



TECHNICAL NOTES FOR ROMEO®

SUMMARY

- An approved professional fungicide - host plant defence inducer- a biofungicide.
- Based on Cerevisane, a purified extract of a *Saccharomyces cerevisiae* strain LAS117. ROMEO mimics a disease attack on the plant and acts to strengthen the plant against disease.
- Can be used alone, in a programme with or in tank mix with chemical fungicides.
- Use for resistance management. Use to increase spray programme performance.
- Use in sustainable organic production, subject to certification body approval.

Approved for use on crops grown under permanent protection with full enclosure - Botrytis on aubergine, strawberry and tomato; powdery mildew on cucumber and other named cucurbits and for downy mildew on lettuce.

Recommended rates are summarised in table 1 and range from 0.5 to 0.75 kg per ha.

ROMEO must be applied preventatively as it has no direct effect on plant disease.

ROMEO offers protection 24 hours after application. Applications should be made every 7-10 days with a maximum of 8 treatments per crop. In case of high disease pressure or disease development ROMEO should be used with other fungicides either by tank mix or alternation.

Mixable with many chemical plant protection products. Details of known compatibilities are summarised in table 2.

Use plant protection products safely. Always read the label and product information before use.

Further product information, including warning phrases and symbols, is included in the main product manual.

VERSION CONTROL

Version	Publication Date	Change from previous version
12/18	December-2018	New product.
02/19	March 2019	Correction

TABLE OF CONTENTS

Item	Page Number
Introduction	3
What is ROMEO?	3
Why use ROMEO?	3
ROMEO activity on strawberry against <i>Botrytis</i>	4
ROMEO activity on tomato against <i>Botrytis</i>	4
ROMEO activity on cucumber against powdery mildew with sulphur - alternated or tank mixed.	5
ROMEO activity on lettuce against downy mildew.	5
What diseases does ROMEO control?	6
History and Development:	6
How does ROMEO work?	6
On what crops and in what situations can ROMEO be used?	8
Application Mixing and Spraying	8
When should ROMEO be applied?	8
How best to apply	8
Water volume	8
Adjuvants	9
Application with ULV equipment	9
Is there a limit on the acidity or alkalinity of the spray solution?	9
Is there any benefit from pre-mixing?	9
What treatment interval is recommended?	9
Harvest interval	9
Are there any issues of plant phytotoxicity	9
Is it possible to over induce the plant?	9
Compatibilities	9
Tank mixing or position in crop management programme	9
Compatibility with other beneficial fungi or organisms	11
Suitability for use in useable in organic systems?	11
What is the shelf life and what are the recommended storage conditions?	11
How is ROMEO packaged?	11

These notes are designed to support the main product manual insert on ROMEO and advise on how to obtain the best possible disease control from the product.

INTRODUCTION

WHAT IS ROMEO?

- ROMEO is an approved fungicide MAPP number 18534.
- ROMEO contains 941 g/kg Cerevisane, a purified extract of the cell wall of a specific strain LAS117 of yeast *Saccharomyces cerevisiae*, it is non - living.
- Cerevisane is a plant defence inducer which acts to strengthen the plant against disease. It has no direct activity on fungal pathogens.
- ROMEO is effective in induction of defence against a broad spectrum of fungal diseases.
- ROMEO's defence induction takes about 24 hours to develop and lasts for 7-10 days after treatment.

WHY USE ROMEO?

- Another way to control downy mildew, powdery mildew and *Botrytis*.
- Use to increase spray programme performance.
- Use for resistance management.
- Can be applied alone or in a programme.
- No phytotoxicity has been seen.
- No residues.
- Usable in organic systems.

Figures 1 to 4 below demonstrate activity.

Figure 1: ROME0 on strawberry against *Botrytis*.

Percent incidence of *Botrytis* on strawberry flowers and fruits. Greenhouse trial Italy. Natural infection of *Botrytis*. 4 foliar applications applied at 10 day intervals.

Treatments:

First bars: Flowers.

Second bars: Fruits on plant.

Third bars: Fruits in store.

Blue bars: - untreated control, Orange bars: - fenhexamid, Grey bars ROME0 0.5 kg/ha, Yellow bars ROME0 0.75 kg/ha.

Good efficacy on flowers and fruits (64-80% efficacy). Dose effect 0.75 kg > 0.5 kg /ha. Statistically similar to fenhexamid reference product.

Agrauxine SA.

