Global scan of current registered agrichemical and management options to control fungal diseases in onion crops across the US, EU, NZ and AU

September 2025

Accelerating the adoption of best management practices for the Australian onion industry (VN21000)

Contents

The Onion Project has been funded by Hort Innovation using the onion levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Australian RD&E

Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture and manages the Onion Fund, supported by the onion grower levy and contributions from the federal government. You can visit the dedicated Onion Fund section of the Hort Innovation website at Hort Innovation | Onion Fund to access onion investment information and updates, download research reports and search growing tips and advice. Beyond Hort Innovation's delegated R&D work, Australian universities, state government departments and private sector providers are contributing new knowledge through peer-reviewed scientific publications and by developing resources for onion growers and agronomists. Additionally, most agribusiness and reseller companies conduct in-house, applied research, usually focused on optimising crop management inputs. Agrochemical, life science and fertiliser companies conduct research on improving pest, disease, weed and nutrition management products and their use.

Disclaimer: Please note that all regulatory information gathered from the Australian regulator is based on the Strategic Agrichemical Review Process from 2020. Check the current status on the APVMA website.

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1. Introduction

According to Hort Innovation, Australia produces an average of 247,423 tonnes of onions annually, valued at approximately $164.8 million. Major production regions are South Australia (48%), Tasmania (23%), and Queensland (10%).

In onion crops, many soil-borne and foliar fungal diseases affect onion germination, root and foliage health and with that yield, quality and profitability.

Broader economic implications of fungal diseases are reduced marketability and storage/shelf life. Increased input costs are often required for fungicides, soil testing, and cultural control methods which add to production expenses. Disease management commonly requires more labour and equipment use in the field and post-harvest. Paddocks infected with persistent diseases cannot be used for onion production, potentially reducing the overall productive area for onions. Infected land also poses a biosecurity risk for 'clean' land due to soil and water movement between paddocks and regions.

Fungal disease management requires an integrated approach to avoid fungicide resistance. This includes cultural control methods such as crop rotation and or cover crops to break the disease cycle and minimise the inoculum for the following season.

2. What is covered in this R&D Scan?

The following review provides an overview of the main onion fungal diseases, emerging disease threats, fungicide resistance threats, fungicide chemical control options and some registered biological options in Australia, the US, NZ and the EU at the time of this Scan. It also provides an overview of methods that can be used in an integrated fungal disease control program. A major aim of integrated control is avoiding or managing fungicide resistance problems.

3. Overview of significant fungal diseases in onions in Australia

3.1 Key fungal diseases nationally

Across Australia, the most common and damaging fungal diseases of onions include:

- **White Rot** (*Sclerotium cepivorum*) is highly destructive, persists in soil for decades. It attacks the roots and base of the plant causing foliage collapse and can lead to bulb rot. White rot is difficult to control with fungicides, so adoption of cultural practices such as crop rotation and hygiene are critical aspects of controlling the disease.

- **Pink Root** (*Phoma terrestris*) is a widespread soil- borne disease and particularly problematic in warmer growing regions. The disease causes roots to turn pink and reduces root mass and vigour leading to smaller bulbs at maturity. The fungus can be spread through soil movement and surface water.

- **Fusarium Basal Rot** (*Fusarium oxysporum f.* sp. *cepae*) affects the bulb base, leading to rot. It is a widespread disease in most warm regions. Infected roots are dark brown and flattened. The leaves of affected plants show yellowing, curling and eventually wither and decay. Cultural controls such as crop rotation are recommended.

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- **Black Mould** (*Aspergillus niger*) is most common in warm climates and usually appears during storage where it cannot be controlled. There are no fungicides registered for post-harvest use in onions.

- **Botrytis Neck Rot** (*Botrytis allii and B.aclada*) can cause spotting and a girdling of the stem and develop on the sheath that protects the inflorescence. The major source of the pathogen is on infected seed. The fungal spreads as conidiophores by wind, infecting the leaf first, then spreading to the neck of the bulb. The foliage dies quickly at the end of the season. Crop rotation with other non-allium species can help control disease spread. *Botrytis* spp. also appears post-harvest, especially in humid storage conditions, it cannot be controlled after harvest.

