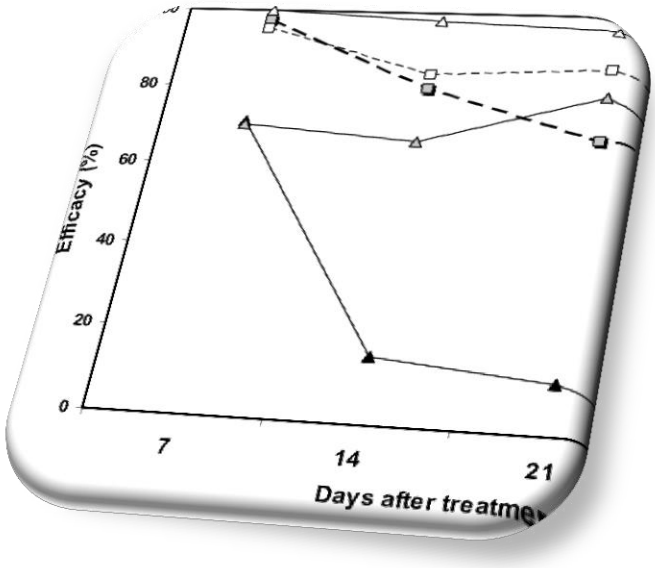
PEST CONTROL PRODUCTS BOARD

GUIDELINES FOR EFFICACY AND CROP SAFETY DATA EXTRAPOLATION FOR PEST CONTROL PRODUCTS IN KENYA



PEST CONTROL PRODUCTS BOARD
P.O BOX 13794 – 00800
LORESHO, NAIROBI, KENYA
info@pcpb.go.ke | md@pcpb.go.ke
http://www.pcpb.go.ke/

Contents

GUIDELINES FOR EFFICACY AND CROP SAFETY DATA EXTRAPOLATION FOR PEST CONTROL PRODUCTS IN KENYA

1.0 Scope

These guidelines describe the principles of extrapolation regarding the efficacy and crop safety of pest control products. The document provides guidance for regulatory authority (Pest Control Products Board, hereafter referred to as the Authority) and applicants in the context of the registration of plant protection products. Acceptable extrapolations are described. These will be updated from time to time.

2.0 Introduction

Extensive data packages are required for registration of pest control products, in order to allow reliable risk assessment and justify their use. The current practice requires that applicants submit efficacy data for each target pest on each specific crop. Lack of requisite data may lead to lack of authorization of products for the market, especially those addressing minor uses (i.e. pests of comparatively low importance on a major crop ['*minor pests*'], or pests of significant importance on crops of relatively low economic importance to the country ['*minor crops*']).

Data extrapolation allows for the existing authorization to be extended to include additional crops or pests without requiring generation of new/specific data. This reduces the cost of product registration and the time required in the process. An additional benefit is also to facilitate the approval of pest control products for minor uses.

The aim of the document is to provide guidance on principles of extrapolation regarding the efficacy and crop safety of pest control products. Extrapolation tables are provided for reference by applicants, accredited institutions and the regulatory authority. The applicant should always provide appropriate justification and information to support the proposed extrapolation. For example, comparability of biology of the target pest either in extrapolating to other target species or for the same target pest in another crop. For crops, factors such as comparable growth habit, structure among others. should also be considered.

The guidelines make reference to the EPPO (European and Mediterranean Plant Protection Organization) standard on Efficacy and crop safety extrapolations for minor uses (PP 1/257 (2).

3.0 Rationale

Data extrapolation takes into consideration that certain similarities do exist in crop and pest combination in the sense that: (a) the same organism could infest/infect different hosts, (b) closely related pests could be managed using the same pest control products, (c) closely related crops may be managed the same way with respect to good agriculture practices (GAP) and could

respond in a similar way to application of pest control products. Hence, experience (data) obtained in one scenario could be used to consider authorization in another closely related scenario without having to generate a whole set of new data.

4.0 Principles

Extrapolations may be considered:

- within the same crop, but across different pests/indications;
- across different crops within the same crop group for similar or different pests;
- taking due consideration of local conditions (e.g. economic importance of a crop(s) or pest(s)), agronomic practices, pest resistance management strategies, among others.

It is important to ensure that expert judgment and regulatory experience are employed when using extrapolation tables. The principles for extrapolation discussed below segregate herbicides from other pest control products (fungicides, insecticides, bactericides, acaricides, molluscicides, avicides and nematicides) and plant growth regulators. Herbicides may cause phytotoxic effects on plants of the same or different grouping as such, crop safety data is very critical.

4.1 Key factors relevant for extrapolation of fungicides, insecticides, bactericides, acaricides, molluscicides, avicides and nematicides.

4.1.1 Crop

Crop morphology, taxonomic relationship (botanical family), cropping system, growth pattern and growth stage are key considerations in extrapolation. It should be noted that considerable differences could still occur between closely related species in terms of growth pattern, leaf surface, canopy size or the parts of plant that are harvested or consumed.

- Control of the target organism in the extrapolated crops is done in the same way as in the crop for which the pest control product was reviewed (indicator crop): timing of application, method, and frequency of application among others.
- The properties of the crops should be taken into account (woody, perennial, annual, growth habit, type of produce among others.) Comparative damage in the reviewed crop - pest, disease and/or weed combination and the extrapolated crop should not differ.
- The most sensitive crop should be reviewed if any difference in sensitivity between crops is known to exist.

4.1.2 Disease/Pest

Taxonomic relationship, pest biology and life cycle, behaviour of the pest, plant parts attacked and nature of damage caused are key considerations in extrapolation. Closely-related species may have

significant differences. A given pest species may behave differently between crops. For example, different generations of a pest may cause different types of damage, so care is needed with extrapolation between crops; or similarities in feeding behaviour of insects may make extrapolation across a range of pest groups appropriate, but the biology of the individual pest is still important. If different stages of the target organism can cause damage, there should be no difference between the reviewed crop and the extrapolated crop in respect to sensitivity to the different stages of the target organism.

For new/emerging pests in Kenya, specific efficacy data may be required.

4.1.3 Product

Formulation, mode of action, specified GAP (good agricultural practices) - including dosage, timing, frequency and method of application; preventative or curative treatment; systemic or non-systemic, quality and amount of existing data are key considerations in extrapolation.

- All proposed extrapolations should concern the same pest control products used in the same formulation and in the same dose. Applicants should provide the scientific rationale for adjustment of the amount of product applied (spray volume) per unit area, where canopy size of plant spacing may be different, and thereby leading to a variation in application volume.
- In case the mode of action of the pest control product is very particular to one target organism only, it will not be possible to extrapolate to other target organisms, even though they are mentioned in the tables.

4.1.4 Agronomic practices

Growing conditions (outdoor or protected) and cultivation techniques, growing systems, soil type (particularly for soil treatments) are key considerations in extrapolation. Generally, foliar applications in protected situations are easier to manage than in outdoor situations.

- Account should be taken of soil type, whenever it is known that soil type has an effect on efficacy. If this is known, it is only possible to extrapolate from crops grown on similar soils. This is for instance relevant for soil treatments, such as granular formulations, and wet soil sterilisation products.
- Both cropping systems and husbandry practices of individual crops should be taken into account (e.g. open field crops, protected crops, use of irrigation).

4.1.5 Seed treatment

Extrapolation between seed treatments of different crops is normally more acceptable when there are similarities in seeding density, thousand grain weight and seed size. Difference in size of seeds between different crops may lead to different dilution effects as the crop continues to grow, which may mean that extrapolation is not possible. Extrapolation may also not be possible where the

growth rate of different crops varies significantly due to differences in dilution effects, especially for systemic plant protection products.

Other factors to be considered for seed treatment are: sowing period, time of appearance of pest, application technique and nature of skin (rough or smooth surface of the seed).

4.2 Key factors relevant for extrapolation of herbicides

Specific principles which may be relevant for extrapolation between crops for the same target weeds:

- When considering the acceptability of an extrapolation, account should be taken of timing of weed control, time/ method of sowing/planting, competitiveness of the crop, time/method of harvesting and ease of separating crop and weed seeds;
- When effectiveness of a herbicide has been adequately demonstrated against a major weed species or a range of species from a particular plant family, it may be possible to extrapolate within the same genus.
- Extrapolation may be possible from the control of a particular weed outdoors to the same species under protected conditions, since conditions are less variable and weeds under protection tend to be more sensitive. However, effectiveness under protected conditions cannot be extrapolated to outdoor use as weeds growing outdoors are usually hardened off and therefore less sensitive to herbicides;
- The efficacy of soil-acting herbicides against weed species in the field cannot be extrapolated to use in container plants or plants in artificial substrate. This is due to the likelihood of different effects of different growing media on efficacy.

Extrapolation from one weed family to other weed family is generally not possible, because of differences in the sensitivity of weed species to a herbicide. However, when trials are carried out with several weed species from the same group of weeds (e.g. annual dicotyledonous or annual grasses), extrapolation is possible to the whole group. This does not mean that all weeds in this group are susceptible. The susceptible weeds may be mentioned on the label.

4.2.1 Crop

Crop morphology, competitiveness of the crop, growth habit and growth pattern are key considerations in extrapolation. It should be noted that closely-related species may still differ significantly in growth habit. Time/method of sowing/planting, cropping system, time/method of harvesting and ease of separating crop and weed seeds should also be considered. In some situations such as plantation crops of different families, extrapolation may be possible where the contact between the herbicide may be minimal e.g a herbicide for use on coffee can be extrapolated to mangoes. However, crop safety data should be provided.

4.2.2 Weed

Taxonomic relationship, biology, life cycle, behaviour and growth stage are key considerations in extrapolation. Closely-related species may have significant differences.

4.2.3 Product

Mode of action, time of application, frequency, method of application, aerial or soil treatment, formulation, dose, spray volume, extent of existing database, regional differences in susceptibility of weeds to plant protection products which might exist are key considerations in extrapolation.

4.2.4 Agronomic Practices

Growing conditions and cultivation techniques, growing systems, field or protected and soil type (particularly for soil treatments) should be considered.

4.3 Crop safety

Phytotoxicity is particularly relevant with certain products, such as herbicides, some types of application, such as soil or seed/plant treatments, and for specific crops such as ornamentals. Phytotoxicity can vary considerably between different crop species, cultivars of the same crop and between different plant protection products. Extrapolation is possible in some situations but should be well reasoned in order to ensure crop safety. It may be based on comparison between the minor crop and crops on which the product is already approved. If an extensive database on crop safety for the plant protection product is available, crop groups may be developed. On the other hand, extrapolation may not be possible where use of the product has resulted in crop damage on some crops or cultivars, where crops concerned are significantly different, or when a crop is known to be particularly sensitive. In addition to or to assist extrapolation, it may be possible to assess crop safety while obtaining data for residues or effectiveness for a particular plant protection product.

The general principles for extrapolation in this guideline apply also in cases of extrapolation for crop safety. In addition, the following specific principles are important:

- The method of application for the crops involved in the extrapolation should be similar;
- Availability and interpretation of evidence of crop safety (or of phytotoxicity) from standard pre- and post-emergence pot tests and greenhouse varietal screens should be treated with care. Conditions in a greenhouse can affect the structure of plant surfaces, as well as pest biology, thereby changing the crop safety of a product.
- Taxonomic relation to the crop for which the product is already approved;
- Similarity in morphology of the crops concerned;
- Availability of adequate crop safety data showing a good margin of safety for the crop(s) from which extrapolation is required and across a range of cultivars.

4.3.1 Crop safety extrapolations for fungicides, insecticides, bactericides, acaricides, molluscicides, avicides and nematicides

As a general principle, insecticides and fungicides would be expected to have low phytotoxic activity with limited adverse effects on the treated crop. The extent of extrapolation within or between crops is largely dependent on the use of the product, known sensitivity of the treated crop and/or growth stage, and the extent of existing knowledge. Evidence may be available from standard pre- and post-emergence pot tests and greenhouse varietal screens. Such preliminary data provides a very useful baseline of inherent crop safety properties for a particular active substance. Following this, trials using the relevant formulation will provide assessments of phytotoxicity in both efficacy trials on the main target crops, and possibly data from specific crop safety trials.

Where relevant for major crops, these should also include some evidence on yield effects. Using this combination of greenhouse and field data, information can be built up on a range of uses and also perhaps formulation types. As existing knowledge builds up, the scope for extrapolation to other crops in the absence of further crop safety data becomes greater. Where there are significant differences between the current use and a proposed extrapolation, particularly regarding dose and formulation, additional data may be required. However, even in these circumstances there may be evidence of inherent crop safety at high doses, or across a range of formulation types, which could be used as evidence in making a reasoned case.

Other factors such as timing, application method, growing conditions and crop morphology will also need to be addressed, either by a reasoned case or further limited data. For insecticides and fungicides with a robust database indicating inherent crop safety across a range of conditions and crops, additional data may only be required in very specific circumstances, e.g. for a new crop of known particular sensitivity.

Given the above, the suitability of extrapolation from a crop safety perspective will need to be considered on a case-by-case basis for a particular product, making full use of existing knowledge. Nevertheless some general comments on crop safety for particular crop groups are provided in 'Extrapolation tables for crop safety of fungicides and insecticides' as well as, where known, information on the more sensitive crops and/or crop stages. These are particularly appropriate as test plants because they represent a 'worst case' and provide greater scope for extrapolation. They could be used as indicator plants in crop groups for crop safety extrapolations to be developed in the future, as experience in crop safety extrapolations develops.

4.3.2 Crop safety extrapolations for herbicides

Crop safety is particularly an issue in the case of herbicides. Specific principles are not available and extrapolations have to be considered on a case-by-case basis. If a herbicide is demonstrated as only effective against monocotyledonous species, it may be possible to extrapolate crop safety

between dicotyledonous crops, and vice versa. However, this will depend on the information available on the active substance.

5.0 Extrapolation Tables

The following tables are attached to this guideline:

- Extrapolation tables for efficacy of fungicides;
- Extrapolation tables for efficacy of insecticides;
- Extrapolation tables for crop safety of fungicides and insecticides
- Extrapolation tables for efficacy of herbicides;
- Extrapolation tables for crop safety of herbicides;
- Extrapolation tables for nematicides

A. VEGETABLES

Extrapolation Tables For Efficacy Of Pest Control Products

Introduction

The table provides detailed lists of acceptable extrapolations organized by crop groups, for the regulatory authority and applicants, in the context of the registration of pest control products. It is important to ensure that expert judgment and regulatory experience are employed when using these tables. The tables should be used in conjuction with the above guidelines.

The scope for extrapolation may be extended as data and experience with a certain plant protection products increases. The applicant should always provide appropriate justification and information to support the proposed extrapolation. For example, comparability of biology of the target pest may be a relevant factor, either in extrapolating to other target species or for the same target onto another crop. For crops, factors such as comparable growth habit, structure among others should be considered.

Table format

The main pest species for the crop group are listed in Column 1 (although this is not exhaustive), and the pest group to which they belong is specified in Column 2. Companies may choose if they wish to provide data only for individual named species, which would then appear individually listed

on the label. But underlined species have been identified as key major targets and as such it is advisable to generate data on these. Furthermore, data on these species then allow a claim to be made for the whole pest group (as specified in Column 2), if required. If a claim for the whole pest group is required but there is no underlined species, then data must be generated on all listed species.

Column 3 indicates the key indicator crop(s) for the crop group. In some instances this may be only one specified crop. In other cases, when separated by an 'or', the company may choose from a range of alternatives within the group. Data generated on crops in Column 3 may be used to extrapolate to all crops listed in Column 4. However, it is preferable to have data on several of the crops within the crop group, but data on the indicator crop should be available.
Column 5 identifies whether data on other crops against the same target may help to reduce the amount of required data on the indicator crop. It may be possible for a direct extrapolation without the need for further data on the indicator crop (marked with an asterisk (*)). However, this is dependent on the extent of available data and similarity of crop/target biology. The company should provide an appropriate reasoned case when wanting to use supporting data from other crop groups.

Column 6 gives examples of acceptable extrapolations for a particular pest claim onto other crops. This is not a comprehensive list. Whether extrapolation may be direct (no data, marked with an asterisk (*)), or require additional supporting data on the other crop, will again be dependent on the extent and relevance of the existing database and companies should provide an appropriate reasoned case.

Extrapolation regarding protected/outdoor situations

Please note that where crops may be grown in both protected and field situations, and where significant differences are expected in pest relevance or crop agronomy between indoor and outdoor situations, it is important to generate a proportion of the data on crops grown in both situations to ensure the product has been tested under a suitable range of typical and challenging conditions.

