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# **Organic Potatoes**

Pathways to coping without copper



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## Intro

Potato late blight, *Phytophthora infestans*, is one of the most serious crop diseases in the UK. It can reach epidemic proportions very quickly and affects organic and non-organic growers alike. Organic growers have access to few direct fungicides and there are limitations to existing cultural control measures. This paper explores some of the challenges faced by organic growers looking at both tried and tested growing methods and immerging innovative solutions. It is not a comprehensive guide but spotlights particular key areas.

### Summary

**Blight-resistant varieties** – careful choice of variety is one of the key tools in avoiding blight. Growers are advised to regularly check blight scores on the AHDB variety database (http://varieties.ahdb.org.uk) as these will lower over time. For example late blight resistance for both Orla and Lady Balfour has over the years reduced to 4/10. Growers also need to adopt strategies to help protect resistance for instance using biostimulants or other preventative products.

**Marketing** – in order to facilitate a successful uptake of blight-resistant varieties the whole chain – consumers, retailers, packhouses and growers - needs to work in collaboration informing consumers of their environmental benefit. Clever marketing such as Agrico's *Next Generation* label could expand appeal as it invites both conventional and organic growers.

**Soil management strategies** – fertile, healthy soils resulting from adhering to fundamental organic principles will produce healthier plants that are better able to fend off disease. Producers should constantly review their whole growing system looking for unique improvements – eg. growing in beds rather than ridges as this retains more moisture in the soil therefore requiring less irrigation with the associated blight risk (Joe Rolfe). For smaller growers who don't have much large scale equipment a harvest can still be achieved by topping at the first sign of blight.

Useful tools for Smith Period alerts and tracking blight incidences include: <u>https://blightwatch.co.uk/, https://blight.ahdb.org.uk/BlightReport</u>

**Treatment** - this year the manufacturer of copper-based fungicide Cuprokylt decided not to apply to Defra for a licence to market this product - we understand this was because total sales had declined to the point where it was not worth the expense. Scientific publications on copper free organic farming methods and some potential alternative plant protection products including mesh cover trials can be found here: <a href="http://www.co-free.net/results.html">http://www.co-free.net/results.html</a>, <a href="http://www.co-free.net/results.html">https://www.co-free.net/results.html</a>, <a href="https://www.co-free.net/results.html">https://www.co-free.net/results.html</a>, <a href="https://www.co-free.

The development of **bio-stimulants** is an exciting area with significant potential to expand organic preventative treatments. The approach involves the whole system – increasing soil vitality, preventing pathogens, promoting plant resistance and alternating between antagonists and natural extracts. The main routes are treating seed, inoculating compost at time of transplanting, and foliar application as the plant develops. There is an overlap here with the more traditional approaches of compost tea and horse tail spray.





# **Blight resistant varieties**

Blight resistant potato varieties play an important role in a grower's integrated pest management strategy. These disease resistant varieties are ever expanding as leading breeders and research companies develop new, stronger varieties. Bioselect, Agrico currently have at least 7 named varieties, some very new to the market exhibiting greater longevity to blight resistance due to clever gene manipulation. Producers are still required to be vigilant strengthening their seed on a yearly basis by roguing out any blighty plants otherwise their resistance will be eroded.

Having attended a recent Bioselect Demo Day, a Soil Association Certification Seed Specialist remarked that the varieties exhibit strong blight resistance with two genes for blight resistance in effect giving them double defense, particularly useful in a year where new blight strains have been identified.



Alouette, one of Agrico's Next Generation varieties, exhibits good foliage and late blight resistance

Agrico have a unique way of breeding working closely with independent breeders, in a process that can sometimes take 10 years from identifying strains, growing them up and getting them accepted. They have a wide range of potato types also breed for flavour and commercial appeal. Over the past 3 years The Soil Association has seen more uptake of blight-resistant varieties increasing year on year. Such varieties include Alouette, Twister and Twinner from Bioselect, Sarpo varieties Shona and Uno, and Acoustic from Meijer.





## Case study - Joe Rolfe RB Organics

Joe manages an area of 450 acres at Houghton Hall, North Norfolk, growing predominantly potatoes, carrots and onions. Four years ago, during developing uncertainty over copper authorisation, he went copper free planning as though copper would eventually be phased out.

