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Research Article

# Effect of AminoSeazyme on Vegetative Growth and Fruit Characteristics of Pomegranate (*Punica granatum* L.)

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## Abstract

Pomegranate (*Punica granatum* L.) is an important fruit crop valued for its nutritional and economic significance. This study evaluated the effect of AminoSeazyme (Amino Acid + Green Seaweed Extract + Hormones + Enzymes) on vegetative growth and fruit characteristics.The study was conducted in 2024. Six-year-old pomegranate trees were treated with AminoSeazyme through foliar application, and growth and fruit parameters were recorded at the end of the season. The results of this study demonstrated that the foliar treatment considerably enhanced vegetative growth, with average shoot length increasing from 17.11 ± 1.12 cm (control) to 27.43 ± 2.48 cm, leaf area from 3.39 ± 0.03 $cm^2$ to 8.22 ± 0.34 $cm^2$, chlorophyll content from 37.41 ± 0.53 to 46.54 ± 1.78 CCI, and leaf dry matter from 48.21 ± 1.89% to 65.76 ± 2.03%. Fruit traits also improved, with average fruit size rising from 177.34 ± 2.43 $cm^3$ to 215.12 ± 10.40 $cm^3$, fruit number per tree from 104.23 ± 1.89 to 117.34 ± 4.40, fruit weight from 359.1 ± 1.23 g to 402.9 ± 2.43 g, total soluble solids from 10.32 ± 0.87% to 17.20 ± 1.42%, and yield per tree from 11.89 ± 0.90 kg to 17.34 ± 1.10 kg. The results indicate that AminoSeazyme foliar application effectively enhances vegetative growth and fruit productivity in pomegranate, indicating its potential as a bioactive treatment for improved fruit quality and yield.

**Keywords:** Pomegranate; Amino Acids; Seaweed Extract; Foliar Application; Vegetative Growth

## Abbreviation

CCI: Chlorophyll Content Index; TSS: Total Soluble Solid; ANOVA: Analysis of Variance

## Introduction

Pomegranate (*Punica granatum* L.) is a fruit-bearing shrub or small tree that has been cultivated for centuries due to its nutritional, medicinal, and economic significance [1]. It is widely grown in arid and semi-arid regions across the world, including the Mediterranean, Middle East, and South Asia [2]. The fruit is highly valued for its edible arils, juice, and nutraceutical potential, which are rich sources of bioactive compounds such as polyphenols, flavonoids, anthocyanins, and tannins [3]. These compounds contribute to the fruit's strong antioxidant, anti-inflammatory, and cardioprotective properties, making pomegranate not only a commercially important fruit but also a functional food with significant health benefits [4]. The increasing global demand for pomegranate products and the need for enhanced nutritional quality make it essential to adopt improved cultivation practices that optimize yield, fruit quality, and plant health [5].

The growth and productivity of pomegranate are influenced by multiple factors, including soil fertility, water availability, climate, and nutrient management [6]. Adequate nutrient supply is critical for vegetative growth, flowering, fruit set, and quality attributes such as aril size, juice content, and biochemical composition [7]. Conventional farming practices often rely heavily on chemical fertilizers, which, although effective in the short term, can lead to soil degradation, reduced microbial activity, and environmental pollution over time [8]. Hence, sustainable and eco-friendly cultivation strategies that improve nutrient use efficiency, promote plant health, and enhance fruit quality are increasingly important [9].

Recent studies have indicated the potential of bioactive compounds such as amino acids, seaweed extracts, plant hormones, and enzymes in promoting plant growth and productivity [10]. Amino acids play a crucial role as building blocks of proteins and precursors of secondary metabolites, enhancing physiological processes and stress tolerance [11]. Seaweed extracts provide natural growth regulators, vitamins, and minerals, which improve photosynthesis, nutrient uptake, and antioxidant activity, leading to increased biomass and improved fruit quality [12]. Plant hormones regulate fundamental processes such as cell division, elongation, and differentiation, while enzymes accelerate metabolic reactions essential for nutrient assimilation and overall plant vigor [13]. The combined application of these compounds has been reported to stimulate vegetative growth, enhance flowering, improve fruit set, and boost fruit quality in several horticultural crops [14].

Integrating these bioactive compounds into pomegranate cultivation offers a sustainable approach to improve plant vigor, yield, and fruit quality [15]. Foliar application or soil supplementation can enhance physiological functions, including photosynthesis, nutrient translocation, and antioxidant defenses, thereby promoting healthy plant development and high-quality fruit production [16]. Such strategies can reduce dependency on chemical inputs while maintaining or increasing productivity, aligning with sustainable agriculture practices and environmental conservation [17].

