DEPARTMENT OF AGRICULTURE

MIMAROPA

Mungbean

Production Guide

Description of Plant

Mungbean (Vigna radiata (L.) Wilczek) is one of the most important legume crops in South and Southeast Asia. It is in the Legume family of plants and is closely related to adzuki and cowpea (in the same genus but different species). It is a warm season annual, highly branched having trifoliate leaves like the other legumes. The plant is upright and vine types of growth habit occur in it, with plants varying from one to five feet in length. Root system consisting of a well-developed taproot with deeply placed lateral roots; stem much branched, with a tendency to twine at the tips, angular, covered with long spreading hairs. Leaves alternate, 3-foliolate (sometimes 5-foliolate), dark green; stipules 5–18 mm × 3–10 mm, peltate, ovate, rhomboid or obovate-oblong; petiole 5–21 cm long, rachis 1.5–4.5 cm long; stipels conspicuous, 5–10 mm long; petiolules 3–6 mm long; leaflets entire or 2–3-lobed, 5–18 cm × 3–15 cm, elliptical, rhomboid or ovate, base broadly cuneate or rounded, apex acuminate, glabrous or hairy on both surfaces, distinctly 3-veined from the base, the lateral leaflets unequal-sided.

The pale yellow flowers are borne in clusters of 12–15 near the top of the plant. Mature pods are variable in color (yellowish-brown to black), about five inches long, and contain 10 to 15 seeds. Self-pollination occurs so insect and wind are not required. Seeds are 2.5–4 mm × 2.5–3 mm × 2.5–3 mm, globose to ellipsoid or cube-like. Mature seed colors can be yellow, brown, mottled black or green, depending upon variety. These round to oblong seeds vary in size from 6,000 to over 12,000 per pound, depending upon variety. Germination is epigeal with the cotyledons and stem emerging from the seedbed.

Mungbean resembles black gram (Vigna mungo (L.)) with two main differences: the corolla of Vigna mungo is bright yellow while that of Vigna radiata is pale yellow; mungbean pods are pendulous whereas they are erect in black gram. It is also slightly less hairy than black gram.

The more common vernacular names include: mungbean, green gram, golden gram (English), balatung (Tagalog), dau-xanh (Vietnamese), Nong taao or pua sha (Hmong), moy-ashimame (Japanese), Iu tou (Mandarin Chinese), look dou (Cantonese Chinese), Haricot mungo, mungo, ambérique, haricot doré (Fr.), Feijão mungo verde (Po.), Mchooko, mchoroko (Sw).

Nutritional Values

As a food source mungbeans have some valuable properties. Products which need high consistency under high temperature benefit from the heat stable viscosity of mungbean starch.

Mungbean is rich in easily digestible protein (24%). It adds much-needed diversity to the cereal-based diets of the poor. The protein is easily digested and is of a high quality, making it based food preparations especially good for children, elderly people and invalids.

It also contains vitamin A (94 mg), iron (7.3 mg), calcium (124 mg), zinc (3 mg) and folate (549 mg) per 100 grams dry seeds. Mungbeans are also high in vitamins B1, B2 and C and niacin.

In the diet it should be noted that mungbeans are not a perfect protein source

and should be consumed with other sources of protein which have high percentages of sulphur-containing amino acids, such as cereals, rice and sesame.

Uses (Culinary)

It is used as a raw material in mungbean sprout production, sotanghon manufacturing, hopia making, and in dishes such as soups, porridge, bread, noodles and ice cream. Its agronomic characteristics permit it to fit in various cropping systems as an intercrop, rotation, and relay crop. In addition, its crop residues can be used as fodder.

Cultivation

Soil and Climatic Requirements

Mungbean is a dry season crop and can be grown best in rotation with rice or corn in an optimum temperature ranging from 20 to30oC. It needs plenty of sunlight and a daylength of 11.5 to 13.0 hours.

In the Philippines, mungbean can be grown during the wet season (May-June); dry season (September-October); and late dry season (February-March). High humidity brought about by continuous rains could severely reduce the quality of harvested seeds. It can be profitably grown in different types of soil with pH ranging from 5.8 to 6.5.

It is fairly well adapted to sandy loam soils and a dry condition, which gives it a competitive advantage and permits it to fit in various cropping systems as an intercrop, rotation, and relay crop.