- **Downy Mildew** (*Peronospora destructor*) starts as a brownish- purple velevet-like sporulation on healthy green leaves. The then enlarge, sometimes girdling the leaf. Lesions progress to a pale yellow followed by brown necrosis resulting in leaf tissue collapse. Infection occurs when the air temperature is <23 degrees C with a relative humidity of > 95%.

- **Stemphylium Leaf Blight** (*Stemphylium vesicarium)* primarily affects onions but can occurs in other crops like tomatoes and lucerne. Early signs include small, water-soaked lesions on leaves. These turn large, brown or black and become necrotic. In severe cases lesions coalesce, causing large, blighted areas and leaf death. The disease thrives in high relative humidity and prolonged leaf wetness in moderate to warm temperatures (15–25°C). Crop stress including nutrient deficiencies and imbalances or other diseases can worsen its severity.

- **Purple Blotch** *(Alternaria porri)* is a less common foliar disease that reduce photosynthesis and bulb quality. It starts as small, purplish, sunken flecks on leaves and stalks, which then expand into larger, irregular, brown-to-purple blotches with concentric rings. High humidity and temperatures, wet conditions, and physical damage from pests like onion thrips increase the disease's severity. Control measures include using disease-free planting material, managing thrips, ensuring good airflow and drainage.

3.2 Key fungal diseases by state - Australia

3.2.1 Overview of fungal disease challenges by state

State	Major Fungal Diseases	Severity	Management Strategies
Victoria	White Rot, Black Mould, Blue-Green Mould, Neck Rot	High in historically productive areas	Crop rotation, Storage hygiene, Fungicide applications
South Australia	Rhizoctonia solani AG8 (Onion Stunting), White Rot, Fusarium Basal Rot	Significant issues with soilborne diseases	Soil testing, Crop rotation, Sanitation
Tasmania	White Rot, Pink Root	Moderate due to cooler climate	Crop rotation, Storage hygiene
New South Wales & Queensland	Downy Mildew, Purple Blotch, Stemphylium Leaf Blight, Black Mould, Fusarium Rot	High due to warm and wet conditions	Fungicide applications, Storage hygiene, Sanitation
Western Australia	White Rot (not present), Other soilborne and foliar diseases	Low due to proactive management and climate	Biosecurity measures, Proactive management

(*Botrytis allii and B.aclada*), White Rot (*Sclerotium cepivorum*) and Basal Rot (*Fusarium oxysporum*). All these diseases are soilborne and can infect the bulb directly in the field or post-harvest.

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3.2.2 Fungal onion diseases in the US, EU and NZ compared to Australia

Disease	Pathogen	Key Symptoms	US	EU	NZ	AU
Black Mould	*Aspergillus niger*	Black mould on bulbs during storage				X
Botrytis Leaf Blight	*Botrytis cinerea*	Greyish-brown leaf lesions	X	X	X	
Botrytis Leaf Blight	*Botrytis squamosa*	Water-soaked leaf lesions		X	X	
Botrytis Neck Rot	*Botrytis allii*	Rot at bulb neck during storage	X	X		X
Botrytis Neck Rot	*Botrytis aclada*	Rot at bulb neck during storage				X
Downy Mildew	*Peronospora destructor*	Yellowing, purple-grey growth on leaves	X	X	X	X
Fusarium Basal Rot	*Fusarium oxysporum f. sp. cepae*	Rotting at bulb base	X	X	X	X
Onion Smudge	*Colletotrichum circinans*	Black spots on outer scales	X			
Onion Smut	*Urocystis cepulae*	Black spore masses on seedlings	X		X	
Pink Root	*Phoma terrestris*	Pink roots, shrivelled	X		X	X
Purple Blotch	*Alternaria porri*	Purplish-brown leaf lesions	X	X	X	X
Stemphylium Leaf Blight	*Stemphylium vesicarium*	Elongated grey/brown leaf lesions	X	X	X	X
White Rot	*Sclerotium cepivorum*	White fungal growth on bulbs	X	X	X	X
Total number of key fungal diseases			10	8	9	9

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3.2.3 Emerging fungal onion disease threats in the US, EU and NZ compared to Australia