Therefore, the present study was undertaken to evaluate the combined effects of AminoSeazyme (Amino Acids + Green Seaweed Extract + Hormones + Enzymes) on pomegranate growth and fruit development. The results are expected to offer practical insights for farmers and researchers seeking sustainable, eco-friendly approaches to maximize pomegranate yield and quality.

## Materials and Methods

### Experimental site and plant material

The study was conducted during the 2024 growing season on six-year-old pomegranate (*Punica granatum L.*) trees planted at a spacing of 4 × 4 m. All trees were maintained under uniform cultural and irrigation practices throughout the experiment.

### Biostimulant description

The treatment used was AminoSeazyme (manufracture by Ashirwad Nutrients), a bioactive formulation containing amino acids, green seaweed extract, natural hormones, and enzymes. The biostimulant was applied as a foliar spray.

### Treatments and experimental design

The experiment consisted of two treatments: a control (no spray) and AminoSeazyme foliar spray, which contains amino acids, green seaweed extract, hormones, and enzymes. AminoSeazyme was applied as a foliar treatment using a handheld sprayer at a concentration of 10 $mg.L^{-1}$. Three sprays were performed during the season: the first in February at the early vegetative stage, the second at full leaf expansion, and the third one month after the second application. Each treatment included 18 trees per replicate, with a total of 54 trees in the experiment.

### Data collection

At the end of the growing season, various vegetative and fruit parameters were recorded, including average shoot length (cm), leaf area ($cm^2$), chlorophyll content index (CCI), leaf dry matter (%), average fruit size ($cm^3$), average number of fruits per tree, average fruit weight (g), total soluble solids (TSS, %), and yield per tree (kg/tree).

### Statistical analysis

All collected data were analyzed using ANOVA to determine the significance of treatment effects. Differences among means were considered significant at the 5% probability level.

## Results and Discussion

### Effect of AminoSeazyme on vegetative growth of pomegranate

#### Shoot length

Foliar application of AminoSeazyme substantially enhanced shoot growth in pomegranate. Treated trees exhibited an average shoot length of 27.43 ± 2.48 cm compared to 17.11 ± 1.12 cm in control trees, indicating improved vegetative vigor (Figure 1). In another study, the foliar application of 75% seaweed extract considerably enhanced the shoot length of pomegranate plants, reaching 23.67 cm [18].

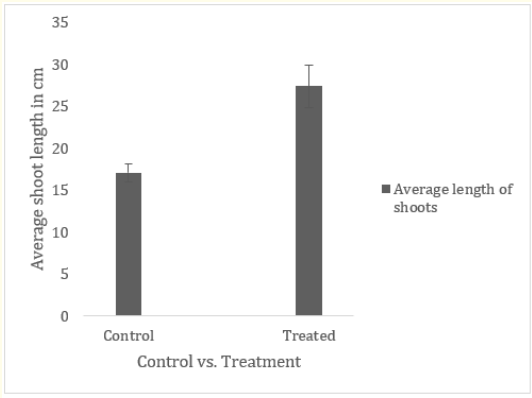


**Figure 1:** Effect of AminoSeazyme foliar application on the average shoot length of pomegranate.

#### Leaf area

Leaf expansion was notably increased in treated trees, with an average leaf area of 8.22 ± 0.34 $cm^2$ versus 3.39 ± 0.03 $cm^2$ in controls, indicating enhanced photosynthetic capacity (Figure 2). In another study, the combined foliar application of amino acids and seaweed extracts (each at 0.2%) on Valencia orange trees significantly enhanced leaf expansion, resulting in a leaf area of 29.35 $cm^2$ [19].

#### Chlorophyll content (CCI)

Chlorophyll content, measured as CCI, increased from 37.41 ± 0.53 in control trees to 46.54 ± 1.78 in treated trees, suggesting

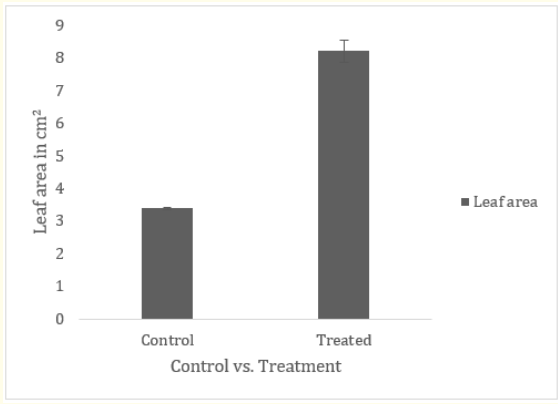


**Figure 2:** Effect of AminoSeazyme on leaf area of pomegranate.

improved photosynthetic efficiency and leaf health (Figure 3). In another study, spraying pomegranate leaves with seaweed extract considerably increased chlorophyll content to 47.31 CCI, indicating enhanced photosynthetic capacity [20].