If grown during the wet season, the soil should be well-drained. Heavy soils are suitable only for dry season planting because mungbean is sensitive to extended periods of water-logging.

Just like other crops, mungbean production can be affected by several constraints such as erratic weather, insect pests and diseases, poor management practices, and the use of inferior or low yielding varieties or cultivars.

Cultural Management Practices

Land Preparation

Prepare the land thoroughly so that mungbean seeds can germinate uniformly, establish rapidly, and compete well with weeds. For the uplands, prepare the soil thoroughly by plowing alternated with harrowing at weekly interval. For post-rice culture, zero or minimum tillage can be practiced.

Planting

Drill the seeds along shallow furrows spaced 60 centimeters apart. Twenty (20) kgs of seeds is enough to plant a hectare. If seed inoculant is available, moisten the seeds with water, then mix the inoculant until all seeds are coated. Keep the newly inoculated seeds under shade until they are planted.

At planting, sufficient soil moisture is necessary so that the seeds can germinate uniformly. For post-rice culture, flood the paddy 1-2 days before planting. Then, drain the water before broadcasting the seeds.

Water Management

Mungbean is relatively tolerant to drought. However, it needs sufficient amount of water during its critical stages of growth and development (germination, vegetative, flowering and pod-filling stages).

The daily water requirement of mungbean differs, depending on intensity of solar radiation and rate of evaporation. In general, the crop requires 3.5 millimeters of

water per day or about 410 millimeters per cropping season.

If there is residual rain and sufficient soil moisture, during the early dry season planting (September-October), supplemental irrigation is not needed. On the other hand, late dry season planting (January-March) requires irrigation at its various critical stages of development. Overhead sprinkler or furrow irrigation may be used to irrigate the field.

Nutrient Management

Mungbean obtains nitrogen through its symbiosis with the N-fixing bacteria in the roots. Excessive nitrates from applied fertilizer will restrict N fixation.

The amount of phosphorous (P) and potassium (K) removed by the crop (when it yields 2 tons per hectare) is the basis for deciding the amount of fertilizer to be applied to avoid depletion of these major elements. In P- and K-deficient soils, about 30-45 kgs per hectare each of these elements should be applied before planting.

In commercial production of mungbean, fertilization rate and type of application depends on the results of soil analysis. However, in the absence of such analysis and during dry season cropping, basal application of three bags (150 kgs of complete fertilizer (14-14-14) per hectare is recommended for heavy soils (loam to clay loam), and four bags (200 kgs) for light soils (sandy to sandy loam). You can also apply organic fertilizer if you want to produce mungbean organically as well as to improve the soil conditions.

It is recommended to inoculate the seeds with appropriate Rhizobia strain inoculant right before planting. Then apply only 20 kgs per hectare of nitrogen which can be supplied by 150 kgs of Triple14. Do not expose the newly inoculated mungbean seeds to direct sunlight. For upland planting, apply fertilizer evenly in furrows and evenly cover with a thin layer of fine soils before planting the seeds. With a machine applicator, the fertilizer is drilled 5 centimeters slightly below the side of the seeds at planting. This makes the fertilizer readily available to the roots of the growing young seedlings.

Crop Protection

A. Insect Pests

1. Bean fly (Melanagromyza sojae Zehntner) – the most destructive insect pest in early vegetative stage. It inserts its eggs into the cotyledonary leaves. The emerging larva tunnels from the leaves towards the stem and pupate within the stem just slightly above the soil surface, eventually causing wilting and stunting of the plants.

Control Measures:

- Spray appropriate insecticide following the recommended dosage, 1-2 days after seedling emergence.
- Biological control is recommended such as the application of Trichogramma chilonis at the rate of 200 strips per hectare divided into weekly application starting seven days after emergence up to 40 days.
- Weekly spraying of naturally fermented solutions (NFS) is also recommended.

2. Aphids (Aphis glycines Matsumura) – can damage the young plants. It can also transmit deadly viruses.

Control Measures:

- Spray appropriate insecticide directly to the aphid colonies.
- Biological control is also recommended such as spraying of naturally-fermented solution, and Effective Microorganisms 5 (EM5).

3. Pod borer (Etiella zinckenella Treitschke) – lays its eggs on the petals or sepals. The larva feeds on the flower buds or immature seeds within the pods.