#### What new techniques have you adopted since going copper free?

Actually it hasn't really been a big change for us. We have maintained fundamental organic principles that promote soil health such as a 7-year rotation. Whilst we have continued to grow blight resistant varieties favouring quick-maturing varieties we decided recently to return to more traditional varieties. Critical here was ensuring we were buying in good quality seed.

Irrigation remains an important tool. When blight risk is high we only irrigate in the daytime so that leaves are not left wet over night. We've moved to growing in beds rather than ridges which as well as fitting with planting carrots and onions, retain water for longer. We micromanage water probing the soil at 10m intervals with a digital probe and using soil moisture weather stations.

### Have you conducted any trials with promising results?



Joe Rolfe, RB Organics. July 2019

We have recently been trialling 3 blight resistant varieties and yes some of the trials have proven successful – this year we have grown them commercially. (one big learning curve for us was to grow them away from commercial fields!). We also trialled transplanted potatoes but these got blight. The challenge has been to keep changing the trial varieties as blight can evolve. Otherwise we have dabbled in bio-stimulants but these trials have not been comprehensive.

Do you think growing in a manner that will reduce the risk of blight will always compromise yield even in a blight-free year? We are continually playing around with plan spacings to get the maximum performance without effecting blight risk – this is a constant moving target depending on soil type, seed size and variety and also the final

size/shape of potato required for the market.

# *Do you think consumers are open to buying more blight resistant varieties?*

The varieties we have been trialling eat very well, so it is a case of showcasing these to our customers in the hope they range them for sale to consumers. The need to look at alternative varieties is not necessarily driven by increased sales, it has been driven by the need to reduce risk and having a forward thinking innovative approach. Obviously if growers pull out of production then the opportunities and requirements (supply/demand) becomes more of a driver.





# Marketing

The copper issue is a marketing problem rather than a technical one - Tony Little, The Sustainable Farming Consultancy

One recurring challenge that blightresistant varieties face is how they are perceived by consumers and retailers. Opinions are divided – some producers say there is still scope for the taste profile to be improved, elsewhere it is advocated that taste is no longer a barrier and that all cooking categories are fulfilled. Stroud Organics, an established retailer at the Stroud Farmer's Market say that they sell blight-resistant varieties (Carolus, Alouette and Mira) just as well as nonresistant but that they don't draw attention to their copper-free nature as a



Alouette and Carolus (not in shot) selling well at Global Organics, Stroud Farmer's Market

selling point. Agrico are now rebranding their potatoes with a 'Next Generation' label as a way of expanding their appeal beyond organic acknowledging the importance of getting conventional farmers on board.

Tony Little, who has been setting up a seed supply chain in Wales believes the marketing of blight-resistant potatoes as critical to their success:

- Consumers tend to buy out of habit retailers are in the position to shape what ends up on the plate
- A collaborative effort from the entire chain is required sending positive messages to consumers bringing them on board
- The Netherlands can be seen as a case study where the outcome of a concerted approach resulted in all organic potatoes going blight-resistant
- We need to identify the person or organisation that is able to unite supermarkets, packhouses and growers





#### Case Study - Andy Dibben, Abbey Home Farm

Andy Dibben has been successfully growing potatoes for the past 15 years without copper. Abbey Home Farm is a mixed farm of 15 acres supplying a large farm shop through the seasons. Potatoes are grown on half a hectare and are part of a diverse range of 60 different crop lines. Andy always plans for blight to appear in July/August but has only been hit by the disease twice. Two things that he can't stress enough are planting early and well-timed irrigation.

Andy plants as early as possible in the Spring giving his potatoes as much time as possible to bulk up before blight arrives on the scene. He focuses on irrigation at 3 key points in the tubers development to accelerate growth of the tubers: the tuber initiation stage, 2-3 weeks before flowering, and during flowering.



The tuber initiation stage or 'hook point' when the plants will benefit from regular irrigation



Andy's Boom irrigator for targeted fast irrigation - this 16m wide boom can put an inch of water down over a 100m<sup>2</sup> area within 1.5 hrs

A variety of potatoes are grown on the same field but care is taken to ensure blight-prone varieties such as Charlotte are planted where the prevailing wind would blow away from the other potatoes. Whilst there is an emphasis on early producing varieties he successfully grows for storage too, to achieve a year round supply. One

blighty potato can ruin a whole batch so he is particularly careful when storing his potatoes.





