Mungbean

Botanical Name - *Vigna radiata* (L.) Wilczek
Origin - India and Central Asia
Synonym - Moong

Introduction

Green gram is excellent source of high quality protein. Moong is consumed as whole grains, sprouted form as well as dhal in a variety of ways in homes. It is also used as green manuring crop. Moong can be used as a feed for cattle even husk of the seed can be soaked in water and used as cattle feed. In India these crops are cultivated in three different seasons, viz., kharif, rabi and summer. Summer moong can be grown after harvesting of pea, gram, potato, mustard, linseed. Cultivation of Jayad Moong is important to increase soil fertility in these areas where paddy –wheat crop rotation is used.

Crop Status

During Twelfth Plan (2012-2015) the total area covered under moong in India was 30.41 lakh hectares with a total production of 14.24 lakh tonnes. The coverage of area and its production was maximum in Rajasthan (29.68 % & 25.51 % of the total area and production). Maharashtra ranked second in area coverage (12.98 %) and third in production (11.92 %). Andhra Pradesh ranked third in area (8.74 %) and second in production (12.43 %). The highest yield was recorded by the state of Punjab (838 kg/ha) followed by Jharkhand (680 kg/ha) and Tamil nadu (675 kg/ha). The National yield average was 468 kg/ha. The lowest yield observed in the state of Karnataka (247 kg/ha) followed by C.G. (269 kg/ha) and Odisha (337 kg/ha). *(DES, 2015-16).*

Nutritive value

Protein	- 24-25%	Calcium	- 124 mg/100 g
Fat	- 1.3%	Phosphorus	- 326 mg/100 g
Minerals	- 3.5%	Iron	- 7.3 mg/100 g
Fiber	- 4.1%	Calorific value	- 334 Kcal/100 g
Carbohydrate	- 56%	Moisture	- 10%

State-wise recommended varieties

State	Kharif	Rabi	Summer
Andhra Pradesh	Madhira 429, Pusa-9072, WGG-2, IPM-02-14, OUM 11-5, CoGG-912	LGG-460, LGG-450, LGG-407, TM 96-2	-
Assam	IPM 2-3, Pant Mung 4, Pant Mung 2, Narendra Mung 1, SG 1,	-	HUM-16, PDM-139, Meha, Pant Mung-5, HUM-12, Pusa vishal, TBM-37
Bihar & Jharkhand	IPM 2-3, MH 2-15, Pant Mung-4, HUM-1, Narendra Mung 1, Pant Mung 2, Sunaina, PDM-139, MH-2-15	-	HUM 16, PDM 139, Meha, Pant Mung 5, Pusa vishal, TBM-37, HUM - 12
Gujarat	Gujarat Mung 3, Gujarat Mung 4, K-851, PKVAKM-4	-	-

Haryana	IPM 2-3, MH 2-15, Muskan	-	SML 668, Pant Mung 5
H.P. & Jammu & Kashmir	Pusa 672, KM- 2241, Shalimar Mung 1	-	-
Karnataka	IPM 02-14 & 2-3, HUM 1, PKVAKM-4, COGG 912, KKM 3, LGG 460, TARM-1, OBGG 52	-	-
M.P. & C.G.	HUM 1, TJM 721, BM 4, Meha	-	-
Maharashtra	HUM 1, BM 2002-1, PKVAKM -4, BM 4, TARM 2	-	-
Odisha	PDM 139, OUM 11-5, COGG 912, IPM 2-3	PDM 139, LGG 460, TARM 1, OBGG 52, IPM 2-3	-
Punjab	IPM 2-3, MH 2-15, ML 818, ML 613	-	SML 668, IPM 2-3, Pant Mung 5
Rajasthan	SML 668, IPM 2-3, RMG 492, MH 2-15	-	SML 668, PDM 139, Meha
U.P.& Uttarakhand	Pant Mung 5, Pant Mung 4, Narendra Mung 1	-	HUM 16, IPM 2-3, PDM 139, Meha, HUM 12
Tamil Nadu	IPM 2-3, Co-6, TM 96-2, Vamban 2, Vamban 3	-	ADT-3, Sujata (Hybrid 12-4)
West Bengal	MH 2-15, Pant Mung 5, Pant Mung 4, NArendra Mung 1	-	HUM 16, IPM 2-3, PDM 139, Meha, Pusa vishal, Pant moong-5, TMB-37, Hum-16

Source: S***eednet GOI***, Min. of Agri. & FW, ***& ICAR-IIPR, Kanpur***

Potential Yield (FLD Result)

It is observed that in general average potential yield gap between FLD and farmer's local check yield is about 27%. The potential yield level could be obtained by adoption of improved package of practices.