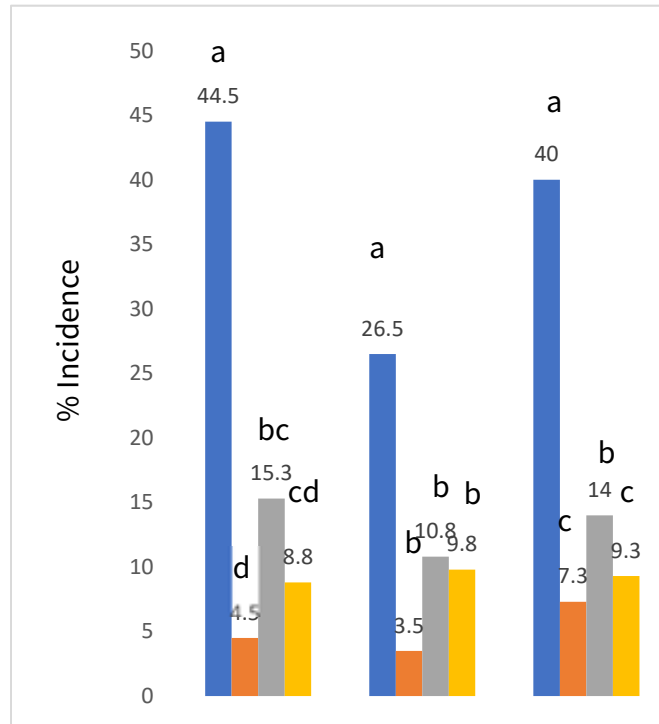


Figure 2: ROME0 on tomato against *Botrytis*.

Greenhouse trial Italy. 5 foliar applications 10/14 day intervals. Natural infection. Comparison with iprodione as a chemical reference.

Treatments:

First bars: *Botrytis*- on flowers.

Second bars: *Botrytis*- fruit on plant.

Third bar: *Botrytis*- fruit in store.

Blue bars: untreated control.

Orange bars: iprodione.

Grey bars: ROME0 at 0.25 kg/ha.

Yellow bars: ROME0 at 0.5 kg/ha.

Pale blue bar: ROME0 at 0.75 kg/ha.

Good intrinsic efficacy on flower and fruits around 82-91% efficacy. Dose effect 0.75 kg/ha better than 0.5kg/ha better than 0.25 kg/ha. Similar to iprodione reference. (*Agrauxine SA*).

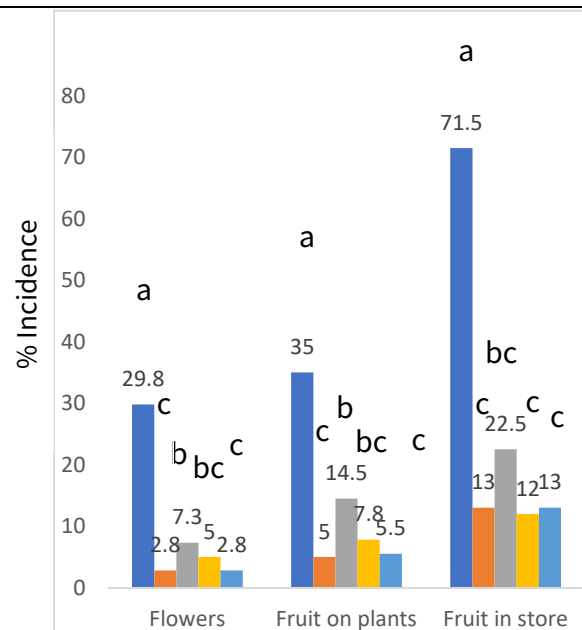


Figure 3: ROME0 on cucumber against powdery mildew. Comparing efficacy with sulphur. Alternated or tank mix with sulphur fungicide.

Greenhouse trials Italy. Comparison with tank mix and alternation.

First bars: tank mix treatment.

Blue bar: untreated control.

Orange bar: sulphur at 0.5 kg/100 L.

Third bar: ROME0 0.5 kg/ha plus sulphur at 0.5 kg/100l.

Second bars: Alternated treatment.

Blue bar: untreated control.

Orange bar: sulphur at 2 kg/ha (treatment B & D only).

Gray bar: ROME0 0.5 kg/ha (treatment A, C & E) alternated with sulphur fungicide 2 kg/ha (treatment B & D).

Good efficacy in tank-mix and alternation with sulphur.

(Agrauxine SA).