A. Extrapolation tables for efficacy fungicides

Table1. DISEASES ON LEGUME VEGETABLES

***Vicia faba* VICFX, *Phaseolus* sp. PHSSS, *Pisum sativum* PIBSX, *Lens culinaris* LENCU, *Cicer arietinum* CIEAR, *Arachis hypogea* ARHHY**

Pests		Crop: within Legume vegetables		Crops: outside Legume vegetables, including pulses	
1 **Pathogen species**	2 **Disease group name**	3 **Indicator crops**	4 **Extrapolation to other crops**	5 **Data from these crops on the same pathogen can support the indicator crops (reduced data or no data *)**	6 **Extrapolation to crops (reduced or no data*)**
Phytophthora pisi PHYTPI	Root rot	Pea PIBSX or Broad bean VICFX	Pea PIBSX, Broad bean VICFX	*Vicia faba* subsp *minor** VICFM (field beans)	*Vicia* sp. VICSS, *Pisum* sp. PIBSS
Fusarium sp. FUSASP *(e.g. Fusarium solani, Fusarium oxysporum)*	Root rot	*Phaseolus vulgaris* PHSVX or Pea PIBSX or Broad bean VICFX or Lentils LENCU or Chickpea CIEAR	All legume vegetables	Fabaceae 1LEGF	Fabaceae 1LEGF
Thanatephorus cucumeris (=Rhizoctonia solani) RHIZSO	Root rot	*Phaseolus vulgaris* PHSVX or Pea PIBSX or Broad bean VICFX or Lentils LENCU or Chickpea CIEAR	All legume vegetables	Potato SOLTU (AG3, AG2-1), Lettuce LACSA (AG4), Cucurbitaceae 1CUCF (in soil) (AG4 (AG5)), Vegetable brassica (AG2-1, AG4), Beets BEAVD (AG2-2, AG4, AG1, AG3, AG5), Fabaceae 1LEGF (AG4, AG2-2)*, Strawberry FRASS (AG2-	All crops where root rot caused by the same AGgroups appear

Pests		Crop: within Legume vegetables		Crops: outside Legume vegetables, including pulses	
				1), Tomato LYPES (AG3, AG4) AG (Anastomosis groups)	
Pythium sp. PYTHSP	Root rot	*Phaseolus vulgaris* PHSVX or Pea PIBSX or Broad bean VICFX or Lentils LENCU or Chickpea CIEAR	All legume vegetables	Fabaceae 1LEGF	Fabaceae 1LEGF
Phytophthora sp. PHYTSP	Root rot	*Phaseolus vulgaris* PHSVX or Pea PIBSX or Broad bean VICFX or Chickpea CIEAR	All legume vegetables	Fabaceae 1LEGF	Fabaceae 1LEGF
Didymella sp. DIDYSP, *D. fabae* ASCOFA, *D. pisi* ASCOPI, *D. rabiei* MYCORA, *Ascochyta phaseolorum* PHOMEX, *Peyronellaea arachidicola* PHOMAR	Leaf and pod spot	*Phaseolus vulgaris* PHSVX or Pea PIBSX or Chickpea CIEAR or Broad bean VICFX,	Pea PIBSX, Broad bean VICFX, *Phaseolus vulgaris* PHSVX, Lentils LENCU, Chickpea CIEAR, Peanut ARHHY	*Pisum* sp. PIBSS, *Vicia* sp. VICSS	*Pisum* sp. PIBSS, *Vicia* sp. VICSS
Didymella pisi ASCOPI (=*Ascochyta pisi*) or *Peyronellaea pinodes* MYCOPI (= *Mycosphaerella pinodes, Ascochyta pinodes*) or *Peyronellaea pinodella* PHOMMP (= *Phoma medicaginis var. pinodella,*	Ascochyta blight	Pea PIBSX	*Phaseolus vulgaris Broad bean VICFX PHSVX,* Lentils LENC, Chickpea CIEAR	Fabaceae 1LEGF	All relevant Fabaceae 1LEGF*

Pests		Crop: within Legume vegetables		Crops: outside Legume vegetables, including pulses	
Ascochyta pinodella)					
Cercospora sp. CERCSP	Leaf spot	*Phaseolus vulgaris* PHSVX or Broad bean VICFX or Lentils *LENCU*	*Broad bean* VICFX, Lentils LENCU, Chickpea CIEAR, Peanut ARHHY	*Vicia* sp. VICSS*, *Lathyrus* sp. LTHSS	*Vicia* sp. VICSS*, *Lathyrus* sp. LTHSS
Phaeoisariopsis griseola PHAIGR	Angular Leaf spot	*Phaseolus vulgaris* PHSVX	*Phaseolus* 1PHSG	Fabaceae 1LEGF	Vigna sp. VIGSS
Colletotrichum sp. (E.g C.lindemuthianum COLLLD, C. truncatum COLLDU)	*Anthracnose*	*Phaseolus vulgaris PHSVX*	*Pea PIBSX, Broad bean VICFX, Phaseolus sp. PHSSS, Lentil LENCU, Chickpea CIEAR, Peanut ARHHY*	*Phaseolus sp. PHSSS, Vigna sp. VIGSS, Glycine 1GLXG*	*Phaseolus* sp. PHSSS, *Vigna* sp. VIGSS, Glycine 1GLXG, *Vicia* sp. VICSS
Uromyces sp. UROMSP, *U. viciae-fabae* UROMVF, *U. appendiculatus* UROMAP *Uromyces ciceris-arietini* UROMCA	Rust	*Phaseolus* sp. PHSSS or Broad bean VICFX or Lentils LENCU or Chickpea CIEAR	All legume vegetables	Fabaceae 1LEGF*	Fabaceae 1LEGF
Erysiphe sp. ERYSSP, *E. pisi* ERYSPI, *E. betae* ERYSBE, *Blumeria graminis f. sp. avenae* ERYSGA	Powdery mildew	Pea PIBSX or *Phaseolus vulgaris* PHSVX or Broad Bean VICFX	Pea PIBSX, Broad Bean VICFX, *Phaseolus* sp. PHSSS Chickpea CIEAR, Lentils LENCU	Fabaceae 1LEGF*, Beta 1BEAG	Fabaceae 1LEGF
Peronospora viciae PEROVI	Downy mildew	Pea PIBSX or *Phaseolus vulgaris* PHSVX or Broad bean VICFX or Lentils LENCU	Pea PIBSX, Broad Bean VICFX, *Phaseolus vulgaris*	, *Vicia* sp. VICSS, *Medicago* 1MEDG, *Trifolium* 1TRFG	*Pisum* sp. PIBSS, *Vicia* sp. VICSS, *Medicago* 1MEDG, *Trifolium* 1TRFG

Pests		Crop: within Legume vegetables		Crops: outside Legume vegetables, including pulses	
Phytopthora sp., *Phytopthora phaseoli* PHYTPH, *Phytophthora nicotianae* var. *parasitica* PHYTNP	Downy mildew	Pea PIBSX or *Phaseolus vulgaris* PHSVX or Broad bean VICFX or Lentils LENCU	Phaseolus vulgaris PHSVX, Lentil LENCU	Any other relevant crop	Any other relevant crop
Botryotinia fuckeliana BOTRCI	Grey mold	*Phaseolus vulgaris* PHSVX	All legume vegetables	Strawberry FRASS, Grapes VITVI, any other relevant crop	All relevant crops where this disease appear
Fusarium oxysporum FUSAOX	Wilt	*Phaseolus vulgaris* PHSVX or Pea PIBSX or Broad Bean VICFX	All legume vegetables	*Pisum* sp. PIBSS, *Phaseolus* sp.PHSSS	*Pisum* sp. PIBSS, *Phaseolus* sp. PHSSS
Sclerotinia sp. *(S. sclerotiorum* SCLESC*, S. minor* SCLEMI*, S. trifoliorum* SCLETR*)*	White mould Watery soft rot	Pea PIBSX or *Phaseolus* sp. PHSSS or *Broad bean* VICFX or Pea nut ARHHY or Lentils LENCU or Chickpea CIEAR	Pea PIBSX, *Phaseolus* sp.PHSSS, or Broad bean VICFX, Peanut ARHHY or Lentils LENCU, Chickpea CIEAR,	Lettuce LACSA, Oilseed rape BRSNN, Sunflower HELAN, Carrots DAUCA or any other relevant crop	All relevant crops where these diseases appear
The following extrapolation possibilities are proposed to be addressed in tables covering generic pests					
Pythium sp. PYTHSP, Oomycetes 1OOMYC	Damping off	*Phaseolus* sp. PHSSS or Pea PIBSX	All legume vegetables	Lettuce LACSA or Vegetable brassica or Cucumber CUMSA or Melon CUMME or Spinach SPQOL or Beet BEASS or Tomato	All crops where damping off caused by Oomycetes appear

Pests		Crop: within Legume vegetables		Crops: outside Legume vegetables, including pulses	
				LYPES	
Aphanomyces sp. APHASP	Damping off	*Phaseolus* sp. PHSSS or Pea PIBSX	All legume vegetables	Pea PIBSX	Other leguminous crops Other beet crops (Beta sp. BEASS), Chenopodioideae 1CHES
Fusarium FUSASP Tomato LYPES or	Damping off	*Phaseolus* sp. PHSSS or Pea PIBSX	All legume vegetables	Tomato LYPES or Cucurbitaceae 1CUCF (both grown in the soil) or any other relevant crop	All crops where Fusarium damping off appear
Thanatephorus cucumeris RHIZSO	Damping off	*Phaseolus* sp. PHSSS or Pea PIBSX	All legume vegetables	Potato SOLTU (AG3, AG2-1), Lettuce LACSA (AG4), Cucurbitaceae 1CUCF (in soil) (AG4 (AG5)), Vegetable brassica (AG2-1, AG4) Beets BEAVD (AG2-2, AG4, AG1, AG3, AG5) Fabaceae 1LEGF (AG4, AG2-2) Strawberry FRASS (AG2-1), Tomato LYPES (AG3, AG4)	All crops where damping off caused by the same AG-groups appear
Sclerotinia sp. SCLESP or *Sclerotium rolfsii* SCLORO	Damping off	*Phaseolus* sp. PHSSS or Pea PIBSX	All legume vegetables	Lettuce LACSA or Tomato LYPES or Pepper CPSAN or Phaseolus sp. PHSSS	All crops where Sclerotina damping off appear
Botryotinia fuckeliana BOTRCI	Damping off	*Phaseolus* sp. PHSSS or Pea PIBSX	All legume vegetables	Fabaceae 1LEGF or Lettuce LACSA or Tomato LYPES	All crops where damping off appear. Not covering post-harvest effects.
Pseudomonas syringae (incl. *Pseudomonas syringae*	Bacterial blight	*Phaseolus vulgaris* PHSVX or Pea PIBSX	*Phaseolus* sp. PHSSS, Pea PIBSX		

Pests		Crop: within Legume vegetables		Crops: outside Legume vegetables, including pulses	
pv. *pisi* PSDMPI, *Pseudomonas savastanoi* pv. *phaseolicola* PSDMPH)					
Xanthomonas axonopodis pv. phaseoli XANTPH	Bacterial blight	*Phaseolus vulgaris* PHSVX	*Phaseolus* sp. PHSSS, Pea PIBSX		

Table 2: DISEASES ON FRUITING VEGETABLES OF SOLANACEAE

LYPES Tomato *Solanum lycopersicum,* SOLME Aubergine *Solanum melongena,* CPSAN Sweet Pepper *Capsicum annuum,* CPSFR Chilli pepper *Capsicum frutescens,* PHYSS *Physalis* sp., SOLMU Pepino *Solanum muricatum*

Pests		**Crops: within Fruiting Vegetables of Solanaceae**		**Crops: outside the Fruiting Vegetables of Solanaceae**	
1 **Pathogen species**	**2** **Disease group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops on the same pathogen can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Mycovellosiella fulva (= Fluvia fulva, Cladosporium fulvum) FULVFU	Leaf mould of tomato	Tomato LYPES			All cucurbit crops 1CUCF, Spinach SPQOL
Leveillula taurica LEVETA	Powdery mildew	Tomato LYPES Or Sweet pepper CPSAN	Aubergine SOLME, Sweet pepper CPSAN, Chilli pepper CPSFR		Seed crops, Chicory CICIN
Oidium neolycopersici OIDINL	Powdery mildew	Tomato LYPES	Aubergine SOLME		Tobacco NIOSS; Lambs Lettuce VLLLO

Alternaria spp. ALTESP *(A. alternata, A. solani etc.)*	Early blight (leaf and stem blight and fruit rot)	Tomato LYPES	Aubergine SOLME, Sweet pepper CPSAN	Potato SOLTU, Strawberry FRASS, Beta beet BEAVX, Cucumber CUMSC, Garden Carrot DAUCS, Garden bean PHSVX, Fennel FOESS Head cabbage BRSOX, Leek ALLPO, Oilseed rape BRSNN, Onions ALLSS, Beans PHSSS, Spinach	Endive CICEN, Wild lettuce LACSE, Lamb's lettuce VLLLO, Black salsify SCVHI, Herbs, Turnip BRSRR, Garden parsley PARCR, Onions ALLSS, Cucumber CUMSC, Artichoke CUYSC, Witloof chicory CICIF, Tobacco NIOSS, potato SOLTU
Phytophthora infestans PHYTIN	Late blight	Tomato LYPES	Aubergine SOLME	Potato SOLTU	Herbs, potato SOLTU
Pyrenochaeta lycopersici PYRELY	Corky root	Tomato LYPES or Aubergine SOLME, or Sweet pepper CPSAN, or chilli pepper CPSFR	Aubergine SOLME, Sweet pepper CPSAN, Chilli pepper CPSFR	All cucurbit crops 1CUCF	Herbs, All cucurbit crops 1CUCF, Spinach SPQOL, Potato SOLTU
Colletotrichum coccodes COLLCC	Black root rot Black dot	Tomato LYPES or Aubergine SOLME, or sweet pepper CPSAN, or chilli pepper CPSFR	Aubergine SOLME, Sweet pepper CPSAN, Chilli pepper CPSFR		Herbs, All cucurbit crops 1CUCF, Spinach SPQOL, Potato SOLTU
Didymella lycopersici DIDYLY	Didymella Stem rot	Tomato LYPES		All cucurbit crops 1CUCF	All cucurbit crops 1CUCF, Herbs
Rhizoctonia spp. RHIZSP	*Rhizoctonia* rot	Tomato LYPES	Aubergine SOLME, Sweet pepper CPSAN, Chilli pepper CPSFR	Strawberry FRASS, Artichoke CYUSC, Cabbage BRSOX, Lettuce LACSS, All Cucurbit Crops 1CUCF, Beta Beet BEAVX, Potato SOLTU, Garden Bean PHSVX, Leek ALLPO, Radish RAPSR, Beans	Herbs, Radish RAPSR, Endive CICEN, Begonia 1BEGG, Cauliflower BRSOB, Chrysanthemum 1CHYG, African violet SNPSS, Witloof chicory CICIF, Potatoes SOLTU

				PHSSS	
The following extrapolation possibilities are proposed to be addressed in tables covering generic pests					
Botrytis cinerea BOTRCI, *Sclerotinia* sp. SCLESP	Grey mould, white mould	Tomato LYPES	Aubergine SOLME, Sweet pepper CPSAN, Chilli pepper CPSFR	Strawberry FRASS, All Cucurbit Crops 1CUCF, Rose ROSSS, Cabbage BRSOX, Artichoke CYUSC, Lettuce LACSS, Pea PIBSS, Potato SOLTU, Leek ALLPO, Garden Bean PHSVX, Grapes VITVI, Beans PHSSS,	Faba Bean VICFX, Herbs, Chrysanthemum CHYIN, Christmas Flower EPHPU, Pelargonium PELSS, Sim's Azalea RHOSI, Begonia BEGGS, Hydrangea HYESS, Cyclamen CYZSS, Primrose PRISS, African Violet SNPSS, All Cucurbit Crops 1CUCF, Lettuce LACSS, Tobacco NIOSS
Phytophthora nicotianae PHYTNN, *P. capsici* PHYTCP, *P. cactorum* PHYTCC *etc.*	Blight of sweet pepper	Sweet pepper CPSAN	Aubergine SOLME, tomato LYPES, Chilli pepper CPSFR	All cucurbit crops 1CUCF, Pineapple	Herbs; Potted ornamentals & cut flowers
Pythium spp. *(P. ultimum* PYTHUL, *P. aphanidermatum* PYTHAP*)*	Pythium wilt	Tomato LYPES	Aubergine SOLME, Sweet pepper CPSAN, Chilli pepper CPSFR	All cucurbit crops 1CUCF, kidney bean PHSVX, beta beet BEAVX, leek ALLPO cabbage BRSOX, lettuce LACSS, Beans PHSSS	Herbs, gloxinia GOXSS, christmas flower (poinsetia) EPHPU, Potted ornamentals & cut flowers, Lettuce LACSS, Spinach SPQOL
Fusarium spp. (Fusarium solani FUSASO, *Fusarium oxysporum*)	Fusarium	tomato LYPES	Aubergine SOLME, Sweet pepper CPSAN	All cucurbit crops 1CUCF	Herbs, All cucurbit crops 1CUCF
Verticillium spp.VERTSP	Verticillium wilt	Tomato LYPES, or Aubergine SOLME, or capsicum CPSSS	Chilli pepper CPSFR, Sweet pepper CPSAN,	Potato SOLTU, all cucurbit crops 1CUCF, strawberry FRASS, artichoke CYUSC, rose ROSSS, bean PHSVX, peas PIBSS, Beans PHSSS	Herbs, chrysanthemum 1CHYG, geranium 1GERG, forsythia FOSSS, brussels sprouts BRSOF, Potted ornamentals & cut flowers, cucurbits 1CUCF,

					tobacco NIOTA, pea PIBSS
Acidovorax valerianella ACVRVA, *Pseudomonas* sp., ERWICA, *Xanthomonas* sp. XANTSP *Clavibacter michiganensis*	Bacterium disease	Tomato LYPES			Lettuce LACSS