Region	Disease	Pathogen	Regions Affected	Key Concerns
USA	Stemphylium Leaf Blight (SLB)	*Stemphylium vesicarium*	NY, MI, CA, GA, ID, WA, OR, TX	Rapid leaf necrosis, yield losses up to 40%, fungicide resistance in FRAC 2, 7, 9, 11
USA	Bacterial Soft Rots	*Burkholderia, Pantoea, Enterobacter, Xanthomonas*	Multiple states	Post-harvest losses, diagnostic challenges, addressed by 'Stop the Rot' initiative
EU	Stemphylium Leaf Blight	*Stemphylium vesicarium*	Slovakia, Germany	Emerging in Central Europe, limited fungicide options
EU	Fusarium Basal Rot	*Fusarium oxysporum f. sp. cepae*	UK and other EU regions	Up to 40% crop loss, limited fungicide options due to regulations
EU	Colletotrichum perseae (Anthracnose)	*Colletotrichum perseae*	Turky, potential spread to southern EU	Cross-host risks, emerging pathogen
EU	Diaporthe goulteri	*Diaporthe goulteri*	Germany	First EU appearance, affects soybean
EU	Neopestalotiopsis rosae	*Neopestalotiopsis rosae*	Germany, USA, Taiwan	Expanding globally, affects strawberries
Australia	Fusarium Basal Rot	*Fusarium oxysporum f. sp. cepae*	All states except NT and Tasmania, esp. South Australia	Bulb decay, stunted growth
Australia	White Rot	*Sclerotium cepivorum*	Victoria, South Australia	Long soil persistence, sudden plant death
Australia	Onion Rust	*Puccinia allii*	Western Australia	Windborne, monitored for biosecurity
Australia	Stemphylium Leaf Blight (SLB)	*Stemphylium vesicarium*	Queensland	Defoliation, reduced bulb quality, no registered fungicides
New Zealand	Stemphylium Leaf Blight (SLB)	*Stemphylium vesicarium*	Pukekohe, Waikato, Hawke's Bay, Canterbury	Defoliation, reduced bulb quality, no registered fungicides
New Zealand	Bacterial Soft Rot	*Pseudomonas viridiflava* and others	Export regions	Post-harvest losses, export impact

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4. Overview of chemical control options

4.1 Challenges for the continuous use of fungicides and otheragricultural chemicals

According to the Bulb Onion Agrichemical Regulatory Risk Assessment March 2020, Onion SARP- August 2020, regulatory pressures on agrichemicals are increasing globally, with many active ingredients being either restricted or withdrawn from use. For older agrichemicals these pressures are often the result of reconsiderations involving new or refined risk assessment methodologies that require the generation of new data. A consequence can be that these chemicals are not meeting contemporary risk assessment standards because the necessary data is unavailable, or where data is available, the risks they identify are now considered unacceptable, or new data generation uncovers new risks.

The use of agricultural chemicals can also be affected by differences in standards between trading partners. The lack of a pesticide maximum residue limit (MRL) for an active ingredient in an importing country can prohibit its use in the exporting country, as breaches of MRLs can adversely affect market access.

Agrichemical reviews by Authorities in all countries that register chemicals place pressure on the availability and use of individual chemicals or chemical groups. Therefore, it is possible that the number of approved agrichemical options will decline.

4.2 Comparison of registered fungicides for control of fungal diseases Australia (AU), the European Union (EU), the United States (US) and New Zealand (NZ).

4.2.1 Registered key fungicides for control of fungal diseases in Australia (excludes fungicides listed for review by APVMA)

Product Name	FRAC Group	Active Ingredient	Target Diseases	Usage Notes
Mancozeb	M3	Mancozeb	Downy Mildew, Botrytis Leaf Blight, Purple Blotch	Multi-site protectant; rotate with single-site fungicides
Chlorothalonil	M5	Chlorothalonil	Downy Mildew, Botrytis	Broad-spectrum protectant; resistance management tool
Amistar	11	Azoxystrobin	Stemphylium Leaf Blight, Botrytis	QoI fungicide; resistance risk if overused
Luna Sensation	7 + 11	Fluopyram + Trifloxystrobin	Stemphylium Leaf Blight, Botrytis	Dual mode of action; rotate with other groups
Switch	9 + 12	Cyprodinil + Fludioxonil	Botrytis, Fusarium	Effective against storage diseases; use preventatively

