Effect of FULZYME PLUS on Cotton in Syria 2003

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Bacillus subtilis and Pseudomonas putida have been used widely in crop production to improve growth and increase crop yields. FULZYME PLUS contains both Bacillus subtilis and Pseudomonas putida and is recommended for agricultural uses. The purpose of these experiments was to investigate the effect of FULZYME PLUS on the growth and yield of cotton under field conditions.

Material and Methods

1. Eight field trials were conducted in two cotton regions of Syria in 2003, five in Hama/Ghab region and three in Aleppo region.

Crop	Total Area of Treated Plots (Ha)	Region / Site	Timing of Applications		
			1st	2nd	3rd
Cotton	2	Hama/Ghab	18/04/03	21/06/03	06/08/03
Cotton	1.5	Hama/Ghab	19/04/03	21/06/03	
Cotton	2	Hama/Ghab	23/04/03	21/06/03	
Cotton	2.5	Hama/Ghab	17/04/03	21/06/03	06/08/03
Cotton	2	Hama/Ghab	25/04/03	21/06/03	05/08/03
Cotton	1	Aleppo	01/05/03	06/07/03	
Cotton	1	Aleppo	01/05/03	06/07/03	
Cotton	3.5	Aleppo	01/05/03	06/07/03	

2. FULZYME PLUS, containing 2 x 10^{10}/gram Bacillus subtilis and Pseudomonas putida + 0.3% bio-stimulants, was applied as a soil treatment by injection through drip irrigation. The product was applied at 1 kg per hectare per application. The treatments for each plot included the following:

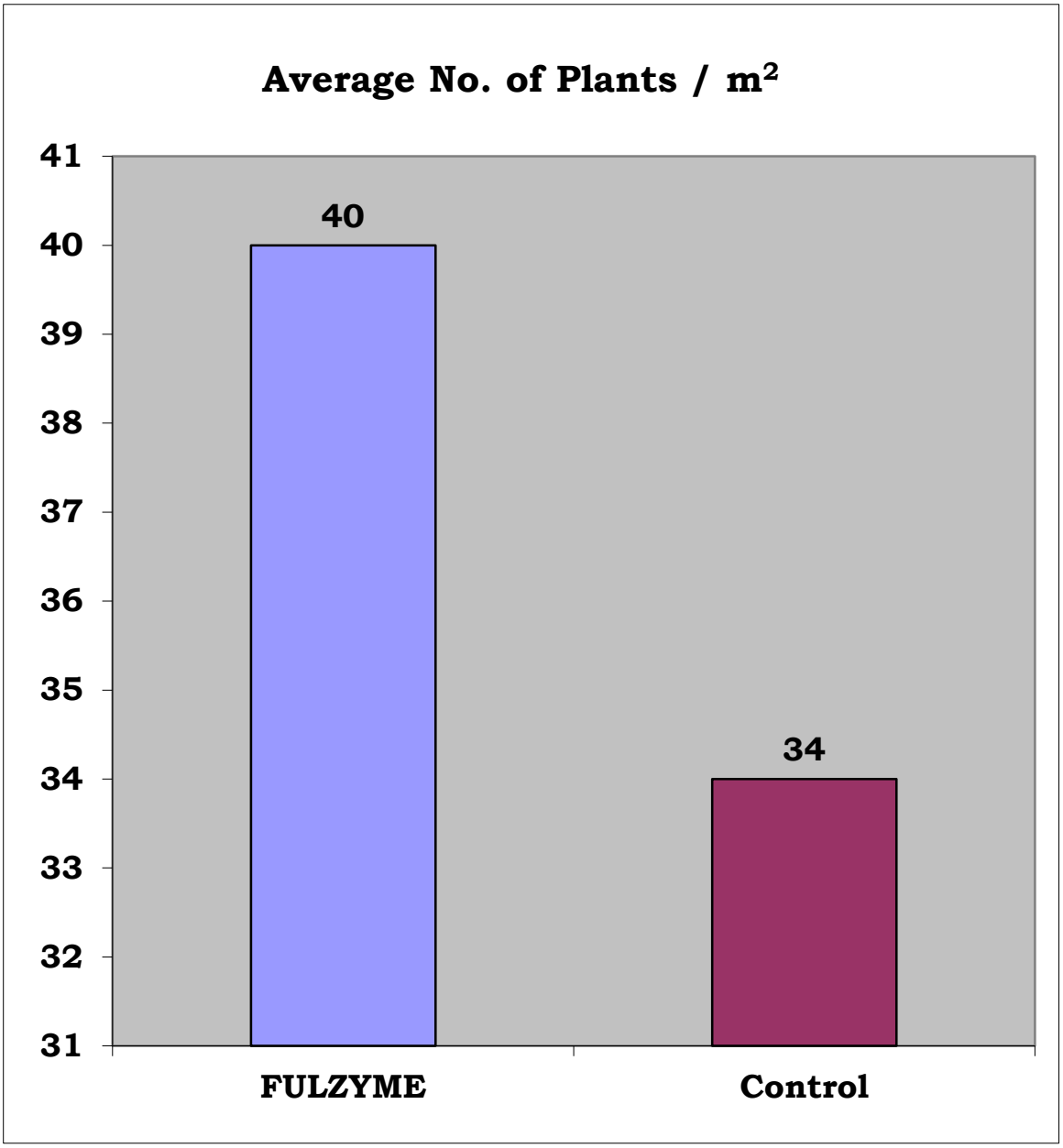
Treatment	Description
1. FULZYME 1	2 Applications of FULZYME PLUS
2. FULZYME 2	3 Applications of FULZYME PLUS
3. Control	No FULZYME PLUS

