FAVA BEANS

GROWERS GUIDE IN NEW ENGLAND




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STOCKBRIDGE SCHOOL of AGRICULTURE | UMASS AMHERST

This guideline has been developed by the University of Massachusetts Amherst and is intended to provide basic information for growing fava beans as a new dual purpose crop for New England.

You can also watch the following video for more information: https://www.youtube.com/watch?v=n6W4EoQD2Q4

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Common names faba bean, fava bean, broad bean, Windsor bean, Scotch bean, horse bean

Botanical name. *Vicia faba*

Origin. Central Asia

Introduction

Fava bean is a cool-season crop that grows best in temperatures ranging from 60° to 65°F but it can grow in conditions as low as 40°F and as high as 75°F. Thus fava beans can be planted in Massachusetts in the spring as soon as the soil is workable for early harvest. Fava bean varieties require 80 to 100 days to reach harvest. In regions with milder winters than New England, fava beans are planted in early fall for winter/early spring harvest.

Fava bean is native to the Mediterranean region, including Italy. It is one of the oldest cultivated plants known, with its culture extending back to prehistoric times. Canada and Mexico are perhaps large producers of fava bean in North America since this crop grows and yields best in areas with cool summers. Minnesota and the lake states produce small acreages. In California, fava bean is grown as seed crops along the coast from Lompoc to Salinas and in the Northern Sacramento Valley, but in other areas of the state it is grown mostly as cover crop/green manure.

Being a legume, fava bean is able to fix atmospheric nitrogen and therefore needs less nitrogen from fertilizers and soil organic. Fava bean seeds are rich in protein and in cultures around the world that use fava bean; they make up a major source of protein in their diet.

Dry fava bean contains about 24% protein, 2% fat, and 50% carbohydrate, and has an average of 700 calories per serving. It is also used in livestock and poultry rations. More recently, attention has been given to the use of fava bean as a legume cover crop.

In many regions fava bean is considered as a "break" crop for cereal crop production because it reduces the occurrence of cereal cyst nematode (CCN) (*Heterodera avenae)* which is considered to be a major disease in many regions. Fava bean tolerates water logging better than many other grain legumes including chickpeas (*Cicer arietinum)*, field peas (*P. sativum* sub sp. *arvense* (L.)), lupines (*Lupinus albus* L.) and lentils. It also tolerates acidic soils better than other leguminous grains. When fresh pods are harvested, the remaining residue which contains high amount of nitrogen can be used as a valuable source of feed, for livestock or can be returned to the soil to enhance soil natural fertility.

Growth and Development

Fava bean is bushy, hardy annual which can grow up to 4 feet tall. It has square stems with leaves divided into leaflets. Pods are 6 to 8 inches long and often contain 3 to 6 flat, oval seeds that can be white, yellow, green, or purple (Figure 2). Fava bean has white flowers with some black or brown spots. In large-seeded varieties, 1 or 2 pods grow at each node whereas in small-seeded types the number of pods per node can be as high as five. On average there are about 15 pods per stalk on large types and 60 pods on small-seeded varieties. When stored under favorable conditions, most fava bean seeds will remain viable for have a life expectancy of 3 years.

Germination and Emergence

In optimum growing conditions, germination of fava bean seeds take about 10 to 14 days (Figure 1). It will take longer in dry or very cold conditions.

Figure 1. Fava beans seedlings

Fava bean plants grow at a rate of around 1 node per week. Because stems are strong and upright, the plant can grow from 3 to 4½ feet, tall depending on the variety. At the 8 to 10 node growth stage, when the plant is around12 inches high, fava bean plants produce their first flowers, usually in June. Both flowers and pods appear about 8 inches above the ground. Roughly 25% of the flowers will produce pods which usually contain three to six seeds in each individual pod (Figure 2).

a

b

c

Figure 2. Reproductive growth stages of fava bean; a) flower formation, b) pods ready for harvest, and c) immature seeds

