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Short Communication

Performance of selected leafy vegetables under different shade levels

Anusiya M.* and Sivachandiran S.
Department of Agronomy, Faculty of Agriculture, University of Jaffna, Sri Lanka
anugobalakrishnan91@gmail.com

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Abstract

Cultivation of Leafy vegetables under shade house could be used to improve yield quantity and quality. Performance of leafy vegetables under different shade levels was studied from March to May of 2016 at Integrated Farm and Training Centre, Kanakarayan Kulam, Vavuniya, Sri Lanka. The experiment was arranged in randomized complete design with three replicates. Four types of leafy vegetables; Centella asiatica (Vallari), Amaranthus tricolor (Keerai), Ipomoea aquatic (Water spinach) and Lactuca sativa (Lettuce) were cultivated under 0%, 50% and 75% with three replicates. Evaluation was done based on the parameters of growth such as plant height, number of leaves, stem length, leaves to stem ratio and leaf area, yield and sensory attributes. The data were assessed through ANOVA test by using SAS computer software package for growth and yield parameters and Kruskal-Wallis test was performed for sensory assessment. Result revealed that the 50% shade level significantly increase the growth and yield of C. asiatica, A. tricolor and L. sativa, where 0% shade level enhance the growth and yield of I. aquatic. Similar correlation which was observed on the leafy vegetables in the sensory evaluation. Overall performance of the foliage was differed with different levels of shade. Therefore, it can be concluded that growth and yield of leafy vegetables were greatly influenced by 50 % shade level except I. aquatic. Present study suggest that Adoption of shade house techniques for leafy vegetables cultivation could improve overall growth and total yield to the farmers in vavuniya district.

Keywords: Growth, leafy vegetables, sensory evaluation, shade level, yield.

Introduction

Leafy vegetables are commonly defined as the fresh and edible leaves of herbaceous plants, which can be eaten raw or cooked[1]. Green leafy vegetables are excellent source of fiber, carotenoids, folate, vitamins C, Vitamin K, minerals, iron and calcium along with saponins and flavonoids[2]. In Sri Lanka recently the demand of leafy vegetables has increased due to increment in the consumer incomes and the widening of dietary diversity[3].

"Light is one of the most important environmental factor, as it is influencing much on the photosynthesis and its primary metabolites in plants"[4]. In green houses, the growth of the plant and productivity is limited by light quantity[5]. Yield quantity and quality can be increased when the cultivation is done under the protected houses[6]. The productivity and quality of vegetables under field conditions are influenced by abiotic and biotic stress where in protected cultivation no more influence of biotic and abiotic stresses over productivity and quality of vegetable.

Cultivation of vegetables under protected house could be used to improve yield quantity and quality[7]. Due to the above reasons, nowadays most of the farmers growing the leafy vegetables under protective structure, especially in large net houses. However profitability in protected cultivation depends on the choice of structure, selection of crop, and selection of varieties, production technology and market price. Based on above reasons, this experiment was designed to evaluate the performance of the leafy vegetables under different shade level in summer season.

Methodology

Leafy vegetable of *C.asiatica*, *A.tricolor*, *I. aquatic* and *L.sativa* were selected for the experiment which was conducted in *complete randomized design* with three replicates. Following treatments were used in this experiment such as 0% shade level (Open field), 50% shade level and 75% shade level.

Area of each treatments were $50m^2$. Each treatment area was further divided into 12 plots of 1.5m×1m size to accommodate the treatments. Seedlings of *C. asiatica* were planted at the spacing of 15cm×15cm at the rate of 2 seedlings per hill. Seeds of *I. Aquatica* and *L. sativa* were sown at 30cm×30cm spacing. Seeds of A. tricolor were broadcast in rows after the mixing with fine soil for well distribution and covered with fine soil. After planting each plot of open field was covered with banana leaves until they germinate. Each bed was kept Moist until plants established well. After planting the soil surface was kept in wet condition, but excess watering was avoided. Watering was done by watering can. Watering was done 2 times per day until they established well.

Five plants were randomly selected and from which, all Growth parameters such as leaf area, plant height, and leaves stem ratio, number of leaves, stem length and number of shoots and yield parameters were measured. Sensory evaluation was done by using sensory evaluation card. Suitable shade level for each leafy vegetables was selected according their preference level based on hedonic scales were used. Sensory characters of colour, leaves and stem based on the appearances of crop were evaluated for each crop.

Results and discussion

On the basis obtained parameters, there was significant variation in many vegetative growth traits and yield of leafy vegetables under different light intensity.

Parameters such as leaves stem ratio, leaf area, number of shoots and yield of *I. aquatic* were decreased with increasing shade level except plant height. *I. aquatic* performed well under 0% shade level (open field condition) than other shade levels. Sensory attributes of *I. Aquatic* showed that panellist rated that open field was a good for appearance of leaf colour, stem size and overall sensory attributes (Figure-1).

