Date of poster presentation: 13 April 2022

INHERITABLE INDUCED RESILIENCE FOR CIRCULAR PLANT PRODUCTION SYSTEMS.

MARIE DUHAMEL1*, KIRSTEN LEISS2, BEN VOSMAN3.

1 Bio Interactions and Plant Health, Wageningen Plant Research, The Netherlands,

2 GTB Gewasgez. Bodem en Water, Wageningen Plant Research, The Netherlands,

3 Plant Breeding, Wageningen Plant Research, The Netherlands

Circular production systems are associated with a higher risk of accumulating contaminants. Therefore innovative strategies are needed to significantly increase the resilience of circular production systems with a minimum input of water, nutrients and pesticides. Generating transient epigenetic phenotypes by treatments mimicking biotic or abiotic changes in the environment of the parental plants could be one of the potential answer to this problematic. It is thus needed to investigate whether the phenomenon of epigenetic inheritance of resilience provides innovative, practical preventive tools that are compatible with biological control and can be implemented relatively easily to obtain a clean, robust and resilient crop production.

To investigate this concept, inbred parental lines of two cultivars (cv Moneyberg and cv Bolstar Grande) of the model crop tomato were primed (induced for resistance) at four different moments in their development, i.e. once in the vegetative phase (time window 1), once in the generative phase at early flowering (time window 2), multiple times in the generative phase during flowering (time window 3), and once during ripening of the first fruit bunch (time window 4). The elicitors applied to obtain this primed state were ß-aminobutyric acid (BABA), 2,6-dichloroisonicotinic acid (INA), methyljasmonate (MeJA), and water as control; they were selected for their ability to induce different plant resistance pathways. The groups of parental plants that were being treated during time window 3 were tested for the presence of induced resistance. This was done by means of detached leaf assays against a biotrophic fungus (powdery mildew), a necrotrophic fungus (Botrytis cinerea), a phloem sucker (whitefly), and a herbivore (thrips). Ripe first fruit bunches were harvested. Germination studies were performed for all these seed batches. In 2019 and 2020 seed batches derived from the parental cultivars primed in the different time windows were investigated by detached leaf bioassays for inherited induced resistance and for potential side effects on shoot growth. Finally, whole plant bioassays were performed to confirm the positive results found in the detached leaf bioassays.

Keywords: