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Easy to use methods to improve mungbean production in Bangladesh



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Correct citation: Islam, K.S., Roy, A., Rashid, M.H., Hossain, K., Pandit, D.B., Matin, M.A., Khan, S.H., Shahrin, S., Krupnik, T.J., 2016. Easy to use methods to improve mungbean production in Bangladesh. Cereal Systems Initiative for South Asia (CSISA). International Maize and Wheat Improvement Center. Dhaka, Bangladesh.

Published by

**International Maize and Wheat Improvement Center
CIMMYT-Bangladesh**

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Published in: July 2016



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Introduction

Mungbean (*Vigna radiata*) is one of Bangladesh's most important pulses. Many places in Bangladesh are suitable for mungbean, which grows well under clear sunshine and low humidity conditions. Cloudy weather, continuous or heavy rainfall may however cause problems like pests and diseases. Mungbean is also nutritious and is good for your health. This manual provides simple guidelines to improve mungbean cultivation in Bangladesh.



Mungbean sown on raised beds in Patuakhali, Bangladesh

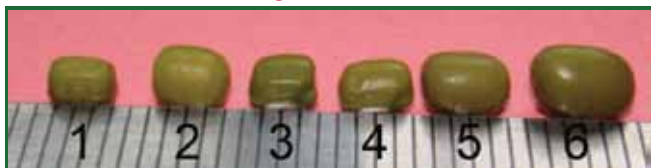




How many popular mungbean varieties do we have in Bangladesh?

Bangladesh has many traditional mungbean varieties as well as newer ones. Both types are still widely cultivated in southern Bangladesh. The newer varieties were made by the Bangladesh Agricultural Research Institute (BARI) and Bangladesh Institute of Nuclear Agriculture (BINA), as well as Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) and BRAC. Table 1 describes the main varieties and their ability to resist (fight off) or tolerate (grow even with infection) some diseases.

Grain size of BARI Mung 1, 2, 3, 4, 5 and 6 (scale is in inches.)



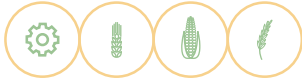


Table 1. Most common mungbean varieties grown in Bangladesh and their characteristics

	Name of the variety	Typical yield (t/ha)	Days from seed to maturity*	Disease tolerance
Traditional	Sona mung	0.5-0.6	90-100	Susceptible to YMV and CLS
	Barisal local Mung	0.5-0.6	90-95	Susceptible to YMV and CLS
BARI	BARI Mung-2 (Kanti)	1.2-1.3	60-65	Tolerant to CLS and YMV
	BARI Mung-3 (Progoti)	1.2-1.3	60-65	Tolerant to CLS and YMV
	BARI Mung-4 (Rupsha)	1.2-1.4	60-65	Tolerant to CLS and YMV
	BARI Mung-5 (Taiwani)	1.5-1.7	55-60	Resistant to CLS and tolerant to YMV
	BARI Mung-6	1.8-2.0	55-60	Resistant to CLS and tolerant to YMV
	BARI Mung-7	2.0-2.2	60-62	Resistant to CLS and tolerant to YMV
	BARI Mung-8	1.6-1.7	60-62	Resistant to CLS and tolerant to YMV
	BINA Mung-3	1.0-1.03	80-85	Tolerant to CLS and YMV
	BINA Mung-4	1.0-1.08	75-80	Tolerant to CLS and YMV
	BINA Mung-5	~1.5	70-80	Tolerant YMV, resistant to PM
BINA	BINA Mung-6	~1.5	64-68	Resistant to YMV, PM, and CLS
	BINA Mung-7	~1.8	70-75	Resistant to YMV and CLS
	BINA Mung-8	~1.8	64-67	Resistant to YMV and CLS
BSMRAU	BU Mung-4	1.8-2.0	55-60	Tolerant to CLS and YMV
BRAC	Holud Mung	1.2-1.5	55-57	Resistant to MYMV and CLS

YMV = Mungbean Yellow Mosaic Virus, CLS = Cercospora Leaf Spot, PM = Powdery mildew

* Note that days from seeding to maturity may vary slightly depending on sowing date. The later in the year mungbean is sown, the shorter its duration will be.