Study on *L. Sativa* showed that leaves number, leaf area and yield were significantly high at 50% shade level. *L. Sativa* performed well under open 50% than other shade levels (Table-1). Same results were observed in sensory analysis which showed that leaf colour, stem size and overall appearance were high at 50% of shade level (Figure-2). This might be due to better vegetative growth of plant due to low light intensities as compared to other situations[8].

Study on *C. asiatica* showed that leaves stem ratio, leaf area, leaves number, stem length and yield were high at 50% shade level. However, plant height, leaf to stem ratio and leaf area of *C. asiatica* were not significantly differed at both 50% and 75% of shade level but yield was significantly high at 50% shade level (Table-1). In sensory analysis of *C. asiatica* showed that leaf size and overall acceptance were high at 50% shade level (Figure-3).

Study on *A. tricolor* showed that plant height, leaves number, leaf area and yield were high at 50% shade level except leaf to stem ratio (Table-1). In correlation with sensory analysis, this showed that the stem and overall appetences of A. Tricolor was high at 50% than other shade levels except leaf colour (Figure-4).

Conclusion

Result of these investigations revealed that Leafy vegetable production significantly influenced by ambient environment. Growing of leafy vegetables under shade net was greatly influenced on growth and yield. The study shows that *C. asiatica*, *A. tricolor* and *L. Sativa* are suitable to cultivate under 50% shade for enhancing the growth and total yield while *I. aquatic* a indicates the need of full sunlight to performed well for the same attributes. Production of leafy vegetables significantly influenced by seasonality and weather conditions.

Table-1: The growth and yield parameters of leafy vegetables with different shade levels.

Leafy vegetable	Treatments (shade levels)	Plant Height (cm)	Leaves or shoots number	Leaves to stem ratio	Leaf area (cm^2)	Yield (kg/plot)
I.aquatic	0 %	51.43 ± 0.084^{c}	7.53 ± 0.06^{a}	1.91 ± 0.021^{a}	45.21 ± 0.67^{a}	1.83 ± 0.02^{a}
	50 %	70.98 ± 0.029^{b}	3.93 ± 0.06^{b}	0.80 ± 0.001^{b}	37.81 ± 0.59^{b}	1.643 ± 0.01^{b}
	75 %	85.41 ± 0.011^{a}	3.86 ± 0.06^{b}	0.75 ± 0.004^{c}	38.63 ± 0.55^{b}	1.41 ± 0.01^{c}
A.tricolor	0 %	14.36 ± 0.05^{c}	7.53 ± 0.06^{b}	1.16 ± 0.015^{a}	28.26 ± 1.02^{c}	0.29 ± 0.009^{c}
	50 %	29.68 ± 0.06^{a}	12.00 ± 0.11^{a}	0.93 ± 0.013^{b}	41.15 ± 0.45^{a}	0.84 ± 0.02^{a}
	75 %	20.28 ± 0.07^{b}	7.66 ± 0.06^{b}	0.69 ± 0.011^{c}	37.00 ± 0.32^{b}	0.57 ± 0.01^{b}
C.asiatica	0 %	3.37 ± 0.06^{b}	14.35 ± 0.25^{b}	1.44 ± 0.011^{b}	19.91 ± 0.14^{b}	0.05 ± 0.01^{c}
	50 %	16.73 ± 0.29^{a}	17.65 ± 0.02^{a}	1.55 ± 0.021^{a}	24.08 ± 0.08^{a}	1.19 ± 0.03^{a}
	75 %	16.62 ± 0.19^{a}	14.67 ± 0.16^{b}	1.54 ± 0.013^{a}	23.77 ± 0.127^{a}	0.95 ± 0.01^{b}
L.sativa	0 %	-	3.73 ± 0.13^{c}	-	28.26 ± 1.02^{c}	0.78 ± 0.011^{c}
	50 %	-	13.42 ± 0.13^{a}	-	195.85 ± 2.06^{a}	1.62 ± 0.02^{a}
	75 %	-	10.53 ± 0.17^{b}	-	163.36 ± 2.02^{b}	1.09 ± 0.02^{b}

Note: Means with the same letter were not significantly different at $\alpha=0.05$.

