Comparative Morphological diversity of cultivated and wild species of Vigna Savi

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ABSTRACT

One of the challenges faced in the study of this genus is the ability to identify them when encountered in the field. This study was carried out to Compare morphological characteristics of a panel of twenty-two (22) Vigna savi of some cultivated(5) and wild(17) species obtained from the International Institute of Tropical Agriculture IITA, Ibadan Nigeria. Seeds were planted at the Department of Crop and Soil Science Research Farm, University of Port Harcourt, Nigeria using the experimental design Complete Randomized Block Design (CRBD). Physical observations were made on the seeds and the vegetative parts were observed for taxa delineation in the field. Results obtained showed the features that were of significance morphologically include the seed size, hilum position, plant height, leaf shape, leaf hairiness, twinning tendency, presence or absence of adventitious roots and the perennating stomps encountered in only one of the cultivated species of Vigna unguiculata (IT81D-975) amongst all others encountered in this study. The leaf shapes observed includes the ovate, lanceolate, cordate, elliptic, linear and deltoid. Variation in stem and petiole pigmentation at the germination phase and maturity were areas of variation indicating their phylogeny. The parameters employed in this result is to aid in providing good description for taxa separation. The relevance of these parameters in the taxonomic delimitation of species provides an easy means of identification when encountered in the field.

The variations revealed morphologically could be exploited to improve passport data available for Vigna.

Key words: Vigna, morphology, hilum, leaf shape, perennating stomp

I. INTRODUCTION

The genus *Vigna* Savi. belongs to the family Fabacee of the plant kingdom. It is a legume which produces multiple edible parts (products). The term legume is applied to all plants of the bean and pea family. The family leguminosae is the second largest family among the dicots. Recent review in the Taxon (2017) classifies it into 6-sub families as against the initial 3-sub family classification. The new subfamily classification was based on a taxonomically comprehensive phylogeny according to Taxon (2017). The new classification is said to address the long term non-monophyly of the traditionally recognized subfamily Caesalpinoideae using plastid mat K gene sequences, as well as
including the near-complete sampling of genera (698 of the currently recognized 765 genera) and Ca. 20% (3696) of known species. The subfamilies which was previously Caesalpinoideae DC., Mimosoideae DC., and Papilionoideae is outdated and now replaced with Ceasalpinoideae, Papilionoideae, Duparaquetioideae, Cercidoideae, Detarioideae, and Dialoideae by the splitting of the Mimosoideae into four(4) subfamilies.

Studies on the distribution of the plant families reveal divers patterns, of which the legumes is said to be cosmopolitan. The family fabaceae showcases this same pattern of distribution. The ecological importance of the legume family can’t be ignored because they represent an important constituent across almost all the biomes in the world. A careful observation in most extreme habitats reveals their occurrence (Schrire et al; 2005a, b).

*Vigna* species are among the well known as well as utilized legumes and they possess great potentials for exploitation. *Vigna* species like *V. unguiculata* seed have long been considered as an important product but researchers have revealed otherwise.

The genus *Vigna* have both cultivated and wild species. Research interests have been triggered from different taxonomists on majority of its species. A great deal of the challenges faced in the study of this genus is the ability to identify them when encountered in the field. Anatomical and morphological features have been employed for an in-depth study in order to address this setback in research work. It is noteworthy that the application of morphological and anatomical characteristics is not limited to the genus *Vigna* alone. These tools have been employed for proper taxa delimitation. Morphological and anatomical characteristics is not limited to the genus *Vigna* alone. They have been employed in a wide range of families for proper taxa delimitation.

According to Agbagwa and Okoli (2005) epidermal characteristics have been employed as a useful tool for comparative anatomy and taxonomic study in some members of the leguminosea, just like the studies carried out on *Abrus* (papilioinaceae) using the leaf epidermal micromorphology in parts of the tropical West Africa.

According to Agbagwa and Okoli (2005) taxonomic information is not enough to resolve controversies surrounding species identification. The need to resolve these controversies associated with variability and overlaps in the vegetative features of species for their easy identification have led to the employment of different tools to mitigate limitations posed by the limited information available. The morphological data amassed in this study on the vegetative features provides good information taxonomically for the species.
**Morphology** is the branch of biological studies that deals with the form and structure of a living thing without further consideration of function. Macro-morphological features are those features which could only be observed or studied without the use of visual aids while micro-morphological features require the use of visual aids as a result of their miniature size and/or ultra-structural details. Macro-morphological characters of the floral/reproductive and vegetative organs have been used in taxonomic delimitation of species (Stace, 1980; Aguoru and Okoli, 2008). Agbagwa and Okoli (2005) employed in the Systematics of *Abrus* micro-morphology.

