Innovation Through Collaboration

IFSH | INSTITUTE FOR FOOD SAFETY AND HEALTH

Best In Class Seed Sanitation

Presented By Dessa Hix
Food Safety Officer and
Preventive Controls Qualified Individual

International Specialty Supply

Institute For Food Safety and Health
Sprout Safety Task Force Meeting
Sept. 24, 2019

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SENTREX SYSTEMS MANUFACTURING

Sprouts
The Original Super Food

INTERNATIONAL
SPECIALTY SUPPLY

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OUR VALUES

- ✓ Safety
- ✓ Integrity
- ✓ Value Creation
- ✓ Teamwork

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THE COMPANY

- **SunGarden Fresh Living -** Supplies the Health, Wellness, and Nutrition industry with sprouts and sprout powders
- **Sentrex –** Creators of highest quality sprouting equipment & services
- **SunGarden Seed –** Global supplier of the Ultimate Premium Sprouting Seed

Who we are:

- Global leader in sprouts & equipment
- 100,000 sq. ft. facility
- Over 40 years of experience
- Best in class food safety systems

We Produce:

- Ultimate Premium Sprouting Seed
- Sprouts
- Sprout powders
- Healthy alternatives
- Unique ingredients

3rd Party Certifications

- SQF Level 2
- HACCP/HARPC
- Kosher
- GMP
- Organic
- GFSI

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BACKGROUND INFORMATION

- Sprouts are a nutrition powerhouse and a great source of fresh food in areas with limited growing space.
- Sprouts represent a special food safety concern because the conditions under which they are produced are also ideal for the growth of pathogens.
- In foodborne illness outbreaks associated with sprouts, epidemiological investigations often identify the most likely sources of contamination as seeds used for sprouting.
- SunGarden Seed offers a scientifically-valid prior treatment to reduce pathogens.

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TREATMENT AND EFFECT

Treatment	Log Reduction	Reduction %	Effect on Germination
Calcium Hypochlorite	3-log	99.9%	Minimal
Heat Treatment	4-log to 5-log	99.999%	Significant
High Pressure	5-log	99.999%	Delayed Germination
SunGarden Seed Treatment	5-log to 6-log	99.999% to 99.9999%	0% to 3%

Current Industry Standard

SunGarden Seed Process

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SUNGARDEN SEED

Organic, Non-Thermal Pathogen Control

Achieves a 5-log to 6-log reduction of pathogens on seeds following a patented and validated process using a dedicated food safety system.

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CHEMICAL AGENT OF SEED TREATMENT

Neo-Pure Solution is a patented, proprietary solution

- Hydrogen peroxide
- Peroxyacetic acid
- Acetic Acid
- Ethanol (carrier)

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THE BENEFITS

Innovation in Sprout Safety

RAW

Low temperature drying ensures seed remains raw and unchanged

ORGANIC

SunGarden™ Seed is approved for organic use under US NOP & Canadian COR standards

VIABLE

Sensory qualities and shelf life are preserved, and product can still sprout!

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THE SEED TREATMENT PROCESS

- Seed arrives in facility
- Representative sample is tested
- Approved and moved to SunGarden Seed holding area

- Treated according to approved SOPs
- Dried to original moisture content
- Bagged in Food Grade multiwall bag
- Post treatment sample tested

- Stored according to GMP practices
- Shipped according to approved SOPs

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3RD PARTY VALIDATION

NOVOLYZE
LEADING FOOD SAFETY REVOLUTION

- Offers solutions to help the food industry manufacture safer food
- Ensure strong compliance with international Food Safety & Quality standards
- Research work mainly focuses on evaluating the inactivation of foodborne pathogens
- Dried, ready-to-use surrogate bacteria

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SURRONOV® 18

- Validation performed using the surrogate microorganism SurroNov®18 to evaluate the lethality of *Salmonella* as a pathogen of concern.
- A surrogate must demonstrate similar or greater resistance when compared to the target pathogen to be considered effective.

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VALIDATION PROCESS STEPS

- Preparation of guidelines to perform the In-Plant Validation
- Production and conditioning of SurroNov® surrogate microorganism
- In-Plant Validation Trials—Generation of data to prove the efficiency of the process to achieve significant log reduction in surrogate microorganism
- Validation Report—Documented report with proof of the process control efficiency.