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4.2.2 Registered key fungicides for control of fungal diseases in the EU

Product Name	FRAC Group	Active Ingredients	Target Diseases	Usage Notes
Chlorothalonil	M5	Chlorothalonil	Downy Mildew, Botrytis	Registered for onion in some EU countries
Copper Hydroxide	M1	Copper Hydroxide	Downy Mildew, Bacterial Blight	Widely used
Procymidone	2	Procymidone	White Rot	Registered in NZ and some EU regions
Difenoconazole	3	Difenoconazole	Leaf spots, Botrytis	Not always registered for onions
Iprodione	2	Iprodione	Botrytis, White Rot	Limited registration
Zonix Biofungicide	BM2	Rhamnolipid biosurfactant	Broad-spectrum (organic)	Preventative use

4.2.3 Registered key fungicides for control of fungal diseases in the USA

Product Name	FRAC Group	Active Ingredients	Target Diseases	Usage Notes
Miravis Prime	7 + 3	Fludioxonil + Pydiflumetofen	Stemphylium Leaf Blight, Botrytis	Effective early-season
Luna Tranquility	7 + 9	Fluopyram + Pyrimethanil	Stemphylium, Botrytis	Moderate efficacy
Omega 500	29	Fluazinam	Botrytis Leaf Blight	High-to-moderate efficacy
Inspire Super	3 + 9	Difenoconazole + Cyprodinil	Stemphylium, Botrytis	Moderate efficacy
Fontelis	7	Penthiopyrad	Botrytis	Moderate efficacy
Merivon	7 + 11	Fluxapyroxad + Pyraclostrobin	Botrytis, Stemphylium	Moderate efficacy
Quadris Top	11 + 3	Azoxystrobin + Difenoconazole	Stemphylium, Botrytis	Moderate-to-low efficacy
Scala	9	Pyrimethanil	Botrytis	Resistance issues
Cevya	3	Mefentrifluconazole	Stemphylium	Promising new option
Copper Products	M1	Copper Hydroxide, Copper Oxychloride	Bacterial & fungal leaf diseases	Used in rotation
OxiDate	NC	Hydrogen Peroxide + Peracetic Acid	Broad-spectrum (organic)	Used preventatively
Serenade ASO	BM2	Bacillus subtilis strain QST 713	Botrytis, Pink Root	Biological option

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4.2.4 Registered key fungicides for control of fungal diseases in New Zealand

Product Name	FRAC Group	Active Ingredient	Target Diseases	Usage Notes
Bravo	M5	Chlorothalonil	Downy Mildew, Botrytis	Protectant fungicide; apply before disease onset
Ridomil Gold	4	Metalaxyl-M	Downy Mildew	High resistance risk; max 3 applications per season
Serenade Max	BM2	Bacillus subtilis strain QST 713	Botrytis, Pink Root	Biological fungicide; use in integrated programs
Zampro	40 + 45	Ametoctradin + Dimethomorph	Downy Mildew	Use preventatively; rotate with other groups
Procymidone	2	Procymidone	White Rot, Botrytis	Limited registration; follow label restrictions

5. Fungicide resistance

5.1 Managing fungicide resistance in Australia

For information on fungicide resistance refer to the Crop Life Australia website for more information on Fungicide Resistance Management Strategies https://www.croplife.org.au/resources/programs/resistance-management/fungicide-resistance-management-strategies/ as well as the SWICP Fungicide Resistance Factsheet – to be published.

There are certain registered chemicals which should be used with consideration to resistance management. Fungicide resistance means that a fungicide or active ingredient that was once effective, becomes no longer effective. This can occur when reduced rates (below label recommendation) of fungicides are used, when spray application is not optimal i.e., due to poor coverage or wrong timing, or when fungicides or active ingredients are over-used, and a complete kill of the pathogen is not achieved meaning that 'survivors' become 'immune' to the chemical. To avoid fungicide resistance, it is important to rotate the fungicide mode of action group or class. It is also important not to become reliant on curative fungicides which generally have a narrow spectrum of activity. Protectants should be applied prior to infection occurs and regularly covering all new growth. And curatives should be applied as soon as disease occurs.

