

# Mung bean

Bruce Imrie

## Introduction

Mung bean (*Vigna radiata*) is a warm season annual pulse grown mostly as an opportunity crop in rotation with cereals. Mung beans are erect plants with few branches carrying pods borne in clusters near the top of the plant. Pods contain 8–15 green seeds. Its main advantages are that, being a legume, it does not require nitrogen fertiliser application, and it has a short (75–90 days) growth duration which means that it requires less water than many other crops and is easily fitted into rotations. Its main disadvantage is that it is difficult to produce premium grade seed that commands top market prices.

## Production and trade

Mung beans are grown from the Northern Territory to southern NSW, with the bulk of production being in central and southern Queensland and northern NSW (Table 1). Most of the crop is exported, with the main destinations in recent years being Taiwan, the Philippines, the USA, and the U.K. (Table 2). The main producing countries are India, Indonesia, China, and Burma, while the largest importers are Japan, Europe, the USA and Taiwan.

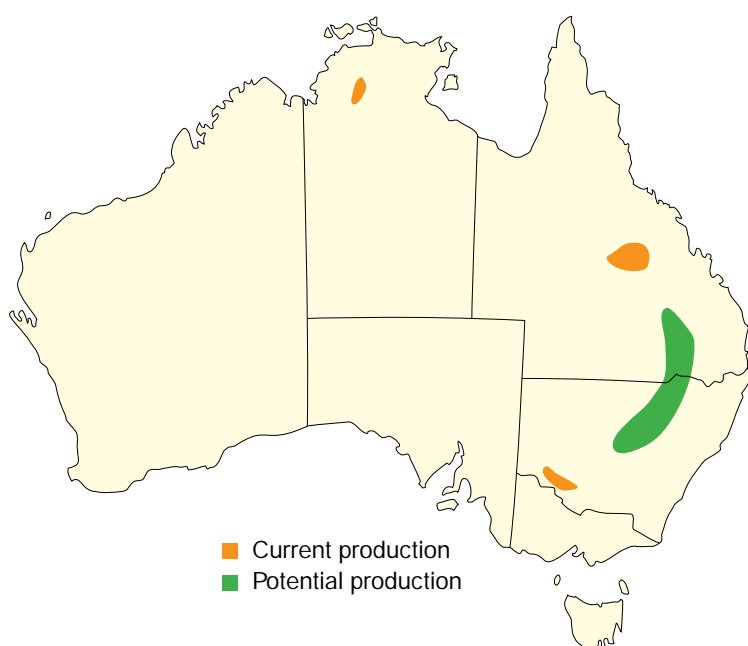
Mung bean is an expanding crop in northern Australia as growers seek to diversify production and to take advantage of market opportunities opened up as production declines in some Asian countries where intensive horticultural production is replacing field crops.

## Adaptation

Varieties of mung bean grown in Australia are day-length insensitive and can be sown at any time of the year provided the minimum temperature is above 15°C. The optimum temperature range for growth is 27–30°C which means that the crop is usually grown during the

summer. Sowing time varies with location with the optimum period being early January in the Northern Territory and central Queensland, late December on the Darling Downs and northern NSW and early December in central and southern NSW. A dry harvest period is highly desirable as most varieties are very susceptible to weather damage caused by wet and humid conditions and leading to severe reduction of seed quality.

Mung beans will grow on most soils, with a preference for loams with a pH in the range 5.5–7.5. Root growth can be restricted on heavy clays, with a consequent limitation to growth. Mung beans do not tolerate saline soils.





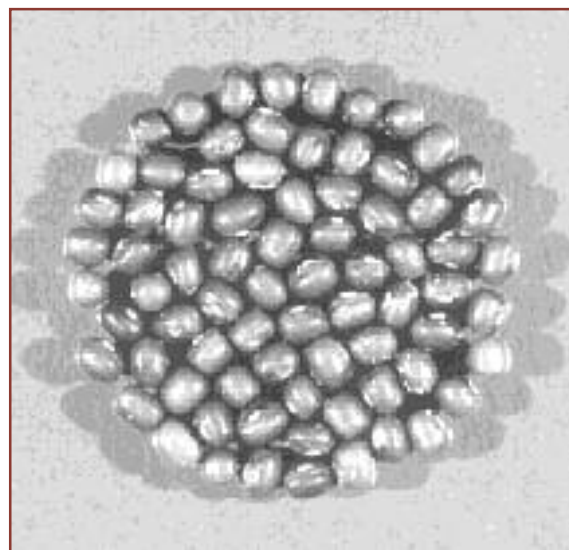
Mung bean crop

## Crop production and management

Mung bean crops are usually managed with the aim of producing premium grade seed. Critical to this objective is to ensure even ripening of the crop. This starts with the choice of a paddock with no variation in soil type and a smooth surface with no sticks, stones, or low spots. There should be at least 60 cm water in the profile at sowing.