Abbreviations in capital letters following the common names of the crops are short forms of botanical names e.g. LYPES for Tomato *Solanum l.ycopersicum*

Table 3: DISEASES ON LEAFY VEGETABLES:

Asteraceae : LACSA lettuce *Lactuca sativa*, LACSE prickly lettuce *Lactuca serriola*, CICEN endive *Cichorium endivia,* CICIN chicory *Cichorium intybus,* CICIF chicory witloof *Cichorium intybus* var. *foliosum,* TAROF dandelion *Taraxacum officinale.*

Crucifereae : LEPSA garden cress *Lepidium sativum,* BARVE landcress *Barbarea verna,* DIPER Rockets *Diplotaxis erucoides* and ERUVE *Eruca vesicaria* subsp. *Sativa*, NAAOF watercress *Nasturtium officinale,* BRSJU leaf mustard *Brassica juncea,* Kales *Brassica oleracea*

Chenopodioideae : SPQOL spinach *Spinacia oleracea,* BEAVV chard (Kenyan spinach) *Beta vulgaris* subsp. *vulgaris.*

Other: VLLLO lamb's lettuce *Valerianella locusta,* SANMI burnet *Sanguisorba minor,* VERBE cow cress *Veronica beccabunga,* VLLER Italian corn salad *Valerianella eriocarpa,* POROS purslane *Portulaca oleracea* subsp. *sativa.*

Pests		**Crops: within the leafy vegetables**		**Crops: outside the leafy vegetables**	
1 **Pathogen species**	**2** **Disease group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Bremia sp. BREMSP	Downy Mildew	Lettuce LACSS	Leafy vegetables of the Asteraceae 1COMF, Prickly lettuce LACSE, Dandelion TAROF, Endive CICEN, chicory CICIN		Artichoke CYUSC, Fresh herbs,

Peronospora sp.		Spinach BEAVV or kales	Crucifereae 1CRUF, Chenopodioideae 1CHES (SpinachBEAVV, Chard BEAVV), Rocket ERUVE, Lamb's lettuce VLLLO, Italian corn salad VLLER	All brassicacae, onion	All brassicacae, Red beet BEAVD
Septoria sp. SEPTSP, *Cercospora* sp. 1CERCG, *Ramularia* sp. RAMUSP	Leaf spot disease	Lettuce LACSS, Spinach BEAVV	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES	Parsley PARCR, Carrot DAUCA	Celery APUGV, Celeriac APUGR, Parsnip PAVSA, Artichoke CUYSC
Alternaria sp. ALTESP		Lambs Lettuce VLLLO or kales	Italian corn salad VLLER, witloof CICIF, Endive CICEN, Wild lettuce LACSE,	Tomato LYPES, Potato, Brassicaceae, Carrot, Cucurbitaceae 1CUCF	Parsley PARCR
Microdochium panattonianum sp. *MARSPA*,		Lettuce LACSS	Leaf spot disease in Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES Italian corn salad VLLER, Witloof CICIF, Endive CICEN, Wild lettuce LACSE,		Parsley PARCR
Cladosporium sp. CLADSP, *Colletotrichum* sp. 1COLLG		Spinach BEAVV,	Lettuce LACSS	Tomato LYPES, Cucurbitaceae 1CUCF	Ornamentals
Phoma sp. PHOMSP	Black leg	Kales	Cruciferae, Brasiccae	Cabbage BRSOL, potatoes SOLTU	

Erysiphe sp. ERYSSP	Powdery mildew	Lambs Lettuce VLLLO, Chicory CICIN or Kales or Spinach	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES (particularly Prickly lettuce LACSE, Dandelion TAROF), Lamb's lettuce VLLLO, Italian corn salad VLLER, Endive CICEN	Cucurbitaceae 1CUCF, Tomato LYPES, Peas	Fresh herbs, peas
Puccinia sp. PUCCSP	Rust	Lettuce LACSS or Chicory CICIN	Leafy vegetables of the Asteraceae (particularly Prickly lettuce LACSE, dandelion TAROF)	Asparagus ASPOF, Liliaceae 1LILF, Cereals*,	Onions
The following extrapolation possibilities are proposed to be addressed in tables covering generic pests					
Botrytis sp. BOTRSP, *Sclerotinia* sp. 1SCLEG	Moulds	Kales or Spinach or Lettuce LACSS	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES, (particularly prickly lettuce LACSE, , chicory CICIN, endive CICEN, witloof CICIF, rocket ERUVE), Italian corn salad VLLER, , lamb's lettuce VLLLO, cowpea leaves	Cucurbitaceae 1CUCF, Tomato LYPES, Brassicaceae 1CRUF, leguminous vegetables	Tobacco NIOSS, fresh herbs, ornamentals[i], Tomato LYPES, Cabbage BRSOX, Brussels sprouts BRSOF, Flower head brassicas, Leafy brassicas

Rhizoctonia sp. RHIZSP	Rhizoctonia root rot	Lettuce LACSS	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES (particularly prickly lettuce LACSE, dandelion TAROF, spinach SPQOL, witloof CICIF, chard BEAVV), lamb's lettuce VLLLO, Italian corn salad VLLER, Endive CICEN	Potato SOLTU, Brassicaceae 1CRUF, Tomato LYPES	Tomato LYPES, leafy herbs
Pythium sp. PYTHSP *Phytophtora*	Pythium root rot	Lettuce LACSS or Spinach BEAVV or kales	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES, (particularly endive CICEN, chicory CICIN, witloof CICIF, chard BEAVV), Italian corn salad VLLER,	Cucurbitaceae 1CUCF, Brassicaceae 1CRUF, Solanaceae 1SOLF, beets BEAVX	Tobacco NIOSS, ornamentals, fresh herbs, Tomato LYPES
Thielaviopsis sp. THIESP *Fusarium*	Root rots	Lettuce LACSS	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES	Carrot DAUCA, Leguminosae 1LEGF	
Acidovorax valerianella ACVRVA, *Pseudomonas sp.*, ERWICA, *Xanthomonas sp.* XANTSP	Bacterium disease	Kales	Leafy vegetables of the Asteraceae 1COMF, Crucifereae 1CRUF, Chenopodioideae 1CHES, (particularly endive CICEN, chicory CICIN, witloof CICIF), lamb's lettuce VLLLO, Italian corn salad VLLER	Liliaceae 1LILF, Umbelliferae 1UMBF, Brassicaceae 1CRUF, Solanaceae 1SOLF	ornamentals, fresh herbs

Can be used in some circumstances to support indicator crop

Table 4: DISEASES ON UMBELLIFEROUS CROPS:

DAUCA Carrot *Daucus carota,* APUGV Celery *Apium graveolens* and APUGR Celeriac *Apium graveolens* var. *rapaceum,* FOEVD Fennel *Foeniculum vulgare* var. *dulce,* PAVSA Parsnip *Pastinaca sativa,* PARCR Parsley *Petroselinum crispum,* CORSA Coriander *Coriandrum sativum,* CRYCA Caraway *Caraway*

Pests		**Crops: within the Umbelliferae**		**Crops: outside the Umbelliferae**	
1 **Pathogen species**	**2** **Pest group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Alternaria dauci ALTEDA; *Alternaria radicina* ALTERA *Alternaria* sp. ALTESP	Leaf spot/blight	Carrot DAUCA	To all umbelliferous	Host crops of *Alternaria sp*	Herbs Salsify TROPS Crops for seed production
Cercospora carotae, CERCCA					

Pythium sp PYTHSP	Cavity spot	DAUCA Carrot *Daucus carota or* CORSA Coriander *Coriandrum sativum or* PARCR Parsley *Petroselinum crispum*	To all umbelliferous		
Stemphylium sp. STEMSP	Leaf blight	carrot DAUCA	Fennel, Celeriac APUGR	Asparagus ASPSS	
Helicobasidium brebissonii, HLCBBR	Violet root rot	Carrot DAUCA	To all umbelliferous		
Rhizoctonia carotae, RHIZCA	Storage disease	Any umbelliferous	To all umbelliferous		
Erysiphe heraclei, ERYSHE	Powdery mildew	Any umbelliferous	To all umbelliferous	Cucumber CUMSA	Black salsify SCVHI Herbs
Mycocentrospora acerina, MYCCAC		Carrot DAUCA	To all umbelliferous		
Phytophthora sp. PHYTSP	Ring rot	Any umbelliferous	To all umbelliferous		

Phoma sp. PHOMSP		Any umbelliferous	To all umbelliferous	Leafy vegetables	
Plasmopara crustosa umbrelliferarum PLASCR, *Peronospora* sp. PEROSP	Downy Mildew	Fennel FOESS Parsley PARCR	To all umbelliferous		
Septoria sp SEPTSP	Septoria leaf spot disease	Any umbelliferous (except carrot DAUCA)	To all umbelliferous		
The following extrapolation possibilities are proposed to be addressed in tables covering generic pests					
Pythium violae, PYTHVI		Carrot DAUCA	Fennel FOESS, Celeriac APUGR	Any other crop*	
Botryotinia fuckeliana, BOTRCI		Celeriac APUGR	Fennel FOESS, Celeriac APUGR	Any other crop*	
Pythium PYTHSP, *Rhizoctonia* RHIZSP, *Phytophtora* PHYTSP, *Fusarium* FUSASP	Damping-off diseases	Carrot DAUCA		Spinach SPQOL, Sugarbeet BEAVA	Herbs
Sclerotinia sclerotiorum, SCLESC	White mould	Carrot DAUCA	Fennel FOESS, Celeriac APUGR Parsley PARSS		

Thanatephorus cucumeris, RHIZSO/ *Rhizoctonia* RHIZSP,	Crown and root rot	Carrot DAUCA		Lettuce LACSA, Brassica 1BRSG	
Streptomyces scabiei, STRESC	potato scab	Carrot DAUCA		Potato SOLTU	
Xanthomonas hortorum pv. *Carotae,* XANTCR	bacterial leaf blight	Carrot DAUCA	Fennel FOESS, Celeriac APUGR		

Table 5: DISEASES ON CUCURBITACEAE

CUMSC Cucumber *Cucumis sativus*, CUUPG Courgette *Cucurbita pepo* var. *giromontiina* (including zucchini and marrow squash), CUUPE Marrow *Cucurbita maxima* (Squash and pattypan/scallop squash and gourds), CUUPM Pumpkin *Cucurbita pepo var. melopepo,* CUMME Melon *Cucumis melo,* CITLA Water Melon *Citrullus lanatus, Thorn melon (Cucumis metuliferus), Karela (Momordica charantia), Butter nut squash (Cucurbita moschata)*

Pest		**Crop: within the Cucurbitaceae**		**Crops: outside Cucurbitaceae**	
1 **Pathogen species**	**2** **Disease group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Pyrenochaeta lycopersici PYRELY	Root rot	Water Melon CUMME	All crops within the group	Tomato LYPES, Potato SOLTU	Tomato LYPES
Pseudoperonospora cubensis PSPECU	Downy mildew	Cucumber CUMSC or water Melon CUMME	All crops within the group		Basil OCIBA, Sage SALSS, Herbs

Alternaria spp. ALTESP *A. cucumerina* ALTECU	Leaf blight	Cucumber CUMSC or water Melon CITLA	All crops within the group	Strawberry FRASS, Tomato LYPES	Auberginesolme, Turnip BRSRR , Scorzonera 1SCVG, Wild Lettuce LACSE, Endive CICEN, Chicory CICIN, Fennel FOESS, Sweet Pepper CPSAN, Umbelliferous Herbs
Cladosporium spp. CLADSP	Scab	Cucumber CUMSC or water Melon CITLA,	All crops within the group	Tomato LYPES	Spinach BEAVV
Erysiphe spp. ERYSSP, *Golovinomyces cichoracearum* ERYSCI or[i] *Sphaerotheca* spp. SPHRSP, *Sphaerotheca fuliginea* SPHRFU	Powdery mildew	Water Melon CITLA or Cucumber CUMSC	All crops within the group	Tobacco NIOTA	Endive CICEN, Lambs lettuce VLLLO, Chicory CICIN, Tobacco NIOSS, Parsley PARSS
Didymella bryoniae DIDYBR	Gummy stem blight Black stem rot	Water Melon CITLA or Cucumber CUMSC	All crops within the group	Cabbage BRSOL, Raspberry RUBID	

Colletotrichum spp. COLLSP	Anthracnose	Water Melon CITLA or Cucumber CUMSC	All crops within the group	Tomato LYPES, Beans PHSSS	Spinach SPQOL, Sweet pepper CPSAN, Beans PHSSS, Peas PIBSS
The following extrapolation possibilities are proposed to be addressed in tables covering generic pests					
Fusarium oxysporum	Fusarium wilt	Water Melon CITLA	All crops within the group	tomato LYPES	Tomato LYPES, Carnations
Fusarium oxysporum f.sp. radicis-cucumerinum FUSARC	Fusarium crown and stem rot	Cucumber CUMSC	All crops within the group	tomato LYPES, asparagus	Sweet basil OCIBA, Tomato LYPES
Verticillium spp. VERTSP	Verticillium wilt	Cucumber CUMSC or water melon CITLA or zucchini CUUPG	All crops within the group	tomato LYPES, potato SOLTU, strawberry FRASS, sunflower HELAN, cotton GOSHI	chrysanthemum 1CHYG, pelargonium 1PELG, Tomato LYPES, Tobacco NIOSS

Botrytis spp. BOTRSP, *Botrytis cinerea* BOTRCI	Grey mould	cucumber CUMSC or water melon CITLA	All crops within the group	tomato LYPES, strawberry FRASS, fabaceae 1LEGF, eggplant SOLME, sweet pepper CPSAN, chilli pepper CPSFR	chrysanthemum 1CHYG, begonia, pelargonium PELSS, Tomato LYPES, Lettuce LACSS, Beans PHSSS, peas, Basil OCIBA, rosmarin RMSS
Pythium spp. PYTHSP	Damping off/root rot	cucumber CUMSC	All crops within the group	Most vegetable crops are susceptible	susceptible minor vegetable crops, Tomato LYPES, Lettuce LACSS, Spinach BEAVV

Rhizoctonia solani RHIZSO	Damping off/root rot	Water melon CITLA or cucumber CUMSC	All crops within the group	Most vegetable crops are susceptible, strawberry FRASS, tobacco NIOTA, potato SOLTU	begonia BEGSS, chrysanthemum 1CHYG, saintpaulia 1SNPG, susceptible minor vegetable crops, Tomato LYPES, Roman chamomile ANTNO, Rosmarin RMSS
Sclerotinia sclerotiorum SCLESC	White mould	Water melon CITLA or cucumber CUMSC	All crops within the group	Most vegetable crops are susceptible, field beans VICFX, potato SOLTU	turnip BRSRR, susceptible minor vegetable crops, Lettuce LACSS
Phytophtora (Phytophtora nicotianae PHYTNN, *P. capsici* PHYTCP, *P. cactorum* PHYTCC etc.)	Blight of sweet pepper	Water Melon CITLA or cucumber CUMSC	All crops within the group		Sweet pepper CPSAN

Table 6: DISEASES ON VEGETABLE BRASSICAS:

Leafy brassicas: BRSOA kale *Brassica oleracea* var. *acephala* including collards and curly kale *Brassica oleracea* var. *sabellica* BRSOC; BRSPK Peking cabbage *Brassica pekinensis;* BRSCH *B. chinensis* [synonyms: *B. rapa* subsp. chinensis; *B. chinensis* var. *parachinensis*; *B. parachinensis*]; BRSNO Mitzuna *Brassica rapa* subsp. *nipposinica*; BRSPE Komatsuna *Brassica perviridis;* SINSP mustard *Sinapis* sp. (red, white brown black); DIPER Rockets *Diplotaxis erucoides* and ERUVE *Eruca vesicaria subsp. sativa*.

