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Research Article

Effect of Ashirwad Nutrivita (manufactured by Ashirwad AWF29 technology) on Growth, Biomass, and Fruit Characteristics of Tomato (*Solanum lycopersicum* L.)

Milan A Bhatt*, Kathad H Kamliya and Nana K Bhammar

Ashirwad Nutrients, Mahuva, Bhavnagar, Gujarat, India

***Corresponding Author:** Milan A Bhatt, Ashirwad Nutrients, Mahuva, Bhavnagar, Gujarat, India.

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Abstract

Tomato (*Solanum lycopersicum* L.) is an important vegetable crop valued for its nutritional and economic significance. This study evaluated the effect of Ashirwad Nutrivita (Amino Acid + Green Seaweed Extract + Hormones + Enzymes) on tomato growth, biomass accumulation, and fruit characteristics. The experiment was conducted under field conditions using a Randomized Complete Block Design (RCBD) with treated plants receiving foliar spray of Ashirwad Nutrivita and control plants sprayed with water. Foliar application of Ashirwad Nutrivita substantially enhanced vegetative growth, with plant height increasing from 47.12 ± 1.21 cm in control plants to 64.78 ± 2.90 cm in treated plants. The number of leaves and shoots per plant increased from 50.12 ± 1.38 to 72.45 ± 2.78 and 4.86 ± 0.76 to 8.12 ± 0.98, respectively, while leaf area increased from 1211 ± 1.08 cm^2 to 1645 ± 2.09 cm^2. Leaf and shoot dry weights improved from 29.32 ± 1.15 g to 43.45 ± 2.23 g and 14.35 ± 1.09 g to 24.06 ± 2.87 g, resulting in a total dry weight increase from 29.84 ± 1.98 g to 69.62 ± 2.20 g. Fruit development was also enhanced, with fruit length rising from 4.78 ± 0.87 cm to 7.01 ± 0.91 cm, fruit diameter from 5.10 ± 0.54 cm to 6.78 ± 1.12 cm, and fruit index from 0.87 ± 0.01 to 1.18 ± 0.02. These results indicate that Ashirwad Nutrivita effectively improves tomato growth, biomass, and fruit quality.

Keywords: *Solanum lycopersicum*; Ashirwad Nutrivita; Plant Hormones; Green Seaweed Extract; Sustainable

Abbreviation

RCBD: Randomized Block Design.

Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most widely cultivated and economically important vegetable crops worldwide [1]. It is valued not only for its high nutritional content, including vitamins, minerals, and antioxidants such as lycopene, but also for its important role in supporting livelihoods and global food security [2]. The productivity and quality of tomato are strongly influenced by vegetative growth, biomass accumulation, and fruit development, which depend on nutrient availability and overall plant physiological status [3]. Modern agricultural practices increasingly emphasize sustainable strategies that enhance plant performance while minimizing reliance on chemical fertilizers, leading to growing interest in bioactive compounds and biostimulants [4].

One promising approach involves the use of bioactive compounds, including amino acids, green seaweed extracts, plant hormones, and enzymes, which have been widely applied to support plant growth and development [5]. Amino acids play an important role in plant metabolism as building blocks of proteins and as precursors of several metabolic compounds [6]. Exogenous

application of amino acids has been reported to promote vegetative growth, leaf expansion, and root development in a range of crops, contributing to improved plant vigor [7].

Green seaweed extracts contain natural growth regulators, polysaccharides, vitamins, and micronutrients that can stimulate root and shoot development and improve nutrient uptake [8,9]. In tomato and other vegetable crops, the application of seaweed-based biostimulants has been associated with enhanced canopy development and improved overall plant growth [10].

Plant hormones are essential regulators of growth and development, influencing processes such as cell division, elongation, flowering, and fruit formation [11-13]. Similarly, enzymes play an important role in plant metabolism and nutrient utilization, supporting normal growth and tissue development [14,15]. When applied in bioactive formulations, these compounds may contribute to improved vegetative growth, biomass accumulation, and fruit development [16].

Although the individual effects of amino acids, seaweed extracts, hormones, and enzymes have been reported in previous studies, information on their combined effects in a single formulation under field conditions remains limited. Therefore, the present study was undertaken to evaluate the effect of Ashirwad Nutrivita, a formulation containing amino acids, green seaweed extract, hormones, and enzymes, on tomato growth, biomass accumulation, and fruit physical characteristics. The results of this study are expected to provide information on the effects of a bioactive foliar formulation on tomato growth, biomass accumulation, and fruit physical characteristics under field conditions.

Materials and Methods

Experimental site and plant material

TThe present study was conducted during the summer season of 2024 at the Experimental Farm to evaluate the effect of Ashirwad Nutrivita manufactured by Ashirwad AWF29 technology, having a combination of Amino Acid, Green Seaweed Extract, Hormones and Enzymes) on tomato (*Solanum lycopersicum* L.) growth, biomass accumulation, and fruit characteristics. Ashirwad Nutrivita was obtained from Ashirwad Nutrients, the manufacturer of the product. Tomato seedlings were grown in plots measuring 15 m^2 with a plant spacing of 40 cm, and each experimental unit consisted of 30 plants.

