Nursery Industry Accreditation Scheme Australia

NIASA BEST MANAGEMENT PRACTICE GUIDELINES

Volume 1 – Best Management Practice

(Volume 2 – contains NIASA Subprogram Specifications)

FOR

NURSERY PRODUCTION
GROWING MEDIA SUPPLY AND
GREENLIFE MARKET

9th Edition 2021

Greenlife Industry Australia

FOREWORD

The Nursery Industry Accreditation Scheme Australia (NIASA) provides a blueprint for the professional management of production nurseries, growing media suppliers and greenlife market businesses. It has provided these businesses with a standard for professionalism and best management practice since 1994.

NIASA operates under national guidelines that are reviewed annually to ensure they cover relevant and current production and environmental issues. The program is governed and administered by Greenlife Industry Australia (GIA) and forms the keystone of the **Australian Plant Production Standard (APPS).**

The **APPS** continues to support leading businesses with their NIASA accreditation; ensuring products have been produced under industry-recognised best management practices. The result is consistently vigorous, healthy crops and growing media produced under defined specifications, independently audited and available from professional and sustainable plant production businesses.

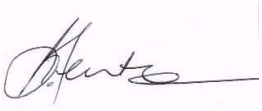
APPS staff and consultants/advisors are professionally trained and can advise on relevant technical and system improvements for production nurseries, growing media suppliers and greenlife market businesses. Such independent advice, coupled with industry-proven best management practices, provides valuable help in dealing with production efficiency, government regulations and technological advancement.

The NIASA Best Management Practice Guidelines provide the standard for the setup and operation of professional production nurseries, growing media suppliers and greenlife market businesses under industry best management practice principles. These Guidelines, along with the support of Technical Advisors, are practical in their advice for businesses due to them having been designed to improve plant production in container cropping systems, growing media production and greenlife market plant management.

The 2021 update (Edition 9) has seen a revision of the guidelines to simplify content for users and support more efficient practice in production requirements. Importantly, for this Edition, specialist certifications (formerly Appendices 12 to 16 of these Guidelines) that may not be applicable to all users have been included as a Volume 2 of these Guidelines.

Over 3,000 copies of previous editions of these guidelines have been distributed throughout Australia and internationally. The Guidelines are now only available electronically through GIA through the Australian Plant Production Standard website at http://nurseryproductionfms.com.au.

The NIASA Best Management Practice Guidelines are a valuable business improvement tool and we recommend the manual to all production nurseries, growing media suppliers and greenlife markets.



Glenn Fenton

President Greenlife Industry Australia

December 2021

ACKNOWLEDGEMENTS

This edition (Edition 9 – 2021) acknowledges the continual hard work of all involved in updating these guidelines.

Updated NIASA BMP Guidelines and review of content by Grant Telford (Biosecurity Analyst - GIA) and John McDonald (National Biosecurity Manager – GIA).

Thank you to everyone who has assisted the development of these and previous editions of the NIASA Best Management Practice Guidelines and congratulations to all who implement them.

The original NIASA guidelines were published in 1994 edited by Keith Bodman, then Senior Pathologist with the Queensland Department of Primary Industries followed by the second edition in 1997, edited by Ian Atkinson, then National Industry Development Officer NIAA.

The 2003 edition was edited by Richard Stephens and had input from many people including current and previous national NIASA committee members; Keith Bodman, Wayne Parr, Robert Harrison, Brent Tallis, Nick Smart, Jerry Holder, Fergus Higson, and David Mathews; current and past Nursery Industry Development Officers including; Edda Keskula, Sandy Pate, Robert Chin, Michael Danelon, John McDonald, Anne Frodsham, Angela Monks, Kath Laurie, Peter Jolly, Phil Wood, Megan Connelly and Ian Atkinson; and State Accreditation & Certification Committee members.

Since that time the NIASA Guidelines have undergone many changes to better accommodate users and to support modern changes to production practice.

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REVISION GUIDE

Please note the following revisions included within this Edition of the NIASA Guidelines:

New sections

- Nil.

