# *Phaseolus albicarminus*, a new and rare wild bean species from Costa Rica

**R. Araya-Villalobos[1], O. Toro-Chica[2], K. Martínez-Umaña[1] , D.G. Debouck[2]**

[1] Project #736-A4-141, "Selección de variedades de frijol con grupos organizados de pequeños productores de frijol bajo el enfoque participativo de Mejora Genética Participativa", Vicerrectoría de Investigación de la Universidad de Costa Rica (UCR) and "Semillas para el Desarrollo" of FAO, San José, Costa Rica (avillalo2005@hotmail.com).

[2] Genetic Resources Program, International Center for Tropical Agriculture (CIAT), Cali, Colombia (d.debouck@cgiar.org).

On December 10, 2012, in an attempt to sample all wild common bean populations in central Costa Rica, we did the transect across Cerro Caraigres from Monterrey to La Legua and then San Francisco and San Rafael Arriba, in the southwestern part of San José province, district of Tarrazú, and found a new *Phaseolus* species (#3242). At collection site already at twilight, it was tentatively identified as *Phaseolus hygrophilus* Debouck (Salcedo-Castaño et al. 2011). During the growing out of this plant in Colombia at CIAT Popayán experimental station, it became evident that it is different from the former and deserves a new name; the main distinctive characteristics are described below.

Figure 1 – Front view of flowers of *P. albicarminus* (left) and *P. hygrophilus* (right).

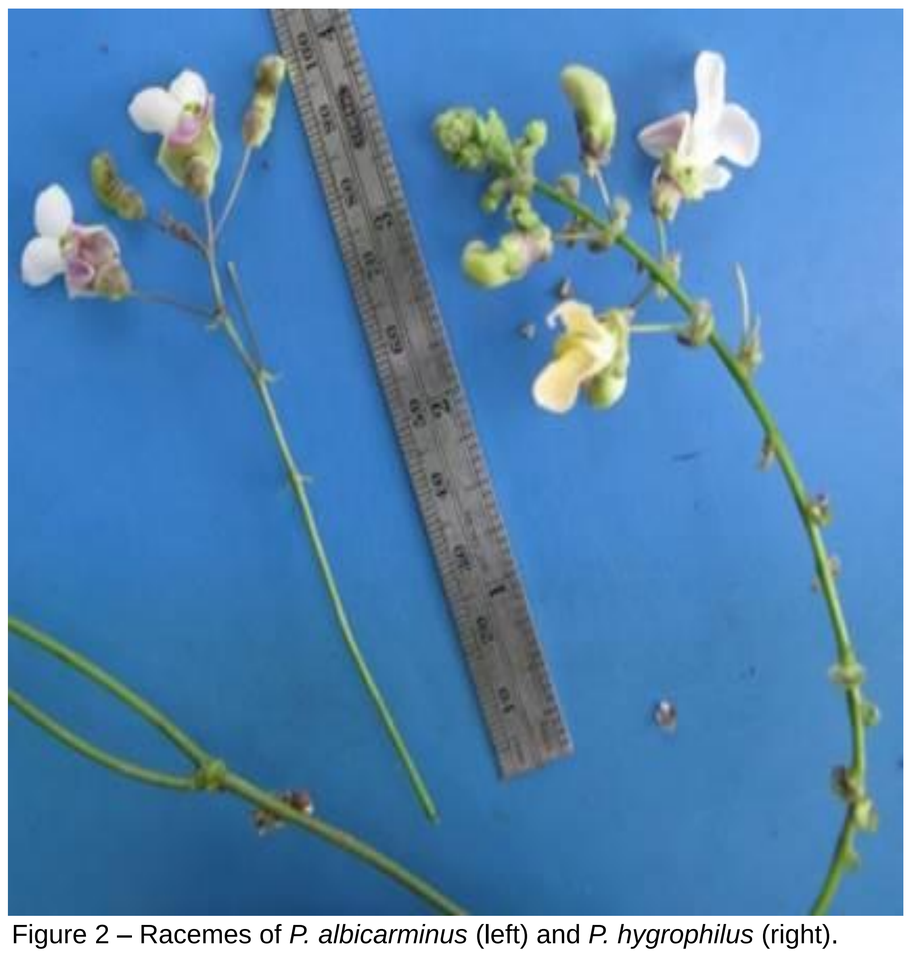

Figure 2 – Racemes of *P. albicarminus* (left) and *P. hygrophilus* (right).

