

GROWING TOMATOES FOR SEED IN THE GARDEN

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QUOTES FROM ELIOT COLEMAN

“I doubt that the direction of present-day seed breeding, selection, and genetic manipulation is favorable to the producer of high quality vegetables ... For most crops the vigor and viability of seed grown under careful cultural practices of this production system will far excel seeds that are purchased... Seeds are the spark of the farm operation...”

AN ESSENTIAL GARDEN VEGETABLE



ORIGINS

- ◉ Tomato, *Lycopersicon esculentum*
- ◉ Native to the tropical Americas, from Mexico to Chile.
- ◉ There are dozens of wild *Lycopersicon* species occupying many environmental niches, from the mountains to the shore, and they are important in transferring genes for fruit quality, pest and disease resistance, and environmental adaptability into the modern tomato.

PEST RESISTANCE

- ◉ Tomato has the genetic base to create a cultivar with resistance to most of the pests for our specific locales. Some diseases are problematic and very difficult to control. i.e. Late blight. Some diseases become difficult to control due to man's bad habits. i.e. lack of plant rotation, consistent incremental plantings, lack of crop-free period. Breaking disease cycles is one strategy to keep a disease at low levels.

GRAPE TOMATO SUGARY (L) & ARIA (R)



BASIS OF RESISTANCE

Wild *Lycopersicon* species:

- ◉ *L. peruvianum* - early blight, leaf mold, fusarium wilt, septoria leaf spot, nematodes
- ◉ *L. hirsutum* - early blight, bacterial speck, root-knot nematodes, natural insecticide, hairs create physical barrier for mites
- ◉ *L. pimpinellifolium* - bacterial wilt, fusarium wilt
- ◉ *L. cerasiforme* - cherry; short stigma = true-to-type
- ◉ *L. cheesemanii* - heat & salt tolerance, high vitamin C, jointless pedicels,

PLANT TYPES

- Determinate (bush) - concentrated harvest, short harvesting period. Field production. Ground culture. More wind resistant.
- Indeterminate (trellis) - Greenhouse; harvest over long period. High yields. Susceptible to wind. Usually pruned to a single stem. Can be grown on the ground but unwieldy.

GRAPE & MINI-ROMA TOMATOES SUGARY / JULIET / ARIA



BASIS OF SELECTION

Each seedling is an individual with the potential to possess genes unique from its siblings. Genes will be expressed under certain conditions. i.e. heat stress, low input, disease pressures, heavy rains, high clay soil, low day & night temperature differential, high humidity, etc

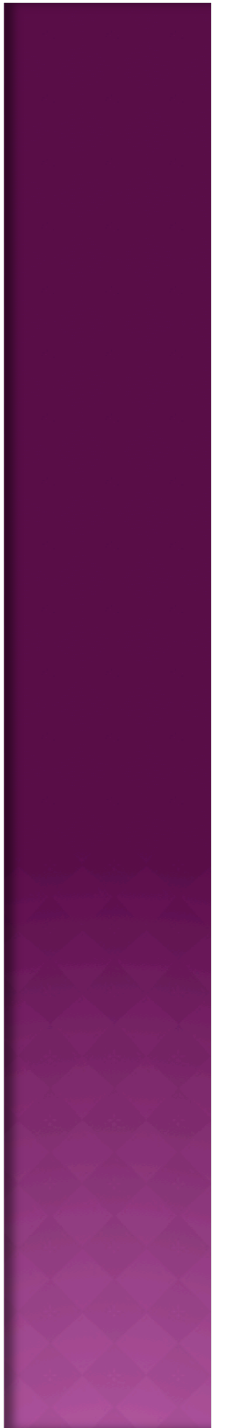
HAWAII DISEASES

- ◉ Tomato Yellow Leaf Curl Virus - NEW
- ◉ Spotted Wilt Virus
- ◉ Pepper Mottle Virus
- ◉ Tobacco Mosaic Virus
- ◉ Root-Knot Nematodes
- ◉ Early Blight & Stem Canker- Alternaria
- ◉ Late Blight - Phytophthora
- ◉ Leaf Mold - Fulvia
- ◉ Stemphylium - Grey Leaf Spot
- ◉ Fusarium & Verticilium Wilt
- ◉ And many, many, more...