To manage fungicide resistance, it is important to apply the following principles:

- Know your crop and use resistant varieties and know which fungal disease can affect the crop under which conditions.
- Rotate fungicides- Use a combination of protectants, systemics and biopesticides to compliment chemical fungicides.
- Monitor crop health carefully and adopt preventative measures where possible to avoid the reliance on systemic products.
- Follow the label rate and timing to ensure efficacy of the product and to prevent the growth of resistant pathogen strains in the population.
- Test for resistance.

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- Adopt integrated crop protection strategies including crop rotations with biofumigants and cover crops to improve soil health.

Fungicides with risk of resistance in Australia include group 7 SDHI s (succinate dehydrogenase inhibitors) and group 11 QoI (quinone outside inhibitors) include:

- Penthiopyrad (Fontelis) SDHI – **high**
- Pyraclostrobin (Cabrio) QoI2- **high**
- Pyraclostrobin/ fluxapyroxad (Merivon Xemium) QoI2/SDHI4-medium to **high**
- Pyrimethanil/fluopyram (Luna Tranquility) anilino-pyrimidine/SDHI4-medium to **high**

5.1.1 Comparative fungicide resistance overview

Region	Diseases Affected	FRAC Groups with Resistance	Management Strategies
Australia	Downy mildew, White rot, Botrytis neck rot, Fusarium basal rot	FRAC 11 (QoIs)	Rotate fungicide groups; use multi-site fungicides (e.g., mancozeb, chlorothalonil); limit single mode of action to one-third of applications
USA	Stemphylium Leaf Blight (SLB)	FRAC 2, 7, 9, 11	Aggressive rotation; limit applications per group; molecular resistance detection tools
EU	Fusarium basal rot	Limited new actives; reliance on emergency permits	Launch of FUSED project; focus on varietal resistance and soil health
New Zealand	Downy mildew	FRAC 4 (Phenylamides), FRAC 11 (QoIs), FRAC 7, 9, 49	Limit applications per FRAC group; use multi-site fungicides and biologicals; apply preventatively with weather-based tools

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6. Biological/softer fungal control options

6.1 Overview of biological options for the management of fungal diseases Australia (AU), the European Union (EU), and the United States (US) and New Zealand (NZ).

6.1.1 Organic fungal control examples for Australia

- PREV-AM – A biopesticide (insecticide, fungicide and acaricide) made from a blend of natural, cold-pressed orange oil that acts on many species of pests and diseases. It's mode of action desiccates the cuticles of soft bodied insects such a flied and thrips. The active ingredient spread into the water repellent layer that protects insects, penetrates it and destroys the soft living tissues underneath which expose the insect to loss of body fluids causing death. As a fungicide, it penetrates the protective membranes causing plant tissue damaged by the fungus to dry out and prevent further spread of the infection.
- Synthetic sulphite compounds, diallyl disulphide (DADS) registered under permit for the control of white rot (*Sclerotium cepivorum*) in onions. DADs, which are volatile compounds emitted naturally by roots of Allium crops, have been successfully used as a pre- plant soil treatment to stimulate sclerotia germination in the absence of a host plant causing the sclerotia to die. DADS have been trialled in Australia and the US where it has lowered the sclerotia population in the soil before onion crops are panted. Ongoing research is being conducted in Australia supported by the Australian Onion Levy.
- Trichoderma- Some species of Trichoderma have been used to parasitize sclerotia. Trichoderma can protect allium roots against white rot
- Systemic copper (Sergomil L60) – A bio stimulant product formulated with saccharide derivatives as acid monomers which induce plant vigour, growth and development. The product supplies an increasing level of copper systemically to crops. It increases the biosynthesis an accumulation of lignin in plant cell walls and strengthens plant tissues thereby improving crop quality and activates key metabolic processes and pathways for biosynthesis of proteins and specific secondary metabolites associated with critical phases of the crop cycle. TAs a bio stimulant product, it helps to improve crop health and thus helps the plant's defence against disease infection.