State	Varieties		Yield (kg/ha)		% Increased over Local
	Improved	Farmers Local Check	Improved	Farmers Local Check	
Kharif					
Punjab	Pusa Vishal ML-818	SML-134	1203 991	1039 928	15.8 6.8
Odisha	PDM-54 OPGG-62	Digaphandi -	510 530	270 270	88.9 96.3
East Uttar Pradesh	Narendra Mung-1 LGG-460	Local -	567 1125	296 810	91.6 38.9
Gujarat	JM-4	Local	619	539	14.8
Jammu & Kashmir	Shalimar M-1 PS-16	Local -	736 678	609 525	20.9 29.1
Karnataka	Sel-4	Local	754	656	14.9
Madhya Pradesh	SML-668	Local	818	600	36.3
Rajasthan	RMG-492 IPM-02-3	Local	733 762	573 643	27.9 18.5

Uttar Pradesh	Smrat	Local	632	517	22.2
	IPM-02-3	-	716	554	29.2
	HUM-16	-	1070	886	20.8
Maharashtra	Vaibhav	Local	626	551	13.6
	AKM-4	-	712	596	19.5
	PKV-Green Gold	-	757	614	23.3
	AKM-8802		753	610	23.4
Chhattisgarh	HUM-6	Local	680	480	41.7
Tamil Nadu	VBN-1	Local	875	695	25.9
	Co-7	-	693	553	25.3
	VBN-3	-	790	704	12.2
	COGG-973	-	864	659	31.1
	Co-6	-	870	690	26.1
Jharkhand	Meha	Local	477	389	22.6
	Pusa Vishal	-	850	638	33.2
Rabi					
Andhra Pradesh	LGG-460	Local	1002	886	13.1
Tamil Nadu	VBN-2	Local	852	698	22.1
	VBN-3	Co-4	754	647	16.5
	LGG-460	-	579	491	17.9
Chhattisgarh	HUM-6	Local	680	450	51.1

Source: ICAR-IIPR, Kanpur, Average of 2008-09 to 2012-13

Climate requirement

The crop needs high temperature, less humidity and moderate rainfall of about 60-80 cm. Water logging is fatal for root development and nitrogen fixation during early vegetative stage. Crop is generally grown as rain fed but under assured irrigation during summer in Indo Gangetic plains of Northern India.

Soil Type & Field Preparation

Best soil for its cultivation is loam soil with good drainage. The crop should not be raised on alkaline, saline or waterlogged soils. A well prepared seedbed is required for proper germination and establishment of the crop. For this give 2 – 3 ploughings followed by planking to make the seedbed free from clods and weeds. For the summer/spring cultivation after the harvesting of last crops, the tillage should be done after irrigation.

Sowing Time

Mungbean should be sown during the last week of June to mid or first week of July. For the summer or spring crop, mungbean should be sown after the harvest of last crop (potato, sugarcane, mustard and cotton, etc). The first fortnight of March is most suitable for spring/summer cultivation. Late sown mungbean takes more loss at the time of flowering stage due to high tempreture and yield affected.

Seed Rate, Spacing & Method

During Kharif season 15-20 kg seed/ha should be sown in rows 45 cm apart while during Rabi and Summer 25-30 kg seed /ha sown in rows 30 cm apart. As a companion crop with sugarcane seed rate should be 7-8 kg/ha. The plant-to-plant distance should be maintained (atleast 5 cm). Sowing can be done behind the local plough or with the help of seed drill.

Seed Treatment

Treat the seed with Thirum (2gm.) +Carbendazim (1gm.) or Carbendazim & Kepton (1gm.+ 2gm) to control the soil & seed germinated disease. For sucking pest control seed treatment with Imidacloprid 70 WS @ 7g/ kg seed. It is also desirable to treat the seed with Rhizobium and PSB culture (5-7gm/kg seed).

Cropping systems: The important crop rotations with moongbean are given as under:

Rice-Wheat-Moong (*summer*) Maize+Moong-Wheat-Moong Maize(early)-Potato(early)-wheat-Moong, Sugarcane+Moong (*summer 1:2*) Cotton + Greengram (1:3 in *Central India* 60/90 cm paired row)	Rice-Rice-Greengram(*south India*) Moong-Wheat/Barley Sunflower+Moong (*summer 2:2*) Moong+Pigeonpea (2:1)

Intercropping

During kharif, mungbean are grown generally with maize, pearl millet, pigeonpea and cotton as intercrop. During spring, mungbean is grown in 2:1 ratio with sugarcane with row to row distance of 90 cm. & from mungbean 30 cm distance maintain. Intercropping with sunflower is also suitable with ratio (2:6).

