Australian Government
Australian Centre for International Agricultural Research

EDITION #2, MARCH 2017

MUNG CENTRAL

The IMIN is a collaboration between The World Vegetable Centre and international partners across Bangladesh, Myanmar, India and Australia to breed new mungbean lines with the hope of uncovering desirable traits for improved production across partner countries. This work is funded by the Australian Centre for International Agricultural Research (ACIAR).

Editorial

Since the last edition of Mung Central, the International Mung Bean Network (IMIN) has been busy conducting multiplication trials, planning for future activities and collating data from last year's work. A number of papers have been published on the work conducted so far and members have been actively sharing news and updates.

In November of 2016, the IMIN held its annual meeting in Delhi, India, where members from Taiwan, Bangladesh, Myanmar, Australia, and India, travelled to discuss the progress of project activities and plan for 2017. Just prior to the annual meeting, a two day training workshop was held for project members to become familiar with a new database that the IMIN will use for collecting and analyzing data and trial planning. The IMIN has chosen a product called KDDart created by Diversity Arrays- located in Canberra, Australia. The program provides a range of software that assists at every stage of crop trials, from trial design right through to data analysis and presentation. The training provided in Delhi was in the use of the programs enabling data collection, curation and analysis, supplied by the company. The applications presented by Diversity Arrays will assist the IMIN in it's goal to generate and employ big data for mungbean improvement on a global scale, across multiple research sites. Some members of the IMIN had not used a digital data application before, but the training provided in the practical collection of data was positively received by all participants. Further training will be conducted using the other software packages associated with KDDart in the coming months.

The next project meeting is planned for May in Dhaka, Bangladesh, where partners will continue to build on the work of 2016.

We hope you enjoy this second edition of Mung Central. To access edition 1 visit: http://aciar.gov.au/news-and-media/mung-central-newsletter-edition-1

Participants at the first annual meeting of the International Mungbean Improvement Network, Nov 2016, New Delhi. Photo credit: Dr Ramakrishnan Nair

What we do

News from WordVeg Head Quarters, Taiwan- Progress of the genetic analysis of the minicore collection

In the last edition of the Newsletter, we described the need to multiply the core and minicore collections of mungbean to enable efficient screening of germplasm collections for breeder-desired traits. We have shipped a minicore collection of 300 accessions, which represents the diversity found in the whole mungbean collection held by the World Vegetable Center germplasm collection to the participants of the IMIN. The seed for the minicore collection was increased by the project partners at their own trial sites and during the seed increase, some accessions were found to be resistant to dry root rot fungal disease. In addition, some accessions were found to be resistant to the Mungbean yellow mosaic virus, a geminivirus that causes a major disease of this crop in Asia.

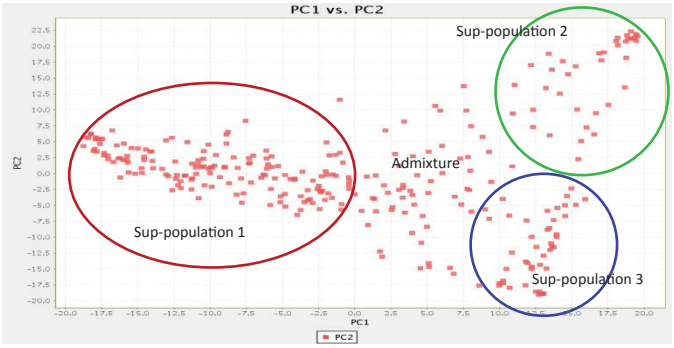
In parallel, the minicore has been analyzed for variation in salt tolerance at the World Vegetable Center headquarters in Taiwan and several tolerant accessions were identified.

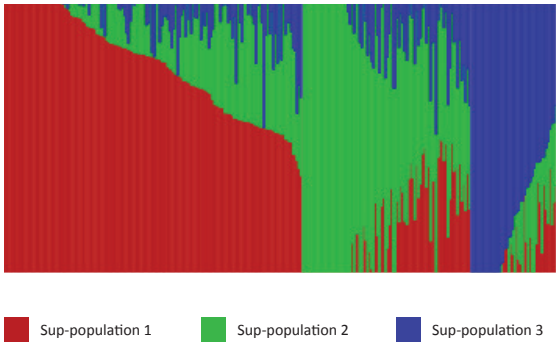
We have proceeded with the genetic characterization of the minicore. In collaboration with Dart PL Australia, we have identified a large number of molecular markers that can be used to measure the diversity present in the collection and to analyze the genetic basis of traits such as disease resistance and stress tolerance. We are starting to use these markers to map salt tolerance genes in the crop.