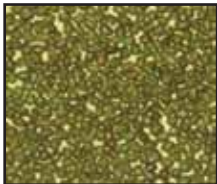




BARI Mung-2



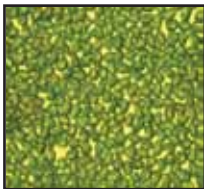
**BARI Mung-3
(Grain)**



BARI Mung-5



**BARI Mung-2
(Grain)**



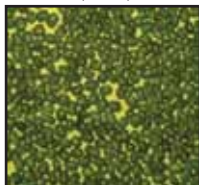
BARI Mung-4



**BARI Mung-5
(Grain)**



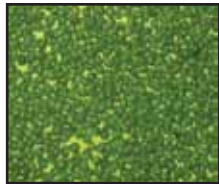
**BARI Mung-6
(Grain)**



BARI Mung-3



**BARI Mung-4
(Grain)**



BARI Mung-6





What are the characteristics of good Seed?

1. Pure, viable, vigorous and with high yielding potential.
2. Free of weed seeds.
3. Free from diseases and pests.
4. Resistant or tolerant to diseases.
5. Not broken or damaged.
6. Not be wet or damp.
7. Not more than two seasons old.
8. High germination percentage (more than 85%).

How do I test the germination percentage?

1. Before planting, take a clay pot, and fill it with sandy-loam soil.
2. Put 50 seeds 1 cm deep into the soil in rows.
3. Cover the seeds with soil.
4. Add water so that the soil is moist.
5. After 5-6 days, count the number of seeds with healthy roots and shoots.
6. Calculate the germination percentage with this equation:

$$\text{Germination percent (\%)} = \left(\frac{\text{Number of healthy germinated plants}}{50} \right) \times 100$$

Acceptable germination percent should be at least 85%. If it is lower than this, do not use this seed. Replace it with another batch.





Where can I get quality seeds?

Certified seed (which has blue tags on their bags) is the best and is available from the Bangladesh Agricultural Development Corporation (BADC). Your local Department of Agricultural Extension (DAE) agent can assist you in finding quality seed. If you purchase seed, make sure it is good quality and the packaging date of the seed has not expired.

What crop rotations can mungbean be used in?

Mungbean is usually sown in late January to mid February, when soil temperatures increase. Colder soil will reduce germination. Mungbean requires some soil moisture to germinate or a post-sowing irrigation.

- For Barisal, Jhalakathi and Patuakhali districts:
 - *T. Aman* – Mungbean – Late *Aus* (on medium high land and higher, with mungbean sown 08 Magh to 07 Falgun or 21 January to 20 February).
 - *T. Aman* – Fallow – Mungbean (on medium high land and higher, with mungbean sown 08 Magh to 07 Falgun, or 21 January to 20 February).
- Jessore, Jhenaidah, Magura, Chuadanga, Meherpur and Kushtia districts:





- o *T. Aman* – Mustard – Mungbean (on medium lowland and higher, 26 *Magh* to 07 *Chytra* or 15 February to 30 March).
- o *T. Aman*–Fallow–Mungbean (on medium highland and higher with mungbean sown 08 *Magh* to 07 *Falgun* or 21 January to 20 February).
- Dinajpur, Rangpur and Bogra districts:
 - o *T. Aman* – Wheat – Mungbean (on medium highland and higher, 26 *Magh* to 07 *Chytra* or end of March).
- Pabna, Rajshahi, Jessore, Faridpur, Dhaka, Tangail, Mymensingh, Sherpur, Comilla, Sylhet and Kustia districts:
 - o *T. Aman*–Fallow– Mungbean (on medium highland and higher, with mungbean sown 08 *Magh* to 07 *Falgun* or 21 January to 20 February).
 - o *T. Aman* – Wheat – Mungbean (on medium highland and higher, 26 *Magh* to 07 *Chaitra* or 15 February to 30 March).





What seed rate should I use for mungbean?



*Broadcasting 6-6.7 kg per bigha
(45-50 kg per hectare)*



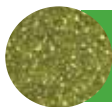
*Line sowing by seeder
4-4.7 kg per bigha
(30-35 kg per hectare)*



*Bed planting 3.75-4.4 kg per bigha
(28-33 kg per hectare)*

- BARI Mung-2 and BARI Mung-8 also requires a special seed rate when broadcasted: 4-4.7 kg per bigha (30-35 kg per hectare).
- BARI Mung-5, BARI Mung-6 and BARI Mung-7 as have seed rates of 6-6.67kg per bigha (45-50 kg per hectare) because seed size is bigger.





