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## Effect of FULZYME PLUS on Cotton in Syria 2003

~ A. B. Ismail, M. Subai, J. Shammat

*Bacillus subtilis* and *Pseudomonas putida* have been used widely in crop production to improve growth and increase crop yields. FULZYME PLUS contains *Bacillus subtilis* and *Pseudomonas putida* in addition to bio-stimulants 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  $2 \times 10^{10}$ /gram *Bacillus subtilis* and *Pseudomonas putida*, 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:

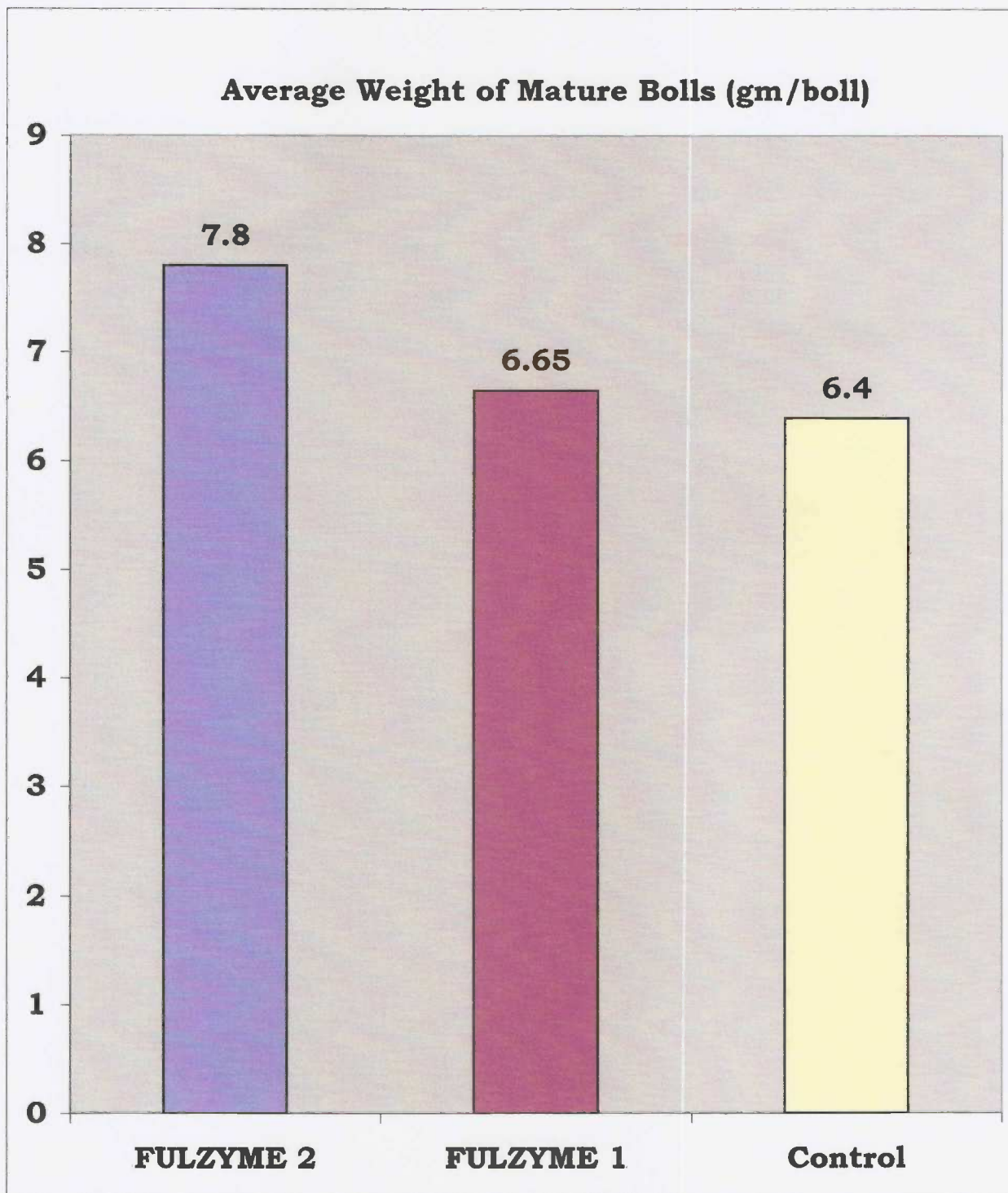
Treatment	Description
1. FULZYME 1	2 Applications of FULZYME PLUS
2. FULZYME 2	3 Applications of FULZYME PLUS
3. Control	No FULZYME PLUS

