



Assured Produce

Crop Specific Protocol

BEANS (GREEN, PROCESSED)

(CROP ID: 51)



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Acknowledgements	4
1 General introduction	6
2 Planning and records	6
3 Site selection	7
3.1 Site history	7
3.2 Crop rotation	7
4 Site management	7
4.1 Soil mapping	7
4.2 Soil management	7
5 Variety selection	7
6 Nutrition	8
6.1 Nutrient requirement	8
7 Irrigation	9
8 Crop protection	9
8.1 The basic approach to crop protection	9
8.2 Plant protection product choice	9
8.3 Advice on the use of pesticides	10
8.4 Application of pesticides	10
8.5 Records of application	10
8.6 Protective clothing/equipment	10
8.7 Pesticide storage	10
8.8 Empty pesticide containers	10
8.9 Pesticide residues in fresh produce	10
8.10 Pest, disease and weed control	11
9 Harvesting and storage	15
10 Pollution control and waste management	15
11 Energy efficiency	15
12 Health & Safety	15
13 Conservation issues	15
Appendix 1 Typical application rates for nutrients	16
Appendix 2 Insecticides approved for aphid control in Dwarf French Beans (Green Beans)	17

Appendix 3 Fungicides approved for Botrytis control in Dwarf French Beans (Green Beans) 18

Appendix 4 Herbicides currently approved for use on Dwarf French Beans (Green Beans) 19

Appendix 5 Seed treatments for Dwarf French Beans (Green Beans) 21

Appendix 6 Molluscicides approved for control of slugs in Dwarf French Beans (Green Beans) . 22

Appendix 7 Specific off-label approvals for use on Dwarf French Beans (Green Beans) .. 23

Appendix 8 PGRO Publications 24

Appendix 9 Control Points: Beans (Green, Processed) 25

Acknowledgement

Assured Produce gratefully acknowledges the contribution of all consultees in the preparation of this protocol, particularly Anthony Biddle of the Processors and Growers Research Organisation and Cathy Knott.

Preface

This crop specific protocol has been written to complement and avoid duplicating the generic principles of the scheme and appendices.

It is advisable to read the Assured Produce Generic Crop Protocol Standards and the Assured Produce Generic Protocol Guidance Notes (referred to in this document as the Generic Standards and Generic Guidance Notes) first before reading this crop specific protocol.

This protocol is designed to stimulate thought in the mind of the reader.

This crop specific protocol contains crop specific parameters and guidance, where applicable, for the requirements stated in the Generic Standards.

All statements in this protocol containing the words "**strongly recommended**" (in bold type) will be verified during the Assured Produce assessment and their compliance will form a part of the certification/approval decision. The score required for these "**strongly recommended**" control points can be found on the final page of this document and in the checklists produced by Assured Produce licensed certification bodies.

Disclaimer and trade mark acknowledgement

Although every effort has been made to ensure accuracy, Assured Produce does not accept any responsibility for errors and omissions.

Trade names are only used in this protocol where use of that specific product is essential. All such products are annotated[®] and all trademark rights are hereby acknowledged.

Notes:

Pesticides with 'Essential Use' derogations that expired 31 December 2007 can no longer be used or stored.

There may be other withdrawals or revocations. Products containing substances which have been revoked are shown on the PSD website (<http://www.pesticides.gov.uk>). Growers should check with their advisers, manufacturers, the Assured Produce website 'Newsflashes', the PSD website (www.pesticides.gov.uk)

Growers should comply with the 'Use up by' dates for all pesticide products. Growers should also be aware of and comply with changes on new product labels.

There may be changes for the following reasons:

- the deadline for use of NPE formulations has been extended to 31 August 2008, see <http://www.pesticides.gov.uk/approvals.asp?id=2122>
- Pesticides with NPE formulations must be used up by 31 August 2008. In many cases products will be replaced by new non-NPE formulations.
- At re-registration stage after Annex 1 listing there may be: reductions of dose rates; changes in timings and/or number of applications for some products.

In the following Appendices products and use by dates are only listed for SOLAs, and in some cases new product MAPP numbers may not be available yet.

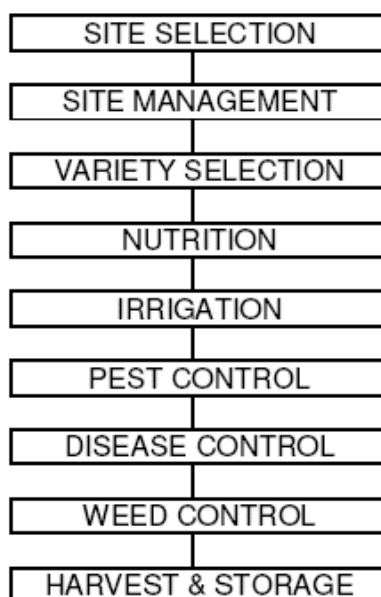
For pesticides on-label, only active substances are shown.

