Morphological Variation in Bitter Leaf Accessions (*Vernonia amygdalina*) in Ifite-Ogwari, Southeastern Nigeria

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KEYWORDS

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ABSTRACT

In spite of the increasing relevance and benefits of bitter leaf, especially in southern part of Nigeria were the leaves are mostly used to prepare unique delicacy, there is still dearth information on the genetic variability among different Vernonia amygdalina found in Southern part of Nigeria especially Anambra State.The major aim of this work is to; assess the morphologicalcharacteristics of various accessions collected. Determine if variation in bitter leaf can be assessed by its morphological features. The research was conducted at the Teaching and Research farm of Crop Science and Horticulture, Nnamdi Azikiwe University, Ifite-Ogwari, Anambra state, Nigeria. The experiment was carried out as a Randomized complete block design (RCBD) which was replicated three times. Statistically there was no significant difference among the accessions. Ifite-Ogwari and Umunze gave a significant increase in both growth parameters and yield. Therefore, planting of the accessions respectively is well recommended for optimum production of bitter leaf plant in southern part of Nigeria.

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INTRODUCTION

Bitter leaf botanically known as *Vernonia amygdalina* is a small tree or shrub that is commonly found in the Sub-Sahara Africa (Echem and Kabari, 2013). Belonging to the family of Asteraceae, it can grow up to 10 m tall with petiole leaf of about 6 mm in diameter. The crop has been domesticated in various parts of West Africa including Nigeria, where it is locally processed and used as vegetable in soups (Etim*et al*., 2012; Habtamu and Melaku, 2018). The commercial production of bitter leaf has been established in Anambra State due to its nutritional, medicinal and economic values. Plant contains not only the active drug molecules but also other substances which are necessary for the maintenance of health and physiological functions of the body without manifestation of toxicity (Iwu, 2002). As a result of these, the crop serves as a low cost and readily available source of important nutrients to human when consumed (Ojiako and Nwanjo, 2006). The variation in the duration and habit of the various species of *V. amygdalina* is of taxonomic and horticultural importance. *Vernoniaamygdalina* (non-bitter variety) which is a perennial plant can be propagated through seedlings and has less longevity compared to that of *V. amygdalina* (bitter leaf). The non-bitter variety also does not need several washing in water to remove the bitter taste before it is used for soup. This research work will help in providing useful information to farmers, researchers and medical field in the selection of *V. amygdalina*based on their morphology and determine if the different varieties available for commercial production and research purpose can be identified based on the morphological features.

Therefore, the objective of this research is to assess the morphological and growth characteristics (such as plant height, leaf shape and colour, flowering, etc.) of various accession collected and also determine if variation in bitter leaf can be assessed by its morphological features.

MATERIAL AND METHODS

Experimental Site

The experiment was carried out at the Teaching and Research Farm of Crop Science and Horticulture Department, Nnamdi Azikiwe University Ifite-Ogwari, Anambra State. Ifite-Ogwari area in Anambra state is a tropical rain forest zone with temperature of about 6°C - 21°C. The area is located within latitude 6°38'11"N N and longitude 6°57'20"E with an altitude of 422 m and an average rainfall of 1650 mm to 2000 mm per annum. The experimental area is mostly, waterlogged during raining season and dominated with grasses, and the soil type have silt clay properties.

Planting Materials

Stem cuttings of bitter leaf were obtained from Awka zone (Nimo accession), Aguata zone (Umunze accession), Anambra West zone (Ifite-Ogwari accession) and Onitsha zone (Ogbaru accession) all from the different local government area in Anambra state. The stems were cut into an average of 15 -20 cm length bearing 4-5 nodes.

Treatments and Experimental Design

The experiment was laid out as a Randomized Complete Block Design (RCBD) with three replications.

Agronomics Practices/ Management

Land Preparation

The experimental site was mapped out using a measuring tape, ropes and pegs. The land were cleared of existing vegetation and the plant residues appropriately removed from the field.

Media composting

Poultry manure was incorporated and allowed to decompose for a period of one to two weeks on all beds measuring 1 m x 1.5 m each. Using 10kg of poultry manure per bed at 10-20% moisture content.

Planting

Planting commenced after the beds had been ploughed and soil amendments applied. The stem cuttings were inserted into the soil at 45° to the soil level, with at least two nodes inserted into the soil while two nodes remains exposed. Weeding was carried out 4 times after planting at two weeks interval manually.

Data collection

Data were collected on phenology; growth (plant height, stem girth, number of leaves, number of branching) and leaf yield (fresh leaf weight) at two weeks interval. Equipment/Implement to be used would include, automated weighing balance, verniercaliper, flexible meter rule, recording book, coverall and a pair of rain boot.