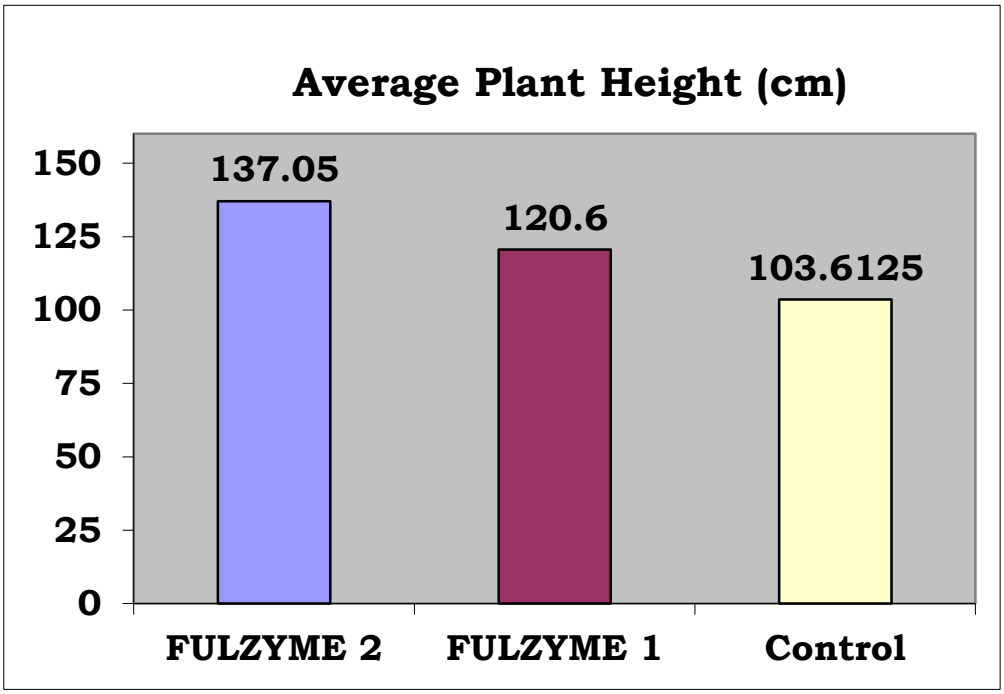
a. 1st application of FULZYME PLUS was effected immediately before planting of cotton seeds.
b. 2nd application of FULZYME PLUS was effected 60 days after planting.
c. 3rd application of FULZYME PLUS was effected 60 days after the 2nd application.

