

Research Article

# Growth Performance of Eggplant (*Solanum melongena* L.) Enhanced by Watering Intervals and Application of Organic Manure

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## Abstract

Eggplant (*Solanum melongena* L.) is one of the high-value vegetable crops grown in the world because of its yield, and nutritional benefits to the consumers. Eggplant grows on different soils of sandy loams and clay loams. In agronomy water is an essential element for plant growth and maintenance of tissues and organs. Eggplant requires less water and the importance of water management is to enhance water stress of plant growth and to maintain turgidity and flaccidity of tissues while organic application improves on yield and self-life of produce. The field experiment was Randomized Complete Block Design (RCBD) of 4 replicates. Treatment/replicates has twenty-four 24 beds with a total number of ninety-six (96) beds. The research objective was to determine the levels watering intervals on plant height, fruit number, stem diameter, fruit weight and yield. Statistical Analysis One-way analysis of variance (ANOVA) used to determine the significant differences among treatments. The result in [Table 1](#) shows plant height of 18.3, 21.0, 31.6, and 23.4 cm respectively. The data analysis shows that, number of fruit diameter registered was in T4 of 35 cm followed by T3 of 25 cm while in T1 the fruit diameter was 20.0 cm. The results in [Table 2](#) indicates that, water application at intervals of 3 days obtained the highest mean values of 6.0<sup>a</sup> and fruit diameter of 2.5<sup>b</sup>. In conclusion, the study reveals that, watering at intervals of 3 days was the best agronomic practices in obtaining maximum crop physiology and better yields. Thus, recommending more research work on watering intervals of eggplants varieties.

## Keywords

Growth, Eggplant, Watering, Intervals, Organic Fertilizer

## 1. Introduction

The Gross Domestic Product of a nation heavily rely on agricultural production and the food systems. The government of the Gambia has anchored high premium priority on promotion and production of vegetable crops such as onion, eggplant, tomato, bitter tomato, bell pepper, carrot, hot pepper

and leafy vegetables. The global demand for vegetables expected to increase exponentially in the future and the demand because of continuing growth of population and the rising per capita consumption of vegetables, particularly in developing countries [14]. Vegetables plays a vital role in every day's

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human diet as an important source of proteins vitamins, and minerals. Further, research finding reveals that eggplant (*Solanum melongena* L.) is the second most important vegetable crop next to potatoes. Eggplant is commercially significant and widely grown throughout tropical and sub-tropical zones of the world [4]. Eggplant (*Solanum melongena*) is a species of nightshade and native to the Indian continent. Importantly, eggplant known as melongena, garden egg, or guinea squash and belong to a family of genus *Solanum* [16]. It was native in India and Bangladesh from the wild nightshade, the thorn or bitter apple. Climatic condition is one of the most important factors determining planting times. An eggplant require very stable temperature ranges with minimum and maximum that is within the limit. The minimum temperature is around 10°C with the maximum being 34°C. Optimum temperatures are around 26 - 29°C [10]. It can survive certain amounts of cold units, but are intolerant of very low temperatures. The eggplant required well-drained loam to sandy loam soils, but will grow moderately well over a wide range of soil types. The declining soil fertility levels due to soil acidity brought about excessive application of synthetic fertilizers without soil analysis and fertilizer recommendation decreases on crop production [9]. Importantly, producers are looking for alternative solutions to address poor yields of eggplant. The options include either the application of organic fertilizer to revive the fertility of the soils or the application of organic fertilizers at the recommended rate [6]. Organic fertilizer is a valuable source of essential plant nutrients, including nitrogen, phosphorus, potassium, and micronutrients. Its slowly-releases properties ensuring a steady supply of nutrients to plants, reducing the need for synthetic fertilizers and minimizing nutrient runoff, which can harm water bodies [15]. The application of organic fertilizer helps restore the properties of soil structure and texture which was destroyed and notably producing eggplant using organic fertilizer or animal manure would reduce the dependency on synthetic fertilizer and improve soil health [7]. Organic manure increases the water holding capacity, makes the soil porous and convenient for the movement of air, and increases the activities of soil friendly microorganisms [3]. The human beings nowadays have turned towards natural manure, which has not only increased their yield, but also improved human health by using organic fertilizers fruits and vegetables in daily diets [12]. Eggplants contains numerous nutrients, needed in the body predominantly for growth, repair of worn out tissues and for protection. Primarily eggplant is hub of vitamins and minerals, dietary fiber, proteins, antioxidants, as well as phytochemicals that possess antioxidant activity [8]. The eggplants could build effective responses at the morphological, physiological and biochemical level enabling them to enhance abiotic stress tolerance. Adaptation of eggplant to the stress conditions achieved with the identification of stress tolerant traits or varieties, and crossing of eggplant with the wild eggplant varieties, regarded as tolerant [5]. The objective of this research work was to determine the effects of watering intervals

at different levels of treatments on plant height, fruit number, stem diameter, fruit weight and yield.

## 2. Materials and Method

### 2.1. Experimental Site

The field experiment conducted at Wellingara model horticulture centre in the West Coast Region (WCR) of the Gambia. The land preparation started in the month of November 2023 followed by transplanting after few weeks of sowing. The duration of the field experiment was four (4) consecutive months from November to March respectively. The climatic condition was favourable when temperatures were ideal for the cultivation of vegetable crops especially eggplant. The optimal temperature for the crop is 23 to 25 degree C during the day and 18 to 25 C during the nights. The optimum pH of the soil is between 5.5 and 6.8. The soil characteristics of the field experiment was observed and was found to be sandy loam and clay loam soils with high micro nutrient content. The experiment was limited only to evaluating the height, fruit weight, fruit numbers, fruit diameter, and yield of eggplant.