Control Measures:

- Timely spraying of appropriate insecticide following the recommended dosage indicated on the label.
- Biological control such as Trichogramma chilonis application, and weekly spraying of naturally fermented solution and vermitea for preventive measure. Likewise, application of assassin bug is also recommended at 1,000 bugs per hectare at the onset of flowering.

4. Green Soldier Bug or stinkbugs (Nezara viridula L.)- observed unusually high populations of this pest (3-4 insects/meter row) uniformly over an entire field when pods are still green.

Control Measures:

- Spray infested crop with appropriate insecticides following the recommended dosage.
- Biological measures such as EM5, vermitea, and naturally fermented solutions (NFS) sprayed at weekly interval are recommended as preventive practice.

5. Bruchids (Callosobruchus maculatus) - commonly called pulse beetles or cowpea weevils. It attacks mungbean both in field and storage but greater losses occur in the latter. The nutritional quality of the grains deteriorates because of the infestation rendering making them unmarketable.

Control Measures:

- Maintain sanitation in the storage area by cleaning storage area properly,
- Dry the seeds well, and apply non-toxic chemicals such as vegetable oils.
- Dried leaves of lagundi (Vitex negundo L.) can be also used.
- For seed purposes, treat the seeds with insecticide following recommended dosage.
- Phosphine fumigation is the only chemical treatment approved for cowpea bruchid control.

General Insect Pest Control Strategies

The following are some strategies to control insect pests of mungbean:

1. **Insect Pest Identification** – to be able to determine what control measure you are going to employ, know what particular pest to control, its life cycle and nature of damage.

2. **Cultural Control** - this includes the different field operations that promote favorable growth of the crop while at the same time could effectively control insect pests by directly destroying them, or interfere with their normal biological processes and make the environment unpleasant for the insect pests such as sanitation and crop rotation.
3. **Mechanical Control** - involves the use of special equipment or operations. Generally, this gives immediate and tangible results. Examples: handpicking and light trapping.
4. **Biological Control** - use of parasites, predators and pathogens to minimize or control the pest. Every pest species has one or more natural enemies which prevent their population from increasing to a disastrous level. Example: application of Trichogramma chilonis at the rate of 200 strips per hectare at weekly interval starting 20 days after germination up to flowering stage. Moreover, assassin bug at the rate of 1,000 nymphs or adults per hectare starting from the onset of flowering up to pod development can control lepidopterous insect pests.
5. **Chemical Control** – most commonly employed to control or kill pests (also known as pesticides). Effective against large pest populations; act within a short period of time, and are readily available in the market. However, despite their advantages in pest control, the frequent use of pesticides often results in problems such as resistance, adverse effects to non-target organisms, hazardous to users and can lead to environmental contamination. Hence, pesticides should only be used when necessary. It should be integrated with other forms of pest control.

B. Diseases

1. ***Cercospora Leaf Spot (CLS)*** – caused by fungus Cercospora sp., which is prevalent during wet season. The first visible symptom of infection is the appearance of water-soaked spots on the leaves. The spots then turn tan to reddish brown necrotic areas with a small gray center. The individual spots may coalesce causing large dead areas on the leaves.

2. **Powdery Mildew** – caused by Erysiphe polygoni; develops under high relative humidity and cool nights. Its first visible symptom is the appearance of small, white, powdery spots on the upper surface of the leaf. The whitish fungal growth occupies part or the entire leaf surface. Infected leaves become yellow, then brown and finally fall off.

Disease Management

- ***Plant high quality, preferably certified seeds.*** High quality, certified seeds reduce the possibility of introducing pathogens into the field. It also produces vigorous seedlings that sustain less seed decay and seedling disease.
- Practice fungicide seed treatment (for fungal diseases). Fungicide seed treatment protects seeds and seedlings from seed-borne and soil-borne pathogens. It is inexpensive and effective.
- ***Use recommended seed bed preparation, planting depth, and seeding rates.*** This will promote rapid seedling emergence and vigorous seedling growth; and prevent disease infection and seedling decay.
- ***Practice crop rotation with non-legume crops.*** Many pathogens survive between cropping seasons on crop debris. Continuous monoculture of crops allows the pathogens to perpetuate and multiply. Crop rotation will reduce the survival of pathogens

in the field.

