November 1, 2016

NOBACTRA NURSERY

EXAMPLE OF POSSIBLE PRIMARY SOURCE OF INOCULUM IN PSEUDOMONAS TOMATO

- 30,000 seeds/seed lot tested to meet infestation threshold (1 infested seed/10,000 pathogen free seeds)
- Pseudomonas tomato - threshold for disease in seedling about 60CFU/seed
- Sensitivity of method depends on 1 infested seed/sample of 10,000 seeds that has no less than 400 CFU/ 1 seed
- This means many contaminated seeds are designated bacteria free due to sampling error

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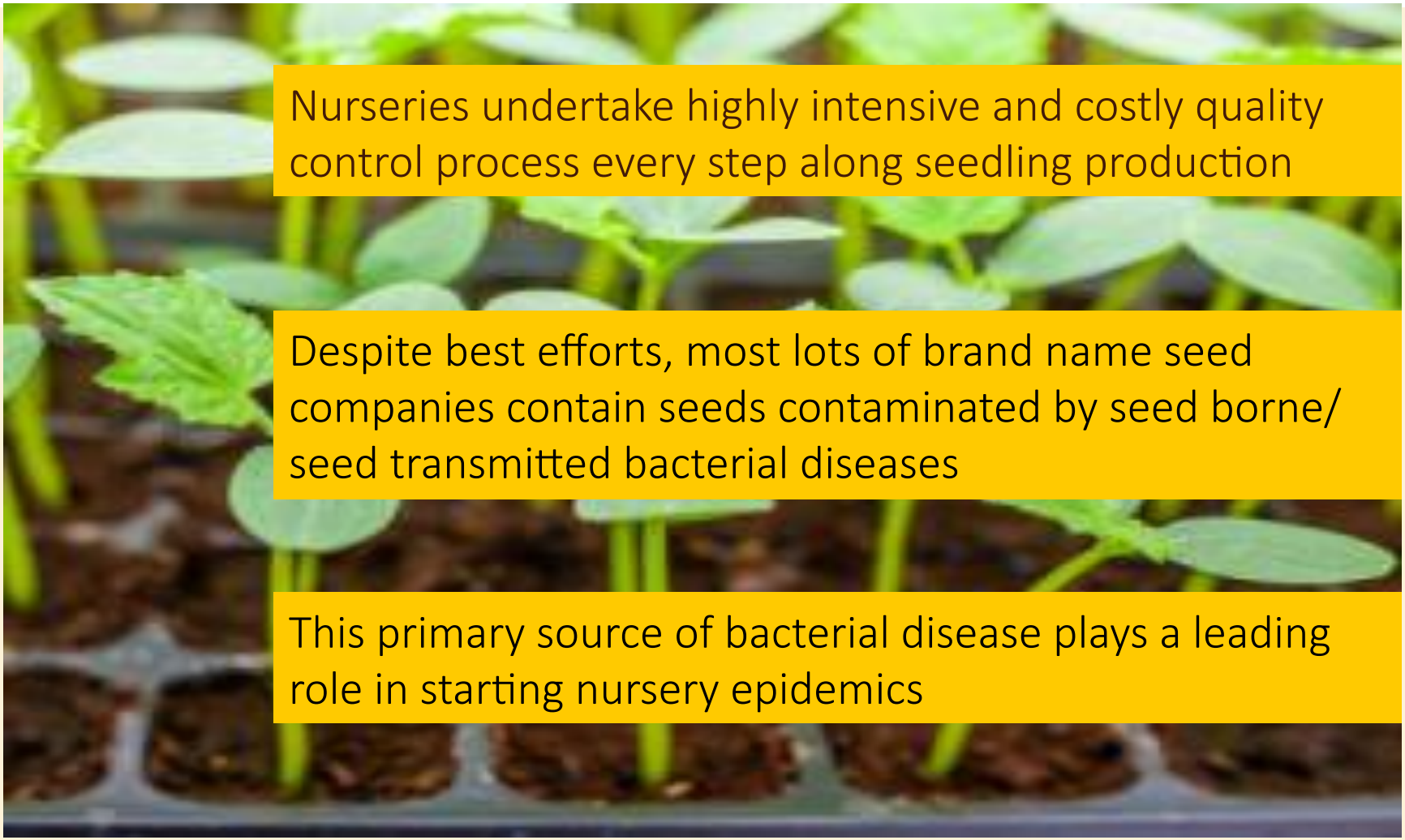
CURRENT PRACTICES IN SEEDLING PRODUCTION