Pollination

Fava bean is self-pollination plant and does not necessarily need the assistance of pollinators such as honey bees; however, some researchers have found that honey bees and other natural pollinators can increase pollinations. Fava bean

has limited ability for self-pollination; therefore, its flowers benefit greatly from insect pollinators for maximum fruit-set. Introducing bee hives, at least one hive for each 6 acres of fava bean is generally recommended for successful pollination. Fava bean flowers open in mid-afternoon and close in early evening. Like other legumes, the flowers are adapted to 'trip' when visited by a pollinator which dusts pollen on the visitor. This trait suggests that cross-pollination is desirable in this crop. Honey bees are capable of pollinating *V. faba*, but larger bees are even more effective (Figure 3). Because honey bees have difficulty reaching nectar in the fava bean, beekeepers may wish to supplement their hives with sugar syrup while they collect pollen on this crop. Honey bees are known to be effective pollinators of fava beans in warmer climates, but it is not clear how effective they are in temperate zones. It is also possible that the use of too many hives may be unnecessary, as the plants will only set fruit from a portion of their flowers no matter how many are pollinated, and abort the rest. Plants in small fields and those near the edges of large fields are more productive, demonstrating the value of wild pollinators to this crop.

Figure 3. Honey bee is pollinating fava bean flower

Cultivation Practices

Soils type

The ideal soil pH for growing fava bean ranges from 6.0 to 6.5. Fava bean does best on well-drained silt-loam soils. Lime should be applied if pH level is below 5.6. Sandy loams are also suitable but require more frequent irrigation. The crop may suffer moisture stress in soils that dry quickly because fava bean has relatively shallow roots. Fava bean seems to be tolerant to short period of water-logging.

Soil temperature

Fava bean is a cool season legume therefore it germinates and grows well under cool soil conditions. Fields may be planted as soon as they can be worked on. Delaying planting till June may increase the incidence of virus or chocolate spot infection. The optimal temperature for plant growth is 59-68°F, especially during the stages of flower and pod development. Fava bean flowers will abort if temperatures exceed 80°F and they are particularly sensitive to hot, dry conditions during pod development. Thus, prolonged cool weather in the spring is ideal for development of pods.

Irrigation

Fava bean requires an average annual rainfall of 16 inches during its growth. Otherwise, it needs supplement for irrigation. Soil type does not affect the amount of total water needed but does dictate frequency of water application. Lighter soils need more frequent irrigation, but less water applied per application. The two critical irrigation times are flowering and pod set stages, both of which are very sensitive to drought stress conditions. If using overhead irrigation, as opposed to drip irrigation, it is advisable to irrigate when it's sunny to allow

plant leaves to dry off quickly before the dun goes down. This will lessen the potential infection of diseases.

Date of Planting

Weather condition during the vegetative growth is of great importance for the compensatory capacity of fava bean and will affect the number of stems per plant. When there is a longer growing season, and given optimum growing conditions, plants grown at low density can effectively compensate for lower plant populations by developing a larger number of side branches. Although weather condition in Massachusetts is quite different in terms of temperature and day-length compared with Mediterranean-type environment, fava bean can be grown successfully if planted as early as mid-March or delayed until early July. In general, earlier planting of fava bean in spring, which experience less humidity and temperature, often results in higher pod yield and fruit quality. It also provides the opportunity of dual purpose production, both as cash crop and as cover crop. Early planting also enables farmers to grow two crops in one growing season – they can grow a crop such as spinach or lettuce in the same field before planting fava bean in July.

Method of Planting

Traditionally fava bean is seeded directly into the soil. However to ensure early planting it can also grown indoor and transplanted to the main field.

Direct Seeding

Fava bean is a cool season crop and can tolerate 15^0F. Conventionally fava bean seed is planted directly into the field at earliest time in spring when soil is workable. Early planting is highly recommended to avoid chocolate spot which is favored by high temperatures that occur in July and August.

Transplanting

In some years, soil and weather conditions do not allow early planting. Therefore, transplanting can be considered as an alternative method to avoid delayed planting of fava bean. Sowing fava bean seeds indoor (greenhouse) in late March and transplanting the seedlings into the field ensures its early planting which is crucial for healthy plants and optimum yield. Our research indicated that the optimum temperature for growing fava bean in greenhouse is 60^0F and the best duration for growing seedlings prior to transplanting is about 12-15 days. Seeds should be inoculated with proper rhizobia and do not need any additional fertilizer to be added. They planted in pro-mix soil in a 1.25” cell size tray.
Fava bean seeds should be planted about 1 inch deep. The distance between plants on planting rows is 6” when row width is 30” and 9” when row spacing is 15”. This planting arrangement provides about 28,000 – 30,000 plants per acre. Our research indicated that 15” rows yield better than 30” rows as much as 15% on average.

