Genetic Resources in the USDA, ARS, PGRCU Legume Crop Germplasm Collections with Phyto-pharmaceutical Uses

J.B. Morris[1] and M.L. Wang[1]

[1]Plant Genetic Resources Conservation Unit, USDA, ARS, Griffin, GA 30223, USA

J.B. Morris, Tel: 770-229-3253. E-mail: Brad.Morris@ars.usda.gov.

ABSTRACT

Seventeen health functional legumes including butterfly pea (*Clitoria ternatea* L.), *Indigofera cassioides* Rottler ex DC., *I. linnaei* Ali, *I. suffruticosa* Mill., hyacinth bean [*Lablab purpureus* (L.) Sweet], velvetbean [*Mucuna pruriens* (L.) DC], jicama [*Pachyrhizus erosus* (L.) Urb.], winged bean [*Psophocarpus tetragonolobus* (L.) DC.], *Sesbania bispinosa* (Jacq.) W. Wight, *Teramnus labialis* (L.f.) Spreng, moth bean [*Vigna aconitifolia* (Jacq.) Marechal *V. angularis* (Willd.) Ohwi & H. Ohashi, *V. mungo* (L.) Hepper, celera bean [*V. radiata* (L.) R. Wilczek, cowpea [*V. unguiculata* (L.) Walp and *V. unguiculata* (L.) Walp g. *unguiculata*], and wild cowpea [*V. vexillata* (L.) A. Rich. have several phytochemicals and extracts which have been reported to have potential for use as medicinal food, nutraceutical, or functional vegetables in the United States and other countries worldwide. The objective of this study was to present a review of several legume species in the USDA, ARS, Plant Genetic Resources Conservation Unit's (PGRCU) collection for potential use as non-traditional human medicinal plants. Specific phytochemicals or other trait attributes will be identified and discussed from these legumes. Potential phyto-pharmaceuticals including flavonoids, glycosides, phenolics, cliotides, steroids, and saponin, from butterfly pea flowers, seed coats, and roots; saponin, steroids, anthro-quinones, terpinoids, flavonoids, and phlabotanin from *I. cassioides* leaves; dequelin, dehydrodeguelin, rotenol, rotenone, tephrosin, and sumatrol from hyacinth bean seeds and roots; L-dopa from velvetbean and *S. bispinosa* seeds; pachyerosin from jicama seeds; vitexin from *T. labialis* aerial parts and flavonol glycoside from stems; caffeic, ferulic, cinnamic acids and kaempferol from moth bean sprouts; 7S globulins from celera bean seeds; defensin, unguilin, trypsin/chymotrypsin inhibitor, 7S globulins from cowpea seeds, and plant extracts with uses ranging from antifungal, antibacterial, antiasthmatic, anti-tuberculosis, anti-malaria, parkinson's disease management, anti-cancer, antioxidant, oxidative stress reduction, cholesterol reduction, anti-*Leishmania amazonensi*, anti-breast cancer, anti-inflammatory, skin disease inhibition, reducing blood pressure, immunostimulation, and myocardial ischemia protection. These species could provide the medicinal, nutraceutical, and functional food industries with valuable health products and can be used by other scientist's and breeders for the development of unique germplasm and/or advanced cultivars with one or more of these traits. Furthermore, plant species in the PGRCU collection need to be evaluated for the identification, quantification, and variability of potentially and very valuable health traits which are currently unknown.

DISCUSSION

Table 1. Medicinal activities from legume crop species.

Species	Organ	Phytochemical	Medicinal activity (Animal model, assay)	Reference(s)
Clitoria ternatea	Blue flowers	Phenolics	Anti-inflammatory (Cell culture)	Nair et al. (2015)
	Roots, seed coats	Cliotides	Anti-bacterial (Radial diffusion)	Nguyen et al. (2016)
	Roots	Saponin, steroids, flavonoids, glycosides	Anti-asthma (Mice, rats)	Taur & Patil (2011)
Indigofera cassioides	Leaves	Saponin, steroids, anthro-quinones, terpinoids, flavonoids, phlabotanin	Anti-tuberculosis (Agar)	Kumar et al. (2014)
I. linnaei	Plant	Extract	Cancer (Mice)	Kumar et al. (2011)
I. suffruticosa	Leaf	Extract	Anti-staph (Disc diffusion)	Bezerra Dos Santos et al. (2015)
Lablab purpureus	Roots (*maximum*) Seeds (minimum)	Deguelin, dehydro-deguelin, rotenol, rotenone, tephrosin, sumatrol	Effective against malaria, dracunculiasis, amoebiasis causal agents (immersion)	Kamal & Mathur (2010)
Mucuna pruriens	Seeds	L-dopa	Parkinson's management (clinical trial)	Katzenschlager et al. (2004)
Pachyrhizus erosus	Seeds	Pachyerosin	Anti-cancer (MTT)	Guo et al. (2014)
Psophocarpus tetragonolobus	Root, stem, leaf, pod	Extract	Anti-microbial (Disk diffusion)	Sasidharan et al. (2008)
Sesbania bispinosa	Seeds	L-dopa	Anti-Parkinson's	Gautam et al. (2012)
Teramnus labialis	Aerial	Vitexin	Anti-oxidant (Rats)	Sridhar et al. (2006)
	Stems	Flavonol glycoside	Anti-bacterial, fungal (Chloroform extract)	Yadava & Jain (2004)
Vigna aconitifolia	Sprouts	Caffeic, ferulic, cinnamic acids, kaempferol	Oxidative stress reduction (HepG2 cells)	Kestwal et al. (2012)
V. angularis	Seeds	Extracts	Inhibit leukemia cells	Nakaya et al. (2012)
			Lower blood pressure (Rats)	Mukai & Sato (2009)
			Reduce staph. (Medium)	Hori et al. (2006)
V. mungo	Seeds	Extract	Reduce inflammation (Rats)	Patel et al. (2015)
V. radiata	Seeds	7S globulins	Reduce cholesterol (Rats)	Ferreira et al. (2015)
V. unguiculata	Seeds	Defensin	Anti-leishmania (Cell)	Souza et al. (2013)
		Unguilin	Anti-fungal (Assay)	Ye & Ng (2001)
		Trypsin/chymo-trypsin inhibitor	Anti-breast cancer (Assay)	Joanitti et al. (2010)
		7S globulins	Reduce cholesterol (Rats)	Ferreira et al. (2015)
V. unguiculata g. *unguiculata*	Seeds	Extract	Anti-breast cancer (Cell)	Nguyen & Ho-Huynh (2016)
V. vexillata	Seeds	Extract	Anti-inflammatory (Bioassay	Leu et al. (2012)

Clitoria ternatea

Lablab purpureus

Mucuna pruriens

Pachyrhizus erosus

Sesbania bispinosa

Psophocarpus tetragonolobus

Teramnus labialis

Vigna radiata

V. unguiculata* ssp. *unguiculata

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