DISEASE SYMPTOMS



FIGURE 19. Disease Symptoms on Plants.



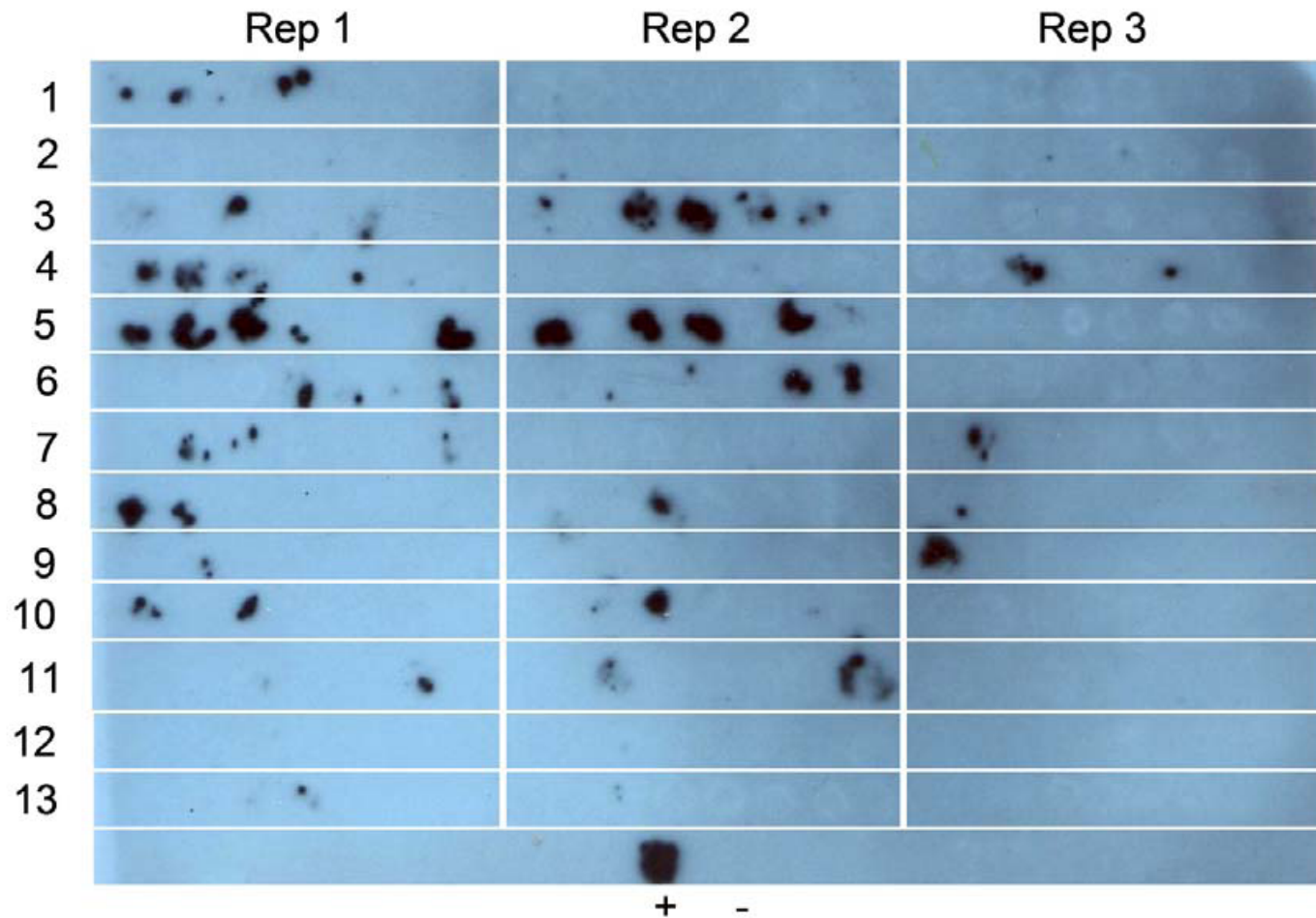
ROOT-KNOT NEMATODES



TOMATO TSWV/TYL CV RESISTANCE TRIAL UH CTAHR POAMOHO EXP STAT. - OCT 2011

#	Variety	Source	Fruit
1	VT-60783	Zeraim Gedera	Globe
2	72767	Nirit	Grape
3	8466	Nirit	Roma
4	Felicity	Hazera	Cherry
5	Olivia	Hazera	Grape
6	Ofri	Hazera	Globe
7	72835	Nirit	Baby Roma
8	72061	Nirit	Globe
9	72205	Nirit	Globe
10	Tymothy	Hazera	Cherry
11	VT-60773	Zeraim Gedera	Globe
12	7105	Nirit	Globe
13	HA-46204	Hazera	Baby Roma

TYLCSV VIRUS RESISTANCE TISSUE BLOT TEST

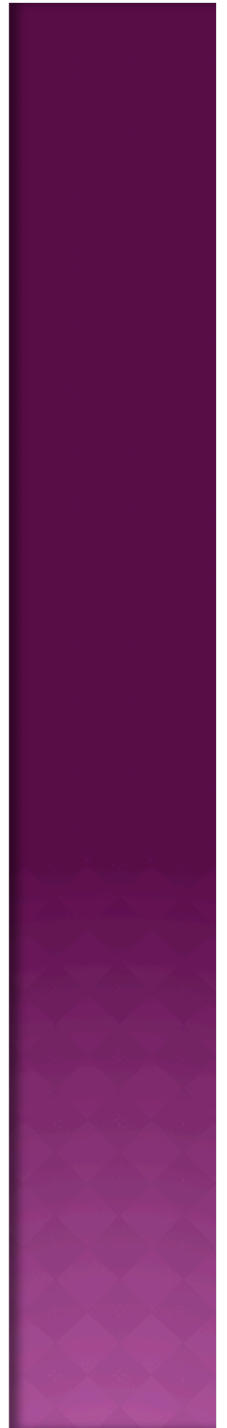


HAWAII'S NEEDS

Our needs are very unique. We have diverse climates, over 140 soil types, and a year-round growing season with year-round pests. Our plants face extremes; drought, heat, heavy rain, and high humidity, creating conditions for diseases of all kinds. Cultivars must be acclimated to high night temperatures. Ideally, we need a tomato for all of these conditions.



TOMATOES, THE #2 MOST CONSUMED VEGETABLE



BREEDING PRIORITIES

- ◉ Fruit Quality: shape, firmness, color, shoulder shape/color, gel color, wall thickness, taste, clusters, pedicel, core, blossom end/stem end scar
- ◉ Defects: cracking, cat-facing, puffiness, blossom-end rot, zipper fruits, nipple tips, blotchy ripening, grey wall,
- ◉ Plant: canopy (sun scald), habit (determinate and indeterminate), compactness
- ◉ Diseases: fungus, bacteria, virus, physiological
- ◉ Other: nutrition, pesticide free, organic vs. conventional

BREEDING OBJECTIVES

- Priorities constantly changing. Trends include nutrition. Breeders attempt to combine quality and disease resistance into one compact plant. Regional breeding, but should be more site-specific.
- Pest resistance: Focus on major diseases based on crop loss. Many site-specific problems in Hawaii due to diverse climate and conditions, even between islands. Need to identify pests in your area and identify cultivars with resistance to your problems.