Seed Size

Seed size varies greatly among varieties and cultivars of fava bean (Table 1). It also varies with pod location on the same plant. Seeds are classified as large (>1.0 g seed^{-1}), medium (0.5-1.0 g seed^{-1}) and small (<0.5 g seed^{-1}). Desired population density is traditionally determined by seeding rate which is primarily related to the number of seeds per unit weight (lb). Therefore seeding rate of cultivars with smaller seed size is significantly lower than those with larger seeds.

Plant breeders have recognized the importance of larger seed in the production of food crops


Figure 4. Transplanting and direct seeding can be used for planting fava bean.

and have been breeding for the trait. The general conception is that larger seeds may have more food reserves and thus germinate faster, quicker establishment, and higher yield than smaller seeds within the same variety/cultivar. However, the use of small seeds can significantly reduce the production costs by lowering the amount of seeds needed per unit area. This is especially important when fava bean is grown as cover crop or as dual purpose. For cover crop purposes, it is recommended to plant small seeded varieties which can be seeded at 80 lb acre^{-1} as oppose to 110 lb acre^{-1}whenWindsor variety is used as a vegetable.

We used Windsor variety in a two-year study and we found that there is significant yield difference among seed sizes. Large seeds (lower pods) produced higher pod number and out-yielded small and medium seed size.

Currently Windsor is the dominant variety available in New England. The cost of seed is relatively high (275 seeds/lb with average cost of 3.0-3.5 $/lb). Therefore the cost of 28,000 seeds would be roughly $300-350 per acre. Smaller seed size varieties therefore are preferable especially if fava beans are grown as cover crop. We also found significant differences in seed size among fava bean varieties (Table 1). Those with larger seeds produced more yield than small seeded varieties.
However even within a variety, seed size may vary significantly (Figure 5). This is mainly because the lower pods which appear first on the pods produce larger seeds than those located in the middle or upper parts of the plant.

Table1. Seed size and pod fresh weight of some fava bean varieties.

Cultivar	Seed Size (g/100 seeds)	Pod Fresh Weight (lb/ac)
Aquadulce	265	15107a*
Bell Bean	51	3327c
D'Aquadulce	392	5549c
Delle Cascine	335	15201a
Early violletto	280	12059ab
Early white	253	10581b
Sweet Lorane	68	1831c
Windsor	311	5144c

***Those with the same letter are not significantly difference.**

Figure 5. Variation in seed size within Windsor fava bean

Seeding Rate

Plant density affects canopy development, radiation interception, dry matter production, evapo-transpiration, weed competition, development of diseases, plant height, seed yield, and the economics of crop production in a farming system.

A wide range of densities of fava bean is commonly used, from 25,000-40,000 plants per acre, depending on the cultivar (seed size) and the region. Thus, for crop-management purposes, reference is made only to cultivar seed size regardless of botanical type. As stated earlier, fava bean varieties are classified as large-seeded (>1.0 g seed^{-1}), medium-seeded (0.5-1.0 g seed^{-1}) and small seeded (<0.5 g seed^{-1}). Regardless of seed size, fava bean yield increases with population and reaches its maximum yield at different plant populations depending on the size of the seed; the smaller the seed, the higher the plant population would be needed to reach its yield peak at around 30,000 plants per acre. It must be noted that fava bean tends to produce lateral branches (Figure 6) in lower populations which often are not as productive as the main stem. Therefore seeding rates should be adjusted for lowering the number of lateral branches. There is a correlation between higher seeding rate and higher humidity within the canopy. Given the fact that fava bean is more sensitive to diseases in high humidity, high populations should be avoided. Also if possible planting should be arranged west-east for better ventilation.

