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Australian Government
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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 teams have been busy harvesting trials and evaluating data on the pest and disease tolerance characteristics of the mungbean mini-core collection. Heavy incidence of Mungbean Yellow Mosaic Disease (MYMD) at a number of locations enabled the teams to collect good data on tolerance and resistance to the disease. In addition, data were collected on the incidence of dry root rot, powdery mildew, anthracnose, thrips and aphids. The data is currently being pooled and will be analysed using Genome Wide Association Mapping to link the traits with genetic markers.

The annual meeting cum mid-term review of the IMIN project was held in May, 2018 in Nay Pyi Taw, Myanmar. The review was very positive and commented on the excellent collaboration between partners. During the meetings, the team also discussed possible mechanisms for the scaling-out of outputs and moving forward into the future, including attracting new partners. If you are interested to find out more about collaboration with the IMIN, please email ramakrishnan.nair@worldveg.org.

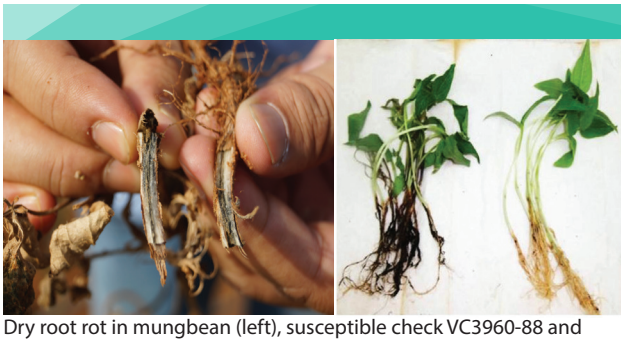
We hope you enjoy this fourth edition of Mung Central. To access previous editions visit the ACIAR website.

Prof. Andrew Campbell, Dr. Pratibha Singh and Dr. Ram Nair inspecting the greenhouses at WorldVeg South Asia.

What we do

News from WorldVeg, South Asia, Hyderabad: Variation for resistance to dry root rot and anthracnose in mungbean mini-core collection

Contributed by Abhay Pandey



Dry root rot in mungbean (left), susceptible check VC3960-88 and VI001509-AG- highly resistant (right).

The 296 mungbean mini-core accessions were screened for dry root rot and anthracnose diseases at WorldVeg, South Asia. Dry root rot disease is prevalent in India and Myanmar, while anthracnose is a major disease in India. In order to screen for dry root rot, the roots of 8-day old seedlings were dipped in the inoculum of *Macrophomina phaseolina* (dry root rot pathogen) using the paper towel method. After 8 days of inoculation, scoring was performed visually using a 1-9 rating scale (1 being highly resistant and 9 being highly susceptible). Mini-core accession VI001509 AG showed a high degree of resistance to dry root rot. The pathogen was confirmed by molecular characterisation.

The screening for anthracnose disease was carried out in *Kharif* (June sowing, rainy season) 2016 and 2017. Scoring was performed using a 1-9 rating scale (where 1 is highly resistant and 9 is highly susceptible). In both the seasons, the VI000020 AY mini-core accession demonstrated resistance, while the VI004244 B-BR accession was highly susceptible. Morphological and cultural characterisation has identified the anthracnose pathogen as *Colletotrichum* species. Molecular characterisation is in progress.

ACIAR CEO and Regional Manager visit WorldVeg, South Asia

Prof. Andrew Campbell, CEO, ACIAR and Dr. Pratibha Singh, Regional Manager (South Asia) visited the WorldVeg team at Hyperabad in June. The group heard about the new ACIAR 10 year strategy from Prof. Campbell and Dr. Nair briefed them on the IMIN progress and discussed linkages to other projects, including the mungbean harvesting project. The team were invited to provide input into ACIAR's plan for South Asia.

Mini-core collection –a potential source for Cowpea Aphid resistance

Contributed by Abdul Rasheed War

Cowpea aphids on mungbean pods can result in 40% yield losses.

Cowpea aphid (*Aphis craccivora*) is a serious insect pest in legumes that causes significant grain yield losses. The adults and nymphs suck the cell sap from the underside of the tender leaves, growing tips, flower stalks and pods causing about 40% yield losses in mungbean. The mini-core collection was screened against cowpea aphid in a replicated field experiment during *Kharif* 2017 (June sowing, rainy season). A heavy natural infestation was observed and the scoring was undertaken at 30, 45 and 60 days after sowing. Scoring was performed on a visually rated scale of 1-5 (1= highly resistant and 5 = highly susceptible). Accessions such as VI002647 AG, VI003534 AG, VI000938 AG and VI003181 B-GM demonstrated high resistance to cowpea aphid with an average rating of one, while accession VI002239 AG was found to be highly susceptible with almost all plants having died (score = 5). The lower scoring accessions could be potential sources of resistance to cowpea aphid in mungbean.