Though the importance of macro-morphological and micro-morphological features cannot be overemphasized, it is recommended to supplement them with additional characters in order to guarantee the level of sensitivity needed to correctly identify and delineate species into particular taxa (De Langhe, 1990).

This research work focuses on elucidation of taxonomic complexities in *Vigna* species using gross morphology.

**II. MATERIALS AND METHOD**

The experiment was done using twenty-two accessions of eleven species of the genus *Vigna* which were obtained from the germplasm unit of the International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria. The seeds were later planted in the Experimental / Research farm of the Faculty of Agriculture in the University of Port Harcourt, Choba, Rivers State, Nigeria.

**EXPERIMENTAL DESIGN**

Complete randomized block design (CRBD) with five replications was used. No treatments were allocated to the experimental units (plots).

**MORPHOLOGICAL STUDIES**

This was done after Radford (1986) and IPGRI (2004). Observations on vegetative characteristics of the *Vigna* species were made on the seeds and on the plants growing in the farm (Agricultural farm site of the Faculty of Agriculture in the University of Port Harcourt, Rivers State, Nigeria). Measurements on the various morphological features of interest were made.

**GERMINATION STUDIES**
Seeds were observed at intervals in the course of germination and measurements taken as well. No seed treatment was applied to any of the seeds. Type of germination, time of germination and characteristics of the first leaf were noted as taxonomic indices.

III. RESULTS

MORPHOLOGICAL STUDIES

Habit and vegetative morphology

*Vigna* species are herbs. They are annual to perennial herbs. The root system is of the tap root type with many branches. Stems are herbaceous, perennial stumps may appear slightly woody at maturity. Stems are hollow in some but all are branched. Some of the stems are hairy. The leaves are usually alternate and trifoliate. These morphological features can be observed in figures 1 to 5 and outlined in tables 1 to 3.

All of these recordings were carried out in the sixth week. Most of them had high twinning tendencies.

<table>
<thead>
<tr>
<th>S/NO</th>
<th>SPECIES</th>
<th>ACCESSION NO</th>
<th>Leaf shape</th>
<th>Leaf base</th>
<th>Leaf apex</th>
<th>Leaf margin</th>
<th>Leaf colour</th>
<th>Leaf texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>V.adenantha</em></td>
<td>TVNu-1853</td>
<td>Ovate</td>
<td>Acute</td>
<td>Acute</td>
<td>Slightly undulated</td>
<td>Intermediate</td>
<td>Membranous</td>
</tr>
<tr>
<td>2</td>
<td><em>V.ambacensis</em></td>
<td>TVNu-11</td>
<td>lanceolate</td>
<td>Acute</td>
<td>Acute</td>
<td>Acute</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>3</td>
<td><em>V.ambacensis</em></td>
<td>TVNu-10</td>
<td>lanceolate</td>
<td>Acute</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>4</td>
<td><em>V.dekindtiana</em></td>
<td>TVNu-1842</td>
<td>Cordate</td>
<td>Truncate</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>5</td>
<td><em>V.gracilis</em></td>
<td>TVNu-1805</td>
<td>Cordate</td>
<td>Rounded</td>
<td>Truncate</td>
<td>Entire</td>
<td>Intermediate</td>
<td>Membranous</td>
</tr>
<tr>
<td>6</td>
<td><em>V.nigritia</em></td>
<td>TVNu-1814</td>
<td>Ovate</td>
<td>Truncate</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>7</td>
<td><em>V.nigritia</em></td>
<td>TVNu-1079</td>
<td>Ovate</td>
<td>Truncate</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>8</td>
<td><em>V.heterophylla</em></td>
<td>TVNu-19</td>
<td>lanceolate</td>
<td>Truncate</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>9</td>
<td><em>V.oblongifolia</em></td>
<td>TVNu-38</td>
<td>Linear</td>
<td>Truncate</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>10</td>
<td><em>V.oblongifolia</em></td>
<td>TVNu-139</td>
<td>lanceolate</td>
<td>Rounded</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
<tr>
<td>11</td>
<td><em>V.racemosa</em></td>
<td>TVNu-45</td>
<td>Ovate</td>
<td>Rounded</td>
<td>Acute</td>
<td>Entire</td>
<td>Dark green</td>
<td>Membranous</td>
</tr>
</tbody>
</table>
Table 2: Morphological result showing plant description at week six