Refer to the biological products database developed by RM Consulting Group (RMCG), Applied Horticultural Research Pty Ltd (AHR) funded by Hort Innovation using the Australian Vegetable grower levies for more information https://soilwealth.com.au/wp-content/uploads/2023/07/APVMAProducttypeTradename202304final.pdf

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6.1.2 Registered biological options for the management of fungal onion diseases in Australia

Product Name	Active Ingredient	Target Diseases	Usage Notes
Serenade Opti	Bacillus subtilis QST 713	Botrytis, Pink Root	Used preventatively in IPM programs
Intervene	Group 19 (unique mode of action)	Downy Mildew, Botrytis	Reduces reliance on conventional fungicides
Cucumeris mites	Neoseiulus cucumeris	Thrips (indirect fungal vector)	Used in storage and field settings

6.1.3 Registered biological options for the management of fungal onion diseases in the EU

Product Name	Active Ingredient	Target Diseases	Usage Notes
Serifel	Bacillus amyloliquefaciens MBI 600	Botrytis, Leaf Spots	Broad-spectrum, low residue
Regalia	Reynoutria sachalinensis extract	Downy Mildew, Powdery Mildew	Plant-based, resistance management
Mycostop	Streptomyces sp. K61	Damping-off, Botrytis	Used in organic systems

6.1.4 Registered biological options for the management of fungal onion diseases in the USA

Product Name	Active Ingredient	Target Diseases	Usage Notes
Botry-Zen	Ulocladium oudemansii	Botrytis, Powdery Mildew	NZ-developed, residue-free
Serenade Max	Bacillus subtilis QST 713	Botrytis, Pink Root	OMRI-listed, used in IPM
Zorvec Enicade + Ranman	Oxathiapiprolin + Cyazofamid	Downy Mildew	Resistance management strategy

7. Cultural control options for managing fungal diseases

7.1 General practices

- Employ a good nutrient program – Nitrate fertilisers are better to use to manage fungal disease compared to urea as a nitrogen source, however high nitrogen fertiliser input may leave to greater canopies and therefore susceptibility to disease.
- Use drip irrigation as more water will be fed directly to the roots
- Crop rotation to break the disease cycle

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- Destroy onion debris to reduce the risk of disease contamination and increase airflow
- Select resistant varieties
- Apply broad-spectrum preventative fungicides. Treatments should be applied when conditions are unfavourable for the fungus.
- Be aware of resistant fungicide groups
- Bio fumigation -The use of biofumigant green manure crops such as Brassicas which contain glucosinolates can reduce soilborne fungal infection due to the biocidal activity these crops can have with a similar mode of action to the Metham sodium.
- Biostimulatns and biologicals/ biopesticides – Biopesticides can help to compete against the pathogen for space on the host crop or provide a synergistic effect with the plant host. Bio stimulants can improve plant health and increase resilience against fungal pathogen infection.

7.2 Cultural controls for high priority onion fungal diseases

- White Rot (Sclerotia cepivorum) – Site selection is important to avoid waterlogged sites which is how the pathogen can spread. Strict farm hygiene is important to prevent the movement of contaminated soil, water, plants and equipment. Cropping sequences and rotations with alternative crops is important to break the disease cycle with the introduction of non- host green manure or biofumigant crops to reduce the number of sclerotia.

- Basal rot (*Fusarium oxysporum*) control- Include a rotation of non- host crops, rouging and removing infected plants, minimising environmental and nutritional plants and careful irrigation management including shorter and more frequent irrigation.

7.3 Biofumigant crops

- Biofumigant crops such as brassicas, when incorporated correctly, release isothiocyanates derived from the glucosinolates which have strong biocidal activity, burning weed seedlings in their early stages. Refer to the biofumigation factsheet for more information:https://soilwealth.com.au/2024/07/biofumigation-fact-sheet/.