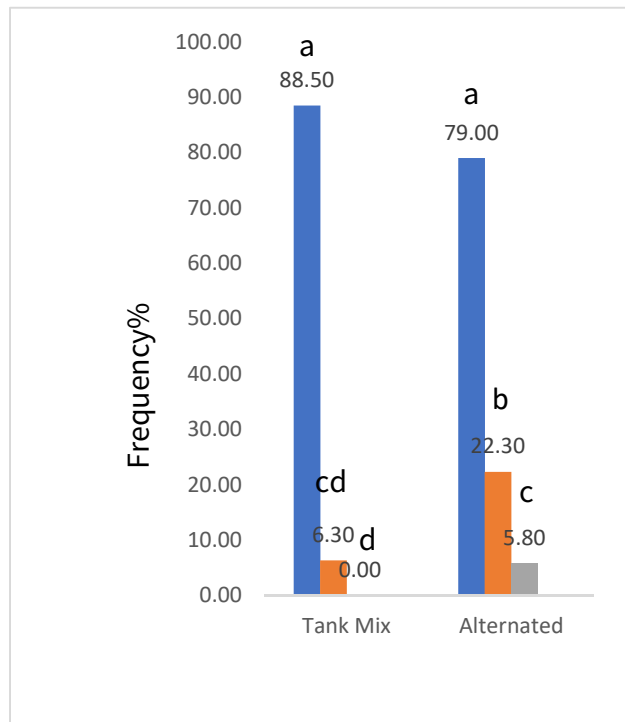


Figure 4: ROME0 on lettuce against downy mildew.

Greenhouse trials. 4-7 foliar applications every 7-14 days at 400 – 1000 l/ha. Based on 9 trials in France, Italy, Spain and Denmark, 2010-2015. High disease pressure. 37% leaves infected per lettuce in the control.

Treatments:

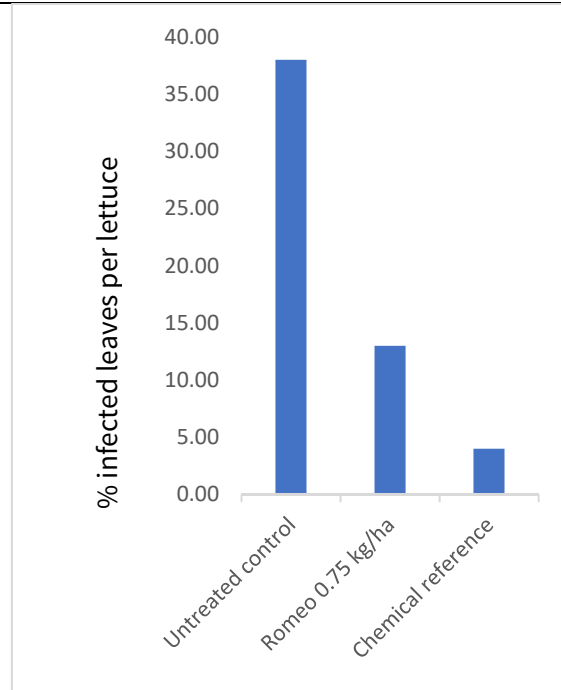
First bar: Untreated control.

Second bar: ROME0 at 0.75kg/ha.

Third bar: Chemical reference programme.

ROME0 gave 69% efficacy, slightly lower than the chemical reference programme (85%).

(Agrauxine SA).



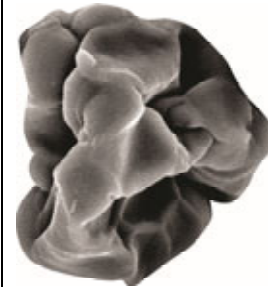
WHAT DISEASES DOES ROMEO CONTROL?

ROMEO has been shown to have activity against powdery mildew, downy mildew and *Botrytis*. Activity has been reported in a limited trial against *Rhizoctonia* on lettuce.

HISTORY AND DEVELOPMENT

ROMEO contains the first microbial fraction activating the physical and biochemical defence mechanisms in plant. The active Cerevisane® was patented in 2006 by Agruaxine Lessaffre Plant Care and the active ingredient approved in the EC on 23/04/2015. It is classified as a low risk substance. On 18/01/2016 Cerevisane was added to annex IV of EC 396 /2005, so no maximum residue limits (MRL) for Cerevisane are required. The product has been developed with over 300 trials and approved in parts of EC for various crops under the development code ALD1901.

