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# Propagation of Black Nightshade (*Solanum Nigrum L.*): Effect of Light and Shade

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## Abstract

*Solanum nigrum L.*; black nightshade has been extensively used in traditional medicine to cure liver disorders, chronic skin ailments, inflammatory, menstrual pain, fever etc. This study was conducted to provide the most effective means of propagating *S. nigrum* and to evaluate the effect of light and shade on the *S. nigrum* seedling. Seeds, branches and stem cuttings are the treatments for the experiment, denoted as T1, T2 and T3 respectively. Thirty (30) seeds, branches and stem cuttings each were planted in 90 perforated polythene bags respectively, arranged in Complete Randomized Design (CRD) and replicated three times. The parameters assessed at maturity include; number of leaves, number of fruits, number of branches, shoot length, plant height, leaf area. Chlorophyll content, fresh leaf weight, fresh fruit weight, dry leaf weight, dry fruit weight, dry root weight, fresh root weight, fresh shoot weight, dry shoot weight were evaluated on the seedling subjected to light and shade. The result showed that the growth parameters determined were significantly higher at ( $p \leq 0.05$ ) in plants propagated by stems than those propagated by branches and seeds. Plants grown under light regime displayed the highest weight and chlorophyll content than those plants under shade regime. It can therefore be concluded that *S. nigrum* should be propagated by stem and also, the vegetable is a light loving-plant.

**Keywords:** Inflammatory; Stem cuttings; Light; Chlorophyll content; Shade

## Introduction

The black nightshade (*Solanum nigrum L.* and related species) are worldwide weeds of arable land, gardens, rubbish heaps and soils rich in nitrogen, in moderately light and warm situations which occur from sea to montane level. Recent studies on agro-pastoral societies in Africa indicate that these plant resources play a significant role in nutrition, food security and income generation [1-4]. It is therefore, worthwhile to note that the incorporation or maintenance of edible wild and non-cultivated plant resources could be beneficial to nutritionally marginal

populations or to certain vulnerable groups within populations, especially in developing countries [5].

Agricultural development and cultivation in developing countries are primarily based on subsistence crops and edible wild plant species, and only secondarily on the cultivation or utilization of a wide diversity of food crops whose total number of species is large [6-10]. However, dietary utilization of non-domesticated plants has received little attention and dramatic narrowing of the food base in many traditional societies has occurred. The domestication and cultivation of wild edible plants are, therefore essential to increase the food base in developing countries. This will lead to diversification which will ensure dietary balance and the intake of essential micronutrients.

Owing to lack of documentation of their total yields and sales, such traditional leafy vegetables have been regarded as minor crops and have been given low priority in most agronomic research and development programmes. These vegetables are widely used as leafy herbs or vegetables, as source of fruit and various medicinal purposes. Therefore, human consumption of their leaves and fruits as food is widespread, particularly in Africa and SE Asia [11,12].

These species are only semi cultivated in a few countries in Africa and Indonesia, and are largely utilized as a vegetable and fruit source through harvesting from plants growing spontaneously as weeds in cultivated field or in weedy plant communities, under trees, along fences and roads, in shaded area, near buildings and on wasteland.

Unfortunately, there is confusion over the propagation of *Solanum nigrum* because despite the propagation of these vegetables by seeds, there is still scarcity of these relish vegetables. The objectives of this research are to determine the most effective means of propagating *Solanum nigrum* and to evaluate the effect of light and shade regime on *Solanum nigrum* seedlings.

## Materials and Methods

### Experimental site

The experiment was carried out on the field of the department of Plant Science Biotechnology, Adekunle Ajasin University, AkungbaAkoko, Ondo State. The town, AkungbaAkoko lies on latitude  $5^{\circ}30^{\prime}E$  of the equator and longitude  $7^{\circ}22^{\prime}N$  of the Greenwich meridian the northern part of Ondo state and it experiences both the rainy season which last for the period of six months from the month of April to the month of September as well as the dry season which also last for six months from the month of October to March. The annual rainfall ranges from 1000 mm to 1200 mm and the average temperature is about  $26^{\circ}C$ .

