



The 10% Rule: How Low-Acid Ingredients Impact Acidified and Formulated Acid Foods

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AFDOSS Conference 2026

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- With VT since 2014
- With VCE since 2019
- B.S. Biological Sciences, Roanoke College
- M.S. Food Safety & Biosecurity, Virginia Tech

- Process Authority

- A person having expert knowledge of thermal processing requirements for foods in hermetically-sealed containers
- AFDO-listed
- BPCS certified for Acidified Foods
- BPCS approved instructor

- Food Safety Specialist

- Acid/Predominantly Acid Foods
- Fermented Foods
- Water Activity-Controlled Foods
- TCS Evaluations
- Nutrition Fact Panel creation
- Ingredient statement review



- 110+ undergraduate and 120+ graduate programs
- 38,000 students (80/20 UG/G)
- Research portfolio of more than \$556 million (top 6% of US universities)
- Land-grant institution
 - 2600-acre main campus in Blacksburg
 - Innovation campus in NoVA
 - Health Sciences and Technology campus in Roanoke
 - Other sites in Newport News, Richmond
 - 11 Agricultural Research & Experiment Centers (ARECs) across the state; spans CALS, CNRE, VMCVM



COLLEGE OF AGRICULTURE AND LIFE SCIENCES
**FOOD SCIENCE
AND TECHNOLOGY**
VIRGINIA TECH.

- Undergraduate degree ranked 9th best nationally
- Food Science major options:
 - Science
 - Food Business
 - Food and Health
 - Food & Beverage Fermentation
- Food Science minor options:
 - Science
 - Fermentation
- IFT-approved
- Recognized by Master Brewers Association of the Americas
- Masters and PhD programs
 - 43 graduate students
- Non-thesis program - OMALS

Food Producer Technical Assistance Network

<https://www.fst.vt.edu/extension/foodbiz.html>

- Has existed within the Food Science and Technology Department at Virginia Tech in some form since 1999
- During FY 2026, more than:
 - 600 products tested
 - 200 individuals served
 - 400 reports written
 - 200 nutrition facts panel reports



Image credit: Alex Hood, VT

- Sent and received more than 4500 emails (program inbox only)
- More than 200 hours on phone calls to producers, regulators, home cooks and anyone else that had questions
- Program operates as a cost recovery center to provide low-cost assistance in support of small entrepreneurs
 - During FY 2026, invoiced around \$48,000
 - Worked with individuals and businesses in 17 states plus DC

Age Group	Percentage
18-24	~10%
25-34	~35%
35-44	~25%
45-54	~20%
55-64	~15%
65-74	~10%
75-84	~5%
85+	~2%

- [illegible]

Image credit: shutterstock.com



But there is also this...



“Carbonated beverages, jams, jellies, preserves or acid foods (including such foods as standardized and nonstandardized food dressings and condiment sauces) that contain **small amounts** of low-acid food(s) and have a resultant finished equilibrium pH that does not **significantly differ** from that of the predominant acid or acid food...are excluded from the coverage of this part.”

21 CFR 114.3

All image credit, unless otherwise noted: pixabay.com



So, how should these products be classified and regulated?

Formulated Acid Foods (Predominantly Acid Foods)

- The act of formulating – combining low-acid ingredients with acid ingredients in a ratio to achieve a final equilibrium pH <4.6 with no significant equilibration time – is what creates the product.
- These products also have a water activity >0.85 , otherwise they would be water activity-controlled foods.
- The term originated from CFSAN
- Generally, products fall into this classification in one of two ways:

Small amounts of low-acid ingredients

Equilibrium pH that does not significantly differ from base acid ingredients

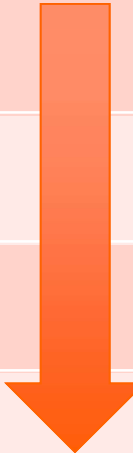


So, how much is a “small amount”?



And what is a “significant difference” in pH?