Any new standards have been prefixed in the text with **(NEW)**

1 General introduction

Following a systematic approach will help growers to identify and manage the risks involved in crop production. This protocol is based on a typical crop production process. Using a flowchart approach, food safety, Health & Safety, environmental and quality hazards are identified. Appropriate controls may then be established to minimise risk. Food safety and Health & Safety issues always take precedence over quality and environmental controls.

The flow chart is structured as shown below. Note that the sectional layout of both this protocol and the crop specific protocols follow the same structure.



The contents of each crop specific protocol are reviewed annually by informed farmers and growers, food technologists, scientists, the relevant fresh produce association, processors and agronomic consultants. Updated editions are issued prior to the cropping season.

The review process considers both new developments and all relevant technology which has emerged throughout the course of the previous year and which have been found to be both workable by the grower and beneficial to the environment. As one aim of the Scheme is to transfer such information and technologies to growers, attention is drawn to those features of specific relevance to ICM by using *italic* script. In order that growers may be confident that they are working to a current document, each protocol is dated and numbered.

2 Planning and records

See Generic Standards and/or Generic Guidance Notes.

3 Site selection

3.1 Site history

3.1.1 Climate

Green Beans are a short season, late sown, cold sensitive crop. They require warm conditions for vigorous uninterrupted growth and the most suitable areas are south of the Wash. They are sown outdoors from mid-May to avoid damage from late frosts. Severe drought reduces yield and pod quality.

3.2 Crop rotation

Crop rotation is essential to reduce the build up of pests and soil-borne diseases. Several root-infecting fungi cause foot and root rots to both Green Beans and other large-seeded legume crops including Peas, Broad Beans and Field Beans. All Pea and Bean crops should be treated as one crop and a break of at least four legume-free years should be maintained between them.

4 Site management

4.1 Soil mapping

See Generic Standards and/or Generic Guidance Notes.

4.2 Soil management

Soil type

Green Beans require deep, free draining but moisture retentive soils to encourage rapid establishment. Germination is epigeal thus soils which 'cap' must be avoided. Root growth must be unrestricted. Heavy clays, compacted and badly drained soils, structureless soils or highly organic peat soils which produce excessive vegetative growth are unsuitable.

Sowing

Green Beans are sown at one of the driest periods in the year and conservation of moisture at drilling is essential. 'Stale seedbed' techniques are helpful. The seed should be sown immediately after soil cultivation.

Green Bean seed is precision sown, shallowly at 2.5 to 4 cm deep into moist soil and covered by about 2.5 cm settled soil to avoid crop damage from leaching of residual herbicide. The seed is very fragile and easily damaged by certain types of drill mechanism. Precision drills of vacuum or belt feed type are commonly used to avoid damage or waste of expensive seed.

Narrow rows of about 20 cm are the optimum for Green Beans but the width of the hoppers of some drills may mean slightly wider rows are used.

5 Variety selection

See Generic Standards and/or Generic Guidance Notes.

6 Nutrition

6.1 Nutrient requirement

Major nutrients

Prior to cropping the field, nutrient status should be determined by sampling and analysis. Fertiliser application must be in accordance with crop needs and soil residues. Nitrogen may be lost through leaching if applied too early. Particular care should be taken to avoid the build up of unnecessarily high levels of phosphorus in the soil as this can cause pollution of surface waters.

Examples of typical fertiliser recommendations are given in Appendix 1.

Phosphate and potash are applied as a base fertiliser before cultivation. Nitrogen is also applied just before cultivation. Where rain or irrigation are to be relied upon to move nitrogen into the root zone, a top dressing of about 40 kg/ha could be beneficial where the crop shows symptoms of nitrogen deficiency, or at flowering.

Where anhydrous ammonia is used, it should be injected into the seedbed at least a week before sowing to avoid damage to emerging seedlings.

Inoculation

Effective strains of nitrogen-fixing *Rhizobia* bacteria which nodulate Green Beans rarely occur naturally in UK soils. An inoculant, in granular form so that insecticidal seed treatments used will not affect viability, can be applied with a micro-granule applicator in the same furrow as the seed. Although 60 kg/ha of nitrogen is needed in the seedbed *the total amount of nitrogen fertiliser can be reduced and there are cost and possibly environmental benefits.*

Lime and pH

A pH of at least 6.5 is required for satisfactory growth. If pH is below 5.5 Green Beans are unlikely to grow normally and an application of lime will be needed. Over-liming should be avoided as it can induce deficiency of trace elements such as manganese.

Trace elements

Treatments should only be applied where a deficiency problem has been identified.

Manganese deficiency symptoms are interveinal and marginal chlorosis of the leaves and in severe cases necrotic spotting and leaf fall. It occurs where the soil is deficient, or if manganese is unavailable to the plant and is common on soils with a pH of over 6.8, on peaty, organic soils and is often associated with compaction and poor drainage. Soil analysis for manganese, however, is of little value. Manganese deficiency can be corrected by foliar sprays of manganese sulphate plus wetter.

