

Duxford Monitor Farm

Meeting title: Plant nutrition

Date: 14 February 2020

Speakers: Sarah Kendall (ADAS), David Fuller-Shapcott (J.N. Fuller-Shapcott & Co.)



Trace elements and micronutrition

Take-home messages

1. Managing plant micronutrients, along with wider agronomic and farming practices, enables healthy plants to reach their yield potential.
2. Look at history of nutrient deficiency and pH levels on-farm and consider whether soil sampling or tissue analysis is the best way to test for deficiency.
3. Consider entering YEN/trying tramline trials/try-outs on your own farm to learn and test for yield responses to treatments.

Micronutrients – Sarah Kendall, ADAS

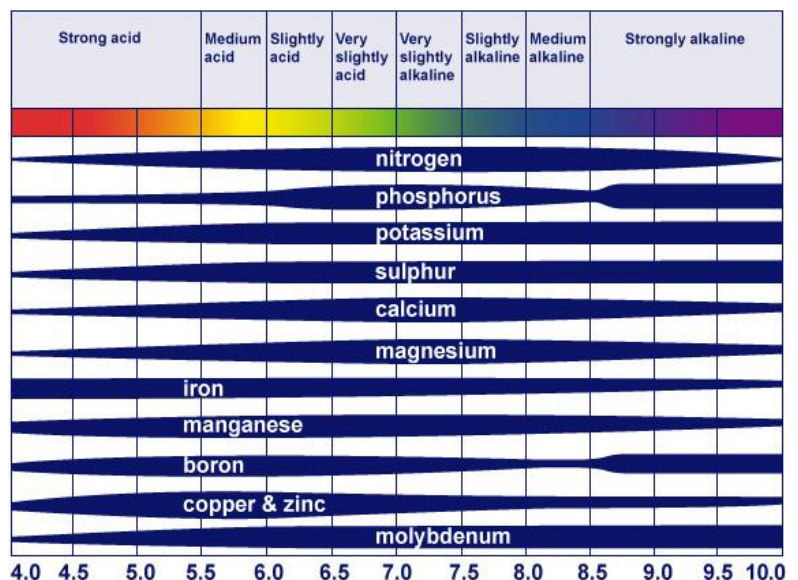
A balance of micronutrients is important for optimum plant growth. Healthy plants depend on effective management of all areas, including good soil structure and nutrient management.






The risk situations for micronutrient deficiencies depend on crop type, soil type and pH. The table shows the availability of micronutrients with pH.

Trials work looking at the response of crops to micronutrients is limited, but research has shown that 10% of OSR crops responded to boron with responses seen in cereals too. Responses are often found with copper (on soils with <1.0 mg/kg Cu) and manganese (soils with pH >7 and if tissue analysis is <20 mg/kg Mn) and a small yield response by using molybdenum in certain situations. Yield responses in UK cereals were not expected by the use of zinc.

Micronutrients are used in different ways

in the plant – the key micronutrients and their deficiency symptoms can be seen below:



Micronutrient	Manganese	Copper	Zinc	Boron	Molybdenum
Role in the plant	Activates enzymes involved in protein synthesis, lipid metabolism and photosynthesis	Essential component of proteins involved in metabolic pathways; important for production of viable pollen in grain production; role in maintaining cell wall structure	Component of enzymes involved in photosynthesis, sugar formation and protein synthesis.	Controls metabolic processes; structural component of cell walls; affects cell division	Required for the function of enzymes involved in redox processes
Deficiency Symptoms					
	Cereals: grey flecking/striping; pale and limp leaves OSR: yellowing and mottling; symptoms first on middle leaves, then spread to older leaves	Cereals: Pale, twisted leaves; stunted plants; blind grain sites	Cereals: Pale stripes; affected tissue dies and turns pale brown	OSR: Dieback of apical growing point; young leaves small/puckered; brittle tissue; stem cracking; poor flowering	OSR: reduced leaf area, pale, limp leaves

In order to diagnose micronutrient deficiencies, this can be done in three ways: visual symptoms, soil analysis or tissue analysis.

This table highlights the currently known ways of determining a risk of deficiency via soil or tissue analysis.