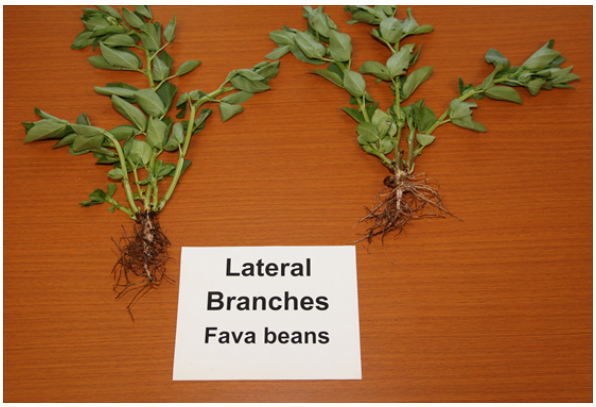

Figure 6. Lateral branch formations in fava bean grown with low plant population

Seed Treatment

Fava bean is a legume crop therefore is able to fix a significant amount of nitrogen through a symbiotic relationship with rhizobium bacteria.

The bacteria enter the root hairs of the host plant and induce nodule formation on its roots (Figure7). The host plant provides organic carbon and sugars to the bacteria living inside the nodules and in return the bacteria converts atmospheric nitrogen into plant-useable forms of nitrogen. Maximum benefit from this symbiotic relationship occurs when available soil nitrogen is low and the soil moisture and temperature levels are adequate for normal seedling development from the time of seeding until seedlings are well established.

High level of nitrogen in the soil prevents proper nodulation since fava bean plants will preferentially use the soil nitrogen rather than fixed nitrogen. Rhizobia can live in the soil for a number of years; however, the most efficient nitrogen-fixing bacteria may not be among those that survive. Fava bean seeds should be inoculated with "*R.leguminosarum bv. viciae*". Although rhizobium bacteria remain alive up to 3 years in soils, it is recommended to inoculate

the seeds every year for achieving maximum nitrogen fixation.

Figure 7. Fava bean root nodules

Growers should ask the seed companies for the best available inoculants when purchasing their seeds. Inoculants should be kept dry and fresh and stored properly (Figure8). A grow-out test can be done to compare the quality of various inoculants.

Seed Inoculation

Farmers should coat their seed with inoculants just before planting so that large numbers of rhizobia will be ready to start the infection process as soon as primary the roots emerge. These rhizobia can then quickly infect the roots and start the process of nodulation.

The Dusting Method

Frequently farmers do not use any sticking agent such as sugar solution. They simply mix dry powdered inoculants such as the peat-based type with dry seed without using any kind of liquid. Dry dusting is the poorest method of inoculation since dry inoculants does not adhere well to seed, and most of it will blow away during planting.

The Slurry Method

Seed can be inoculated by coating them with slurry of inoculants and sticker solution. Just before planting, mix premeasured amounts of sticker solution and inoculants thoroughly to make smooth liquid slurry. Add this to a weighed amount of seed and stir the mixture continuously until the seed is evenly coated. The mixing container should be twice as large as the volume of the seeds. A cement mixer is recommended for large amounts.

The rate of sticker solution mixed with the inoculants depends on the type of seed used. Smaller seeds require more sticker solution per seed weight than larger seeds because they have a larger surface area to be coated. The slurry should be added to the seeds in small amounts because too much sticker solution will cause the seeds to clump together or swell. For all variety of fava beans, 5 g of inoculants should be applied for each 2 lb of seeds.

The Two—Step Method

In the two-step method, the sticker and inoculants are applied to the seed separately. In the first step, seeds are evenly coated with the sticker solution. In the second step, the powdered inoculants are added to the sticky seeds. About 10 times as many rhizobia can be bound to seeds by the two-step method as by the slurry method. With this method, it is particularly important to use the proper amount of sticker.

