

## Tyfu Cymru Pumpkin Network

### Managing Blossom End Rot in Pumpkin

Blossom End Rot (BER) is a particular problem that pumpkin growers face, especially when growing for pick-your-own (PYO) markets. BER is a rot caused by a range of different pathogens including *Fusarium* and *Botrytis* that begins at the fruit base at the flower scar, spreading up the rind making the fruit unmarketable (**Figure 1**). This is more likely in damp conditions where the flower does not fully abscise from the fruit where it can provide an early foothold for pathogens in the environment. Early maturing PYO pumpkins may be left in the field for several weeks until they are marketed at Halloween, increasing the risk of BER development. The rots render fruit unmarketable as well as making fields less picturesque for customers looking for social media opportunities, and can impact up to 15 – 20% of the crop. Chemical control options are limited and largely ineffectual.



**Figure 1.** Blossom end rot in pumpkin – basal rots starting at the flower scar spread up the rind, making the fruit unmarketable.

#### BER as a Physiological Problem

BER can be viewed as a physiological problem as well as a disease. BER is common in a range of crops including tomato and pepper besides squash, courgette and pumpkin. In hydroponically grown tomato increased incidence of BER is typically as a result of sub-optimum calcium in feed water leading to low concentrations in the fruit. Calcium is used by plants to strengthen and stabilize plant cell walls, facilitate intercellular communication and disrupt cell wall degrading enzymes from pathogens, and so low concentrations increase the incidence of rots. Ensuring that fruit have sufficient calcium can be key to preventing BER and risking the risk of pumpkins wasting in the field.

#### Managing Calcium Nutrition

Calcium is found in the soil in a variety of forms - as free  $\text{Ca}^{2+}$ , or locked up in insoluble forms. Free  $\text{Ca}^{2+}$  is more common with a low soil pH although this can negatively impact root development and increase the availability of toxic aluminum ions. For pumpkins, targeting a soil pH of 5.5 – 7.5 (with 6.5 as optimum) will still offer sufficient  $\text{Ca}^{2+}$ , especially in soils that have been limed. However, excessive irrigation can lead to leaching, promoting BER development. You should soil sample frequently and aim to maintain ratios between calcium and other nutrients to avoid competition. Calcium uptake is enhanced by a high nitrate:ammonium ratio, so nitrate-based fertilizers may be preferable despite the additional costs. It may also be beneficial to monitor other micronutrients (especially boron) to ensure calcium uptake and use can be maximized.

Uptake of calcium from the roots can be promoted by a number of ways. Low soil temperature, high pH and poor nutrient availability can reduce uptake from the roots. Calcium is taken up with the inflow of water and transported in the xylem. Plants under water stress, or under conditions where transpiration will be reduced (e.g. high humidity) calcium uptake will negatively impacts. The use of mulches can improve soil water status and warm the root zone to improve uptake, as well as improving weed control. Irrigation could be applied during periods of drought, although slow application (e.g. trickle tape) are likely to have a more positive impact. Large swings in soil moisture can lead to poor growth more prone to rot development, high humidity will reduce uptake and increase the risk of foliar disease development. The aim here is promote consistent crop transpiration across the crops lifespan to ensure sufficient calcium is present throughout the growing fruit. Calcium deficiency is generally seen in younger leaves which exhibit tipburn and concave cupping, leading to claw-shaped leaves with patchy chlorosis between veins. However, calcium levels can be low in the fruit even without deficiency symptoms in the leaves.

### Novel Ways of Managing Calcium

Besides managing soil uptake, foliar sprays of calcium may also help improve fruit calcium content. Application to leaves and fruits will provide an additional source of calcium to supplement that available from the soil. Calcium is available in a variety of forms, including additional nutrients and biostimulants (see **Table 1** for a list of products) Foliar applications of calcium may improve fruit quality and postharvest lifespans, as well as offering increased rates of growth. Foliar feeds should be used as dilute solutions to avoid tip burn, and should be applied in dull, overcast conditions in cool, moist conditions where sprays will not dry too rapidly on the leaf surface. Ensure correct spray calibration with nozzles set about 45° to create a fine mist over the crop to give a consistent and even coating. Application should begin with first flowering and continue through until the fruit begins to mature, roughly two weeks before harvest. For growers using hydroponics to grow strawberry, spent grow bags can be planted with pumpkin and water and nutrient applications precisely managed over the crops lifespan (**Figure 2**). Lastly, postharvest treatment of the fruit can also reduce BER incidence. Pumpkins can be lifted and stored in well ventilated barns or polytunnels for curing. For long term storage, fruit should not be chilled and kept in a relative humidity of 80-85%. If pumpkins are to be stored you should avoid washing them, wiping off any dry soil with a cloth. This may be of less relevance to PYO growers, but high value culinary pumpkins may be stored for sale later in the season.



