



Minni Payaru [*Vigna stipulacea* (Lam.) Kuntz.]: an underutilized ancient legume of India

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Minni Payaru [*Vigna stipulacea* (Lam.) Kuntz] is an underutilized traditional legume species mainly used for food, animal fodder and green manure, particularly in Southern India. In the era of global climate change, this indigenous crop has the ability to survive under harsh environment and also has resistance against various biotic and abiotic stresses. Based on acquired knowledge about this crop, farmers prefer *Minni Payaru* compared to other commercial kharif pulses. Though *Minni Payaru* has huge potential to be used as main legume crop, it has not gained popularity in India. Currently, the cultivation of *Minni Payaru* is restricted to the Southern regions of India. The present review summarises the budding role of *Minni Payaru* in human nutrition, animal fodder and green manure.

Keywords: Biotic and abiotic stresses, Fodder, Food, Green manure, Neglected crop

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Legume crops are the major contributor of plant protein, vitamins, essential amino acids and minerals. To ensure the nutritional security of the ever-growing population, we need more pulse seed production. It has been reported that only ten *Vigna* species are extensively grown for food purpose. These cultivated species are prone to attack by various pest and diseases and also to abiotic stresses. On the other side, wild species are fit to the harsh environment like limestone rocks, sandy beaches, deserts, wetlands and acid soils and also to various biotic and abiotic stresses¹ which makes them a vital basis of new genes that can be transferred in to the cultivated species. Despite of its local importance, many wild species remain underutilized. Hence, it is need of the hour to popularize *Minni Payaru* to exploit full potential of this wild species. *Minni Payaru* is one such species mainly inhabits in South Asian countries known for its fast growth and short vegetative stage. *Minni Payaru* is one dual purpose pulse crop in Southern India grown for both food and fodder purpose. This species is recognized as sources of Mungbean yellow mosaic virus resistance (MYMV)¹⁻⁵ resistance and have the potential for 'neo-domestication'. This

species is a reservoir of various useful traits that can be targeted for its domestication as new crop and, or these can be enlisted in the cultivated *Vigna* species⁶.

Botanical description

Though *V. stipulacea* was treated as *V. trilobata* (L.) Verdc since long, it is taxonomically very different⁷. The peculiar characteristic of this species is large stipules and bright yellow colour flower with purple coloured beak. *V. stipulacea* is annual, short duration crop, the life cycle completed within 2-3 months. It has erect, semi-erect and spreading type of growth habit. Erect and semi-erect types have the potential to be used as green fodder. At two leaves stage, leaves are petiolate and shape of leaf tip is cordate and elliptic. Stem is angular and sparsely covered with white hairs (0.8 to 1.2 mm long). Stipules are oval shaped and conspicuously large and broad at base. Terminal leaflet shape is obtuse at apex and rounded at base, shape varied from oval to trilobed, size varied from 1.3–6.5×1.2–5.9 cm. The lateral leaf-lets are oval and oblique with two or three lobes; rounded at the apex and base. Size of lateral leaf-lets varies from 1.4–5.6×1.0–5.7 cm. Inflorescence bears 4-12 flowers. Colour of the flower is shiny yellow and standard petal has purple tinge in

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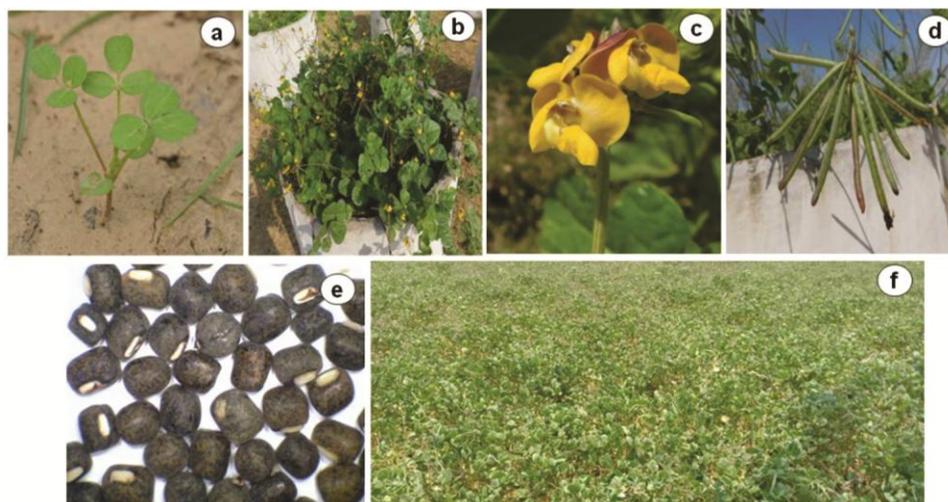