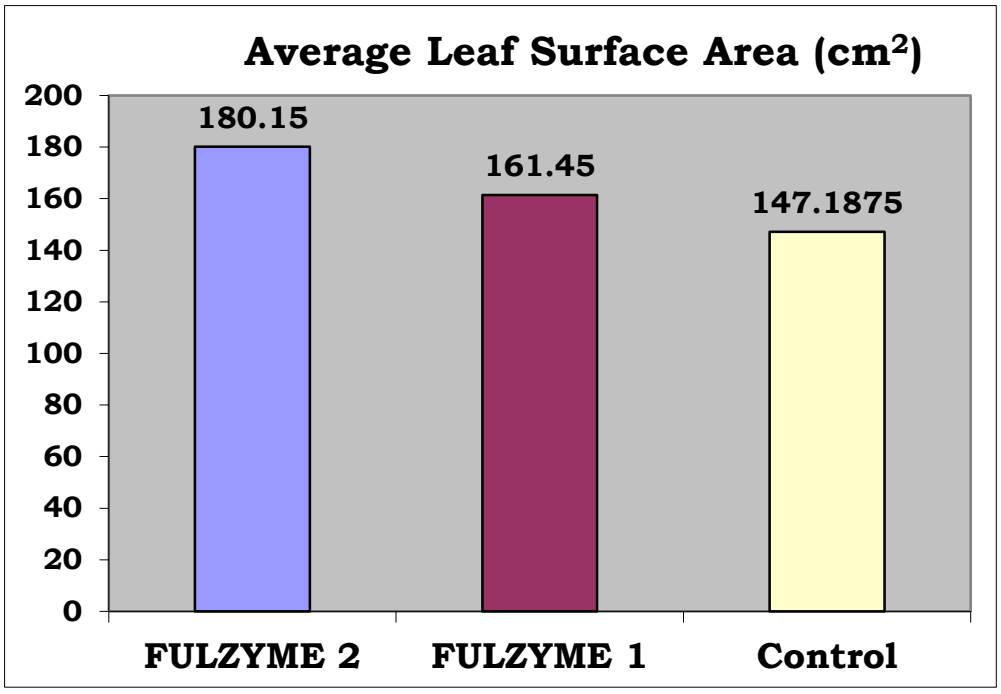
3. All three treatments received the same amount of fertilizers during the season.
4. Total area of the treated plots in both regions: 15.5 hectares.
5. Total area of the control plots in both regions: 15.5 hectares.
6. Readings that were taken from each plot of the three treatments.
a. Average No. of plants per m^2 and hence the % germination.
b. Average height of plants in cm.
c. Average leaf surface area in cm^2.
d. Average number of mature bolls per plant.
e. Average number of non-maturing bolls per plant.
f. Average number of bolls per plant.
g. Average yield of pure cotton in kg/hectare.
h. Average yield of cotton seeds in kg/hectare.
i. Average yield of raw cotton in kg/hectare.
j. Average weight of mature bolls in grams per boll.
7. Calculations.
a. Calculation of averages.
b. Calculation of percentages.