Nurseries undertake highly intensive and costly quality control process every step along seedling production

Despite best efforts, most lots of brand name seed companies contain seeds contaminated by seed borne/ seed transmitted bacterial diseases

This primary source of bacterial disease plays a leading role in starting nursery epidemics

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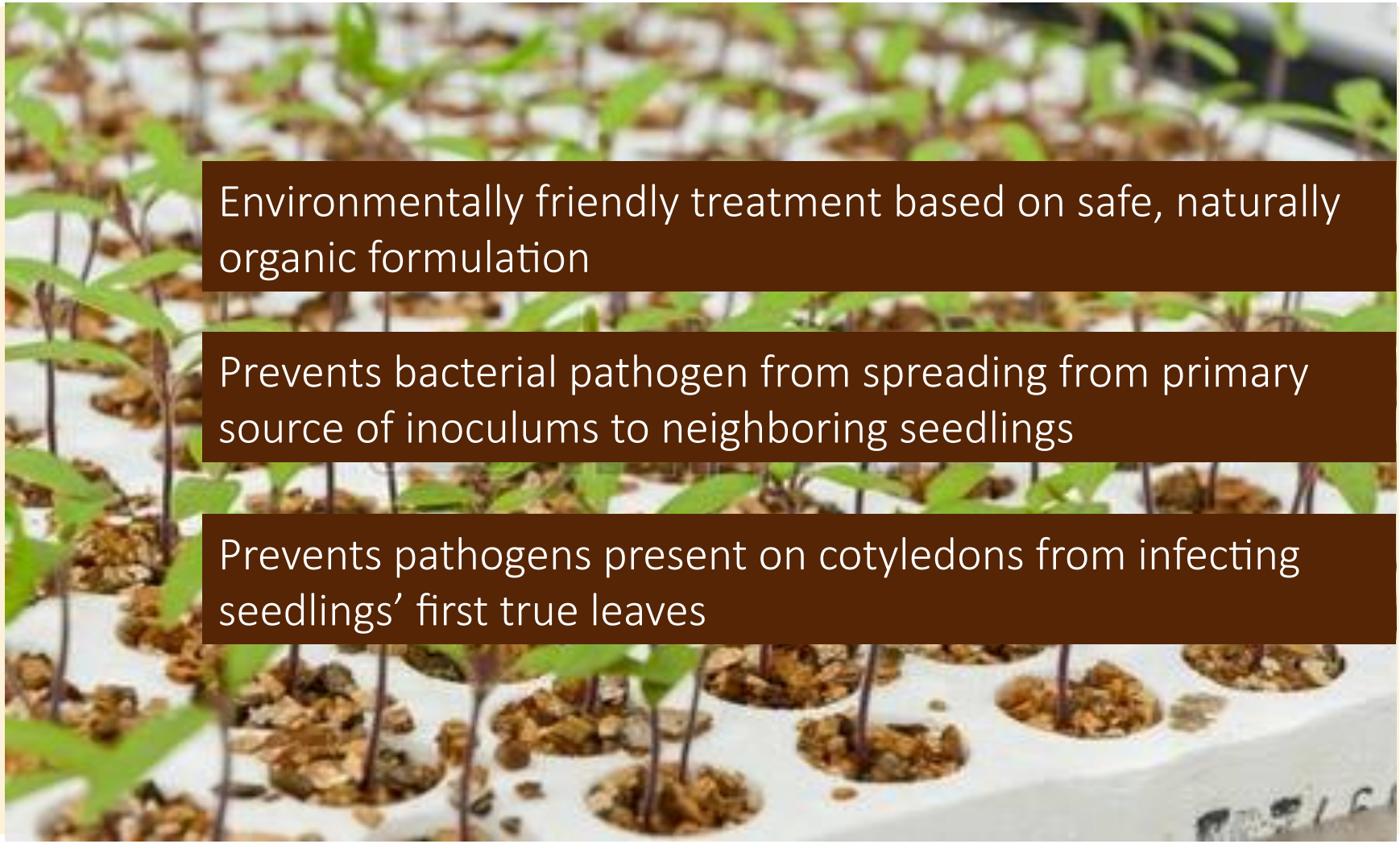
COMMON SEED BORNE/SEED TRANSMITTED PATHOGENIC BACTERIA IN VEGETABLE NURSERIES