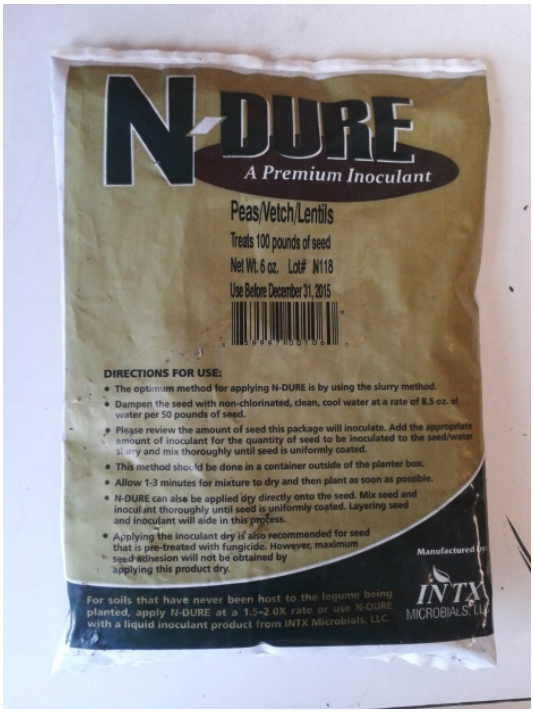

Figure 8. A sample of fava bean Inoculant

Fertility

Soil testing is highly recommended prior to planting fava bean for specific nutrient recommendations.

Nitrogen: Application of nitrogen fertilizer often is not recommended, since much of fava bean nitrogen requirement can be met through nitrogen fixation. There has been some controversy about the benefits from application of low level of nitrogen fertilizer as starter which may overcome N-limitations during early growth stages but a positive yield response is seldom observed if the soil contains more than 20–30 lb N ac^{-1} in the plow layer.

Phosphorus: Fava bean is a relatively high user of phosphorus (Table 2).Phosphorus fertilizer should be banded at planting for vigorous early seedling growth. Bands should be located 2 to 3 inches to the side and 2 to 3 inches below the seed. It is recommended banding a starter fertilizer that is high in P. If the P is very low, it would be recommended broadcasting so that phosphorus is evenly distributed in the field for future plantings.

Potassium (K): Potassium should be applied before planting or banded at planting time. Amounts above 50 K_2O per acre should be broad casted and incorporated into the soil. Table 2 shows the recommended rate of potassium application at different existing soil levels.

Table 2. Recommendation for phosphorus fertilizer for fava bean

	Nitrogen Lb/A	Phosphorus P_2O_5 Lb/A				Potassium K_20 Lb/A			
Soil test result		Very Low	Low	Optimum	Above Opt.	Very Low	Low	Optimum	Above Opt.
Rate recomended	50	100	75	0-50	0	100	75	0-50	0

***Assumes extraction procedures similar to those used by the UMass soil testing Laboratory. Specific information on soil test procedures is available atwww.nevegetable.org as "new England vegetable guide, 2015-2016."**

ZINC (Zn): When soil test indicates less than 1 ppm Zn, a response to Zn is expected on all soil. Where Zn is required, 15 lb of Zn per acre may improve growth and yield of fava beans. A broadcast application of 15 lb $acre^{-1}$ of zinc sulphate is recommended**.**

Variety selection

As with other crops, variety selection requires achieving a balance between adaptability to a specific environment, disease tolerance, and marketability. As mentioned earlier, fava bean varieties vary significantly in seed size and colour. Small-seeded types (*Viciafaba* var. minor) may be called fava bean or tick bean and are commonly used for human consumption and animal feed. Medium and large size seed types (V. *faba* var. major) also called broad bean used more commonly as dry or green beans. Select varieties tested at UMass are shown in Figure 8 and their specifications are

Figure 9. Select varieties of fava bean

Variety	Seed size	Seed colour	Flowering time	Maturity	Chocolate spot
Aquadulce	large	light green	early	early	MS
D'Aquadulce	large	dark green	mid	early	MS
Bell Bean	small	light brown	mid	mid	MRMS
Sweet Lorane	small	light brown	late	late	MRMS
DelleCascine	large	light green	early	early	MS
Early White	med-large	green	late	early	MS
Early Violletto	med-large	purple	early	early	S
Windsor	large	light green	early	early	MRMS

Table 3. Agronomic and disease guide for some Fava beans varieties tested at UMass

R = Resistant
RMR = Resistant to moderately resistant MR = moderately resistant
MRMS = moderately resistant to moderately susceptible MS = moderately susceptible
MSS = moderately susceptible to susceptible S = Susceptible
SVS = Susceptible to very susceptible
VS = Very susceptible

Yield Potential

Seed yield in fava bean is mostly dependent on environmental factors and agronomic practices including date of planting and fertility. However, plant genetics also can play a major role. Some varieties produce higher yield than others, which is important for variety selection. In general, shorter season fava bean produce slightly less yield potential than longer season varieties, but this is not always the case. Fresh pod yield varies greatly and could be as high as 5 tons per acre when grown solely for fresh pods.

Disease and pests

Chocolate spot (Botrytis fabae)

This disease is caused by fungus. Long periods of high humidity and high temperature promote the switch from a non-aggressive phase to an aggressive phase of the disease. The aggressive phase of the disease is favored also by low levels of potassium and phosphorus in the soil and high plant density which leads to more humid conditions within the plant canopy.

Symptoms

Symptoms for non-aggressive chocolate spot include small red-brown lesions on leaves of the plant which may also be present on stems and pods. Under high temperature and humidity the disease moves to the aggressive stage and lesions coalesce and become covered by fluffy mycelium and large patches of tissue can become necrotic and die.

Management

Prevention is the most effective management strategy. Early planting is recommended to avoid high humidity and hot temperatures in late spring and early summer. In addition, appropriate plant spacing to encourage air circulation around the plants is also an effective management tool. Foliar fungicide application throughout the season can also be effective.

Figure 10. Chocolate spot (*Botrytis fabae*) symptom on fava bean leaves.

Leaf blight (Xanthomonascampestris, *syn*. Xanthomonasaxonopodis)

This bacterial disease can be introduced by contaminated seed and over wintering bacteria in crop residues. This disease is favored by warm temperatures and wet, humid conditions.

Figure 11. Necrotic fava bean leaves caused by leaf blight (*Xanthomonascampestris*, syn. *Xanthomonasaxonopodis*).

Symptoms

Water-soaked spots on leaves which enlarge and become necrotic. Spots may be surrounded by a zone of yellow discoloration and lesions can coalesce and give the plant a burnt appearance. Dead leaves remain attached to the plant and circular, sunken, red-brown lesions may be present on pods. The lesions on pod may leaking out during humid conditions.

Management

Use of clean seeds, resistant varieties, seed treatment with an appropriate antibiotic prior to planting and spraying plants with an appropriate protective, copper-based fungicide before appearance of symptoms are among effective treatments.

Bacterial brown spot (Pseudomonas syringae)

The bacteria over-winters in crop residues and is more severe when the foliage is wet for relatively long period.

Figure 12. Bacterial brown spot (*Pseudomonas syringae*) on beans

Symptoms

Small, dark brown necrotic spots on leaves which may be surrounded by an area of yellow tissue, water soaked spots on pods which turn brown and necrotic and pods may twist and distort in area of infection.

Management

Use of clean seeds, use of proper crop rotation and the removal of crop residues from the field after harvest.

Powdery mildew (Erysiphe cichoracearum)

Fungus overwinters on plant residues or alternate hosts. Disease emergence is favored by warm, dry weather with cool nights that result in dew formation.

Figure 13. Bacterial brown spot *(Erysiphe cichoracearum)* on beans

Symptoms

Yellow spots on upper surface of leaves, powdery gray-white areas which coalesce to cover entire plant and if the plant is heavily infected it may appear light blue or gray in color.

Management

Use of resistant varieties and when possible use of overhead irrigation which washes fungus from leaves and reduces its viability. Also, recommended early planting to avoid high air temperature and humidity. Application of sulfur-based pesticides may be required to control heavy infestations.

Fusarium root rot (Fusarium solani)

Damage caused by the emergence of the fungus disease is worsened by warm, compacted soils, limited soil moisture and poor soil fertility.

Symptoms

Stunted plant growth and yellowing, necrotic basal leaves. Brown, red or black streaks on roots that coalesce as they mature and these lesions may spread above the soil line.

Management

The use of clean seed and not planting fava bean in the same area for more than five years in the same field.

Black bean aphid (Aphis fabae)

Black bean aphids can cause severe damage to fava bean. Distinguishing features include the presence of cornicles (tubular structures) which project backwards from the body of the aphid; will generally not move very quickly when disturbed; transmit viruses.

Figure 14. Black bean aphid *(Aphis fabae)* on fava bean plant

Symptoms

Small soft bodied insects on underside of leaves and/or stems of plant; usually green or yellow in color, but may be pink, brown, red or black depending on species and host plant; if aphid infestation is heavy it may cause leaves to yellow and/or distorted, necrotic spots on leaves and/or stunted shoots; aphids secrete a sticky, sugary substance called honeydew which encourages the growth of sooty mold on the plant.

