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RESEARCH ARTICLE

Note on Diversity in Legumes and Oilseeds and their Wild Relatives in Eastern Ghats of India: Utilization and Conservation Concerns

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Investigation was carried out during 2013-2016 for collection, conservation and updating the present status of legumes, oilseeds and their wild relatives in Eastern Ghats of India. Frequent field surveys were conducted and the plant specimens at flowering and fruiting stages were collected. A total of 66 wild species of legume and oilseeds were collected. These belong to 11 genera and two families. The genus *Rhynchosia* represented maximum number of species with 16 followed by *Vigna* (13), *Flemingia* (10), *Cajanus Mucuna* (6), *Sesamum* (5), *Canavalia* (4), *Macroptelium* (3) and *Dunbaria*, *Dolichos*, *Paracalyx* represented one species each. These wild relatives possess important traits such as resistance to abiotic and biotic stresses and high nutritional value can be utilized for trait specific crop improvement.

Key Words: Conservation, Eastern Ghats, Legumes, Oilseeds, Wild relatives

Introduction

Grain legumes are an important source of nutrients and renowned as poor man's meat especially in developing countries (Hayat *et al.*, 2014). Legumes provide an exceptionally varied nutrient profile, including proteins, fibers, vitamins and minerals (Wang *et al.*, 2003; Mitchell *et al.*, 2009). Climate change is another converging force, which potentially decrease crop productivity (Varshney *et al.*, 2010; McClean *et al.*, 2011). Wild relatives of domesticated crops possess genetic diversity useful for developing more productive, nutritious and resilient crop varieties (Nora *et al.*, 2016). Crop wild relatives are species with a close genetic similarity to crops and many of them have the potential or actual ability to contribute beneficial traits to these crops such as resistance to biotic and abiotic stresses, higher and stable yields (Meilleur and Hodgkin, 2004; Hajjar and Hodgking, 2007; Maxted *et al.*, 2010; Elangovan *et al.*, 2012). Crop wild relatives share a relatively recent common ancestry with domesticated species and due to that close relationship are reservoirs of genetic traits that can be useful in crop improvement (Guarino and Lobell, 2011; Dempewolf *et al.*, 2014). The efficient utilization of wide diversity of plant genetic resources improves the collection and conservation of more distant relatives of the crop plants (Khoury *et al.*, 2015).

Grain legumes provide an unparalleled solution to food and nutritional security problem because of their inherent capacity for symbiotic atmospheric nitrogen fixation, which provides economically sustainable advantages for farming (Foyer *et al.*, 2016). Food legumes are second most important group of crops after cereals which have been a vital ingredient of balanced human diet since millennia and second most valuable plant source for human and animal nutrition (Bhatt and Karim, 2009). Underutilized legumes make a significant contribution to the diet of the rural households particularly, during drought, famine and dry season. These are the life-savers for millions of resource poor people in the regions where ensuring food and nutritional security is one of the significant problems, particularly in traditional subsistence farming systems. Legumes have the ability to quench the demands for human consumption as well as supply of quality supplementary livestock feed and also exhibit high potential for soil conservation strategies (Pengelly and Maass, 2001). Legumes encompass the ability to fix atmospheric nitrogen (N) through their symbiosis with rhizobia and hence supply N to

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Fig. A. 1. ***Flemingia stricta*** 2. ***Cajanus scaraboides*** 3. ***Canavalia gladiata***

subsequent crops (Wortmann *et al.*, 2000). Due to its high nutritive value and agronomic traits, legumes can play an increasing role in low input production systems in India, East Africa and elsewhere in the dry sub-tropics and tropics. Oilseeds are next to food grains in terms of area of cultivation and production value in India. The genetic base of the currently cultivated oilseed varieties is narrow which can be further broadened by utilization of diverse germplasm/wild relatives.