Figure 5:
Cerevisane
microscopic
structure. (SEM)



At the time of writing ROMEO is approved in France, Italy, Belgium, Holland, Germany, parts of the USA and the UK. Approval is pending in a number of other European countries.

HOW DOES ROMEO WORK?

ROMEO acts as a host plant defence inducer and has no direct effect on plant pathogens.

- The active mimics a microbial attack on the plant.
- It activates the cell signalling cascade, inducing many defence genes including those dependant on the salicylic acid protection mechanism, (powdery mildews, downy mildews) and the defence mechanism dependant on jasmonic acid and ethylene protection mechanism against necrotrophic pathogens (kill host cell and live on the contents) eg *Botrytis*.
- Metabolic changes in the plant result with the stimulation of phytoalexins (antimicrobial compounds) and strengthening cell walls and leaf cuticle.
- Efficacy lasts for 7-10 days and is typically effective 1 day after application.

Figure 6: Effect of
ROMEO on internal
colonisation of
powdery mildew.
Top -untreated, bottom
- treated. (INRA Dijon)

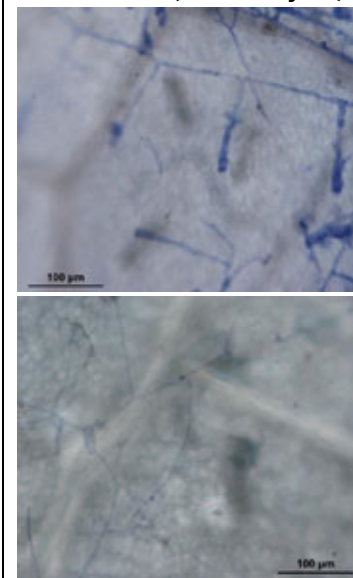


Figure 7: Induction of defence genes. Induction of PR1 and PR4 marker genes.

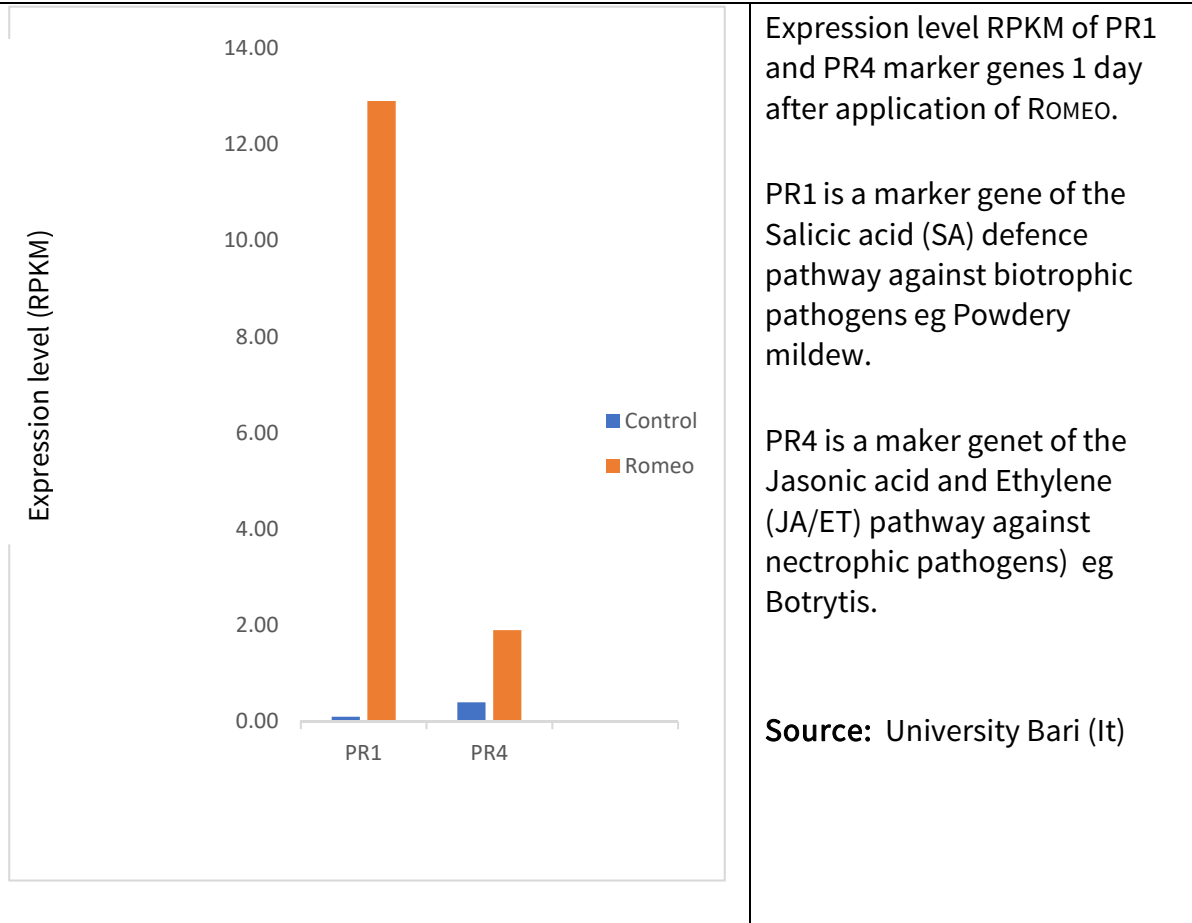
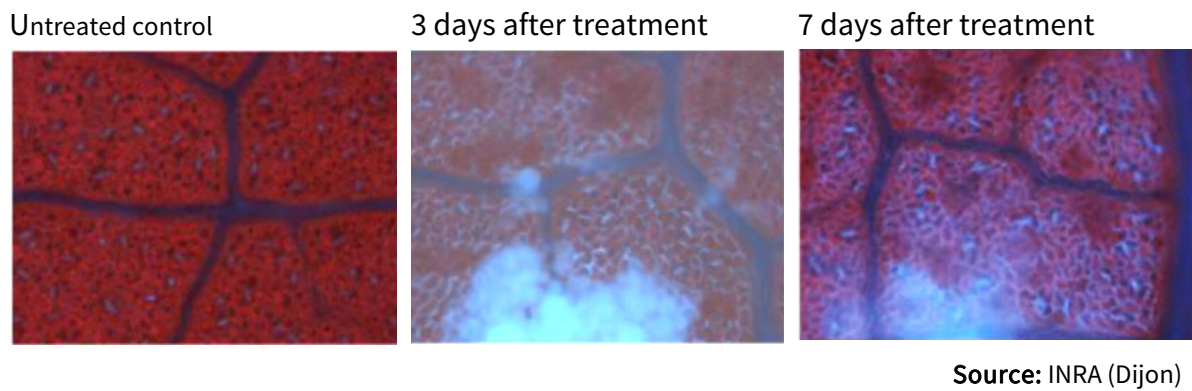