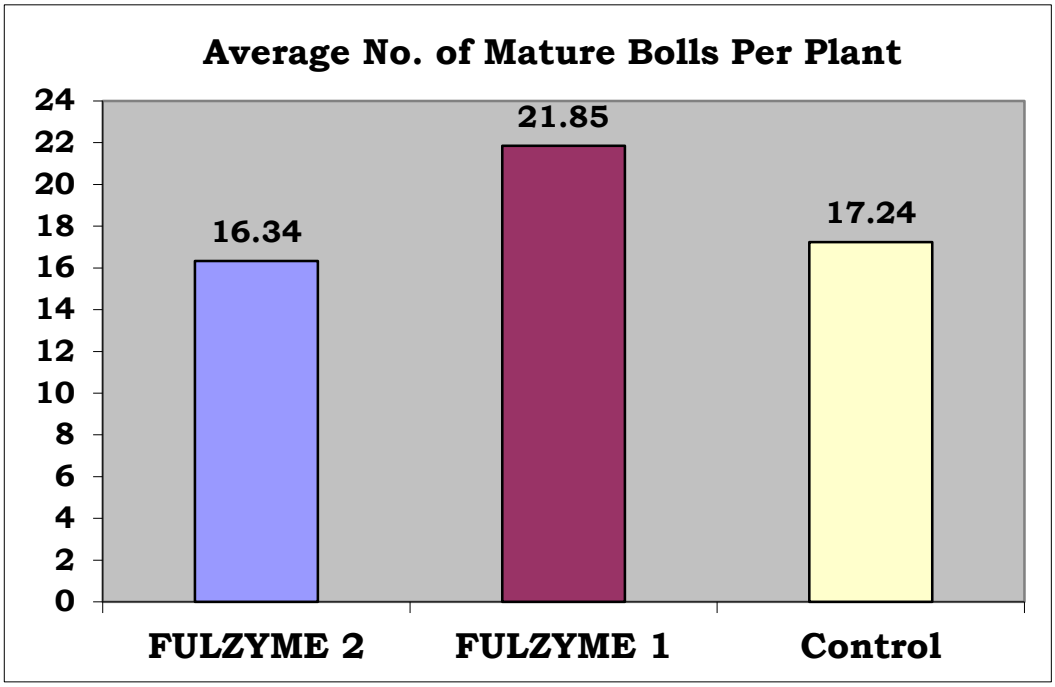
Summary of the Results

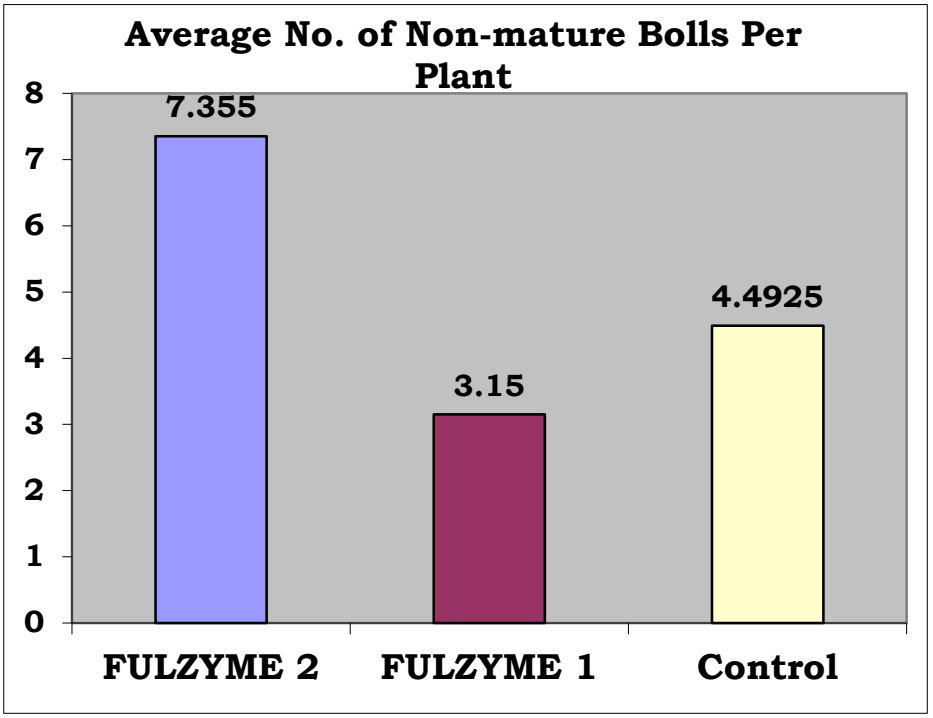
All the results are shown in the attached charts. The results show the following:
1. Both treatments of FULZYME PLUS increased the % germination significantly.
2. Both treatments of FULZYME PLUS improved plant growth significantly over the control.
a. 2 applications increased plant height by about 16% and 3 applications by 32%.
b. 2 applications increased leaf surface area by about 10% and 3 applications by 22%.
3. 2 applications increased the total number of bolls per plant by about 15% and 3 applications by 9%.
4. 2 applications increased the number of mature bolls per plant by about 27%. However, 3 applications **reduced** the number of mature bolls per plant by 5%.
5. 2 applications reduced the number of immature bolls per plant by about 30%. However, 3 applications **increased** the number of immature bolls per plant by 64%.
6. 2 applications increased the yield of pure cotton by about 27% and 3 applications by 15%.
7. 2 applications increased the yield of cotton seeds by about 28% and 3 applications by 9%.
8. 2 applications increased the yield of raw cotton by about 27% and 3 applications by 12%.
9. 2 applications increased the average weight of mature bolls by about 4% and 3 applications by 22%.

