



Taxonomical evaluation of *Vigna umbellata* (Thunb.) Ohwi & Ohashi, *Vigna mungo* (L.)Verdc., *Vigna trilobata* (L.)Verdc. Var. *trilobata* and *Vigna radiata* (L.)Wilczek Var. *sublobata* (Roxb.)Verdc. From Vidarbha region of Maharashtra State.

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ABSTRACT

During the survey of above four species author has came to realise that the number of these species in nature has reduced fastly. Therefore their protection and conservation is very essential otherwise they are on the way of extinction.

The main objective of this work is to bring them in Botanical garden and try to acclimatize them to new environmental condition and to study them in detail taxonomically, therefore the collection, identification and taxonomic description of the above mention four species is taken for detail study of the wild species with their relatives in cultivation and try to correlate their relationship on the basis of morphological studies.

Key Words: *Vigna* species, taxonomic description, localities, ecological note.

Introduction

Vigna radiata – *mungo* complex is a group of edible legumes originated from tropical asia. It is composed of mungbean (*vigna radiata* (L.) Wilczek), black gram (*v. Mungo* (L.) Hepper) and related wild forms. These legumes are consumed not only in the form of sprouting beans, but also in the forms of vegetables. The genus *vigna* savi is represented by seven species in india (santapau & henry, 1973) viz. *Vigna aconitifolia* (jacq.) Marechal, *v. Mungo* (linn.) Hepper, *v. Pilosa* (baker), *v. Radiata* (linn.) Wilczek, *v. Trilobata* (linn.) Verdcourt, *v. Unguiculata* (linn.) Walp, *v. Vexillata* (linn.) A. Rich. Out of these seven species *v. Mungo*, *v. Radiata* and *v. Unguiculata* are widely cultivated in bihar, *v. Trilobata* are commonly grown in wild state in plains and *v. Vexillata* and *v. Pilosa* have been reported from singbhum (south chotanagpur).

Arora et al., (1973) collected wild *vigna* species and reported the occurrence of two distinct types akin to mung and urd. Several other wild *vigna* species including the wild forms of urd were also collected from the western ghats. Later sharma et al., (1977) and singh and ahuja (1977) also collected variable populations from the poona – khandala and u. P. Hilly regions. Chandel (1981) studied the wild population at different transacts in simla hills (900 – 1800 m) and reported that swarms of var. *Sublobata* were found to occur, were intermediate with reference to differentiation of taxonomic characters at subspecies level. Similar situations

prevailed in kumaon / garhwal himalayass and pachmarhi hills, central india; these populations exhibited sympatric variation with in wild species i.e. *V. Umbellata* and *v. Vexillata*. The wild var. *Silvestris*, occurring in poona – khandala region shows similar type of variation (sharma et al., 1974).

Review of work

Chandel (1984) presented role of *vigna* species in the evolution and improvement of mung, (*v. Radiata* (L.) Wilczek) and urd bean (*v. Mungo* (L.) Hepper); 49 accessions consist of mung, urd, their intermediate forms, two closely related wild species viz. *V. Radiata* (L.) Wilczek var. *Sublobata* verdc. And *v. Mungo* (L.) Hepper var. *Silvestris* lukoki, marechal & otoul. All these species/forms were grown during july-oct. 1978 at the iari farm at new delhi. The wild taxon namely *v. Mungo* (L.) Hepper var. *Silvestris* lukoki, marechal and otoul was collected by arora et al., (1973) from the western ghats, india was found to be the present day ancestral form of urd bean; their studies furnished more evidences from phytogeographic distribution, population structure in natural habitats, gene flow and possible introgression and elucidated evolutionary relationships among wild, weedy and cultivated *vigna* species. The overlapping distribution of wild, weedy and cultigen forms and the occurrence of archaeological remains further substantiated the origin of mung and urd beans in india. High genetic variability

with respect to yield components occurrence of wild ancestral forms especially wild *v. Mungo* var. *Silvestris*. Similarly, wild *v. Mungo* var. *Silvestris* is certainly of great potential importance as a source of genes for improving urd bean by plant breeders.

Ignacimuthu and babu (1984)

worked on phenotypic variations in natural population of *vigna radiata* (L.) Wilczek var. *Sublobata* (roxb.) Verdc. (leguminosae –papilionoideae). In this paper authors deal with the variability patterns for eight quantitative, adaptive and economically important phenotypic traits in eight natural populations of *v. Radiata* (L.) Wilczek var. *Sublobata* (roxb.) Verdc, inhabiting four different localities (shenbaganur, manjam patty, payalset and memballam) in palney hills of western ghats in (tamilnadu). Eight natural populations inhabiting different ecological habitats were sampled for the analysis of phenotypic variability.