Management

If aphid population is limited to just a few leaves or shoots, then the infected portions of

the plants can be pruned out to provide control. When using seedlings, check for aphids before transplanting; use of those without any aphids. Reflective mulches such as silver colored plastic can deter aphids from feeding on plants; sturdy plants can be sprayed with a strong jet of water to knock aphids from leaves; insecticides are generally only required to treat aphids if the infestation is very high - plants generally tolerate low and medium leaf infestation; insecticidal soaps or oils such as neem or canola are usually the best method of control; Labels of the products should be checked for specific usage guidelines prior to use.

Table 4. Fava beans disease guide summary*

Disease	Organism	Symptoms	Occurrence	Hosts	Control
Ascochyta blight	*Ascochytafabae*	Large, light tan to grey lesions on leaves. Small black fruiting bodies develop within lesions. Centres of lesions may fall out, leaving holes in leaves. Sunken lesions on stem similar in colour to leaf lesions. Brown-black discolouration of grain.	Common in all fava bean growing areas in southern Australia. Most severe in wet seasons. Spores spread by wind and rain. Infected seed.	Fava bean, vetch.	Foliar fungicides. Resistant varieties. Crop rotation. Control volunteer plants. Clean seed.
Chocolate spot	*Botrytis fabae* *Botrytis cinerea*	Passive phase: small chocolate covered spots scattered over leaves. Aggressive phase: tissue around spots turn dark grey and black. Leaves die and blacken.	Occurs in all areas where beans are grown. Disease usually becomes established in late winter and becomes more severe as day temperatures increase during spring. Spores spread by wind and rain. Can destroy unprotected crops in wet seasons.	Fava bean, vetch, lentil, chickpea.	Foliar fungicides. Resistant varieties. Crop rotation. Control volunteer plants.
Cercospora leaf spot	*Cercosporazonata*	Irregular black lesions, with a distinct margin on the leaf. Easily confused with Ascochyta or Chocolate spot but distinguished by the concentric pattern within lesions.	Occurs in all areas where beans are grown.	Fava bean, vetch.	Foliar fungicides.
Rust	*Uromyces viciae-fabae*	Numerous small, orange-brown rust pustules, surrounded by a light yellow halo on the leaves of infected plants.	Most prevalent in northern Australia. Crops usually affected late in the season.	Fava bean, vetch.	Foliar fungicides. Crop rotation. Control volunteer plants.
Sclerotinia stem rot	*Sclerotinia trifoliorum* var. *fabae, Sclerotinia sclerotiorum*	Infection usually begins close to ground level and slimy wet rot extends into stem and down into the roots. Plants easily pulled from soil and have blackened base covered with cottony, white fungus growth. Usually isolated plants that suddenly	Rapid development of disease in wet, cool conditions. Foliar form of disease spread by air-borne spores. Fungus survives in the soil for many years.	Wide host range.	Crop rotation. Lower seeding rates, wider row spacing and good weed control.

		wilt and collapse. Sclerotia on surface and within stem turn from white to black.			
Stem nematode	*Ditylenchusdipsaci*	Patches of malformed and stunted plants with curling leaves and water-soaked spots. Stem may die back, turning reddish-brown colour.	Most severe in wet seasons. Nematode can survive many years in seed, straw or soil.	Fava bean, pea, oat, wild oat. Infected seed straw or soil.	Seed test. Crop rotation.
VIRUS DISEASES					
SCSV	Subterranean clover stunt virus	Stunting, tip yellowing, small and thick leaves.	Prevalent in all bean growing areas, symptoms appear early on fava bean.	Sub clover, fava bean, lupin, lentil, chickpea, lucerne, soybean.	Managing aphids and weeds.
BLRV	Bean leaf roll virus	Interveinal yellowing, leaf rolling, stunting, leathery leaves.	Occurs in all bean growing areas.	The host range is limited to *Fabaceae.*	Managing aphids.
PSbMV	Pea seedborne mosaic virus	Can be symptomless or systemic dark and light-green leaf mottle, leaf margins upright leaf blade reduced in size. Seeds have brown rings or line patterns on surface.	Occurs in all bean growing areas.	Host range is limited to *Fabaceae*	Virus free seed is recommended. Managing aphids.