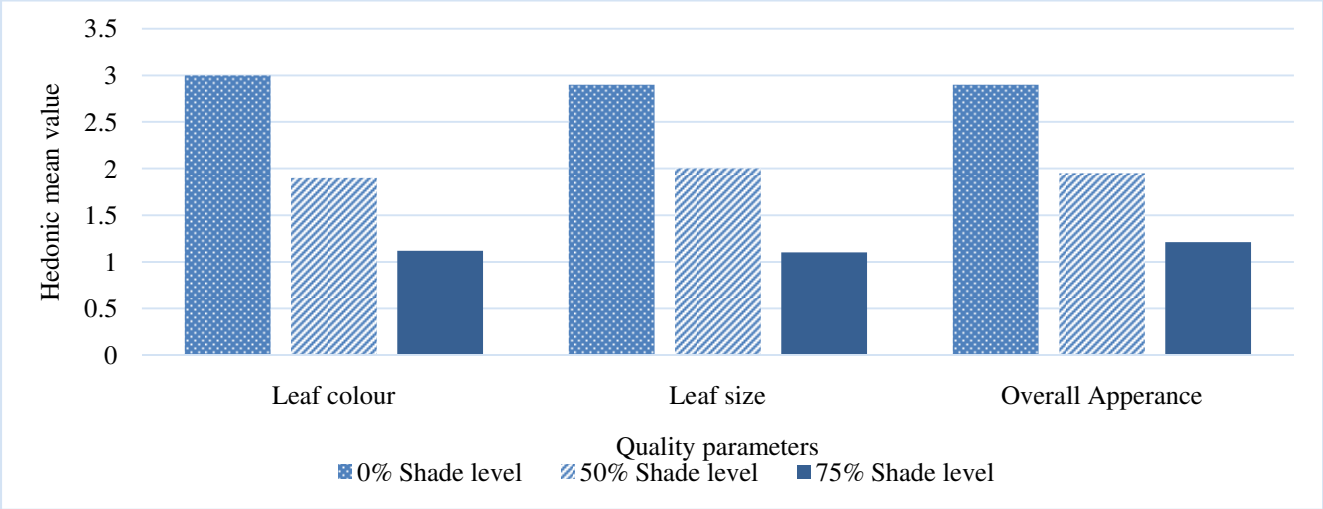

Figure-1: Result of sensory evaluation of *I. aquatic*.