Figure 8: Stimulation of phytoalexins (fluorescent antimicrobial compounds).



ON WHAT CROPS AND IN WHAT SITUATIONS CAN ROME0 BE USED?

In the UK ROME0 is approved for use on the following crops. The approval currently restricts use to permanent protection with full enclosure.

CROP LIST

Table 1: Crop list.

Crop (Permanent protection with full enclosure)	Rate kg/ha	Disease on label
Aubergine	0.5	botrytis
Courgette	0.5	powdery mildew
Cucumber	0.5	powdery mildew
Gherkin	0.5	powdery mildew
Lettuce	0.75	downy mildew
Melon	0.5	powdery mildew
Pumpkin	0.5	powdery mildew
Strawberry	0.75	botrytis
Summer Squash	0.5	powdery mildew
Tomato	0.5	botrytis
Watermelon	0.5	powdery mildew
Winter Squash	0.5	powdery mildew

APPLICATION MIXING AND SPRAYING

WHEN SHOULD ROME0 BE APPLIED?

ROME0 acts preventatively and prepares the plant to defend itself against fungal attack. ROME0 must be applied before the risk of disease appearance.

Application should be made every 7-10 days ensuring a minimum interval of 7 days is maintained and the maximum number of applications of 8 treatments per crop is not exceeded.

The first application may be made at BBCH 12, two true leaf stage with leaves unfolded to BBCH 89, beginning of fruit abscission stage).

In case of disease development or under high disease pressure ROME0 should be used with other fungicides either by tank mix or alternation.

HOW BEST TO APPLY ROME0?

What is the recommended water volume for dilution?

Use sufficient water to ensure uniform coverage of the crop, without causing run-off. The label advises 100 to 1000 litres per hectare

Adjuvants:

Adjuvants are not necessary for ROMEO and do not increase efficacy.

APPLICATION WITH ULV EQUIPMENT

At the time of writing ULV application has not been tried on the UK crops.

IS THERE A LIMIT ON THE ACIDITY OR ALKALINITY OF THE SPRAY SOLUTION?