Mungbean seedlings emerging on raised beds



Mungbean growing on raised beds



Mungbean nearing flowering on the same raised beds

How do I prepare land for sowing mungbean?

Land preparation depends on whether you will sow by broadcasting (by hand) or by machine, as well as soil texture and structure. Mungbean seed must touch moist soil after sowing to germinate.





- Keep the soil free from weeds.
- If broadcasting, use 1-2 passes of a power tiller followed hand broadcasting, followed by one more pass to incorporate seed into the soil.

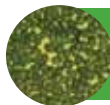
- Mungbean can also be planted by machine that establishes the crop in lines 30 cm apart. This lowers production costs because seeding and tillage is done at the same time.



Mungbean is sensitive to salinity and performs poorly in saline soils.

- A seeder machine can also be used to grow mungbean with strip tillage (where only small lines are tilled in the soil into which seed is placed, saving fuel costs, time and money). Strip tillage is done by removing bladed from a seeder machine it tills in strips 30 cm apart from each other (four lines on a seeder 120 cm wide) and works best in loamy soils. Strip tillage does not perform well in heavy clay soils. Pre-emergent herbicide usually needs to be applied before strip tillage.
- Mungbean can also be sown by bed planting. This





machine tills the soil and place seed on top of a long bed that alternates with furrows that can be used for irrigation. Bed planting may require 1-2 passes of a power tiller before planting, especially where soils are heavier. Bed planting performs poorly in very heavy soils or where the soil is saline.

Mungbean line sowing by machine in Patuakhali

- In 2015, 11 farmers experimented with machine sowing mungbean.
- Line sowing by machine produced yields slightly higher than farmers own yields.
- Using the machine saved costs and was more profitable.
- The production cost of mungbean sown in lines by machine was (10,162 Taka per ha) less than in farmer's fields where several tillage passes with a power tiller were needed.



Line sowing mungbean by machine



Mungbean sown in lines after germination





- Line sowing resulted in profits 35% higher than broad casting, because only a single pass of the seeding machine was needed. Fertilizers were also applied by the machine.
- Line sowing by machine also reduced the time needed for tillage by 33% compared to using a power tiller.

Are weeds a problem for mungbean?

Weeds compete with mungbean for water, soil nutrients, and light. The more weeds there are the less mungbean will yield.

- Keep the crop weed free from 2 weeks after germination to 5 weeks after, to reduce weed competition with the crop. If this is too difficult, at least one weeding should be done within 15-25 days after sowing.
- If using strip tillage to grow mungbean, a pre-emergent herbicide may be required.
- Learn what the major weeds of mungbean are and make sure to remove them from your field.





Table 2. Most common weeds of Mungbean grown in Bangladesh (common English and their scientific names (*in italics*) are shown in parentheses)



Durba
(*Cynodon spp.*)



Bon Mula
(Wild Radish, *Raphanus spp.*)



Kata Notey
(*Amaranthus spp.*)



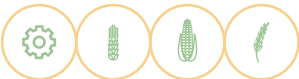
Foshka begun
(Clammy Ground Cherry,
Physalisheterophylla)



Knot Ghash
(*Paspalum spp.*)



Dubia Sag/ Chemti Sag
(*Polygonum spp.*)





Do I need to fertilize mungbean?

Mungbean is a legume. Legumes can take nitrogen (which is the element that Urea is largely made of) from the air and move it into the soil with the help of soil microbial species (organisms in the soil too small to see that assist in fixing nitrogen). If soil quality is poor, legumes will put more nitrogen into the soil, provided the right soil microbial species are there to assist. If soil quality is good, then legumes will fix less nitrogen into the soil.

Most farmers do not apply fertilizer to mungbean. Where rice is rotated with mungbean over several years, mungbean may help to improve soil quality by supplying nitrogen over time. A little fertilizer can still help improve yield and profits for mungbean. Use of phosphorous also helps improve how much nitrogen can be fixed by mungbean. We advise you to apply a small amount of fertilizer at sowing.





Table 3. BARI's recommendation for fertilizer is show below in kg per bigha and hectare.

Urea	Triple super phosphate (TSP)	Muriate of Potash (MoP)
5.33-6.0 kg per bigha 40-45 kg per hectare	10.7-11.3 kg per bigha 80-85 kg per hectare	4.0-4.7 kg per bigha 30-35 kg per hectare

For low soil fertility BARC also recommends the following micronutrients to be applied at sowing.