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VALIDATION STRATEGY

- 3 samples of non-inoculated, non-treated seed to serve as Control Samples.
- Inoculated 250 lbs. of seed and recovered 10 Non-Processed Samples
- Apply sanitizing solution
- 10 Intermediate Processed Samples
- 30 samples in thermal cages
- After drying, the thermal cages were recovered from the dryer to serve as Processed Samples.

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SUNGARDEN SEED SYSTEM

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TESTING PARAMETERS

	Usual Production	Validation Trials
Batch Size	1200 lbs. (544 kg)	250 lbs. (113 kg)
Applicator – Residence Time	3-5 minutes	3-5 minutes
Applicator – Application Ratio	40L/metric ton of seed	40L/metric ton of seed
Holding Time	1 hour	1 hour
Dryer · Temperature	140°F (60°C)	140°F (60°C)
Dryer – Drying Time	Depends on seed type	Depends on seed type

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3RD PARTY VALIDATION

Broccoli

Log Reduction
6.17 ± .20

Clover

Log Reduction
5.67 ± .00

Alfalfa

Log Reduction
5.51 ± .40

Radish

Log Reduction
5.37 ± .40

Sunflower

Log Reduction
3.52 ± .57

Treated Seed Validation Results

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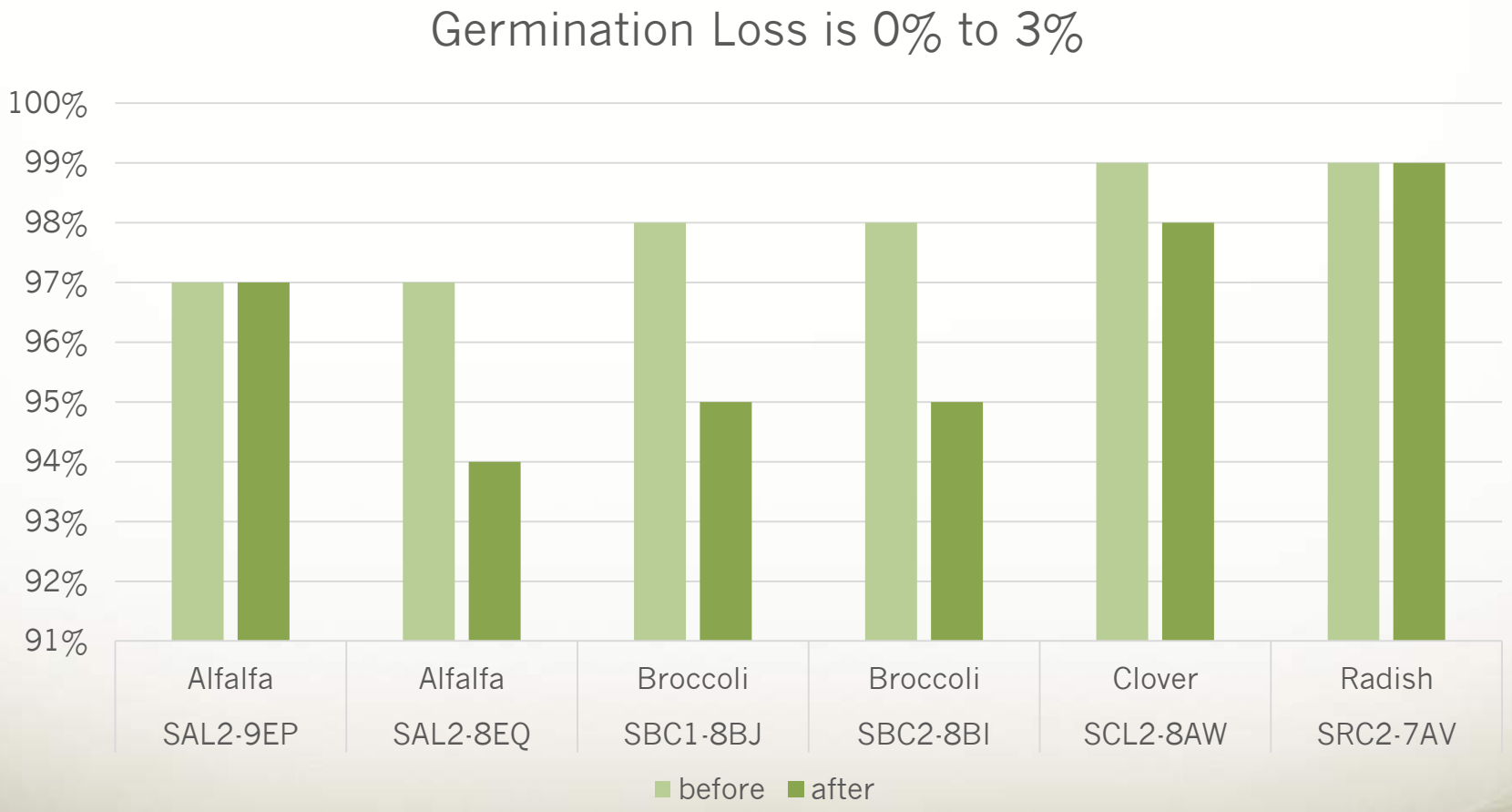
IMPACT OF TREATMENT ON GERMINATION