7.4 Area wide management, farm hygiene and biosecurity

Area wide, regional management of farm hygiene via good biosecurity practices need to be adopted. They include the following essentials:

Practice good biosecurity practices with consideration to the following essentials:

- Have a biosecurity plan that identifies risks and how to control them
- Ensure vehicles, machinery and footwear do not carry loose dirt (containing weed seeds or diseases) or plant matter on or off farm
- Use a QR code linked to an app or paper copies to record movement of people, vehicles, equipment and animals were possible
- Ensure farm inputs or animals do not spread weed seeds
- Ensure that run-off water does not enter or leave the farm
- Train staff and educate people who regularly come to the farm to sign in, to come clean and leave clean.

Refer to the Onion Industry Biosecurity Manual for more information: https://www.onionsaustralia.org.au/wp-content/uploads/2018/04/Biosecurity-Manual-for-Onion-Growers-WEB.pdf

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8. Regulations

8.1 Australian Regulator- Australian Pesticides and Veterinary Medicines Authority (APVMA).

The APVMA maintains current details about agricultural and veterinary (agvet) chemical products registered for use in Australia or approved for use under permit in an online database called PubCris. https://portal.apvma.gov.au/pubcris

An application for registration of an agricultural or veterinary chemical product, or approval or variation of a registered product is required to be made through the APVMA. Chemical reviews can occur as new scientific information emerges after the registration of an active constituent. This program has been active since the introduction of the National Registration Scheme (NRS) in 1995.

CropLife Australia represents the innovators, developers, manufacturers, formulators and registrants of crop protection and ag-biotechnology products. The non-for-profit organisation provides professional advocacy and aims to achieve a regulatory environment that provides the plant science industry (plant protection products developers and producers) the freedom to responsibly operate, grow and enhance its ability to support Australia's farmers and environmental land managers. CropLife Australia works on behalf of their members with governments and other stakeholders engaged in the future of food and farming to maintain the benefits that flow to the Australian agricultural community and public from a responsible plant science industry.

8.2 European regulator- European Food Safety Authority (EFSA)

The EFSA is an agency of the European Union which is an impartial source of scientific advice on risks to the food chain providing scientifically founded laws and regulations to protect European consumers from food related risks.

Currently they have made modifications to existing minimal residue limits (MRL) requirements for Teldor (*Fenhexamid*) (Bayer) in Onions to 0.6 mg/kg due to low persistence in the soil. There has also been an increase in the minimum residue limit made to benzovindiflypyr in leeks, spring onions, green onions and Welsh Onions from 0.01 to 0.09 mg/kg.

8.3 USA regulator- Environmental Protection Agency- (EPA)

All pesticides distributed or sold in the United States must be registered by the Environmental Protection Agency. The Federal Pesticide, Fungicide and Rodenticide Act (FIFRA) is the federal regulator of pesticide distribution, sale and use.

By law the EPA is responsible for regulating the pesticides that are used by growers to protect crops grown for human food and animal feed and for setting limits on the amount of pesticide that remains in or on foods marketed in the USA. The limits on pesticides left on foods are called tolerances which are called maximum residue limits of MRLs in other countries.

The office of pesticide programs (OPP) regulated the manufacture and use of all pesticides (insecticides, herbicides etc) and establishes the MRLs in food supply. All test data must be Good Laboratory Practice Standards compliant to ensure quality and integrity of the test data submitted to the agency.

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PPIS (Pesticide Production Information System) – contains information concerning all pesticide products registered in the United States. It includes registrant name, chemical ingredients, toxicity category, product names, distributor brand names, site/pest uses, pesticidal type, formulation code and registration status.
https://www.epa.gov/ingredients-used-pesticide-products/ppis-download-product-information-data
https://www.epa.gov/pesticide-registration

8.4 New Zealand Regulator- Agrichemical Veterinary Medicine (ACVM)

ACVM is the regulatory body in New Zealand for the registration of agrichemical veterinary medicines under the ACVM Act 1997. There are no assurances on timelines. The NZ EPA (Environmental Protection Authority) evaluates the safety and toxicology of products on flora and fauna. Every new registrant active ingredient has to be tested and approved by both the ACVM and the EPA. https://www.mpi.govt.nz/agriculture/agricultural-compounds-vet-medicines/class-determinations-and-self-determinations-under-the-acvm-act-1997/

Different from all states in Australia, with the exception of Victoria, in New Zealand, off label chemical use is allowed as long as the active ingredient residue in the crop or animal product does not exceed the MRL of 0.1 mg/kg.