Family	Cultivated species	Pathogen/s
Brassicaceae (Cruciferea)	Cabbage; Cauliflower; Broccoli; Kohlrabi.	*Xanthomonas campestris; Erwinia carotovora.*
Solanaceae	Tomato; Pepper; Eggplant	*Xanthomonas vesicatoria ;X. spp.; Pseudomonas tomato; P. spp. Clavibacter.*
Cucurbitaceae	Melon; Watermelon; Cucumber; Pumpkin; Zucchini	*Pseudomonas lachrymans; P. spp. Xanthomonas cucurbitae*
Liliaceae	Onion	*Erwinia spp.; Pseudomonas spp.*
Umbelliferae	Parsley; Dill; Celery	*Erwinia spp.; Pseudomonas spp.*
Compositae (Asteraceae)	Lettuce	*Erwinia spp.*
Araceae	Leek	*Erwinia spp.; Pseudomonas spp.*

NOBACTRA NURSERY SOLUTION



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NOBACTRA NURSERY RESULTS

Nobactra dramatically reduces the secondary inoculum sources in nurseries.

The result:
Pathogen free, healthy seedlings

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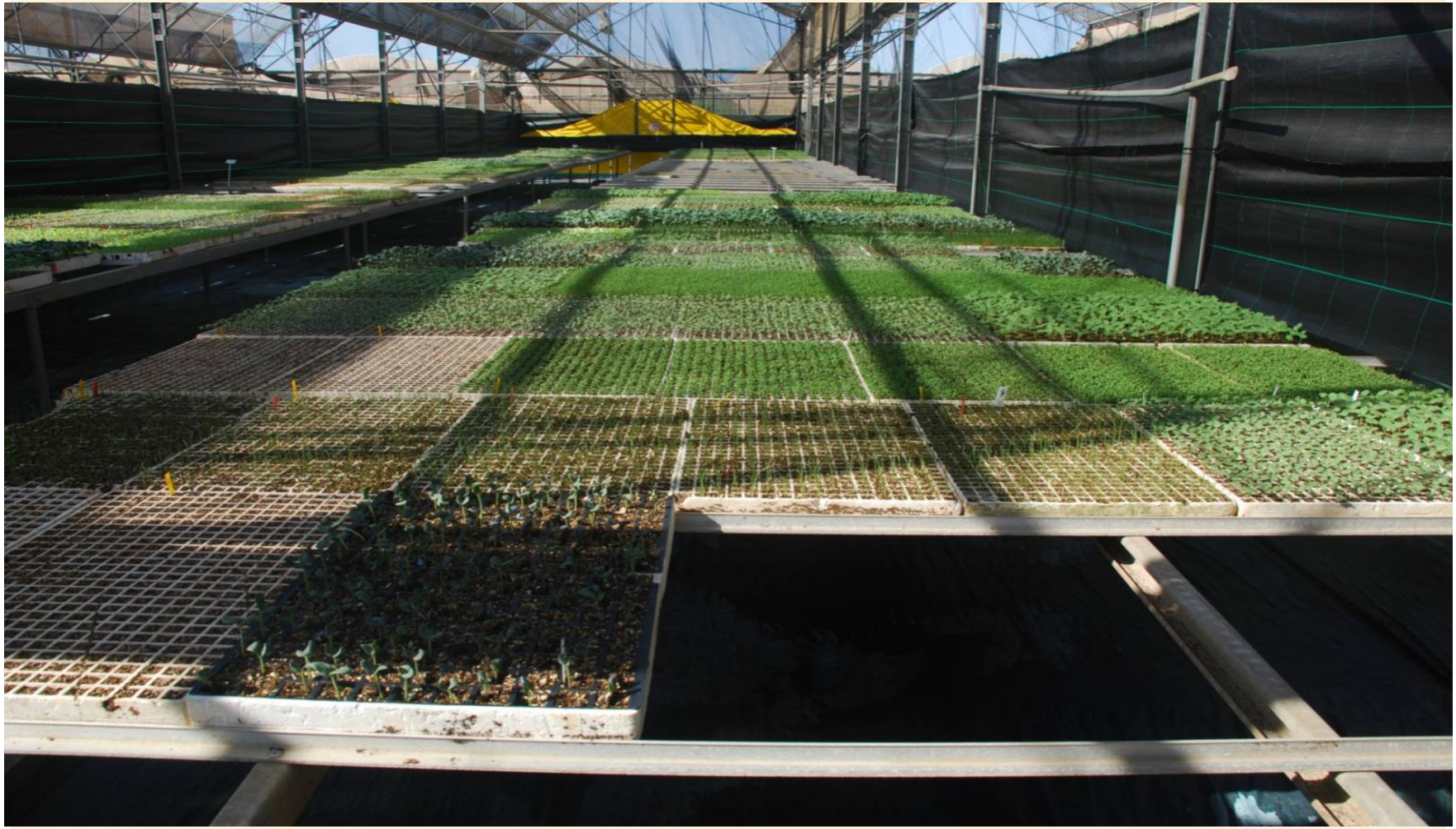
TRIALS IN ISRAEL'S SECOND LARGEST NURSERY