Magnesium deficiency symptoms are interveinal chlorosis or necrosis of older leaves with leaf margins. It is uncommon, but may occur on sandy acid soils or where there is excess potash. Soil analysis will identify where there is a problem. At Index 0 and if liming is also necessary, it can be corrected with magnesian limestone (Appendix 1), either before Green Beans or elsewhere in the rotation. If crop treatment becomes necessary, corrective foliar sprays with magnesium sulphate should be applied.

7 Irrigation

Green Beans are shallow rooted and have a relatively short growing season and for maximum yield the soil should be maintained close to field capacity throughout the growing period. Irrigation is most beneficial during flower initiation and pod development. Irrigation during flowering is less desirable because water causes petals to stick to developing pods and increases the incidence of pod rot caused by *Botrytis cinerea*.

8 Crop protection

8.1 The basic approach to crop protection

The guiding principle is that pesticide use should be minimised. An integrated approach should be adopted to achieve this involving the following management steps.

Planning:

- a. *Sensible crop rotations to avoid build-up of problems.*
- b. *Careful site selection to avoid potential or previous problems thereby enhancing crop health and cleanliness.*
- c. *Inclusion of resistant varieties in cropping programmes whilst retaining the required quality parameters and eating characteristics.*

Cultural preventative techniques:

- a. *Good crop and field hygiene.*
- b. *Promoting crop health by ensuring effective nutrient availability through soil analysis and accurate application of fertilisers and trace elements.*
- c. *Utilising available irrigation to promote healthy growth and as a control measure wherever appropriate and feasible.*

Corrective action:

Where corrective or protective action is necessary the following approach should be adopted.

- a. The need to take corrective or protective action must be established by regular monitoring and reference to established thresholds. The effect of prevailing and predicted weather conditions on the need for treatments must be considered.
- b. The availability and use of biological and natural methods of pest and disease control must be reviewed and applied if appropriate.
- c. Where chemical control is essential:
 - *Green Beans are self-pollinating, but bees may visit flowering crops. Pesticides classed as harmful, dangerous or extremely dangerous to bees must not be used when Green Beans are in flower.*
 - *The least toxic and persistent product should be selected with due regard to its efficiency and ecotoxicity.*
 - *The minimum effective dose should be used.*
 - *An appropriate application method with effectively maintained equipment should be chosen.*
 - *Selective and spot treatments should be used whenever appropriate.*

8.2 Plant protection product choice

See Generic Standards and/or Generic Guidance Notes.

Approved uses not included on the product label

In some circumstances product labels do not include all of the approved uses and growers and advisers wishing to check the approval notice of a particular product should note that this information is available from www.pesticides.gov.uk/psd_databases.asp

A search on the database for a product name should yield a results page. A click on the product name should link to a summary of the approval information. At the bottom of the summary are links to available notices which will give the statutory conditions of use.

In the case of products with older approval an electronic approval may not be available. In these cases growers should contact the PSD Information Services Branch for details of the approved conditions of use. Contact details are: p.s.d.information@psd.defra.gsi.gov.uk tel. 01904 455775.

8.3 Advice on the use of pesticides

See Generic Standards and/or Generic Guidance Notes.

8.4 Application of pesticides

See Generic Standards and/or Generic Guidance Notes.

8.5 Records of application

See Generic Standards and/or Generic Guidance Notes.

8.6 Protective clothing/equipment

See Generic Standards and/or Generic Guidance Notes.

8.7 Pesticide storage

See Generic Standards and/or Generic Guidance Notes.

8.8 Empty pesticide containers

See Generic Standards and/or Generic Guidance Notes.

8.9 Pesticide residues in fresh produce

See Generic Standards and/or Generic Guidance Notes.

See Generic Protocol Guidance Notes 8.9 for further background and generic advice.

Assured Produce is aware that a key area in the production of fresh produce which requires continued attention by growers and their advisers is that of keeping pesticide residues to a minimum. This issue is not just one of meeting the MRL trading standard but ensuring that any individual or multi residues are kept as low as possible below this level.

The key targets are:

- **Optimising late applications of fungicides and insecticides to the edible part of the crop**
- **Optimising the use of post harvest treatments**

- Ensuring minimum harvests intervals are followed
- Ensuring that application equipment is applying products correctly

8.10 Pest, disease and weed control

8.10.1 Pest control

8.10.1.1 Slugs (*Deroceras* spp.)

Slug damage can occur at any time after planting. Stems of seedlings may be rasped or tunnelled and leaves eaten. Later, slugs may feed on the pods causing unsightly 'ragged' edged tunnels along the surface of the Bean pods.

Chemical control: This is best achieved by baiting with slug pellets. Pellets based on metaldehyde are less harmful to the predator ground beetles than methiocarb. If slugs are seen to be a problem, then pellets should be applied to the crop.