Table 1 – Major differences in racemes and flowers between *P. albicarminus* and *P. hygrophilus*.

| Traits | *P. albicarminus* | *P. hygrophilus* |
|---|---|---|
| total length of raceme (cm) | 4-7 | 11-17 |
| no. of primary bracts | 3-5 | 9-18 |
| shape and length (mm) of 1$^{ary}$ bracts | triangular lanceolate, 4 | cupped, rounded, 5 |
| shape and length of bracteoles | triangular, 1/6 calyx length | cupped, ½ calyx length |
| shape and length (mm) of lower calyx lobes | pointed, 1.5 | conspicuous, rounded, 3 |
| color of inner face of standard | light carmine | white pinkish |
| margins of blade of standard | both sides reflexed | only left side reflexed |

## Results

*Vegetative parts*

Although the leaves are of the same size and shape as those of *P. hygrophilus*, they lack the variegation present on all leaflets of the latter taxon. The axillary guides at the lower nodes of main stem in *P. hygrophilus* usually display a prostrate growth habit, while they are climbing in *P. albicarminus* Debouck. As compared to the former taxon, stems reach 2-3 m and more in the new one.

*Reproductive parts*

The major differences between these taxa are summarized in Table 1. The flowers are shown in Figure 1, where the contrast of inner faces of standards can be seen. The differences in bracts and bracteoles can be seen in Figure 2.

## Discussion

The aforementioned facts elicit the following points for discussion. **First**, all morphological characteristics point to the new taxon belonging to the section Brevilegumeni, together with *P. campanulatus* Freytag & Debouck, *P. hygrophilus* Debouck, *P. oligospermus* Piper and *P. tuerckheimii* Donnell-Smith (Freytag & Debouck 2002; Salcedo-Castaño et al. 2011). **Second**, although the new taxon shares some traits with *P. hygrophilus*, the differences summed up in Table 1 are thought to be strong enough as to deserve the specific rank, not the varietal one. Interestingly, the amount of rainfall (in mm/ year) at the collection sites have been estimated at 5,000 for *P. hygrophilus* and 2,000 for *P. albicarminus*, respectively (Colin Khoury, personal communication, 2013). **Third**, one should mention that *P. albicarminus* has been found first during a field exploration, since the study of 82 Herbaria by one of us (DGD) since 1977 has not revealed this taxon. It has been found without GIS models that have been useful for disclosing additional populations of other taxa (Jarvis et al. 2002, 2005), since there were no data to build the GIS models on. **Finally**, although the core of distribution of *Phaseolus* species seems to be in western Mexico (Ramírez-Villegas et al. 2010), field work in Costa Rica continues to be rewarding with the addition of several endemic species.

## Acknowledgments

This work has been possible thanks to the support of the Global Crop Diversity Trust, in the framework of the Project on Crop Wild Relatives, both for the exploration in Costa Rica and the seed increase in Colombia. The authors thank Ministerio de Ambiente, Energía y Telecomunicaciones of Costa Rica and express full appreciation to Ing. Javier Guevara Sequeira for his invaluable help for the collecting permits. They also want to acknowledge the support of the 'Representación de la FAO en Costa Rica' for the support through the Project 'Semillas para el Desarrollo', for the exploration in Costa Rica. The authors thank Drs Hannes Dempewolf (GCDT), Luigi Guarino (GCDT), Jane Toll (GCDT), Joe Tohme (CIAT) and Jorge Warner (UCR) for their continuing interest into this project. The help of César Franco and Josefina Martínez at different steps of this research is deeply appreciated.

## Literature cited

Freytag, G.F. & D.G. Debouck. 2002. Taxonomy, distribution, and ecology of the genus *Phaseolus* (Leguminosae-Papilionoideae) in North America, Mexico and Central America. SIDA Bot. Misc. 23: 1-300.

Jarvis, A., L. Guarino, D. Williams, K. Williams, I. Vargas & G. Hyman. 2002. Spatial analysis of wild peanut distributions and the implications for plant genetic resources conservation. FAO/IPGRI Plant Genetic resources Newsl. 131: 29-35.

Jarvis, A., K. Williams, D. Williams, L. Guarino, P.J. Caballero & G. Mottram. 2005. Use of GIS for optimizing a collecting mission for a rare wild pepper (*Capsicum flexuosum* Sendtn.) in Paraguay. Genet. Resources & Crop Evol. 52: 671-682.

Ramírez-Villegas, J., C. Khoury, A. Jarvis, D.G. Debouck & L. Guarino. 2010. A gap analysis methodology for collecting crop genepools: a case study with *Phaseolus* beans. PLoS ONE Biology 5 (10): 1-18.

Salcedo-Castaño, J., R. Araya-Villalobos, N. Castañeda-Alvarez, O. Toro-Chica & D.G. Debouck. 2011. *Phaseolus hygrophilus* (Leguminosae--Papilionoideae), a new wild bean species from the wet forests of Costa Rica, with notes about section *Brevilegumeni*. J. Bot. Res. Inst. Texas 5 (1): 53-65.

**Poster presented at PCCMCA – 59 Reunión Anual, Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos y Animales. Managua, Nicaragua, 28 April-3 May 2014.**