Planting seed must be a pure line, preferably with high vigour. A seeding rate to achieve a plant population of 200–350 thousand plants/ha dryland and 400 thousand plants/ha under irrigation is recommended. The crop is sown at different row spacings from 18–100 cm depending on yield expectations, planting equipment, stubble management and rotated crops. When there is a full profile at sowing or when the crop is to be irrigated, and a high yield is expected, narrower rows are preferred. However, many irrigated crops are sown on ridges

or beds spaced for other species and mung beans are similarly sown in wide rows. Frequently, twin rows, rather than a single row, are sown on ridges to achieve a higher plant population. Narrow rows and high populations are desirable for late sowings to achieve some compensation for the yield limitation due to small plant size. Crops grown in a minimum or no-till system are grown in wide rows which are also chosen when yield expectation is low due to dry conditions.



Mung bean seed

## About the author



Dr Bruce Imrie is a Project Leader in CSIRO Tropical Agriculture in Brisbane (see Key contacts for address) where he has been a breeder of mung beans and other crops for more than 20 years.

Varieties available and their characteristics are shown in Table 3.

Nitrogen fertiliser is usually not applied but it is advisable to use Rhizobium inoculum on the seed, particularly when the crop is to be grown in a paddock that has not been sown to mung beans for several years. Phosphate fertiliser

is usually required at 5–10 kg P/ha on dryland crops and 10–20 kg P/ha on irrigated crops. Higher rates may be required if the crop is grown after a long fallow when VAM levels decline, or on severely P deficient soils. Mung beans are also sensitive to zinc deficiency which can be corrected by a soil application of zinc sulphate monohydrate pre-sowing or a foliar spray of zinc sulphate heptahydrate.

### Key messages

Mungbean is a high value pulse crop with a short growth duration that fits into many crop rotations.

A high standard of crop management, conducted under a HACCP quality assurance program is required to produce premium grade beans.

The crop is well serviced and promoted by an active industry association.

Weed control reduces competition during growth and improves yields but, more importantly, the presence of weed seeds in the harvested crop can cause the seed to be downgraded in quality. Grain sorghum, cereal and thornapple seeds are extremely difficult to grade out of mung beans and their occurrence is not tolerated in premium grade seed. Several herbicides are registered for use on mung bean, including both pre- and post-emergence herbicides for control of grasses and broadleaf weeds. Advice on suitable herbicides can be obtained from local traders and/or chemical companies.

Mung beans are frequently grown under irrigation. Because of their short growth duration they need less water than many other crops, and their high value produces good returns per megalitre of water applied. Since mung beans are sensitive to waterlogging, laser-levelled paddocks with a relatively steep grade are preferred. Water should be applied quickly and tailwater drained away. The most critical time for irrigation is during flowering and early podfill. It is

essential to manage irrigation carefully to provide sufficient water to fill pods but not so much that maturity is delayed and uneven.

Insect pest control is also important to achieve high seed quality. The following are the main insect pests of mung bean.

- Green mirids and thrips which are flower feeders and cause flower and pod abortion leading to yield reduction and uneven maturity.

### Basic quality standards for export mung beans (1996)

*Premium sprouting:* Bright even green, 99% pure with no other seeds, minimum 94% germination, maximum 6% hard seeds and 7% oversoaks. No charcoal rot.

*No. 1 sprouting:* Bright green, 99% pure with up to 0.3% other seeds, minimum 90% germination, maximum 10% hard seeds and 10% oversoaks. No charcoal rot.

*Cooking:* Bright green, 99% pure with up to 0.3% other seeds. There are no germination standards.

*Processing:* Colour not up to cooking standard, 98% pure with up to 2% other seeds. There are no germination standards.

Colour is checked against standard samples.



Irrigated mung beans

Table 1. Area and production of mung beans in Australia.

	NSW	Queensland	Australia
Area (' 000 ha)			
1991-92	3.7	30.3	34.0
1992-93	7.0	25.0	32.0
1993-94	7.0	14.0	21.0
1994-95	7.3	21.7	29.0
1995-96	10.0	35.0	45.0
Production (kt)			
1991-92	3.2	16.8	20.0
1992-93	5.0	10.0	15.0
1993-94	7.0	20.0	27.0
1994-95	2.9	9.7	12.6
1995-96	8.0	8.0	16.0

Source: Australian Commodity Statistics 1996.

Table 2. Amounts of mung beans (t) exported to the main destination countries for Australian product.

	1993-94	1994-95	1995-96
Philippines	1956	6468	6655
Taiwan	3646	2645	4361
USA	1145	1278	1078
UK	901	1661	1312
Europe	856	826	1196

Source: Australian Bureau of Statistics.

- Heliothis and *Maruca* caterpillars which feed in flowers and on developing pods. They can cause a large reduction in both seed yield and quality.
- Bugs such as the green vegetable bug, red banded shield bug, pod sucking bug and brown bean bug which stick their proboscis into pods and seeds and cause various levels of damage depending on the stage of growth of seeds at the time of attack. Bug 'stings' on seeds are often the

cause of oversoaks, seeds that have rapid imbibition of water during the sprouting process.