Treatments and experimental design

The experiment included two treatments: control plants sprayed with tap water and plants treated with Ashirwad Nutrivita. Treatments were arranged in a Randomized Complete Block Design (RCBD) with three replicates. Ashirwad Nutrivita contains amino acids, plant hormones, enzymes, and other bioactive compounds that promote plant growth and productivity.

Foliar application of Ashirwad Nutrivita

Ashirwad Nutrivita was applied as a foliar spray starting 30 days after transplanting, and repeated three times at 10-day intervals (30, 40, and 50 days after transplanting). Control plants were sprayed with tap water to account for the effect of spraying.

Data collection

Vegetative growth parameters were recorded at 60 days after transplanting. Three representative plants from each plot were randomly selected to measure plant height (cm), number of leaves and shoots per plant, and leaf area (cm^2). For dry weight determination, leaves and shoots were collected from sampled plants, oven-dried at 70°C until constant weight, and weighed to obtain leaves, shoots, and total plant dry weight. At harvest, five representative fruits from each plot were collected to record fruit length (cm), fruit diameter (cm), and fruit index (length/diameter).

Statistical analysis

All data are expressed as mean ± standard error (SE) of three replicates. SE was calculated as SD divided by the square root of the number of replicates. Statistical analysis was performed using analysis of variance (ANOVA) at $p \leq 0.05$.

Results and Discussion

Effect of Ashirwad Nutrivita on tomato growth and fruit characteristics

Plant height

Foliar application of Ashirwad Nutrivita substantially enhanced vegetative growth in tomato, as reflected by increased plant height compared with control plants (Figure 1). This indicates that Ashirwad Nutrivita promotes shoot elongation and overall plant vigor.

Similar improvements in vegetative growth and plant development have been reported in tomato following foliar

application of seaweed-based biostimulants [17,18]. These studies suggest that biostimulants containing amino acids and bioactive compounds can enhance plant vigor and shoot growth, which is consistent with the effects observed in the present study.

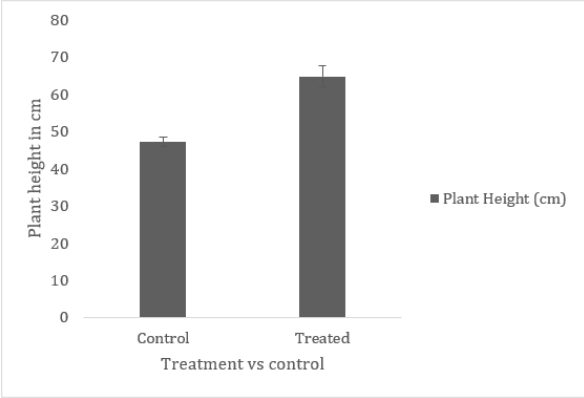

Figure 1: Effect of Ashirwad Nutrivita on tomato plant height.

Number of leaves

Treated plants showed a higher number of leaves per plant compared with control plants (Figure 2), indicating enhanced leaf production and a larger photosynthetic canopy. Previous studies have also reported that foliar application of seaweed-based fertilizers or amino acid formulations can promote leaf development in tomato, supporting improved vegetative growth [19].

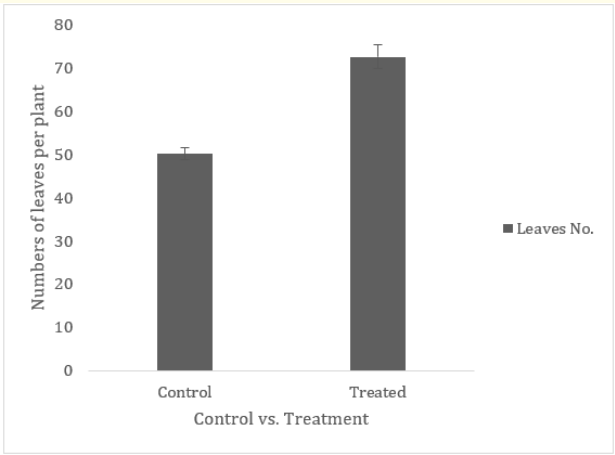

Figure 2: Effect of Ashirwad Nutrivita on number of leaves in tomato.

Number of shoots

The number of shoots per plant increased from 4.86 ± 0.76 in the control to 8.12 ± 0.98 in AminoSeazyme-treated plants (Figure 3), demonstrating a improvement in shoot production under foliar application.