Head brassicas: (Head) Cabbage (includes red BRSOR *Brassica oleracea* var. *capitata* f. *rubra* and white *Brassica oleracea* var. *capitata* f. *alba* BRSOL); BRSON *Brassica oleracea* var. *capitata* f. *conica;* BRSOF Brussels sprouts *B. oleracea* var. *gemmifera*; BRSOS Savoy cabbage *B. oleracea* var. *sabauda*.

Flowerhead brassicas: (Flowering brassicas); BRSOB Cauliflower *B. oleracea* var. *botrytis* subvar. *cultiflora*, BRSOK Broccoli, Calabrese, cima di rapa *B. oleracea* var. *italic*; BRSAG Chinese kale (Chinese broccoli) *Brassica alboglabra.*

Root / Stem brassicas and radish crops: BRSNA Swedes *B. napus var. napobrassica*, BRSRR Turnips *B. rapa*, RAPSS Radishes *Raphanus* spp. (including red, white, Black Spanish radish); RAPSR Small radish *Raphanus sativus;* RAPSN Garden radish *Raphanus sativus* var. *niger*; ARWLA Horseradish *Armoracia lapathifolia;* BRSOG Kohlrabi, *B. oleracea* var. *gongylodes.*

Pests		Crops: within the Vegetable Brassicas		Crops: outside the Vegetable Brassicas	
1 **Pathogen species**	2 **Disease group name**	3 **Indicator crops**	4 **Extrapolation to other crops**	5 **Data from these crops can support the indicator crops (reduced data or no data *)**	6 **Extrapolation to crops (reduced or no data*)**
Alternaria spp. (*Alternaria brassicicola ALTEBI, A. brassicae ALTEBA, A. raphani* ALTERP)	Alternaria leaf spot	Cauliflower BRSOB or broccoli BRSOK or Brussels sprouts BRSOF	Leafy and flower head and root brassicas	Oilseed rape BRSNN, Mustard SINSS	Carrot DAUCS Tomato LYPES
Pseudocercosporella capsellae (=Mycosphaerella capsellae) PSDCCA	White leaf spot	Head cabbage BRSON	Leafy and flower head and root brassicas		
Pyrenopeziza brassicae PYRPBR	Light leaf spot	Kales or Collards BRSOA	Leafy and flower head brassicas	Oilseed rape BRSNN	Oilseed rape BRSNN
Mycosphaerella brassicicola MYCOBR	Ring spot	Kales or Collards BRSOA or Brussels sprouts BRSOF	Flower head brassicas and leafy brassicas		Cucumber CUMSC

Colletotrichum higginsianum COLLHG	Anthracnose	Head cabbage BRSON or turnip BRSRR	Leafy and root brassicas	Mustard SINSS	
Botryotinia fuckeliana *BOTRCI*	Gray mold	Head cabbage BRSON or Brussels sprouts		Lettuce LACSA Strawberry FRASS, all cucurbit crops 1CUCF, rose ROSSS, artichoke CYUSC, pea PIBSS, potato SOLTU, leek ALLPO, garden bean PHSVX, grapes VITVI, Beans PHSSS,	Lettuce LACSA, Tomato LYPES
Erysiphe cruciferarum ERYSCR, *Erysiphe polygoni ERYSPG*	Powdery mildews	Head cabbage BRSON or Brussels sprouts BRSOF	Leafy brassicas and flower head brassicas, root brassicae, Swede BRSNA	Cucurbits 1CUCF, Oilseed rape BRSNN Rocket (*Diplotaxis erucoides* DIPER and *Eruca vesicaria subsp. sativa* ERUVE)	

Peronospora parasitica PEROPA *Hyaloperonospora brassicae* HPERBR	Downy mildews	BRSOK Broccoli or Cauliflower BRSOB(any crop where use is on seedlings)	Leafy brassicas, Head cabbages	Lettuce LACSS Onion ALLCE, Oilseed rape BRSNN	
Plasmodiophora brassicae PLADBR	Club root of cabbage	BRSOK Broccoli or Cauliflower BRSOB or Kales or Collards BRSOA	Flower head brassicas and leafy brassicas, Head cabbages	Oilseed rape BRSNN, mustard SINSS	
Leptosphaeria maculans = Phoma lingam LEPTMA	Black leg	BRSOK Broccoli or Cauliflower BRSOB or Kales or Collards BRSOA	Flower head brassicas and leafy brassicas, Head cabbages	Oilseed rape BRSNN	Origano ORISS, Fennel FOESS
The following extrapolation possibilities are proposed to be addressed intables covering generic pests					
Rhizoctonia solani RHIZSO *Fusarium* spp. FUSASP *Pythium* spp. PYTHSP	Damping off	Any vegetable brassica	Leafy and flower head and head and root brassicas	Any relevant crop*	Lettuce LACSS, Tomato LYPES

Sclerotinia sclerotiorum SCLESC *Sclerotinia minor SCLEMI*	Stem rot	BRSOK Broccoli or Cauliflower BRSOB or Kales or Collards BRSOA	Flower head brassicas, leafy brassicas and Head cabbages	Lettuce LACSA, oilseed rape BRSNN	Oilseed rape BRSNN, Lettuce LACSS, Tomato LYPES
Acidovorax valerianella ACVRVA, Pseudomonas sp. ERWICA, Xanthomonas sp. XANTSP	Bacterial disease	Any vegetable brassica	All vegetable brassica		Lettuce LACSS, Herbs
Verticillium spp. VERTSP	Verticillium wilt	Brussels sprouts BRSOF or Head cabbages BRSON		Tomato LYPES, Eggplant SOLME, Capsicum CPSSS	

Table 7: DISEASES ON ALLIUM VEGETABLES

ALLCE Onion *Allium cepa*, ALLAS Shallots *Allium cepa Aggregatum types,* ALLAH Silverskin onions *Allium ampeloprasum f. holmense,* ALLFI Welsh onion (Spring onion, Bunching onion) *Allium fistulosum,* ALLSC Chives *Allium schoenoprasum,* ALLSA Garlic *Allium sativum*, ALLPO Leek *Allium porrum.*

Pest		Crops: within allium vegetables		Crops: outside allium vegetables	
1 **Pathogen species**	**2** **Disease group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Botryotinia porri BOTTPO, *B. squamosa* SCLESQ, *B. alli* BOTRAL	Grey mould bulb rot and collar rot	Onion or Garlic	All Allium ALLSS		
Fusarium oxysporum (f.sp. Cepae) FUSACE	Root rot, Pink root	Onion or Garlic	All Allium ALLSS	Allium ornamental bulbs	Allium ornamental bulbs
Pyrenochaeta terrestris PYRETE	Pink root	Onion or Garlic	All Allium ALLSS		
Davidiella allii-cepae (=Heterosporium allii) CLADAC	Onion leaf spot	Onion or Garlic	All Allium ALLSS	Allium ornamental bulbs	Allium ornamental bulbs

Peronospora destructor PERODE	Downy mildew of onion	Onion or Garlic	All Allium ALLSS		Allium ornamental bulbs
Phytophthora porri PHYTPO	Neck or bulb rot	Leek ALLPO or Onions	Onion ALLCE Welsh Onion ALLFI, Chives ALLSC,		
Stromatinia cepivorum (=Sclerotium cepivorum) SCLOCE	White rot of onion	Onion or Garlic	All Allium ALLSS		
Urocystis colchici (=Urocystis cepulae) UROCCE	Smut of onion	Onion or Garlic	All Allium ALLSS		
Alternaria porri ALTEPO *Pleospora allii (=Stemphylium vesicarium) PLEOAL*	Purple blotch Leaf blight	Onion or Garlic	All Allium ALLSS	Tomato LYPES PotatoSOLTU Pear PYUSS (only for PLEOAL), asparagus ASPSS, allium ornamental bulbs, arachis sp. ARHSS	Tomato LYPES Allium ornamental bulbs, Arachis sp. ARHSS

Puccinia allii PUCCAL, *P. porri* PUCCPO	Rust	Onion or Garlic	All allium ALLSS		Mint MENSS, Tarragon ARTDR
Collectotrichum dematium f.sp circinans	Smudge	Onion ALLCE	All Allium ALLSA		
The following extrapolation possibilities are proposed to be addressed in tables covering generic pests					
Pythium sp. PYTHSP	Damping off	Onion or Garlic	Garlic ALLSA, shallot ALLAS, leek ALLPO		Tomato LYPES
Rhizoctonia spp. RHIZSP (soil borne)	Rhizoctonia rot	Leek ALLPO or onions	All Allium ALLSA		Tomato LYPES

Table 8: DISEASES ON CHENOPODIACEOUS VEGETABLES

Spinach *Spinacia oleracea* SPQOL, Chard *Beta vulgaris* BEAVV, Swiss chard *Beta vulgaris subsp. vulgaris var. flavescens* BEAVF, Beetroot *Beta vulgaris subsp. vulgaris var. conditiva* BEAVD, Garden beet *Beta vulgaris subsp. vulgaris var. lutea* BEAVL, Quinoa *Chenopodium quinoa* CHEQU, White goosefoot (wild spinach) *Chenopodium album* CHEAL

Diseases		**Crops: within the chenopodiaceous vegetables**		**Crops: outside the chenopodiaceous vegetables**	
1 Pathogen species	**2 Disease group name**	**3 Indicator crops**	**4 Extrapolation to other crops**	**5 Data from these crops can support the indicator crops (reduced data or no data *)**	**6 Extrapolation to crops (reduced or no data*)**
Aphanomyces cochlioides APHACO *Aphanomyces cladogamus*	Root rot	Beetroot BEAVD or Spinach BEAVV	To all chenopodiaceous vegetables	Sugarbeet BEAVA*	
Phytophthora PHYTSP				Sugarbeet BEAVA	
Pythium PYTHSP, *Fusarium* FUSASP				Sugarbeet BEAVA, Carrot DAUCA, Lettuce LACSA	Carrot DAUCA, Lettuce LACSA, Rocket ERUVE/DIPER, Fennel FOEVA
Thanatephorus cucumeris RHIZSO				Sugarbeet BEAVA, Lettuce LACSA, Brassica 1BRSG, Carrot DAUCA	
Pleospora betae PLEOBJ				Sugarbeet BEAVA*, Any umbelliferous (Phoma)	Any umbelliferous
Cercospora beticola	Cercospora Leaf spot	Spinach	To all chenopodiaceous vegetables		
	Powdery mildew	Spinach	To all chenopodiaceous vegetables		

Table 9: DISEASES ON ROOT, STEM AND TUBER VEGETABLES

Cassava roots/manioc *Manihot esculenta* MANES, Sweet potatoes *Ipomoea batatas* IPOBA, Yams *Dioscorea spp.* DIUSS, Arrowroots *Maranta arundinacea* MARAR, Taro *Colocasia esculenta* CXSES

Diseases		Crops: within Tropical root and tuber		Crops: outside Tropical root and tuber vegetables	
1 Pathogen species	2 Pest group name	3 Indicator crops	4 Extrapolation to other crops	5 Data from these crops can support the indicator crops (reduced data or no data *)	6 Extrapolation to crops (reduced or no data*)
Drechslera euphorbiae (=Helminthosporium euphorbiae) DRECEU	Silvery gall	Sweet potatoes IPOBA	All tropical root vegetables	Potato SOLTU	
Phoma sp. PHOMSP	Canker, Phoma leaf spot	Yam DIUSS		Potato SOLTU	
*Colletotrichum sp.*COLLSP	Anthracnose			Potato SOLTU, Tomato LYPES	
Phytophthora colocasiae PHYTOO	Leaf blight	Taro CXSES		Potato SOLTU, Tomato LYPES	

Table 10: DAMPING-OFF, SOIL AND AIRBORN FUNGAL DISEASES Table a Extrapolation table for damping off effects

Diseases		Cr	
1 **Pest species**	**2** **Pest group name**	**3** **Indicator crops** *Data from any other relevant crop, if available, can support (reduced data) the indicator crop*	**4** **Extrapolation to other crops or crop groups**
Pythium sp. PYTHSP *Oomycetes* 1OOMYC	Damping off	Lettuce LACSA or vegetable brassicae or Cucumber CUMSA or Melon CUMME or Spinach SPQOL or Beet BEASS or Tomato LYPES	All crops where damping off caused by Oomycetes appear
Aphanomyces sp. APHASP		Pea PIBSX or Sugar beet BEAVA	Other leguminous crops Other beet crops (*Beta* sp. BEASS), Chenopodioideae 1CHES
Alternaria sp. ALTESP		Head cabbage BRSON or Tomato LYPES or Pepper CPSAN or Cucurbitaceae 1CUCF	All crops where alternaria damping-off appear
Fusarium sp. FUSASP		Tomato LYPES or Cucurbitaceae 1CUCF (both grown in the soil)	All crops where Fusarium damping off appear
Thanatephorus cucumeris (=*Rhizoctonia solani*) RHIZSO		Potato SOLTU (AG3, AG2-1), or Lettuce LACSA (AG4), or Cucurbitaceae 1CUCF (in soil) (AG4 (AG5)), or Vegetable brassica (AG2-1, AG4) or Beets BEAVD (AG2-2, AG4, AG1, AG3, AG5) or Fabaceae 1LEGF (AG4, AG2-2) or Strawberry FRASS	All crops where damping off caused by the same AG-groups appear

Table b Extrapolation table for other crop effects other than damping off

Diseases	Crops	

1 **Pest species**	2 **Pest group name**	3 **Indicator crops** *Data from any other relevant crop, if available, can support (reduced data) the indicator crop*	4 **Extrapolation to other crops or crop groups**
Alternaria sp. ALTESP	Leaf spots	Chinese cabbage BRSPK or Carrot DAUCA or Potato SOLTU	All crops where alternaria appear
	Fruit spot	Tomato LYPES	All crops where alternaria appear
Fusarium sp. FUSASP	Root rot and wilt	Any relevant crop	Any crop within the same crop botanical family
Pythium sp. PYTHSP	Root rot	Any relevant crop	Any crop within the same crop botanical family
Phytophthora sp. PHYTSP (except *P. infestans*)	Downy mildew	Potato SOLTU or Tomato LYPES or cucurbitaceae (depending on P. species)	Any other solanaceae or cucurbitaceae or to other crops with reduced data (depending on P. species)
Phytophthora cinnamomi PHYTCN	Phytophthora root rot	*Chamaecyparis* sp. CHCSS	Any relevant crop

Table 11: Seed borne diseases

Seed borne diseases	Cr op

1 **Pest species**	2 **Pest group name**	3 **Indicator crops** *Data from any other relevant crop, if available, can support (reduced data) the indicator crop*	4 **Extrapolation to other crops[1]**
Alternaria sp. ALTESP e.g. *A. alternata* ALTEAL *A.dauci* ALTEDA *A.brassicae* ALTEBA *A.brassicicola* ALTEBI *A.raphani* ALTERP *A.cichorii* ALTECC *A.porri* ALTEPO *A.cucumerina* ALTECU *A.solani* ALTESO	Leaf spot	Tomato LYPES or Any Umbelliferous or Any brassica vegetable or Any Asteraceae 1COMF or Any Allium ALLSS or Cucumber CUMSC or Melon CUMME or Fabacae 1LEGF	To all host crops of *Alternaria* or Stemphyliose
Stemphylium sp. STEMSP *Pleospora herbarum* (=*Stemphylium botryosum)* PLEOHE	Stemphyliose leaf spot/blight		
Cercospora sp. CERCSP e.g. *C. beticola* CERCBE, *C.kikuchii C.apii* CERCAP, *C.foeniculi (=Passalora puncta)* CERCPE, *C. carotae* CERCCA	Leaf spot	Any Chenopodiaceae 1CHES or Fabaceae 1LEGF or Umbelliferous 1UMBF	To all host crops of *Cercospora*

B. EXTRAPOLATION TABLES FOR EFFICACY OF INSECTICIDES

Table 1: INSECTICIDES - PESTS ON CUCURBITACEAE

Cucumber *Cucumis sativus* CUMSC, Courgette *Cucurbita pepo* var. *giromontiina* (including zucchini and marrow squash) CUUPG, Marrow *Cucurbita maxima* (Squash and pattypan/scallop squash and gourds) CUUPE, Pumpkin *Cucurbita pepo var. melopepo* CUUPM, Melon *Cucumis melo* CUMME, Water Melon *Citrullus lanatus* CITLA