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CATEGORIZATION STUDY

- Objective was to categorize 25 seed types according to factors that influence the growth of pathogens and the efficacy of chemical treatments to eliminate pathogens
- Use data to select one or two seeds per category that represent the worst-case scenario—the seed that would be hardest to sanitize in that category

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GROUPING OF SEED

How do we group seed?

- Water Activity Level
- Moisture Level
- Total Fat Content
- Total Protein Content
- Carbohydrate Content

Summary of the impact of these factors on the efficacy of chemical treatment

- Low moisture and low water activity ➔**Higher bacterial resistance**
- High carbohydrate and high protein environment ➔**Higher bacterial resistance**
- High fat environment ➔**Higher bacterial resistance**

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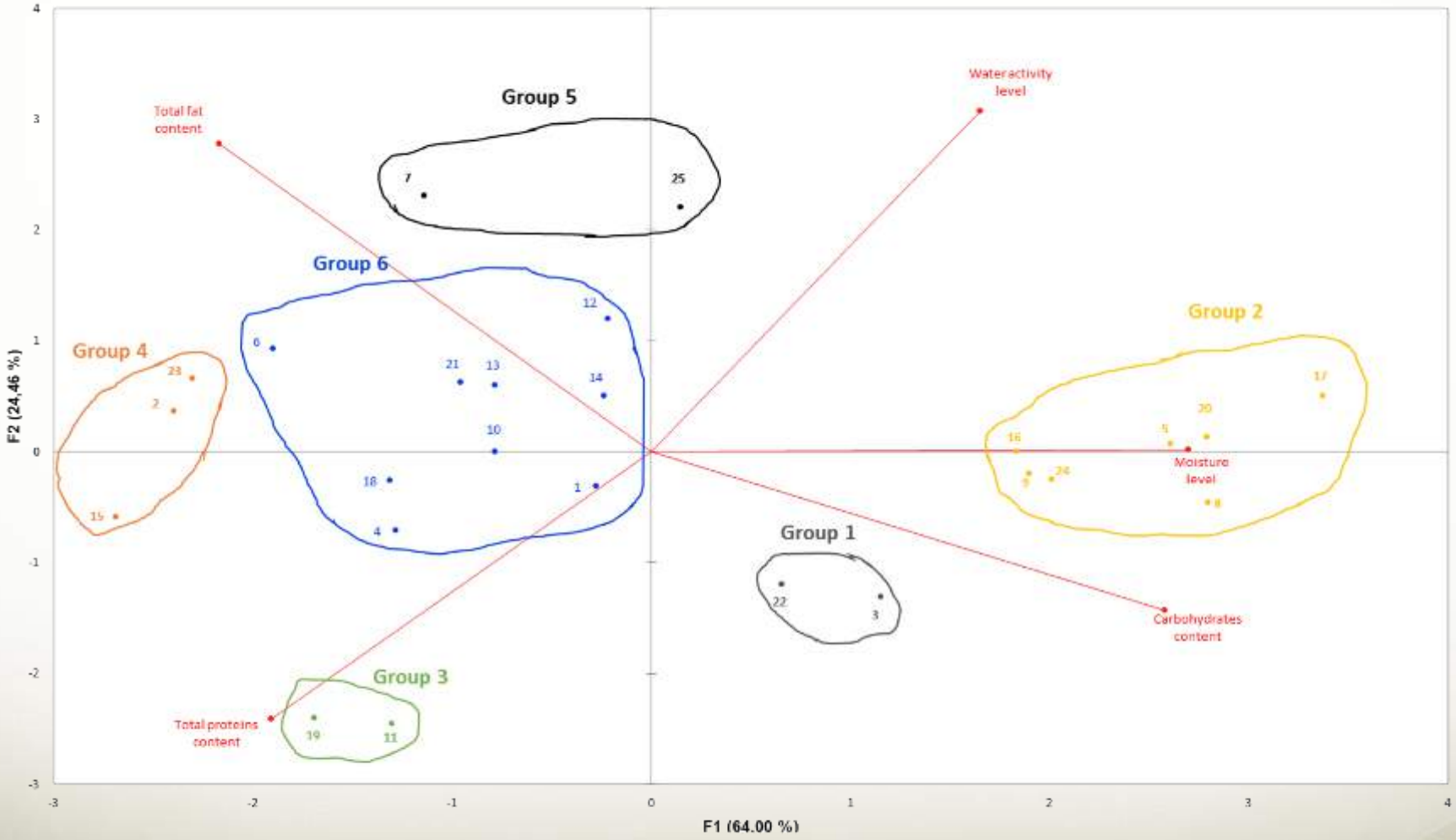
RESULTS