Cultural control: *Slugs have become more prevalent following a succession mild winters which have ensured a high survival rate. Straw incorporation also encourages slugs as does a high usage of farmyard manure. Cereal straw should be chopped and disced in the autumn to disperse dense volumes of straw and well-rotted farmyard manure should be used and ploughed down in early autumn well before planting Beans.*

8.10.1.2 Bean seed fly (*Delia platura*)

Attack by this pest is usually first apparent due to partial or even total failure of seedlings to emerge. Survivors are malformed and either the stem base is damaged or the leaves are only partially developed. Damage is caused by the larvae of the bean seed fly which develop from eggs laid on the soil surface and feed on the germinating seed. The seeds may be tunnelled and the larvae can be found inside the developing root or stem.

Chemical control: There are no approved chemicals available in the UK for controlling bean seed fly and it is **strongly recommended** that protection is gained by using treated seed. Imported Bean seed may be treated with an insecticide, which is particularly effective in preventing large-scale damage.

Cultural control: *Bean seed fly larvae are scavengers and will feed on all kinds of vegetable debris. If untreated seed is used, then it should be sown in a stale seedbed, as the fly lays eggs in freshly disturbed soil. Soils with crop remains should be avoided and also those with quantities of unrotted farmyard manure.*

8.10.1.3 Caterpillars - Cutworms (*Agrotis* spp.) /Silver Y moth (*Autographa gamma*)

Cutworms are the caterpillars of the turnip moth (*Agrotis segetum*) which is common in the UK. Seedlings are attacked either singly or along the rows. Typically, seedlings can be found lying over to one side, wilting, due to stems being partly or wholly severed at the soil surface. Damage is more likely after a period of dry weather. The caterpillar is large (40 mm long) greyish-brown in colour and sometimes tinged with green. It has a dark line along its back and lighter lines along each side.

Damage by Silver Y caterpillars can occur to the pods. The large green caterpillars feed on leaves and pods devouring large sections of each.

Chemical control: Insecticides applied at the first sign of attack should be made in a medium to high volume of water. Pyrethroid insecticides offer an effective means of control together with a short harvest interval. Silver Y moths can be monitored using a pheromone trap (available from Agralan).

Cultural control:*Irrigation during long dry spells will discourage attacks of cutworm when the seedlings are most susceptible. Good control of weeds will also discourage the immigration of Silver Y moths.*

8.10.1.4 Black bean aphid (*Aphis fabae*)

Small colonies of black bean aphid can infest the underside of leaves and often remain in relatively low numbers apparently causing little harm. Occasionally, in warm dry seasons, the colonies may develop on the stalks of the flower clusters and envelop the young pods. Pods may then be small, abnormally shaped or discoloured. Some of the older varieties of Beans may develop virus diseases (see Section 8.10.2.5) if aphids colonise before flowering.

Chemical control: Several insecticides are approved for aphid control and can be applied if necessary. However, treatment is usually only required when flowers and pods become infested and then the choice of insecticide should be restricted to those which are not harmful to bees.

Cultural control:*Black bean aphids are attracted to several weeds and those, especially fat hen and thistles, should be controlled. Often, colonies do not develop further than the underside of the leaves and populations are kept in check by naturally occurring predators such as ladybirds.*

8.10.2 Disease control

8.10.2.1 Foot rot (*Fusarium solani f.sp. phaseoli*) / Black root rot (*Thielaviopsis basicola*)

Soil-borne fungi cause both diseases. Affected plants may occur in patches in the field or along sections of rows, particularly where the soil is consolidated following wheeling pressure. The plants are stunted, the foliage yellows and at the stem base, the plants may collapse and die. Black root rot is characterised by severe blackening of the roots and a black streaking of the stem base at, and below soil level.

Chemical control: There are no chemicals approved for the control of these soil-borne diseases.

Cultural control:*Both fungi build up as a result of frequent cropping of host crops which include Peas, field and broad Beans. In addition, black root rot has a wider host range that includes cucurbits and ornamentals. Thielaviopsis basicola is also favoured by alkaline soils and is more likely to cause severe problems in Beans where Peas are included in the rotation. Host crops of both pathogens should not be grown more frequently than once in five years and a longer break will be necessary if either of the diseases become established in the Bean crop.*

8.10.2.2 Botrytis pod rot (*Botrytis cinerea*)

Botrytis, or grey mould, may occur early in the season, causing a stem girdling of young plants, or later as a pod rot shortly after flowering. The disease is favoured by wet conditions and lush growth, which encourages a moist microclimate. The stem girdling of young plants occurs as a result of crop debris, particularly the remains of the cotyledons falling next to the stem. Stems become infected and a grey fluffy mould encircles the plant causing the plant to wilt and break-off. Pod rot occurs when the flower petals adhere to the pods in wet weather, or where the pods come into contact with vegetable debris on the soil surface.

Chemical control: Resistance to MBC fungicides is common and alternatives such as cyprodinil plus fludioxonil, iprodione or azoxystrobin will offer better protection. For prevention of pod rot, a spray should be applied as soon as the first pods are about 10mm long, when the majority of flowers and buds are visible. A second spray may be made after 7-10 days if weather conditions remain favourable for disease development, although care must be taken to maintain the correct harvest interval. Stem girdling does not occur frequently and treatment is seldom justifiable.