PROBLEMS IN BREEDING

- Good genes are closely linked to bad genes, and the need to break the linkage. Examples include root-nematode resistance and cracking, Tobacco Mosaic Resistance and soft fruit. May have to plant thousands of seedlings before you can break linkage, and find one with only the favorable gene.

SORTING TOMATOES FOR RIPENESS AND COLOR



WHAT DOES THE COMMERCIAL HAWAII FARMER WANT

- ◉ Yield - high pack-out and grade-out \$\$\$
- ◉ Concentrated set (field production) \$\$\$
- ◉ Sustained production (greenhouse) \$\$\$
- ◉ Pest and Disease Resistance \$\$\$
- ◉ Vigor-fast germination & quick growth \$\$\$
- ◉ Shelf-life/Standability: non-cracking, firm fruit, Rough Handling \$\$\$
- ◉ Appearance - glossy, appealing to the eye \$\$\$

GARDENERS CONSIDERATIONS

- ◉ Nutrition & Taste
- ◉ Harvest over long period of time
- ◉ High genetic variability - can select for resistance to problems, seed can be saved
- ◉ Multiple Disease resistance
- ◉ Efficiency in fertilizer use - not high input
- ◉ Eating Quality - balance of sweet & sour
- ◉ Large Root System - ability to withstand stress
- ◉ Adaptable to Tropical Conditions - heat, rain

PRIORITIES TO CONSIDER

- ◉ Nutrition
- ◉ Taste
- ◉ Low Input - requires less fertilizer
- ◉ Pest and Disease Resistance
- ◉ Drought & Heat Tolerant
- ◉ Rain Tolerant
- ◉ Late Maturing = large root system
- ◉ Yield
- ◉ Adapted to Tropical Conditions
- ◉ Vigor



THE IDEAL GARDEN TOMATO

- ◉ Late maturing - longer vegetative season to produce a large scavenging root system to sustain plant over a long fruiting season - 3+ months
- ◉ Nutrient rich
- ◉ Utilizes nutrients efficiently = low input
- ◉ Heat-tolerant & rain-tolerant,
- ◉ Resistance to many diseases found in Hawaii - V,F123,N,T,A,TYLCV
- ◉ Excellent taste - explodes in your mouth!

NEW COLORS



SELECTING VARIETIES

Eliot Coleman's List of Priorities:

- ◉ Eating Quality
- ◉ Appearance
- ◉ Pest & Disease Resistance
- ◉ Days to Maturity
- ◉ Storage
- ◉ Vigor
- ◉ Performance
- ◉ Standability
- ◉ Ease of Harvest



SELECTING VARIETIES - CONT'D

- ◉ Time of Harvest
- ◉ Frost Resistance & Hardiness
- ◉ Day Length
- ◉ Ease of Cleaning
- ◉ Convenience
- ◉ Ease of Preparation
- ◉ Adaptability
- ◉ Nutrition
- ◉ Marketability



BREAKING F1 HYBRIDS

- A novel way of developing a disease-resistant inbred for your area. Save the seeds from a F1. You may want to take fruits from several fruits instead of one. More variability since F1's are segregating for certain resistance. Plant at less-than-ideal times to express genes, then select what you want. If the disease is not present, you may not capture resistance in your selection. Overcome nematodes by grafting onto resistant rootstock.

VEGETABLE SEED PRODUCTION - CTAHR VOLCANO



HEALANI TOMATO

Resistance to:

- ◉ Tobacco Mosaic Virus
- ◉ Root-knot nematodes
- ◉ Vascular browning from still, wet weather
- ◉ Fusarium Wilt
- ◉ Stemphylium
- ◉ Alternaria
- ◉ Others