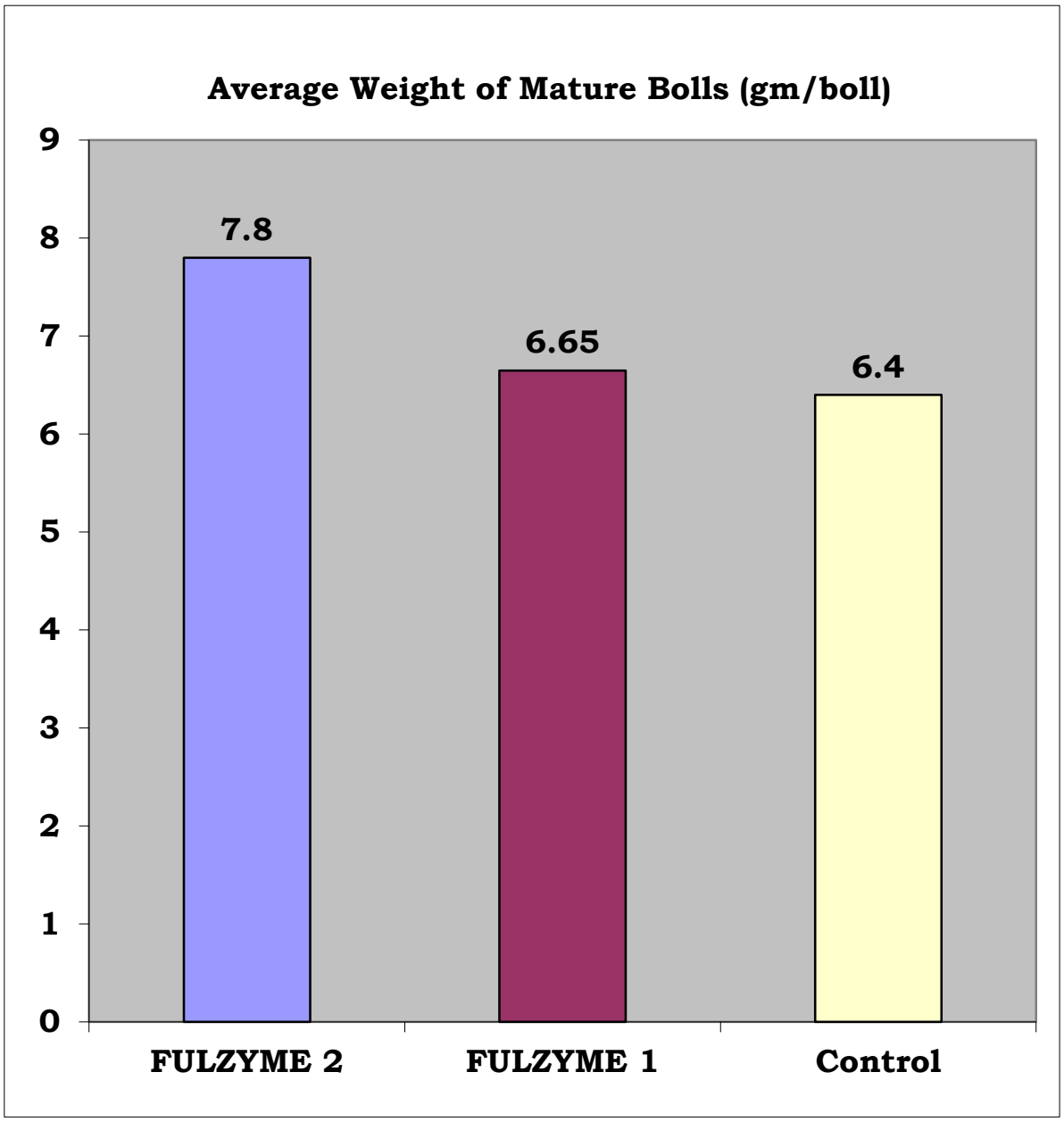

Average No. of Plants / m2
41
40
39
38
37
36
35
34
33
32
31
40
34
FULZYME
Control

