Beans with benefits: Integrating improved mungbean as a catch crop into the dryland systems of South and Central Asia

Roland Schafleitner[a], Ramakrishnan Nair[b], Shernabi Khan[c], Bakhodir Kuziev[d], Pepijn Schreinemachers[a], Thomas Hilger[e] and **Svein O. Solberg**[a]

[a] *AVRDC – The World Vegetable Center, Headquarters, Taiwan*
[b] *AVRDC – The World Vegetable Center South Asia, India*
[c] *AVRDC – The World Vegetable Center, Pakistan*
[d] *AVRDC – The World Vegetable Center, Uzbekistan*
[e] *Hohenheim University, Institute of Agricultural Sciences in the Tropics, Germany*

svein.solberg@worldveg.org

Mungbean (*Vigna radiata*) is a popular pulse crop, producing protein-rich food and nitrogen-rich residues. Dryland cultivation of mungbean in South and Central Asia is constrained by a shortage of water, high salinity soils, yellow mosaic disease (begomovirus) and storage pests like bruchids (*Bruchidae sp*.). The "Beans with Benefits" project aims to increase mungbean cultivation in these regions. The project has four components: 1) identify salt tolerant, bruchid resistant and *Mungbean yellow mosaic virus* (MYMV) resistant germplasm; 2) share this germplasm with breeders and researchers; 3) develop production technologies; and 4) capacity building. Accessions from the AVRDC genebank and from other genetic sources are screened to identify tolerant and resistant germplasm. In an early stage of the project, resistance to MYMV was mapped on top of chromosome 5, responsible for almost 50% of the variation in resistance observed. A nucleotide marker tightly associated with the resistance locus was converted to a PCR-based marker and made available for breeders. In addition, three minor resistance loci were detected. Resistance against bruchids has been found in wild mungbean and in two cultivated accessions. Resistance loci were successfully mapped and three major loci were validated for both resistance sources. Markers at the resistance loci on chromosomes 3 and 4 predicted resistance and susceptibility correctly at 98.5% for both resistance sources TC1966 and V2802, while markers along the resistance locus on chromosome 5 correctly predicted the resistance phenotype at 100%. Thirteen PCR-based markers to select for the three loci have been shared with breeders for marker-assisted selection of bruchid resistant genotypes. Thirty bruchid resistant (F_7) lines have been selected for distribution to partners in two target countries. Additionally, 30 lines with resistance to powdery mildew and potential resistance to MYMV were identified for distribution to partners. In Pakistan, the first ever mungbean learning alliance has been established, consisting of researchers, farmers, input suppliers, processors, and extension workers. Pulses are important cash crops in Pakistan but are sensitive to environmental changes and are costly due to manual harvesting. Hence, crop improvement suitable for mechanical harvesting and resistance to bruchid and MYMV is emphasized. Heat tolerance, sprouting resistance and bug control are other important issues. The AVRDC mini-core collection has been multiplied successfully in both countries. In Uzbekistan, mungbean is a well-known legume but there is a need for new sources of genes to develop extra-early maturing, drought- salt- and heat-tolerant varieties. Every year after the winter grain harvest, 1.5 million hectares are available for secondary cultivation. For the first time, a comprehensive study on mungbean has been conducted in the country with a series of field trials. Identification of technologies for increasing soil fertility and crop productivity are being developed. This includes greenhouse and growth chamber trials examining temperature and drought impact on production, plant growth promoters as affected by salinity, decomposition of mungbean residues, and uptake of nutrients by follower crops.