Table 4. BARC recommendations for micronutrients to be applied to mungbean.

Gypsum	Zinc Sulfate (ZnSO ₄)	Boron
13.3 kg per bigha 100 kg per hectare	0.7 kg per bigha 5.6 kg per hectare	0.9 kg per bigha 5.9 kg per hectare





Is it beneficial to apply manure or biofertilizers to mungbean?

Applying manure to fields over several seasons improves soil fertility and the ability of the soil to retain nutrients applied through fertilizers and also to hold moisture. Use of manure is therefore recommended, but yield increase in a single season. It may be necessary to apply manure over several years to see benefit.

Can Irrigation and drainage help mungbean growth?

Mungbean will not germinate if there is excessive water in the soil. Any standing water should be drained before sowing. Farmers usually cultivate mungbean using soil moisture left over after *T. Aman*. Farmers' in West Bengal and other locations in India however regularly apply a single irrigation after sowing to improve mungbean growth.

If mungbean is sown with bed planting, then irrigation can be easily applied, although bed planting is not advised where soils are saline. If planted on beds, a single post sowing irrigation can raise yield up to 50%. If sowing mungbean by broadcasting or machine line sowing, irrigation may only be beneficial on fields that are very well leveled and flat.





What diseases and pests cause problems for mungbean and how can they be managed?

Mungbean originally comes from dry countries like Afghanistan, Iraq, and Iran. In these climates, mungbean has fewer problems with diseases and pests. In humid climates like in Bangladesh, mungbean can have problems with diseases that can reduce yield. It is important to manage diseases using different techniques, because an integrated approach provides the best protection against diseases and pests. You should only apply pesticides if you have been trained and you wear protective clothing.

DO NOT apply insecticides without first consulting with qualified extension agents or a trained agriculturalist. Protective clothing that should be used if applying fungicides, herbicides, or pesticides.



Cap



Goggles



Respirator



Gloves



Gum boots



Rubber or plastic apron



All clothing





Mungbean Yellow Mosaic Virus:

Yellow mosaic virus is a very destructive disease. It is usually transmitted by white flies that suck on leaves or stems.



Yellow mosaic virus signs on leaves

How can I manage yellow mosaic virus?

- Use resistant/tolerant varieties like BARI Mung-5, BARI Mung-6, BARI Mung-7, BARI Mung-8, BINA Mung-5, BINA Mung-7 and BU Mung-4.
- Be attentive when you visit the field. Look for plants that look diseased or whitefly insects and take action to control them.





A field with serious yellow mosaic virus infection

- Uprooted and burn infected plants.
- Make sure your field is free of weeds, especially broadleaved weeds (Bonmarich or Sialmutha), which may also carry the virus.
- Sow mungbean early to avoid diseases.

If a lot of yellow mosaic virus is found in your field, consider using different biological and chemical pesticides:

- (1) Spray detergent at 2gm/liter water.
- (2) Spray crushed neem seed extract at 50g/L water.
- (3) Control white fly using insecticides, but note this only works early in the season. Foliar sprays of Imidachloprid (Imitaf 20 SL) at 0.5 ml/liter of water or Admire 200 SL (Imidachlorpid) at 0.25 ml/liter 2 to 3 times 7-10 days interval at first sign but not after flowering. Note that this product is highly toxic to bees and other beneficial insects. Do not use it near flowering time.





Leaf spot Disease:

Leaf spot of mungbean is caused by *Cercosporacroenta* and looks like water soaked spots on leaves. Leaf spots that are irregularly shaped with grey-white centers and reddish brown to dark brown edges. As spots become older, they turn red or brown. Spots cause dead areas on leaves.

How can I manage leaf spot disease?

- Use resistant/tolerant varieties like BARI Mung-5, BARI Mung-6, BARI Mung-7, BARI Mung-8, BINA Mung-5, BINA Mung-7 and BU Mung-4.
- Visit your mungbean field regularly and take action to control leaf spot.
- Make sure your field is free of weeds.
- If leaf spot is observed at levels high enough to take action to control against reduced yields, you can consider use of a fungicide such as Bavistin 70 WP (Carbendazim) at 2 g/liter.