Aims and objectives

Review of work on wild and cultivated species of *vigna* indicated that a meagre work has been done on survey of wild vignas in maharashtra in general and vidharbha in particular. These species *v. Radiata*(L.) Wilczek.var. *Sublobata* (roxb.)Verdc., *v. Umbellata*,*v. Trilobata*(L.)Verdc.var. *Trilobata* and *v. Mungo* are rare and uncommon in distribution in this region. During the survey of above four species author has come to realise that the number of these species in nature has reduced fastly.therefore their protection and conservation is very essential otherwise they are on the way of extinction.

The main objective of this work is to bring them in botanical garden and try to acclimatize them to new environmental condition and to study them in detail taxonomically.

Methodology

Plant species of the genus *vigna* collected from various localities of vidarbha region from the rural area as well as core areas of the melghat forest and some other localities. The herbarium of collected four plant species was made and the identification was confirmed from botanical survey of india, centre pune. Taxonomic description was made according to bentham and hooker system

of classification (1862-1883) as well as preparation of key of *vigna* species incorporated in observation chapter.

1) Measurements of floral parts –

During the study of morphodiversity of different wild and cultivated species selected for present work it was found most essential to go for floral parts measurement which could assist in establishing interrelationship between wild and cultivated species.

2) bentham and hooker system of classification (1862-1883)

Has been followed for the taxonomic description as well as preparation of key of *vigna* species incorporated in observation chapter.

Observations

Taxonomic description of the species

***Vigna umbellata* (thunb.) Ohwi & ohashi**

Spreading herb, twiners; root tap, nodulose, stem squarish, smooth glabrous, racemose branching, hairy, leaf stipulate, stipule small lateral foliaceous, pennately compound trifoliate, petiole grooved 4cm hairy, two lateral leaflets oblique entire acute, shortly stalked, terminal leaflets ovate, venation reticulate unicostate, inflorescence axillary racemose, medium pedunculate glabrous length 3 cm, flower typically papilionaceous shortly stalked, bracteate, colour-faint yellow, calyx gamosepalous with 5 sepals. Corolla-papilionaceous, colour faint yellow; androecium 1 + 9 diadelphous. Gynoecium-monocarpellary unilocular with marginal placentation. Pod legume many seeded; pod length 3-5 cm, compressed, beaked, hirsute, colour brown to black. Seed 6-12 oblong, 2 mm long, colour pale brown to black with truncate ends. Flowering period last week of sept.-2nd week of oct. Ecological note – growing on either sides of road in forest of melghat on gravelly soil. (fig no.- 1,2,3,4,5.)

***VIGNA MUNGO* (L.) VERDC.**

Erect herb; Root tap, profusely nodulose; Stem square, glabrous reddish brown in colour, branching racemose. Leaf stipulate, trifoliate, petiole long stipel present, two lateral leaflets oblique, entire, apex acute, shortly stalk, terminal leaflet ovate to rhomboid, venation reticulate unicostate. Inflorescence axillary or terminal racemose, peduncle

glabrous medium length 3.5 to 4 cm. Flower typically papilionaceous, shortly stalked, bracteate, bright yellow; Calyx gamosepalous with 5 sepals; Corolla papilionaceous, yellow. Androecium 1+9 diadelphous; Gynoecium-monocarpellary unilocular with marginal placentation. Pod legume, many seeded, length 4.5 cm, blackish to brown, glabrous. Seed cylindrical arillate, pale brown to black. Flowering period – 2nd week of Aug. – 1st week of Sept. Ecological note – cultivate in black cotton soil. (Fig no.-6,7,8,9,10.)

VIGNA TRILOBATA (L.) VERDC. VAR. TRILOBATA

Wild seasonal spreading herb. Root fibrous with nodules; stem prostrate green, angular, solid, branching racemose, aerial; Leaf simple, petiolate, stipulate foliaceous, alternate, length of petiole 7.5 cm, trifoliolate, central leaflet having larger petiole, side leaflets having small petiole, stipules free lateral, trilobed leaflets, margin entire, venation reticulate multicostate, convergent, rough surfaced, size 4.5 X 5cm, green. Inflorescence long pedunculate, axillary raceme, flowers, shortly stalked, racemes with tumid nodes, peduncles 10-22cm long, striate, glabrous, pedicels very short, bracts ovate, acute, deciduous, bracteoles linear-lanceolate 3 mm long; Calyx gamosepalous with 5 sepal, glabrous teeth deltoid minutely deltoid. Corolla pale yellow 5-6 mm long; Androecium- 1+9 diadelphous; Gynoecium monocarpellary unilocular with marginal placentation; Pods many seeded ending in a sharp point, thinly hairy up to 5 cm linear, oblong, quadrate; Seed- oblong, drum shaped with white conspicuous aril 2mm, brown black. Flowering period – 2nd week of Aug. – 2nd week of Nov. Ecological note – frequent in grasslands around cultivated fields. (Fig no.-11,12,13,14,15.)