- *To minimise the risk of pesticide residues when using a two-spray programme, choose the product with the shorter harvest interval for the second of the two sprays.*
- *To reduce the risk of fungicide resistance developing, use products with different active ingredients when following a two spray programme*

Cultural control:*Botrytis is encouraged by vigorous crops and high humidity. Close planting of vigorous varieties should be avoided.*

8.10.2.3 Sclerotinia(*Sclerotinia sclerotiorum*)

The most common effect of *Sclerotinia* in Green Beans is as a stem rot that can spread to the pods during wet weather. At first, the stems develop water soaked lesions that are quickly covered with dense white mycelium. The stems may then collapse and the infection can then develop on the pods. After a short time, hard black resting bodies (sclerotia) develop in the mycelium. The disease spreads rapidly from plant to plant during warm wet conditions.

Chemical control: Fungicides applied at flowering to prevent *Botrytis* will give some protection against *Sclerotinia*. The fungus spreads initially by air blown spores that germinate on moribund flower petals.

Cultural control:*Sclerotinia can infect a wide range of vegetables including carrots, Peas, Beans, potatoes and brassicas (including oil seed rape). Cereals are not infected and a rotation, which allows at least three years between host crops, will help prevent a build up of the fungus in the soil. The sclerotia can remain viable for several years, but germinate in the spring. Where infection occurs, the land should not be deeply cultivated before planting cereals.*

Beans should not be planted in fields adjacent to the previous years infected crop.

8.10.2.4 Halo blight (*Pseudomonas syringae* pv *phaseolicola*)

Halo blight attacks the foliage and pods of Beans. The disease is most destructive where temperatures are cool and rainfall is frequent. Halo blight is caused by a seed-borne bacterium and has the ability to spread rapidly particularly during wet weather. Infected seeds may give rise to yellow leafed seedlings with conspicuous green veins, however other environmental conditions may also cause this. Later these plants become the primary foci of infection. Infected leaves show small angular water-soaked spots about 3 mm across and surrounded by a conspicuous yellow area (halo). These spots can become larger and coalesce and then dry up causing the leaves to wither. Pods may become covered with water-soaked spots from which a greasy substance exudes.

Chemical control: There are no chemicals approved for control of halo blight.

Cultural control:*It is essential to use healthy seed. NIAB and Processors and Growers Research Organisation can test seed for the presence of halo blight. If an occasional infected plant is found, then this and surrounding plants may be removed from the field to help to reduce the inoculum level if wet weather conditions are imminent or if overhead irrigation is used.*

8.10.2.5 Virus diseases (eg. Bean common mosaic virus/Bean yellow mosaic virus)

Occasionally, individual or small groups of plants develop virus symptoms. Leaves may be slightly distorted, domed or sharply downward curling. There may be a distinctive chlorotic mottle or mosaic pattern on the leaves and some vein reddening may occur. Often, affected plants fail to develop flowers or pods.

Chemical control: Several Bean viruses are transmitted by aphids and therefore efficient aphid control should be maintained, particularly if aphids infest crops before flowering.

Cultural control:*Many of the newer varieties are resistant to a range of Bean viruses and the use of*

such varieties is recommended.

8.10.3 Weed control

Green Beans offer very poor competition to weeds, which must be controlled to protect yield and to avoid difficulties with machine harvesting. Every attempt should be made to control weed species that are likely to cause a contaminant problem, for example black nightshade and volunteer potatoes, in the machine harvested crop.

Green Beans should not be grown on land infested with couch. Wild oats are usually controlled by cultivation prior to sowing. Successive weed flushes can be encouraged to germinate by cultivations before sowing. If there is danger of the seedbed drying out, a stale seedbed technique can be used where weeds, which emerge before the crop is sown, are killed with a non-selective herbicide (e.g. carfentrazone-ethyl, glufosinate-ammonium, glyphosate). Inter-row cultivation is not advised because weeds are left within the row and the Bean roots may suffer damage. In addition, disturbance of the soil causes moisture loss and may result in soil contamination of pods during machine harvesting.

(Revised 2005) It is **strongly recommended** that weeds are controlled using appropriate methods to avoid the reduction of crop quality by weedy contaminants.

8.10.3.1 Herbicides

There is a limited range of herbicides available for this crop. It may be necessary to use a weed control programme using a combination of some of the following: a pre-sowing herbicide (trifluralin expires 20 March 2009), pre-emergence (chlorthal-dimethyl) or linuron (SOLA), and a post-emergence herbicide (bentazone). Herbicides should be chosen which are complementary in terms of weed species controlled.

It is **strongly recommended** that growers are aware of the correct stage of the crop for application of post-emergence herbicide.

Some varieties of Green Beans are sensitive to herbicides and information is available from Processors and Growers Research Organisation.

Currently approved herbicides are listed in Appendix 4.

8.10.3.2 Problem weeds

It is **strongly recommended** that growers adopt a policy for reducing volunteer problems for oilseed rape and potatoes by using appropriate husbandry practices after harvest of these crops.