Powdery Mildew:

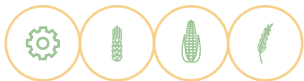


Powdery mildew occurs with cool temperatures (20-26°C) and in cloudy weather. It first appears on leaves as powdery masses that turn dirty white and later on pods and stems.

At the early stage it appears as light yellowish irregular spots on leaves and turns brown quickly. A powdery mass grows over the spots covering the entire leaf. Leaves eventually fall off the plant.

How can I manage powdery mildew?

- Use resistant/ tolerant varieties like BARI Mung-5, BARI Mung-6, BARI Mung-7, BARI Mung-8, BINA Mung-5, BINA Mung-7 and BU Mung-4.
- Observe your fields regularly, especially if there is rain or cloudy, cold weather and remove infected plants from the field.
- Sow and grow the crop when you are confident temperatures will be above 26° C.
- If powdery mildew is observed at high levels, consider





using a fungicide. Apply foliar spray (2-3 times) with Tilt 250EC (0.05% i.e. 0.5 ml/liter) or Thiovit 80 WP (0.2% i.e. 2 g/ liter) at around every 2-3 weeks. Note that these chemicals can be slightly toxic to humans and need to be used with extreme care. Thiovit can irritate the skin, eyes, and throat, so be sure to use protective clothing. Thiovit is also can also kill and contaminate fish, so do not use it near ponds or canals.

How are insect pests of mungbean best managed?

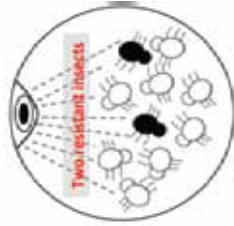
Insects can cause large yield losses to mungbean. They also spread diseases. They therefore require careful management. But before using insecticides, it is always advised to try to use cultural methods to control insect pests. It is also important to understand that as insect pests mature, they pass through larval and then adult stages. Appearance of the pest can be very different in each stage and different methods of management may be needed.

It is important to visit the field regularly and monitor pests. If you decide to use insecticides the cost of insecticides should be carefully considered against the expected cost of yield lost if they are not used. If the cost of insecticide application is higher than the value of lost yield, then it is not advised to apply insecticides. Also remember that pesticides are poison. Apply them only if you are well trained and are using full safety gear.

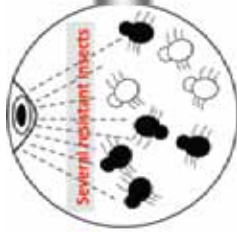




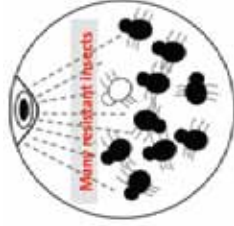
It is also important to avoid repetitive use of the same insecticide. Using the same insecticide over and over again can cause resistance and resurgence among the pests you wish to control. The process resistance is shown below.



First spraying of the season kills many insecticide susceptible insects, but leaves two insecticide resistant insects to reproduce and have babies



The second to third spraying of the season, there are fewer susceptible insects, but the resistant insects reproduce and increase



After several sprays with the same products, resistant insects reproduce and multiply, and then cause crop damage. This is called pesticide resistance.





Pod borers (*Euchryisops cnejus* and *Maruca* spp):

After hatching, larvae of pod borers damage flowers and pods. They lay eggs on mungbean flowers. Larvae feed for 3 weeks, reducing seed formation.

How can I manage pod borers?

- Regularly visit your field and look for pod borers to assess how many there are.
- Place bird perches in the field to attract birds that eat pod borders. Install at least 7 perches per bigha.
- Install pheromone traps, which attract adult pod borer moths and kill them at a distance of 10 m in a grid pattern.
- Partner with your neighboring farmers to install light traps, which also attract adult pod borer moths and kill them during the night. Use one trap can per hectare.



Mungbean pod borer



Mungbean pods damaged by borers

If pod borer populations are large enough to cause significant yield loss,



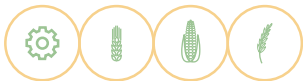


consider application of insecticide. Make sure to wear protective clothing. Application of Imidachloprid (0.5 ml/litre) at 35 and 42 days after sowing (when flowers begin to appear) or Lambda-Cyhalothrin (karate 2.5 EC/ Reeva 2.5 EC) at 1 ml/liter of water at early pod formation and grain filling stage can also be effective.