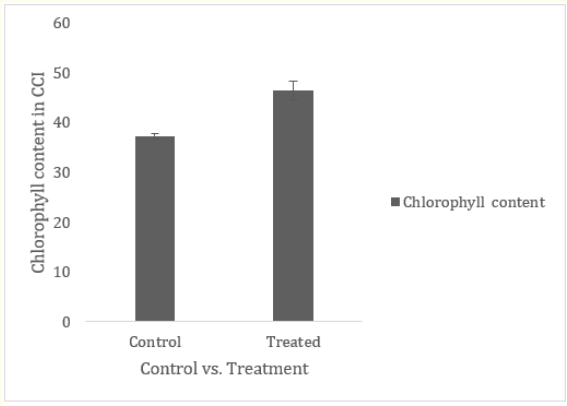


**Figure 3:** Effect of AminoSeazyme on chlorophyll content (CCI) in pomegranate leaves.

#### Leaf dry matter (%)

Leaf dry matter was also positively affected, rising from 48.21 ± 1.89% in controls to 65.76 ± 2.03% in treated trees, indicating greater biomass accumulation in foliage (Figure 4).

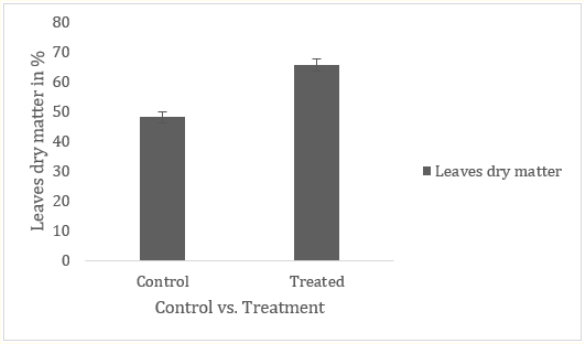


**Figure 4:** Effect of AminoSeazyme on leaf dry matter (%) in pomegranate.

## Effect of AminoSeazyme on fruit characteristics of pomegranate

In Table 1. Foliar application of AminoSeazyme substantially improved fruit development in pomegranate. Treated trees produced larger fruits, with an average size of 215.12 ± 10.40 $cm^3$ compared to 177.34 ± 2.43 $cm^3$ in control trees. The number of fruits per tree also increased, reaching 117.34 ± 4.40 in treated trees versus 104.23 ± 1.89 in control trees, indicating enhanced fruit set. Additionally, fruit weight was higher in treated trees (402.9 ± 2.43 g) than in control trees (359.1 ± 1.23 g), indicating improved fruit quality.

**Table 1:** Effect of AminoSeaZyme on vegetative growth of Pomegranate.

| Treatments | Growth characteristics | | | |
|---|---|---|---|---|
| | Average length of shoots (cm) | Leaf area (Cm2) | Chlorophyll content (CCI) | Leaves dry matter (%) |
| Control | 17.11 ± 1.12 | 3.39 ± 0.03 | 37.41 ± 0.53 | 48.21 ± 1.89 |
| Treated | 27.43 ± 2.48 | 8.22 ±0.34 | 46.54 ± 1.78 | 65.76 ± 2.03 |

Moreover, the total soluble solids (TSS), an indicator of fruit sweetness and quality, increased from 10.32 ± 0.87% in controls to 17.20 ± 1.42% in treated trees. Overall productivity was enhanced, with treated trees yielding 17.34 ± 1.10 kg per tree compared to 11.89 ± 0.90 kg in control trees, demonstrating that AminoSeazyme application substantially increased pomegranate fruit yield and quality. In another study, the combined application of microbial bio-stimulant and seaweed extract significantly enhanced pomegranate fruit yield. Treated trees produced 18.57 kg per tree, demonstrating a clear improvement in productivity compared to untreated controls [21].

## Conclusion

The results of the study demonstrates that foliar application of AminoSeazyme considerably improves both vegetative growth and fruit productivity in pomegranate. Treated trees showed enhanced shoot length, larger leaf area, higher chlorophyll content, and greater leaf dry matter, indicating improved physiological efficiency and nutrient utilization. These vegetative gains translated into better fruit development, with notable increases in fruit size, fruit weight, fruit number, TSS content, and overall yield per tree. Such improvements not only enhance fruit quality but also provide substantial economic advantages to farmers by increasing marketable yield, improving fruit grade, and potentially reducing the need for chemical inputs. Therefore, AminoSeazyme serves as an effective and sustainable biostimulant that can support higher productivity, better fruit quality, and improved profitability for pomegranate growers.

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