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USE OF STANDARD NURSERY MACHINARY

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Seeds contaminated by seed borne/seed transmitted bacterial diseases & seeds treated with Nobactra Nursery

Tomatoes – *P. tomato*

Tomatoes – Nobactra Treated

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0.12%

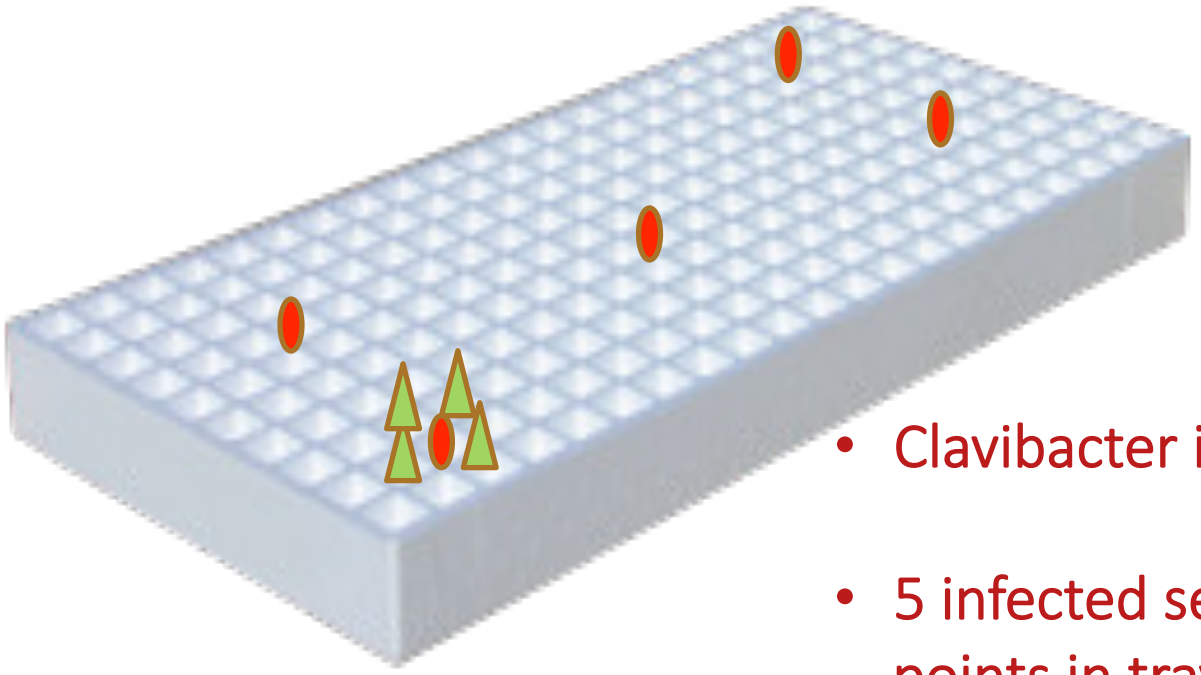

CONTROL
TOMATO


CONTRO

NOBACTRA NURSERY:

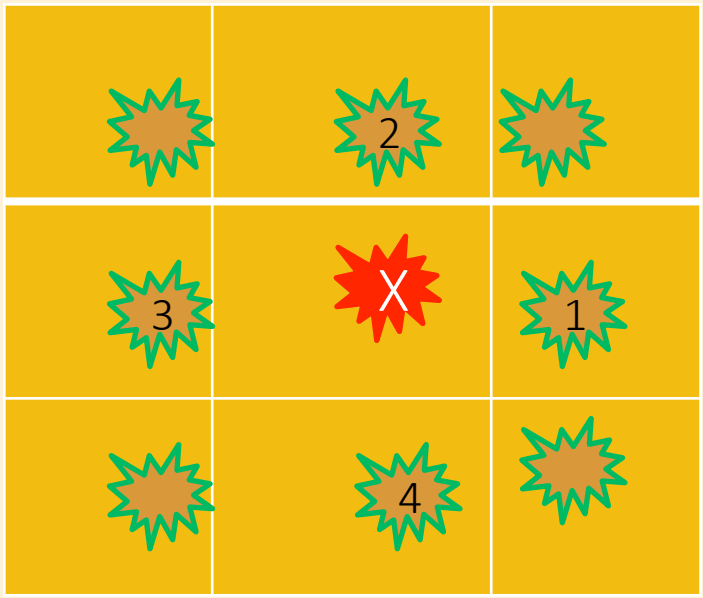
CONTROL OF CLAVIBACTER MICHIGANENSIS

Infested seed- Healthy seed



- Clavibacter in nursery is symptomless
- 5 infected seeds sowed in known points in tray
- Trays received two Nobactra Nursersy treatments at physiological stage of two cotyledons
- Third treatment day before marketing

NOBACTRA NURSERY FOR THE CONTROL OF CLAVIBACTER:
MATERIALS AND METHODS



- Using Agdia USA Kit determined if sowed seeds developed into infected seedlings (red)
- If positive, checked seedling #s 1-4 (per picture) for Cmm

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IMPACT OF NOBACTRA NURSERY ON TRANSFER OF CLAVIBACTER PATHOGEN FROM INFECTED SEED TO NEIGHBORING SEEDLING (EACH TREATMENT IN 10 TRAY REPLICAS)

TREATMENT	# INOCULATED SEEDS	# SEEDS INFECTED FROM INOCULATED SEEDS	# NEIGHBORING SEEDLINGS (1-4) INFECTED
CONTROL 1	0	0	0
CONTROL UNTREATED	50	38	95
NOBACTRA 0.3%	50	40	6
NOBACTRA 0.6%	50	37	0

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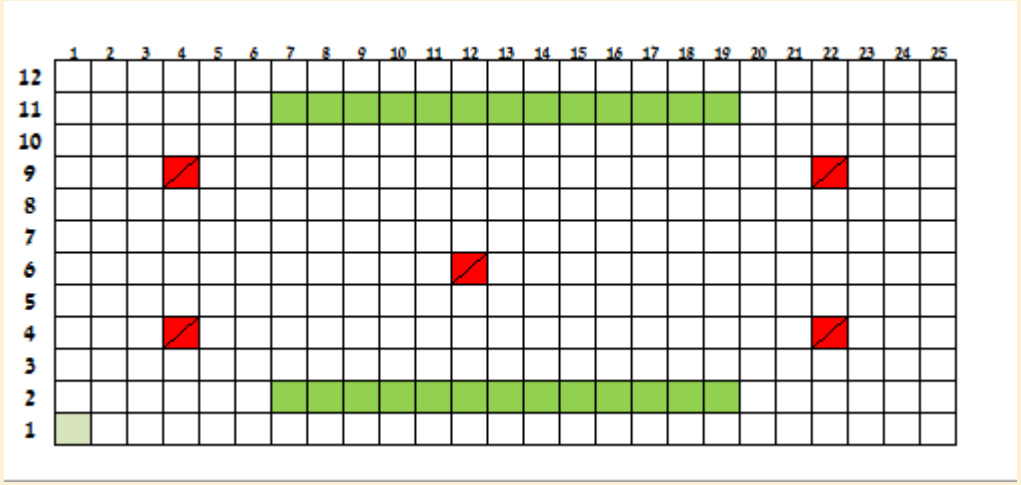
PCR TEST FOR SEED TRANSMITED DISEASES: CMM

Red: Represents individual seedlings from infected seeds

Green: Represents area from which seedlings were sampled for Cmm



RESULTS (Avg. 5 trays/treatment):

- Untreated control: all red are infected and green average 21 out of 26 positive seedling per tray

- Nobactra Nursery treatment: all red are infected and green 0 infected out of 26 per tray