# Biostimulants

The development of bio-stimulants is an exciting area with significant potential to expand organic preventative treatments. The approach involves the whole system – increasing soil vitality, preventing pathogens, promoting plant resistance and alternating between antagonists and natural extracts. The main routes are treating seed, inoculating compost at time of transplanting, and foliar application as the plant develops.

There are a number of companies working in this area, one; Itaka Crop Science, suggest the solution is not simply to substitute copper for a product hoping to mimic its properties – this will likely be impossible. An agronomic approach is needed focusing on prevention and pre-prevention, reducing the presence of spores in the first place and preventing spores from getting into the plant.

# Horse Tail Spray

Horse tail spray has been advocated as successfully combatting blight particularly on Biodynamic Farms. It has the advantage of growing on marginal, marshy areas which might not otherwise be productive for the farmer. It is applied as a foliar feed when the potato leaves have established and exhibits fungicidal properties attributed to its high silica content.



Joe Rolfe speaking at the Soil Association Potato Workshop, Sept 2019





#### Case Study – Justin Le Gresley, Anneville Farm

Justin has been using compost tea and believes it has helped to combat blight over the years describing it as his first line of defense. Compost tea should contain as much diversity as possible with the possible addition of seaweed extract which has been linked to aiding frost resistance. Compost extract (a compost tea brewed for 6 hours rather than 48) can be applied directly to the ground turned in to protect the microbes and quickly planted into. Justin has also experimented applying compost extract to coat seed potatoes during his trials. Compost tea which contains a much higher



"Here we are putting the tea into a tank on top of our potato planter. It then feeds by gravity directly into the furrow before the furrow is closed. It is my understanding that the micro organisms are not a fan of UV's even if it was January when we were planting here!" Justin Le Gresley

concentration of microbes can be applied as a foliar feed and Justin has noted that the pH of the soil improved post spraying.

#### **Drone Trials**

Justin will be undertaking a drone trial which will hopefully improve his ability to detect disease and deficiency issues. The camera drone will use its unique light spectrum viewer to alert Justin to abnormalities in the field much sooner than is otherwise possible. He also may conduct seaweed trials building on traditional approaches of spreading seaweed on fields prior to planting.





## Some more key approaches:

• Purchasing clean seed and avoiding reusing home-saved.

• Incubating potato seeds at 15C for two weeks to identify subclinical blight before sowing. And carrying out a full disease analysis.

 $\cdot$  Good crop rotation. The spores of the fungal pathogen phytophthora infestans that causes late blight, can last for up to four years. So a good rotation where you don't plant any nightshades in a bed for 5 years can be a good disease control.

 $\cdot$  ensuring the soil has sufficient nutrients including N,P,K and Sulphur can give the potato plants strong resilience to infection.

 $\cdot$  Using green manures/winter cover to retain nutrients, particularly nitrogen can also give the potato plants strong resilience to infection.

 $\cdot$  Earlier sowing (for earlier harvest), but only where possible as this does give rise to soil erosion risks.

• Chitting, where you allow small sprouts to form on the tubers prior to planting can help quick establishment of the crop, and allow slightly earlier harvest

• Early harvest of younger potatoes. Not suited to longer term storage. But this does compromise overall yield.

• Planting a mix of varieties in the same field can delay the spread of blight across the field, but complicates harvest with additional handling required.

• Wider spacing of rows to delay canopy closure.

• Growing more erect varieties –this avoids the canopy closure and increases air flow.

• Trickle irrigation in preference to rain gun or boom irrigation to keep leaves drier.

• The ideal conditions for blight are measured as Smith Period. Growers can use predicted Smith Periods to react more quickly to the threat of blight. New strains of blight are becoming active at lower humidity and lower temperature than previously accepted.

• Planting rows in to the predominant wind direction. Increases air flow.

• Excellent plant hygiene. Removing any trace of previous crop residues, volunteers and particularly any waste material and out-grades from post harvesting and packing.

• Removing single plants that show initial focus of infection.





# Summary of The Organic Potato Workshop - Growing without Copper

On 18<sup>th</sup> September the Soil Association held an Organic Potato Workshop hosted by RB Organics. Attended by a good range of representation from across the industry including breeders, seed producers, agronomists, biological product producers, growers, AHDB, certification bodies and retailers the workshop culminated in a constructive discussion exploring ways forward in a future without copper in potato production.