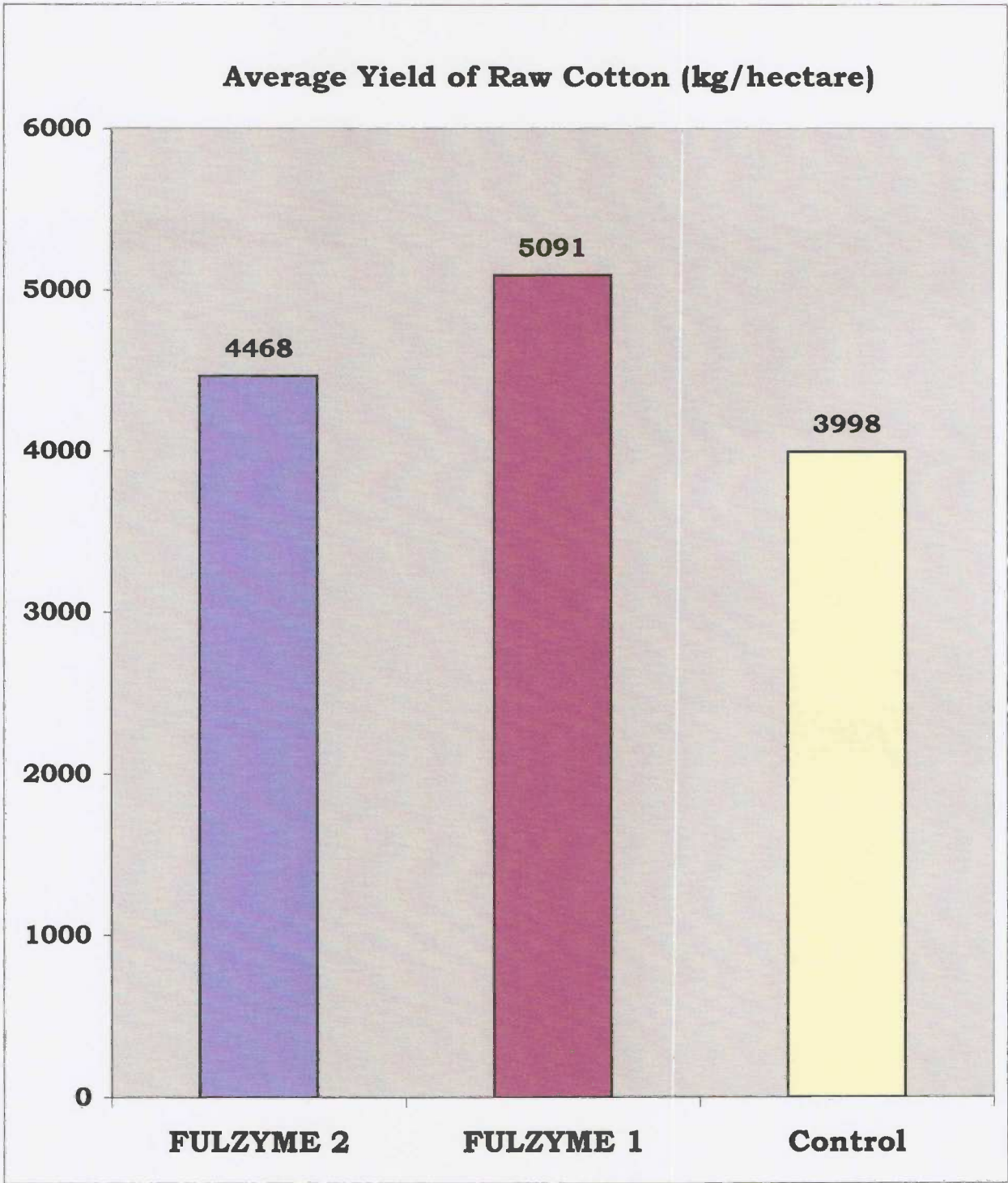
- a. 1<sup>st</sup> application of FULZYME PLUS was effected immediately before planting of cotton seeds.
  - b. 2<sup>nd</sup> application of FULZYME PLUS was effected 60 days after planting.
  - c. 3<sup>rd</sup> application of FULZYME PLUS was effected 60 days after the 2<sup>nd</sup> application.
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<sup>2</sup> and hence the % germination.
    - b. Average height of plants in cm.
    - c. Average leaf surface area in cm<sup>2</sup>.
    - 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