Harvesting commenced two months after planting, the leaves were harvested by hand and data were collected at 2 weeks interval.

RESULTS

Plant height (cm) of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting.

Table 1 shows the Plant height (cm) of bitter leaf at 3, 5, 7, 9, and 10 weeks after planting. There was no significant difference ($P>0.05$) in the plant height at 5 and 7 weeks among the accessions. However, at 9, and 10 WAP, plant heights of bitter leaf varied among accessions.At 5, 7, 9, and 10weeks after planting, the plant height progressively increased with increase in Ifite-Ogwari and Umunze accession. It was observed that the

mean values (5.86cm, 6.05cm, 7.70cm and 8.43cm) obtained with Umunze accession gave the highest mean of plant height. But the plant height were not significantly influenced by the various accessions.

Table 1: Plant height (cm) of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting (WAP).

Plant height (cm) of tallest branch in weeks after planting					
Accessions	**3 WAP**	**5 WAP**	**7 WAP**	**9 WAP**	**10 WAP**
Ifite-Ogwari	4.33	5.72	5.84	6.19	6.51
Nimo	4.17	5.53	4.38	5.90	6.68
Ogbaru	3.69	5.25	6.02	5.08	5.56
Umunze	4.06	5.88	6.05	7.70	8.43
$LSD_{0.05}$	ns	ns	ns	ns	3.103

Stem girth (mm) of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting.

The results in Table 2. shows the stem girth of the bitter leafaccessionsat 3, 5, 7, 9, and 10 weeks after planting. No significant difference (P>0.05) was observed in the stem girth at 9 and 10 weeks after planting with respect to the other weeks. At 3 weeks after planting,there was significant (P<0.05) differences in the stem girth.

At 9 weeks after planting, Ifite-Ogwari and Ogbaru produced the widest stems (21.2mm and 10.4mm), although there was no significant difference in the means with Nimo and Umunze. At 10 weeks after planting, it was observed that Ifite-Ogwari produced widest stem (6.22mm) even though the mean did not differ significantly (P>0.05) at Nimo, Ogbaru and Umunze accessions. However, at 5 and 7 weeks after planting, it can be observed that Nimo and Ogbaru were not significantly (P>0.05) differ in their means.

Table 2: Stem girth (cm) of bitter leaf at 3, 5, 7, 9, and 10 weeks after planting

Stem girth (mm) of tallest branch in weeks after planting					
Accessions	3	5	7	9	10
Ifite-Ogwari	2.017	3.20	3.28	21.2	6.22
Nimo	1.947	2.15	2.54	4.0	3.82
Ogbaru	2.070	3.96	3.85	10.4	4.17
Umunze	2.320	2.75	2.86	4.1	3.82
$LSD_{0.05}$	ns	ns	1.920	37.59	3.443

Number of leaves of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting (WAP).

Table 3, shows thenumber of leaves of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting. The number of leaves (on the tallest branch) was significantly (P<0.05) different among the accessions at 5, 7, 9, and 10 weeks after planting.

At 3 weeks after planting, the highest mean value of leaves (7.56mm) was obtained on Ifite-Ogwari accession though the means did not differ significantly at Nimo, Ogbaru and Umunze. At 7 and 9 weeks after planting, Umunze gave the highest mean of leaves (67.7mm and 65.7mm) while at 5 and 10 weeks after planting, the highest mean value of leaves (49.2mm and 49.8mm) was obtained at Umunze and Ifite-Ogwari. At 3, 5, 7, and 9 weeks after planting, there was significant (P<0.05) increase in the number of leaves for Ifite-Ogwari and Nimo compared to the Ogbaru and Umunze accessions that decrease from 7, 9, and 10 weeks after planting.

Table 3: Number of Leaves of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting.

Number of leaves on tallest branch in weeks after planting					
Accessions	3	5	7	9	10
Ifite-Ogwari	7.56	29.5	36.5	54.8	49.8
Nimo	5.56	22.8	33.5	46.2	39.6
Ogbaru	6.44	21.3	45.6	42.8	32.4
Umunze	7.11	49.2	67.7	65.7	48.2
$LSD_{0.05}$	ns	29.21	41.89	50.49	39.18

Number of Branchesof bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting.

The results in Table 4, shows the number of branches of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting. At 5weeks after planting there was a significant difference (P<0.05) between the accessions. From the result obtained, a progressive increase was observed at 3, 5, 7, and 9 weeks after planting on Ifite-Ogwari and Umunze accessions.

Table 4. Number of Branches of bitter leaf accessions at 3, 5, 7, 9, and 10 weeks after planting.