<table>
<thead>
<tr>
<th>S/N</th>
<th>SPECIES</th>
<th>ACCESSION NO</th>
<th>Stem colour (pigmented)</th>
<th>Petiole colour (pigmented)</th>
<th>Stem hairiness</th>
<th>Leaf hairiness</th>
<th>Adventitious roots</th>
<th>TWINNING TENDENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>V. adenantha</em></td>
<td>TVNu-1853</td>
<td>Yes</td>
<td>Nil</td>
<td>Nil</td>
<td>nil</td>
<td>Present</td>
<td>Pronounced</td>
</tr>
<tr>
<td>2</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-11</td>
<td>Yes</td>
<td>Nil</td>
<td>Pronounced</td>
<td>Pronounced</td>
<td>Pronounced</td>
<td>Very slight</td>
</tr>
<tr>
<td>3</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-10</td>
<td>Yes</td>
<td>Nil</td>
<td>Pronounced</td>
<td>Pronounced</td>
<td>Nil</td>
<td>Very slight</td>
</tr>
<tr>
<td>4</td>
<td><em>V. dekindtiana</em></td>
<td>TVNu-1842</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>-nil</td>
<td>-nil</td>
<td>Pronounced</td>
</tr>
<tr>
<td>5</td>
<td><em>V. gracilis</em></td>
<td>TVNu-1805</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>-Nil</td>
<td>Pronounced</td>
</tr>
<tr>
<td>6</td>
<td><em>V. nigritia</em></td>
<td>TVNu-1814</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>-nil</td>
<td>-Nil</td>
<td>Pronounced</td>
</tr>
<tr>
<td>7</td>
<td><em>V. nigritia</em></td>
<td>TVNu-1079</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>-Nil</td>
<td>Pronounced</td>
</tr>
<tr>
<td>8</td>
<td><em>V. heterophylla</em></td>
<td>TVNu-19</td>
<td>Yes</td>
<td>Nil</td>
<td>Pronounced</td>
<td>Pronounced</td>
<td>Nil</td>
<td>None</td>
</tr>
<tr>
<td>9</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-38</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>nil</td>
<td>-Nil</td>
<td>Very slight</td>
</tr>
</tbody>
</table>
Table 3: Measurements on the mature leaf and plant of the *Vigna* species at six weeks after germination