*Figure 1. Shows the planting stage.*



*Figure 2. Shows the vegetative stage.*



**Figure 3.** Reproductive stage.

## 2.2. Design of the Field Experiment

The field experiment was in a Randomized Complete Block Design (RCBD) prepared in four (4) replicates with different treatments. T1 daily watering, T2 weekly watering T3-two (2) days of watering and T4 three (3) days of watering. There was

four (4) treatments and four (4) beds per treatment resulting to sixteen (16) beds. The bed size of the experiment was 2 x 3 meters with a plant spacing of 50 cm by 50 cm. The “Kalenda” variety was use for the field experiment with a plant population of ninety-six (96) in all the treatments/replicates. Further, forty-eight (48) kilograms of animal manure applied to enhance soil health, water absorption capacity and soil aeration. Statistical Analysis One-way analysis of variance (ANOVA) used to determine the significant differences among treatments in a randomized complete block design.

## 3. Results and Discussion

In the field of agronomy, children, young women and pregnant mothers because of its nutritive value in rural communities usually consumed eggplant [12]. The result in Table 1 shows the average plant height of 18.3, 21.0, 31.6, and 23.4 cm respectively. However, daily watering of eggplants both morning and evening was not favourable for growth, resulting to roots blockage, inhibits root respiration, leaves drop off, wilting, undersized fruits, cracking or showing blossom end rot. Significant differences among treatments on the plant height of eggplant was observe on treatment 4 that is watering after every two (2) days [10].

**Table 1.** Average plant height of eggplant (cm).

Treatment	Parameters	Average height	Total height
1	Control	18.3 cm	183
2	Weekly	21.0 cm	210
3	3 days	23.4 cm	23.4
4	2 days	31.6 cm	31.6

The schedule time of watering intervals and application of animal manure to eggplant was vital for crop growth and yield performance. In Table 2, the highest fruit number of six (6) was noticed in T2 and T3 followed by four (4) which was T4 while the lowest fruit number of two (2) was found in T1. Importantly, apart from the benefits of watering at intervals of plant growth by extension application of animal manure also increases flowering time, fruit production but also enhances the process of photosynthesis as an integral part of physiology because of its mineral composition [11]. Furthermore, data analysis shows that, the highest number of

fruit diameter was in T4 followed by T3 while the lowest fruit number registered in T1 that is the control. The eggplant fruit and stem diameter indicates significant difference between treatments of watering intervals [13]. The study shows that highest stem diameter was 3.0a cm and the least stem diameter was 2.6a cm. However, the implication of this research findings results to watering intervals of different treatment meaning that continuous watering of eggplant without intervals would have adverse effect on the performance of growth and yield [1].

**Table 2.** Fruit number/egg-plant (cm).

Treatment	Parameters	No of fruits/plant	Fruit diameter (cm)	Stem Diameter (cm)
1	Control	2.0 <sup>c</sup>	20.0 <sup>c</sup>	2.6d
2	Weekly	6.0 <sup>a</sup>	18.0 <sup>d</sup>	2.8c
3	3 days	6.0 <sup>a</sup>	25.0 <sup>b</sup>	3.0a
4	2 days	4.0 <sup>b</sup>	35.0 <sup>a</sup>	2.9b

In agronomy watering vegetable crops is a major indicator of physiologically process to tissue development and dissolves salts, sugars and other properties from cell to cell, organ to organ, and essential for the maintenance of the turgidity necessary for cell enlargement and growth, dry matter and growth characters [2]. The result in Table 3 shows that, increasing watering on weekly and every two (2) days was attributed to the responding characters of values such as fruit

weight 0.11 and 0.16 kg while the least weight was 0.05 respectively. Further, the result reveals that, eggplant positively responded very well by increasing the application of animal manure yields to the highest value of 0.41 as per total fruit weight. According to [14] the increase in fruit weight can also be associated to the increment in fruit size applied with animal manure to enhance the growth of eggplant.

**Table 3.** Fruits weight of eggplant.

Treatment	Parameters	Fruit weight (kg)/plant	Average yield (kg)/plant	Total weight/kg
1	Control	0.05 <sup>c</sup>		
2	Weekly	0.11 <sup>a</sup>		
3	3 days	0.16 <sup>a</sup>	0.10	0.41
4	2 days	0.08 <sup>b</sup>		

## 4. Conclusion and Recommendation

In the rural communities, vegetable cultivation particularly eggplant is widely grown by women farmers to enhance their livelihood. The government had set high premium priority on horticulture production as it contributes 5% to Gross Domestic Product (GDP) while serving as income generating activities for women and youths. The objective of this research work was to determine the effects of watering intervals at different levels of treatments on plant height, fruit number, stem diameter, fruit weight and yield. In the field of agronomic practices water and nutrient is essential for the process of photosynthesis and maintenance of crop growth. The watering systems at different intervals of watering registered significant results amongst different treatments. The result shows the average plant height of 18.3, 21.0, 31.6, and 23.4 cm respectively. In conclusion, from all the treatments, watering of egg-plant on every three (3) and two (2) every two days would enhance different vegetative process and yield characteristics like plant height, number of fruits, fruit diam-

eter, fruit weight, and stem diameter, enhance nutrient uptake by the plants. Thus recommend, more research work on different parameters of watering intervals using different varieties of eggplants and application of organic fertilizer to treatments.

## Abbreviations

ANOVA	One-Way Analysis of Variance
GDP	Gross Domestic Product
RCBD	Randomized Complete Block Design
WCR	West Coast Region

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## Conflicts of Interest

The authors declare no conflicts of interest.

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