Eastern Ghats is one of the major hill ranges of India form an assembly of discontinuous ranges of hills, plateaus and narrow basin which are and spread over to an area of 7500km^2. The Eastern Ghats cover parts of Odisha, Andhra Pradesh, Telangana, Tamil Nadu and smaller area of Chhattisgarh, Maharashtra and Karnataka states with rich infloristic diversity. More than 2500 species of Angiosperms represented from this area which constitute about 13 percent of the flowering plants of India. Identifying both the cultivated and their wild relatives are a subject of contemporary investigations. Based on the experience of these initiatives and to meet the chanllaenges of Indian agriculture this paper aims to outline coherent information on legumes, oil seeds and their wild relatives with respect to conservation and its utilization in future.

Materials and Methods

The present study was carried out during 2013-2016. Wild species of legumes and oilseeds were collected from different phyto-geographical regions of the Eastern Ghats of India. Information on species distribution was were prepared based on published literature, local, regional, and state floras and monographs. Frequent field surveys were conducted and plant specimens were collected at flowering and fruiting stages.Collected fresh plant materials were dried for herbarium specimen's preparation and specimens collected in Formalin Acetic Acid (FAA) (Alcohol 70% + Acetic acid 5% + Formaldehyde 5% + Distilled water 20%) solutions were used for morphological charactersiations for species identifications. All the collected plants were identified up to species level using regional and local floras (Pullaiah and Ramamurthy, 2000; Pradheep *et al.*, 2014). The wild relatives of crop plants were recorded and herbarium specimens were prepared following standard methodology and finally validated through reference material at the herbarium of National Herbarium on Cultivated Plants (NHCP), ICAR-National Bureau of Plant Genetic Resources (NBPGR), New Delhi, India.

Results

A total of 66 wild species of legumes and oilseeds were identified. These comprised of 11 genera belonging to two families in Eastern Ghats. The genus Rhynchosia were represented by maximum number of species (16), followed by Vigna (13), Flemingia (10), Cajanus and *Mucuna* (6), *Sesamum* (5), *Canavalia* (4), *Macroptelium* (3) and *Dunbaria*, *Dolichos* and *Paracalyx* are represented by single species, respectively. The wild relatives with their available location are listed in Table 1 along with their photographs (Fig. A&B). The details of crop wise wild relatives of legumes and oilseeds present in Eastern Ghats are given below:

Legumes

Cultivated grain legumes or pulses belong to the family Fabaceae (Leguminosae), which comprises 800 genera and 20,000 species, is the third largest family of flowering plants, after the Orchidaceae and Asteraceae. The family Papilionoideae is divided into four clades: (1) Phaseoloids (*Glycine* Willd., *Phaseolus* L., *Cajanus* L. and *Vigna savi*), (2) *Galegoids* (*Pisum* L., Lens Mill., *Lathyrus* L., *Vicia* L., *Medicago* L. and *Cicer* L.), (3) Genistoids (*Lupinus* L.) and (4) Dalbergoids (*Arachis* L. and Stylosanthes Sw.) (Lewis *et al.*, 2005; Petr *et al.*, 2015).

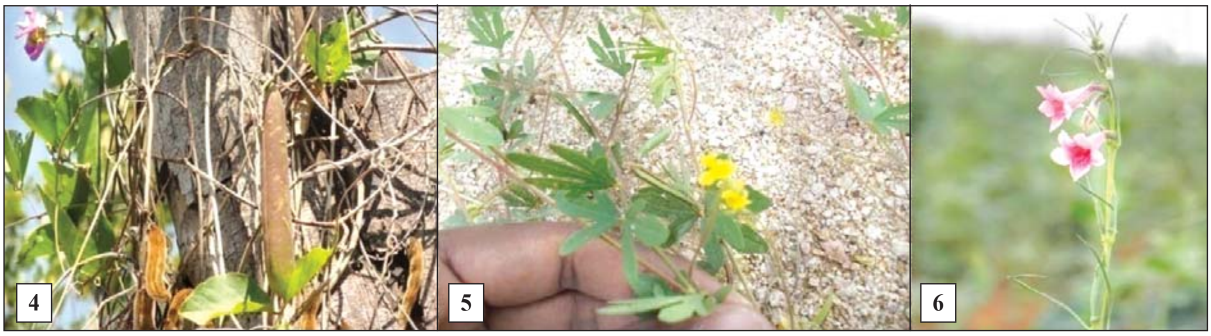

Fig. B. **4. *Mucuna* and *Canavalia*** **5. *Vigna aconitifolia*** **6. *Sesamum alatum***