***Source: DEPI's Victorian Winter Crop Summary**

Weed control

Generally fava bean is a poor competitor to weeds, particularly in the seedling stage or under moisture stress condition. Appropriate control of perennial weeds during the years preceding fava bean, and use of clean seeds are important for successful production.

Post-emergent harrowing should be avoided during crop emergence or during wet condition or conditions of heavy dew to prevent the spread of fungal diseases. Harrowing can occur when seedlings are 6" high. An increased seeding rate should be considered to compensate for the loss of crop seedlings during harrowing. Tine harrows are the most effective across the direction of seedings. Best weed control will be obtained by harrowing on a dry and sunny day.

A pre-emergent burn off application of glyphosate will help control winter annual and early emerging weeds. Products containing phenoxy herbicides such as dicamba or 2, 4-D should not be used before or just after planting. Fava bean is sensitive to the soil residues of a number of herbicides and should not be planted in fields with a history of these products. Use of proper crop rotation can significantly reduce weed populations in fava bean field. Also, as pre-plant herbicide, a mixture of Dual Magnum (12fl-oz) and Treflan 4e (10fl-oz) could be helpful.

Harvest

Fava bean is grown for fresh pod harvest or dry beans. When harvested for fresh pods, immature, less starchy seeds are used for specific recipes while mature starchy green seeds are used for other uses. Green seeds can be consumed fresh or being frozen for future use. Fava bean pods may also be harvested after the pods are dried for various recipes. In many fava bean producing regions early pods are harvested as fresh and remainder are being harvested as dry beans.

Fava bean is an indeterminate plant; in other words the plant continuously produces flowers

and pods. Flowers and pods first appear on lower nodes usually about 6-9" above the ground. Growers often harvest fava beans 2-3 times when crop is grown as fresh produce. Fresh pods are usually harvested when the seeds have reached full size but are still green, thick and have a glossy shining appearance(Figure 15). When harvested green, pods may be sold intact or as shelled product either fresh or frozen.

Figure 15. Mature fava bean pods

Seed Storage

Fava bean fresh pods should be stored at 40 to 45^{0}F and relative humidity of 95%. Pods or seeds lose moisture rapidly if not properly protected by packaging or by a lower relative humidity. When the relative humidity approaches saturation, as in consumer packages, temperatures above 44^{0}F must be avoided or decay is likely to be serious within a few days. For home consumers, unshelled fava beans can be kept in the refrigerator for up to 1 week. Broad beans can be frozen, canned, or dried. Dried shelled fava beans can be stored in

Figure 16. Packaging of fava bean for storage or marketing

a cool dry place for 10 to 12 months.

Nutritional value of fava bean

Fava bean stubble/crop residue offers significant value as a source of feed for grazing animals. A major portion of the value of stubble lies in the grain remaining after harvest and not in the dead plant (leaf and stem) material. Although the dead plant has some nutritive value, livestock select the grain first and only eat plant residues when grain is not available.

Table 5. Nutritive value of fava bean per 100 g. (Source: USDA National Nutrient data base)

Principle	Nutrient Value	Percentage of RDA
Energy	341 Kcal	15%
Carbohydrates	58.59 g	45%
Protein	26.12 g	46.5%
Total Fat	1.53 g	7%
Cholesterol	0 mg	0%
Dietary Fiber	25 g	66%
Vitamins		
Folates	423 µg	106%
Niacin	2.832 mg	18%
Pantothenic acid	0.976 mg	19.5%
Pyridoxine	0.366 mg	28%
Riboflavin	0.333 mg	25%
Thiamin	0.555 mg	46.25%
Vitamin A	53 IU	2%
Vitamin C	1.4 mg	2%
Vitamin K	9 µg	7.5%
Electrolytes		
Sodium	13 mg	1%
Potassium	1062 mg	23%
Minerals		
Calcium	103 mg	10%
Copper	0.824 µg	91%
Iron	6.70 mg	84%
Magnesium	192 mg	18%
Manganese	1.626 mg	71%
Phosphorus	421 mg	60%
Selenium	8.2 µg	15%
Zinc	3.14 mg	9%

Additional Resources

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