BALLTECH ON DEMAND™

KALE

Sanitation is critical for limiting Black Rot of crucifers (cabbage and kale and similar crops).

- Black Rot (*Xanthomonas*) can move rapidly within the greenhouse so strict sanitation is critical to prevent spread.
- Isolate production blocks to prevent mechanical spread by personnel or equipment and splashing water during irrigation.
- Thoroughly sanitize all equipment and production areas between production cycles.
- Produce finished plants in areas where other crucifers (cabbage and cauliflower) are NOT being grown since these crops can contaminate the Kale.
- Refer to 'Sanitation for @Risk Crops' for additional tips to make sure you have reduced the risk of spreading this pathogen within your production.
- ***Growers are responsible for preventing the spread of Black Rot of Crucifers in their operations.***

Kale: At Risk Crop

*Black Rot of crucifers (Cabbage & Kale) is a seed-borne disease that, if not managed throughout the production cycle, will cause serious plant losses. Ball has worked diligently to minimize the risk, BUT growers are **solely responsible** for growing the plants under clean cultural conditions and applying bactericides to suppress the disease.*

PLUG CULTURE

STAGE 1 Time of radicle emergence (3-4days)

- Soil temperature 65-70°F (18-21° C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Kale is very sensitive to high salts, particularly high ammonium, during germination.

STAGE 2 Stem and cotyledon emergence (4-7 days)

- Soil temperature 62-65° F (17-18° C).
- Reduce moisture levels once radicle emergence occurs! Allow the soil to dry out slightly before watering for best germination and rooting.
- Increase light levels to 1000-2500 foot-candles.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

STAGE 3 Growth and development of true leaves (10-14 days)

- Soil temperature 62-65° F (17-18° C). Cooler temperatures will minimize stretching.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Bonzi (1-5+ ppm) applied early in stage 3 will control hypocotyl stretch and encourage rosette formation.

STAGE 4 Plants ready for transplanting or shipping (7 days)

- Soil temperature 60-62° F (16-17° C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH 5.5-5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with a balanced fertilizer at 50-75 ppm N as needed.

GROWING ON TO FINISH: ***Start with transplants produced under strict sanitation.***

TEMPERATURE

- Night -- 50-60° F (10-15° C)
- Day -- 55-60° F (18-21° C)

LIGHT

- Maintain light levels around 4000-5000 foot-candles while maintaining moderate temperatures.

MEDIA

- Use a well-drained, disease-free soil-less medium with a medium initial nutrient charge and a pH 5.5-6.3.

FERTILIZATION

- Once plants are established feed at 200+ ppm nitrogen from a balanced fertilizer source (20-10-20) to encourage leaf expansion.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

CONTROLLING HEIGHT

- Once plants are rooted to the sides of the containers allow plants to wilt prior to irrigation to provide some height control.
- Kale are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Bonzi (1-5 ppm) must be applied after transplant to encourage compact habit and encourage color expression.

BACTERICIDES TO CONTROL Black Rot of Crucifers*

- Copper based bactericides are the most effect chemicals to suppress the spread of Black Rot of Crucifers
- Copper is a protectant and is not curative once Black Rot of crucifers infections begin. Apply copper bactericides every 5-7 days when disease pressure is low and every 3-5 days when disease is present
- Copper is easily washed off the foliage after irrigating. Trials have shown that >50% of the copper residue is gone after 2 days when overhead irrigation is used.
- Tank mix of copper compounds and Mancozeb were shown to be more effective than copper alone.
- Though not as effective, rotations of Mancozeb and Cease have suppressive qualities and may be used in part of a complete bactericide program that included copper applications.

For more information on this disease: http://vegetablemdonline.ppath.cornell.edu/factsheets/Crucifers_BR.htm

Find more resources: https://www.ballseed.com/QuickCulture/ProductionGuides/

Tech On Demand Podcast: https://www.growertalks.com/TechOnDemand/

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**Be sure to read and follow all pesticide label and instructions.*