Manure & Fertilizer

Mungbean is generally grown on the basic fertility of soil. If available 8-10 tonnes of compost or farm yard manure should be applied before 15 days of sowing. For mungbean, 15-20 kg nitrogen, 30-40 kg phosphorus should be applied at sowing time. It is advisable to use fertilizers on the basis of soil test and recommendations, normally 100 kg DAP/ha is enough for one hectare the fertilizer should be applied by drilling either at the time of sowing or just before sowing in such a way that they are placed about 2-3 cm below the seed.

Secondary and Micro Nutrients

1. **Sulphur**- In medium black soils and sandy loam soils apply 20 kg S ha^{-1} (equivalent to 154 kg gypsum/ phospho-gypsum/ or 22 kg bentonite sulphur) as basal to each crop. If S deficiency is diagnosed red sandy loam soils, apply 40 kg S ha^{-1} (equivalent to 300 kg gypsum/phospho-gypsum/or 44 kg bentonite sulphur) per hectare. This quantity is sufficient for one crop cycle.
2. **Zinc** - Quantity of Zinc requirement determined according to the soil type & it's availability or status in the soil. Therefore, the doses of zinc should be applied based on the soil type as follows:
   - **Red sandy and loamy soils**-2.5 kg Zn ha^{-1} (12.5 kg zinc sulphate hepta hydrate/ 7.5 kg zinc sulphate mono hydrate) per hectare.
   - **Black soils-** 1.5 to 2.0 kg Zn ha^{-1} (7.5 to 10 kg zinc sulphate hepta hydrate/ 4.5 to 6.0 kg zinc sulphate mono hydrate) per hectare.
   - **Laterite , medium and alluvial soils-** 2.5 kg Zn ha^{-1} (12.5 kg zinc sulphate hepta hydrate/ 7.5 kg zinc sulphate mono hydrate) as basal along with 200 kg of farm yard manure.
   - **High organic carbon containing Tarai soils**-3.0 kg Zn ha^{-1} (15 kg zinc sulphate hepta hydrate/ 9 kg zinc sulphate mono hydrate) as basal once in three year.
   - **Low organic carbon content and hilly sandy loam soil** - 2.5 kg Zn ha^{-1} (12.5 kg zinc sulphate hepta hydrate/ 7.5 kg zinc sulphate mono hydrate) as basal in every alternate year.
3. **Boron**- In B deficient soils, apply 0.5 kg B h-1 (5 kg borax ha-1/ 3.6 kg di-sodium tetra borate penta hydrate).

4. **Manganese**- In manganese deficient sandy loam soils, Seed soaking with 2% manganese sulphate OR foliar spray of 1% manganese sulphate is recommended.

5. **Molybdenum** - In molybdenum deficient soils, application of 0.5 kg Sodium Molybdate ha^{-1} as basal OR two foliar sprays of 0.1% Sodium Molybdate or seed treatment is recommended.

Water Management

Generally the kharif crop requires one life saving irrigation, which may be applied during the early pod formation stage. For the summer/spring mungbean, 3–4 irrigations are required. Apply first irrigation after 20-25 days of sowing and repeat after 10-15 days as per need. One irrigation before flowering and another at pod-filing stage would ensure healthy seeds. Water logging in the field should be avoided at all cost. No irrigation should be given when the crop is in full bloom stage.

Weed Control

Two weeding should be given to keep the crop free from harmful weeds. First weeding should be done 20-25 DAS and Second 40-45 DAS. Use Pendimethalin (Stamp) @ 0.75-1 kg . a.i. per ha in 400-600 liter of water a pre-emergence application . Always flat nozzle is used during spraying of weedicide.

Plant Protection Measures

There are several important disease of mung, yellow mosaic, lea crinkle, leaf curl, anthracnose, cercospora leaf spot are important one.

Diseases

Yellow Mosaic Virus

Symptoms

This disease is caused by the mung bean yellow mosaic virus (MYMV) belonging to Gemini group of viruses, which is transmitted by the whitefly (*Bemisia tabaci*). The tender leaves show yellow mosaic spots, which increase with time leading to complete yellowing. Yellowing leads to less flowering and pod development. Early infection often leads to death of plants.