"several tolerant accessions were identified"

Symptoms of the Mungbean yellow mosaic virus disease. Heavy infection of young plants can cause 100% yield losses.

Comparison of a salt tolerant mungbean accession (left) with a salt susceptible accession. Seedling development is seriously diminished in the susceptible accessions when grown in hydroponics with 25 and 50 mM of NaCl, while the tolerant accessions grows well in 25 and 50 mM NaCl.





Principal component (left) and structure (right) analysis depicting the genetic diversity of the minicore collection. Both analysis methods suggest the presence of 3 subpopulations and accessions that represent admixtures between the 3 groups. The admixture accessions are shown as stripes in the right figure that contain more than one color.

News from Hyderabad, India- Worldveg efforts towards developing `Climate Resilient' Mungbeans!!

Contributed by Bindumadhava Hanumantha Rao and Ram Nair, Worldveg South Asia, Hyderabad

Climate change will result in a change in precipitation patterns, a rise in temperatures, and higher levels of atmospheric CO_2. All these changes pose a threat to future sustainable food and vegetable production, and will affect growth and production dynamics of crop plants. These effects will be felt particularly strongly in the tropics and subtropics. The exploration of physiological responses of crop plants holds the key to estimating 'cause-effect' relationships between climate and plants.

Towards addressing this critical challenge, WorldVeg, South Asia, is engaging in physiology based screening approaches for identifying elite mungbean lines with high temperature tolerance under field and controlled growth conditions. Initially promising heat tolerant lines were further subjected to elevated CO_2 conditions to determine their physiological responses, growth and yield abilities, to predict possible adaptability to the changing climates of the future. Preliminary results indicated that the photosynthetic rate of mungbean increased in elevated CO_2 conditions where temperatures remained at ambient levels, at 40-45%, stomatal efficiency and transpiration rate also increase by 90-100% and 20-22%, respectively.

Among the accessions, an appreciable increase in growth traits (plant height, leaf area, total dry matter) in the range of 78-125 %, under both elevated levels of CO_2 (550 and 700 ppm) was observed along with increased yield traits (number of pods, pod fresh and dry weights, pod and seed yield) ranging from 47 % to 111 % (Fig. 1). Interestingly, exposure of mungbean accessions to 550 ppm CO_2 resulted in a maturity of around 12 to 14 days earlier than normally observed in a few lines (Fig. 2). A second level of confirmatory experiments is underway.

We are hopeful that work on promising lines displaying heat tolerance will perform well under higher CO_2 levels and would give useful clues on developing a much needed strategy for future climate change challenges.

Figure 2: Higher concentrations of CO_2 increased the biomass in a putative heat tolerant mungbean accession