<table>
<thead>
<tr>
<th>S/N</th>
<th>SPECIES</th>
<th>ACCESSION NO</th>
<th>PLAN T HEIG HT (cm)</th>
<th>LEAF LENGTH (cm)</th>
<th>LEAF WIDTH (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean 1 2 3 Mean</td>
<td>Mean 1 2 3 Mean</td>
<td>Mean 1 2 3 Mean</td>
</tr>
<tr>
<td>1</td>
<td><em>V. adenantha</em></td>
<td>TVNu-1853</td>
<td>57 5.6 4.8 4.7 5.03</td>
<td>4.9 5.0 3.8 4.56</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-11</td>
<td>15 5.3 6.5 4.9 5.67</td>
<td>1.0 0.8 1.6 1.13</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-10</td>
<td>15.0 6.1 5.4 4.7 5.40</td>
<td>1.5 1.9 1.3 1.57</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><em>V. dekinditiana</em></td>
<td>TVNu-1842</td>
<td>30.9 8.6 7.7 8.2 8.17</td>
<td>5.3 4.7 4.4 0.90</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><em>V. gracilis</em></td>
<td>TVNu-1805</td>
<td>46 3.5 3.0 2.9 3.13</td>
<td>1.8 1.7 1.6 1.70</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><em>V. nigritia</em></td>
<td>TVNu-1814</td>
<td>21.3 9.3 8.4 8.6 8.77</td>
<td>5.8 5.3 5.6 5.67</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><em>V. nigritia</em></td>
<td>TVNu-1079</td>
<td>26.0 8.2 8.5 8.0 8.23</td>
<td>5.8 5.3 5.0 5.37</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><em>V. heterophylla</em></td>
<td>TVNu-19</td>
<td>11.3 2.3 3.0 2.5 2.60</td>
<td>0.4 0.3 0.4 0.37</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-38</td>
<td>67.0 3.0 2.9 3.1 3.00</td>
<td>0.3 0.3 0.2 0.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Species</td>
<td>Accession</td>
<td>1st Leaf</td>
<td>2nd Leaf</td>
<td>3rd Leaf</td>
</tr>
<tr>
<td>----</td>
<td>--------------------------</td>
<td>-----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>10</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-139</td>
<td>90.0</td>
<td>4.9</td>
<td>4.0</td>
</tr>
<tr>
<td>11</td>
<td><em>V. racemosa</em></td>
<td>TVNu-45</td>
<td>32.0</td>
<td>3.4</td>
<td>4.1</td>
</tr>
<tr>
<td>12</td>
<td><em>V. racemosa</em></td>
<td>TVNu-44</td>
<td>18.0</td>
<td>5.1</td>
<td>3.3</td>
</tr>
<tr>
<td>13</td>
<td><em>V. racemosa</em></td>
<td>TVNu-47</td>
<td>11.1</td>
<td>2.3</td>
<td>2.9</td>
</tr>
<tr>
<td>14</td>
<td><em>V. reticulata</em></td>
<td>TVNu-56</td>
<td>15.0</td>
<td>3.2</td>
<td>6.0</td>
</tr>
<tr>
<td>15</td>
<td><em>V. reticulata</em></td>
<td>TVNu-54</td>
<td>10.0</td>
<td>8.3</td>
<td>8.3</td>
</tr>
<tr>
<td>16</td>
<td><em>V. reticulata</em></td>
<td>TVNu-57</td>
<td>7.0</td>
<td>3.3</td>
<td>2.9</td>
</tr>
<tr>
<td>17</td>
<td><em>V. unguiculata</em></td>
<td>TVu 13094</td>
<td>12.8</td>
<td>4.3</td>
<td>5.1</td>
</tr>
<tr>
<td>18</td>
<td><em>V. unguiculata</em></td>
<td>IT81D-975</td>
<td>18.7</td>
<td>12.</td>
<td>10.</td>
</tr>
<tr>
<td></td>
<td><em>V. unguiculata</em></td>
<td>TVNu-209</td>
<td>72.0</td>
<td>6.3</td>
<td>6.9</td>
</tr>
<tr>
<td>19</td>
<td><em>V. unguiculata</em></td>
<td>TVNu-1623</td>
<td>54.0</td>
<td>9.9</td>
<td>12.</td>
</tr>
<tr>
<td>20</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1578</td>
<td>22.0</td>
<td>5.3</td>
<td>4.2</td>
</tr>
<tr>
<td>21</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1592</td>
<td>16.0</td>
<td>4.3</td>
<td>4.5</td>
</tr>
</tbody>
</table>

*Leaf measurements were done on the third leaf for accessions studied. There was an exception to TVnu-54 whose third leaf was just a single leaf and TVNu-56 whose fourth leaf started being a trifoliate.


Fig 5: Plant habit of a). TVNu-1592 *Vigna vexillata*

**Fruit and Seed Morphology**

The different morphological types observed in the seeds of the species are shown in table 4 and in figures 6 to 11. Variations were revealed in seed colour, shape, sizes and hilum position. The seed shapes ranges from rhomboid to ovoid.

The hilum position varies from marginal to apical and near marginal to near apical.