Animal and Plant Health New Zealand (APHANZ) is the peak industry association of companies that manufacture, distribute and sell agrichemical and veterinary medicines products in NZ. Its members are made of a group of distributors and chemical producing companies which lobby and engage with regulators and stakeholders in the best interests of farmers. They aim to reach sensible solutions with the end goal of healthy crops, healthy animals and a healthy economy while minimising risks to the public and the environment.
https://animalplanthealth.co.nz

The registration process is currently undergoing a review to try and improve the efficiency of the registration of new agrichemical veterinary medicines. Due to the current backlogs in the EPA queue it is taking 4-6 years to get approval for products in NZ.

9. References

9.1 General

https://www.pesticideinfo.org
https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/onion-sarp-2020-final.pdf
https://www.holland-onions.org/gb
https://ausveg.com.au/app/uploads/2024/09/Onions-Poster_Soilborne-Diseases-_2019FINAL-1.pdf
https://agriculture.vic.gov.au/biosecurity/plant-diseases/vegetable-diseases/onion-storage-diseases
https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt19012/mt19012---vn13003-impact-assessment.pdf
https://bimcointernational.com/en/stemphylium-leaf-blight-fungicide-resistance-management/
https://www.canr.msu.edu/news/protect-onions-against-stemphylium-leaf-blight
https://agrolearner.com/common-diseases-and-pests-of-onions/
https://www.lsuagcenter.com/portals/our_offices/departments/plant-pathology-crop-physiology/plant_disease_clinic/disease_image_gallery/herbs_vegetables/onions/diseases-of-onions
https://extension.colostate.edu/resource/soil-borne-diseases-of-onion/
https://tricalnz.com/onions/
https://www.mygarden.co.nz/effective-pest-disease-management-for-onion-growth/

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https://www.mygarden.co.nz/effective-pest-disease-management-for-onion-growth/#google_vignette
https://www.hutchinsons.co.uk/fusarium-is-biggest-challenge-for-onion-sector-the-vegetable-farmer/
https://cals.cornell.edu/news/2020/02/onion-growers-have-new-tool-versus-fungicide-resistant-disease
https://alliumnet.com/wp-content/uploads/2024/01/FIGHT-THE-BLIGHT-STEMPHYLIUM-LEAF-BLIGHT-AN-EMERGING-THREAT-TO-UNITED-STATES-ONION-PRODUCTION.pdf
https://link.springer.com/article/10.1007/s41348-024-00927-9
https://www.useforesight.io/news/emerging-plant-health-threats-identified-in-efsas-december-2024-horizon-scanning-newsletter
https://zendy.io/title/10.1094/pdis-05-21-0903-fe
https://onionworld.net/2021/06/25/progress-report/
https://grdc.com.au/ data/assets/pdf file/0033/614967/Paper-Baxter-Brad-2025-Wagga-GRDC-Update-fungicide-paper.pdf
https://site.extension.uga.edu/vidaliaonion/files/2022/09/Disease-Management-Update-Fall-2022.pdf
https://www.onionpatch.dixondalefarms.com/being-proactive-against-fungal-disease-in-onions/
https://www.jungseed.com/category/onion-disease-control

9.2 Biocontrol

https://bioprotectionportal.com/productsearch/?country=au&occupation=Researcher&crop=32624001
https://biologicalservices.com.au/crops/onions/
https://nufarm.com/au/product/intervene/
https://www.botryzen.co.nz/

9.3 Disease identification

https://www.onionsaustralia.org.au/biosecurity-agri-chemical/onion-disease-identification/

9.4 Biosecurity

https://www.onionsaustralia.org.au/wp-content/uploads/2018/04/Biosecurity-Manual-for-Onion-Growers-WEB.pdf
https://www.farmbiosecurity.com.au/crops/onion/onion-pest-eradication-or-control-examples/

Disclaimer: Please note that all regulatory information gathered from the Australian regulator is based on the Strategic Agrichemical Review Process from 2020. Check the current status on the APVMA website.

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