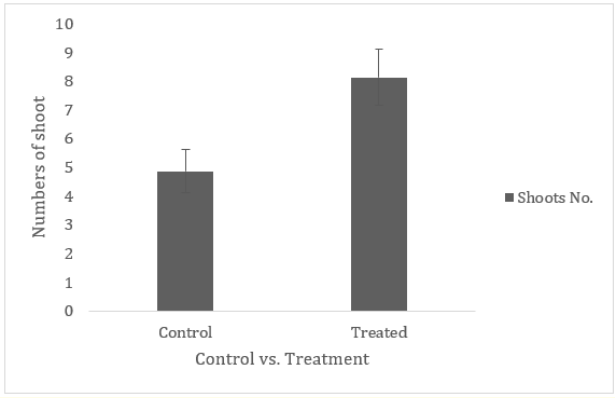

Figure 3: Effect of Ashirwad Nutrivita on shoot production in tomato plants.

Leaf area

Ashirwad Nutrivita treatment resulted in a larger leaf area compared with control plants (Figure 4), indicating improved canopy development and vegetative growth. An expanded leaf surface is generally associated with a greater capacity for light interception and biomass production, which supports overall plant vigor. Similar enhancements in leaf expansion following the application of seaweed-based biostimulants have been reported in tomato under non-stress conditions [20], suggesting that bioactive compounds can promote vegetative development across different cultivation systems.

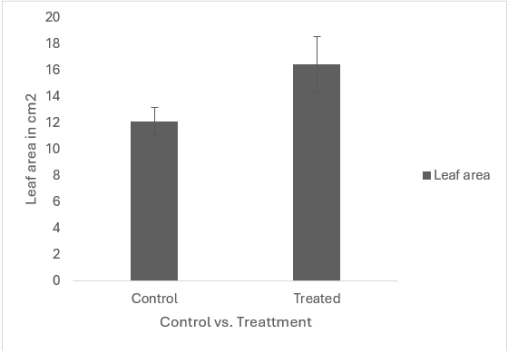

Figure 4: Effect of Ashirwad Nutrivita on leaf area of tomato plants.

Effect of Ashirwad Nutrivita on plant biomass

Ashirwad Nutrivita application resulted in a significant increase in vegetative biomass compared with the control treatment (Table 1). Both leaf and shoot dry matter accumulation were higher in treated plants, indicating improved overall plant growth and biomass production. The greater total dry weight observed in Ashirwad Nutrivita-treated plants reflects enhanced vegetative development, which is an important indicator of plant vigor and growth efficiency.

Treatments	Dry Weight (g/plant)		
	Leaves (mean ± SE)	Shoots (mean ± SE)	Total (mean ± SE)
Control	29.32 ± 1.15	14.35 ± 1.09	43.67
Treated	43.45 ± 2.23	24.06 ± 2.87	

Table 1: Effect of Ashirwad Nutrivita on dry weight of tomato.

Values represent mean ± standard error (SE) of three replicates (n = 3).

Previous studies have also reported that seaweed-based biostimulants and amino acid formulations can promote biomass accumulation in tomato and other vegetable crops [21]. These results are consistent with the present study and support the potential of bioactive foliar formulations to improve plant growth under field conditions.

Effect of Ashirwad Nutrivita on physical characteristics of tomato fruits

Foliar application of Ashirwad Nutrivita improved the physical characteristics of tomato fruits compared with the control treatment (Table 2). Treated plants produced fruits with greater size and a more favorable length-to-diameter ratio, indicating improved fruit shape and development. These changes reflect a positive influence of the bioactive formulation on reproductive growth and fruit morphology.

Treatments	Physical Characteristics/ plant		
	Fruit length (cm, mean ± SE)	Fruit diameter (cm, mean ± SE)	Fruit index (L/D, mean ± SE)
Control	4.78 ± 0.87	5.10 ± 0.54	0.87 ± 0.01
Treatment	7.01 ± 0.91	6.78 ± 1.12	1.18 ± 0.02

Table 2: Effect of Ashirwad Nutrivita on physical characteristics of tomato. Values represent mean ± standard error (SE) of five fruits per plot (n = 3 replicates). Fruit index is calculated as fruit length divided by fruit diameter.

Previous studies have also reported that seaweed-based biostimulants and related bioactive formulations can enhance fruit development and physical attributes in tomato [22,23]. Although those studies were conducted under different experimental conditions, the general trends support the role of bioactive compounds in improving fruit quality.

Overall, the application of Ashirwad Nutrivita enhanced vegetative growth, biomass accumulation, and fruit physical characteristics in tomato, indicating its potential as an effective bioactive foliar treatment for improving plant growth and fruit quality under field conditions.

Conclusion

The present study demonstrated that foliar application of Ashirwad Nutrivita, containing amino acids, green seaweed extract, hormones, and enzymes, considerably improved vegetative growth, biomass accumulation, and fruit physical characteristics of tomato under field conditions. Treated plants showed enhanced plant growth, leaf and shoot development, and improved canopy structure, indicating overall better vegetative performance. In addition, improvements in fruit size and shape suggest a positive influence on reproductive development. These results indicate that Ashirwad Nutrivita has potential as an effective bioactive foliar treatment for improving tomato growth and fruit quality in sustainable cultivation systems.

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