**Table 4: Morphological results on seeds characters**

<table>
<thead>
<tr>
<th>S/NO</th>
<th>SPECIES</th>
<th>ACCESSION NO</th>
<th>SEED COLOUR</th>
<th>SEED SHAPE</th>
<th>SEED SIZE (mm)</th>
<th>Hilum position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>V. adenantha</em></td>
<td>TVNu-1853</td>
<td>Dark brown</td>
<td>Rhomboid</td>
<td>5x5</td>
<td>marginal</td>
</tr>
<tr>
<td>2</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-11</td>
<td>Mottled with cream, brown and black</td>
<td>Ovoid</td>
<td>6x3</td>
<td>Near apical</td>
</tr>
<tr>
<td>3</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-10</td>
<td>Mottled with cream, brown and black</td>
<td>Rhomboid</td>
<td>4.5x3</td>
<td>Near apical</td>
</tr>
<tr>
<td>4</td>
<td><em>V. dekindtiana</em></td>
<td>TVNu-1842</td>
<td>Mottled brown</td>
<td>Rhomboid</td>
<td>4.5x3</td>
<td>marginal</td>
</tr>
<tr>
<td>5</td>
<td><em>V. gracilis</em></td>
<td>TVNu-1805</td>
<td>Mottled with cream, black and grey</td>
<td>Rhomboid</td>
<td>3x2</td>
<td>Near apical</td>
</tr>
<tr>
<td>6</td>
<td><em>V. nigrita</em></td>
<td>TVNu-1814</td>
<td>Mottled brown and black</td>
<td>Rhomboid</td>
<td>3.5x2</td>
<td>marginal</td>
</tr>
<tr>
<td>7</td>
<td><em>V. nigrita</em></td>
<td>TVNu-1079</td>
<td>Dark brown and black</td>
<td>Rhomboid</td>
<td>3.5x2</td>
<td>marginal</td>
</tr>
<tr>
<td>8</td>
<td><em>V. heterophylla</em></td>
<td>TVNu-19</td>
<td>Mottled with cream, black and grey</td>
<td>Rhomboid</td>
<td>4x3</td>
<td>Near apical</td>
</tr>
<tr>
<td>9</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-38</td>
<td>Brown</td>
<td>Rhomboid</td>
<td>4x3</td>
<td>Near apical</td>
</tr>
<tr>
<td>10</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-139</td>
<td>Brown</td>
<td>Rhomboid</td>
<td>5x3</td>
<td>Near apical</td>
</tr>
<tr>
<td>11</td>
<td><em>V. racemosa</em></td>
<td>TVNu-45</td>
<td>Mottled brown, grey and ash</td>
<td>Rhomboid</td>
<td>3x2</td>
<td>Near apical</td>
</tr>
<tr>
<td>12</td>
<td><em>V. racemosa</em></td>
<td>TVNu-44</td>
<td>Mottled brown and ash</td>
<td>Rhomboid</td>
<td>4x2</td>
<td>Near apical</td>
</tr>
<tr>
<td>13</td>
<td><em>V. racemosa</em></td>
<td>TVNu-47</td>
<td>Mottled black and grey</td>
<td>Rhomboid</td>
<td>3.5x2.5</td>
<td>Near apical</td>
</tr>
<tr>
<td>14</td>
<td><em>V. reticulata</em></td>
<td>TVNu-56</td>
<td>Brown</td>
<td>Rhomboid</td>
<td>3x2</td>
<td>Marginal</td>
</tr>
<tr>
<td>15</td>
<td><em>V. reticulata</em></td>
<td>TVNu-54</td>
<td>Mottled brown, black and grey</td>
<td>Rhomboid</td>
<td>4x3</td>
<td>Marginal</td>
</tr>
<tr>
<td></td>
<td>Genus</td>
<td>TV Number</td>
<td>Description</td>
<td>Shape</td>
<td>Size</td>
<td>Margin</td>
</tr>
<tr>
<td>---</td>
<td>-----------</td>
<td>-----------</td>
<td>-------------------------------------------</td>
<td>--------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>16</td>
<td><em>V. reticulata</em></td>
<td>TVNu-57</td>
<td>Mottled black and brown</td>
<td>Rhomboid</td>
<td>3x2</td>
<td>Marginal</td>
</tr>
<tr>
<td>17</td>
<td><em>V. unguiculata</em></td>
<td>TVu-13094</td>
<td>Black and brown</td>
<td>Rhomboid</td>
<td>4x3</td>
<td>Marginal</td>
</tr>
<tr>
<td>18</td>
<td><em>V. unguiculata</em></td>
<td>IT81D-975</td>
<td>Light brown</td>
<td>Rhomboid</td>
<td>10x7</td>
<td>Marginal</td>
</tr>
<tr>
<td>19</td>
<td><em>V. unguiculata</em></td>
<td>TVNu-209</td>
<td>Mottled black, brown and grey</td>
<td>Rhomboid</td>
<td>4x2.5</td>
<td>Marginal</td>
</tr>
<tr>
<td>20</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1623</td>
<td>Black</td>
<td>Rhomboid</td>
<td>4x2.5</td>
<td>Marginal</td>
</tr>
<tr>
<td>21</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1578</td>
<td>Mottled black and brown</td>
<td>Rhomboid</td>
<td>4x3</td>
<td>Marginal</td>
</tr>
<tr>
<td>22</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1592</td>
<td>Black and brown</td>
<td>Rhomboid</td>
<td>4x2</td>
<td>Marginal</td>
</tr>
</tbody>
</table>