Control Measure

Diseased plants should be rogued out to prevent further spread of the disease; ii) In order to prevent whitefly (Bemisia spp.) infestation spray with triazophos 40 EC @ 2.0 ml/l or malathion 50 EC @ 2.0 ml/l or oxydemeton methyl 25 EC @ 2.0 ml/l at 10-15 days intervals if required; iii) Grow tolerant/resistant varieties like Narendra Mung1, Pant Mung 3, PDM 139 (Samrat), PDM 11, MUM 2, ML 337, IPM 02-14, MH 421, SML 832 etc.

Leaf Curl

Symptoms

The symptoms are visible first in third leaf after three to four weeks of sowing. These are characterized by enlargement of leaves followed by their crinkling. Later the leaves become thicker an leathery. The affected plants, however, do not die till the harvest of the crop.

Control Measures

i) Treat the seeds with imidacloprid 70 WS@ 5ml/kg; ii) Foliar spray of insecticide (dimethoate 30 EC @ 1.7ml/ha) on 30 days after sowing; iii) Rogue out the infected plants and Field sanitation; iv) Use resistant varieties like D-3-9, K 12, ML 26, RI 59, T-44.

Anthracnose

Symptoms

The fungus Colletotrichum spp. is the causal organism affecting aerial plant parts, however, the leaves and pods are more vulnerable. The characteristic symptoms of this disease are circular brown sunken spots with dark centers and bright red orange margins on leaves and pods. Infection just after germination causes seedling blight.

Control Measures

i) Hot water seed treatment at 58^{o}C for 15 minutes has been found effective in checking the seed-borne infection and increasing proportion of seed germination; ii) Seed treatment with carbendazim 50 WP @ 2g/kg of seed helps in eliminating the seed borne infection; iii) Spray the crop with carbendazim @ 2g/ liter of water with first appearance of symptoms on the crop and repeat after 15 days (if necessary).

Cercospora leaf spot

Symptoms

It is most important fungal disease of mungbean. Leaf spots are circular and irregular in shape with brown to greyish-white centres and reddish-brown to dark brown margins. Such spots are also visible or pods are the affected pods become blackened.

Control Measures

i) Field sanitation, crop rotation, destruction of infected crop debris; ii) Opt for resistant varieties as per recommendation of local agricultural authorities (Like- LM 113, LM 168, LM 170, JM 171, Ganga 1, HUM 12, Pusa 06722); iii) Treat the seeds with thiram or captan @ 2.5g/kg of seed; iv) On appearance of the symptoms spray with carbendazim 50 WP @1.0 g/liter or mancoze 75 WP @ 2.0 g/liter or hexaconazole (contaf 5 % EC) @ 1 ml/ liter of water.Subsequent spray should be done after 10 to 15 days, if required. Spraying with copper oxychloride @ 3 to 4 g /liter water has also been found effective in management of the disease.

INSECT-PEST Management

Numerous insect pests attack the mungbean. The loss in the production caused by them may reach up to 70% depending upon the severity of attack. Some common insect pests of mungbean and their management are as follow:

White fly

Nature of damage: The infested plants become very weak showing downward cupping of the leaves giving a sickly look and the plant may die Insect secretes honey dew on leaves results blackening of leaves, drastically reducing photosynthetic rate and drying of leaves. Whitefly is a vector of number of viral diseases especially mungbean yellow mosaic virus (MYMV).

Control Measures

i) Seed treated with Dimethoate 30 EC @ 5ml/kg; ii) Foliar spray of Triazophos 40 EC @ 2.0 ml/l or Malathion 50 EC @ 2.0 ml/l at 10-15 days intervals if required; iii) Grow cotton as a trap crop one month earlier between the mungbean rows; iv) Grow maize, sorghum or pearl millet as a barrier crop to minimize the incidence of whiteflies; v) Install Sticky trap; vi) Opt. resistant varieties e.g. ML 1256, ML 1260 and ML 1191

Bean Thrips

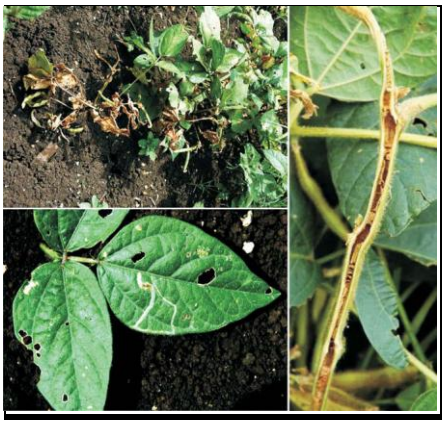
Nature of damage

The thrips nymphs and adults feed on stigma inside the flower, flower sheds before opening and there is elongation of terminal shoot. Plants attain a bushy growth and the crop looks dark-green in colour, bearing few pods with shrivelled grains.