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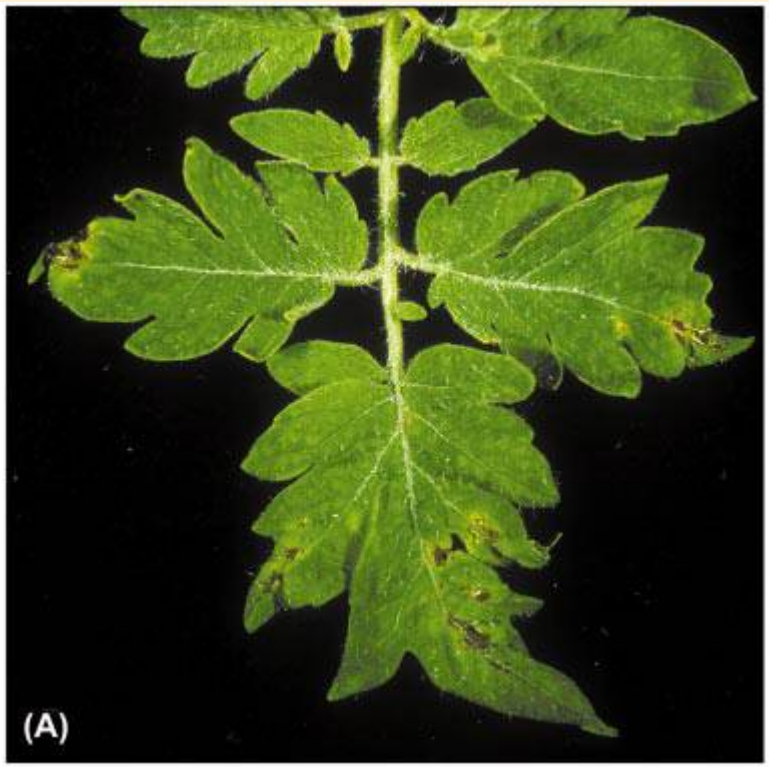
NOBACTRA NURSERY:

CONTROL OF PSEUDOMONAS TOMATO AND XANTHOMAS VESICATORIA

EXPERIMENT TO TEST FOR EFFICACY OF NOBACTRA NURSERY FOR CONTROL OF BACTERIAL SPOT: MATERIALS AND METHODS



- Treatments:
  - Nobactra Nursery 0.3%
  - Nobactra Nursery 0.6%
  - Nobactra Nursery 1.2%
  - Untreated control: all red are infected and green average 21 out of 26 positive per tray
- In every tray 5 seeds infected with Pseudomonas tomato were sowed
- Seedlings planted in green house to determine yield and disease

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EXPERIMENT: NOBACTRA NURSERY FOR CONTROL OF XANTHOMONAS VESICATORIA

NUMBER	TREATMENT	SEEDS	AVG. INFECTED SEEDS/TRAY 28 DAYS AFTER TREATMENT	AVG. YIELD / PLANT FROM TWO HARVESTS (KG)	DISEASE IN FIELD (0-5)
1	NO	(C) CERTIFIED	5	6.38	0
2	0.6% NB	C	1	6.74	0
3	NO	5+C**	174	N/A	-
4	0.3% NB	5+C**	23	N/A	-
5	0.6%NB	5+C**	5	6.73	0.2
6	1.2%NB	5+C**	5	6.74	0
7	KOCID* 2000	5+C**	122	3.54	3.6
8	KOCID* 2000	C	2	6.35	0

* Cu(oh)2; ** Addition of 5 infected seeds to the tray

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Xanthomonas vesicatoria

EXPERIMENT: NOBACTRA NURSERY FOR CONTROL OF PSEUDOMONAS TOMATO

NUMBER	TREATMENT	SEEDS	AVG. INFECTED SEEDS/TRAY 28 DAYS AFTER TREATMENT	AVG. YIELD / PLANT FROM TWO HARVESTS (KG)	DISEASE IN FIELD (0-5)
1	NO	(C) CERTIFIED	70	6.27	2.7
2	0.6% NB	C	2	6.45	0
3	NO	5+C**	187	N/A	-
4	0.3% NB	5+C**	66	N/A	-
5	0.6%NB	5+C**	9	6.63	0.1
6	1.2%NB	5+C**	7	6.58	0
7	KOCID* 2000	5+C**	94	N/A	-
8	KOCID* 2000	C	57	6.05	2.4

* Cu(oh)2; ** Addition of 5 infected seeds to the tray

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TOMATOES PLANTED AFTER RECEIVING NOBACTRA NURSERY TREATMENT


Thank you

ABOUT NOBACTRA

COMPANY LIFECYCLE

2011-2013

DISCOVERY

- Antagonistic Bacteria, Oil Formulation
- Cocktail

2014

POC

- Concentration Limits, Phytotoxicity
- Survivability, Toxicology and Environmental Fate