GERMINATION AND GROWTH STUDIES

The result for growth parameters are represented in tables 5 and 6. Great variation was observed in the time of germination, germination percentage, total number of seed that germinated as compared to the number of seeds planted, time of flowering and length of fruit pods of the individual species of Vigna studied. Total number of the species that podded is also recorded in table 5.
Table 5: Germination result showing growth statistics

**PLANTING DATE: 28<sup>TH</sup> APRIL, 2015**

<table>
<thead>
<tr>
<th>S/NO</th>
<th>SPECIES</th>
<th>ACCESSION NO</th>
<th>NO OF SEED PLANTED</th>
<th>NO OF GERMINATE SEED</th>
<th>GERMINATION TIME</th>
<th>% GERMINATION</th>
<th>FLOWERING DATE</th>
<th>FLOWER COLOUR</th>
<th>LENGTH OF POD (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>V. adenantha</em></td>
<td>TVNu-1853</td>
<td>5</td>
<td>5</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10</td>
<td>13&lt;sup&gt;th&lt;/sup&gt;, August</td>
<td>White</td>
<td>5.5-4.5</td>
</tr>
<tr>
<td>2</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-11</td>
<td>5</td>
<td>3</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>60</td>
<td>August</td>
<td>White</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-10</td>
<td>5</td>
<td>2</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td><em>V. dekindtiana</em></td>
<td>TVNu-1842</td>
<td>5</td>
<td>2</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td><em>V. gracilis</em></td>
<td>TVNu-1805</td>
<td>5</td>
<td>4</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td><em>V. heterophylla</em></td>
<td>TVNu-19</td>
<td>5</td>
<td>2</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td><em>V. nigritia</em></td>
<td>TVNu-1814</td>
<td>5</td>
<td>3</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>60</td>
<td>9&lt;sup&gt;th&lt;/sup&gt;, July</td>
<td>Purple</td>
<td>7.8-6.0</td>
</tr>
<tr>
<td>8</td>
<td><em>V. nigritia</em></td>
<td>TVNu-1079</td>
<td>5</td>
<td>5</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-38</td>
<td>5</td>
<td>5</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-139</td>
<td>5</td>
<td>5</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td><em>V. racemosa</em></td>
<td>TVNu-45</td>
<td>5</td>
<td>5</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td><em>V. racemosa</em></td>
<td>TVNu-44</td>
<td>5</td>
<td>3</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>60</td>
<td>23&lt;sup&gt;rd&lt;/sup&gt;, July</td>
<td>Pink</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td><em>V. racemosa</em></td>
<td>TVNu-47</td>
<td>5</td>
<td>4</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td><em>V. reticulata</em></td>
<td>TVNu-56</td>
<td>5</td>
<td>4</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td><em>V. reticulata</em></td>
<td>TVNu-54</td>
<td>5</td>
<td>3</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td><em>V. reticulata</em></td>
<td>TVNu-57</td>
<td>5</td>
<td>4</td>
<td>12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td><em>V. unguiculata</em></td>
<td>TVu 13094</td>
<td>5</td>
<td>1</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
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<td>Accession</td>
<td>n.r.</td>
<td>r.r.</td>
<td>d.d.</td>
<td>Colour</td>
<td>Colour range</td>
<td></td>
<td></td>
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<td>----------------</td>
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<td>-----</td>
<td>-----</td>
<td>------</td>
<td>--------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td><em>V. unguiculata</em></td>
<td>IT81D-975</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>80</td>
<td>June</td>
<td>Yellow</td>
<td>10.0-8.0</td>
</tr>
<tr>
<td>19</td>
<td><em>V. unguiculata</em></td>
<td>TVNu-209</td>
<td>5</td>
<td>4</td>
<td>4th</td>
<td>80</td>
<td>30th, July</td>
<td>Purple</td>
<td>7.7-7.0</td>
</tr>
<tr>
<td>20</td>
<td><em>V. vexillate</em></td>
<td>TVNu-1623</td>
<td>5</td>
<td>4</td>
<td>10th</td>
<td>80</td>
<td>30th, Purple</td>
<td>11.5-9.9</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td><em>V. vexillate</em></td>
<td>TVNu-1578</td>
<td>5</td>
<td>4</td>
<td>9th</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td><em>V. vexillate</em></td>
<td>TVNu-1592</td>
<td>5</td>
<td>4</td>
<td>5th</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Table 6: Showing colour pigmentation contrast on plant during the process of growth