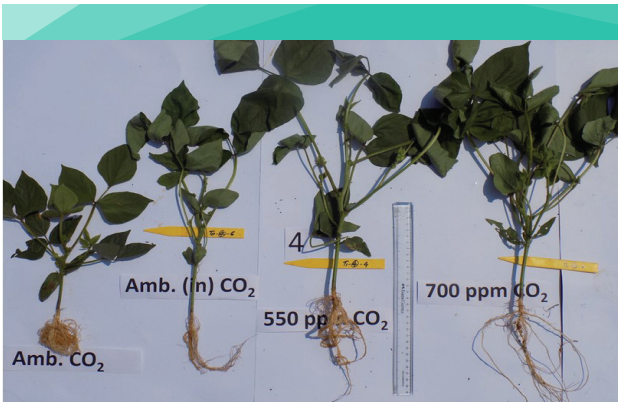
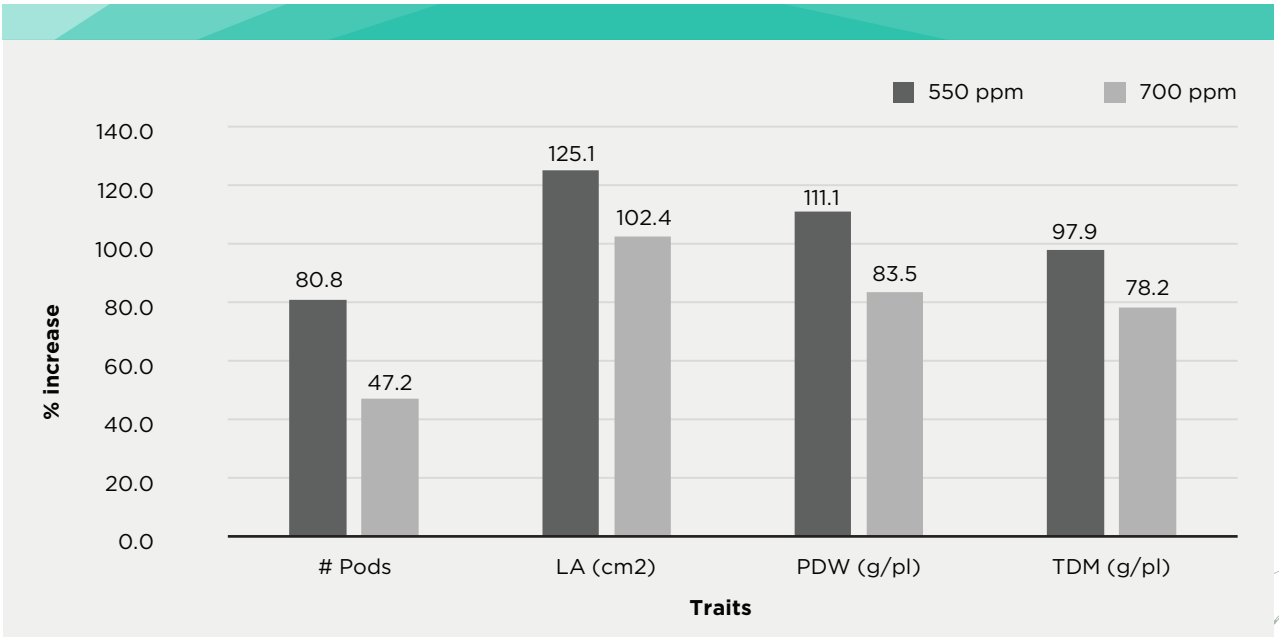


Figure 1: Percent change in growth and yield traits of CO_2 fertilized plants over ambient CO_2 (control) across all mungbean lines (LA – Leaf Area, PDW – Pod Dry Weight, TDM – Total Dry Weight of the whole plant).



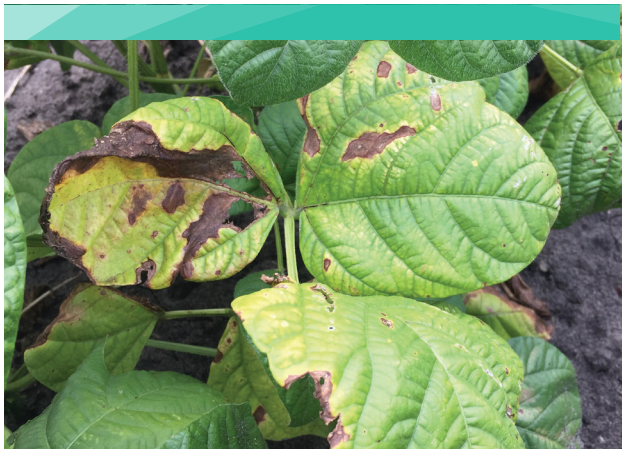
Bold yellow accession VI000020 AY has a strong plant type and yield potential and good field resistance to Curtobacterium.
Photo credit: Col Douglas

News from Australia- Queensland DAF initial trial results, Contributed by Col Douglas

Here in Australia the first replicated field experiment of the mungbean mini core collection is just coming to completion. The 296 MCC lines have been screened along with 25 shared varieties from Australia, Bangladesh and Myanmar in a disease nursery artificially inoculated with the *Curtobacterium*, tan spot pathogen. This seed-borne bacterial disease is a major threat to mungbean production in Australia and is prevalent in hot dry summer conditions. With no in-crop control options, genetic resistance is the most effective means of protecting productivity and reliability. The Australian program urgently requires new resistance donors to counter this pathogen.