**Figure 2.** Pumpkin cultivated in spent strawberry bags using line-fed fertigation can offer precise control water and nutrition.

**Table 1. Calcium Foliar Spray Products** (Table adapted from Gage *et al.*, 2018 AHDB Calcium Review – Horticulture (Cucurbits))

Product	Supplier	Form	w/w (%)	w/v (%)	mg/kg	mg/kg	Notes
Bio18	OMEX	CaO	-	-	190	290	An 18-18-18 NPK + 3% Fe concentrated water soluble suspension.
Bio 20	OMEX	CaO	-	-	190	290	Complete fertiliser optimised for foliar application.
CalMax Ultra	OMEX	CaO	14.5	21.8	490	730	Propriety formulation including AXM to promote calcium uptake in periods of low metabolic activity.
Kelpak	OMEX	CaO	800 mg/L	-	0.24 mg/L	-	Organic biostimulant containing concentrated extract of the kelp species <i>Ecklonia maxima</i> .
Kelpomex	OMEX	CaO	800 mg/L	-	0.24 mg/L	-	Organic growth stimulant containing concentrated extract of kelp species <i>Ecklonia maxima</i> . Approved as an unrestricted input by the Soil Association.
Micromex	OMEX	CaO	-	-	0.75	1	Water soluble suspension containing a balanced range of micronutrients.
Quad 14	OMEX	CaO	12.5	19.5	-	-	Concentrated suspension formulation N, P as phosphite, K and Ca.
YaraLiva TROPICOTE	YARA	CaO	26.3	-	-	-	Granular calcium nitrate for field application.
YaraLiva NITRABOR	YARA	CaO	25.9	-	0.30%	-	Field grade calcium nitrate fertiliser, with added boron.
YaraLiva CALCINIT	YARA	CaO	26.3	-	-	-	Water soluble nitrogen and calcium fertiliser (15.5% N + 26.3% CaO) is a fully water soluble nitrogen and calcium fertiliser.
YaraVita STOPIT	YARA	CaO	16.9				Liquid micronutrient fertiliser (calcium chloride solution) for foliar application.
Nutri-Cal	NUTRI-CAL (U.S.)	Ca	8				Formulation of calcium and carboxylic acids + 6% NO <sub>3</sub> -N, for regular foliar application, ( <b>U.S. Product</b> )
Nutral	Indigrow	CaO	16.5				Formulation of calcium for foliar or fertigation application
IndiPlex Ca + B	Indigrow	Ca	30		3		Calcium complex with soluble source of boron for foliar application or fertigation.
CaBo	Solufeed	Ca	6.5	7.8			Calcium and boron liquid foliar fertiliser with 5.2% w/w N
Carnival	Headland	CaO	225 g/L		750 ppm		Soluble calcium formulation with 30 g/L MgO, 149 g/L N and 300 ppm Zn
TECAL	Crop Intellect	CaO	7		0.10%		Calcium formulation with patented chemistry to adjust cellular calcium partitioning.
Agroleaf Liquid Calcium+	ICL	Ca <sub>5</sub> H <sub>4</sub> N <sub>12</sub> O <sub>33</sub>	40 - 65				Calcium formulation including amino acids, plant sugars, lignates and surfactants
Nova Calcium	ICL	CaO	26.5				Calcium formulation with nitrogen for fertigation.
Chelan CaP	Nature SA	CaO	6	18			Liquid Ca/P fertiliser for foliar application. P205, CaO, B and Zn blend.
Cal-Mag Max	Growth Products	Ca(NO <sub>3</sub> ) <sub>2</sub>	4				Chelated Ca and Mg blend.
InCa	Plant Impact		5				1-1/5 L/ha, applying in 100L/ha of water - apply from first flower to harvest, 7 - 14 days
Calcium nitrate (Horticulture Grade)	Van Iperen	Ca(NO <sub>3</sub> ) <sub>2</sub>	18.8				CaO/NO <sub>3</sub> mix

**Disclaimer**

Every effort is made to ensure the accuracy of information and recommendations given in these notes. These recommendations are given as general guidance, and Tyfu Cymru does not accept any liability for their impact. It is strongly advised you seek targeted recommendations from a qualified FACTS/BASIS advisor for detailed disease and nutrition management advice for your site. This is available free of charge for eligible growers through the Tyfu Cymru program, please contact us to arrange a visit to your site.