	Crop affected	Soil risk factors	Soil analysis	Tissue analysis
Boron	OSR	Sandy, High OM pH >7	Yes <0.8 mg/l	Yes <20 mg/kg
Copper	Cereals	Sandy, peat, Shallow chalk, High OM	Yes <1.0 mg/l	No
Manganese	Cereals & OSR	pH >7.5, sandy >6.5 Organic/peat pH >6 Fluffy seed bed	No	Yes <20 mg/kg
Molybdenum	OSR	pH < 6.5	Yes <0.1 mg/l	?
Zinc	Cereals	Sandy soils with high pH and P index	Yes <1.5 mg/l	Yes <15mg/kg

Tissue analysis sampling

- Early in season at stem extension
- Sample of at least 25 points (2-3 plants per point)
- Systematic sampling – W pattern
- Sample youngest fully expanded leaf
- Take several leaves/sample
- Ensure no soil contamination, dry leaves
- Avoid sampling leaves with evidence of disease/pest damage

Once sampling has been completed there are two options depending on when the deficiency is detected. If soil analysis confirms the deficiency, correction can be made through liming, seed treatments, seedbed fertilisers or autumn applications, if possible. If tissue analysis confirms a deficiency, foliar applied fertilisers is the best way to correct the deficiency.

A nutritional diet for fitness and wellbeing – David Fuller-Shapcott

- Farming 370 ha in the Scottish Borders – rotation inc. OSR, WW, Spring oats, Spring and winter barley.
- Rooting is critical for the uptake of nutrients from the soil. “If we don’t have rooting, we don’t have full potential”. Always carry a spade when crop walking.
- Important to do a broad spectrum soil analysis (see pictured report for example) and to know what your soil will bring to the party.

Analysis	Result	Guideline	Interpretation	Comments
pH	6.7	6.5	Normal	Adequate level.
Phosphorus (ppm)	23	16	Normal	(Index 2.7) 65 kg/ha P2O5 (52 units/acre). Winter crop, straw removed. Maintenance. Apply using Yara's Activa program, consult your distributor for details.
Potassium (ppm)	235	121	Normal	(Index 2.8) 55 kg/ha K2O (44 units/acre). Winter crop straw removed. Maintenance. Apply using Yara's Activa program, consult your distributor for details.
Magnesium (ppm)	99	51	Normal	(Index 2.8) Adequate level.
Calcium (ppm)	3350	1600	Normal	Adequate level.
Sulphur (ppm)	5	15	Very Low	Apply YaraVita THIOTRAC 300.
Manganese (ppm)	19	55	Very Low	Apply YaraVita MANTRAC PRO.
Copper (ppm)	2.1	4.1	Low	Apply YaraVita COPTREL 500.
Boron (ppm)	0.67	1.60	Very Low	Apply YaraVita BORTRAC 150.
Zinc (ppm)	1.7	4.1	Very Low	Apply YaraVita ZINTRAC 700.
Molybdenum (ppm)	0.01	0.40	Very Low	Low priority on this crop. Other crops may be affected.
Iron (ppm)	356	50	Normal	Adequate level.
Sodium (ppm)	24	90	Very Low	Not a problem for this crop.
C.E.C. (meq/100g)	15.0	15.0	Normal	Cation Exchange Capacity indicates a soil with a good nutrient holding ability.

- When using tissue analysis, timing and consistency are vital. Choose the same time of day, as regular as possible through the season, eg. 1 week before T0, T1, T2 etc.
- Use sampling results (soil, tissue, grain, historical data) to inform your decision making process.
- David uses micronutrient applications early in the season, to set the plant up.
- “Treat your crop like an athlete – poor nutrition = poor performance”

Further information

- [AHDB Micronutrients Review](#)
- [Nutrient Management Guide \(RB209\)](#)
- [Webinar: Crop yields and how to maximise potential](#)
- [Yield Enhancement Network](#)

AHDB resources

- Understand your business costs with AHDB's benchmarking tool Farmbench at ahdb.org.uk/farmbench
- Monitoring tools are available at ahdb.org.uk/tools
- Sign up to market information and research newsletters at ahdb.org.uk/keeping-in-touch
- Find out what's going on at other Monitor Farms and Strategic Farms at ahdb.org.uk/farm-excellence
- All AHDB events can be found at ahdb.org.uk/events
- For guidance on how Brexit will impact your business, see ahdb.org.uk/brexit

Contact details

For more information contact: Teresa Meadows

E: Teresa.Meadows@ahdb.org.uk

M: 07387 015465

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