Updated sections

- Section 1.1.2 Growing media/propagating media. Approved materials updated to include peat, coir, perlite, and vermiculite.
- Recognising Reverse Osmosis (RO) as an approved water disinfestation method in Table 1 - NIASA approved water disinfestation methods.

All sections

- General formatting and minor edits.
- Where references are made to other sections of the Guidelines, or external resources, links to those sections or resources have been added.

Other

- APPENDICES 13 to 17 related to subprogram certifications have been removed from this Edition and now form part of new Volume 2 of the NIASA BMP Guidelines.

ACCREDITATION IN THE NURSERY INDUSTRY

Nursery Industry Accreditation Scheme Australia (NIASA) is a national scheme governed, administered, managed, and promoted by Greenlife Industry Australia (GIA). NIASA is the cornerstone of the Australian Plant Production Standard (APPS) and provides a set of guidelines that ensures a plant production business operates according to industry best management practice and commits to a continuous improvement cycle (Plan, Do, Check & Review).

The GIA, through NIASA, provides specialist Best Management Practice (BMP) advice and accreditation services to:

- Nursery Production Businesses.
- Growing Media Suppliers.
- Greenlife Marketers.

NIASA also supports nursery production in specialised areas. Volume 2 of this 9th Edition includes BMP advice for production of tree stock for landscape use, and production of high-quality avocado, macadamia, banana nursery stock and ethical production considerations.

Building onto NIASA under the APPS is EcoHort, the industry specific Environmental Management System (EMS), that provides businesses with a systematic approach to assess their environmental and natural resource management responsibilities as part of their daily business management. BioSecure HACCP, the industry specific on-farm plant protection and biosecurity module, is also available for businesses who have successfully gained NIASA Accreditation.

Together, NIASA, EcoHort and BioSecure HACCP form the APPS designed for businesses to assist them in planning for the future through risk analysis and action planning.

For more information on NIASA, EcoHort, or BioSecure HACCP contact GIA on email: biosecure@greenlifeindustry.com.au or visit www.nurseryproductionfms.com.au or https://www.greenlifeindustry.com.au.

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- Appendix 13 Avocado Nursery Stock Specification
- Appendix 14 Landscape Tree Stock Specification
- Appendix 15 Macadamia Nursery Stock Specification
- Appendix 16 Banana Nursery Stock Specification
- Appendix 17 Ethical Nursery Stock Specification

INTRODUCTION TO NIASA

These guidelines describe industry 'Best Management Practices' for production nurseries, growing media suppliers and greenlife markets. They have been divided into five major sections:

- Crop hygiene (root disease prevention, and disease, pest and weed control).
- Crop management practices (nutrition and environment control).
- General site management.
- Water management.
- Appendices.

These Guidelines can be used as a reference for the professional operation of production nurseries, growing media suppliers and greenlife markets. They are also used as the mechanism for assessment to gain and maintain NIASA accreditation status. Such assessments are carried out by Auditors using the appropriate NIASA Checklist.

The areas shaded on the NIASA Checklists indicate they are mandatory items which must achieve a 'Does not apply', 'Satisfactory' or a 'Complies fully' rating prior to NIASA Accreditation being issued and then subsequently maintained as evidenced during each future audit.

Note: In certain situations, the Auditor has discretion in the interpretation of these Guidelines, as long as any variations are approved by the National Governance Committee.

NIASA business operators are proud of their products and professionalism

1 CROP HYGIENE

1.1 The prevention of root diseases

The prevention of root diseases, particularly those caused by Phytophthora spp., *Cylindrocladium* spp. and *Chalara elegans* are a major consideration as, once contracted, most cannot be eradicated in a commercial or end-use situation. Root rot prevention relies on a complete package of strategies, which is successfully operated only when the life cycles of the pathogens are fully understood.

Where a root rot outbreak occurs in a production nursery set up cropping system with what appears to be the full complement of cultural and physical barriers in place to prevent the completion of pathogen life cycles, the cause is almost invariably due to a lack of staff or operator training. There will be annual scientific testing of the effectiveness of hygiene practices at the direction of the Auditor.

An Auditor inspecting roots for disease symptoms.