Fig. 1 a) — Early vegetative stage; b) Flowering stage; c) Flower; d) Immature pods; e) Seeds; f) Large scale cultivation of *V. stipulacea* in Karnataka state.

the center and tip of keel pocket is also purple that serve as the key trait to delineate *Mini Payaru* with its closely related species, *V. trilobata* and other *Vigna* species⁷. Pods are linear, cylindrical and sparsely to densely cover with hairs, size of pod varies from 4-5x0.2-0.3 cm. At maturity colour of pod is blackish brown. Seed thickness varies from 2.1 to 2.2 mm, length is 2.0 to 2.4 mm and width 2.1 to 3.5 mm. Seeds are elliptic in shape with black in colour. The hilum is whitish, oblong and slightly protruding with slightly developed aril⁸ (Fig. 1).

Distribution

Minni Payaru is widely distributed in India particularly, in Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu. 94 accessions of *Minni Payaru* collected from all over the India are conserved at National Gene Bank of India housed at Indian Council of Agricultural Research-National Bureau of Plant Genetic Resources (ICAR-NBPGR), New Delhi. Figure 2 represent the uses of *Minni Payaru* in the different states of India.

Cultivation

Minni Payaru is *kharif* season crop, usually seeds are planted by broadcasting method in the month of August and it start flowering from September to October. This crop is planted as main crop for harvesting the seeds to use as human food and animal fodder and also as green manure before paddy cultivation. Also found growing in a wet clay soil habitat in and around paddy field in the wild form.

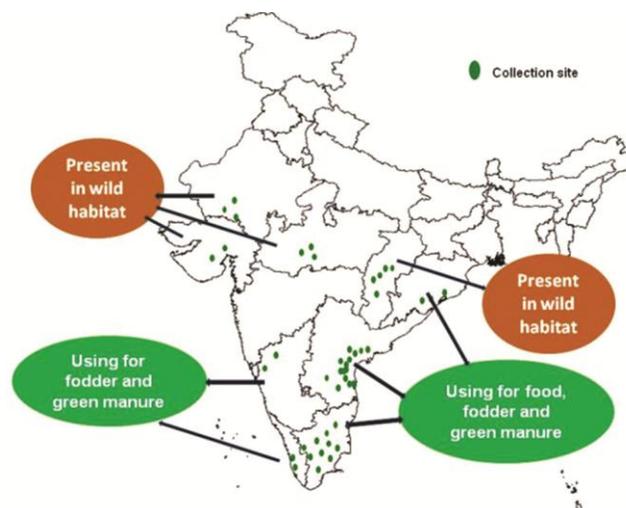


Fig. 2 — Collection sites and use of *V. stipulacea* in each region.

Utilization in food

In Southern states of India, *Minni Payaru* is consumed directly by cooking as whole pulse and also as spilt dal. Seeds are consumed as “Sambal” (vegetable stew) or “Thuvayal (Chatney)” condiment prepared with spices and vegetable. Rural people said that the dishes prepared from these seeds are delicious. In South India, when seed flour of *Minni Payaru* is used for preparation of the “Dosa” and “Idali” fermentation is a not required. Seed flour is also used for bread baking.

Utilization in fodder

The major global issues like protein malnutrition and fodder scarcity can be overcome by adopting suitable multipurpose crops which satisfy both human

and animal nutrition. Many of the underutilized *Vigna* species has the potential to alleviate global animal nutritional challenge⁹. Among the cultivated *Vigna* species, *V. unguiculata* (L.) Walp and *Vigna umbellata* (Thunb.) Ohwi & H. Ohashi are the major legumes are grown for fodder purpose¹⁰. Besides, this species can also contribute to overcome the problem of fodder shortage however, remain underutilized. It is an annual trailing and twinning herb grows to a height of 4- 28 cm and length of branches varies from 45 to 152 cm⁷. These are the desirable trait associated with higher fodder yield. In some parts of Tamil Nadu and Southern Karnataka farmers are growing this legume for fodder purpose and sometimes harvested from wild habitat to feed the milching cows. Because they ascribed higher milk yield on the day of feeding cows with *Minni Payaru*. Therefore, scientific community must consider these lines of suggestions from farmers for future research on utilization of its potential fodder value in minimising imbalance in fodder nutrition. Besides, the grains also need to be studied to unveil its nutritional significance of this crop. Because of immense fodder value associated with *Mini Payaru*, it can be a better option to overcome fodder deficit in future.

