

Appendix IG.1

WATER MATRIX

The Water Matrix supports the microbiological risk assessment of water used in primary agricultural production.

The matrix sets frequencies (high, medium, low) for analysis of the water for indicators of faecal contamination (Indicator E. coli) during the use of the water (growing season or period of application of the water source) and corresponding thresholds, depending on the intended use of the water and the water source.

- **High frequency-** one analysis per month (minimum of two tests before first harvest)
- **Medium frequency-** one analysis twice a year (minimum of one test before first harvest)
- **Low frequency-** once a year

The grower must take a number of samples depending on the intended use of the water and the crop category (0,1,2,3). In the case of irrigation, the samples must be taken during peak-use period.

If the test results are unfavourable or identify a potential problem, the grower must take corrective actions to reduce the risk to the consumer and after that, another water test should be carried out to verify the effectiveness of the actions taken.

Matrix key:

- **High**: If there is no other alternative, this water can be used subject to sampling at a high frequency using the E. Coli thresholds as an indicator that the water is suitable for use or consider water treatment/disinfection.
- **Medium**: This water can be used subject to sampling at a medium frequency using the E. Coli thresholds as an indicator that the water is suitable for use
- **Low**: This water can be used but subject to sampling at a low frequency using the E. Coli thresholds as an indicator that the water is suitable for use
- : This water can be used without any sampling or analysis. There will need to be evidence of a water authority test certificate.

WATER MATRIX GUIDANCE NOTES (SEE P72)

Additional Where irrigation is completed purely for the establishment of drilled crops (and where crop growing cycle is greater than 42 days) this may be considered as outside of the scope of irrigation water requirements).

Additional Where a **medium risk** testing frequency of 2 tests per year applies, members may choose instead to adopt the high risk testing frequency of monthly if - in practice - this means a lower frequency of testing.

NB. The water matrix is based on the Water Matrix in the European Commission's Guidance Document on Addressing Microbiological Risks in Fresh Fruit and Vegetables at Primary Production through Good Hygiene.

Appendix IG.1 (continued)

WATER MATRIX

Categories (Crop categories can be found on the Red Tractor website)	Intended use of the water				
		Mains water supply (1)		Treated/disinfected water (2)	
CROP PRODUCTION WATER USE		Risk Level	Test Frequency	Risk Level	Test Frequency (11)
Category 0 crops - e.g. salad cress and micro leaves	Irrigation (any use)	Low	Annual	High	Monthly
	Application of pesticide, fertilisers etc.				
Category 1 crops - eg. Salads, herbs, strawberries etc.	Irrigation in direct contact with edible portion of the crop		Water authority test certificate	Low	Annual
	Dilution of PPPs, fertiliser, cleaning of equipment in direct contact with edible portion of the crop		Water authority test certificate	Low	Annual
	Irrigation NOT in direct contact with edible portion of the crop (13)		Water authority test certificate	Low	Annual
	Dilution of PPP's, fertiliser, cleaning of equipment in NOT in direct contact with edible portion of the crop		Water authority test certificate	Low	Annual
Category 2 crops - e.g. Brassicas, bulb onions, legumes, carrots etc.	Irrigation (where use is in direct contact with edible portion- e.g. overhead irrigation)		Water authority test certificate	Low	Annual
	Dilution of PPPs, fertiliser, cleaning of equipment in direct contact with edible portion of the crop		Water authority test certificate	Low	Annual
	Irrigation (where use is NOT in direct contact with edible portion of crop e.g. trickle application)		Water authority test certificate		
	Dilution of PPP's, fertiliser, cleaning of equipment in NOT in direct contact with edible portion of the crop		Water authority test certificate		
Category 3 crops - eg. Potatoes	Irrigation (where the crop is likely to be eaten cooked and in direct contact with edible portion of crop - e.g. sprouts or leeks)		Water authority test certificate	Low	Annual
	Dilution of PPPs, fertiliser, cleaning of equipment on crops likely to be eaten cooked (in direct contact with edible portion of crop - e.g. sprouts or leeks)		Water authority test certificate	Low	Annual
	Irrigation (where the crop likely to be eaten cooked and NOT in direct contact with edible portion of crop - e.g. potatoes)		Water authority test certificate		
	Dilution of PPPs, fertiliser, cleaning of equipment on crops likely to be eaten cooked (NOT in direct contact with edible portion of crop - e.g. potatoes)		Water authority test certificate		
Categories - 1, 2 & 3 (8)	Use for desoiling and stone separation		Water authority test certificate	Low	Annual
	Post harvest cooling and transport of crops that are likely to be cooked before consumption (12)		Water authority test certificate	Low	Annual
	Water used for first-wash, cooling and drenching, post harvest transport (e.g. flume) of crops likely to be eaten raw (9) (12)		Water authority test certificate	Low	Annual
	Water used in cleaning equipment and food contact surfaces (12)		Water authority test certificate	Low	Annual
Category - 0	Final rinse, ice or drenching for cooling	Low	Annual	High	Monthly
Categories - 1, 2 & 3	Final rinse, ice or drenching for cooling		Water authority test certificate	Medium	2 per year