HEALANI TOMATO



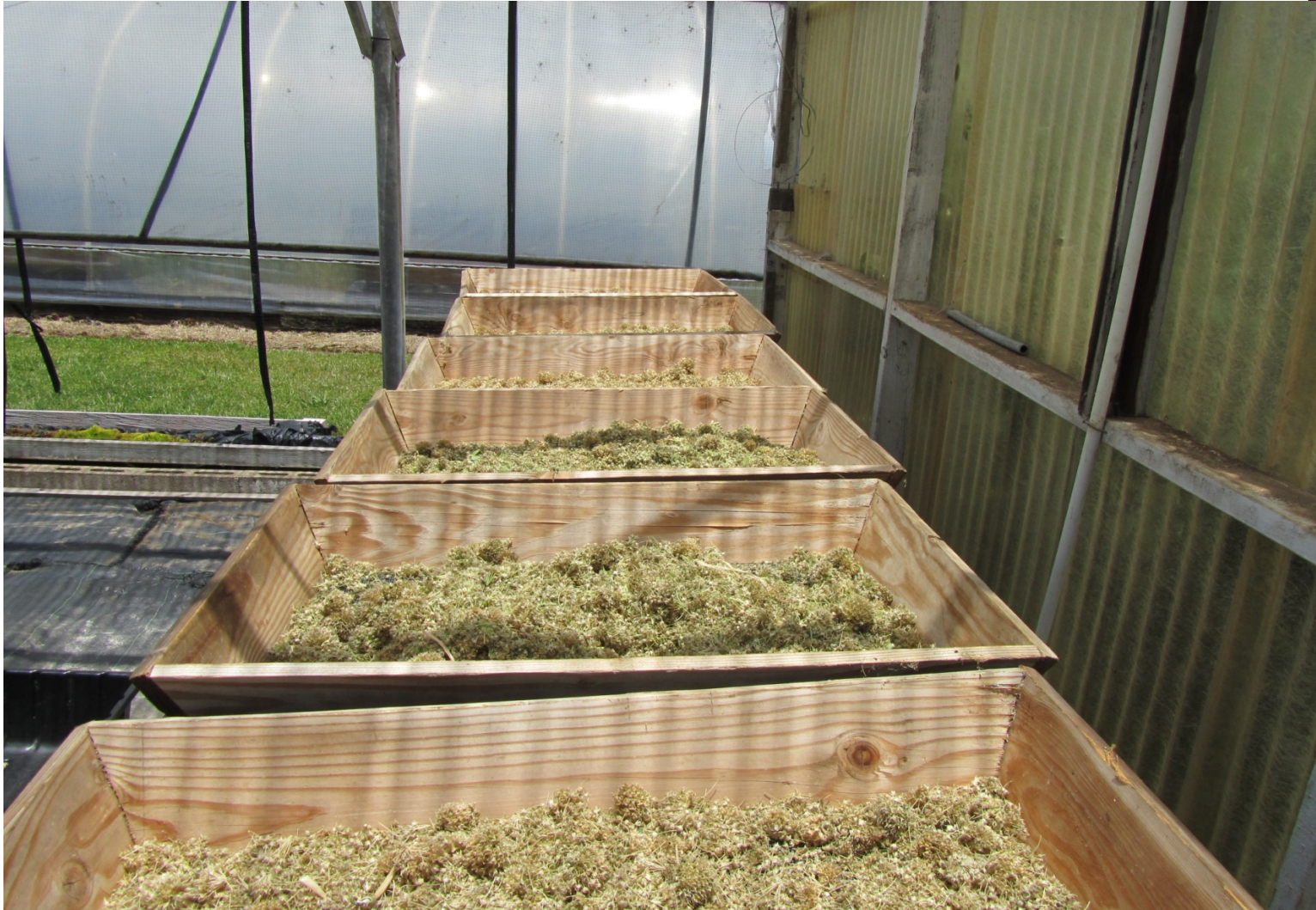
HYDROPONIC MEDIA



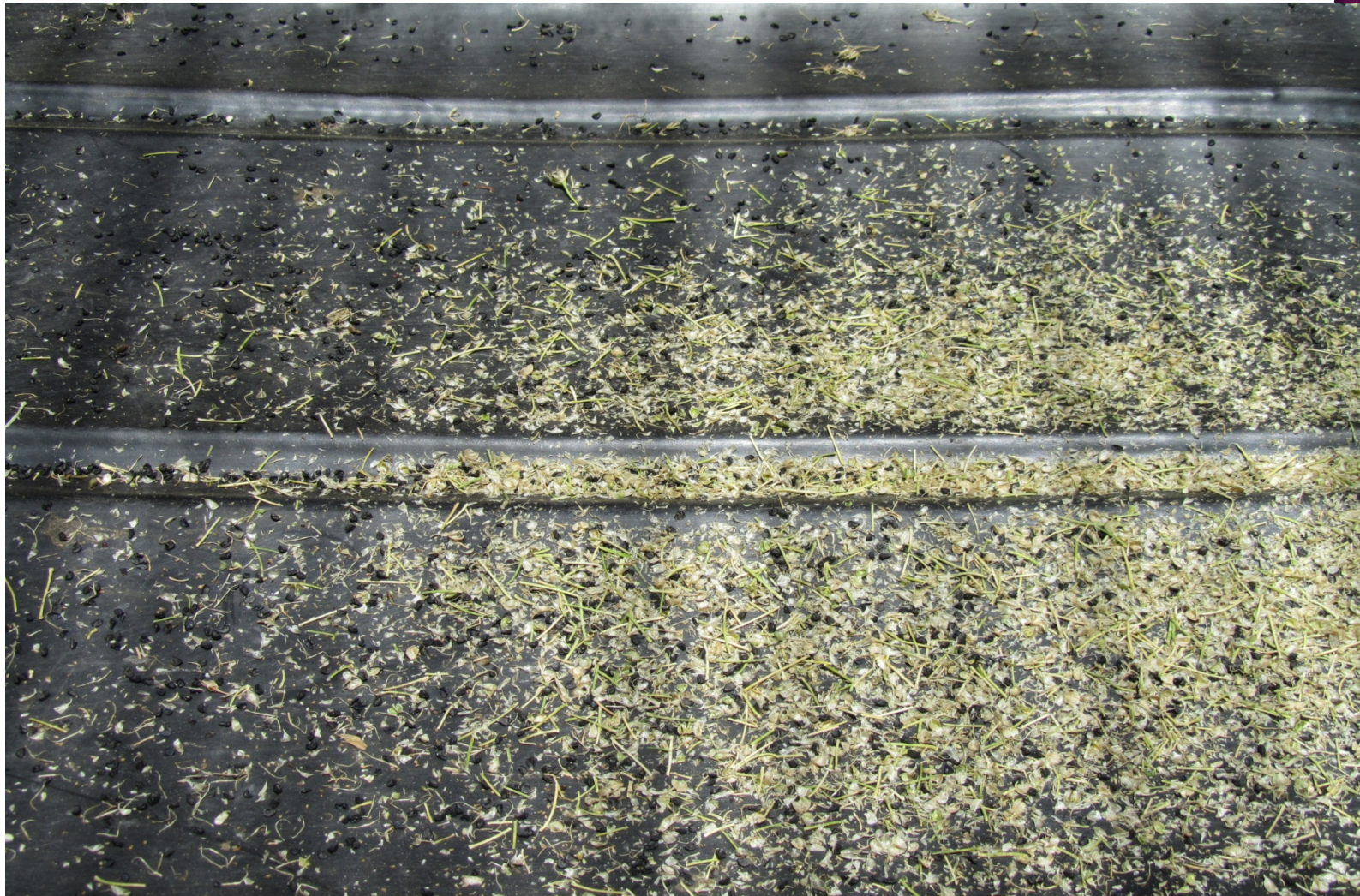
GREEN ONION SEED PRODUCTION - KOBA



GREEN ONION SEED



KOBA GREEN ONION SEED



The End