- ***Practice deep plowing to bury plant debris.*** Pathogens survive between planting seasons on plant debris. Deep plowing will physically remove plant debris and likewise hasten decomposition. As the debris decays, the pathogens will also die out.
- ***Plant disease resistant cultivars and varieties.*** Plant resistance is the most efficient and least expensive disease management practice. However, resistance to all known diseases is not available; thus resistance may not last forever. Pathogens sometimes develop new strains which overcome plant resistance.
- ***Use fungicides only when necessary.*** When disease pressure is high, fungicides are effective and profitable. Apply at proper time and rate following label instructions.
- ***Employ appropriate crop management practices***. This includes good drainage, fertilization, irrigation, weed control, and insect management. It promotes healthy, vigorous crop growth that enables the plant to be more tolerant to pathogens.
- ***Disease management is best accomplished using an integrated approach.*** This involves incorporating as many of the principles listed above.

C. Weed Control

Weed control is critical when mungbean grows slowly 2-3 weeks after emergence. To minimize weed growth, prepare the land thoroughly before planting. Fifteen days after planting, off-barring should be done to loosen the soil and eradicate weeds. This will be followed by hand weeding to totally eradicate remaining weeds. Right after weeding, immediately do the hilling-up by passing a carabao-drawn plow in between the rows of mungbean crop not only to eradicate remaining weeds but also to improve plant anchorage. Moreover, option of spot weeding should also be done when weed population is high during the growth and development of the crop.

Harvesting

Mungbean is harvested by priming. Harvesting is done 60-70 days after planting. Mature pods turn brown and then black. Begin harvesting as soon as 75% of the pods have dried up. Pick the harvestable pods by hand. Repeat harvesting every 3 to 5 days. The number of primings (number of harvesting) depends on the available soil moisture and fertility, and on the condition of the crop.

Right after harvesting, sun-dry mungbean pods. When pods are sufficiently dry enough, thresh by placing the dried pods in sack and beating it until all seeds severed from the pods. A mechanical rice thresher may be used for large scale production. Take precaution not to damage the mungbean seeds. Clean the seeds and sundry until 12% moisture content is reached.

Post Harvest

Storage

Store mungbean seeds in tight containers or in nylon/jute sack. Store them in a cool, dry place protected from rodents. Practice good sanitation to prevent storage pest infestation like weevils. You can also mix dried neem seeds or leaves, or dried hot pepper (siling labuyo) with the mungbean seeds.

Cost of Production and Return on Investment (ROI) for a One-Hectare Land

ITEMS/ACTIVITY	Unit of Measure	Quantity	Unit Price (Php)	Cost/ha (Php) -Conventional	Cost/ha (Php) -Organic
A. FARM INPUTS					
Mungbean seeds	kg	20	80	1,600	1,600
Inoculant	pack	4	10	40	40
Fuel	liter	80	50	4,080	
Tripple 14	bag	4	1,200	4,080	-
Organic Fertilizer	bag	20	150		3,000
Insecticide	kg	1	900	900	-
Fungicide	kg	0.5	900	450	-
Botanical Pesticides (EMS-Plus)	liter	4	300		1,200
Fermented Plant/Fruit Juice	liter	6	350		2,100
Sacks	piece	50	20	1,000	1,000
SUB TOTAL				**12,870**	**7,940**
B. Labor					
Land Preparation	Tractor rental		6,500	6,500	
plowing by carabao	manday	6	225	-	1,350
harrowing by carabao 2x	manday	8	225	-	1,800
furrowing by carabao	manday	5	225	-	1,125
Fertilization	manday	4	225	900	900
Planting	manday	5	225	1,150	1,150
Off barring	manday	2	225	450	450
Weeding	manday	15	225	3,375	3,375
Irrigation (Optional)	manday	2	225	450	450
Spraying fungicide/ insecticide	manday	4	225	900	
Spraying FPJ/EM5-Plus	manday	6	225	-	1,350
Hilling-up	manday	2	225	450	450
Spot weeding	manday	5	225	1,125	1,125
Harvesting (3 primings; processing, and drying)	manday	30	225	6,750	6,750
Seed cleaning	manday	2	225	450	450
SUB TOTAL				**22,500**	**20,725**
TOTAL PRODUCTION COST				**35,370**	**28,665**
Gross Production					
(conventional)	kg	**800**	**60**	**48,000**	
(Organic)	kg	**600**	**80**		**48,000**
NET INCOME				**12,630**	**19,335**

Source:
http://bpi.da.gov.ph/index.php/production-guide/161-mungbean

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