A pheromone trap in a farmers' field

Note that Imidachloprid can be toxic to bees and beneficial insects, so use it sparingly. Lambda-Cyhalothrin is only advised for use at chemical to water ratios below 10%.



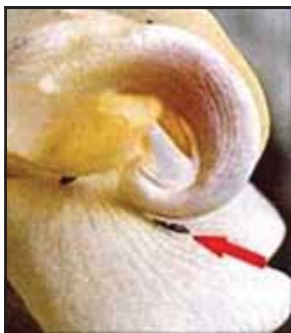


Thrips (*Megalurothrips distalis*):

Thrips cause major yield loss to mungbean and attack during flowering and pod formation. They feed on leaves and damage flowers.

How can I manage thrips?

- Visit your field at least once a week to look for thrips. Thrips are very small but can be found on the bottom of leaves or flowers.
- If a many thrips are found to justify use of an insecticide, you can crush neem seeds or tobacco leaf extracts @ 50 g/ liter or Neem oil @ 5 ml/liter, and spray them upwards so they contact the underside of leaves. These are relatively safe biological insecticides and are advised for use before chemical insecticides.
- If biological insecticides are not effective, consult a qualified extension agent to apply Imidachloprid (Imitaf 20 SL) at 0.5 ml/ liter of water can be applied at early and peak flowering. Try to assure the chemical contacts the bottom of mungbean leaves, where thrips are most common. Avoid using Imidachloprid at flowering as it will also kill beneficial insects.





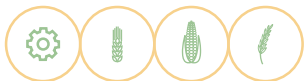
Hairy Caterpillar (*Diacrisia obliqua*)



These caterpillars feed on leaves. Over time, the leaves begin to look like fishnets and then they die.

How can I manage hairy caterpillar?

- Regularly visit the field and look for caterpillars.
- Collect and destroy leaves with egg and larvae.
- Place bird perches in the field to attract birds that eat pod border larvae. Install at least 7 perches per bigha.
- Partner with your neighboring farmers to install light traps, which also attract adult hairy caterpillar moths and kill them, during the night. Use one trap per hectare of mungbean planted land.





Bruchids (*Callosobruchus chinensis*, *C. maculatus*)

Female beetles lay their eggs on pods. Hatching larvae bore feed on seed. Infestation may begin in the field and continue after harvest in storage. Infested grains are unfit for food.

How can I manage burchids?

- Before storing seeds or grain after harvest, make sure seeds are well dried.
- Store seeds in an air-tight plastic bag protected by a stronger woven plastic bag, or in a super bag. If the bag is air tight, grain eating pests will suffocate and die.
- Plastic or metallic drums can also be used to store seed. Try to remove all air from these containers before seeds are stored. For the drums, you can light a candle and put the top of the drum on, and the candle will remove all oxygen so that pests die.
- Controlling burchids in the field is usually not effective.



Burchid infested seed



Burchid adult





Stem fly (*Ophiomyia phaseoli*)

Stem flies lay eggs on mungbean leaves. Larvae bore into mungbean stems after hatching. Stem fly attacks young plants, so monitoring in the early part of the season is important.



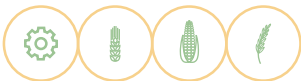
Stem fly larvae feeding on mungbean

How can I manage stem fly?

- Regularly visit your field soon after sowing and remove and destroy any plants where stem fly damage, eggs or larvae are found.
- If field visits determine that infestation is high, application of Dimethoate @2 ml/litre at 30 days after sowing can be effective. *Note that this chemical can however have important negative effects on humans and beneficial insects, so use with care. Do not spray this chemical at flowering.*
- Where large populations of stem flies have been observed, three sprayings of Dimethoate @ 2 ml/litre of water from 3 days after germination at a 7 days interval can be used until pests are no longer found, or until pod formation. *Do not use this insecticide after flowering or pod*



Rotting stem caused by stem fly





formation begins, because it can cause health problems for people who eat mungbean! It also kills beneficial insects like bees during flowering time.

Flea Beetles (*Phyllotreta* spp.)

Two species of flea beetles (cruciferous flea and striped flea beetle) attack mungbean. The larvae live in the soil and fed upon mungbean roots. Adults feed on leaves. Older damaged leaves dry up causing low yields.



Mungbean leaves severely damaged by flea beetles are shown.