STATISTICAL ANALYSIS

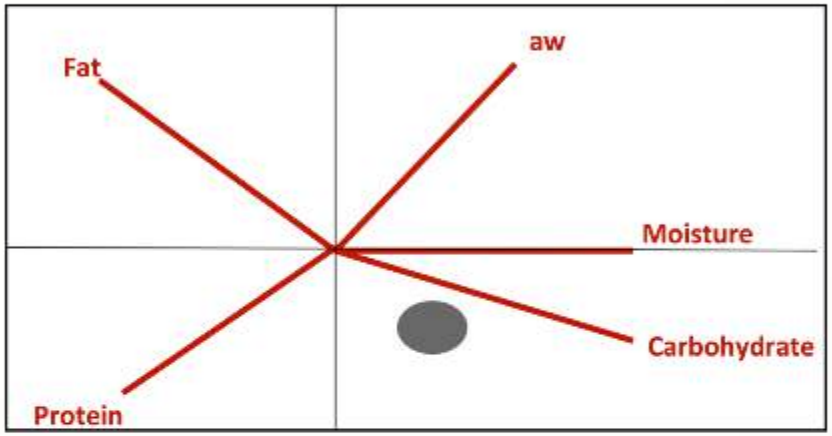


RESULTS

STATISTICAL ANALYSIS

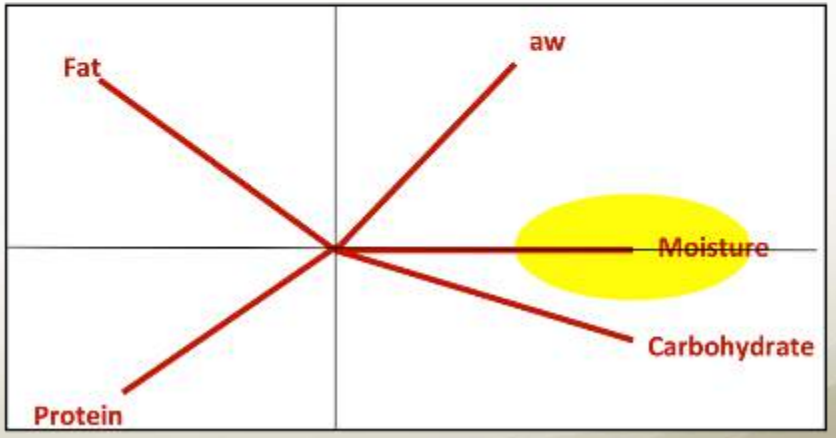
- Group 1:

	Minimum		Maxium		Mean		Level of factor
	Group	All	Group	All	Group	All	
Water activity level	0,490	0,370	0,520	0,650	0,505	0,525	Medium
Moisture level	10,40	5,1	11,28	14,7	10,84	9,29	Medium
Total fat content	2,01	1,6	4,04	44,3	3,03	19,19	Low
Total proteins content	24,47	11,1	28,87	37,5	26,67	22,82	High
Carbohydrates content	53,67	23,3	58,28	78,9	55,98	44,99	High
Density	0,76	0,34	0,81	0,87	0,79	0,67	/



- Group 2:

	Minimum		Maxium		Mean		Level of factor
	Group	All	Group	All	Group	All	
Water activity level	0,510	0,370	0,640	0,650	0,580	0,525	High
Moisture level	10,91	5,1	14,74	14,7	12,58	9,29	High
Total fat content	1,62	1,6	7,74	44,3	4,20	19,19	Low
Total proteins content	11,05	11,1	20,58	37,5	15,34	22,82	Low
Carbohydrates content	59,36	23,3	78,86	78,9	65,59	44,99	High
Density	0,36	0,34	0,87	0,87	0,68	0,67	



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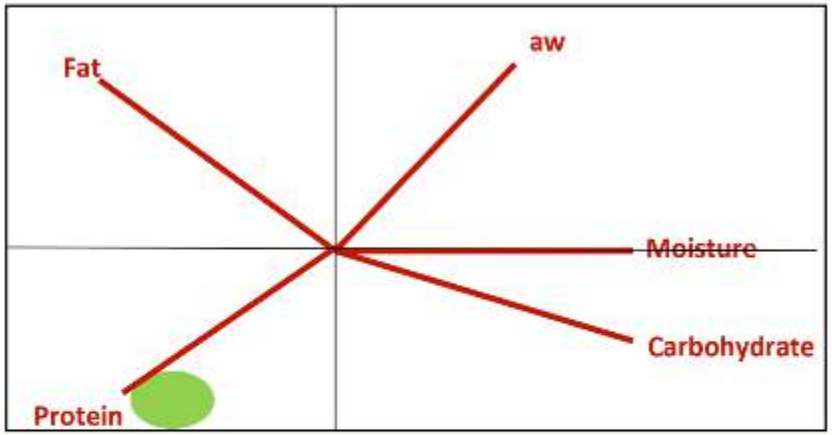
RESULTS

STATISTICAL ANALYSIS

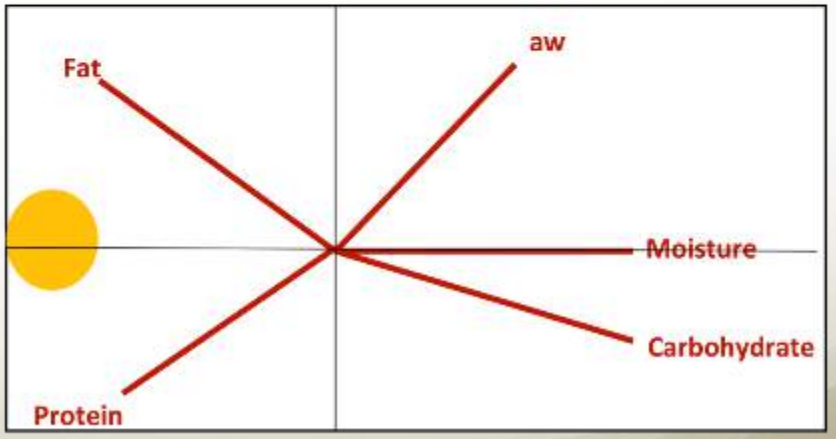
- Group 3:

	Minimum		Maxium		Mean		Level of factor
	Group	All	Group	All	Group	All	
Water activity level	0,370	0,370	0,400	0,650	0,385	0,525	Low
Moisture level	6,48	5,1	7,75	14,7	7,12	9,29	Low
Total fat content	6,44	1,6	10,47	44,3	8,46	19,19	Low
Total proteins content	35,28	11,1	37,52	37,5	36,40	22,82	High
Carbohydrates content	43,15	23,3	43,65	78,9	43,40	44,99	Medium
Density	0,83	0,34	0,85	0,87	0,84	0,67	