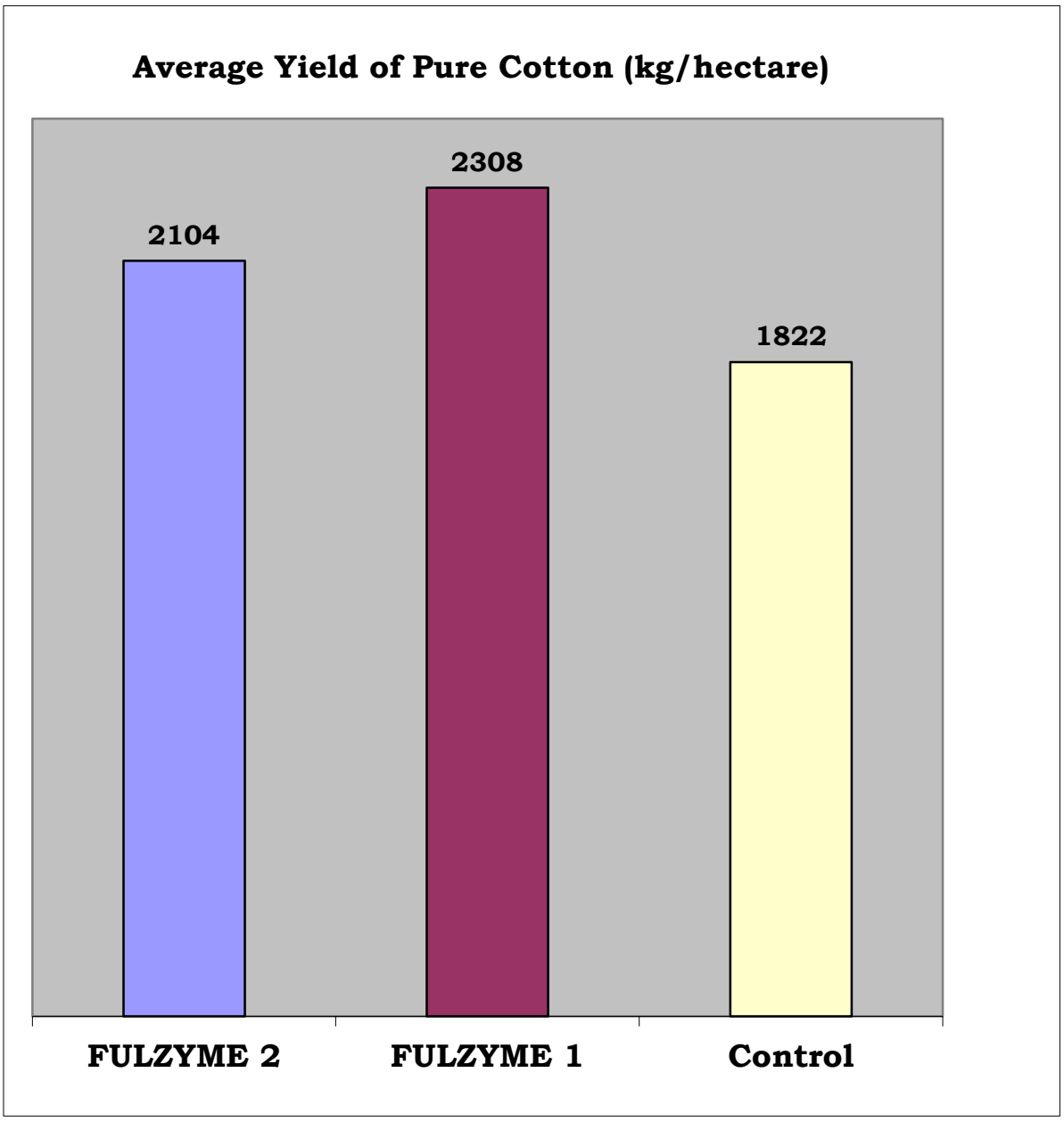

Average Plant Height (cm)
150
125
100
75
50
25
0
137.05
120.6
103.6125
FULZYME 2
FULZYME 1
Control