<table>
<thead>
<tr>
<th>S/N</th>
<th>SPECIES</th>
<th>ACCESSION NO</th>
<th>STEM COLOUR (PIGMENTED -RED) AT GERMINATION</th>
<th>PETIOLE COLOUR (PIGMENTED-RED) AT MATURITY</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td><em>V. adenantha</em></td>
<td>TVNu-1853</td>
<td>Nil</td>
<td>yes</td>
</tr>
<tr>
<td>2</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-11</td>
<td>Yes</td>
<td>yes</td>
</tr>
<tr>
<td>3</td>
<td><em>V. ambacensis</em></td>
<td>TVNu-10</td>
<td>Nil</td>
<td>yes</td>
</tr>
<tr>
<td>4</td>
<td><em>V. dekindiana</em></td>
<td>TVNu-1842</td>
<td>Nil</td>
<td>nil</td>
</tr>
<tr>
<td>5</td>
<td><em>V. gracilis</em></td>
<td>TVNu-1805</td>
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<td>nil</td>
</tr>
<tr>
<td>6</td>
<td><em>V. nigrina</em></td>
<td>TVNu-1814</td>
<td>nil</td>
<td>nil</td>
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<tr>
<td>7</td>
<td><em>V. nigrina</em></td>
<td>TVNu-1079</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>8</td>
<td><em>V. heterophylla</em></td>
<td>TVNu-19</td>
<td>Yes</td>
<td>yes</td>
</tr>
<tr>
<td>9</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-38</td>
<td>Yes</td>
<td>nil</td>
</tr>
<tr>
<td>10</td>
<td><em>V. oblongifolia</em></td>
<td>TVNu-139</td>
<td>Yes</td>
<td>nil</td>
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<tr>
<td>11</td>
<td><em>V. racemosa</em></td>
<td>TVNu-45</td>
<td>Yes</td>
<td>nil</td>
</tr>
<tr>
<td>12</td>
<td><em>V. racemosa</em></td>
<td>TVNu-44</td>
<td>Yes</td>
<td>nil</td>
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<tr>
<td>13</td>
<td><em>V. racemosa</em></td>
<td>TVNu-47</td>
<td>Yes</td>
<td>nil</td>
</tr>
<tr>
<td>14</td>
<td><em>V. reticulata</em></td>
<td>TVNu-56</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>15</td>
<td><em>V. reticulata</em></td>
<td>TVNu-54</td>
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<td>nil</td>
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<tr>
<td>16</td>
<td><em>V. reticulata</em></td>
<td>TVNu-57</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>17</td>
<td><em>V. unguiculata</em></td>
<td>TVu</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>18</td>
<td><em>V. unguiculata</em></td>
<td>IT81D-975</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>19</td>
<td><em>V. unguiculata</em></td>
<td>TVNu-209</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>20</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1623</td>
<td>nil</td>
<td>yes</td>
</tr>
<tr>
<td>21</td>
<td><em>V. vexillata</em></td>
<td>TVNu-1578</td>
<td>nil</td>
<td>yes</td>
</tr>
</tbody>
</table>
IV. DISCUSSION

Morphology has been greatly employed as a tool for the delineation of taxa in research works and has proven to be of great relevance. In this study the variations detected in the morphological characters of the species adds to the pool of information available for *Vigna* species to aid its identification when encountered in the laboratory. Perennating stumps of ITD81D-975, a cultivated accession of *Vigna unguiculata*, was observed to regenerate and yield fruits after the first circle of germination. No other accession of *V. unguiculata* whether wild or cultivated or any other species studied showed this characteristic. This observation has not been encountered in any of the research works so far. Thus, this is been reported for the very first time.

REFERENCE


International Plant Genetic Resources Institute [IPGRI], (2017) Rome, Italy.


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