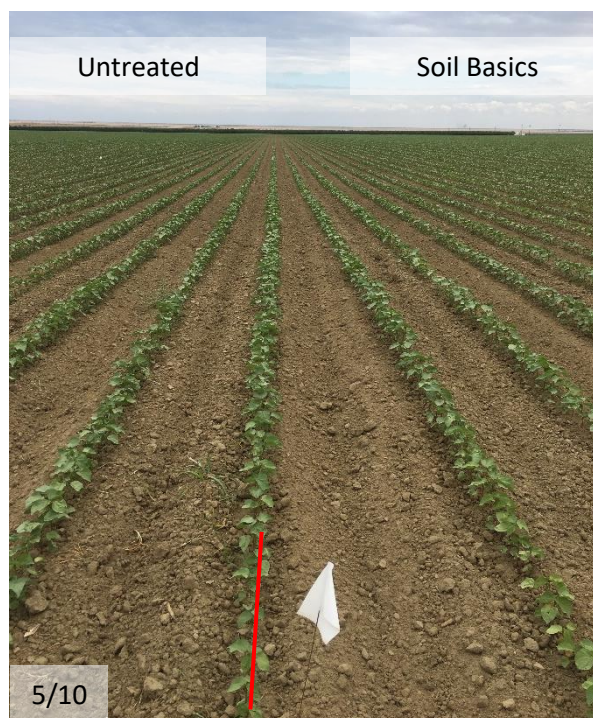
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The addition of Soil Basics starter fertility increased plant population in both fields, statistically so in field 1. Early season, plant height followed a sigmoidal curve. In both fields, Soil Basics-treated plants were numerically higher than untreated plants at all measuring dates. The most notable improvements were seen in early May in field 1. Statistical significance was achieved on the first three sampling dates. In field 2, increases were greatest and were statistically separated on May 10 and May 18. Overall, starter fertility improved stand establishment and plant vigor relative to no starter.

