

Black gram

Bruce Imlrie

Introduction

Black gram is, like mung bean, a member of the Asiatic *Vigna* crop group. It is a warm season annual pulse grown mostly as an opportunity crop in rotation with cereals. In Australia, black gram is marketed under the generic term 'mung bean'. Black gram seeds are dull grey to black. Black gram's main advantages are that, being a legume, it does not require nitrogen fertiliser application, and has a relatively short (90–120 days) growth duration. Black gram is an indeterminate plant and produces pods in groups of 2–4 in leaf axils throughout the foliage. Because of its indeterminacy, maturity can be uneven, with consequent harvest difficulties. This is most pronounced when early sowing and/or hot, moist conditions promote excessive vegetative growth and a tendency to vine.

Black gram is grown mostly in Wambo Shire in south-eastern Queensland, with production being less than 5000 t/year. Separate statistics are not kept for black gram, the crop being included with mung bean. Most of the crop is exported, with the main destinations being Japan and South Asia. The main

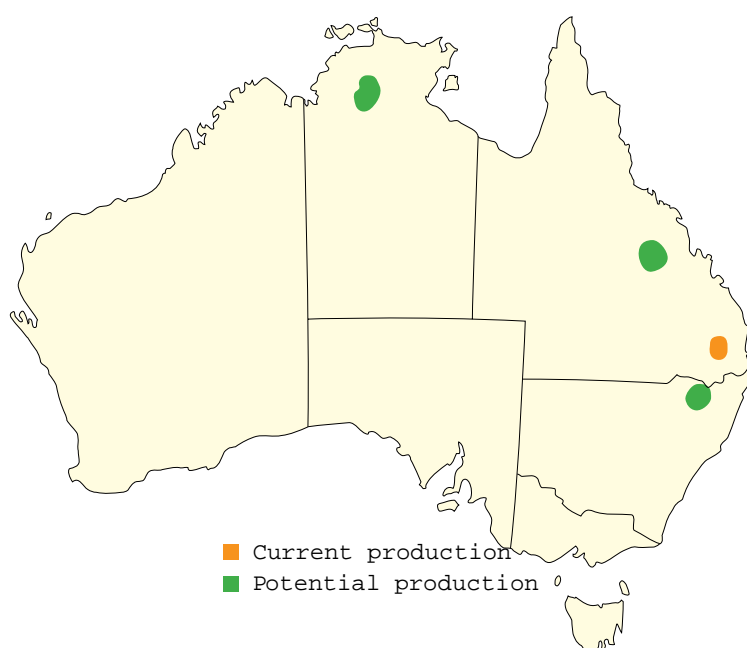
producing countries are India and Burma, and the largest importers Japan and India.

Production requirements

Only one variety of black gram, Regur, is available in Australia. Regur is relatively day-length insensitive but, because it is an indeterminate plant, it has a more restricted planting window than mung bean. Research is currently being conducted to determine optimum sowing dates in different environments but current recommendations are that black gram be sown between mid December and mid

January. Trials have indicated that Regur is much better adapted to southern Queensland than to areas further south or north. The optimum temperature range for growth is 27–30°C. A dry harvest period is desirable as this forces the crop to mature and reduces the risk of weather damage, although black gram is less susceptible to this than mung bean.

Black gram will grow on most soils, with a preference for loams with a pH of 5.5–7.5. Root growth can be restricted on heavy clays, with a consequent limitation to growth. Black gram is more tolerant of waterlogging than is mung bean.





Black gram in flower

Crop agronomy

Choice of a paddock is important because black gram pods are set throughout the plant and the header cutter bar must be set as low as possible for harvest. Consequently, a paddock with a smooth surface with no sticks, stones, or low spots is required. There should be at least 60 cm water in the soil profile at sowing.

A seeding rate to achieve a plant population of 200–300 thousand plants/ha is recommended. The crop is usually sown with row spacings of 30–60 cm depending on yield expectations, planting equipment, stubble management and rotated crops. For example, when there is a full profile at sowing and a high yield is expected, narrower rows are preferred, while in a minimum till system with stubble retention wider rows are necessary. Narrow rows and high populations are desirable for late sowings to achieve some compensation for the yield limitation due to small plant size.

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 either black gram or mung beans for several years. Phosphate fertiliser is usually required at

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 pulse crops for more than 20 years.

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. Black gram is 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.

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. Several herbicides are registered for use on black gram, including both pre- and post-emergence herbicides for control of broadleaf weeds and grasses. Advice on suitable herbicides can be obtained from local traders and/or chemical companies.

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

- Green mirids and thrips, which are flower feeders and cause flower and pod abortion leading to yield reduction and uneven maturity.
- *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. Black gram is less susceptible than mung bean to bug damage, possibly because of its very hairy pods.

Chemical control involving one or two sprays is usually necessary but care is needed in choice of insecticide and the time and method of application to achieve maximum effectiveness. Because the flowers and pods are located throughout the canopy, it can be difficult to get good coverage with contact sprays. Many growers employ a bug checker to monitor crops and advise on control measures.

Black gram is 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

Key messages

Black gram is a high value pulse crop in which the only available cultivar, Regur, is best adapted to the Darling Downs region of Queensland.

Black gram is a member of the Asiatic *Vigna* crop group and its management is similar to mung bean with which it is grouped for marketing.

Because of its indeterminate growth habit, the crop is not as easy to harvest as mung bean.

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. Regur is more tolerant of powdery mildew than are most mung bean varieties. Plants affected by legume little-leaf disease, caused by a Mycoplasma, are frequently observed in black gram crops but rarely at a frequency to cause significant yield loss. The most serious disease of stressed plants is tan spot caused by *Curtobacterium flaccumfaciens*. The most common symptom is a leaf spot, but when infection is severe, systemic symptoms of stunting and poor pod and seed set occur.

An important disease of black gram is charcoal rot when seed is destined for sprouting, and infection precludes seed lots being classified sprouting grade. The causal organism is extremely widespread in cropping soils, and attacks a range of species.

Harvest and marketing

Black gram is a specialised food crop used primarily in South Asia for dhal production. In some countries, Japan in particular, it is used to produce bean sprouts because the sprouts have a good white colour. Black gram flour is used for making pappadams.

Harvest occurs when more than 90% of pods are mature and dry, but timing can be difficult in black gram because of its indeterminate growth habit. The crop is most popular with

growers on lighter soil in areas where a dry autumn forces plants to maturity. A desiccant may be used to kill green leaf and the remaining green pods before harvest. Later sown crops may be left in the field to be frosted before harvest. This is an option because shattering in black gram is rare. 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 destined for the sprouting market. Some growers employ a harvesting contractor who specialises in mung bean and black gram.

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 placed with an exporter who arranges a sale. Most seed lots are sold on sample.

Economics

Black gram can be a valuable field crop, both in terms of dollar returns and in its 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 1.

Table 1. Gross economic margins for black gram grown on the Darling Downs in Queensland.

Item	Dryland high yield	Dryland low yield
Expected price (\$/ton farm)	500	500
Expected yield (t/ha)	1.0	0.6
Expected income (\$/ha)	500	300
Variable costs (\$/ha)	128	119
Gross margin (\$/ha)	372	181

Key contacts

Dr Bruce Imrie
CSIRO Tropical Agriculture
Cunningham Laboratory
306 Carmody Road
St Lucia, Qld 4067
Phone: (07) 3377 0209
Fax: (07) 3371 3946

Australian Mungbean Association
Mr Brian Algate
Promotions Chairman
P.O. Box 639
Springwood, Qld 4127

Pulse Australia
P.O. Box R838
Royal Exchange
Sydney, NSW 1225

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