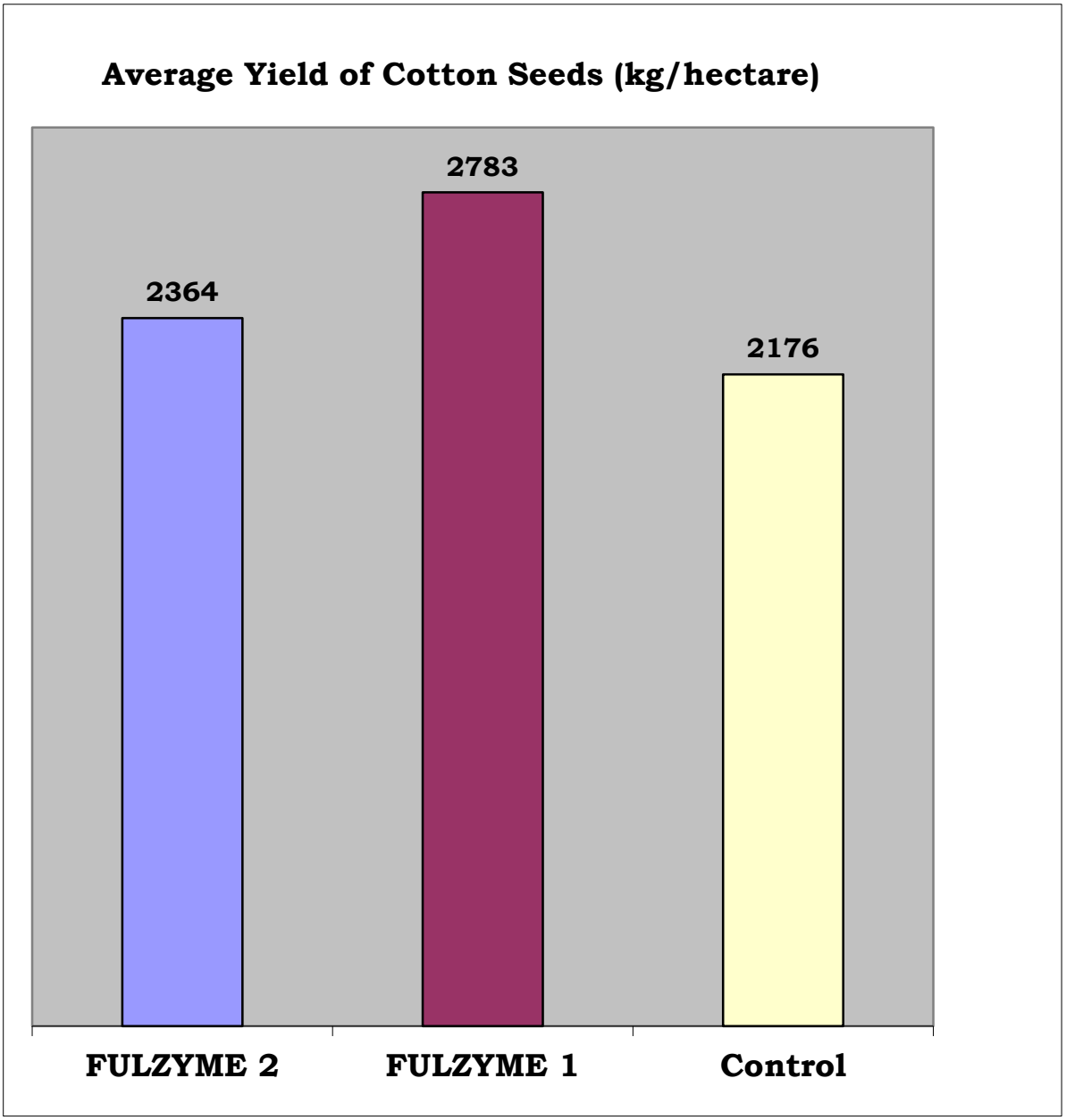

Average Leaf Surface Area (cm2)
200
180
160
140
120
100
80
60
40
20
0
180.15
161.45
147.1875
FULZYME 2
FULZYME 1
Control