VIGNA RADIATA (L.) WILCZEK. VAR. SUBLOBATA (ROXB.) VERDC.

Suberect or twining herb. Root tap. Stem rounded, slender, angled, striate clothed with spreading or deflexed reddish brown hairs, racemose branching; Leaves- 3- foliolate pinnate compound, two lateral leaflets rhomboid, entire,

acute, shortly stalked; terminal leaflets ovate, cunate rounded or truncate at base, silky, hairy on both sides, venation reticulate unicostate; petiole 5-7 cm. Long hairy; Stipules ovate, oblong, acute, hairy attached much above the base; Petiolule 2-3 cm. long hairy. Inflorescence axillary racemose, medium pedunculate hairy, length 2.5 –3 cm. Flower typically papilionaceous, with tumid nodes; Peduncles 4-12 cm. long, hairy; Pedicels very short, bracts ovate oblong 3-4 cm, acute deciduous; bracteoles linear, long 5-6 mm ciliate. Calyx gamosepalous with 5 sepals. 3-4 cm long glabrous, toothed deltoid shorter than the tube. Corolla Papilionaceous, light yellow, 12 – 15 mm long. Androecium 1+9 diadelphous. Gynoecium monocarpellary unilocular with marginal placentation; Pod cylindrical, 3 – 6 cm, straight densely hispid, brown black in colour, beak knob shaped. Seed 8-12, oblong 2-3 mm. Flowering period – Sept. – Nov. Ecological note – growing on the banks of nalas, ponds, lakes, ditches on humus mixed soil, some time on black cotton soil. (Fig no.-16,17,18,19,20,21.)

Taxonomic key

BENTHAM AND HOOKER SYSTEM OF CLASSIFICATION (1862-1883) HAS BEEN FOLLOWED FOR THE TAXONOMIC DESCRIPTION AS WELL AS PREPARATION OF KEY OF VIGNA SPECIES.

KEY TO THE SPECIES AND VARIETIES TREATED IN THE TEXT.

1A. STEM SLENDER; LEAFLETS 2-5 CM LONG AND BROAD; PODS SLENDER, -----

----- V. UMBELLATA.

B. STEM RATHER STOUT; LEAFLETS 3 – 12 X 2 – 8 CM; PODS STOUT, -----

----- V. MUNGO

2. STIPULES LARGE, FOLIACEOUS ---

----- V. TRILOBATA VAR.