- Group 4:

	Minimum		Maxium		Mean		Level of factor
	Group	All	Group	All	Group	All	
Water activity level	0,410	0,370	0,470	0,650	0,443	0,525	Medium
Moisture level	5,10	5,1	6,19	14,7	5,77	9,29	Low
Total fat content	31,88	1,6	41,97	44,3	37,23	19,19	High
Total proteins content	22,39	11,1	29,76	37,5	26,53	22,82	High
Carbohydrates content	24,40	23,3	28,55	78,9	26,54	44,99	Low
Density	0,68	0,34	0,72	0,87	0,70	0,67	



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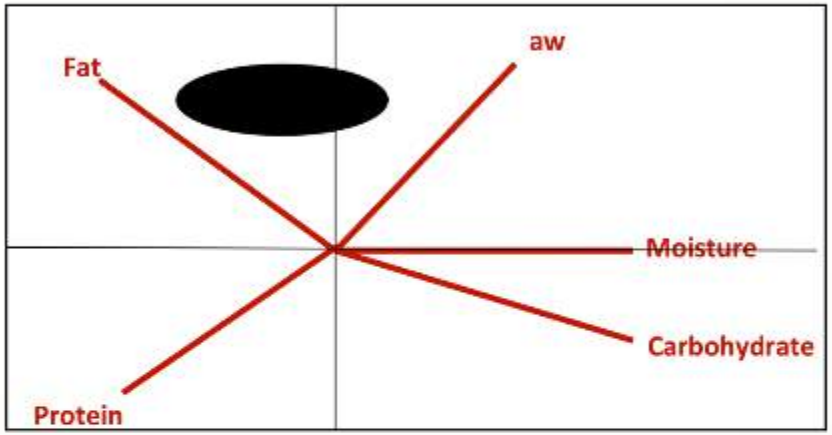
RESULTS

STATISTICAL ANALYSIS

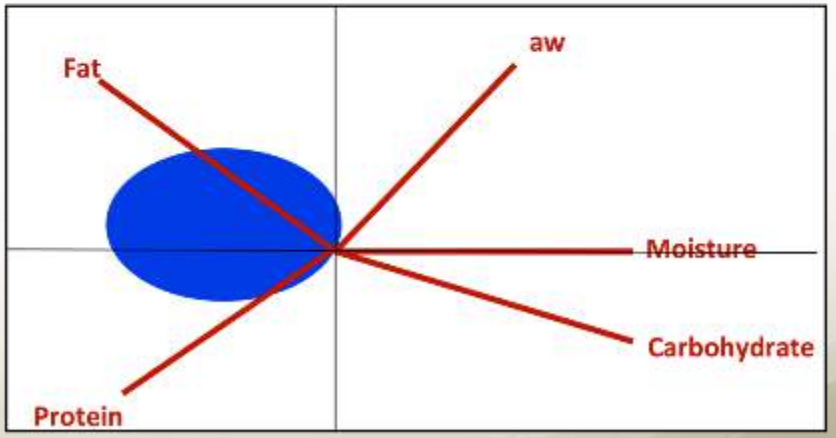
- Group 5:

	Minimum		Maxium		Mean		Level of factor
	Group	All	Group	All	Group	All	
Water activity level	0,610	0,370	0,650	0,650	0,630	0,525	High
Moisture level	7,74	5,1	8,41	14,7	8,08	9,29	Medium
Total fat content	33,15	1,6	44,29	44,3	38,72	19,19	High
Total proteins content	14,87	11,1	18,57	37,5	16,72	22,82	Medium
Carbohydrates content	26,09	23,3	39,06	78,9	32,58	44,99	Low
Density	0,42	0,34	0,72	0,87	0,57	0,67	



- Group 6:

	Minimum		Maxium		Mean		Level of factor
	Group	All	Group	All	Group	All	
Water activity level	0,410	0,370	0,570	0,650	0,521	0,525	Medium
Moisture level	7,03	5,1	10,17	14,7	8,30	9,29	Medium
Total fat content	19,55	1,6	36,11	44,3	26,46	19,19	High
Total proteins content	16,06	11,1	32,30	37,5	24,88	22,82	High
Carbohydrates content	23,27	23,3	45,72	78,9	35,79	44,99	Low
Density	0,34	0,34	0,76	0,87	0,61	0,67	



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SENTREX SYSTEMS MANUFACTURING

RESULTS

IDENTIFICATION OF WORST CASE PRODUCT

- Group 1: 2 products

#	Product name	Water activity level	Moisture level	Total fat content	Total proteins content	Carbohydrates content	Density	Worst case
3	Mung	0,490	11,3	2,0	24,5	58,3	0,81	
22	Fenugreek	0,520	10,4	4,04	28,87	53,7	0,76	✓

WC: Fenugreek

- Group 2: 7 products

#	Product name	Water activity level	Moisture level	Total fat content	Total proteins content	Carbohydrates content	Density	Worst case
5	Greenpea	0,630	13,74	2,01	19,97	60,98	0,71	
8	Wheat	0,530	11,76	2,67	11,05	78,86	0,80	
9	Garbanzo	0,570	11,75	5,43	18,61	61,18	0,67	
16	Red Beet	0,550	10,91	6,99	14,05	61,53	0,36	
17	Barley	0,630	13,95	2,92	11,38	70,04	0,59	
20	Adzuki	0,640	14,74	1,62	20,58	59,36	0,77	
24	Quinoa	0,510	11,23	7,74	11,77	67,15	0,87	✓

WC: Quinoa

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RESULTS

IDENTIFICATION OF WORST CASE

- Group 3: 2 products

#	Product name	Water activity level	Moisture level	Total fat content	Total proteins content	Carbohydrates content	Density	Worst case
11	Clover	0,400	7,75	6,44	37,52	43,15	0,83	
19	Alfalfa	0,370	6,48	10,47	35,28	43,65	0,85	✓

WC: Alfalfa

- Group 4: 3 products

#	Product name	Water activity level	Moisture level	Total fat content	Total proteins content	Carbohydrates content	Density	Worst case
2	Mizuna	0,470	6,19	37,85	27,44	24,4	0,71	
15	Broccoli	0,410	5,10	31,88	29,76	28,55	0,72	✓
23	Flax	0,450	6,03	41,97	22,39	26,68	0,68	

WC: Broccoli

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RESULTS

IDENTIFICATION OF WORST CASE PRODUCT

- Group 5: 2 products

#	Product name	Water activity level	Moisture level	Total fat content	Total proteins content	Carbohydrates content	Density	Worst case
7	Sunflower	0,610	7,74	44,29	18,57	26,09	0,42	✓
25	Kale	0,650	8,41	33,15	14,87	39,06	0,72	

WC: Sunflower

- Group 6: 9 products

#	Product name	Water activity level	Moisture level	Total fat content	Total proteins content	Carbohydrates content	Density	Worst case
1	Garlic chives	0,490	8,72	19,55	23,16	45,72	0,57	
4	Onion	0,410	7,40	24,50	23,90	40,11	0,51	
6	Daikon Radish	0,560	7,03	36,11	29,15	23,27	0,70	✓
10	Cress	0,570	8,96	20,52	32,30	33,62	0,76	
12	Cilantro	0,540	9,30	31,55	16,06	37,25	0,34	
13	Black Chia	0,520	7,99	29,23	21,31	37,15	0,69	
14	Carrot	0,510	10,17	26,36	20,02	36,46	0,46	
18	Arugula	0,530	7,28	22,19	31,97	34,73	0,76	
21	Cabbage	0,560	7,89	28,17	26,05	33,84	0,72	