Table 1. List of wild species of legumes and oil seeds from Eastern Ghats of India

S.No.	Scientific Name	Chromosome No.	Location
1	*Cajanus albicans* (Wight & Arn). Van der maesen	2n=22	KNL, PKSM
2	*C. cajanifolius* (Haines) van der maesan	2n=22	CTR, KDP, KNL, PKSM
3	*C. rugosus* (Wight & Arn) van der maesen		CTR, KD, KNL, MBNR
4	*C. scarabaeoides* (L.) du Petit	2n=22	Throughout EG
5	*C. sericeus* (Benth ex Baker) van der maesen	2n=22	Throughout EG
6	*C. volubilis* (Blanco) Blanco (Syn. C. crassus)	2n=22	CTR, KNL, PKSM
7	*Canavalia cathartic* Thouars (Syn. C. africana)	2n=22	CTR, KNL, PKSM
8	*C. ensiformis* (L.)Dc	2n=22	CTR, KNL, PKSM
9	*C. lineata* DC	2n=22	CTR, VSKP
10	*C. mollis* Wall ex Wight & Arn	2n=22	CTR, KNL, MBNR
11	*Dunbaria ferruginea* Wight & Arn		Throughout EG
12	*Dolichos trilobatus* L.	2n=20	Throughout EG
13	*Flemingia bracteata* (Roxb)Wight		KNL, PKSM
14	*F. chappar* Bush. Ham		CTR, KDP, VSKP
15	*F. lineata* (L.) Roxb		KNL, PKSM, MBNR
16	*F. macrophylla* (Willd.) Prain ex Merr.	2n=22	KNL, PKSM
17	*F. nana* Roxb		CTR, KDP, KNL, MBNR
18	*F. praecox* C.B. Clarke ex prain var. *robusta* (Mukerjee) Benet		KNL, PKSM, MBNR
19	*F. semialata* Roxb		KNL, PKSM, VSKP
20	*F. stricta* Roxb		Throughout EG
21	*F. strobilifera* (L.) R.Br		CTR, KNL, PKSM
22	*F. wallichii* Wight & Arn		CTR, KDP, KNL
23	*Macroptilium atropurpureum* (DC.) Urban		Throughout EG
24	*M. lathyroides* (L.) Urban var. *semierectum* (L.) Urban		VSKP
25	*M. uniflorum* (Lam.) verde		Throughout EG
26	*Mucuna atropurpurea* DC. Prodr		Throughout EG
27	*M. gigantea* D.C. Prodr.		CTR, KNL, VSKP
28	*M. monosperma* DC ex Wight		CTR, KNL, MBNR
29	*M. nigricans* (Lour.) Steud		KNL, PKSM, CTR
30	*M. pruriens* (L.) DC Prodr		Throughout EG
31	*M. pruriens* var. *Hirsuta* (Wight & Arn) Wilmot Dean		Throughout EG
32	*Paracalys scariosus*		KNL, PKSM, CTR
33	*Rhynchosia beddomei* Baker		Throughout EG
34	*R. bracteata* Benth		CTR, KDP, KNL, MBNR
35	*R. cana* (Willd.) DC. Prodr		CTR, KDP, KNL
36	*R. capitata* DC Prodr		Throughout EG
37	*R. courtallensis* van der Maesen		CTR, KNL, VSKP
38	*R. densiflora* (Roth) Roth. Prodr		CTR, KDP, KNL, MBNR
39	*R. filipes* Benth		CTR, KDP

Contd.