*Field Trials* - With a strong appetite from growers to work on potential alternatives, be that systems or treatments, discussions opened on setting up a range of field labs. The results of these robust trials would help inform and steer research exploring innovative solutions. Innovative Farmers and AHDB and hope to arrange the first meeting of interested growers before Christmas. Growers interested in participating in trialling new innovative solutions can contact Hugh Blogg on <u>hblogg@soilassociation.org</u>

*Working group* - There was a great willingness at the workshop to come together and work collaboratively across the sector. Due to this enthusiasm we propose to set up a working group to meet a few times a year to help the sector with blight and any other relevant issues. Additional members are most welcome – if you are interested in joining please contact Hugh Blogg on <u>hblogg@soilassociation.org</u>

*Temporary licensing* - It was decided that AHDB would lead on possible solutions for licenses for copper making it available in the short term. Growers opting for this approach are advised to make themselves known to Kathryn Hales at AHDB on <u>Kathryn.Hales@ahdb.org.uk</u> For the latest technical legislative advice Sarah Hathway, Soil Association Certification, can be contacted on <u>SHathway@soilassociation.org</u>

*Retailers* – The workshop highlighted the need for retailers and packers to collaborate dramatically improving the uptake of blight-resistant varieties. The Soil Association business development team will be exploring moving forward on this initiating conversations with key retailers and feeding back to the relevant parties.

We'd like to thank Organic Plus for funding the workshop – for more information about Organic Plus: <u>https://organic-plus.net/</u>

November 2019 update:

AHDB has amassed evidence from growers and agronomists on the impact of the absence of copper this year. The evidence focused on yield reduction and the ensuing economic repercussions. Having received a good number of strong responses AHDB has submitted an emergency application for a copper hydroxide product and will keep growers up to date via the Soil Association and other certifying bodies.





	Chế	aract	teris	tics	of k	ey di	sease	-resi:	stant	varie	ties	
	Mira (Sarpo)	Shona (Sarpo)	Blue Danube (Sarpo)	Axona (Sarpo)	Una (Sarpo)	Kifli (Sarpo)	Carolus (Agrico)	Athlete (Agrico)	Alouette (Agrico)	Twinner (Agrico)	Sorrento (Greenvale)	Wizard (Greenvale)
Maturity	Maincrop	Early maincrop	Early maincrop	Maincrop	2 <sup>nd</sup> early	Early maincrop	Maincrop	Early/ 2 <sup>nd</sup> early	Early maincrop	2 <sup>nd</sup> early	Maincrop	Maincrop
Skin colour	Red	White	Blue	Red	Pink	White	Parti colour	Pale yellow	Red	Yellow	White/ pink eyes	White
Flesh colour	White	White	White	Cream	White	Cream	Yellow	Pale yellow	Yellow	Yellow	White/ cream	Cream
Late blight foliage	7	7	4	7	9	5	6	6	6	8	7	6
Late blight tuber	б	4	4	ß	'n	5	6	6	8	8.5	9	З
Blackleg	7	3	7	9	9	7	6	8			6	5
Common scab	4	S	m	4	2	4	4	4	5.5	5.5	9	7
Powdery scab	2	7	9	S	7	Е	5	5	7		8	9
PCN Pallida	2	2	B	2	2	2	Susceptible	Susceptible	Susceptible	Susceptible	1	3
PCN Rost.	2	3	6	2	Э	9	Susceptible	Resistant	Resistant	Resistant	1	7
Leaf roll virus	S	E	6	8	2	Э					8	4
Virus Yo	6	7	8	8	8	7	8	6	8	7		3
Dry matter (%)	23	21	25	23	18	19	21	23	21	20		
Preparation /use	Mash, chip, bake, roast, crisp	Mash, chip, roast	Mash, chip, roast, crisp	Mash, chip, bake, roast, crisp	Boil, salad	Boil, salad	Roast, homemade chips, boil & mash	Salad, boil	Mash, boil	Bake, boil, mash	Bake	Bake
									<b>77</b> 0	rganic Farr	ming <b>Wint</b>	er 2017

Leading breeders of blight-resistant potato seed - Sarpo, Agrico and Greenvale – have further developed this range since 2017