Chemical control involving one or two sprays is usually necessary but care is needed in choice of insecticide and the time of application to achieve maximum effectiveness. Many growers employ a bug checker to monitor crops and advise on control measures.

A serious postharvest pest is the bruchid beetle (*Callosobruchus maculatus*) which can infest the

crop in the field before harvest, then develop during storage. Stored infested grain can be completely destroyed if not fumigated. This pest is prevalent in tropical areas northwards from central Queensland.

Mung beans are susceptible to diseases caused by fungi, bacteria and viruses but their effects are usually not severe in the growing crop. Seedling loss sometimes occurs due to Sclerotinia, particularly in stressed crops sown into cereal stubble. Various leaf and stem pathogens such as powdery mildew and bacterial blight are frequently seen but do not cause much damage. Powdery mildew is usually seen late in the life of a crop and is of little consequence in crops sown at the optimum time but can cause significant damage to spring sown crops or those sown late in summer. Gummy pod, caused by a bacterium, is most frequently seen in crops under stress and generally a low proportion of plants are affected. The most serious disease of stressed plants is tan spot caused by *Curvobacterium flaccumfaciens*, which mostly causes a leaf spot, but when infection is severe, systemic symptoms of stunting and poor pod and seed set occur.

The most important disease of mung bean is charcoal rot caused by the fungal pathogen *Macrophomina phaseolina*. Charcoal rot normally has little effect on growing plants but is an important problem for bean sprouters, and infection precludes seed lots being classified sprouting grade. The causal organism is extremely widespread in cropping soils, and attacks a range of species. In some years most mung bean crops can be affected.

## Harvest and marketing

Mung bean is a specialised food crop used for production of bean sprouts, or cooked as whole beans and dhal, while mung bean flour is used for making noodles and a wide range of traditional Asian foods. Mung bean growers are being encouraged to adopt a HACCP quality assurance plan to satisfy the needs of buyers.

Harvest occurs when more than 95% of pods are mature and dry.

Harvesting too early results in the loss of immature pods while harvesting too late can also result in losses as pods are shaken from the plant during the harvest operation. A desiccant is often used to kill green leaf and the few remaining green pods before harvest, particularly in spring sown crops or when high soil-water content slows maturation. Beans are easily split or damaged during heading but this can be minimised by harvesting at the correct seed moisture content (14–16%), avoiding harvest

during the middle of the day, and careful attention to header settings. Small cracks in the seed coat that are not readily visible can occur with incorrect header settings or rough handling and can cause downgrading of a seed lot due to a high oversoak level. Many growers employ a harvesting contractor who specialises in mung bean.

Following harvest, beans are trucked to a grading shed where they are cleaned, graded and bagged as soon as possible. The graded seed is sampled for quality evaluation by an accredited laboratory and, following classification, a sample is usually given to an exporter who arranges a sale. It has been common practice for exporters to sell on sample but the establishment of quality grades has resulted in an increasing number of seed lots being sold on description. A recent innovation has been the sale of crops in bulk for dhal production. This is an option for growers who can see at the time of harvest that their crop will be classified processing grade.

## Economics

Mung beans are a valuable field crop, both in terms of dollar returns and in their contribution to total farm income as a leguminous rotation crop. Estimates of gross economic margins for production on the Darling Downs are presented in Table 4. The expected price is an average of returns from the various grades. In recent years, premium grade sprouting beans have been valued above \$700/t, No. 1 sprouting grade and cooking beans above \$600/t, and processing grade \$400/t.

Table 3. Mung bean varieties grown in Australia.

Variety	Seed colour/ lustre	Seed size g/ 100	Comments
Berken	Green/ shiny	6.0	Standard sprouting bean, susceptible to all diseases and weather damage.
Celera	Green/ shiny	3.5	Older variety with high hard seed content. Used mainly for processing.
Black Pearl	Black/ shiny	6.0	Proprietary variety similar to Berken.
Emerald	Green/ shiny	6.5	Hard seeded, used mainly for cooking/ processing. High yielding.
Satin	Green/ dull	5.7	Weather tolerant. Produces high sprout yield.
Putland	Green/ shiny	4.5	Photoperiod sensitive variety suited only to tropical areas (NT).
Delta	Green/ shiny	6.8	High yielding sprouting bean but weather susceptible.
Green Diamond	Green/ shiny	4.5	Hard seeded, used mainly for processing. Tolerates dry conditions.

Table 4. Gross economic margins for mung beans grown on the Darling Downs in Queensland.

Item	Dryland fallow crop	Dryland double crop	Irrigated crop
Expected price (\$/ t on farm)	420	420	420
Expected yield (t/ ha)	0.8	0.6	1.5
Expected Income (\$/ ha)	336	252	630
Variable costs (\$/ ha)	122	113	129
Gross margin (\$/ ha)	214	139	501

## Key contacts

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