

Wild Vigna Legumes

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Legumes (family Fabaceae) represent the third largest family among flowering plants, consisting of approximately 650 genera and 20,000 species which possess an undeniable vital nutritional value for both humans and animals due to their protein content. The genus *Vigna* is a huge and important set of legumes consisting of more than 200 species. The term under-exploited wild *Vigna* species has been attributed to some *Vigna* species of legumes that have not yet been domesticated. They do not possess commercial names since they have not got a common popular use by people or groups of people. Very few domesticated legumes species exist with more than one hundred (100) wild species under-exploited despite global food demand. A recent study explored farmers' perceptions, preferences, and possible utilization of some wild *Vigna* species of legumes through quantitative and qualitative surveys conducted in a mid and high altitude agro-ecological zones in Tanzania to obtain the opinion of 150 farmers about wild legumes and their uses.

Keywords: *Vigna racemosa* ; *Vigna reticulata* ; *Vigna ambacensis* ; Wild Crops ; Wild Crop Relatives ; Wild Legumes ; Wild Foods ; *Vigna* species ; Legume Diversity

1. Content and New Findings

Legumes (family Fabaceae) represent the third largest family among flowering plants, consisting of approximately 650 genera and 20,000 species^[1]. They possess an undeniable vital nutritional value for both humans and animals due to their protein content. They are known to be the second most valuable plant source of nutrients for both humans and animals. Some of the most commonly domesticated, grown and commercialized legumes such as soybeans, cowpeas, common beans, and others have demonstrated a considerable contribution to global food security^[2]. Yet, their production rate remains unsatisfying as compared with their consumption rate due to biotic and abiotic challenges^[3]. Then arises a need to look for alternatives. A systematic screening of the hitherto wild non-domesticated and wild relatives of the domesticated species within the commonly known and the little-known genera of legumes seems to be a promising alternative.

2. genus *Vigna*

The genus *Vigna* is a huge and important set of legumes consisting of more than 200 species^[4]. It comprises several species of agronomic, economic and environmental importance. The most common domesticated ones include the mung bean [*V. radiata* (L.) Wilczek], urd bean [*V. mungo* (L.) Hepper], cowpea [*V. unguiculata* (L.) Walp.], azuki bean [*V. angularis* (Willd.) Ohwi & Ohashi], bambara groundnut [*V. subterranea* (L.) Verdc.], moth bean [*V. aconitifolia* (Jacq.) Maréchal], and rice bean [*V. umbellata* (Thunb.) Ohwi & Ohashi]. Many of these species are valued as forage, green manure, and cover crops besides their high protein grains. The genus *Vigna* also comprises more than 100 wild species that do not possess common names apart from their scientific appellation yet^[5]. They are given different denotations such as under-exploited wild *Vigna* species, non-domesticated *Vigna* species wild *Vigna* or alien species depending on the scientist^{[2][4]}.

Crop species with little attention or completely ignored by agricultural researchers, plant breeders, and policymakers which are wild or semi-domesticated varieties and non-timber forest species adapted to particular local environments are defined as neglected and underutilized species^[6]. The term under-exploited wild *Vigna* species has been attributed to some *Vigna* species that have not yet been domesticated. They do not possess commercial names since they have not got a common popular use by people or groups of people. Thus, they are different from some domesticated *Vigna* species such as Bambara groundnuts (*Vigna subterranea*), considered as under-utilized or orphan crops. They are regarded as wild and under-exploited species of *Vigna* which are collected from their natural agro-ecological environment and kept in research genebanks for breeding purposes sometimes.

It is curiously noted that neglected and underutilized species present tremendous opportunities for fighting poverty, hunger, and malnutrition^[6]. In addition, it is also reported that wild plant relatives present uncontested potential genetic resources for crop improvement and an avenue for exploring alternative production systems^[7]. However, the social and practical uses of the non-domesticated, wild and under-exploited *Vigna* species are less or almost not documented. Their habitats have been reported to be so diverse that their genomes could harbor various genes responsible for environmental stress adaptation, which could lead to innovations in agriculture^[5].

Many species of wild under-exploited *Vigna* genus have been reported with good agronomic characteristics such as disease resistance^[8], important nutrients and mineral elements^{[9][10]} as well as nutraceuticals^[11]. On the other hand, the challenges faced by the cultivated legumes varieties are beginning to raise serious concerns to the scientific community as it is revealed in a recent report that domesticated legume crop production is challenged by a number of biotic (diseases and pests) and abiotic stresses (heat, frost, drought, and salinity), edaphic factors (associated with soil nutrient deficits) and policy issues (where less emphasis is put on legumes compared to priority starchy staples)^[3].