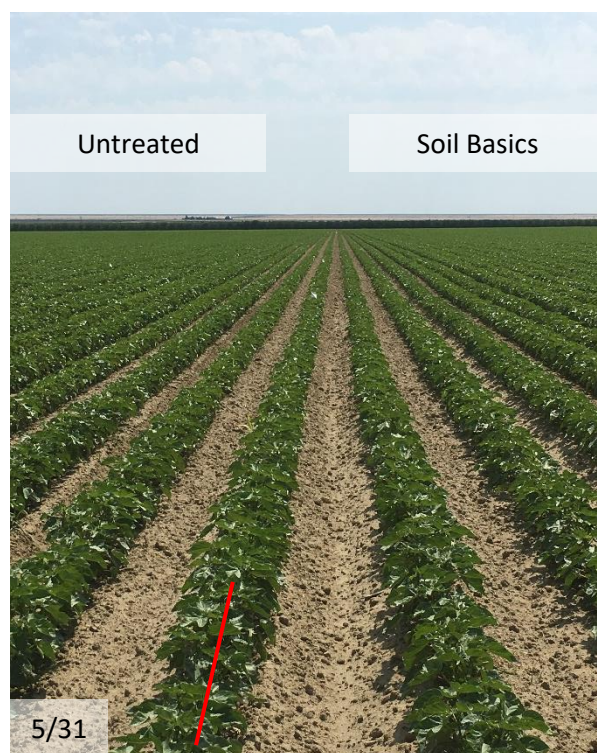


## Photographs

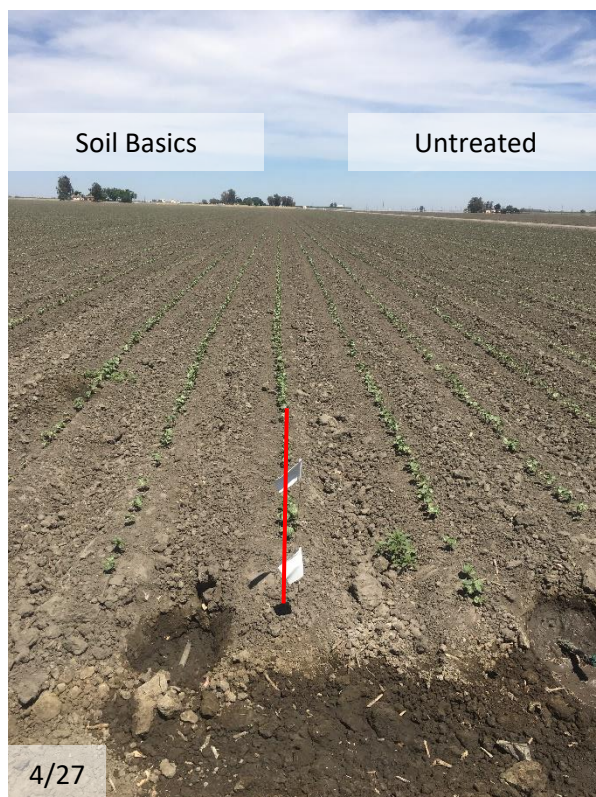
### Field 1



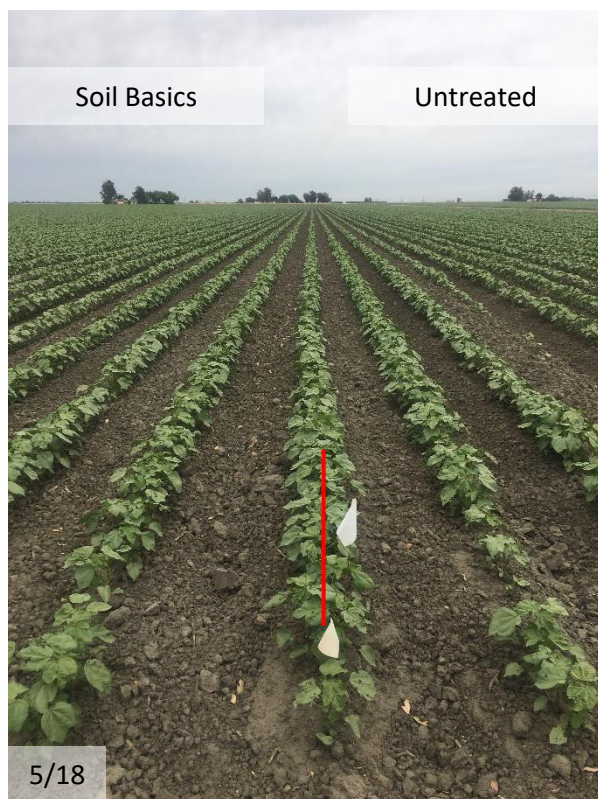




**Field 2**







## Raw Data

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<i>Plants per 15' of Row</i>			
<i>Field 1</i>		<i>Field 2</i>	
<i>Soil Basics</i>	<i>Untreated</i>	<i>Soil Basics</i>	<i>Untreated</i>
47	38	41	45
48	42	42	38
45	42	41	34
46	46	41	48
47	41	46	44
48	39	44	40
41	37	41	41
44	39	43	39
49	35	35	46
47	40	37	38
47	45	38	40
45	36	45	41
42	39	36	37
45	46	45	35
43	43	34	36
45	41	36	31
43	43	43	35
45	44	35	34
41	40	36	42
39	39	37	20

Field 1 Plant Height (inches)									
April 27		May 4		May 10		May 18		May 31	
treated	untreated	treated	untreated	treated	untreated	treated	untreated	treated	untreated
4	3	7	7	8	7.5	8.25	8	15	12.5
4	2.75	6.75	6	7	8	7	9	12.5	12
3	2.75	5	7	7	7.5	8	8	12	12
2.5	2.5	6	7.25	7	8	8.5	10.5	12	9
3	2.25	5	5	7.75	8.5	9	8.75	13	11
3	3.75	7.5	6.25	8	8.75	8	9.75	15	12
3.25	3.5	7.25	7	6.5	9	8.25	9.5	12	15
3.5	3	7.5	6.75	7.25	9	10	10	12.5	13.5
3.25	3	7	6.5	7.5	9	9	9	13	13.5
2.75	3.5	7.5	7	8.5	6	9.5	9.5	14	12.5
3	3.5	8	7	7.25	6.5	9.5	9.75	15.25	13
3.25	4	6	6.5	8.5	7.5	10	10	13	12
3	3.75	7	7	7	8	8.25	10	12.25	13.5
2.5	2.5	7.5	6	7.5	6	10	8	15	12
2.75	2.5	7.25	6.5	9	5.5	8.5	10	13.5	13
3	3	6.75	6.25	8	6	8.5	9.5	14	14
3.25	3	6	6.5	8	7.5	9.25	9.5	11	13
4	3	7.5	5.25	9.25	7	8	11	11.75	14.5
4.25	2.5	5.25	6	7.5	7.5	9.5	8	14	14.25
4	2.75	7.5	6.5	6.25	6.75	9.5	8.5	11	12.5
3	3	7.25	5	7.25	6	10	9	11.5	11
3	3	7	6.25	7.5	5.5	10	8	13.25	11
2.5	2.5	7.5	6	7	5.5	8	8	11	9
2.5	3	6.5	7	7	8	9	9.75	15	12.5
3.5	3	6.25	5.5	8	6.5	7.25	9.25	10	13.25
3.25	3.5	7.5	5.75	9	7	11	10	12.5	15
4	3	6.75	6	7.5	7.5	8.25	7.75	9.75	12
2.25	3	6.25	6	8.25	7.25	8	8.25	14	14
3	3	6.25	5.25	5.5	6.5	9	7	13.5	12
3.25	2.5	6.5	6	8.5	7.25	10	7.5	11	13.75
3.25	1	7	5.75	6	7.25	10	7.75	13	9.5
3.5	3	6.75	5.5	6.25	6.5	8	9	12.25	10.5
4.25	2	6.25	7	8.5	6	7	8.75	12.25	11
4	1.5	6.25	4.25	8.5	7	9	8.75	12.75	12
3	2	7	7	7	6.5	9.5	10	12	13
3.25	3	7.5	5.5	7.5	6.5	7	8.5	12.5	10.25
2.75	3	7	6.5	8.75	7	8.25	7.5	12	13
3	2	8	6.25	7	8	10	7	13	12
2.5	2.5	7	6	7.25	7.75	10	7.5	13.5	13
2.75	3	7	6.5	7.5	6.5	8.75	7	12.75	12.75
3.25	3	6.25	5	7.75	7	9	7.5	12.5	11
3.75	2	7	5.5	8.25	7.25	8	8	14	12.75
4	2.5	6.75	6.25	9.25	8	9.25	11	11	11
2.5	3	6.25	5.75	7	7.5	8	8.5	12	12.5
3.5	3	6.5	5	7.25	7	10	8	13	10
2.5	2.5	6	5.75	9.25	7.5	9	8	10	13.75
3	2.25	7	6.75	10	7.5	7.5	9	11.25	9.5
3	2.75	6.25	6.25	8.75	8	8.5	9.5	11.5	12
3.25	3	7	5.25	9	5.5	9.5	8	14	10
3.25	2.5	7.25	5.25	7.5	7	8.5	9	13	13