Number of branch weeks after planting					
Accessions	**3**	**5**	**7**	**9**	**10**
Ifite-Ogwari	2	3.5	3.5	4.67	3.67
Nimo	1.444	3.22	2.44	3.06	2.67
Ogbaru	1.556	2.82	3.5	3.19	2.39
Umunze	1.278	2.83	3.22	3.44	2.94
LSD0.05	ns	ns	2.209	2.93	ns

Fresh leaf weight (g) of harvested bitter leaf accessions at 7, 9, and 10 weeks after planting.

Table 5, shows the fresh leaf weight (g) of harvested bitter leaf accessions at 7, 9 and 10 weeks after planting (WAP). The fresh weight of leaves harvested at 9 and 10 weeks after planting were significantly (P<0.05) with the highest mean weight of fresh leaves observed with Ogbaru accession at 7.00g. The weight of fresh leaves harvested at 9 and 10 weeks after planting did not differ significantly (P>0.05), however the highest mean weight was also observed at Ifite-Ogwari and Umunze with 1.347g and 1.192g respectively. The total fresh leaf weight per plant gotten from harvested leaves at 7, 9 and 10 weeks after planting differed significantly (P<0.05) with Ogbaru having the highest mean weight (7.00g).

Table 5: Weight of leaf of bitterleafaccessions at 7, 9, and 10 weeks after planting.

Weight of leaves weeks after planting			
Accessions	7	9	10
Ifite-Ogwari	5.00	1.347	0.873
Nimo	1.00	1.185	0.716
Ogbaru	7.00	1.249	1.031
Umunze	2.00	1.274	1.192
$LSD_{0.05}$	9.50	0.384	0.2963

Total number of leaves of bitter leaf at 3, 5, 7, 9, and 10 weeks after planting.

Table 6, shows the total number of leaves of bitter leaf at 3, 5, 7, 9, and 10 weeks after planting. There was significant difference (P<0.05) in the total number of leaves at 3, 5 and 7 weeks among the accessions. However, at 9, and 10 weeks after planting, total number of leaves did not vary among accessions.At 3, 5, 7, 9, and 10 WAP, the total number of leaves progressively increased with increase in Ifite-Ogwari accession. It was observed that the mean values (112.3, 155.0, and 149.0) obtained with Umunzeaccession gave the highest mean for total number of leaves.

Table 6: Total number of leaves of leaf of bitter leaf at 3, 5, 7, 9, and 10 weeks after planting.

Total number of leaves weeks after planting					
Accessions	**3**	**5**	**7**	**9**	**10**
Ifite-Ogwari	22. 67	41.7	56.0	87.0	98.0
Nimo	16.67	40.0	65.0	84.0	78.0
Ogbaru	19.33	53.8	92.0	73.0	48.0
Umunze	21.33	112.3	155.0	149.0	94.0
$LSD_{0.05}$	4.837	47.75	60.85	74.3	74.5

DISCUSSION

Growth parameters

Optimum plant height had been reported to positively correlate with the productivity of plant (Saeed *et al*., 2001). The height of a plant is an importance growth parameter that is directly linked with the productivity potential of a plant. There was a progressive increase in the means of plant height observed.

Yield parameters

The study showed that there was a progressive decrease which did not differ significantly in the fresh weight of harvested bitter leaf at 7, 9 and 10 weeks after planting. Significant decrease in the weight of harvested bitter leaf was however observed among all accessions at 7, 9 and 10. although there was an increase but the increase was not significantly ($P>0.05$) different with the values obtained at 7weeks after planting.

The result of the study showed that the total number leaves of bitter leaf plants harvested from Umunze accession at 5, 7, and 9 gave the highest number of leaf. There was a progressive increase on the total number of leaves from IfiteOgwari accession. Obtaining a higher yield of the leaves is the desire of every bitter leaf farmer. According to Agriculture and Volume (2016), marketable leaf yield, number of branches/plant and number of leaves and plant are important characters. It was discovered from the trend, that Umunze gave the highest means in plant height, no of leaves and total number of leaves. While Ifite-Ogwari gave the highest mean for stem girth and no. of branches, and Ogbaru with the highest mean for the weight of harvested leaves. Although no significant difference was observed.

CONCLUSION AND RECOMMENDATION

It is observed from the research work that the four different bitter leaf accessions exhibited the same features at different time of their growth and development among the accession with respect to their morphological characteristics. Therefore, these accessions cannot be selected just based on their morphology alone.

Ifite-Ogwari and Umunze produced most vigorous plants and highest fresh leaf yield. This trend was also consistent in the number of branches and stem girth in the field.

Therefore, for optimum production of *Vernonia amygdalina in* Ifite-Ogwari, Ifite-Ogwari and Umunze accessions are recommended.

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