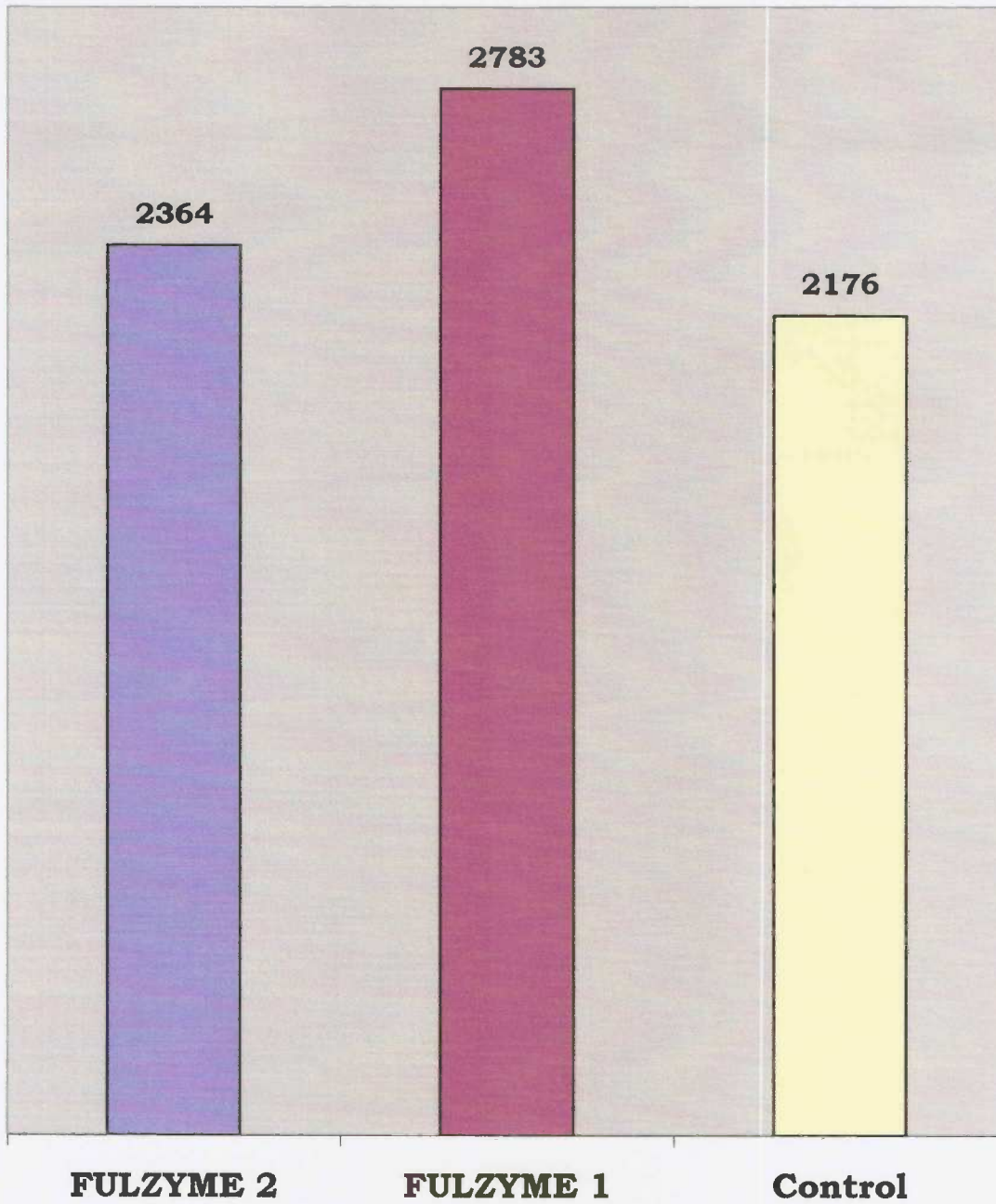
All the results are shown in the attached charts. The results show the following:

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%.

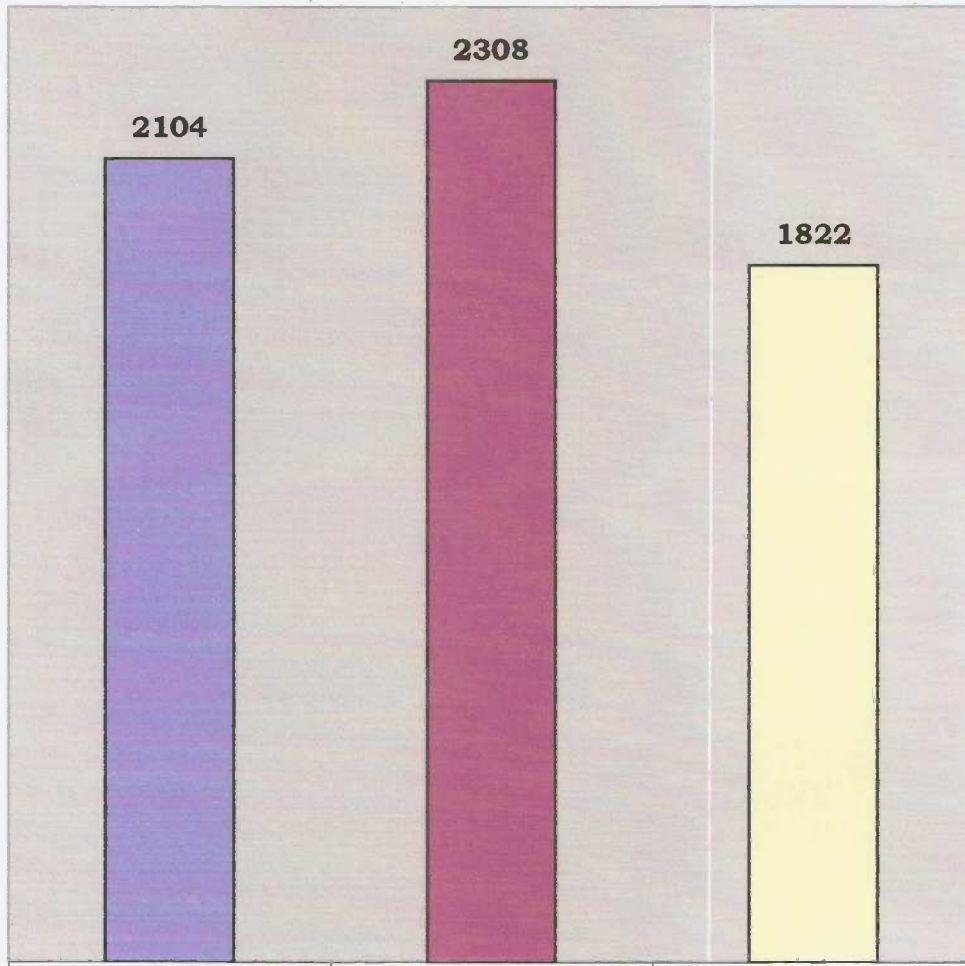




**Average Yield of Cotton Seeds (kg/hectare)**



**Average Yield of Pure Cotton (kg/hectare)**



**FULZYME 2**

**FULZYME 1**

**Control**

**Average No. of Bolls Per Plant**