### Experimental design

The layout of the experiment was Completely Randomized Design. The three treatments (i.e. stems, branches and seeds) were planted out on the field with three replicates each. Each replicate (for each treatment) consisted of 10 plants each to make a total of 30 plants per treatment and 90 plants altogether on the experimental field.

### Planting

The seeds which were embedded in the berries were first extracted by washing them off the mucilage to prevent the seeds from decaying, airdried for four days and were sown in the perforated bags filled with the topsoil.

The branches and the stem cuttings were planted in the perforated bags filled with the topsoil at an angle of  $45^{\circ}$  in order to pave way for the formation of the root.

### Experimental regimes

After 9 weeks when the plants have attained maturity, the plants were divided into two groups. Group A, for those plants under light (open field) with an average light intensity of 978,000lux and for Group B, for those plants under shade with an average light intensity of 15,125lux.

### Data collection

The parameters measured were number of leaves, number of branches, number of fruits, plant height, shoot length, leaf area, chlorophyll content, fresh root weight, fresh shoot weight, fresh leaf weight, fresh fruits weight and the dry leaf weight, dry root weight, dry shoot weight and dry fruits weight.

## Result

The plants propagated by the stems were observed to have higher number of leaves (70.03), followed by those plants propagated by branches (38.57) while those plants propagated by seeds had the lowest number of leaves (33.80). Plants propagated by the branches were observed to have the highest number of branches (1.93). Also, the number of branches were

higher in those plants propagated by the stems (1.80) than those propagated by the seeds (1.63). However, the differences were not significant (Table 1).

**Table 1.** Effects of Three Treatments (Stem, Branches and Seeds) on the Number of leaves and Number of branches of *Solanum nigrum L.*

	Stems	Branches	Seeds
Number of leaves	$70.03 \pm 8.42^b$	$38.57 \pm 4.14^a$	$33.80 \pm 1.72^a$
Number of branches	$1.80 \pm 0.06^c$	$1.93 \pm 0.09^b$	$1.63 \pm 0.03^a$

Plants propagated by branches and stem cuttings displayed the highest plant height than those plants propagated by seeds (23.43). Plants propagated by stems had the highest shoot length (7.63), followed by those propagated by branches (6.07) and there was significant ( $p \leq 0.05$ ) difference. Therefore those plants propagated by seeds displayed the lowest shoot length the lowest (5.93) (Table 2).

**Table 2.** Effects of Three Treatments (Stem, Branches and Seeds) on the Shoot height of *Solanum nigrum L.*

	Stem	Branches	Seeds
Shoot height	$7.63 \pm 0.41^b$	$6.07 \pm 0.37^a$	$5.93 \pm 0.22^a$

There was an increase in the number of fruits in the plants propagated by the stems (85.07) than those plants propagated by the branches (6.80) and seeds (4.37). Leaf area of the plants propagated by the stems was higher (8.17), followed by those propagated by the branches (6.80) and the seeds had the lowest leaf area (4.37). However, there was no significant ( $p \leq 0.05$ ) difference (Table 3).

**Table 3.** Effects of Three Treatments (Stem, Branches and Seeds) on the Leaf area and Number of fruits of *Solanum nigrum L.*

	Stem	Branches	Seeds
Leaf area (cm <sup>2</sup> )	$8.17 \pm 0.48^c$	$6.80 \pm 0.21^b$	$4.37 \pm 1.03^a$
Number of fruit	$85.07 \pm 20.46^a$	$65.50 \pm 1.95^a$	$46.33 \pm 5.18^a$

After 14 weeks, the results of the plant grown under light and shade were obtained. Plants under light yielded the highest fresh root weight (3.45) and dry roots weight (1.50) and were significantly ( $p \leq 0.05$ ) different than those plants under shade (Table 4).

**Table 4.** Synergistic Effects of Light and Shade on the Root fresh weight and Root dry weight of *Solanum nigrum L.*

	Light	Shade
Root fresh weight	$3.45 \pm 0.35^b$	$2.35 \pm 0.35^a$

Root dry weight	1.50 ± 0.20 <sup>b</sup>	0.70 ± 0.10 <sup>a</sup>
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All the plants under light had the highest fresh shoot weight (3.90) than those plants under shade (3.25) but there were no significant ( $p \leq 0.05$ ) difference in the dry shoot weight between the treatments (Table 5).