2015-ONWARDS

Efficacy Trials & Registration

- Hatchery Eggs, Nurseries, Potatoes, Soil Treatment, Tomatoes, Crucifers, Eggs

2016-ONWARDS

Go-to-Market and R&D

- Eggs, Nurseries, Potatoes, Soil Treatment, Tomatoes
- Secondary Metabolites, Micro-encapsulation; New solutions*

*Feasibility trials for food additive antibiotic replacement in chicken feed begun Q1 2015

REGISTRATION SCHEDULE IN ISRAEL

REGISTERED

HATCHERY EGGS:
Salmonella, other coliforms and fungi

PENDING

NURSERY:
17 botanical varieties for
all relevant pathogens

SUBMITTED

TOMATO/POTATO/CRUCIFERS:
Tomato canker (*Cmm*)/potato scab
(*Streptomyces*)/black rot (*Xanthomonas*)

TRIALS

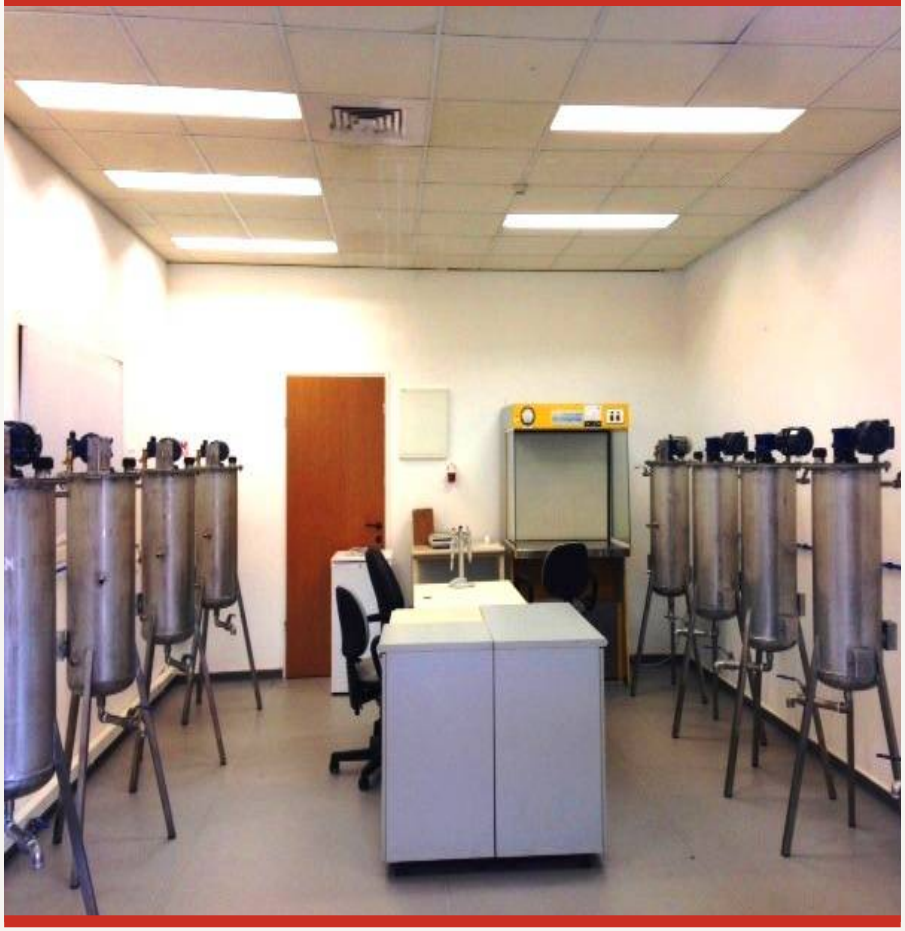
PEPPERS,TOMATOES/SOIL TREATMENTS
Xanthomonas/Streptomyces/
Root Knot Nematodes

MANUFACTURING CAPABILITY

- Production plants of bacteria and powder formulation under ISO
- Limiting factor is 600 liter of bacteria cocktail/week (for 50 liter spray we use 150ml)
- Capacity can be enlarged in future quickly

Mixer for Oil Formulation

Bacteria Production Facility



THANK YOU