Pest		**Crop: within the Cucurbitaceae**		**Crops: outside Cucurbitaceae**	
1 **Pest species**	**2** **Pest group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Bemisia tabaci *Trialeurodes* spp.	Whiteflies	water melon or courgette	All crops within the crop group	Phaseolus spp., cotton , strawberry , Solanaceous crops	Poinsettia , Gerbera spp. asteracea, rose , tobacco, lettuce, rubus spp., ribes spp.
Liriomyza trifolii , *Liriomyza* spp.	Dipteran leaf miners	water melon or courgette	All crops within the crop group	Phaseolus spp., field bean, lettuce, Solanaceous crops	rhubarb, spinach, celeriac, celery, lambs lettuce, Gerbera spp., chrysanthemum, gypsophila

Delia platura	Root and soil flies	water melon or courgette	All crops within the crop group	field bean , potato , soybean, Phaseolus spp., spinach, asparagus	Freesia
Aphis gossypii and *Myzus persicae*, *Myzus* spp.	Aphids	water melon or courgette	All crops within the crop group	strawberry, cotton , Solanaceous crops, Phaseolus spp.	Chrysanthemum, hibiscus, rose
Frankliniella spp., *Thrips* spp.	Thrips	water melon or courgette	All crops within the crop group	strawberry, Solanaceous crops, Phaseolus spp., cotton, flowering ornamentals	
Tetranychus urticae	Spider mites	water melon or courgette	All crops within the crop group	Phaseolus spp. , ornamentals, cotton , soybean, strawberry, Solanaceous crops	Passion fruit

Table 2: PESTS ON VEGETABLE BRASSICAS

Leafy brassicas: BRSOA kale *Brassica oleracea* var. *acephala* including collards and curly kale *Brassica oleracea* var. *sabellica* BRSOC; BRSPK Peking cabbage *Brassica pekinensis;* BRSCH *B. chinensis* [synonyms: *B. rapa* subsp. chinensis; *B. chinensis* var. *parachinensis*; *B. parachinensis*]; BRSNO Mitzuna *Brassica rapa* subsp. *nipposinica*; BRSPE Komatsuna *Brassica perviridis;* SINSP mustard *Sinapis* sp. (red, white brown black); DIPER Rockets *Diplotaxis erucoides* and ERUVE *Eruca vesicaria subsp. sativa*.

Head brassicas: (Head) Cabbage (includes red BRSOR *Brassica oleracea* var. *capitata* f. *rubra* and white *Brassica oleracea* var. *capitata* f. *alba* BRSOL); BRSON *Brassica oleracea* var. *capitata* f. *conica;* BRSOF Brussels sprouts *B. oleracea* var. *gemmifera*; BRSOS Savoy cabbage *B. oleracea* var. *sabauda.*

Flowerhead brassicas: (Flowering brassicas); BRSOB Cauliflower *B. oleracea* var*. botrytis* subvar. *cultiflora*, BRSOK Broccoli, Calabrese, cima di rapa *B. oleracea* var*. italic*; BRSAG Chinese kale (Chinese broccoli) *Brassica alboglabra.*

Root / Stem brassicas and radish crops: BRSNA Swedes *B. napus var. napobrassica*, BRSRR Turnips *B. rapa*, RAPSS Radishes *Raphanus* sp. (including red, white, Black Spanish radish); RAPSR Small radish *Raphanus sativus;* RAPSN Garden radish *Raphanus sativus* var. *niger*; ARWLA Horseradish *Armoracia lapathifolia;* BRSOG Kohlrabi, *B. oleracea* var. *gongylodes.*

Pests		**Crops: within Vegetable Brassicas**		**Crops: outside Vegetable Brassicas**	
1 **Pest species**	**2** **Pest group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Delia radicum (soil), *Delia* sp	Root flies	Cauliflower or Turnip or Radish	Leafy and flower head and head brassicas Root brassicas	Onion	Oilseed rape (if a pest problem) , Spinach, Herbs Beans, Onion
Delia radicum (leaves) *D. floralis*	Flies	Head cabbage and Brussels sprouts	Leafy brassicas	*Delia radicum* (leaves) *D. floralis*	
Delia radicum (flower buds)	Flies	Broccoli or Cauliflower	Flowerhead brassicas	*Delia radicum* (flower buds)	

Brevicoryne brassicae *Lipaphis erysimi*	Aphids	Head cabbage	Leaf and flower head and root brassicas	Oilseed rape any other crop for aphids other than *Brevicoryne brassicae*	Oilseed rape, Lettuce, Tomato, Herbs
Myzus persicae		head cabbage		Lettuce	* for all: Gherkins, Blanched celery and green celery, Courgettes, Patisson, Celeriac, Florence fennel, Fennel, Beetroot, Leek, Rhubarb, Lettuce, Green Belgian endive, Endive, Spinach, Lamb's lettuce, Witloof and chicory roots (root growing culture), French beans, Slicing beans, Runner bean, Parsley, Chervil and Celery leaves, Ornamentals
Aleurodes proletella	Whiteflies	head cabbage and Brussels sprouts	Leafy and flower head ,savoy cabbage and root brassicas	Ornamentals	Celery
Phyllotreta sp.	Flea beetles	Any vegetable brassica	Leafy and flower head and head and root brassicas	Spring oilseed rape, Tomato Cucumber	Oilseed rape (*Phyllotreta* only), Tomato, Herbs

Putella xylostella *Mamestra brassicae* or *Pieris brassicae, pieris rapae*	Caterpillars	Any vegetable brassica	Leafy and flower head and root brassicas	Oil seed rape	Oil seed rape,Herbs
Meligethes sp.	pollen beetle	Broccoli or Cauliflower	All cabbage species	Oil seed rape* or Mustard	Oilseed rape, Mustard, Herbs
Dasineura sp., Contarinia nasturtii	Gall midges	Broccoli or Cauliflower	Leafy and flower head and head and root brassicas		Herbs Oilseed rape
Liriomyza sp LIRISP, Phytomyza rufipes PHYYRU, Scaptomyza flava SCATFL	Stem and leaf miner flies	Any vegetable brassicas	All vegetable brassicas	Oil seed rape BRSNN or Mustard SINSS	Tomato LYPES, Lettuce LACSA, Spinach BEAVV Herbs, Celery APUGV
Ceutorhynchus quardridens (=Ceutorhynchus pallidactyrus) CEUTQU	Cabbage weevil	Any vegetable brassicas	All vegetable brassicas	Oil seed rape BRSNN	

Table 3: PESTS ON RHUBARB AND ASPARAGUS
Rhubarb *Rheum rhabarbarum* RHERH, Asparagus *Asparagus officinalis* ASPOF

Pests		Crops: rhubarb and asparagus		Crops: outside rhubarb and asparagus	
1 **Pest species**	2 **Pest group name**	3 **Indicator crops**	4 **Extrapolation to other crops**	5 **Data from these crops can support the indicator crops (reduced data or no data *)**	6 **Extrapolation to crops (reduced or no data*)**
Delia platura, *Delia florilega*, Delia sp.	Rootflies	Asparagus		*Phaseolus* spp. , *Phaseolus* spp. and any other crops in which the pest occurs	Cucurbitaceae, Allium sp. Cucurbitaceae, *Allium* spp.
Platyparea poeciloptera, *Ophiomyia simplex*	Asparagus flies				
Hypopta caestrum	Caterpillars			Any crop affected by this pest	Any crop affected by this pest

Ostrinia nubilalis,				Zea mays, *Phaseolus* spp., Pepper	Pepper
Autographa gamma				Any vegetable brassica, Lettuce, Allium vegetables	
Crioceris asparagi, *Crioceris duodecimpunctata*, *Crioceris sp.*	Leaf beetles			Umbelliferous crops and any other crop affected by these pests	Any other crop affected by these pests
Collembola	Collembola			Root brassicas, Cucumber	
Blaniulus guttulatus	Millipedes			Cucumber, Strawberry	

Table 4: PESTS ON LEGUME VEGETABLES

Vicia faba VICFX, *Phaseolus* sp. PHSSS, *Pisum sativum* PIBSX, *Lens culinaris* LENCU, *Cicer arietinum* CIEAR, *Arachis hypogea* ARHHY

Pests		**Crop: within Peas and Beans**		**Crops: outside Peas and beans**	
1 **Pest species**	**2** **Pest group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Myzus persicae, Aphis fabae , Macrosiphum euphorbiae, *Aulacorthum solani, Uroleucon sonchi Megoura viciae*	Leaf aphids (field conditions)	Any *Phaseolus* sp. or *Vicia* sp. or *Pisum sativum* or chickpea	All *Pisum* sp. and *Phaseolus* sp. chickpea, Lentils and *Vicia sp*	Ornamentals, Peach Chenopodioideae, Cucumber Chinese cabbage, Solanaceae, Strawberry	Herbs, Ornamentals, Solanaceae, Strawberry

Aphis gossypii and two other aphid species among *Myzus persicae , Aphis* sp., *Macrosiphum euphorbiae*, *Aulacorthum solani*	Leaf aphids (protected conditions)	Any *Phaseolus* sp.	All *Phaseolus* sp. , Lentils	Cucurbitaceae*, Ornamentals, Solanaceae	Herbs, Ornamentals, Solanaceous crops, Strawberries
Acyrthosiphon pisum or *Acyrthosiphon* sp.	Leaf aphids	Any *Pisum* sp.	All *Phaseolus* sp.		
Delia sp.	Bean seed fly	Any *Phaseolus* sp.	All *Pisum* sp. and *Phaseolus* sp., *Vicia sp*., Chickpea	Allium vegetables	Asparagus , Spinach , Allium vegetables, Cucurbitaceae Freesia
Liriomyza sp. , Chromatomyia syngenesiae, *Phytomyza* sp.	Leaf miner flies	Any *Phaseolus* sp. or *Pisum* sp., Chickpea	All *Phaseolus* sp. or *Pisum* sp., Chickpea, *Vicia sp*	Tomato *, Ornamentals, Leafy vegetables, Vegetable brassicas and cucumber	Tomato, Cucurbitaceae, Alliaceae
Contarinia pisi, Contarinia sp.	Gall midge	Any *Pisum* sp.	Lentil, All *Vicia sp*	Vegetable brassica	
Tetranychus urticae	Spider mites	Any *Phaseolus* sp.	All *Phaseolus* sp.	Cucurbitaceae, Ornamentals	Cucurbitaceae, Ornamentals, Tomato

Chrysodeixis chalcites	Caterpillars	Any *Phaseolus* sp. or *Pisum* sp., chickpea	All *Phaseolus* sp. or *Pisum* sp., Chickpea, Lentils	*Chrysodeixis chalcites* in any crop*	
Spodoptera exigua				*Spodoptera exigua* in any crop*	
Autographa gamma or Mamestra sp.				*Autographa gamma or Mamestra* sp. in any crop*	

Ostrinia sp. , *Helicoverpa armigera*				Cucurbitaceae , Solanaceous crops, Maize	
Cydia nigricans	Caterpillars	Any *Pisum* sp.	Lentil, All *Pisum sp*	Cucurbitaceae	Herbs
Bruchus sp. *Acanthoscelides* sp.	Weevils	Any *Pisum* sp. or *Phaseolus* sp.	All *Phaseolus* sp. , Broad beans, Lentil, Field beans, Chickpea and *Vicia sp*		Pulses forage
Sitona lineatus		Any *Pisum* sp	All *Phaseolus* sp. and *Vicia sp*	Soybean, *Lupinus sp*	Soybean, *Lupinus sp, Pulses forage*
Frankliniella sp. (except F. occidentalis [1]*),* *Thrips* sp. , *Kakothrips* sp.	Thrips	Any *Pisum* sp. or *Phaseolus* sp.	All *Phaseolus* sp., All*Pisum* sp., *Vicia sp*	Tomato, Ornamentals, Allium vegetables, Brassica vegetables	Tobacco Ornamentals
Ophiomyia phaseolus	Bean fly (Bean stem maggot)	Any *Phaseolus* sp.	All *Phaseolus* sp., All *Pisum* sp., *Vicia sp and* all relevant leguminous crops		
Agrotias sp	Cut worms	Any *Phaseolus* sp.	All *Phaseolus* sp., All *Pisum* sp., *Vicia sp and* all relevant leguminous crops		

Table 5: PESTS IN UMBELLIFEROUS CROPS

DAUCA Carrot *Daucus carota,* APUGV Celery *Apium graveolens* and APUGR Celeriac *Apium graveolens* var. *rapaceum,* FOEVD Fennel *Foeniculum vulgare* var. *dulce,* PAVSA Parsnip *Pastinaca sativa,* PARCR Parsley *Petroselinum crispum,* CORSA Coriander *Coriandrum sativum,* CRYCA Caraway *Caraway*

Pests		**Crops: within the Umbelliferae**		**Crops: outside the Umbelliferae**	
1 **Pest species**	**2** **Pest group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Aulacorthum solani; *Cavariella aegopodii*; *Dysaphis crataegi*; *Hyadaphis foeniculi* ; *Macrosiphum euphorbiae*; *Myzus persicae* ; *Semiaphis dauci*	Aphididae	Any umbelliferous	All umbelliferous	Lettuce Cucumber	Black salsify
Pemphigus sp. , *Pemphigus phenax*	Root aphids	Carrot or Fennel		Lettuce, Chicory	Herbs
Chamaepsila rosae, (syn. *Psila rosae*)	Carrot root fly	Carrot	All other umbelliferous	Onion, Vegetable brassicas	Herbs, Crops for seed production, Spinach

Depressaria pastinacella, *Plutella xylostella* , *Hepialus humuli*, *Hepialus lupulinus*, *Autographa* sp. , *Mamestra* sp. and other caterpillar species	Caterpillars	Celery or Parsley or Caraway	All umbelliferous	Lettuce All brassicas	
Phyllotreta cruciferae	Flea beetles	Any umbelliferous	All umbelliferous	All brassicas*	
Napomyza carotae,	Mining fly (damaging roots)	Carrot or Celery	All umbelliferous	Lettuce, Lambs lettuce	Herbs Ornamentals Leafy brassicas
Liriomyza sp. , *Euleia sp. (=Philophylla sp.)*	Mining fly (damaging leaves)				
Trioza apicalis,	Carrot psyllid	Carrot	Parsnips		
Cixius wagneri	Leafhopper	Celeriac	Carrot, Fennel	Strawberry Ornamentals	Herbs
Thrips sp	Thrips	Fennel	Carrot, celeriac	Leek	
Lygus rugulipennis	Bugs	Carrot, Celery		Cucumber, Lettuce, strawberry	

Table 6: PESTS ON LEAFY VEGETABLES

Asteraceae : LACSA lettuce *Lactuca sativa*, LACSE prickly lettuce *Lactuca serriola*, CICEN endive *Cichorium endivia,* CICIN chicory *Cichorium intybus,* CICIF chicory witloof *Cichorium intybus* var. *foliosum,* TAROF dandelion *Taraxacum officinale.*

Crucifereae : LEPSA garden cress *Lepidium sativum,* BARVE landcress *Barbarea verna,* DIPER Rockets *Diplotaxis erucoides* and ERUVE *Eruca vesicaria* subsp. *Sativa*, NAAOF watercress *Nasturtium officinale,* BRSJU leaf mustard *Brassica juncea.*

Chenopodioideae : SPQOL spinach *Spinacia oleracea,* BEAVV chard *Beta vulgaris* subsp. *vulgaris.*

Other: VLLLO lamb's lettuce *Valerianella locusta,* SANMI burnet *Sanguisorba minor,* VERBE cow cress *Veronica beccabunga,* VLLER Italian corn salad *Valerianella eriocarpa,* POROS purslane *Portulaca oleracea* subsp. *sativa.*

Pest		**Crop: within the leafy vegetables**		**Crops: outside leafy vegetables**	
1 **Pest species**	**2** **Pest group name**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Pemphigus bursarius	Aphids	kales	chicory, witloof, lettuce	Carrot, Tomato,	umberliferous herbs,
Nasonovia ribisnigri[a], *Myzus persicae*, *Macrosiphum* sp., *Aphis.gossypii*, *Acyrthosiphon* sp., *Aulacorthum* sp., *Uroleucon sonchi*		kale	Leafy vegetables of the Asteraceae, Crucifereae, Chenopodioideae (particularly prickly lettuce, dandelion, spinach, chicory, witloof, rocket, chard), Italian corn salad, lamb's lettuce	Cucurbitaceae, Solanaceae, Brassicaceae, leguminous vegetables	Umbelliferae, Alliaceae, ornamentals, fresh herbs