TRILOBATA

3. LEAFLETS ENTIRE AS WELL AS SHALLOWLY LOBED; PODS COVERED WITH

SHORT, DENSE HAIRS -----

V. RADIATA VAR. SUBLOBATA

V. UMBELLATA (THUNB.) OHWI & OHASHI.



FIG.1-WHOLE PLANT

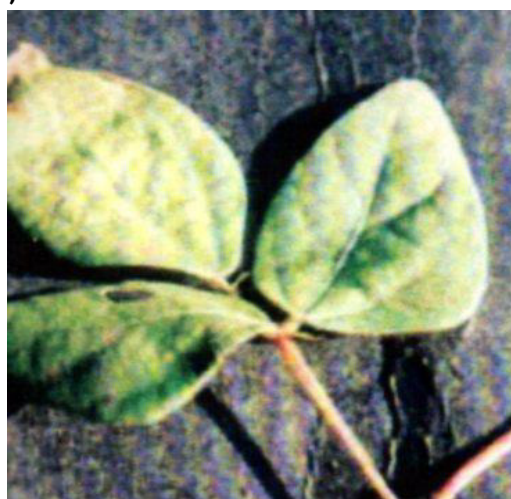


FIG.2-LEAF



FIG.3-MATURE PODS



FIG.4-FLORAL PARTS

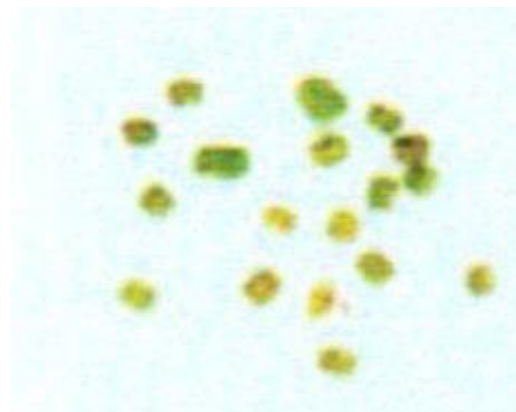


FIG.5-SEEDS

V. MUNGO (L.) VERDC.



FIG.6-WHOLE PLANT



FIG.7-LEAF



FIG.8-MATURE PODS



FIG.9-FLORAL PARTS



FIG. 10-SEEDS

***V. TRILOBATA* (L.) VERDC. VAR. *TRILOBATA*.**



FIG.11-WHOLE PLANT



FIG.12-FLOWERS



FIG.13-LEAF



FIG.14-FLOAL PARTS



FIG. 15-SEEDS

V. RADIATA (L.) WILCZEK VAR. SUBLOBATA (ROXB.) VERDC.**FIG.16-WHOLE PLANT****FIG.17-LEAF****FIG.18-FLOWER****FIG.19-YOUNG POD****FIG.20-FLORAL PARTS****FIG.21-SEEDS****RESULTS & DISCUSSION****Results-**

It is seen from comparative morphology of stem, leaves and petioles that they are less hairy in cultivated species and more hispid in wild forms. Red coloured anthocyanin shades are observed less on the cultivated species and more on the wild forms.

v. Trilobata var. *trilobata* is simply lobed and venation is reticulate, multicostate.

On the basis of pod colour at mature stage *v. Umbellata*, *v. Trilobata* var. *Trilobata* and *v. Radiata* var. *Sublobata* having brown black colour can indicates their affinity with one another. black pod colour in *v. Mungo* seen.

Pod pubescence in *v. Umbellata* and *v. Radiata* var. *Sublobata* show closeness with each other. *V. Mungo* having dense pubescence. *v. Trilobata* var. *Trilobata* with glabrous pod. In cultivated species the seed colour is brown, black, green, whereas in wild forms it is brown

mosaic to black. In majority of wild forms seeds are mosaic black in colour.

In majority of cultivated species due to luster on seed surface, seeds look is shiny and attractive whereas it is absent in wild forms; so wild seeds are dull in appearance with mosaic ornamentation.

Seed is drum shaped in cultivated species where as it is drum shaped, globose and ovoid in wild forms.

Hilum is concave in majority of cultivated forms and non-concave in wild forms.

Fruit setting capacity is less in wild forms with respect to cultivated species.

Length of branches is more in wild forms than in cultivated species.

Lukaki, marechal and otoul (1980) suggested that wild forms, *v. Radiata* (l.) Wilczek var. *Sublobata verdc.* And *v. Mungo* (l.) Hepper var. *Silvestris lukoki*, marechal and otoul, are the closest relatives of the cultivated mung and urd beans, and could be regarded as their putative progenitors.

The results obtained from taxonomy, scanning electron microscopy of seed coat patterns and hilum structure; seed protein polymorphism as well as chromatography of leaf phenolic substances (flavonoids) provided very strong evidences. The study showed that mung and urd are two distinct species. Close affinity of wild var. *Sublobata* with mung and that of wild var. *Silvestris* with urd was established (Chandel et al., 1984).

Chandel and Lester (1985) reviewed the evidence from all available sources to elucidate origin and evolutionary relationships among wild and cultivated *vigna* species.

According to Harlan (1975) the evolution of weeds often parallels the evolution of crops and both often begin with a common progenitor.

The wild and weedy *vigna* species, perhaps evolved under similar situations in the disturbed habitats (Chandel, 1981).

A change in ecological adaptation usually associated with morphological differentiation, from forms identical to wild races to fully domesticated races (Harlan, 1975).

Weedy forms both of mung and urd thrive well in the disturbed habitats / under cultivation. (Chandel, 1984).

Author of the thesis has worked on nature of morphodiversity within wild

species occurring in various parts in Vidarbha. Emphasis is also given on type of interrelationship amongst wild and cultivated species in the area. The four cultivated species belonging to the genus *vigna* were close relatives of each other, in addition to these; six wild forms were surveyed and collected from unknown localities of Vidarbha exhibiting morphodiversity within them. Some of the morphological features in a particular wild species occurring in Vidarbha are also reflected in the same species found in different parts of country. It is also interesting to see whether any trend of evolution can be traced within the genus *vigna*.

Conclusions

On the basis of the closeness in morphological characteristics with respect to flower colour, pod and seed structure, texture and size, flowering period, study of floral parts and ecological adaptations. It is concluded that *v. radiata* (l.) Wilczek var. *sublobata* (roxb.) Verdc., *v. Umbellata* and *v. Mungo* shows more close affinity with each other so they may be close relatives of each other.

Out of the total species taken into study *v. umbellata* and *v. trilobata* verde. Var. *trilobata* are wild relatives of the cultivated species of *v. Radiata* and *v. Mungo*. *Dolichus trilobata* is the escape form of *vigna sublobata* showing difference in the texture and size of leaf, this is just a little variation, it is noted in this study.

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