Scoring was undertaken at 74 days after sowing; we established a moderate disease pressure and observed a good range of reactions in the MCC (scoring on a 1-9 scale, where 1=no symptoms and 9= dead plants). 50% of MCC accessions were equal or better than the Australian varieties Crystal and Jade-AU (score of 4.3). Five MCC accessions had a mean score of 2.0 across three replicates, indicating an excellent chance of discovering new resistance and ultimately identifying QTL regions or markers.

Of particular interest accession, VI000020 AY is a yellow-seeded accession with bold seed, strong plant type and good field resistance to foliar disease. Along with bold dull seeded line VI000317 BG I see very useful parents and potentially even direct releases for these niche markets from the MCC.



Characteristic tan spot lesions of brown papery lesion with yellow margin. Photo credit: Col Douglas.

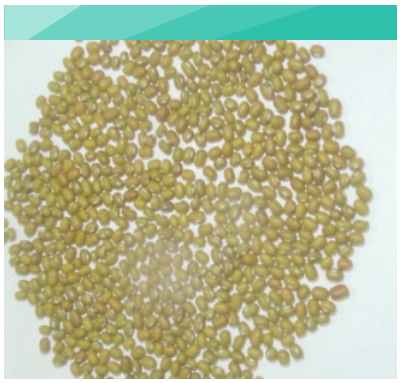
Other mungbean news from our Partners

New Mungbean Variety released by Pulses Research Centre, Bangladesh Agriculture Research Institute

Contributed by AKM Mahbubul Alam, Ph.D.

Mungbean is the third most important legume (pulse crop) in Bangladesh. Legumes are also important in diversifying wheat-rice cropping systems, improving human nutrition, and contributing to the incomes of rural communities. The Pulses Research Centre (PRC), and the Bangladesh Agriculture Research Institute (BARI) are working for research and development of different legumes crops. PRC and BARI recently released two improved mungbean varieties with high yield potential, and resistant/tolerant to mungbean yellow mosaic virus. Names of the two mungbean varieties are BARImung 7 and BARImung 8.

Main characteristics of these two varieties are:



Grain of BARImung 7, Photo credit: AKM Mahbubul Alam

BARImung 7

Characteristics:

- Plant height: 50-60 cm
- Days to maturity : About 60-65 days
- Tolerant to YMV, CLS & Powdery mildew
- 1000 seeds weight: about 49-51 grams
- Seed Color : Light Green
- Suitable for 3 seasons - Kharif-1 (March–June), Kharif-2 (August– October), Late Rabi (15 January-15 May)
- Yield : 1700-1900 kg/ha

Grain of BARImung 8, Photo credit: AKM Mahbubul Alam

BARI mung 8

Characteristics:

- Plant height: 55-60 cm
- Days to maturity : About 58-60 days
- Tolerant to YMV, CLS & Powdery mildew
- 1000 seeds weight: About 25-32 grams
- Seed color : Golden
- Suitable for 3 seasons - Kharif-1 (March – June), Kharif-2 (August– October), Late Rabi (15 January-15 May)
- Yield : 1600-1700 kg/ha

News from Kanpur, India- New Releases

Mungbean Varieties IPM 205-7 (Virat) and IPM 410-3 (Shikha) released for commercial cultivation in India

Contributed by: Aditya Pratap, Sanjeev Gupta and N.P. Singh

Two superior varieties of mungbean viz., IPM 205-7 and IPM 410-3 have been recently developed and released for commercial cultivation by ICAR-Indian Institute of Pulses Research, Kanpur. The early duration mungbean variety, IPM 205-7, popularly known as 'Virat', has been developed from the cross between 'IPM 2-1' and 'EC 398889'. It matures in 52-55 days and has a wider adaptability across the country. Due to shorter duration, it is especially suitable for cultivation after the harvest of wheat, potato and rapeseed mustard in northern and central part of India, as the crop can be harvested safely before the onset of monsoon. With a yield potential of 1000-1200 kg/ha, IPM 205-7 has short-statured, erect and upright plants with green, ovate and entire leaves and a green stem with purple splashes.