Liriomyza sp., *Pegomya* sp., *Phytomyza* sp.	Mining flies	kale	Leafy vegetables of the Asteraceae, Crucifereae , Chenopodioideae (prickly lettuce, spinach, witloof, rocket, chard, lamb's lettuce	Cucurbitaceae 1, beets, leguminous vegetables, Solanacea	Celery, parsley, ornamentals, fresh herbs
Pegomya hyoscyami (Mangold fly)		Spinach	Leafy vegetables of the Asteraceae, Crucifereae, Chenopodioideae	Beets	
Delia platura	Root flies	Spinach	Leafy vegetables of the Asteraceae, Crucifereae, Chenopodioideae, Lamb's lettuce	Beans, cabbage, umbelliferous vegetables, onion	Fresh herbs
Autographa gamma., *Mamestra* sp., *Spodoptera* sp.	Caterpillars	Lettuce or Kale	Leafy vegetables of the Asteraceae, Crucifereae, Chenopodioideae (particularly prickly lettuce, dandelion, spinach, chicory, witloof, rocket, chard), , lamb's lettuce	Solanaceae, Crucifereae, beans, beets	Umbelliferae, beetroot, fresh herbs, ornamentals
Trialeurodes sp. , *Bemisia* sp.	Whiteflies	Lettuce or Kale	Leafy vegetables of the Asteraceae, Crucifereae, Chenopodioideae(particula rly prickly lettuce , dandelion, rocket),	Cucurbitaceae*, Solanaceae*, strawberry*	Tobacco

Thrips tabaci., *Frankliniella* occidentalis , Thysanoptera	Thrips	Lettuce or Kale	Leafy vegetables of the Asteraceae, Crucifereae , Chenopodioideae (particularly, chicory , witloof, rocket),	Solanaceae, Cucurbitaceae, beans, Crucifereae, alliums, ornamentals	Fresh herbs
Lygus rugulipennis	Bishop bug	Lettuce	chicory, witloof, salad rocket	Cucurbitaceae, Crucifereae	

Table 7: PESTS ON ALLIUM VEGETABLES
ALLCE Onion *Allium cepa,* ALLAS Shallots *Allium cepa Aggregatum types,* ALLAH Silverskin onions *Allium ampeloprasum f. holmense,* ALLFI Welsh onion (Spring onion, Bunching onion) *Allium fistulosum,* ALLSC Chives *Allium schoenoprasum,* ALLSA Garlic *Allium sativum,* ALLPO Leek *Allium porrum*

Pest	**Crop: allium vegetables**[i]	

1 [i] **Pest species**	2 **Pest group name**	3 [i] **Indicator crops within the crop group**	4 **Extrapolation to other crops within the group**	5 [i] **Extrapolation from crops outside this crop group that enables reduced or no data* on the indicator crops**	6 [i] **Extrapolation to crops outside the crop group with reduced or no data***
Delia antiqua	Onion fly	onion	Allium vegetables		herbs and flowered seed crops**,** herbs
Delia platura	Onion maggot	onion	Allium vegetables	tomato potato cucumber melon garden bean	herbs and flowered seed crops herbs, zucchini gherkin carnation sword lily radish turnip faba bean asparagus spinach

Thrips tabaci	Onion thrips	onion or leek	Allium vegetables	potato lucerne beta beet cucumber melon strawberry cabbage tomato	carnation ornemental crops, gherkin zucchini garden vegetables, herbs and flowered seed crops, herbs, eggplant common fennel sweet pepper
Acrolepiopsis assectella	Leek moth	onion	Allium vegetables		herbs and flowered seed crops
Myzus ascalonicus	Shallot aphid	onion	Allium vegetables	Potato strawberry beta beet lettuce tomato cucumber	herbs, herbs and flowered seed crops, endive eggplant sweet pepper , wild lettuce spinach
Dyspessa ulula	Garlic borer	Onion	Allium vegetables		

Phytomyza gymnostoma	Leaf miners	Onion	Allium vegetables		
Aceria tulipae	Wheat curl mite	Garlic	Shallot		

Table 8: PESTS ON FRUITING SOLANACEOUS CROPS

LYPES Tomato *Solanum lycopersicum*, SOLME Aubergine *Solanum melongena*, CPSAN Sweet Pepper *Capsicum annuum*, CPSFR Chilli *Capsicum frutescens*, PHYSS *Physalis* sp., SOLMU Pepino *Solanum muricatum*

Pests		**Crops: within Fruiting Solanaceous crops**		**Crops: outside Fruiting Solanaceous crops**	
Pest species	**2** **Pest group**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**
Aphis fabae	Aphids	Tomato	Sweet pepper	Potato, Bean, Garden Carrot, Beta Beet, Field Bean, Strawberry	Faba bean , Field bean, Ornamental crops, Garden bean, Tobacco, Lettuce, Potato , Spinach , Tropical root vegetables

Aphis gossypii		Tomato	Eggplant, Sweet pepper	Cucurbitaceae, Strawberry, Lettuce, Cotton	Zucchini, Mallow, Other Ornamental Crops, Citrus, herbs
Myzus persicae *Macrosiphum euphorbiae*		Tomato	Eggplant , Sweet pepper	Potato, Cabbage, Cucumber, Melon, Lettuce, Strawberry, Rape, Lettuce, Beets	Chicory, Zucchini, Spinach, Citrus, Ornamental Crops: Floral crops (Chrysanthemum, Dahlia, Carnation, Etc.), herbs
Aculops lycopersici	Bud and rust mites	Tomato	Eggplant	Potato	
Polyphagotarsonemus latus	Broad mite	Eggplant	Tomato		Common ivy
Tetranychus sp. *Tetranychus evansi* *Tetranychus urticae*[1]	Spider mites	Tomato	Sweet pepper , Eggplant,	Potato, Garden Bean, Cucurbitaceae	Cotton, Relevant seed crops,Ornamentals, Tobacco, Cucurbitaceae, Herbs
Leptinotarsa decemlineata	Colorado beetle	Tomato	Eggplant, sweet pepper	Potato	
Ostrinia nubilalis	European corn borer	Tomato	Eggplant , Sweet pepper	Maize * Fabaceae	Hop, Raspberry, Gladiolus
Phthorimaea operculella, *Tuta absoluta*	Leaf miners	Tomato	Eggplant	Potato	Tobacco
Liriomyza sp.	Stem and leaf miner flies	Tomato	Sweet pepper, Chilli pepper, Eggplant	Cucumber, Lettuce, Cabbage, Potato, Rape, Garden bean, Melon	Chicory , Celery, Ornamentals (Chrysanthemum), Gerbera, Beta beet, Pea
Helicoverpa armigera	Bollworms	Tomato	Eggplant, Sweet pepper	Maize, Lettuce	Cotton, Tobacco, Artichoke, Carnation, Fabaceae

Autographa gamma, *Lacanobia oleracea* (=*Mamestra oleracea)*	Caterpillars	Tomato	Eggplant, Sweet pepper	Potato, Beta beet, Cereals, Maize, Brassicaceae, Beta beet, Lettuce	Flax , Asparagus
Metcafa prunosa	Leaf hopper	Tomato	Egg plant, Sweet pepper	Potato	Trees and bushes: Magnolia, Olive, Herbs, Ornamentals

C. EXTRAPOLATION TABLES FOR CROP SAFETY OF FUNGICIDES AND INSECTICIDES

The extrapolation tables should be used in conjunction with efficacy extrapolation guidelines. The tables provide detailed lists of acceptable extrapolations organized by crop groups for the regulatory authority and applicants in the context of the registration of plant protection products for minor uses. It is important to ensure that expert judgment and regulatory experience are employed when using these tables. The regulatory authority excludes liability as to the reliability of the information provided through these tables.

For seed treatments, indicator crops should include seeds of similar or smaller size. Specific trials with insecticides and fungicides are not essential for foliar treatment. Observations in efficacy or residue trials are usually acceptable. For seed treatment a germination study on the indicator crop is usually necessary.

Table 1. VEGETABLE BRASSICAS

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)

Type of application	Type of application	Crop	Crop	Crop	Crop
Seed treatment		Cauliflower BRSOB	Leafy and flower head and head and root brassicas	Lettuce LACSA	
Soil treatment		Any			
Foliar treatment	Before heading	Head cabbage			
	After heading	Head cabbage and Broccoli BRSOK or cauliflower BRSOB			

Table 2: LEAFY VEGETABLES

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Kale and Spinach BEAVV or Lettuce LACSS	All leafy vegetables	Head brasiccas	
Soil treatment				
Foliar treatment				

Table 3: CUCURBITACEAE

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Cucumber CUMSC or water melon CITLA	All the crops within the crop group		
Soil treatment				
Foliar treatment				

Table 4: ALLIUM VEGETABLES

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Onion ALLCE and garlic	All Allium		
Soil treatment				
Foliar treatment				

Table 5: PEAS AND BEANS

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Green grams and French beans or snow peas	All crops within the Crop group		
Soil treatment	French beans PHSSS or Snowpeas PIBSX			
Foliar treatment				

Table 6: UMBELLIFEROUS

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Carrot DAUCSA or coriander CORSA	All crops within the crop group		
Soil treatment				
Foliar treatment				

Table 7: FRUITING VEGETABLES OF SOLANACEAE

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Tomato LYPES	All crops within the crop group		
Soil treatment				
Foliar treatment				

Table 8: RHUBARB AND ASPARAGUS

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Rhubarb RHERH or Asparagus ASPOF	Rhubarb RHERH or Asparagus ASPOF		
Soil treatment				
Foliar treatment				

Table 9: ROOT/STEM TUBER VEGETABLES

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Potato and sweet potato	All crops within the crop group		
Soil treatment				
Foliar treatment				

Table 10: CHENOPODIACEOUS VEGETABLES

Treatment type	Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment	Spinach BEAVV	All crops within the crop group		
Soil treatment				
Foliar treatment				

D. EXTRAPOLATION TABLES for EFFICACY of HERBICIDES

Table 1: WEEDS IN VEGETABLE BRASSICAS

Leafy brassicas: BRSOA kale *Brassica oleracea* var. *acephala* including collards and curly kale *Brassica oleracea* var. *sabellica* BRSOC; BRSPK Peking cabbage *Brassica pekinensis;* BRSCH *B. chinensis* [synonyms: *B. rapa* subsp. chinensis; *B. chinensis* var. *parachinensis*; *B. parachinensis*]; BRSNO Mitzuna *Brassica rapa* subsp. *nipposinica*; BRSPE Komatsuna *Brassica perviridis;* SINSP mustard *Sinapis* sp. (red, white brown black); DIPER Rockets *Diplotaxis erucoides* and ERUVE *Eruca vesicaria subsp. sativa*.

Head brassicas: (Head) Cabbage (includes red BRSOR *Brassica oleracea* var. *capitata* f. *rubra* and white *Brassica oleracea* var. *capitata* f. *alba* BRSOL); BRSON *Brassica oleracea* var. *capitata* f. *conica;* BRSOF Brussels sprouts *B. oleracea* var. *gemmifera*; BRSOS Savoy cabbage *B. oleracea* var. *sabauda.*

Flowerhead brassicas: (Flowering brassicas); BRSOB Cauliflower *B. oleracea* var. *botrytis* subvar. *cultiflora*, BRSOK Broccoli, Calabrese, cima di rapa *B. oleracea* var. *italic*; BRSAG Chinese kale (Chinese broccoli) *Brassica alboglabra.*

Root / Stem brassicas and radish crops: BRSNA Swedes *B. napus var. napobrassica*, BRSRR Turnips *B. rapa*, RAPSS Radishes *Raphanus* spp. (including red, white, Black Spanish radish); RAPSR Small radish *Raphanus sativus;* RAPSN Garden radish *Raphanus sativus* var. *niger*; ARWLA Horseradish *Armoracia lapathifolia;* BRSOG Kohlrabi, *B. oleracea* var. *gongylodes.*

Weed		**Crop: Vegetable Brassicas**		**Crop: outside Vegetable Brassicas**	
1*	**2**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no data *)**	**6** **Extrapolation to crops (reduced or no data*)**

Commelina benghalensis, Nicandra physalodes, Oxalis spp, Tagetes minuta, , Brassica napus, Portulaca oleracea, Datura stramonium, *Digitaria scalarum, Setaria verticillata Cynodon dactylon, Eleusine indica, Echinochloa colona, Pennisetum clandestimum*	Dicotyledons Monocotyledons	Cabbage BRSOL or, Broccoli BRSOK, or Cauliflower BRSOB,	Leafy and flower head and head and root brassicas	Other similar growing crops	Other similar growing crops *

*It will be desiarable to have efficacy data on atleast 4 broadleaved weedsin column 1 and atleast 2 annual grass weeds and one perennial grass weed for any product that would be extrapolated on dicotyledon and monocotyledon weeds . However, where efiicacy data on other weeds are provided extrapolation would be applicable on the respective weed species

Table 2: WEEDS IN BETA CROPS

e.g. sugarbeet *Beta vulgaris subsp. altissima var. saccharifera* BEAVA, chard beet/ Leaf beet *Beta vulgaris subsp. vulgaris var. cicla* BEAVV, beet root *Beta vulgaris subsp. vulgaris var. conditiva* BEAVD, fodder beet *Beta vulgaris subsp. vulgaris var. crassa* BEAVC

W		**Crop: within the *Beta* crops**		**Crop: outside the *Beta* crops**	
1	**2**	**3** **Indicator crops**	**4** **Extrapolation to other crops**	**5** **Data from these crops can support the indicator crops (reduced data or no**	**6** **Extrapolation to crops (reduced or no data*)**

Amaranthus (*Amaranthus retroflexus),* Fat hen (*Chenopodium album),* Common Purslane (*Portulaca oleracea , Polygonium spp, Sonchus avennsis* Love grass *Setaria vertcilata, Avena fatua –*	Dicotyledons Monocotyledon	Any *Beta* species BEASS	Any *Beta* species BEASS		Spinach

Table 3: WEEDS IN BULB VEGETABLES (ALLIUM VEGETABLES)

ALLCE Onion *Allium cepa*, ALLAS Shallots *Allium cepa Aggregatum types,* ALLAH Silverskin onions *Allium ampeloprasum f. holmense*, ALLFI Welsh onion (Spring onion, Bunching onion) *Allium fistulosum,* ALLSC Chives *Allium schoenoprasum,* ALLSA Garlic *Allium sativum*, ALLPO Leek *Allium porrum.*

Weed	**Crop: Bulb Vegetables**	**Crop: outside Bulb Vegetables**

1	2	3 **Indicator crops**	4 **Extrapolation to other crops**	5 **Data from these crops can support the indicator crops (reduced data or no data *)**	6 **Extrapolation to crops (reduced or no data*)**
Purslane (*Portulaca)* Double thorn (*Oxygonum sinuatum*) Devil's thorn (*Emex australis*) Goose grass (*Eleusine indica*) Wild oats (*Avena fatua*), Barnyard grass (*Echinochloa crusgalli*), Nutsedge (*Cyperus spp*)	Dicotyledon Monocotyledons Cyperaceae	Bulb onion or Garlic	All bulb vegetables	Any bulb flower or flower bulbs or leek ALLPO	Other similar growing crops

Table 4: WEEDS IN PEAS AND BEANS: *Pisum* spp. PIBSS, *Vicia* spp. VICSS, and *Phaseolus* spp. PHSSS

Weed	Crop: within the peas and beans	Crop: outside the peas and beans

1	2	3 **Indicator crops**	4 **Extrapolation to other crops**	5 **Data from these crops can support the indicator crops (reduced data or no data *)**	6 **Extrapolation to crops (reduced or no data*)**
Pigweed (*Amaranthus spp*), Sowthistle (*Sonchus eraceae*), Mexican marigold (*Tagetes minuta*), Devil's thorn (*Emex australis)*, Thorn apple *(Datura stramonium*), Macdonald's eye (*Galinsoga parviflora*), Black jack *(Bidens pilosa,* Nightshade *(Solanum nigrum,* Oxalis (*Oxalis spp*)	Dicotyledons	*Phaseolus* spp PHSSS or Any *Pisum* spp. PIBSS or *Vicia* spp. VICSS except *Vicia faba* VICFX	All *Pisum* spp. PIBSS, all *Phaseolus* spp. PHSSS, all *Vicia* spp. VICSS , Green grams , *Dolichos lablab, cow pea Vigna unguiculata*	Soybean GLXMA	Lupin LUPSS, soybean GLXMA

Table 5: WEEDS IN UMBELLIFEROUS CROPS: carrot DAUCA, celery APUGV, celeriac APUGR, fennel FOEVD, parsnip PAVSA, parsley PARCR, coriander CORSA and caraway CRYCA.