Green Manure

Legumes are well known for improving the productivity of field crops, because of its innate capacity to fix atmospheric nitrogen¹¹. Along with their nitrogen-fixing capacity, incorporating the legumes into the cropping area (green manure) improves the organic carbon content, nutrient availability and physiochemical properties of soil¹². Besides the most commonly grown legume crops, *Minni Payaru* is also cultivated as a leguminous green manure crop. It is grown as *in situ* green manure crop to improve the soil condition of perennial plantations in Southern parts of India. Because of its profuse growth and short life cycle it can be grown as a cover crop or *in situ* green manure.

Resistance to biotic and abiotic stresses

The powdery mildew and mungbean yellow mosaic virus (MYMV) are the major devastating diseases in all mungbean growing area. Availability of resistance source to this disease is very limited in cultivated germplasm. Among the available *Vigna* species, *Minni Payaru* was reported as resistant to MYMV¹³. Besides, it also shows high resistance to other major foliar diseases like powdery mildew (caused by

Podosphaera xanthii) through hypersensitive reaction⁴. The pods of *Mini Payaru* are also harder as compared with cultivated legume like, mungbean and blackgram, hence have more resistant to the attack by a stink bug. Many wild *Vigna* species were found in a harsh environment or wild habitat. For example, *Minni Payaru* found little affected by pest and diseases even when the crop was not treated with pesticide at NIAS experimental field Tsukuba, Japan¹, same was observed by farmers. Though many improved cultivars of cultivated *Vigna* species have been developed, biotic and abiotic stresses are remaining major problem deterring the true yield potential of the crop. The source of resistance is limited in cultivated germplasm hence closely related species such as *Minni Payaru*, can be utilized to transfer the resistant genes.

Domestication trends

Crop domestication is the intentional selection of plants to meet according to the human needs. Plant domestication process has been started near about 10,000-year ago^{14,15}. It is a long-term process that started with a selection from the wild species, which are present in the nature for particular traits. Over the years plant species get acquainted to the specific niche area (semi-domestication) and then with millennia of selection crop gets domesticated¹⁶. Human beings are selecting plants for traits like, increased yield, rich in various nutrients, vitamins and minerals, palatability and taste, long term storage, ease in the cultivation practice etc. (Fig. 3). *Minni Payaru*, is recognized as candidates for neo-domestication as it possesses several traits which are suitable for human requirements like, drought tolerance and disease and pest resistance, fast growth, short vegetative stage^{1,5,6}.

Future opportunities

In the current era, increased dependence on few major food crops led to the dwindling of diversity in

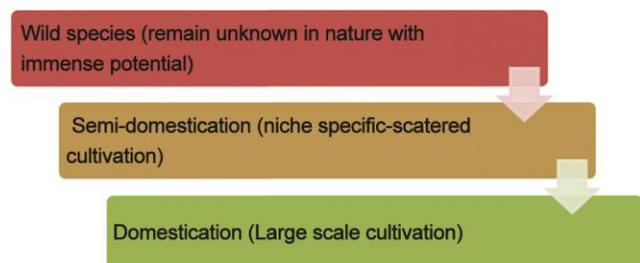


Fig. 3 — Event of domestication from wild state/ Shift from wild to cultivated type in crop species.

our food basket and also adversely affected traditionally grown crops. Despite of its of its potential value in food and fodder and broad resistance to pest and diseases like Yellow Mosaic virus, it remained as neglected and orphan crop. The genes for resistance to biotic and abiotic resistance are lacking in the commercially cultivated species, which makes them vulnerable to various pest and diseases and abiotic stresses. Therefore, *Minni Payaru* can be utilized in *Vigna* improvement programme to transfer the genes of resistance into the cultivated species. Furthermore, characteristics like short life span and broad resistance to pest and diseases indicates the potentiality to domesticate *Minni Payaru* in India. Research needs to make *Minni Payaru* from minor to major legume are mentioned below:

- Extensive collection of *Minni Payaru* germplasm across the India for conservation in the long term storage at the National Gene Bank, ICAR-NBPGR, New Delhi for future use.
- Accelerated discovery of proteinaceous germplasm.
- Extensive cross ability studies to transfer the gene of interest into the cultivated *Vigna* species.
- Focussed extension and policy initiatives to popularize this crop.
- Identification of sources of resistance against various pest and diseases.
- Refinement in production technologies.
- Generation of novel genetic and genomic resources to hasten the development of new varieties.

We consider that fulfilling the aforementioned research primacies will help improve the crop agronomically and also to popularize *Minni Payaru* to the potential areas where it can be beneficial to farmers. In addition to the research, extension and policy initiatives are required for making the most use of neglected legume¹⁷.

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Conflict of Interest

Authors unanimously proclaim that they do not have conflict of interest.

Authors' Contribution

Conceptualization: PG, KT; Writing - original draft: PG, SKR, BH; Writing - review & editing: VG, NS, KT

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