Cowpea aphid resistant line VI003181 B-GM (left) and cowpea aphid susceptible line VI002239 AG (right).

News from Myanmar

Contributed by Patricia Wai Wai

The team in Myanmar hosted the network in Nay Pyi Taw for the annual cum mid-term review meetings, which included attendance of representatives from the ICCO Cooperation. ICCO and IMIN project team members have been in communication regarding links between their work and openings for collaboration to see enhanced livelihoods and sustainability from improved mungbean production in Myanmar. The P4 project 'Pulses, People, Planet and Profit' is a possible example of this. P4 began in September 2017 and works with four townships in the Yangon and Magway regions looking at improving agricultural practices and targeted market opportunities. During the meetings, IMIN and ICCO staff discussed opportunities for the development of varieties better suited to markets in Europe, for example, the possibility of developing a variety with good sprouting characteristics, like Yezin 1, but with resistance to MYMD. The project has made much progress through organising farmers into grower groups that have a stronger voice when communicating with government and leveraging better prices. Farmers are learning through demonstration plots and Farmer Field Schools. Fifty seed multiplication farms are being established for access to better quality seed. The seed distribution systems created within the P4 project may prove to be a valuable mechanism for the distribution of improved lines produced by the IMIN. The P4 project is a joint collaboration between ICCO Myanmar, the Myanmar NGO Network Activities Group and the private sector partner East West Seeds. It is funded by the UK Department for International Development (DFID). Interactions with projects and companies such as these will be important for the scale-out and adoption of outputs from the IMIN into the future.

Dr. Aye Lae Lae Hlaing and Ms. El El Cho preparing leaf samples for DNA analysis.

Growers, researchers and industry representatives inspect the mini-core material at the 2018 Warwick Field Day in Queensland, Australia.

News from Australia

Contributed by Col Douglas

The Australian summer cropping season came to an end in April. 2017/18 was a difficult year for grain growers with low rainfall and high temperatures. IMIN activities started in December with the planting of the mini-core into foliar disease nurseries. Good levels of resistance to halo blight and powdery mildew were observed. For agronomic and yield evaluation, the mini-core was partitioned into separate field trials for early, regular and late season groups. Long duration material was in the ground in December and experienced the full brunt of a hot, dry Queensland summer. Maturities ranged from less than 60 to over 90 days. Early and regular maturity groups were subject to waterlogging at vegetative growth stages with plant type and yield potential being severely affected. Despite these conditions, a handful of mini-core accessions appear to have performed very well.

This opportunistic screening will be cross referenced with waterlogging and salinity trial data from partner countries to identify any similarities or patterns in genotype reaction. Mungbeans are particularly prone to waterlogging, the effect on nodulating bacteria and the short duration of the crop makes it difficult for plants to recover. Enhanced levels of tolerance would make a big difference to farmers in South Asia and Australia.

The mini-core germplasm set has now been shared with Australian Grains Genebank. Researchers at the University of Queensland, Queensland University of Technology and University of Southern Queensland have requested the material and will join the University of Western Australia which already has already accessed the mini-core material. A coordination meeting has been flagged for later in 2018 with these groups keen to become part of the IMIN family here in Australia.

In other news, our annual field day at Hermitage in southern Queensland was enthusiastically attended by 65 growers, agronomists and industry representatives under the theme *how mungbeans work and how to make mungbeans work for you.* We showcased GRDC and ACIAR research and the importance of international collaborations in the public sector improvement of our small, yet mighty crop. Our event was showcased on local TV news and local radio. Look out for a bigger and better event next year.

Mini-core collection showing variable responses to waterlogging on heavy black clay soil at Warwick, Australia.

News from Bangladesh

Contributed by AKM Mahbubul Alam

William Erskine (University of Western Australia), who leads the ACIAR Project on *Incorporating salt tolerant wheat and pulses in smallholder farming system in southern Bangladesh,* along with Tim Colmer (University of Western Australia) and AKM Mahbubul Alam (BARI) visited the mungbean mini-core evaluation trial at BARI research station at Barisal. They discussed the possibility of running a workshop at BARI Gazipur on screening techniques for salinity and waterlogging during late July, 2018.

Other mungbean news from our Partners

News from ICAR-IIPR, India: New Mungbean Varieties Developed in India

Contributed by Aditya Pratap

Two new mungbean varieties *viz.,* Kanika (IPM 302-2) and Varsha (IPM 2K14-9) have been developed recently by the ICAR-Indian Institute of Pulses Research, Kanpur, for commercial cultivation in Uttar Pradesh, India. In Uttar Pradesh, mungbean is grown on an area of about 100 thousand hectares. Mungbean is cultivated for domestic consumption, commercial sale and to increase soil fertility. The Kanika variety is suitable for Spring (March sowing) as well as *Kharif* (June sowing, Rainy) seasons. It exhibited a wider adaptability and showed a yield superiority of >15% over the commercial check IPM 02-3 in the State Adaptive Trials over 3 years (2014-16). Kanika also recorded yield superiority in the All India Coordinated Trials of about 15% over the check cultivar Pusa 9531, with a yield potential of 1.2-1.4 t/ha. This variety matures in 65-70 days with an average maturity period of around 70 days. It is highly resistant to MYMD, and resistant to *Cercospora* leaf spot, leaf crinkle and leaf curl diseases. The seeds are green, shiny and medium-large in size (3.4 g/100-seed weight), with high protein content (26%).