WC: Radish

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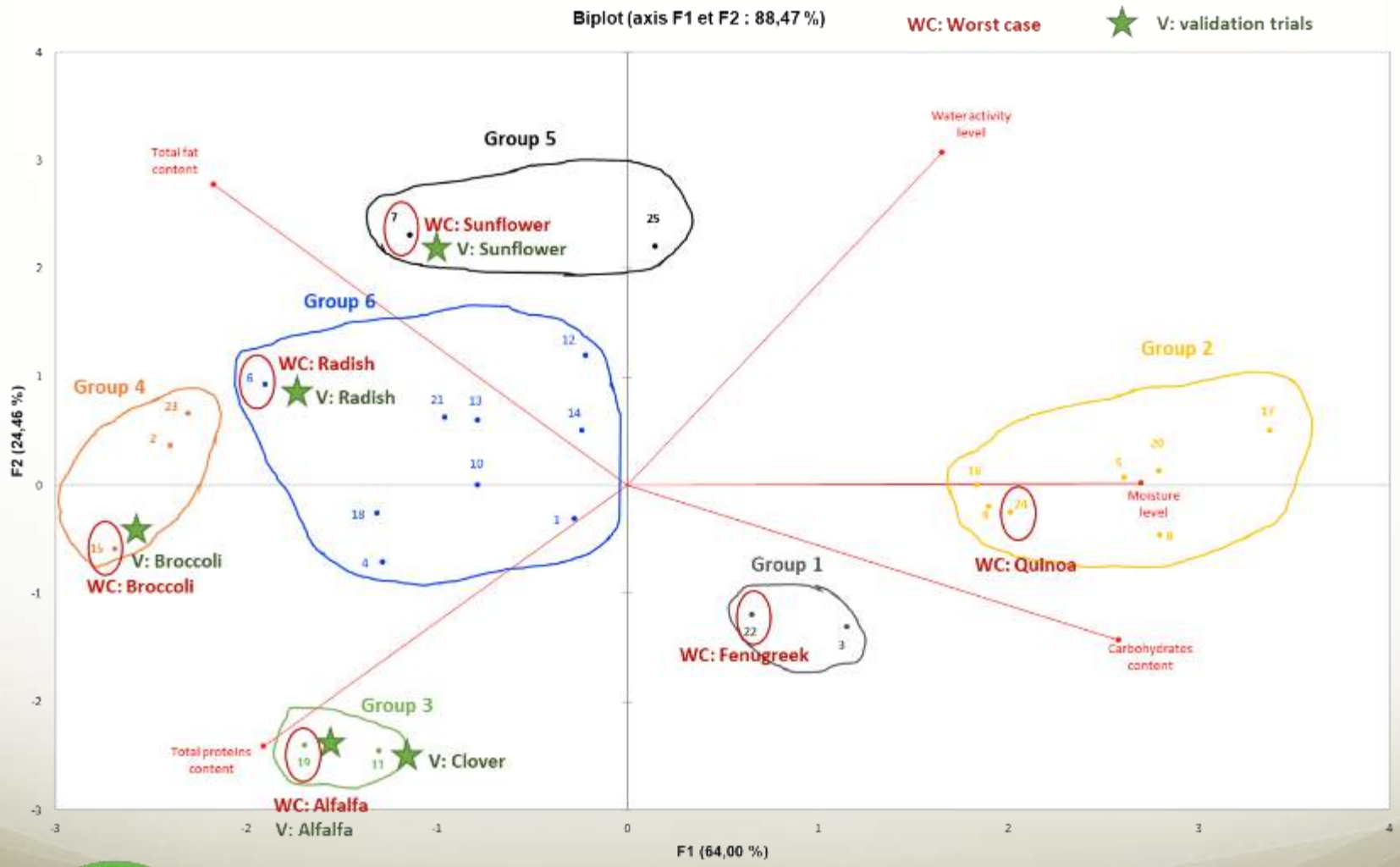
RESULTS

IDENTIFICATION OF WORST CASE PRODUCT



CONCLUSIONS

- ✓ SunGarden Seed is the first commercially-available seed that meets the January 2017 Proposed Guidance recommendation for a scientifically-valid prior treatment to reduce microorganisms of public health significance.

- ✓ SunGarden Seed is organic, eco-friendly, and can achieve a 5-log to 6-log pathogen reduction without significant impact on germination.

- ✓ We apply Best-in-Class food safety practices to ensure the safety of the seed throughout the process:

  - Supplier Approval
  - Receipt, inspection, and sampling of seed
  - Seed testing to confirm absence of pathogens
  - SunGarden Seed Sanitation
  - Storage and shipping
  - Sprouting in our facility

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