Control Measures

i) Seed treatment with Thiomethoxam 70 WS @ 2 ml /kg seed + foliar spray of Thiomethoxam 25 WG 0.2 g/liter of water of is quite effective in controlling bean thrips; ii) Spray neem seed kernel extract (50 g/l) and neem oil 3000 ppm @ 20 ml/l; iii) Opt for resistant varieties (Mungbean: PIMS 2, PMS 3, 12-333, Co 3, ML 5, ML 337; iv) Timely irrigation at an interval of 15 days results in low build up of thrips; v) The incidence of bean thrips can be minimized by intercropping mungbean with cotton; vi) Spray of Triazophos 40 EC @ 2.0 ml/liter , Ethion 50 EC @ 2 ml/liter of water.

Stem fly



Nature of Damage

Stem fly (*Ophiomyia phaseoli*) maggots mine the leaves or bore into the leaf petiole or tender stem resulting in withering, drooping and death of plant. The characteristic symptoms of damage include drooping of the first two leaves and yellowing of plants. It can cause 5 – 20% damage in mungbean.

Control Measures

i) Follow clean cultivation, crop rotation, earthing up, growing trap crop, destroying alternative hosts like *Solanum nigrum* to minimize the stem fly incidence; ii) Opt for resistant varieties (Mungbean: CoGG 912 & CoGG 917; Urdbean: CoBG 671 & AC 222); iii) Seed soaking either in imidacloprid 17.8 SL @ 5.0 ml/kg seed in 100 ml water for one hour or thiomethoxam 25 WG @ 5.0 g/kg seed in 100 ml water to avoid early incidence of stem fly is recommended; iv) Spray either Imidacloprid 17.8 SL @ 0.2ml/l or thiomethoxam 25 WG @ 0.3g/lit at 15 days after sowing.

Bihar Hairy Caterpillar

Nature of damage

Female moths lay eggs on plants in a field.Young caterpillar eat away all the green matter of the leaves and it can be easily recognized by perforated, dustywhite coloured leaves in the field. The grown-up caterpillars feed voraciously on leaves, soft stems and branches. The insect totally denude the crop within few days resulting in total failure of the crop.

Control Measures

i) Uproot the damaged plants along with the young larvae at the gregarious phase and burry under the soil; ii) Spray of Quinalphos 25 EC @ 2.5 ml/liter or Dichlorvos 10 EC @ 1.0 ml/ liter or Fenvalerate 20 EC @ 1.87 ml/ liter of water or dusting with Fenvalerate 0.4% @ 15 kg/ha.

Harvesting Threshing & Storage

Mung should be harvested when more than 80 per cent pods mature. One or two rounds of picking of pods are also recommended to avoid losses due to shattering. The plants are cut with the sickle and dried on the threshing floor. These are then threshed by beating with sticks or by trampling with bullocks. The clean seeds should be sun dried for 3-4 days to bring their moisture content at 8-10% to safely store in appropriate bins.

Yield

A well managed crop, as indicated above, may produce 8-10 quintals and in mixed crop yield 3-5 quintals grains per ha. In rainy season crop produce 10 qtls/ha and in sume3r crop produce 12-15 qtls. /ha. In mixed cropping 3-5 qtls/ha.

Recommendation to achieved higher production

i) Deep summer ploughing once in 3 years.
ii) Seed treatment should be done before sowing.
iii) Application of fertilizer should be based on soil test value.
iv) In kharif season sowing should be done by ridge & furrow method.
v) Yellow mosaic resistant/ tolerant varieties Narendra Mung1, Pant Mung 3, PDM 139 (Samrat), PDM 11, MUM 2, ML 337, IPM 02-14, MH 421, SML 832 etc choose as per suitability of region.
vi) Weed control should be done at right time.
vii) Adopt integrated approach for plant protection.

- For technical information of crop production please contact to district KVK/ nearest KVK.
- To avail benefit from Centrally and State Government running schemes for crop production (ploughing, fertilizers, micronutrient, pesticide, irrigation equipment), agricultural implements, storage infrastructure etc., please contact to your DDA/SADO office.

For more information also visit

- **M- kisan portal - http://mkisan.gov.in**
- **Farmers portal - http://farmer.gov.in**
- **Kisan Call Centre (KCC)-Toll Free No.- 1800-180-1551**

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