S.No.	Scientific Name	Chromosome No.	Location
40	*R. hainesiana* Satyan & Thoth		CTR, KDP
41	*R. heynei* Wight & Arn		CTR, KNL
42	*R. hirta* (Andr.) Meikle & Verdc.		Throughout EG
43	*R. minima* (L.) DC Prodr		Throughout EG
44	*R. ravii*		ATP
45	*R. rothii* Benth ex Aitch		CTR, KDP, KNL, MBNR
46	*R. rufescens* (Willd.) DC. Prodr		Throughout EG
47	*R. suaveolens* (L.f.) DC. Prodr		CTR, KDP, KNL
48	*R. viscosa* (Roth) DC. Prodr		CTR, KNL
49	*Vigna aconitifolia* (Jacq) Marechal	2n=22, 44	Throughout EG
50	*V. dalzelliana* (O. Kuntze) Verdc	2n=22	CTR, VSKP
51	*V. grahamiana* (Wight & Arn) Verdc	2n=22	VSKP
52	*V. hainiana* Babu *et al.*		Throughout EG
53	*V. mungo* (L.) Hepper	2n=22	Throughout EG
54	*V. pilosa* (Willd) Baker	2n=22	KNL, PKSM, VSKP
55	*V. radiata* Wilczek	2n=22	Throughout EG
56	*V. sublobata* (Roxb) Babu *et al.*	2n=22	Throughout EG
57	*V. trilobata* (Thunb) Ohwi & Ohashi	2n=22, 44	Throughout EG
58	*V. umbellata* (Thumb.) Ohwi & Ohashi	2n=22, 44	Throughout EG
59	*V. unguiculata* (L.) walp subsp. *cylindrica* (L.) ESH	2n=22, 44	VSKP
60	*V. unguiculata* subsp. *sesquipedalis*		Throughout EG
61	*V. vexillata* (L.) A. Rch var. Stocksii Benth ex Baker	2n=22	VSKP
62	*Sesamum alatum* Thonn	2n=26	KNL, PKSM
63	*S. laciniatum* Klein ex willd	2n=32	CTR, KNL
64	*S. indicum* L. var. *indicumorientale* L.	2n=26	CTR, KDP, KNL
65	*S. prostratum* Retz.	2n=32	KNL, MBNR
66	*S. radiatum* Schumach &Tginn	2n=64	KNL

CTR: Chittor; KDP: Kadapa; KNL: Kurnool; MBNR: Mahabubnagar; PKSM: Prakasam; VSKP: Visakhapatnam

In Eastern Ghats regions, several legume crops such as Pigeon pea (*Cajanus cajan*), chickpea (*Cicer aritinum*), Soybean (*Glycine max*), horse gram (*Macrotyloma uniflorum*), groundnut (*Arachis hypogea*), green gram (*Vigna radiata),* black gram (*Vigna mungo*), cowpea (*Vigna unguiculata*) and Indian bean (*Lablab purpureus*), cluster bean (*Cymopsis tetragonoloba*), sword bean (*Canavalia gladiata*) are cultivated for livelihood and commercial purposes. Although Chickpea and groundnut are extensively cultivated in Eastern Ghats but we did not find any wild relatives of these crops in the surveyed region area. Similarly, soybean and and cluster bean are cultivated in small pockets but their wild relatives are not reported so far.

Cajanus: Pigeonpea (*Cajanus cajan* (L.) Millsp.), a sub-tropical and tropical grain legume that originated in the northern region of the Indian sub-continent, spreading to East Africa at least 4000 years BC and then to Southeast Asia, West Africa, Latin America, and the Caribbean (Khoury *et al.*, 2015). Smartt (1990) classified the wild relatives of *Cajanus* into primary, secondary and tertiary gene pools based on their crossability. Upadhyaya *et al.* (2013) reported seven genera closely related to pigeonpea. These included *Cajanus, Dunbaria, Flemengia, Paracalyx* and *Rhynchosia* which occur in Eastern Ghats. Bio-systematic studies encompassing morpho-cytological and electrophoretic analysis of *Cajanus cajan* (7), one of *Rhynchosia* revealed that *C. cajanifolius* is closest to *C. cajan* followed by *C. lineatus*, *C. scarabaeoides*, *C. sericeus*, *C. albicans*, *C. volubilis*, *C. platycarpus* and *R. rothii* (Pundir and Singh, 1985a). Except *C. lineatus* and *C. platycarpus*, all other species are present in Eastern Ghats.