Weed	Crop: within the Umbelliferae	Crop: outside the Umbelliferae

1	2	3 **Indicator crops**	4 **Extrapolation to other crops**	5 **Data from these crops can support the indicator crops (reduced data or no data *)**	6 **Extrapolation to crops (reduced or no data*)**
Pigweed (*Amaranthus hybridus*), black jack *(Biden pilosa*), oxalis (*Oxalis latifolia*), chick weed (*Stellaria media* L) and Common lambsquarter (*Chenopodium album)*, Crabgrass (*Digitaria sanguinalis*) Yellow nutsedge (Cyperus esculentus L.),					

Pigweed (*Amaranthus hybridus*), black jack *(Biden pilosa*), oxalis (*Oxalis latifolia*), chick weed (*Stellaria media* L) and Common lambsquarter (*Chenopodium album)*, Crabgrass (*Digitaria sanguinalis*) Yellow nutsedge (Cyperus esculentus L.),	Dicotyledon Monocotyledon Cyperaceae	Carrot ,	Any umbelliferous e.g Raddish ,	Parsley PARCR, coriander CORSA and caraway CRYCA.	

E. EXTRAPOLATION TABLES FOR CROP SAFETY OF HERBICIDES

EXTRAPOLATION REGARDING PROTECTED/OUTDOOR SITUATIONS

Please note that where crops may be grown in both protected and field situations, and where significant differences are expected in pest relevance or crop agronomy between indoor and outdoor situations, it is important to generate a proportion of the data on crops grown in both situations to ensure the product has been tested under a suitable range of typical and challenging conditions.

Table 1: WEEDS IN BETA CROPS e.g. sugarbeet *Beta vulgaris subsp. altissima var. saccharifera* BEAVA, chard beet/ Leaf beet *Beta*

vulgaris subsp. vulgaris var. cicla BEAVV, beet root *Beta vulgaris subsp. vulgaris var. conditiva* BEAVD, fodder beet *Beta vulgaris subsp. vulgaris var. crassa* BEAVC

		Crop: within the *Beta* crops		Crop: outside the *Beta* crops	
1 Treatment type		2 Indicator crops	3 Extrapolation to other crops	4 Data from these crops can support the indicator crops (reduced data or no data *)	5 Extrapolation to crops (reduced or no data*)
	Herbicide group				
Solanum spp, amaranthus (*Amaranthus retroflexus)*, Rag weed *(Ambrosia artemisiifolia),*Fat hen (*Chenopodium album)*, Common Purslae (*Portulaca oleracea , Polygonium spp*	Broadleaved weed Herbicides	Beet root BEAVD	Any Beta species BEASS		
convolvulus arvensis, Love grass *Setaria vertcilata, Avena fatua* – wild oats	Graminicides	Any Beta species BEASS	Any Beta species BEASS		

Table 2: VEGETABLE BRASSICAS (seeded and planted) a

Treatment type		Indicator crops	Extrapolation to other crops	Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)	Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)
	Herbicide group	**Crop**	**Crop**	**Crop**	**Crop**
Commelina bengalensis, Oxalis spp,,Brassica napus, Portulaca oleracea, Datura stramonium, *Digitaria scalarum, Cynodon dactylon, Eleusine indica, Pennisetum clandestimum*	Broad-spectrum herbicides [i]	Cauliflower BRSOB or broccoli BRSOK or cabbage BRSCH	Leafy [i], flower head, head,	Leafy, flower head, head,	
		Any root brassica	root brassicas		
	Graminicides	Any vegetable brassica	Leafy, flower head, head, root brassicas	Leafy, flower head, head, root brassicas	oilseed rape BRSNN

[i] It is possible to extrapolate from sown to planted brassicas, but not vice versa.

[i] Broad-spectrum herbicides include herbicides with any broad-leaved weed activity.

Table 3: BULB VEGETABLES (seeded and planted) b

		Crop: bulb vegetables			
1 Treatment type		2 [i] Indicator crops within the crop group	3 Extrapolation to other crops within the group	4 [i] Extrapolation from crops outside this crop group that enables reduced or no data* on the indicator crops	5 [i] Extrapolation to crops outside the crop group with reduced or no data*
	Herbicide group				
Purslane (*Portulaca Oleraceae*) Double thorn (*Oxygonum sinuatum*) Devil's thorn (*Emex australis*) Thorn apple *(Datura stramonium*)	Broad-spectrum herbicides [i]	Bulb onion or Garlic under protected conditions	Same specific bulb vegetable in the field		Leek ALLPO
Goose grass (*Eleusine indica*) Wild oats (*Avena fatua*), Barnyard grass (*Echinochloa crusgalli*), Nutsedge (*Cyperus spp*)	Graminicides	Any seeded bulb vegetable crop	Transplanted onion ALLCE and shallot ALLAS	Leek, ALLPO, Subgroup 009B (Codex groups)	Leek ALLPO

Generally direct seeded crops are more sensitive to phytotoxicity compared to transplanted crops

[i] For the purpose of this extrapolation table, 'Bulb Vegetables' are defined as: garlic, bulb onion, shallot, salad onion.
[i] Note that it is commonly preferable to have data on several of the crops within the crop group, but data on the indicator crop should be available.
[i] Column 5 identifies whether data from other crops against the same weed may enable a reduction in the amount of data required on the indicator crop (or no data on the indicator crop if the other crop is marked with an asterisk (*)). If this column is blank, the use of data from other crops is not possible/relevant.

[i] Where extrapolation to other crops or crop groups is acceptable, then this is indicated in column 6. In column 6 crops marked with an asterisk (*) indicate that no data are required if appropriate data on the indicator crop is present. Note that column 6 is optional and should only be added to, or applied when there are clear possibilities for extrapolation to other crop groups.

Table 4: PEAS AND BEANS *Pisum* spp. PIBSS, *Vicia* spp. VICSS, and *Phaseolus* spp. PHSSS , Pegion pea

		Crop: within the peas and beans		Crop: outside the peas and beans	
1 **Treatment type**		2 **Indicator crops**	3 **Extrapolation to other crops**	4 **Data from these crops can support the indicator crops (reduced data or no data *)**	5 **Extrapolation to crops (reduced or no data*)**
	Herbicide group				
Devil's thorn (*Emex australis)*, Thorn apple *(Datura stramonium*), Macdonald's eye (*Galinsoga parviflora*),	Broadleaved weed herbicides	*Vicia faba* VICFX	All *Vicia* spp. VICSS	Soybean GLXMA	Lupin LUPSS, soybean GLXMA
Black jack *(Bidens pilosa,* Nightshade *(Solanum nigrum,* Oxalis (*Oxalis spp*)	Broadleaved weed herbicides	*Phaseolus vulgaris* PHSVX	All *Phaseolus* spp. PHSSS, Cow peas , Green grams ,*Dolichos lablab,* Pegion pea (*Cajanus cajan)*	Soybean GLXMA	Lupin LUPSS, soybean GLXMA
Pig weed (*Amaranthus spp*), Sow thistle (*Sonchus oleraceae*), Mexican marigold (*Tagetes minuta*),	Broadleaved weed herbicides	*Pisum sativum* PIBSX	All *Pisum* spp. PIBSS	Soybean GLXMA	Lupin LUPSS, soybean GLXMA
Crabgrass *(Digitaria spp),* Barnyard grass (*Echinochloa crusgalli*), Nutsedge (*Cyperus spp*),	Graminicides	Any pea or bean	All peas and beans	Soybean GLXMA	Lupin LUPSS, soybean GLXMA

Table 5: **UMBELLIFEROUS CROPS: carrot DAUCA, celery APUGV, celeriac APUGR, fennel FOEVD, parsnip PAVSA, parsley PARCR, coriander CORSA, and caraway CRYCA.**

		Crop: within the umbelliferous crops		Crop: outside the umbelliferous crops	
1 **Treatment type**		2 **Indicator crops**	3 **Extrapolation to other crops**	4 **Data from these crops can support the indicator crops (reduced data or no data *)**	5 **Extrapolation to crops (reduced or no data*)**
	Herbicide group				
Pigweed (*Amaranthus hybridus*) Black jack (*Bidens pilosa)* oxalis (*Oxalis latifolia*) Common lambsquarter (*Chenopodium album)*	Broadleaved weed herbicides	Carrot (DAUCA) and Parsnip (PAVSA) or Coriander (CORSA)	All umbelliferous crops (1UMBF)		
Crabgrass (*Digitaria sanguinalis*) Yellow nutsedge (*Cyperus esculentus*).	Graminicides	Carrot and any other umbelliferous crop	All umbelliferous crops		

F. GENERIC EXTRAPOLATION TABLE FOR EFFECTIVENESS OF NEMATICIDES ON VEGETABLES

►NEMATODES

INTRODUCTION

The table provides detailed lists of acceptable extrapolations, for the regulatory authority and applicants, in the context of the registration of plant protection products. The table should be used in conjunction with the crop safety extrapolations. It is important to ensure that expert judgment and regulatory experience are employed when using these tables.

The scope for extrapolation may be extended as data and experience with a certain plant protection product increases. The applicant should always provide appropriate justification and information to support the proposed extrapolation. For example, comparability of target biology may be a relevant factor, either in extrapolating to other target species or for the same target onto another crop. For crops, factors such as comparable growth habit, structure etc. should be considered.

TABLE FORMAT

The main pest species are listed in Column 1 (although this is not exhaustive), and the pest group to which they belong is specified in Column 2. Companies may choose if they wish to provide data only for individual named species, which would then appear individually listed on the label. But underlined species have been identified as key major targets and as such it is advisable to generate data on these. Furthermore, data on these species then allow a claim to be made for the whole pest group (as specified in Column 2), if required. If a claim for the whole pest group is required but there is no underlined species, then data must be generated on all listed species. Column 3 indicates the key indicator crop(s). In some instances this may be only one specified crop. In other cases, when separated by an ‘or’, the company may choose from a range of alternatives within the group. Data generated on crops in Column 3 may be used to extrapolate to all crops listed in Column 4.

NEMATODES	Crops

1 **Pest species**	2 **Pest group name**	3 **Indicator crops Data from any other relevant crop, if available, can support (reduced data) the indicator crop(s)**	4 **Extrapolation to other crops or crop groups**
Any relevant species among: *Meloidogyne sp*. MELGSP (e.g. M. hapla MELGHA or M. incognita MELGIN, M. chitwoodi MELGCH, M. fallax MELGFA, *M. arenaria* MELGAR, *M. javanica* MELGJA)	Root knot nematodes (indoor)	Tomato LYPES, *Phaseolus vulgaris* PHSVX or Spinach, BEAVV or Cucumber CUMSA, or Melon CUMME	All other relevant indoor vegetables
Any relevant species among: *Meloidogyne sp*. MELGSP (e.g. *M. hapla* MELGHA or M. incognita MELGIN, *M. chitwoodi* MELGCH, M. fallax MELGFA, *M. arenaria* MELGAR, *M. javanica* MELGJA)	Root knot nematodes (outdoor)	*Phaseolus vulgaris* PHSVX or Spinach, BEAVV or Carrot or Potatoes or Tomatoes	All other relevant outdoor vegetables
Pratylenchus penetrans PRATPE	Root lesion nematodes	Potato SOLTU or Carrot DAUCS	All other vegetables
Any relevant species among: *Trichodorideae spp*. 1TRIHF *Pratylenchus spp*. 1PARAG *Rotylenchus spp*. 1ROTLG	Free living (Ectoparasitic) nematodes	Carrot DAUCS or Onion ALLCE or Leek or Potatoes SOLTU	All other vegetables
Globodera rostochiensis HETDRO or *G. pallida* HETDPA	Cyst nematodes	Potato SOLTU Tomato LYPES	All other relevant vegetables
Heterodera carotae	Cyst nematodes	Carrot DAUCS	All other relevant vegetables
Ditylenchus dipsaci DITYDI	Stem and bulb nematodes	Onion ALLCE or Field bean VICFX or Garlic ALLSA or Alfalfa MEDSA or Carrot DAUCS	Any other relevant vegetables

Relevant* All vegetables attacked by respective species of nematodes

B. CEREALS

Extrapolation Tables For Efficacy Of Pest Control Products

Introduction

The table provides detailed lists of acceptable extrapolations organized by crop groups, for the regulatory authority and applicants, in the context of the registration of pest control products. It is important to ensure that expert judgment and regulatory experience are employed when using these tables. The tables should be used in conjuction with the above guidelines.

The scope for extrapolation may be extended as data and experience with a certain plant protection products increases. The applicant should always provide appropriate justification and information to support the proposed extrapolation. For example, comparability of biology of the target pest may be a relevant factor, either in extrapolating to other target species or for the same target onto another crop. For crops, factors such as comparable growth habit, structure among others should be considered.

Table format

The main pest species for the crop group are listed in Column 1 (although this is not exhaustive), and the pest group to which they belong is specified in Column 2. Companies may choose if they wish to provide data only for individual named species, which would then appear individually listed on the label. But underlined species have been identified as key major targets and as such it is advisable to generate data on these. Furthermore, data on these species then allow a claim to be made for the whole pest group (as specified in Column 2), if required. If a claim for the whole pest group is required but there is no underlined species, then data must be generated on all listed species.

Column 3 indicates the key indicator crop(s) for the crop group. In some instances this may be only one specified crop. In other cases, when separated by an 'or', the company may choose from a range of alternatives within the group. Data generated on crops in Column 3 may be used to extrapolate to all crops listed in Column 4. However, it is preferable to have data on several of the crops within the crop group, but data on the indicator crop should be available.

Column 5 identifies whether data on other crops against the same target may help to reduce the amount of required data on the

indicator crop. It may be possible for a direct extrapolation without the need for further data on the indicator crop (marked with an asterisk (*)). However, this is dependent on the extent of available data and similarity of crop/target biology. The company should provide an appropriate reasoned case when wanting to use supporting data from other crop groups.

Column 6 gives examples of acceptable extrapolations for a particular pest claim onto other crops. This is not a comprehensive list. Whether extrapolation may be direct (no data, marked with an asterisk (*)), or require additional supporting data on the other crop, will again be dependent on the extent and relevance of the existing database and companies should provide an appropriate reasoned case.

Extrapolation regarding protected/outdoor situations

Please note that where crops may be grown in both protected and field situations, and where significant differences are expected in pest relevance or crop agronomy between indoor and outdoor situations, it is important to generate a proportion of the data on crops grown in both situations to ensure the product has been tested under a suitable range of typical and challenging conditions.

A. EFFECTIVENESS OF PEST CONTROL PRODUCTS IN CEREALS

Barley, Maize, Rice, Oat, Rye, Sorghum, Wheat, Millet, Popcorn, Baby corn and Sweet corn

TABLE 1: EXTRAPOLATION TABLE FOR EFFECTIVENESS OF HERBICIDES

Weed		**Crop: within cereals**		**Crop: outside cereals**	
1	2	3	4	5	6
Weeds	**Weed group**	**Indicator crops**	**Extrapolation to other crops**	**Data from these crops can support the indicator crops (reduced data or no data *)**	**Extrapolation to crops (reduced or no data*)**

Oxalis latifolia L. *Oxygonium sinuatum Hochst* *Erucastrum arabicum* Fisch. & C.A. Mey. *Amaranthus hybridus* L. *Nicandra physalodes* L. *Datura stramonium L*. *Bidens pilosa* L. *Commelina benghalensis* L. *Tagetes minuta* L. *Euphorbia esula* L. *Emex spinosus* L *Tagetes patula* L. *Galinsoga parviflora* L. *Striga hermonthica* De Benth	Broad leaf weeds	Maize	Sorghum Popcorn Sweet corn Baby corn	Other similar growing crops (Pigeon pea, Sunflower, sugarcane- plant crop)	Other similar growing crops (Pigeon pea, Sunflower, sugarcane-plant crop)

Avena fatua L. *Eleusine indica* L. *Setaria verticilata* (L.) P. Beauv *Digitaria scalarum* (Schweinf.) Chiov.	Grasses				
Cyperus species	Sedges				

Polygonum convolvulus *Bidens pilosa* *Nicandra pysalodes* *Gallium spurium* *Oxygonum sinucutum* *Galinsonga paviflora* *Polygonum aviculare* *Chenopodium album* *Capsela bursa pastoris* *Physalis ixorcarpa* *Malva verticilatta* *Tagetes minuta* *Solanum nigrum* *Amaranthus hybridus* *Brassica napus* *Brassica campestris* *Raphanus raphanistrum*	Broad leaf weeds	Wheat or Barley	Barley Oats Rye Upland rice Millet Triticale wheat		

Bromus sterilis *Setaria verticilatta. Setaria pumila* *Avena fatua* *Eleucine indica* *Cynodon* spp.	Grasses		Barley Oats Rye Upland rice Millet Triticale		Pseudocereals
Cyperus species	Sedges		Barley Oats Rye Upland rice Millet Triticale		

Ludwigia adscendens *Monochoria vaginalis* *Ludwigia octavalis* *Ammania coccinea* *Commelina diffusa* *Marsilea minuta* *Spharanthus cyakuloides* *Alternanthera sessilis* *Sphaeranthus africanus* *Eclipta prostrata*	Broad leaf weeds	Paddy rice**			Arrow root Taro
Leptochloa chinensis *Echnochloa colona* *Leersia hexandra* *Echinocloa crusgalli*	Grasses	Paddy rice**			Arrow root Taro
Cyperus difformis *Bolboschoenus maritimus* *Cyperus rotundus*	Sedges				Arrow root Taro

Note: spp. represents more than one species in that genus

*Reduced or no data may be required on case by case basis depending on robustness of data, whether the pest is a major pest on the crop or either the symptoms manifest better on this crop (for column 5).