**Table 5.** Synergistic Effects of Light and Shade on the Shoot fresh weight and Shoot dry weight of *Solanum nigrum* L.

	Light	Shade
Shoot fresh weight	3.90 ± 1.39 <sup>b</sup>	3.25 ± 0.35 <sup>a</sup>
Shoot dry weight	1.20 ± 0.40 <sup>a</sup>	0.95 ± 0.25 <sup>a</sup>

Fresh fruits weight and dry fruits weight of plants under light were the higher (8.95) than those plants grown under shade (7.65). However, the differences were not significant (Table 6).

**Table 6.** Synergistic Effects of Light and Shade on the Fruit fresh weight and Fruit dry weight of *Solanum nigrum* L.

	Light	Shade
Fruit fresh weight	8.95 ± 0.35 <sup>a</sup>	7.65 ± 2.15 <sup>a</sup>
Fruit dry weight	3.40 ± 0.20 <sup>a</sup>	3.10 ± 0.67 <sup>a</sup>

It was observed that the leaves of plant under light were broad which therefore make the fresh leaf weight and dry leaf weight to be higher but not significantly different from those plants under shade (Table 7).

**Table 7.** Synergistic Effects of Light and Shade on the Leaf fresh weight and Leaf dry weight of *Solanum nigrum* L.

	Light	Shade
Leaf fresh weight	7.75 ± 1.85 <sup>b</sup>	3.75 ± 0.35 <sup>a</sup>
Leaf dry weight	1.75 ± 0.15 <sup>a</sup>	1.30 ± 0.20 <sup>a</sup>

An increase in the chlorophyll content was recorded from plants under light while those plants under shade had a slight decrease in chlorophyll content but there was no significant ( $p \leq 0.05$ ) differences between the treatments.

## Discussion

To overcome the scarcity of these vegetables and increase its productivity, it is pertinent to propagate it both sexually and vegetatively. Determination of the best means of propagation and evaluation of the effect of light and shade regime on *S. nigrum* will increase its propagation in most development programme. However, at variance with the report of Ruberte et al. that these traditional leafy vegetables have been given low priority in most agronomic research and development programme [11]. Analysis of variance among different agronomic traits has revealed high significant differences in the treatments used in this experiment.

The results obtained from the experiment showed that the number of leaves, fruits (which perhaps represent yield) and branches of the plants propagated by stem cutting were higher than those propagated by branches and seeds. This disagree with the result of Mwafusi that cuttings may be used as propagules though plants propagated in this way (branch), spread and yield less than those propagated by seed [12].

Also, it was observed that the plant height, leaf area and shoot length of the plants propagated by branches and stems were significantly different and higher than those plants propagated by seeds.

Dry leaf weight, dry fruits weight and dry root weight of the plants under light were higher than those plants under shade.

It was observed that fresh roots weight, fresh leaf weight, fresh shoots weight and fresh fruits weight of those plants under light regime were higher than those plants under shade. These results agree with the previous findings of Fawusi et al. that plants of *S. nigrum* would tolerate shade up to 60% but full sun (light) is beneficial to weight and growth [13]. This indicate that shade causes a decline in total plant weight and changes the distribution of the biomass.

This study showed that chlorophyll content of the plants under light was higher than those under shade. According to Taiz and Zeiger which found that that synthesis and degradation of the photosynthetic pigments are associated with the plants adaptability to different environments and that chlorophylls are usually synthesized and photo-oxidized in the presence of light [14]. Also, this conform with the work of Czczuga who showed that the highly pigmented leaves show higher light absorption efficiency per unit of leaf biomass, which may allow the plant to achieve better carbon balance under light [15-18].

## Conclusion

The result showed that plants propagated by stems are more productive than those propagated by branches and seeds. Also, plants under light regime yielded and have weight than those under shade.

It can therefore be concluded that *S.nigrum* should be propagated by stems and also, *S. nigrum* is a light loving- plant.

Considering the the range and diversity of the economic importance of these vegetables, it is recommended that the vegetables should be propagated under light (open field) by stem.

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