Kanika variety

Varsha variety

The Varsha variety is suitable for cultivation during *Kharif* (June sowing, Rainy) season. It exhibited a yield superiority of >20% over the check IPM 02-3 in the State Adaptive Trials over 3 years (2014-16). This variety matures in 65-75 days. It is highly resistant to MYMD and powdery mildew, and moderately resistant to *Cercospora* leaf spot. Varsha has an average yield potential of 1.2 t/ha. The seeds are green, shiny and medium-large in size (3.0 g/100 seed weight) with protein content of 23%. Cultivation of these two varieties will help in the horizontal as well as the vertical expansion of mungbean in the central part of India.

Dr. Lutz Depenbusch (WorldVeg), Dr. Aye Moe San (Yezin Agricultural University, Myanmar) and Dr. Cathy Farnworth (independent consultant) interview an input dealer to gain insight into mungbean production in Myanmar.

Socio-economics workshop prepares the estimation of social and economic effects of improved mungbean harvesting

Contributed by Lutz Depenbusch

How will the improvement of mungbean harvesting affect the life of small-scale farmers and farm workers in Bangladesh and Myanmar? What characteristics do the new technologies need to have so that female farmers can equally profit from it?

These and similar questions were at the centre of the socioeconomics planning workshop of the ACIAR-funded project "Improved Mungbean Harvesting and Seed Production Systems for Bangladesh, Myanmar, and Pakistan." Researchers of the Bangladesh Agricultural Research Institute, Yezin Agricultural University, and WorldVeg met in Nay Pyi Taw from 23rd to 26th January 2018 to discuss the best methods to answer them. The meeting benefited from the experiences shared by partners from the Myanmar Department of Agricultural Research, and ICCO Cooperation. Discussions with local farmers and workers gave a first-hand impression of the current situation.

In 2018 and 2019, the teams will interview around 1000 farm households in Bangladesh and Myanmar to learn about their mungbean production. Focus group discussions with farmers, workers, and key informants will put the data into the bigger picture. Bringing male and female farmers to technology trials will help to adapt the innovations to local needs. This research will help to develop technologies and related policies that may benefit farmers and their families. It will also identify the economic risk of improved harvesting to the poor, mostly female workers who are currently employed in the mungbean harvest. Understanding if and how technological change puts this vulnerable group at risk will be the first step in mitigating unintended consequences and ensuring broad based benefits.

Future Newsletters

The IMIN aims to publish a semi-regular newsletter and is now calling for submissions for the next edition. Please email emily.lamberton@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

Macau-style cookies
Ingredients:

1 1/2 cups of mungbeans
7/8 cups of whole almonds
3/4 cups of icing sugar
5 1/2 tbsp lard (or shortening)
1 tbsp water

Recipe:

1. Heat mungbeans in a pan until brown and aromatic
2. Blend cooled mungbeans together with almonds and icing sugar to obtain a flour-like mixture
3. Add lard, using your fingers to crumble the mixture
4. Add the vanilla extract and then add water slowly until all ingredients are combined
5. Roll the mixture into balls and flatten onto tray lined with baking paper
6. Cook for 25 minutes at 150 °C

Mungbean Thai Mocktail

One tall glass consisting of equal parts coconut water, mungbean juice and lychee juice. Add one red chilli de-seeded and chopped and finely ground ginger (2 cm piece). Use one stick lemon grass – finely chop and add a 1 cm piece, the remainder can be used as a stirrer. Serve over ice.

Staff feature From Australia

Welcome to our newest member!

Tom Noble is currently a PhD student at the Centre for Tropical and Biocommodities (CTCB), Queensland University of Technology (QUT), Australia. Tom is working on halo blight, a bacterial disease of mungbean, through an industry-based scholarship from the Australian Mungbean Association (AMA). His work involves developing new molecular techniques to identify the disease and whole-genome sequencing to compare the differences between isolates over time and between regions.

He previously worked as a research assistant on a Queensland Government funded project for the improvement of tropical pulses in Queensland from 2014. In this role, he helped develop the mungbean NAM population and assessed mungbean genetic diversity using next-generation sequencing.

Project News & Events

AKM Mahbubul Alam from BARI received the ACIAR John Dillon Fellowship for Leadership Development during 2018.

KDDArT training will continue in India, Myanmar and Bangladesh in August.

IMIN results were presented at the Seventh International Food Legumes Conference in Morocco.

Follow Australian Mungbean work on Instagram at mungbean_au