Cajanus cajanifolius is the progenitor of the present day cultivated pigeon pea (Kassa *et al.*, 2012) and it is the donor for dwarf genes and cytoplasmic male sterility and having high protein content (Jha and Ohri, 1996), salinity tolerant, tolerant to pod borer, pod fly and pod wasp and a source for A5 cytoplasm, crossable with pigeon pea (Singh *et al.*, 1990; Sharma *et al.*, 2006).

C. scarabaoides is resistant to pod-borer, bruchids and drought and water logging and it exhibit early flowering, resistance to wilt, sterility mosaic disease, phytophthora blight, alternaria blight and also source for A2 cytoplasm and crossable with pigeon pea. While, *C. sericeus*, *C. albicans* and *C. volubilis* is resistant to pigeon pea sterility mosaic virus, Phytophthora blight, pod fly and pod borer (Pundir and Singh, 1985b; Sharma, 2006). *C. crassus* is a Source for A3 Cytoplasm (Upadhyaya *et al.*, 2013). All these wild relatives are highly tolerant to drought, salinity and high protein content. Many wild relatives including those of pigeon pea have survived drought, floods, extreme heat and cold and have developed resistance to various biotic and abiotic stresses.

Jack bean: The Jack bean (*Canavalia ensiformis*) is very closely related to the sword bean but the seeds can be distinguished by the length of the hilum which is nearly as long as the seed in the sword bean and less than half its length in the jack bean (Smartt, 1976). According to Herklots (1972), the plant *C. gladiate* is considered as an Old World Tropic, whereas *C. ensiformis* is a New World Tropic. The mature seeds of *Canavalia gladiata* have been originally consumed by people of ancient India and are now consumed even by urbanized population (Vishnu Mittra, 1981). Jack bean and sword bean are advocated to be good sources for protein since the protein quality is similar to most edible food legumes both as a food and a feed (Bressani *et al.*, 1987). Tribal people of ancient India consume Canavalia seeds traditionally (Rajaram and Janardhanan, 1987).

Lablab bean: Lablab is an ancient domesticated crop, widely distributed in Africa, the Indian sub-continent and Southeast Asia . This is a drought tolerant plant. It is used as a grain legume and vegetable for more than 3500 years (Maass *et al.*, 2006).

Mucuna: Underutilized legumes are in demand as alternate protein sources to meet the ever increasing demand of vegetable protein (Pugalenthi *et al.*, 2005).

Rhynchosia: The genus *Rhynchosia* comprises about 250 species and closely related to the genus *Cajanus* and distributed throughout the tropics (Ramcharan *et al.*, 1973). In India the genus is represented by 25 species, as well as one variety and one subspecies of which 7 species are endemic to India.

In India, a great diversity of the *Rhynchosia* species (~60 found in the Eastern Ghats) have been reported (Pullaiah and Sriramamurthy, 2000). *Rhynchosia* species are used as anti-nociceptive and anti-inflammatory agents and some species also have anti-fertility and antipyretic effects (Vimala *et al.*, 1997).