Volunteer Potatoes can be a severe problem in Green Beans as a contaminant in produce and reducing yield. Every attempt should be made to control them in other crops in the rotation. *After Potato harvest tubers remaining should not be ploughed down, as this aids their survival. They should be left on or near the soil surface to be killed by frost or eaten by vermin.*

Potato shoots which emerge before Beans are sown, can be treated with glyphosate. Later, if there is sufficient height differential between the crop and the Potato shoot, a selective application of glyphosate with a 'weed wiper' (two passes in opposite directions) for example can be effective. Potatoes are often removed by hand pulling or hoeing.

Black nightshade, which germinates late in June, should also be controlled with herbicides.

9 Harvesting and storage

Crop hygiene

It is recommended that areas of crop adjacent to lay-bys, public highways, footpaths and other areas at risk are inspected just before machine harvest. Any glass, metal, plastic, wood objects or other foreign bodies should be removed to avoid product contamination and the resulting problems in the factory.

10 Pollution control and waste management

See Generic Standards and/or Generic Guidance Notes.

11 Energy efficiency

See Generic Standards and/or Generic Guidance Notes.

12 Health & Safety

See Generic Standards and/or Generic Guidance Notes.

13 Conservation issues

See Generic Standards and/or Generic Guidance Notes.

Appendix 1 Typical application rates for nutrients

Major nutrient requirements (kg/ha) (Source: DEFRA booklet RB209)

Nutrient	Soil Index						
	0	1	2	3	4	5	6
Nitrogen (N)	180	150	120	80	30	0 ⁽²⁾	0 ⁽²⁾
Phosphate (P ₂ O ₅)	200	150	100	50M	0	0	0
Potash (K ₂ O)	200	150	100(2-) 50M(2+)	0	0	0	0
Magnesium ⁽¹⁾ (MgO)	100	50	0	0	0	0	0

Notes:

(1) Magnesium is not necessary for every crop and can be applied elsewhere in the rotation as magnesian limestone on acid soils

(2) A small amount of nitrogen may be needed if SMN levels are low in the 0-30cm of soil

These recommendations for P + K are high and are to build up nutrients in a vegetable rotation. Where there is no plan to raise the soil index level, or it is an arable rotation, the recommendations may be reduced by 150 kg/ha at index 0, 100 kg/ha at index 1 and 50 kg/ha at index 2. The amounts shown as M are maintenance dressings to replace nutrients removed by typical crop yields.

No more than 100 kg/ha N applied to the seedbed, the rest when the crop is fully established.

Only 60 kg/ha N is needed, as a base dressing, if an inoculant with *Rhizobia* is used.

Where FYM is used, reduce the amount of fertiliser accordingly.

Consult your processor before using FYM

Untreated and digested sewage sludge must not be applied within the crop rotation

Only advanced treated sewage sludge may be used within the crop rotation and it must not be applied within 10 months of harvest. Applications shall be carried out in accordance with the Regulations and the current DEFRA Code of Practice for the Agricultural Use of Sewage Sludge

Exempted wastes for example septic tank sludge and blood & guts from abattoirs should not be used within the rotation.

Consult your processor if vegetable waste is to be applied to the field.

Appendix 2 Insecticides approved for aphid control in Dwarf French Beans (Green Beans)

Active Ingredient	Product Features	Harvest Interval ⁽¹⁾	Hazard Rating	LERAP Category	MRL (mg/kg)
nicotine	a general purpose non-persistent contact alkaloid insecticide. Harmful to bees. Dangerous to fish or other aquatic life.	2 days	Toxic Poison Highly flammable	none stated	none set
pirimicarb	carbamate with contact fumigant and translaminar activity: water dispersible granule. Has little effect on bees, ladybirds or other insects.	3 days	Harmful	none stated	none set
fatty acids	a soap concentrate. Harmful to fish and other aquatic life.	0 day	Irritant	none stated	none set

Notes:

⁽¹⁾ or latest time of application

Consult processors before using any of these agrochemicals.

Not all formulations of each active ingredient may be currently approved for use on Dwarf French Beans. Check before use. Label recommendations are revised regularly, read a current label before use.

Appendix 3 Fungicides approved for Botrytis control in Dwarf French Beans (Green Beans)

Active Ingredient	Product Features	Harvest Interval ⁽¹⁾	Hazard Rating	LERAP Category	MRL (mg/kg)
azoxystrobin ⁽²⁾	systemic translaminar and protectant strobilurin; dangerous to fish and other aquatic life	7 days	none	none required	1.0
carbendazim	systemic benzimidazole: suspension concentrate or water dispersible granules.	21 days	none stated	none stated	0.1*
cyprodinil and fludioxinil	broad spectrum fungicide: water dispersible granules	14 days	irritant	B	none set
iprodione ⁽²⁾	a protectant dicarboximide: suspension concentrate.	7 days	irritant	none stated	5.0

Notes:

(1) or latest time of application

(2) SOLA - see Appendix 6 for the specific product and expiry date

* set at or about the limit of determination

Consult processors before using any of these agrochemicals.