No problems have been reported

IS THERE ANY BENEFIT FROM PRE-MIXING?

There is no requirement to pre-mix in water. Agitation in the spray tank is required.

WHAT TREATMENT INTERVAL IS RECOMMENDED?

Apply every 7 to 10 days with at least two successive treatments.

A maximum of 8 treatments may be applied to the crop.

HARVEST INTERVAL

A pre-harvest interval of 1 day is specified under the restrictions section of the label.

ARE THERE ANY ISSUES OF PLANT PHYTOTOXICITY?

No phytotoxicity has been observed in any of the trials.

IS IT POSSIBLE TO OVER INDUCE THE PLANTS DEFENCE?

There is a maximum point of plant stimulation beyond which the plant fails to respond any more.

COMPATIBILITIES

TANK MIXING OR POSITION IN CROP MANAGEMENT PROGRAMME

The label states that ROMEO is compatible with most plant protection products (fungicides, insecticides) and fertilisers. In case of new mixtures, please initially test physical compatibility in a small container. It is also not possible to guarantee the biological and physical compatibility of all spray mixtures.

Table 2, below, lists some experience generated outside the UK. Some of the products listed may not be approved in the UK on the labelled crops. The formulations listed appear to be the same as the UK product listed but this may not be the case.

Users are advised to test a small sample first to check physical compatibility and then test treat a small trial area. Liability may cannot be accepted for any issues with regard to tank mixing.

Table 2: Tank mixing		
Active	UK Example	Key
Fungicides		
Ametoctradin + dimethomorph	Percos	Y
<i>Ampelomyces quisqualis</i>	AQ 10	N
Azoxystrobin	Amistar	Y
<i>Bacillus amyloliquefaciens</i> subsp. plantarum strain D747	Amylo-X WG	Y
<i>Bacillus subtilis</i> strain QST713	Serenade (not UK formulation)	
Boscalid + pyraclostrobin	Signum	Y
Bupirimate	Nimrod	Y
Chlorothalonil	Bravo	Y
Cyflufenamid	Cyflamid (no data Takumi)	Y
Difenoconazole	Plover	Y
Fenhexamid	Teldor	Y
Fenpyrazamine	Prolectus	Y
Fludioxonil + cyprodinil	Switch	Y
Fluopyram+trifloxystrobin	Luna sensation	Y
Flupicolid+propamocarb	Infinito	Y
Fosetyl aluminium + propamocarb	Previcur Energy	Y
Kresoxim methyl	Stroby	Y
Mancozeb	Dithane NT WDG	Y
Meptyldinocap	Kindred	Y
Metalaxyl plus mancozeb	Fubol Gold	Y
Penconazole	Topas	Y
Potassium bicarbonate	Karma / commodity substance	N
Proquinazid	Talius / Justice	Y
Pyrimethanil	Scala	Y
Sulphur	Kumulus DF	Y
Sulphur	Microthiol Special	Y
Trifloxystrobin	Flint (no data on Swift)	Y

Insecticides		
<i>Bacillus thuringiensis</i> ssp kurstaki	Dipel DF	Y
Esfenvalerate	Sumi-Alpha	Y

Adjuvants		
Silwet L77		Y
Nu-Film P		Y

Y: ROMEO has been successfully tank mixed with ROMEO first.

N: Problems in tank mixing have been reported, be careful.

COMPATIBILITY WITH OTHER COMPONENTS OF A CROP PRODUCTION PROGRAMME OR WITH OTHER BENEFICIAL FUNGI OR ORGANISMS?

In efficacy trials to date no deleterious effect has been observed on insects or mites.

IS ROMEO USABLE IN ORGANIC SYSTEMS?

ROMEO is used in organic growing systems according to EU 889/2008. It is suggested that certification body approval is obtained before use.

WHAT IS THE SHELF LIFE AND WHAT ARE THE RECOMMENDED STORAGE CONDITIONS?

ROMEO has a shelf life of 2-years from manufacture when stored in a cool dry location. Do not freeze.

HOW IS ROMEO PACKAGED?

ROMEO is packed in 1 kg plastic containers in outers of 8.

This product is to be used only in accordance with the recommendations and instructions given on the labels provided with the pack. Use in any other circumstances is entirely at the user's own risk.

APPROVAL HOLDER AND MARKETING COMPANY

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Distributed in the UK by Fargro Ltd. Pack Size: 1 kg (outer 8).

Safety data sheet available on request.

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