A recent report related to this article has just revealed that in a sample of experienced legume farmers, very few are aware of the existence of wild legumes and therefore ignore their uses. The study explored farmers' perceptions, preferences, and possible utilization of some wild *Vigna* species of legumes through quantitative and qualitative surveys conducted in a mid and high altitude agro-ecological zones in Tanzania to obtain the opinion of 150 farmers about wild legumes and their uses. The study further revealed through binary logistic regression analysis that the prior knowledge about wild legumes depends mainly on farmers' location and not on their gender, age groups, education level or farming experience. From the experimental plot with 160 accessions of wild *Vigna* legumes planted and grown up to near complete maturity, 74 accessions of wild *Vigna* legumes attracted the interest of farmers who proposed various uses for each wild accession. A Chi-square test (likelihood ratio test) revealed that the selection of preferred accessions depends on the farmers' gender, location and farming experience. Based on their morphological characteristics (leaves, pods, seeds and general appearance), farmers perceive wild *Vigna* legumes as potentially useful resources that need the attention of researchers. Specifically, wild *Vigna* legumes were perceived as **human food, animal feed, medicinal plants, soil enrichment material and soil erosion preventing** materials. It is, therefore, necessary for the scientific community to consider these lines of farmers' suggestions before carrying out further research on agronomic and nutritional characteristics towards the domestication of these "alien" species for human exploitation and decision settings. The figure below illustrates the diversity of the wild *Vigna* species in terms of vegetative and seed morphology.

More details on the full article can be found here: <https://www.mdpi.com/2073-4395/9/6/284>

And here: <https://www.sciencedirect.com/science/article/abs/pii/S2211912418300105>

I



yellow flower



pale lilac color flower

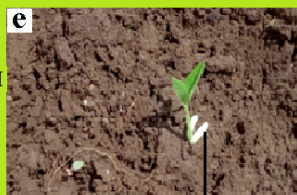


purple violet flower



blue flower

II

cotyledons
epigeal germinationcotyledons or seed remain in the ground
hypogeal germination

III



petiolate primary leaf attachment

absence of petiole
sessile primary leaves attachmentsub-sessile primary leaves attachment
(presence of a small petiole)

IV



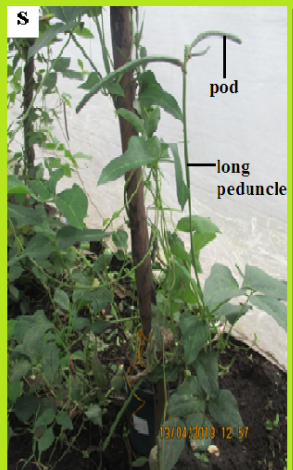
pods with pubescence (hair)



pods without pubescence (hair)



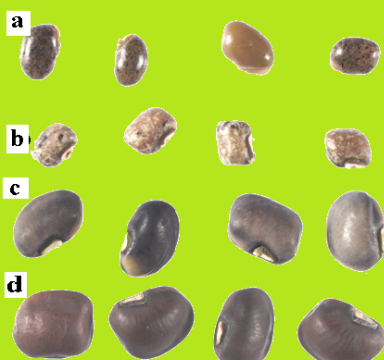
V



Plant identity:*

- a: *Vigna ambacensis* accession (TVNu 452)
 b: *Vigna vexillata* accession (AGG308101WVIG1)
 c: *Vigna vexillata* accession (TVNu 955)
 d: *Vigna reticulata* accession (AGG118137WVIG1)
 e: *Vigna vexillata* accession (TVNu 381)
 f: *Vigna reticulata* accession (TVNu 450)
 g: *Vigna reticulata* accession (AGG17856WVIG1)
 h: *Vigna ambacensis* accession (TVNu 1185)
 i: *Vigna racemosa* (unclassified accession)
 j: *Vigna reticulata* accession (TVNu 758)
 k: *Vigna vexillata* accession (AGG77011WVIG4)
 l: *Vigna vexillata* accession (AGG308096WVIG2)
 m: *Vigna reticulata* accession (AGG17856WVIG1)
 n: *Vigna vexillata* accession (TVNu 1586)
 o: *Vigna ambacensis* accession (TVNu 1827)
 p: *Vigna racemosa* accession (AGG53597WVIG1)
 q: *Vigna reticulata* accession (AGG17856WVIG1)
 r: *Vigna vexillata* accession (TVNu 955)
 s: *Vigna racemosa* accession (AGG53597WVIG1)

* accession number as assigned by the genebank are in bracket.

*Vigna racemosa* accessions*Vigna reticulata* accessions*Vigna ambacensis* accessions

Accession numbers:

Figure Source: Compiled by author and parts extracted from author's previous article^[2]

