Carrot Seed Technology
Carrot Symposium 2017

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Seed Technology Research

- packing
- production
- testing
- coating
- priming & B-MOX
- sorting & upgrading
- disinfection

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Carrot Seed Production
Carrot Seed Production

seed maturation

seed drying

Production environment → seed quality
• germination
• seed health

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Seed Quality Control

Seed health

Research

Seed analysis
Seed Quality Control

- Purity
- Germination
- Seed Count
- Seed Moisture
- Seed Health
Naktuinbouw authorized (NAL)

- Protocols reviewed by NAKtuinbouw
- ISTA rules
- Proficiency Testing between companies and NAKtuinbouw
- Regular audits by NAKtuinbouw
Germination testing
Abnormalities

- short or stunted roots
- deformations in shoot development
- strong growth reductions
- necrotic spots
- discolorations
Moisture analysis

- Optimize storability
- Prevent microbial growth
Seed Health Tests

Bio assays

DNA test (PCR)

Seed incubation test on agar or blotter

Serological test

Dilution plating

Grow out test
Mission

Secure the delivery of healthy seed to customers on a worldwide basis.

How

Co-operation by exchanging information on economically important seed-borne pathogens of vegetable crops and developing detection methods for their control.
ISHI Health Test Protocols

- Accepted reference methods
- Facilitate seed trade
- Improve product quality
- Improve risk management
- Comply with national and international regulations
- Collaboration with ISTA for validation
- Co-operation with national and international regulatory and accreditation authorities.
Detection method characteristics

- specific
- selective
- sensitive
- reproducible / reliable
- **fast**
- easy
- cheap
**Xanthomonas hortorum pv. carotae**

- bacterial blight
- foliar symptoms
- yellowing
- brown necrotic lesions
- disease symptoms in warm and humid conditions
- soilborne, plant debris, human, irrigation, insects, seedborne
Xanthomonas hortorum pv. carotae

Detection
• Dilution plating
• sePCR
Alternaria dauci/ radicina

- leaf blight/ black rot
- brown black foliar lesions
- dry black lesions on the root
- disease symptoms humid environment
- soilborne, plant debris, wind, irrigation, seedborne
Alternaria dauci/ radicina

- freeze blotter
- sePCR
- seed incubation on agar
Seed disinfection

- Chemical
- Physical
  - Hot water treatment
  - Steam Vacuum Treatment
- Retest after treatment
Hot water treatment
Dose response of disinfection

![Graph showing the dose response of disinfection with treatment time on the x-axis and infection/germination on the y-axis. The graph includes lines for Germ, Infection, Contamination, and Vigour.]
Steam vacuum treatment
Priming & B-MOX

- Priming
  - Basic priming technique

- Bmox
  - Enhanced priming in combination with innovative seed coating
Benefits of priming

- Faster germination
- Improved Uniformity
- Improved Germination under Stress conditions
- Dormancy Breaking
Primining theory

Water uptake during Germination

Phase 1: Imbibition
Phase 2: Embryo development
Phase 3: Germination

Seed moisture

imbibition  Embryo development  Germination
Priming theory

Water uptake during Priming

Phase 1: Imbibition
Phase 2: Embryo development
Phase 3: Germination
Priming

- Pretreatment to improve seed germination rate and uniformity of seedling emergence
Treated

Untreated
improved stress tolerance
more energy, more vigour of the plant
stimulates growth in early stage
development of root system
More smooth, uniform crop development
Higher yield and pack out
Coating technology

- protection against fungi
- sowability
- dust reduction
- enhancement
# Efficiency of fungicides in seed coating

## Seedlot A

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<tr>
<td>Naked</td>
<td>9.0 %</td>
<td>8.0 %</td>
<td>78 %</td>
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<tr>
<td>Metalaxyl</td>
<td>3.5 %</td>
<td>3.8 %</td>
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<td>Iprodione &amp; Metalaxyl</td>
<td>0.3 %</td>
<td>0.0 %</td>
<td>77 %</td>
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<tr>
<td>Thiram, Iprodione &amp; Metalaxyl</td>
<td>0.0 %</td>
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<tr>
<td>Fludioxonil &amp; Metalaxyl</td>
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<td>83 %</td>
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## Seedlot B

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<td>Metalaxyl</td>
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<tr>
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<tr>
<td>Fludioxonil &amp; Metalaxyl</td>
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<td>87 %</td>
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Seed Technology Research
Exploring nature never stops