Vigna: Vigna is a pan-tropical genus comprising 104 species distributed widely in tropical and subtropical regions (Lewis *et al.*, 2005; Schrire, 2005). Maréchal *et al.* (1978) recognized seven subgenera in the genus *Vigna* sp. l.: *Ceratotropis, Haydonia, Lasiospron, Macrorhynchus, Plectotropis, Sigmoidotropis* and *Vigna*. *Vigna* subg. *Macrorhynchus* is now included in *Wajira* (Thulin *et al.*, 2004). Among the listed accessions species, five subgenera presently recognized (*Ceratotropis, Haydonia, Lasiospron, Plectrotropis* and *Vigna*), and cultivated species have been developed only from three subgenera (*Ceratotropis, Plectrotropis* and *Vigna*) (Takahasi *et al.*, 2016). The sub-genus *Ceratotropis* has its centre of diversity in Asia with 21 species (Tomooka *et al.*, 2011). The genus *Vigna* has a complex taxonomy because of its relationship with *Phaseolus* (Maréchal *et al.*, 1978). About ten *Vigna* species are domesticated or cultivated as food, feed and for ground cover. Mungbean (*V. radiata* (L.) Wilczek), blackgram (*V. mungo* (L.) Hepper), cowpea (*V. unguicul*ata (L.) Walps) and Bambara groundnut (*V. subterranea* (L.) Verdc.) are the most important crops of the genus *Vigna* and grown as a main component in cropping systems (Tomooka *et al.*, 2002). Babu *et al.*, (1987) enumerated 23 species of *Vigna* including naturalized and cultivated ones from India and a total of 13 *Vigna* species (56%) present in Eastern Ghats.

Moth bean: It is reported as a crop most tolerant to drought and heat in the subgenus *Ceratotropis* (Jain and Mehra, 1980). The wild form of moth bean was documented to be distributed in India (Arora and Nayer, 1984).Takahashi *et al.* (2016) collected three *V. aconitifolia* accessions as wild forms from Tamil Nadu and Andhra Pradesh. The collection sites of these three accessions suggest that the primary habitat of the wild form of moth bean is south-eastern India, Andhra Pradesh, some parts of Tamil Nadu under Eastern Ghats region. *Vigna aconitifolia* is resistant to Mung bean Yellow Mosaic Virus (MYMV) (Bhaskar *et al.*, 1990, Yaqoob, 2007; Meghwal *et al.*, 2015).

Vigna unguiculata subsp. *sesquipedalis* are believed to have been selected and developed for their long tender pods in South-East Asia. This is from vegetable types of *Vigna unguiculata* introduced from India (Steele and Mehra, 1980). It is recently identified and collected from coastal regions of Andhra Pradesh and Odisha of Eastern

Ghats (Kamala *et al.*, 2014). This crop has potential uses in the cosmetic, food, textile and pharmaceutical sectors because of their therapeutic properties (Singh and Basu, 2012). It is a source of several vitamins, minerals and other trace elements (Singh *et al.*, 2003).

Vigna vexillata (L.) A. Rich. belongs to sub genus *Plectotropis* of *Vigna* within the subtribe Phaseolinae (Smartt 1990; Karuniawan *et al.*, 2006). It is considered to be closely related to the cowpea (*V. unguiculata*) (Sonnante *et al.*, 1996; Garba and Pasquet, 1998). The cultivation of *V. vexillata* as a root crop has been reported in East and North East India, where it is locally known as 'halunda' (Bhattacharyya *et al.*, 1984) and in the foothills of the Himalaya region (Sasikumar and Sardana, 1988). Seeds of *Vigna vexillata* are boiled and consumed by the tribal people living in the hilly region of Pune district, India (Siddhuraju *et al.*, 1994).

Oilseeds

In Eastern Ghats several oil yielding crops are cultivated like groundnut (*Arachis hypogea*), oil palm (*Elaeis guineensis*), safflower (*Carthamus tinctorius*), mustard (*Brassica* sp.), soybean (*Glycine max*), castor (*Ricinus communis*), sunflower (*Helianthus annuus*) and coconut (*Cocos nucifera*). Wild relatives of only sesamum crop are reported and found in this region.

Sesamum: Sesamum orientale and *Sesamum indicum* are the alternatively used scientific names of sesame (Bedigian 2003). Nicolson and Wieserma (2004) proposed *S. indicum* name against *S. orientale*, which was conserved against *S. orientale* and is in use since 2005. More than 38 species have been described in this genus, which are classified into different groups on the basis of their geographic distribution, morphologic and cytogenetic information (Kobayashi 1991). Nayer *et al.*, (2006) categorized reported six species of *Sesamum* into in India of which 5 of them are reported from Eastern Ghats. The genus *Sesamum* L. contains about 19 species and is widely distributed in Old world tropics and South Africa. Earlier research and reports on sesame have mainly focused on quantitative genetics (Wei *et al.*, 2009), traditional genetic breeding (Sarwar and Hussain, 2010), mutation breeding (Sengupta and Datta, 2005) and genetic relationships and diversity among sesame germplasm collections (Laurentin and Karlovsky, 2006; Abdellatef *et al.*, 2008; Uzun and Çağırgan, 2009) and screening for biotic stresses (Gupta 2004; Kumar *et al.*, 2010; Mishra *et al.*, 2016). Wild species are reservoir of potential traits which can help in the breeding activities to meet the oil demand. *S. radiatum* having large number of capsules and wide adaptation for diverse climatic conditions, is resistance to powdery mildew, leaf-webber, phyllody and drought tolerance (Thangavelu, 1994). *S. alatum* is resistant to phyllody and antigastra, *S. malabaricum* is resistant to water logging, donor for cytoplasmic male sterility, *S. mulayanum* is resistant to *fusarium* wilt and gall fly, *S. prostratum* is resistant to antigastra, salinity and non-shattering capsules whereas *S. laciniatum* is resistant to antigastra, drought and non-shattering habit Sesame is susceptible to phyllody disease caused by phytoplasma, resulting stunted plant growth and yield losses (Singh *et al.*, 2007), whereas *S. prostratum* is resistance to powdery mildew, phyllody and highly tolerant to drought and salinity and less seed shattering in nature (Pandey *et al.*, 2008).

Discussion

Grain legumes have a narrow genetic base since they are self-pollinated (though cross-pollination does take place, it is at very low frequency). Thus, there is a need to study legume genetics and genomics in depth to understand the biology of legume crops to widen the genetic base, support legume breeding programs and introgression of traits of interest (Varshney and Kudapa, 2013).Bean cultivars with tolerance to low temperatures and salinity derived from wild *Vigna* are in the pipeline (Bayuelo-Jimenez *et al.*, 2002). *Vigna* wild relatives are currently being screened for resistances to web blight, rust, white mold, bean golden yellow mosaic, bruchids, and seed storage insects (Hajjar and Hodgkin, 2007). Pest and disease resistance in wild species are still the foremost criteria for utilization. Elangovan and Kiran Babu (2015) reported 111 cultivated crops belonging to 120 genera with 139 species of 74 families from Andhra Pradesh and Telangana states, of which nine belonged to legume crops and eight belonged to oilseed crops. Khoury *et al.* (2015) proposed, priority species such as *C. crassus* and *C. scarabaeoides* occur outside these regions, thustargeted collecting throughout the geographic distributions of the species is necessary in order to form germplasm collections that are comprehensive at the population level. Non-native distributions of widespread species, particularly *C. scarabaeoides*, may also be considered for further collection for useful traits for crop improvement.

Further collecting for *ex situ* conservation of this diversity, securing long-term funding for this conservation and associated research, ensuring safety duplication of unique germplasm and sharing of this diversity with the global research community are critical to this process (Esquinas-Alcázar, 2005). Greater investment in genotypic and phenotypic characterization and evaluation for traits of interest (Mallikarjuna *et al.*, 2011; Varshney *et al.*, 2011) and in breeding programs using crop wild relatives (Tester and Langridge, 2010; Khoury *et al.*, 2015). The wild relatives have not received due attention from germplasm collectors and plant breeders, and remain under-represented, accounting for lessthan two percent of the global germplasm collections of major food crops (Kameshwara Rao, 2003). Neglected and under-valorised crop has great untapped potential to support smallholder rural farming communities by providing income, food and nutritional security as well as sustaining the genetic resources needed to address present and future environmental challenges (Kahane *et al.*, 2013). The cultivation of grain legumes over cereals is a promising way for resource-poor farmers to increase income as they can be grown well with low inputs (Siddique *et al.*, 2012). Wild relatives of crop plants potentially rich with various sources of resistance (biotic and abiotic stresses) can be improved suitably for adoptability to changing climate and meet the increasing food demand.

