



Influence of Light Intensity and Growing Media on the Growth and Yield of *Solanecio biafrae*

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Abstract

This study was carried out to investigate the effects of light intensity and growing media on the growth and yield of *Solanecio biafrae*. It was a factorial experiment which involved using three light regimes which include; half shade (HS; 600 flux), more intense shade (MIS; 63.6 flux), and full light (FL; 1120 flux), and four growing media; rice husk + cocopeat (M1), rice husk (M2), biochar (M3), and topsoil (M4). Light intensity significantly influenced performance in which HS produced the highest leaf production (23.38), MIS induced greater stem elongation (35.31 cm) but reduced biomass, while FL resulted in the lowest leaf number and height (20.88 and 20.69). Growing media effects were also observed where biochar (M3) and rice husk + cocopeat (M1) enhanced leaf number height, and fresh weight, rice husk (M2) and topsoil (M4) performed less. A strong interaction between light and medium was observed, with HS × biochar and HS × M1 performing better in terms of growth and yield, while MIS × topsoil performed less. Overall, *S. biafrae* performed optimally under moderate shade combined with nutrient-rich organic substrates; this is consistent with its natural adaptation to shaded plantation environments. These findings provide a basis for sustainable domestication and improved cultivation of this underutilized vegetable.

Keywords: *Solanecio biafrae*, indigenous vegetable, light intensity, growing media, domestication.

Introduction

Solanecio biafrae (family Asteraceae) [1] is an underutilized indigenous leafy vegetable widely consumed in parts of West and Central Africa. In southwestern Nigeria, it is locally known as worowo, while in Sierra Leone, it is referred to as bologi. The plant is predominantly found under the shade of tree crops and is commonly cultivated beneath cocoa and oil palm plantations, where the humid, well-drained, and fertile soils favour its growth [2]. Despite its nutritional and economic potential, cultivation of *S. biafrae* remains limited to small-scale production in Nigeria, Uganda, and Cameroon [2]. Its production is further constrained by environmental and agronomic challenges, leading to irregular production and threatening its availability [3].

The domestication and large-scale cultivation of *S. biafrae* is therefore crucial to ensure consistent production and to promote its utilization as a sustainable food resource. Among the factors that determine its growth performance are light intensity and growing medium. Light serves as the primary energy source for photosynthesis and is a major driver of plant growth and development. [4]. Suboptimal light conditions can limit crop performance, whereas adequate light promotes photosynthetic activity and vegetative growth. Previous research has shown that low to moderate light intensity can enhance leaf production in *S. biafrae* [5]. In addition to light, the choice of growing medium influences nutrient availability, root development, and overall yield, making it a key determinant of successful vegetable production.

Despite these perceptions, limited research has investigated the

combined effects of light intensity and growing media on the performance of *S. biafrae*. This study was therefore conducted to examine the influence of varying light intensities and growing media on the growth and yield of *S. biafrae*, with the aim of identifying optimal production conditions for sustainable cultivation.

Objectives

The primary objective of this study was to evaluate the effects of different light intensities and growing media on the growth and yield of *Solanecio biafrae*. Specifically, the study was aimed at:

1. Assessing the individual effects of light intensity and growing media on leaf number, plant height, and fresh weight.
2. Examining the interaction between light intensity and growing media on growth and yield performance

Materials and Methods

Experimental Site

The study was conducted at the teaching and research farm of the Faculty of Agricultural Sciences, Ekiti State University (EKSU), Ado Ekiti, located in the southwestern region of Nigeria characterized by a humid tropical climate rainforest zone. The area experiences a bimodal rainfall pattern, with an annual average rainfall of 1,200–1,500 mm and temperatures ranging between 25°C and 30°C. The experimental period lasted for two months.

Planting Material

Healthy stem cuttings of *Solanecio biafrae* were collected from

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established local farms in the vicinity and were sterilized in a solution of food-grade hydrogen peroxide before planting.

Experimental Design

The experiment was laid out in a factorial arrangement (3×4) in a completely randomized design (CRD), with three replications. The factors were:

Light intensity: half shade (HS; 600 flux), more intense shade (MIS; 63.6 flux), and full light (FL; 1120 flux).

Growing media: rice husk + cocopeat (M1), rice husk alone (M2), biochar (M3), and topsoil (M4).

Treatments and Management

Shade intensities were achieved using different tree stands of diverse shades and an open field, while flux values were measured using a light meter. Growing media were prepared in equal proportions by volume. Plants were transplanted into growing bags each containing 5 kg of medium

Data Collection

Growth and yield parameters were recorded at 8 weeks after planting (2 months). Measurements included:

Number of leaves:

Plant height (cm): measured from the soil level to the apical bud.

Fresh weight (g): determined by harvesting and weighing shoots immediately after collection.

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) using IRRISTARS software version 2.0.1.

RESULTS

Effect of Light Intensity on Growth and Yield of *Solanecio bialfrae*

Light intensity significantly influenced plant growth and yield (Table 1). Plants under half shade (HS; 600 flux) produced the highest number of leaves (23.38), followed by more intense shade (MIS; 63.6 flux; 21.62), while full light (FL; 1120 flux) recorded the lowest (20.88). Plant height was greatest under MIS (35.31 cm), intermediate under HS (24.44 cm), and lowest under FL (20.69 cm). Fresh weight was similar under FL (20.77 g) and HS (20.10 g), but significantly lower under MIS (13.99 g).