The flowers are of light yellow color while the pod habit is intermediate. Pods are short, straight and black on maturity while the seeds are medium large (4.2 g/100 seed), green, oval and shining. Seeds have high protein content (25%). This variety is highly resistant to mungbean yellow mosaic disease and powdery mildew, and moderately resistant to Cercospora leaf spot. It has been recommended for cultivation under irrigated conditions during the Summer season in the North Western Plain Zone, North-Eastern Plain Zone, Central Zone and Southern Zone of India.

Another high yielding variety IPM 410-3, popularly named as Shikha has been developed from the segregating materials of a cross between 'IPM 03-1' and 'NM-1'. The breeding, selection and appraisal work was executed at the ICAR-Indian Institute of Pulses Research, Kanpur during 2004-2011. The variety was bred with the objectives of developing high yielding, widely adaptable and disease resistant mungbean cultivar for spring/summer season. IPM 410-3 has an average yield potential of 1200-1300 kg/ha and portrayed a significant yield advantage over the current varieties of mungbean.

This variety has been found to be highly resistant to mungbean yellow mosaic virus and powdery mildew while moderately resistant to cercospora leaf spot. Having crop duration of 65-70 days, it has green, shining, attractive and medium large seeds, and will be a suitable choice to farmers for cultivation during spring season in the states of Punjab, Haryana, Uttar Pradesh, Rajasthan, and Madhya Pradesh.

Future Newsletters

The IMIN aims to publish a semi-regular newsletter and is now calling for submissions for the next edition. Please email Miriam.McCormack@aciar.gov.au to submit articles or for further information on the newsletter.

For further information on the IMIN:
Project Leader: Dr Ramakrishnan Nair
E: ramakrishnan.nair@worldveg.org
P: +91 40 30713756 F: +91 40 30713074

Photo credit: Dr Rakhi Gupta, Kanpur, India

Recipe- Mungbean Sprout Pulao

Contributed by Aditya Pratap from IIPR, Kanpur, Prepared and photographed by Dr. Rakhi Gupta

Sprout Mungbean Pulao is a popular all time dish in India and liked by numerous people. If mungbean sprouts are available, it takes very little time to cook and therefore is very trendy among office goers, students and professionals. Looking very attractive, it offers a combination of both; ease of cooking and nutrition of a balanced diet and can be savoured with curd, yoghurt, pickle or simply without any side dish.

Ingredients:

1. Mungbean sprouts: 100 g
2. Finely chopped tomato: ¼ cup
3. Chopped onion: ½ cup
4. Basmati rice: 200 g
5. Olive oil: 1 tablespoon
6. Cumin seeds: 1/2 teaspoon
7. Salt: as per taste
8. Red chilli flakes: as per taste
9. Mixed spices: ½ teaspoon
10. Coriander leaves

Recipe

1. Cook washed basmati rice in a closed pan in 3 cups of water untill soft and drain excess water after cooking.
2. Add cumin seeds and chopped onion in a pan with olive oil and fry untill golden brown.
3. Add cooked rice, mung sprouts, tomato, chilli flakes and salt in the pan and stir well
4. Reduce heat, cover and simmer for 5 minutes.
5. Yummy sprouted mungbean pulao is ready. Sprinkle with a few pinches of mixed spices and serve hot after garnishing with coriander leaves.

Staff feature From Myanmar

Dr Tun Shwe- Myanmar

Dr. Tun Shwe is working as the Director of Oilseeds and Food Legumes Division, Department of Agricultural Research (DAR), Myanmar for the past 30 years and has contributed to the development of newly released groundnut varieties such as Sinpadaetha 6 (Drought resistance), Sinpadaetha 7 (Short-duration) and Sinpadaetha 11 (High-yielding). He has also contributed to the development of new varieties of mungbean (Yezin Mungbean 14, mungbean yellow mosaic virus resistance), soybean (Yezin Soybean 14, Short-duration with bold-seeded) and chickpea (Yezin Chickpea 11, Kabuli, bold-seeded). He has also contributed to the development of yellow mosaic virus resistant blackgram variety (Yezin Blackgram 7). He is an active partner in Mungbean Improvement Networking Project.

Project News & Events

The second IMIN annual meeting is planned for May 2017 in Dhaka, Bangladesh.

The International Tropical Agriculture Conference (TropAg2017) will be held in Brisbane, Australia from the 20-22nd November 2017, a symposia on tropical pulses will be held alongside. Go to the conference website (http://tropagconference.org) to register.

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