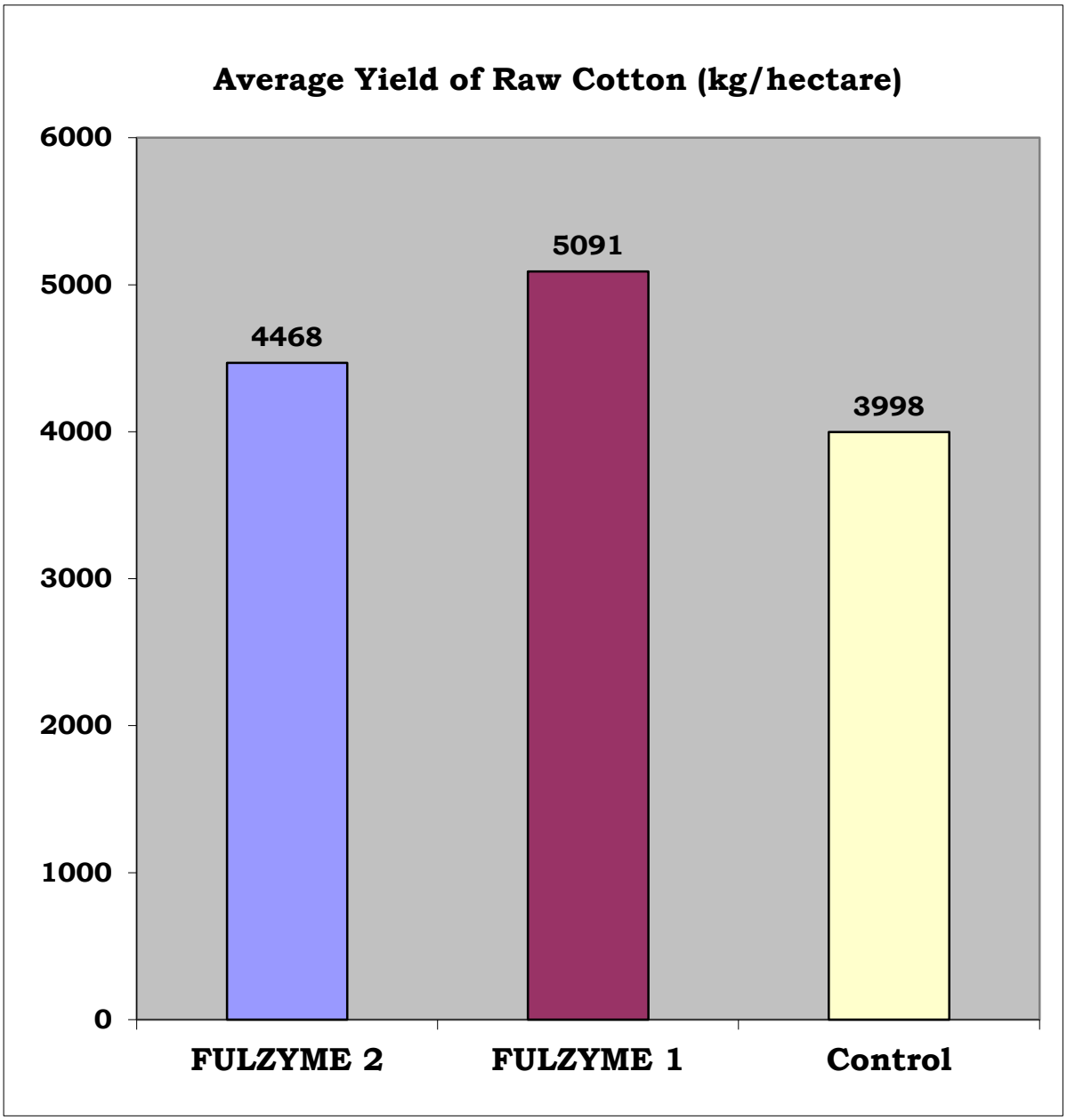

Average No. of Mature Bolls Per Plant
24
22
20
18
16
14
12
10
8
6
4
2
0
16.34
21.85
17.24
FULZYME 2
FULZYME 1
Control


Average No. of Non-mature Bolls Per Plant
8
7
6
5
4
3
2
1
0
7.355
3.15
4.4925
FULZYME 2
FULZYME 1
Control


Average Weight of Mature Bolls (gm/boll)
9
8
7
6
5
4
3
2
1
0
7.8
6.65
6.4
FULZYME 2
FULZYME 1
Control


Average Yield of Pure Cotton (kg/hectare)
2104
2308
1822
FULZYME 2
FULZYME 1
Control


Average Yield of Cotton Seeds (kg/hectare)
2364
2783
2176
FULZYME 2
FULZYME 1
Control


Average Yield of Raw Cotton (kg/hectare)
6000
5000
4000
3000
2000
1000
0
4468
5091
3998
FULZYME 2
FULZYME 1
Control