**Weed species are specific to paddy rice and cannot be extrapolated to upland rice or any other cereals.

TABLE 2: EXTRAPOLATION TABLE FOR EFFECTIVENESS OF INSECTICIDES AND AVICIDES

Pest		**Crop: within cereals**		**Crop: outside cereals**	
1	2	3	4	5	6
Pest species	**Pest group name**	**Indicator crops**	**Extrapolation to other crops**	**Data from these crops can support the indicator crops (reduced data or no data *)**	**Extrapolation to crops (reduced or no data*)**
Spodoptera exempta	African armyworm	Maize	Sweet corn Sorghum Baby corns Rice	Sugarcane Cotton Soybeans Groundnuts Peanuts Tobacco	

Spodoptera frugiperda	Fall armyworm	Maize	Sweet corn Sorghum Baby corns Rice	Sugarcane Cotton Soybeans Groundnuts Peanuts Tobacco	
Busseola fusca *Chilo* spp.	Stem borer/ Stalk borer	Maize	Sweet corn Baby corns Sorghum Rice	Sugarcane	
Rhopalosiphum maidis	Aphids	Sweet corn/Maize	Popcorns Sorghum Baby corn Sweet corn Maize	Sugarcane *Phaseolus* spp. *Pisum* spp. Solanaceae	

Macrotermes spp. *Coptotermes* spp. *Odontotermes* spp..	Termites	Maize	Sweet corn Popcorns Baby corns Upland rice Sorghum	Sugarcane Pigeon peas Cotton Groundnuts Tobacco Beans	
Cicadulina mbila	Leaf hoppers	Maize	Sweet corn Popcorns Baby corns Rice	Sugarcane	
Frankliniella spp.	Thrips	Maize	Sweet corn Popcorns Baby corns	Pigeon peas Cotton	
Heliothis (Helicoverpa) armigera	African bollworm	Maize	Sorghum Sweet corn Popcorns Baby corns	Tobacco Cotton	

Agrotis spp.	Cut worms	Maize	Sweet corn Popcorns Baby corns Sorghum	Amaranth Pigeon pea	
Spodoptera exempta	African armyworm	Wheat	Barley Oats Rye Rice Millet Triticale	Sugarcane	Pseudocereals
Spodoptera frugiperda	Fall armyworm	Wheat	Barley Oats Rye Rice Millet Triticale	Sugarcane	Pseudocereals

Diuraphis noxia	Russian wheat Aphids	Wheat	Barley Oats Rye Upland rice Millet Triticale		
Rhopalosiphum padi; *R. maidis;* *Metopolophium dirhodum*	Other aphids	wheat	Barley Oats Rye Upland rice Millet Triticale		

Agrotis spp.	Cut worms	Wheat	Barley Oats Rye Upland rice Millet Triticale	Tobacco Cotton	Pseudocereals
Haplothrips spp. *Megalurothrips sjostedti* *Frankliniella* spp.	Thrips	Wheat	Barley Oats Rye Upland rice Millet Triticale	Pigeon pea Cowpea Cotton	Pseudocereals
Petrobia latens	Mites	Wheat	Barley Oats Rye Triticale Rice		Pseudocereals

Heliothis (Helicoverpa) armigera	African bollworm	Wheat	Oat Barley Triticale	Tobacco Cotton Sunflower	
Nezara viridula	Green stink Bugs	Wheat	Rice Barley	Soybean Pepper Beans	
Quelea quelea	Weaver birds	Wheat/Sorghum	Barley Rye Millet Wheat Sorghum Oat Rice Triticale	Sunflower	Sunflower

Note: For seed treatment extrapolation refer to table 4; spp. represents more than one species in that genus

***Reduced or no data may be required on case by case basis depending on robustness of data, whether the pest is a major pest on the crop or either the symptoms manifest better on this crop (for column 5).**

TABLE 3: EXTRAPOLATION TABLE FOR EFFECTIVENESS OF INSECTICIDE FOR STORAGE PESTS

Pest		**Crop: within cereals**		**Crop: outside cereals**	
1	2	3	4	5	6
Pest species	**Pest group name**	**Indicator crops**	**Extrapolation to other crops**	**Data from these crops can support the indicator crops (reduced data or no data *)**	**Extrapolation to crops (reduced or no data*)**
Prostephanus truncates *Sitophilus* spp. *Rhyzopertha dominica* *Sitotroga cerealella* *Tribolium castaneum*	Storage pests	Wheat	Rye Oats Barley Millet Rice	Cassava Yams	Pseudocereals

Prostephanus truncates *Tribolium castaneum* *Sitophilus* spp. *Rhyzopertha dominica* *Sitotroga cerealella*	Storage pests	Maize	Popcorn Sorghum Sweet corn	Cassava Yams	

Note: spp. represents more than one species in that genus

***Reduced or no data may be required on case by case basis depending on robustness of data, whether the pest is a major pest on the crop or either the symptoms manifest better on this crop (for column 5).**

TABLE 4: EXTRAPOLATION TABLE FOR EFFECTIVENESS OF PEST CONTROL PRODUCTS FOR SEED TREATMENT

Pest		**Crop: within cereals**		**Crop: outside cereals**	
1	2	3	4	5	6

Pest species	Pest group name	Indicator crops	Extrapolation to other crops	Data from these crops can support the indicator crops (reduced data or no data *)	Extrapolation to crops (reduced or no data*)
Macrotermes spp. *Coptotermes* spp. *Odontotermes* spp.	Termites	Wheat	Rye Oats Barley Millet Rice	Cotton	Pseudocereals
Agrotis spp.	Cut worms	Wheat	Rye Oats Barley Millet Rice	Tomatoes Kales Cotton Beans Cabbages	Pseudocereals

Schizonycha spp. *Aeolus* spp.	Chafer grubs** Wire worm	Wheat	Rye Oats Barley Millet Rice	Tomatoes Carrots beans Peas Cucurbits	Pseudocereals
Macrotermes spp. *Coptotermes* spp. *Odontotermes* spp	Termites	Maize	Popcorn Sorghum Sweet corn	Cotton	
Agrotis spp.	Cut worms	Maize	Popcorn Sorghum Sweet corn	Tomatoes Kales Cotton Beans Cabbages	

Schizonycha spp. or *Hereronychus arator* *Aeolus* spp.	Chafer grubs or African black beetles** Wire worms	Maize	Popcorn Sorghum Sweet corn	Peas Tomatoes Carrots beans Peas Cucurbits	
Atherigona soccata	shootfly	Sorghum	Barley		
Pythium spp. *Rhizoctonia* spp. *Fusarium* spp.	root rots	Wheat	Oats Rye Barley	Leafy vegetables Carrots Cucurbits *Allium* spp.	Pseudocereals
Pythium spp. *Fusarium* spp. *Anthracnose* spp. *Botryodiplodia* spp.	Stalk rot	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		

Note: spp. represents more than one species in that genus

*Reduced or no data may be required on case by case basis depending on robustness of data, whether the pest is a major pest on the crop or either the symptoms manifest better on this crop (for column 5).

** Data on chafer grub or African black beetles can be extrapolated to wire worm

TABLE 5: EXTRAPOLATION TABLE FOR EFFECTIVENESS OF FUNGICIDES

Pest		**Crop: within cereals**		**Crop: outside cereals**	
1	2	3	4	5	6
Pathogen species	**Disease group name**	**Indicator crops**	**Extrapolation to other crops**	**Data from these crops on the same pathogen can support the indicator crops (reduced data or no data *)**	**Extrapolation to crops (reduced or no data*)**
Puccinia graminis	Stem rust	Wheat	Barley Triticale Rye		
Puccinia striiformis *Puccinia triticina* *Puccinia hordei* *Puccinia recondita*	Yellow rust Leaf rust	Wheat	Barley Rye Triticale		
Ustilago nuda	Loose smut	Wheat	Barley		

Fusaruim graminearum	Fusarium head blight/Scab	Wheat	Barley Rye		
Septoria tritici Septoria nodorum	Septoria leaf spots/blotch	Wheat	Barley Oats		
Parastagonospora nodorun	Glume blotch	Wheat	Triticale Barley		
Barley yellow dwarf virus	Barley yellow dwarf disease	Wheat	Barley Oats Triticale Rice Rye	Maize	Pseudocereals
Erysiphe graminis	Powdery mildew	Wheat	Barley		
Microdochium oryzae	Scald	Wheat	Rice Barley Rye		

Pyrenophora teres	Net blotch	Barley	Wheat Oats		
Physoderma maydis	Brown spot	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		
Cercospora zeae *Leptosphaeria* spp. *Curvularia* spp.	leaf spots	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		
Ustilago maydis *Sphacelotheca reiliana*	Smut	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		

Puccinia sorghi *Puccinia polysora* *Physopella zeae*	Rusts	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		
Exsehilum turcicum	Northern leaf blight	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		
Helminthosporium maydis	Southern leaf blight	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		
Maize chlorotic mottle virus *Sugarcane mosaic virus*	Maize lethal necrosis disease* (aphids, thrips, beetles and rootworms as vectors)	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		

Maize streak Virus	Maize streak disease* (leafhoppers as vectors)	Maize/baby corn	Popcorn Maize Sweet corn Baby corn		
Peronosclerospora spp. *Sclerophthora* spp.	Downy mildew	Maize/baby corn	Popcorn Maize Sweet corn Baby corn Sorghum	Sugarcane	
Aspergillus spp. *Penicilium* spp. *Gibberella* spp. *Diplodia* spp. *Fusarium* spp	Ear rots	Maize/baby corn	Popcorn Maize Sweet corn Baby corn	Cotton Groundnuts	

Note: spp. represents more than one species in that genus; Control of viral diseases the focus will be on the vectors

*Reduced or no data may be required on case by case basis depending on robustness of data, whether the pest is a major pest on the crop or either the symptoms manifest better on this crop (for column 5).

TABLE 6: EXTRAPOLATION TABLE FOR EFFECTIVENESS OF NEMATICIDES

Pest		**Crop: within cereals**		
1	2	3	4	5
Pest species	**Pest group name**	**Indicator crops**	**Extrapolation to other crops**	**Data from these crops on the same pathogen can support the indicator crops (reduced data or no data *)**
Pratylenchus spp.	Lesion nematodes	Wheat or maize	Barley Rye Oats Sorghum Rice Wheat Maize	Bananas

Meloidogyne spp.	Root knot nematodes	Wheat or maize	Barley Rice Rye Sorghum Oats Wheat Maize	Tomatoes Spinach Beans Night shade
Anguina tritici	Ear cockle of wheat	Wheat	Rye Triticale	

Note: spp. represents more than one species in that genus

***Reduced or no data may be required on case by case basis depending on robustness of data, whether the pest is a major pest on the crop or either the symptoms manifest better on this crop (for column 5).**

B. CROP SAFETY

EXTRAPOLATION TABLES FOR CROP SAFETUNGICIDES, HERBICIDE AND INSECTICIDES IN CEREALS

The extrapolation tables should be used in conjunction with efficacy extrapolation guidelines. The tables provide detailed lists of acceptable extrapolations organized by crop groups for the regulatory authority and applicants in the context of the registration of plant protection products for minor uses. It is important to ensure that expert judgment and regulatory experience are employed when using these tables. The regulatory authority excludes liability as to the reliability of the information provided through these tables.

For seed treatments, indicator crops should include seeds of similar or smaller size. Specific trials with insecticides and fungicides are not essential for foliar treatment. Observations in efficacy or residue trials are usually acceptable. For seed treatment a germination

study on the indicator crop is usually necessary.

TABLE 7: EXTRAPOLATION TABLE FOR CROP SAFETY OF HERBICIDES

Treatment type		**Crop: within cereals**		**Crop: outside cereals**	
1	2	3	4	5	6
Treatment type	**Herbicide group**	**Indicator crops**	**Extrapolation to other crops**	**Data from these crops can support the indicator crops (reduced data or no data *)**	**Extrapolation to crops (reduced or no data*)**
Pre-emergence	Broad leaf weed herbicides	Baby corn and maize	Popcorn Sweet corn Maize Baby corn		
Post-emergence					
Pre-emergence	Broad leaf weed herbicides	Wheat and Barley	Oats Rye Upland rice		

Post-emergence			Millet Triticale		

Note: Extrapolation for graminicides and sedges is not possible.

For sorghum, specific studies for post-emergence and pre-mergence herbicides are required.

Extrapolation is applicable within the same method of application only (Pre- or post- emergence application).

TABLE 8: EXTRAPOLATION TABLE FOR CROP SAFETY OF FUNGICIDES AND INSECTICIDES

Treatment type	**Indicator crops**	**Extrapolation to other crops**	**Data from other crops (or crop groups) that enables reduced data on the indicator crops (or no data *)**	**Data on indicator crops that permits extrapolation to other crops (or crop groups) with reduced data (or no data *)**
Type of application	**Crop**	**Crop**	**Crop**	**Crop**
Seed treatment Soil treatment	Baby corn or Maize	Popcorns Sweet corn		

Foliar treatment		Baby corn Maize Sorghum		
Seed treatment	Wheat or barley	Oats Wheat Barley Rye Triticale		
Soil treatment				
Foliar treatment	Wheat and barley			

C. HERBS AND SPICES

Efficacy and Crop Safety guidelines

Indicator pests and representative commodities for extrapolation of efficacy data in herbs and spices commodity group

Representative commodities within herb or spices group were selected based on principles of data extrapolation in the EPPO guidelines. Recognizing that herbs and spices are minor crops, major vegetable groups with some similarities to herbs and spices were identified as indicator crops. Pests and diseases were also identified in the indicator crops as representative species for the efficacy trials. Data generated for the identified vegetables/pest combination can be used for extrapolation to various herbs and spices in column 6 in the vegetable extrapolation tables for vegetables. For details, refer to the extrapolation tables.

Herbs and spices may have different growth habit, canopy sizes and GAPs from the representative indicator crops in the efficacy tables. In order to ensure adequate coverage of the crop with the pesticide during application and to reduce incidences of residues, applicants are advised to carry out calibrations for the various herbs and spices to establish appropriate spray volumes per hectare. This information will be used together with the dosage established through efficacy trials on the representative crop and species for extrapolation.

Indicator pests and representative commodities for extrapolation of crop safety data in herbs and spices commodity group (herbicides, fungicides, insecticides, seed treatment, etc.)

Phytotoxicity is particularly relevant to certain products such as herbicides, some types of applications and for specific crops. It can vary considerably between different crop species, cultivars of the same crop, and between different plant protection products. Crop safety extrapolation is possible in some situations, but should be well reasoned in extrapolating from vegetables to herbs. Extrapolation may not be possible where use of the product has resulted in crop damage on some crops or cultivars where the crops concerned are significantly different, or when a crop is known to be particularly sensitive. The following principles are important to consider;

1. Method of application should be similar.

2. Availability and interpretation of evidence of crop safety.

3. Taxonomic relationship and similarity in morphology.

4. Availability of adequate crop safety data showing a good margin of safety in vegetables for extrapolation to herbs and spices.

N/B: For details on crop safety extrapolation for fungicides, herbicides, insecticides, etc, refer to the extrapolation tables for vegetables.

PEST CONTROL PRODUCTS BOARD
P.O BOX 13794 – 00800
LORESHO, NAIROBI, KENYA
info@pcpb.go.ke | md@pcpb.go.ke
http://www.pcpb.go.ke/