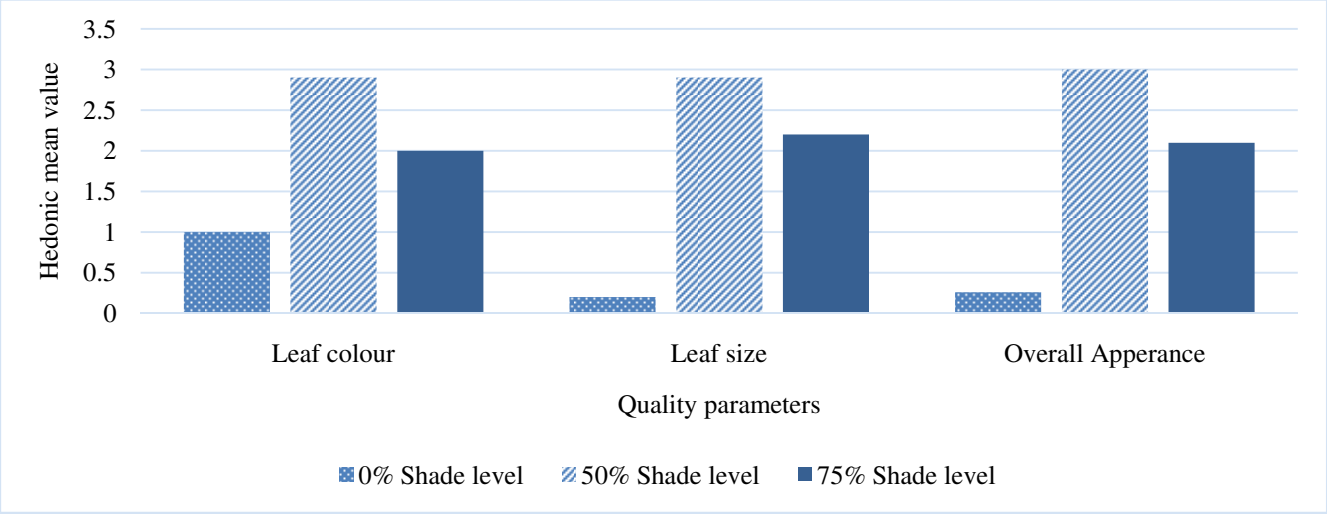

Figure-2: Result of sensory evaluation of *L. sativa.*

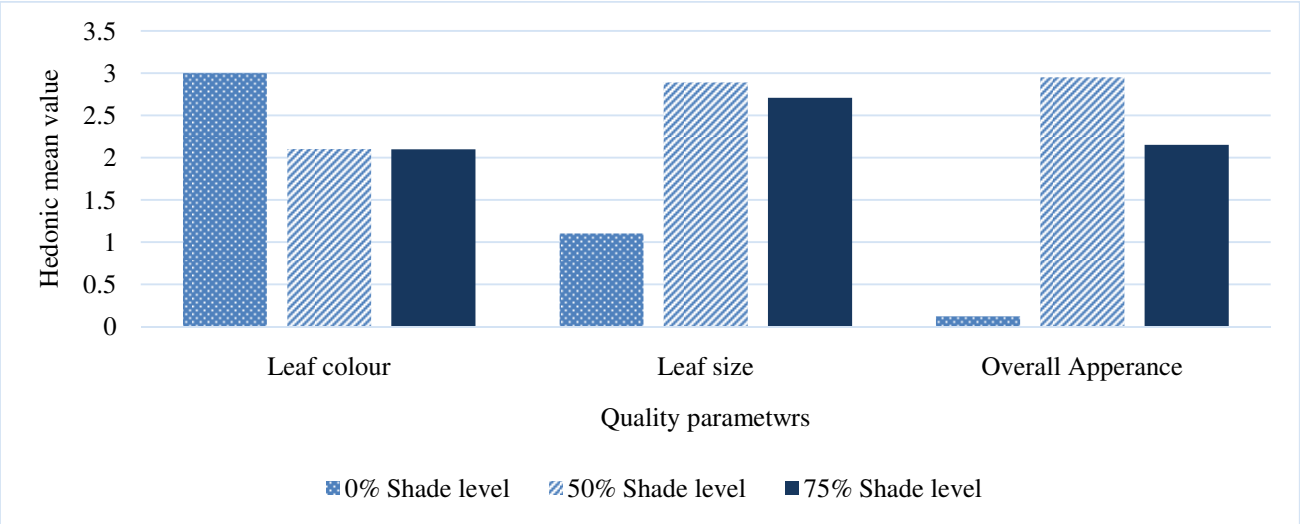

Figure-3: Result of sensory evaluation of *C. asiatica.*

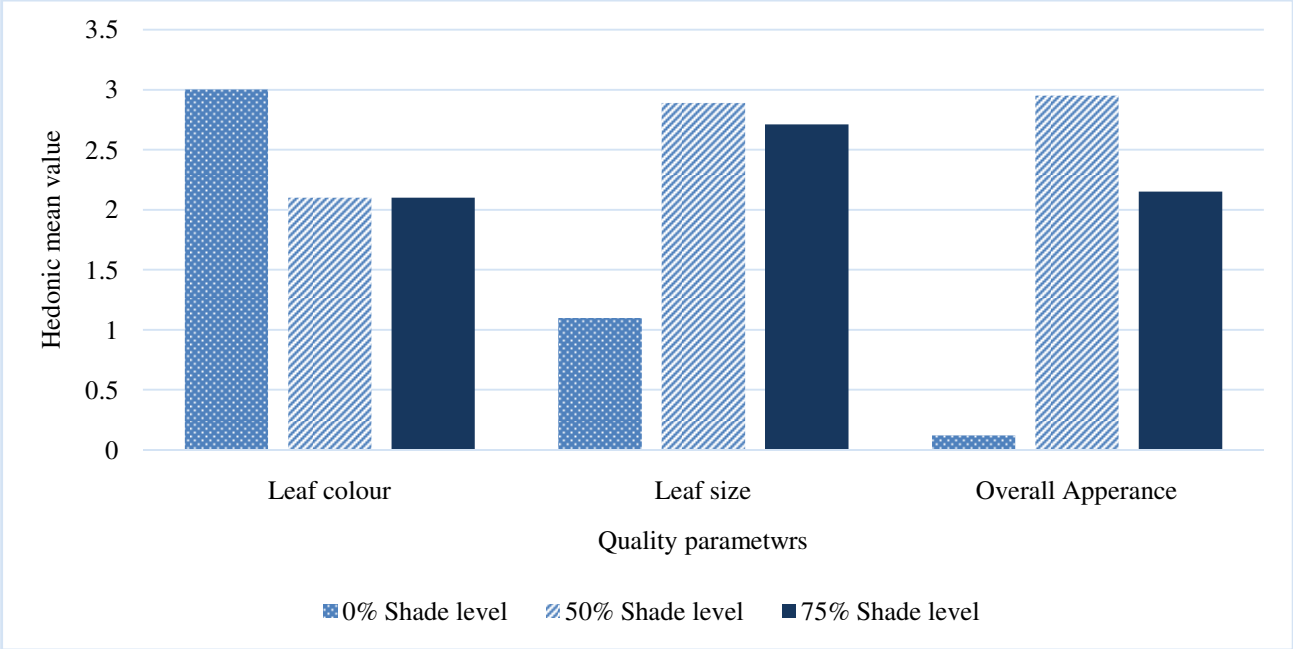

Figure-4: Result of sensory evaluation of *A.tricolor.*

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