How can I manage flea beetles?

- Flea beetles can live off weeds. Regular field visits are advised, and any weeds should be removed.
- There are no insecticides currently available in Bangladesh to control flea beetles that do not have unacceptably high levels of toxicity and can cause serious harm to human health.



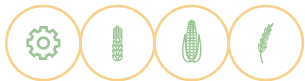
Green Jassid (*Empoasca kerri*)

Green jassids can have several generations during mungbean growth. Young and adult insects suck juice from leaves, turning them red or yellow causing their death. This reduces yield. Jassids also spread diseases.



How can I manage green jassid?

- Jassids are eaten by other insects and spiders. Try to conserve spiders in your field, and to avoid insecticides unless you have a very severe infestation of jassids. If you apply insecticides, you will also kill spiders, which can cause later outbreak of jassids over time.
- In case of heavy infestation, spraying with Dimethoate (Tafgor 40 EC) @ 2 ml/litre of water can give good control. Apply from the 1st observed infestation up to two times. *Do not use this insecticide after flowering or pod formation, because it can cause health problems for*





people who eat mungbean! It also kills beneficial insects like bees during flowering time.

- Jassids can quickly develop resistance to insecticides. Use insecticides only if risk of jassids is severe.

Aphid (*Aphis craccivora*)

Aphids suck juices from mungbean. Severely infested mungbean will have reduced yield. Aphids also transmit viruses and have many generations (reproduce frequently) during the crop season.

How can I manage aphids?

- Look for and conserve predatory and parasitic insects in your field. Insects that eat or kill aphids include lady birds, syrphid flies and lacewings. Avoid using insecticides if many of these insects are found in your fields.
- Ants are often found near aphids and they sometimes protect them.
- In case of heavy infestation, Dimethoate (Tafgor 40 EC) can be sprayed once at 2 ml/litre of water.

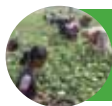


Example of an aphid infestation on mungbean pods



Damaged mungbean





Note that this chemical can be harmful to humans and their reproductive and developmental health. Use it only with extreme caution and care. This chemical also kills beneficial insects such as bees, so do not use it at flowering.

Leaf roller (*Omiodes indicata*)

Mungbean leaf roller is a late season pest that feeds on leaves, causing them to roll up like pan before it is eaten. Leaves will also turn yellow and drop off, and can lower yield, but usually not severely.



Mungbean leaf roller in larval stage



Dried leaves following leaf rolling

How can I manage mungbean leaf roller?

- Regularly visit the field and look for signs of pests. Any rolled/folded leaves can be removed along with leaf rolling larvae and destroyed.
- Insecticides are not recommended for leaf rollers, as the larvae are usually protected from sprays inside the rolled leaves.





Spider Mites (*Tetranychus spp.*)

Mites are a relatively new pest in Bangladesh. Both young and adult insects are found on leaf bottoms. They suck on the leaves causing them to curl downwards towards. A brown waxy appearance also develops on the leaves, which resembles a spider web. Leaves die and yield can be reduced.



Dried mungbean leaves with mites

How can I manage mungbean spider mites?

- Avoid planting near dirt or gravel roads. Mites are more common where there is a lot of dust.
- Do not use broad-spectrum insecticides (these kill the natural predator insects that eat mites)
- In case of severe infestation, spraying should be done once with acaricide (Vertimec 1.8 EC @ 2 ml/liter). Because mites appear on the bottom of leaves it is important to make sure that the spray touches the bottom of leaves. *This chemical is very harmful if*





swallowed, or if it is used continually. Use it only with caution. Do not use it near ponds, canals, or rivers, as it can kill fish.

When should mungbean be harvested?

Mungbean is ready for harvest when the pod turns black and dries. If mungbean is sown early, it can be harvested up to three times. Late sown mungbean may however not be picked more than once.

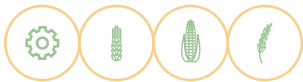
After picking, pods should be sun dried for 1-2 days. After drying, check if the seed in the pods makes sound in pods when shaken. If you can hear the seeds, the pods can be threshed. Threshing can be done on a large tarp by hitting mungbean with a bamboo stick, or by walking over the pods until they shatter. Pods are then separated from mungbean grain by winnowing.



Maturing Mungbean plant. Note that the pods are still mainly green



Matured Mungbean pod. Note the black color of the pods





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