

# Antimicrobial Resistance in Australian Horticultural Supply Chains

Screening-Level Risk Assessment across leafy greens, cucumbers and carrots

**Antimicrobial resistance (AMR) is when microbial infections stop responding to treatment – antibiotics for clinically relevant bacteria, or fungicides and bactericides like copper for plant diseases.**

It affects growers two ways: your disease-control sprays may lose effectiveness over time, and it's an emerging food-safety consideration for produce you send to market.

This project assessed AMR risk across the paddock-to-plate journey for leafy greens, cucumbers and carrots, to identify where that risk is highest and what it means for how you manage your crops.

**The biggest driver of risk, for both human and plant disease resistance, is what's already present before the crop is even in the ground or before the season starts .**

That means seed and seedling sourcing, and your soil/media's chemical-use history, may matter more to long-term AMR risk than day-to-day handling once the crop is growing.



## One action, two benefits

Irrigation water quality and soil amendments came up as important drivers in both the food safety and the plant-disease findings.

**Note:** the current regulatory guideline (under 100 *E. coli* /100 mL) is a general food-safety standard, not a validated measure of AMR risk.

Meeting it doesn't guarantee a lower resistant fraction. Verifying water quality is still worth doing, but it isn't a confirmed AMR fix on its own.

The stages assessed, from planting material through to the consumer.



## Chemical resistance in plant diseases



The study looked at how likely it is that a standard spray program stops working as well as it should, due to resistance building up in the disease population. All three crops showed meaningful risk here:

← Lower risk Higher risk →

|              |  |                                                      |
|--------------|--|------------------------------------------------------|
| Leafy greens |  | Highest, repeated copper use is losing effectiveness |
| Carrots      |  | High, phenylamide resistance building                |
| Cucumber     |  | High, strobilurin resistance building                |

## What this means for you

- Your field's chemical-use history matters. Resistance can build up in the soil over multiple seasons.
- Keep records of what's been used on each field and factor that into rotation decisions.
- Soil condition and irrigation water quality feed into this risk too
- For leafy greens growers relying heavily on copper: plan now to rotate in different modes of action.

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### Resistant human health pathogens on produce



The study also looked at how likely resistant pathogenic *E. coli* bacteria are to be present on the crop by the time it reaches a consumer. Relative to each other, the three crops rank:

|                                 |                                                                                     |                                                   |
|---------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------|
| ← Lower risk      Higher risk → |                                                                                     |                                                   |
| Leafy greens                    |    | Highest. Overhead watering wets the leaf directly |
| Cucumber                        |    | Medium. Lower direct product contact              |
| Carrot                          |  | Lowest. No seedling stage, less direct contact    |

#### What this means for you

- Source seed and seedlings from reputable, quality-assured suppliers
- Keep irrigation water as clean as practical, particularly for overhead systems on leafy crops
- Leafy greens: harvesting hygiene is your most effective lever for reducing bacteria levels.
- Cucumbers: most of the reduction in bacteria levels happens at retail refrigeration, worth discussing cold-chain handling with whoever moves your crop to market.
- Carrots: cooling straight after harvest is the most effective step you can take to limit bacterial growth.

### The bottom line

AMR risk in vegetable production may build up early and accumulate over time. The choices that matter most are made before the season starts - where you source planting material, and what you know about your field's spray history - not just how carefully you manage the crop once it's growing.

Most seasons and field will sit in a fairly typical range, but conditions can push some situations well above that - a wetter season, or a field with a longer chemical-use history, for example.

Attention to the upstream factors above is what keeps those higher-risk situations less likely.

#### Why you might not have seen this yet

Resistance can be present well before it causes a visible spray failure or detectable disease.

Once introduced, it can persist and quietly build up over several seasons.

**An absence of obvious problems today doesn't mean the underlying risk is low.**

#### About this assessment



*These findings come from a screening-level risk assessment.*

*A tool for identifying where attention is best directed across the industry, using Australian survey data, international research and expert input.*

*It is a general guide, not a test result for any individual farm or batch.*