Conservation

Increasing awareness of the extent of habitat destruction, invasive species and other threats to the habitats of the CWR of major crops has given urgency to efforts to identify important species, determine their distributions, and to ensure their conservation for the long-term and thus their availability to plant breeders (Jarvis *et al.*, 2008; FAO,2010). Indian National Genebank holds ~0.44 million accessions of germplasm, of which, legumes represent 11,185 accessions and sesame clasps 9,954 accessions respectively. The species wise accessions conserved in Indian National Genebank given in Table 2. A gap analysis for collected and conserved crop wild relatives in Indian National Genebank revealed that out of a total of ~2000 taxa (Arora and Nayar, 1984; Pradheep *et al.*, 2014) crop wild relatives reported from India only 94 species are conserved in Indian National Genebank (Gupta *et al.*, 2016).There is an urgency to ensure that the diversity in landraces is sampled and conserved in *ex situ* genebanks, especially as farming evolves from subsistence to a market orientated endeavor dominated by modern cultivars and resulting in the erosion of crop genetic diversity (Petr *et al.*, 2015).

Table 2. List of wild germplasm accessions of legumes and sesame conserved at Indian National Genebank

S.No.	Name of the species	No. of Acc.
1	*Cajanus albicans*	3
2	*C. cajanifolius*	3
3	*C. platycarpa*	4
4	*C. scaraboides*	15
5	*Canavalia africana*	3
6	*C. cathartica*	50
7	*C. ensiformis*	62
8	*C. gladiata*	34
9	*C. obtusifolia*	2
10	*C. virosa*	7
11	*Flemingia sp.*	1
12	*Mucuna capirata*	1
13	*Mucuna gigantea*	2
14	*Mucuna monosperma*	5
15	*Sesamum laciniatum*	3
16	*S. prostratum*	6
17	*S. radiatum*	31
18	*Vigna angularis*	171
19	*V. heyniana*	2
20	*V. mungo var. sylvestris*	13
21	*V. pilosa*	3
22	*V. vexillata*	115
23	Yardlong bean	13
	Total	549

Further development in targeting germplasm for key traits is to use a GPS map of landrace collection sites, which can be overlaid with climate data corresponding to vegetative and reproductive growth stages and to identify landraces corresponding to sites with severe abiotic stresses during the previous 25 years (Petr *et al.*, 2015). Priorities and strategies for collection followed by their conservation will be defined based on the economic value of cultivated species, distribution of wild species and its potential use in crop improvement program for enhancing the food and nutritional security (Tyagi, 2016). The genus *Cajanus* holds 25 wild accessions, *Canavalia* (158), *Flemingia* (1), *Mucuna* (8), *Vigna* (304) and *Sesame* (40) and yardlong bean (13), respectively. This figure indicates that there is an urgent need for collection and conservation of trait specific wild legumes and oil seeds for future needs. At the same time, identification of trait specific germplasm for biotic, abiotic stresses needs to be identifiedexplored by characterization and evaluation for its best utilization and value added products.

Conclusion

Eastern Ghats are rich in grain legumes and oilseed plant resources and indigenous livelihood traditions, therefore under the framework of proper policy and guidelines, these resources can be more effectively used to benefit for crop improvement programs, sustainable utilization and conservation strategies. Conservation and development in this region need to be specifically suited to the environmental fragility and unique cultural aspects. Thrust area need to be for plant genetic resource based conservation, sustainable use and management of species and ecosystems that are unique to the region. The increased number of species at risk as a result of the changing climatic conditions will force the National Active Germplasm Sites (NAGS) which is responsible for crop specific to refocus, to strengthen their conservation policies and to increase their participation in recovery programs for trait specific germplasm, landraces, primitive cultivars and threatened species, including crop wild relatives. It is necessary to network and link institutions involved in agro-biodiversity related research, management and training in this region.

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