Field 2 Plant Height (inches)									
April 27		May 4		May 10		May 18		May 31	
treated	untreated	treated	untreated	treated	untreated	treated	untreated	treated	untreated
3	2.5	7	6	8	7	9.5	9.5	11	15
3	2.5	5.75	6.5	7.5	7.5	7.5	9.5	11	12.5
2.25	3	6	7	7.25	8.75	8.25	9.5	12.5	12.25
2.75	2.75	6.25	5.5	7.25	8.25	8	9	11	13
2.75	3	5.75	8	7.5	7	9.5	9	11	13
3	2	6.5	6.5	7.75	6	8.5	8	10.75	13
3	3	6	5.5	7.75	7	8	8	12	10
3	2.5	6	4.75	7.5	6.75	10	7.5	13.5	10.5
2.5	3	6	5	7.75	7.5	9	8.25	12.5	16
2.75	2.5	6.5	7.25	7.25	6.5	8.5	7.25	12	12
3	3	6.25	6.5	7.25	6.25	8.5	9	13.5	13
3.5	2.75	5.25	6	7.75	6.75	9	10.25	10.25	12
2.75	1.5	7.25	5.75	7.5	6.25	7.75	7.75	11	13.5
3	3	6	6	7.25	7	8	10	14	16
3	2.5	5.25	5.5	6.5	6	10	8	9.75	14
3.25	2	6	7.25	7.5	5	8	9	11.75	13.25
3	2.75	5.5	6	7	6.75	9.5	9	13	12
3	3.5	6	5.5	8.25	7.25	10	10	14	13
3	3.75	6	6	8	6.5	10	9.25	11	13.5
3	2.75	5.75	6.5	8	6.5	9	8.25	10.25	12
2.75	2	7	6.75	8	6.25	10	8	14	11.5
3	3	7	5	8.25	7	10.25	9	12	9
3.25	2.5	6	5	8	8.25	10	9	11.5	9.5
3.25	3	7.5	5.25	7.75	7	10.5	8	12	12
4	2.25	6.25	6	8	6.5	10.25	10	15	11
2.75	3	5.75	6	7.25	7	8	9	12.5	12
3	3.25	6.25	6.5	8	7.5	11	10	13	10.5
3	3	6.5	4.75	7.5	7.5	8.5	9	14	13.5
3.25	2.5	6.25	6	8.5	6.25	8.5	8	9.75	14
2.75	3	7	5.5	8.5	7.75	9	8.5	14.5	10.25
4	2.5	6	6	7	7.25	10	7	13.5	10
3	3	5.25	6.75	8.5	6.5	9.5	6.5	11.5	12
3	3.5	7.75	6	7	7	10	9	12.25	9
2.25	3	4.25	5.75	7.5	7.25	7	8	12	9.5
2.75	3	6	5.25	8.5	6.75	9	8.75	12	11
3.75	2.75	6.25	5.25	7.5	9	9	8	11.5	11
2.75	3.25	6	7	7	8.25	10	6.5	10	11
1.5	3	6.5	6	7.5	7	11	7	14	12.5
2.75	2.25	5.5	5.75	8	8	9.5	8	12	9
2.5	2.75	7.5	6.75	9	8.5	9.5	8.75	12	13
2.25	2.5	6	6	8.75	7	10	8	10.5	13.25
3	3	5.75	5.75	8.75	7.5	10.5	9.25	12.5	12
2	3	6	5	8.25	7.25	11.25	8	12.75	12
3.25	4.5	6	5.5	8	6.5	10	8.5	13	13
2	2	6	5.5	7.75	7.25	10.5	8.5	13	13
3	3	6	5.5	7	6.5	10	9	14.25	9
2.75	3.5	6.5	5.5	7.5	6.25	9	9	13.25	10.25
3	2	5.5	7	7.5	7.5	9	8	12.5	12
3	2.25	5.5	6.25	7.75	6	10	9	13	13.75
3	3	6.25	5.25	6	6	10.5	8.75	15	10.75