1.1.1 Water

Reticulated (town) water and water from bores and clean roof catchments should not require disinfestation treatment. However, if water from such sources is stored in a way that allows contamination, for example an unlined earth dam or uncovered tank, then it must be treated as for surface water supplies. Note: town water in some country areas is not treated by the supply authority and may require disinfestation.

Water sourced from non-contaminated sources or disinfested and stored for subsequent use must be stored in such a way as to prevent contamination by pathogens.

Clean water is essential for healthy vigorous plant growth.

The pH and EC of all water sources must be checked and recorded at least once per month as even town water supplies can have variations in quality. See APPENDIX 4 SAMPLE RECORDING SHEETS for a sample recording sheet.

Water from surface supplies, springs, effluents, or water testing positive for the presence of root-rot organisms must be disinfested by at least one of the methods approved by the National Governance Committee (NGC).

Chlorine (as hypochlorous acid)

It is known that above pH 7, the amount of available hypochlorous acid in solution falls rapidly until little occurs at pH 8. Chlorine residual levels for effective water treatment need to be maintained between 2ppm – 3ppm for a minimum contact time of 20 minutes at a pH of between 5.5 and 7.5.

Chlorination, like all oxidants, has a reduced efficacy if water contains high levels of organic material (e.g., soil), iron and nitrogenous fertilisers.

Chlorobromination

To treat water effectively a residual level of 3ppm is required after an 8 minute contact time. It may be required to increase the contact time at higher pH levels to achieve the desired 3ppm residual.

Chlorobromine has a similar action to chlorine in disinfesting water. It is effective over a wider range of pH's and at pH 8.5 60% of bromine is still present as hypobromous acid. Bromine and chlorine react with nitrogen-based compounds to form bromamines which have comparable disinfestation properties to bromine, meaning less chemical should be required when using bromine.

Chlorine dioxide

Chlorine dioxide has been shown to be highly effective for disinfesting a range of plant pathogens including *Fusarium oxysporum*, *Alternaria zinniae*, *Colletotrichum capsici*, *Pythium ultimum* and *Phytophthora cinnamomi* (zoospores and chlamydospores) over a range of water pH levels up to pH 10.

It needs to be applied at a minimum available concentration of 3 mg/L ppm for 8 minutes to control waterborne fungal pathogens. Chlorine dioxide also oxidises iron.

Disinfestation properties of chlorine dioxide are unaffected by pH as high as 10 plus chlorine dioxide is 10 times as soluble in cold water than chlorine and is a more selective oxidiser than chlorine therefore not as reactive to organic matter in the water. This translates to having a lower dosage rate to achieve an active residual disinfectant. Although chlorine dioxide equipment is more expensive than other chlorination systems, this method of disinfestation is likely to be more effective considering the quality of surface captured water in Australia (high pH).

Ozonation

Ozone kills chlamydospores of *Phytophthora cinnamomi* in dam water at an average residual dose of 1.4 mg/L (ppm) over 16 minutes. Ozone demand increases with alkalinity and the concentration of bicarbonate, iron and ammonium but is less affected by pH and temperature than chlorine. Ozone can oxide manganese and iron compounds and many pesticides and has excellent activity against viruses.

Ultraviolet (UV) radiation

Ultraviolet radiation is an effective and environmentally friendly method of controlling *Phytophthora cinnamomi*, *Fusarium oxysporum*, *Colletotrichum capsici* and *Alternaria zinniae*. Water must be of a very high quality, be free of suspended materials, tannins, iron and manganese and have a high UV transmission (greater than 60% UV transmission after filtration) and exposure dose is at least 5.0 x105µW.s.cm-2.

Microfiltration

Microfiltration and membrane filtration have been shown to be impractical in Europe because the poor quality water in nurseries clogs filters. It also has extremely high operating costs. However, in situations where low volumes of water are required, and disposal of wastewater can be addressed it may provide a viable option.

