AZOMITE SOIL PRODUCTS, LLC

# WATERMELON RESEARCH

During the process of AZOMITE® registration for soil amending purposes in the People's Republic of China (PRC), the PRC review committee requested that several Federally supported Agricultural Research Stations conduct research projects with the product. This study on watermelon use was conducted under the supervision of Lu Wei-Guang, Ph.D., Associate Scientist, and Shen Guo-Hwei Ph.D., Deputy Director, Shanghai Agriculture Academy of Science.

In the study, the scientists used modern statistical methodology to design and conduct a comparative investigation of AZOMITE® vs. other fertilizer products and procedures. At the end of the first round of investigative research, the review committee asked the distributor to provide additional product, because the results were too positive to be correct. Although the repeat testing delayed registration for over a year, the second round of testing yielded almost identical test results and subsequently the product registration was granted. The product is now sold in PRC for various agricultural uses.

Other than to provide sufficient amounts of AZOMITE® the distributor was not involved in any aspect of the investigative process. The University Professor did not ask for recommended dosages or any information from any of us. Thus, the statements made about the product are those of the investigators without benefit of editing for correctness by anyone; e.g., AZOMITE® is not a montmorillonite as stated in their report nor is it a soil conditioner. Below are the unaltered conclusions of the investigators and the full report that we were given by the review committee.

a) AZOMITE® soil conditioner was able to provide significant enhancement in growth rate, development, and viability.

b) AZOMITE® soil conditioner increased the central sugar content in when compared against blank, normal fertilizer and silica fertilizer by 0.85, 1.25, and 0.25 degree, respectively, significantly improving the quality of the Watermelon.

c) AZOMITE® soil conditioner increased the yield of Watermelon significantly. The increase when compared with blank, normal fertilizer, and silica fertilizer groups were 22.31%, 9.08, and 6.00% respectively.

2. Introduction:

AZOMITE® is a natural mineral soil conditioner that contains silica and various rare earth elements. Previously it has been shown to increase the growth rate of crops, improve yield, and quality of the produce. The purpose of this field trial is to study the effect of AZOMITE® on the growth, production, and quality of Watermelon in a small-plot-trial, thereby establishing scientific evidence for further application and promotion of the product.

3. Material and Methods:
   a) Test site: The test was conducted in a production greenhouse of Shanghai Agriculture Science Institute. Total size of the plots was 400 $m^2$. The soil had a basic fertility strength at 26.3mg/kg organic content, total nitrogen 1.75 mg/kg, effective P 76.2mg/kg, effective K 120.0mg/kg, pH7.9.
   b) Fertilizer: Soil conditioner AZOMITE® is provided by Shanghai Lytone Biochemical, Ltd. The product contained 62.92% $SiO_2$. A commercial Silica fertilizer was purchased from the market, containing 41.28%. The combination fertilizer was provided from the fertilizer department of SAAS and contained $N:P_2O_5:K_2O=15:15:15$.
   c) Crop: Variety No.8424 Watermelon was used.
   d) Design and Treatments:
      i. Design: There were 4 treatments. Treatment 1: CK (Blank), Treatment 2: Combination Fertilizer 50kg/Mu(667$m^2$), Treatment 3: Silica fertilizer 30kg/Mu + combination fertilizer 50kg/Mu, Treatment 4: AZOMITE® 30 kg/Mu + combination fertilizer 50kg/Mu. Each treatment was triplicated. Each replicate plot was 30 $m^2$ in size, randomly located in the green house.
      ii. Field management: AZOMITE® and the combination fertilizers were mixed together on Apr. 6, 2006 and applied into soil according to plan. The Watermelon seedlings were fix planted on April 7, 2006, and the recording started on May 20$^{th}$. An additional application of fertilizer was performed on June 6$^{th}$ with a combination formula at 40kg/Mu on all the treatment groups except Treatment 1. Harvesting was on July 3$^{rd}$. The amount of Watermelon harvested from each plot was recorded individually. Thickness of pericarp, sugar content in the center of fruit, as well as in the peripheral region were recorded. Pest control and moisture management were identical among all the treatments.

4. Results and Analysis:
   a) Effect of AZOMITE® on the growth and other biological properties of Watermelon:

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The biological properties and characteristics of Watermelon were studied on May 20 , 2006 during the early stage of fruiting. Parameters included length of vine, total number of flowers, and fruits. It was apparent that AZOMITE® was able to enhance the growth of watermelon when compared against the other fertilizers. The vine length of AZOMITE® group was longer than the Blank, Normal Fertilizer, and Silica fertilizer groups by 40 cm, 8.2 cm and 12.3 cm respectively. Total number of flower and fruits were also higher with AZOMITE® group when compared against the other groups. The viability was also increased. For results please see Table 1.

Table 1. Effect of various treatments on the biological properties of Watermelon.

| Treatment | Vine length (cm) | flower/plant | Fruit/plant |
|---|---|---|---|
| 1 (Blank) | 190.2 | 8.0 | 2.40 |
| 2(Normal fertilizer) | 222.0 | 8.33 | 2.47 |
| 3(Silica fertilizer) | 217.9 | 8.35 | 2.50 |
| 4(AZOMITE® fertilizer) | 230.2 | 8.55 | 2.58 |

b) Effect of various treatments on the quality of Watermelon:

Sugar content of Watermelon and skin thickness are two important index for the quality of the fruit. As shown in Table 2, Central sugar level of melons in AZOMITE® group was 11.55◦, higher than the blank group, normal fertilizer group and Silica fertilizer group by 0.85, 1.25 and 0.25 degree, respectively. Peripheral sugar level of AZOMITE® group was also higher than the respective comparison groups by 0.35, 0.85 and 0.2 degrees. Thickness of AZOMITE® group watermelons was thinner by 0.1 cm, 0.18 cm and 0.02 cm, respectively.

Table 2. Effect of various fertilizers on the quality of Watermelons

| Treatment | Pericarp thickness,cm | Central sugar (%) | Peripheral sugar (%) |
|---|---|---|---|
| 1 (Blank) | 0.80 | 10.70 | 9.85 |
| 2(Normal fertilizer) | 0.88 | 10.30 | 9.35 |
| 3(Silica fertilizer) | 0.72 | 11.30 | 10.00 |
| 4(AZOMITE® fertilizer) | 0.70 | 11.55 | 10.20 |

c) Effect of various treatments on the yield of Watermelon:

Original data on the yield of different treatments and their analysis are shown in Table 3 and Table 4. Multiple factor comparison are shown in Table 5. F value analysis (Table 4) indicated that the yield difference among different groups were HIGHLY significant (error level <1%) ($F=12.42$, $F_{0.01}=9.78$). Multifactor analysis (Table 5) indicated significant difference (5% error level) between the AZOMITE® group and the other groups except the Silica fertilizer group.

Table 3. Yield of Watermelon from different treatments (kg/plot).

| Treatment | Replicate 1 | Replicate 2 | Replicate 3 | Total | Average. |
|---|---|---|---|---|---|
| 1 (Blank) | 88.3 | 91.1 | 97.6 | 277 | 92.3 |
| 2(Normal fertilizer) | 100.4 | 107.3 | 102.8 | 310.5 | 103.5 |
| 3(Silica fertilizer) | 110.3 | 102.7 | 106.4 | 319.4 | 106.5 |
| 4(AZOMITE® fertilizer) | 113.8 | 108.4 | 116.6 | 338.8 | 112.9 |
| total | 412.8 | 409.5 | 423.4 | 1245.7 | |

Analysis of the data above is shown in Table 4 and Table 5.

Table 4. Statistical analysis on the effect of AZOMITE® on Watermelon.

| Comparison | Degree of freedom | Summation of Square SS | Average square MS | F value | $F_{0.05}$ | $F_{0.01}$ |
|---|---|---|---|---|---|---|
| between treatment groups | 3 | 26.37167 | 13.18583 | 0.737131 | 5.143253 | 10.92477 |
| Between replicates | 2 | 666.3092 | 222.1031 | 12.41628 | 4.757062 | 9.779538 |
| Variance | 6 | 107.3283 | 17.88806 | | | |
| Total D.F. | 11 | 800.0092 | | | | |

Table 5. Multiple comparison of Watermelon yield in various plots (LSD method)

| Treatment | Average yield (kg/plot) | Significance | |
|---|---|---|---|
| | | 5% | 1% |
| 4AZOMITE® | 112.9 | a | A |
| 3 Si | 106.5 | ab | A |
| 2 Normal | 103.5 | b | AB |
| 1 Blank | 92.3 | c | B |

AZOMITE® unit yield was higher than the blank, normal fertilizer, and Silica fertilizer group by 22.31%, 9.08% and 6.00% respectively. Profit gained by AZOMITE® group was higher than the blank, normal fertilizer, and silica fertilizer group by 637.0 CNY/MU, 328.0 CNY/MU, and 224.6 CNY/MU, respectively.

Table 6, Economic analysis of different treatment groups

| Treatment | Yield (Kg/667m$^2$) | Value (CNY/667m$^2$) | Gross profit (CNY/667m$^2$) |
|---|---|---|---|
| 1 (Blank) | 2052.1 | 4104.3 | 4104.3 |
| 2(Normal fertilizer) | 2301.2 | 4602.3 | 4413.3 |
| 3(Silica fertilizer) | 2367.8 | 4735.7 | 4516.7 |
| 4(AZOMITE® fertilizer) | 2510.1 | 5020.3 | 4741.3 |

*Note: Watermelon price 2.0 CNY/kg, AZOMITE® 3.0CNY/kg, Commercial SiO2 fertilizer 1.0 CNY/kg, Normal combination* fertilizer is 2.1 CNY/kg.

5. Conclusion:
   a) AZOMITE® soil conditioner was able to provide significant enhancement in growth rate, development, and viability.
   b) AZOMITE® soil conditioner was able to increase the central sugar content in Watermelon when compared against blank, normal fertilizer and silica fertilizer by 0.85, 1.25, and 0.25 degree, respectively, significantly improve the quality of Watermelon in general.
   c) AZOMITE® soli conditioner is able to increase the yield of Watermelon significantly. The increase when compared with blank, normal fertilizer, and silica fertilizer groups were 22.31%, 9.08, and 6.00% respectively. The advantage is obvious.

The preceding research was conducted under supervision of Environmental Sciences Research Institute, Shanghai Agriculture Academy of Science, by Lu Wei-Guang, pH.D, Associate Scientist, and Shen Guo-Hwei, Deputy Director. Summary by Dr. Doug Fodge.