GUIDANCE NOTES

(1) Use of municipal water directly on crop does not require testing other than where indicated. Where municipal water is stored in open reservoir prior to use see point 6. (2) Treated/ disinfected water can be from any primary sources that has passed through a validated treatment process (e.g. UV, chlorine, chlorine dioxide etc. which has been proved to be effective in reducing microbial loading to an acceptable level) that is under direct control/management of the grower/ producer. This is required to be well managed (e.g. as a critical control point). (3) Rainwater (water collected from rainfall (or snow) and sometimes also called rain

harvested water) captured from building roofs etc. - generally low risk of microbial contamination. (4) Water taken from borehole or well point that is either applied directly to the crops or stored in a reservoir prior to application. Where water is stored in a reservoir see point 6. (5) Water taken from a river/stream/canal can show significant variation in levels microbial contamination between tests as rivers open to contamination outside growers control e.g. upstream sewage outfalls, upstream livestock production etc. and need more frequent testing on higher risk crops where the water is in contact with edible portion of the crop. (6) Where water is stored in an open reservoir, no matter its original source, it is open to potential

Water Sources								Maximum acceptable level – indicator of faecal contamination: <i>E coli</i> (7)
Rainwater (untreated) (3)		Borehole/well water (untreated) (4)		Surface water (untreated) - river/canal /stream (5)		Reservoirs - water from any water source held in an open reservoir prior to use (6)		
Risk Level	Test Frequency	Risk Level	Test Frequency	Risk Level	Test Frequency	Risk Level	Test Frequency	
Unacceptable	N/A	Unacceptable	N/A	Unacceptable	N/A	Unacceptable	N/A	<10 CFU/100ml
Medium	2 per year	Medium	2 per year	High	Monthly	High	Monthly	<100 CFU/100ml
Medium	2 per year	Medium	2 per year	High	Monthly	High	Monthly	
Medium	2 per year	Medium	2 per year	Medium	2 per year	Medium	2 per year	<1000 CFU/100ml
Medium	2 per year	Medium	2 per year	Medium	2 per year	Medium	2 per year	
Medium	2 per year	Medium	2 per year	High	Monthly	High	Monthly	<1000 CFU/100ml
Medium	2 per year	Medium	2 per year	High	Monthly	High	Monthly	
Low	Annual	Low	Annual	Medium	2 per year	Medium	2 per year	
Low	Annual	Low	Annual	Medium	2 per year	Medium	2 per year	
Low	Annual	Medium	2 per year	Medium	2 per year	Medium	2 per year	<1000 CFU/100ml
Low	Annual	Medium	2 per year	Medium	2 per year	Medium	2 per year	
		Low	Annual	Low	Annual	Low	Annual	<10,000 CFU/100ml
		Low	Annual	Low	Annual	Low	Annual	
Post Harvest Uses								
Low	Annual	Medium	2 per year	Medium	2 per year	Medium	2 per year	<1000 CFU/100ml
Low	Annual	Medium	2 per year	Medium	2 per year	Medium	2 per year	
Medium	2 per year	High	Monthly	High	Monthly	High	Monthly	<100 CFU/100ml
Medium	2 per year	High	Monthly	High	Monthly	High	Monthly	
Only Potable Water								
Unacceptable	N/A	Unacceptable	N/A	Unacceptable	N/A	Unacceptable	N/A	Potable standard (10)
High	Monthly	High	Monthly	High	Monthly	High	Monthly	Potable standard (10)

microbial contamination from the local environment, farming and neighbouring activities and wildlife etc. (7) Where testing results for faecal indicator levels (*E coli*) are greater than maximum acceptable standard, the grower must develop a corrective action plan to reduce risk to consumers and address the adverse microbial levels e.g. water treatment, application methods, period between last application and harvest, use alternative source etc. (8) Category 0 crops use post harvest must meet mains/ drinking water standards. (9) Washing is classed as use of water to remove soiling etc. on crops and is not for washing in terms of producing a ready to eat product. (10) Potable water standard as defined

by DEFRA Drinking Water Inspectorate: <http://dwi.defra.gov.uk/consumers/advice-leaflets/standards> (11) For water which is required to be tested at high frequency, a minimum of two tests must be taken before harvest. For medium testing a minimum of one test must be taken before harvest. (12) Where post-harvest water is recirculated, a treatment process to ensure continued microbiological suitability of water for product contact must be in place, except where water is used purely for desoiling/stone separation/transferring product to the commencement of the washing line. Initial quality of water used must meet the microbiological parameters defined in the matrix.