Not all formulations of each active ingredient may be currently approved for use on Dwarf French Beans. Check before use. Label recommendations are revised regularly, read a current label before use.

Appendix 4 Herbicides currently approved for use on Dwarf French Beans (Green Beans)

Active Ingredient	Product Features	Harvest Interval ⁽¹⁾	Hazard Rating	LERAP Category	MRL (mg/kg)
bentazone	contact diazinone: soluble concentrate (SL) or water soluble granule (SG). Apply post-emergence, from 2 trifoliolate leaf stage for annual broad-leaved weeds. One application, or two as a split dose. Minimum 6 hr free from rain required after application. Harmful to aquatic organisms	Before flower buds are visible	Harmful SG,SL Irritant SL Risk of serious damage to eyes	none stated	0.1* (beans with pods)
carfentrazone-ethyl	contact triazolinone: microemulsion (ME). Apply pre-planting for control of emerged annual broad-leaved weeds. It does not control grasses. Dangerous for environment, very toxic to aquatic organisms.	One month pre-planting	Irritant	none stated	0.01*
chlorthal-dimethyl ⁽²⁾	SOLA (drilled or immediately after transplanting)	pre-emergence	Harmful	none stated	none set
Cycloxydim some products use up by 31 August 2008	translocated oxime: emulsifiable concentrate. ACCase inhibitor # Apply post-emergence for annual and perennial grass weeds and volunteer cereals. Not annual meadow-grass. Toxic to aquatic organisms.	5 weeks	Irritant Harmful	none stated	none set
glufosinate-ammonium	contact phosphinic acid: soluble concentrate. Non-selective. Apply only between 1 March - 30 Sept. Apply pre-drilling or pre-emergence of the crop, alone or in tank-mix with some residual herbicides. Rain free period of 4 hr should follow spraying. Harmful to fish and other aquatic life.	pre-drilling or pre-emergence	Harmful Irritant	none stated	none set
glyphosate	translocated phosphonic acid: soluble concentrate or water-soluble granule. Non-selective. Apply pre-drilling and (some formulations) pre-emergence of the crop alone or in tank-mix with some residual herbicides. A selective application (eg. with a weed wiper) can be made to control volunteer potatoes if there is sufficient height differential between crop and weed. Rain free period of 6 hr should follow spraying. Toxic to aquatic organisms	pre-drilling or pre-emergence	Irritant	none stated	0.1*

Notes:

* set at or about the limit of determination

(1) or latest time of application

(2) SOLA - see Appendix 7 for the specific product and expiry date

To avoid the build up of resistance do not apply products containing an ACCase inhibitor herbicide more than twice to any crop

Consult processors before using any of these agrochemicals.

Not all formulations of each active ingredient may be currently approved for use on Dwarf French Beans. Check before use. Label recommendations are revised regularly, read a current label before use.

Appendix 4 Herbicides currently approved for use on Dwarf French Beans (Green Beans) (Cont'd)

Active Ingredient	Product Features	Harvest Interval ⁽¹⁾	Hazard Rating	LERAP Category	MRL (mg/kg)
linuron ⁽²⁾	SOLA Maximum dose rate 0.75 L/ha. Dangerous to fish or other aquatic life.	pre-emergence	Do not apply by hand-held equipment	B	0.05* (beans with pods)
paraquat Use by 11 July 2008	contact bipyridyl: soluble concentrate. Non-selective. Apply to stubble, pre-sowing or pre-emergence of the crop or as a tank-mix with some residual herbicides. Spray is rainfast after 10 minutes. Very toxic to aquatic organisms.	pre-sowing or pre-emergence	Harmful Irritant Poison: Paraquat can kill if swallowed	none stated	0.02*
paraquat/diquat Use by 11 July 2008	contact bipyridyl: soluble concentrate. Non-selective. Apply to stubble, pre-sowing or pre-emergence of the crop, alone or in a tank-mix with some residual herbicides. Spray is rainfast after 10 minutes. Very toxic to aquatic organisms.	pre-sowing or pre-emergence	Harmful Irritant Poison: Paraquat can kill if swallowed	none stated	0.02*/0.05*
pendimethalin ⁽²⁾	SOLA For crop safety apply 'Stomp 400 SC' immediately or as soon as possible after sowing and final seed bed preparation (i.e. at dry seed stage).	pre-emergence	Irritant	B [^]	0.2 (with beans)
trifluralin \$ Use by 20 March 2009 (a few products by 31 August 2008)	Soil-incorporated dinitroaniline: emulsifiable concentrate. Apply pre-sowing and incorporate (some products pre-emergence) for annual meadow-grass and some broad-leaved weeds. Mayweeds, volunteer oilseed rape and cruciferous weeds resistant. Harmful to fish or other aquatic life.	pre-sowing, (pre-emergence)	Harmful Irritant	none stated	none set

Notes:

(1) or latest time of application

(2) SOLA - see Appendix 7 for the specific product and expiry date

* at or about the limit of determination

\$ Take care with waste disposal. Substance prescribed under the Water Resources Act.