Effect of Growing Media on Growth and Yield

Growing media also had a marked effect on plant performance (Table 1). Biochar (M3) and rice husk + cocopeat (M1) supported the highest leaf numbers (26.33 and 25.25, respectively), plant heights (32.00 and 31.33 cm), and fresh weights (21.27 g and 22.39 g). In contrast, rice husk alone (M2) and topsoil (M4) resulted in significantly fewer leaves (17.92 and 18.33), shorter plants (22.42 and 21.00 cm), and lower biomass (15.49 g and 14.00 g).

Interaction of Light Intensity and Growing Media

Significant interactions were observed between light intensity and media (Table 2). Under HS, biochar (HS $\times$ M3) produced the highest leaf number (31.00) and plant height (62.75 cm), while HS $\times$ M1 gave the greatest biomass (24.90 g). Under MIS, rice husk + cocopeat (MIS $\times$ M1) supported the highest leaf.

Table 1: Main Effects of Light Intensity and Media on Growth and Yield of *Solanecio Bialfrae*

FACTORS	PARAMETERS		
	Number of leaves	Plant Height (cm)	Plant Weight (g)
LIGHT INTENSITY			
FL	20.88b	20.69c	20.77 a
HS	23.38a	24.44b	20.10 a
MIS	21.62b	35.31a	13.99b
MEDIA			
M1	25.25a	31.33 a	22.39a
M2	17.92ab	22.42 b	15.49b
M3	26.33a	32.00 a	21.27a
M4	18.33b	21.00 b	14.00b

M1 = Rice husk + Cocopeat, M2 = Rice husk, M3 = Biochar, M4 = Top soil, FL = Full light, HS = Half Shade, MIS = More Intense shade number (33.00), although fresh weight remained lower than in HS treatments. The poorest performance was recorded under MIS $\times$ M4, with only 11.75 leaves, 11.65 cm height, and 4.30 g biomass.

Table 2: Effect of Interaction of Light Intensity and Media on Growth and Yield of *Solanecio Bialfrae*

LIGHT	Media	Number of leaves	Plant Height (cm)	Plant Weight (g)
FL	M1	22.00b	21.96a	20.50a
	M2	20.25d	19.50a	23.80a
	M3	24.75b	19.05a	19.75a
	M4	16.50d	14.00b	19.05a
HS	M1	20.75c	37.50b	24.90a
	M2	15.00d	52.00ab	10.70c
	M3	31.00a	62.75a	26.12a
	M4	26.75b	25.50c	18.67b
MI(SHADE)	M1	33.00a	8.25c	21.77a
	M2	18.50d	11.50b	11.97c
	M3	23.25b	13.75a	17.92b
	M4	11.75d	11.65b	4.30d

M1 = Rice husk + Cocopeat, M2 = Rice husk, M3 = Biochar, M4 = Top soil, FL = Full light, HS = Half Shade, MIS = More Intense Shade

Discussion

The findings highlight the role of light intensity in determining the performance of *S. bialfrae*. Moderate shading (HS) enhanced leaf production compared to FL and MIS, backing up earlier work by [5]. The improved performance under HS likely reflects reduced photo-inhibition and increased leaf expansion efficiency. Plant height was greatest under MIS, a typical shade-avoidance response where limited light availability induces stem elongation to maximize light capture [6]; however, this elongation did not translate into greater biomass, as excessive shading compromised assimilate production.

Growing media also strongly influenced growth and yield. Biochar and rice husk + cocopeat consistently supported more vegetative growth, likely due to improved nutrient retention, aeration, and water-holding capacity. Similar benefits of organic substrates for vegetable production have been widely reported [7]. In contrast, rice husk alone and topsoil yielded poor growth, likely reflecting low nutrient availability and suboptimal physical structure.

The interaction effects emphasized the importance of optimizing both environmental and substrate conditions. HS combined with biochar and rice husk + cocopeat provided the most favorable conditions for growth and biomass accumulation, while MIS with topsoil limited performance. The overall results align with the plant's natural adaptation to shaded, fertile environments beneath plantation canopies such as cocoa and oil palm [5].

Mainly, the study demonstrates that *S. bialfrae* performs best under moderate shade coupled with nutrient-rich organic substrates.

Conclusion

This study demonstrates that the growth and yield of *Solanecio biafrae* are strongly influenced by both light intensity and growing media. Moderate shade (HS; 600 flux) consistently enhanced leaf production and biomass accumulation compared to full light and more intense shade, while biochar and rice husk + cocopeat provided superior growth media. Significant interaction effects further revealed that the combination of moderate shade with nutrient-rich substrates produced the most favorable outcomes, whereas excessive shading and poor substrates severely limited performance.

Therefore, *S. biafrae* thrives best under moderately shaded environments with organic-based growing media, showing its natural adaptation to plantation understorey conditions.

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