Slow flow filtration

This system uses both physical and biological processes to filter and break down organic matter and kill pathogenic bacteria and fungi. To adequately control the range pathogens using slow flow filtration (SFF) flow rates of 100L/hr/m^2 should be used. Sand of specific grades is the predominant filter medium used, but if rockwool is used as the filtering medium it must be granulated premium superflock rockwool. Slow flow filtration systems must not be allowed to dry out or heat up and pre-filtering is necessary to remove algae or silt.

See the relevant Nursery Papers and other references for alternative methods and discuss them with the Auditor.

The following table lists the minimum residual levels and contact times for NIASA approved disinfectants

Table 1 - NIASA approved water disinfestation methods

Chemical Disinfectants				
Name	**Residual level after contact time (ppm)**	**Contact time (minutes)**	**Effective water pH range**	**Comments**
Chlorine	2.5	20	5.5 – 7.5	Decreased efficacy at higher pH
Chloro bromine	3	8	5.5 – 9.0	Increase contact time at higher pH
Chlorine dioxide	3	8	5.0 – 10.0	Increased efficacy with higher pH
Ozone	1.4	16	Nil	Requires complete mixing into water
Iodine	5	30	Nil	Increased efficacy at approx. 20°C
Non-Chemical Disinfestation				
Name		**Treatment regime**		
Ultrafiltration		<0.1µm		
UV irradiation		>60% UV transmittance at 254µm		
Slow Flow Filtration (SFF) (**)		≤100L/hr/m^2 flow rate		
Reverse Osmosis (RO)		<0.0001µm		

** **Note:** *If rockwool is used as the filtering medium in SFF, it must be granulated premium superflock rockwool.*

Adequate records of water disinfestation treatments must be maintained. The minimal requirement for testing and recording chlorination, chlorine dioxide or chloro-bromination treatments is once per month. These records must include pH of water before treatment, free chlorine concentration at start of contact time, contact time, free chlorine concentration at end of contact time (residual). See APPENDIX 4 SAMPLE RECORDING SHEETS for a sample recording sheet.

The Auditor can require a greater degree of testing.

The Auditor will recommend recording requirements for other disinfestation treatments.

The subsequent storage of treated water requires facilities and procedures that do not allow for contamination by untreated water, soil, plant debris, dust and animal movement.

References

- ✓ Beware of Chalara elegans – Black root rot, The Nursery Papers, 1999#13
- ✓ Chalara (black root rot), can you recognise it? The Nursery Papers, 2001#07
- ✓ Using ultraviolet radiation and chlorine dioxide to control fungal plant pathogens in water, The Nursery Papers, 1996#05.
- ✓ Water disinfection – Chloro-bromination and ozone systems get the thumbs up!
- ✓ The Nursery Papers, 1997#08.
- ✓ Slow flow sand filtration for water disinfestation in nurseries and greenhouses,
- ✓ The Nursery Papers, 1999 #03
- ✓ Managing water in plant nurseries, NSW Agriculture, 2nd edition, 2000

1.1.2 Growing media/propagating media

Routine disinfestation of growing media/propagating media. There is no requirement to routinely disinfest materials generally considered to be free of major plant pathogens (approved materials) or those from a source consistently testing free of specified pathogens (approved supplier).

Perlite, peat, coir, vermiculite, and properly composted and correctly stored pine barks prepared on clean surfaces, are generally considered to be free of the major plant pathogens occurring in propagating facilities - *Pythium* spp., *Rhizoctonia solani, Fusarium* spp., *Cylindrocladium* spp., *Phytophthora* spp., *Chalara* spp. and *Botrytis* spp..

However, experience indicates that contaminated propagules, tools, containers, preparation surfaces, water and dust and splashed or windborne inoculum presents a much greater risk of plant disease.

Sand presents a significant risk of carrying plant diseases including *Pythium* spp., *Rhizoctonia* spp., *Phytophthora* spp. and nematodes and if sourced from a depth less than 2 metres must be treated or regularly tested and found free of specified pathogens.

Sand is often washed with water from surface water supplies such as rivers, creeks, dams and, without disinfestation, may potentially contaminate clean sand.

To minimise the risk of contamination with plant pathogens and nematodes, growing media suppliers must source sand from deeper than 2 metres and ensure that no surface water drains onto the