Buffer Zone: Category B. This product qualifies for inclusion within the LERAP scheme for ground crop sprayers if there are measures applicable (eg. nozzles).

Consult processors before using any of these agrochemicals.

Not all formulations of each active ingredient may be currently approved for use on Dwarf French Beans. Check before use. Label recommendations are revised regularly, read a current label before use.

Appendix 5 Seed treatments for Dwarf French Beans (Green Beans)

Imported Green Bean seed may be treated with an insecticide for control of Bean seed fly and damping-off diseases.

Seed may be treated with thiram for protection against damping-off diseases.

Appendix 6 Molluscicides approved for control of slugs in Dwarf French Beans (Green Beans)

Active Ingredient	Product Features	Harvest Interval ⁽¹⁾	Hazard Rating	LERAP Category	MRL (mg/kg)
metaldehyde	molluscicide bait: pellet. Dangerous to game, wild birds and animals. Harmful to fish and aquatic life.	none stated	none stated	none stated	none set

Notes:

(1) or latest time of application

Appendix 7 Specific off-label approvals for use on Dwarf French Beans (Green Beans)

Number	Product Name	Ingredient	Expiry	LERAP Category	MRL (mg/kg)
3544/07	Quad	Diquat	05/03/11		
2311/03	Amistar	Azoxystobin	31/12/11		
1987/07	XL All Insecticide	Nicotine	31/08/08		
1919/07	Rovral WP	Iprodione	31/08/08		
1880/03	Folicur	tebuconazole	Unstipulated	none stated	0.2
1789/07	Rovral WP [®] (for <i>Botrytis</i> and <i>Sclerotinia</i> control)	iprodione	31/12/08	none stated	none set
1698/05	Alpha linuron 50 SC (Do not apply with hand-held equipment)	linuron	31/12/08	B	0.05*
1401/05	Orius	tebuconazole	31/12/13		
1385/07	Alpha Tebuconazole 20 EW	tebuconazole	31/12/13		
1357/07	Mitre	tebuconazole	31/12/13		
1320/07	Orius 20 EW	tebuconazole	31/12/13		
1291/07	Cleancrop Silo	lambda-cyhalothrin	13/11/09		
0874/03	Dacthal W75	Chlorthal-dimethyl	31/12/13		
0739/06	Hallmark with Zeon Technology	lambda-cyhalothrin	13/11/09		
0551/07	Riza	tebuconazole	31/12/13		
0432/07	Dipel DF	Bacillus thuringiensis var. kurstaki	31/12/13		
0202/08	Markate 50	lambda-cyhalothrin	28/06/11		
0053/08	Stomp 400 SC	pendimethalin	31/12/13		

Notes:

* at or about the limit of determination

Buffer Zone: Category A . This product is not eligible for buffer zone reduction under the Local Environmental Risk Assessment for Pesticides (LERAP) scheme.

Buffer Zone: Category B. This product qualifies for inclusion within the LERAP scheme for ground crop sprayers if there are measures applicable (eg. nozzles).

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or pests other than those included on the product label. Such use is undertaken at the user's choosing and the risk is entirely theirs and/or their advisers.

Specific off-label uses may only take place if all the conditions given in the "Notice of Approval" document, the product label and/or leaflet and any additional guidance on off-label approvals have first been read and understood. The conditions of approval given in the "Notice of Approval" are statutory and supersede any on the label which would otherwise apply.

All SOLAs are conditional on the extant approval of the specific product.

Appendix 8 PGRO Publications

The following is a list of PGRO publications applicable to Green Bean production:

Reaction of varieties of green beans, broad beans & field beans to herbicides	Inf. sheet 135
Choice of herbicides for beans	Inf. Sheet 179
Checklist of fungicides & insecticides for beans	Inf. sheet 161
Varieties of Green Beans	Descriptive List
Pests & diseases of peas & beans	Booklet
Herbicide damage in peas & beans	Booklet
Notes on growing green beans	Inf. sheet 170

PGRO publications are available from:

The Information Officer, PGRO, Thornhaugh, Peterborough, PE8 6HJ.

Tel: 01780 782585 Fax: 01780 783993 or www.pgro.co.uk

Appendix 9 Control Points: Beans (Green, Processed)

CS.51 BEANS (GREEN, PROCESSED)

- CS.51.1 You should have a policy for reducing volunteer problems for oilseed rape and potatoes by using appropriate husbandry practices after harvest of these crops -
- Protocol reference: Section 8.10.3.2
- CS.51.2 You should know the correct growth stages of the crop for application of post-emergence herbicides -
- Protocol reference: Section 8.10.3.1
- CS.51.3 You should consider the use of seed treatments as a first line of defence against Bean seed fly -
- Protocol reference: Section 8.10.1.2
- CS.51.4 Weeds should be controlled using appropriate methods to avoid the reduction of crop quality by weedy contaminants -
- Protocol reference: Section 8.10.3 (**Revised 2005**)