If the equilibrium pH of the predominant acid or acid food is:		Then you should consider a shift in pH to be significant when:	
	>4.3	Any shift in pH is present	
	4.2	The shift in pH is ≥ 0.2	
	≥ 3.8 and < 4.2	The shift in pH is ≥ 0.3	
	< 3.8	The shift in pH is ≥ 0.4	



As the equilibrium pH goes up, the allowable shift goes down. This is to ensure a comfortable buffer when approaching pH 4.6.



In practical application for many Process Authorities,
this necessitates that

“...the determination of acid versus acidified should
focus on low-acid ingredients and their impact on pH
equilibrium time as per the intent of the Acidified
Foods regulation.”

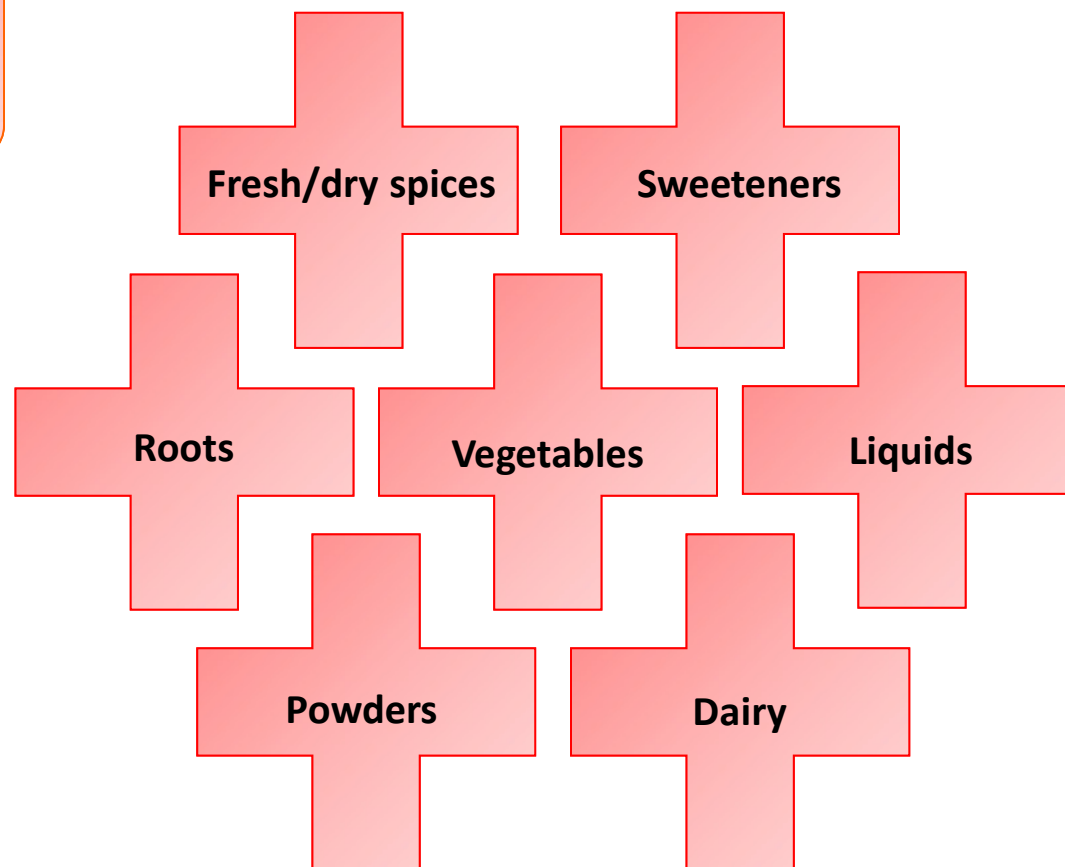
*An Examination of the Acidified Foods Rule with Regard to the Acid versus
Acidified Foods Classification.* CHRIS BALESTRINI, D. Bresnahan, Y. Lou, W.
Ocasio, R. Ramaswamy, K. Weise. January/February 2022. Food Protection
Trends, Vol. 42, No. 1, Pages 82-87.

Low-Acid Ingredient pH Impact Study

Starting material:
100% Tomato Puree
pH: 4.26 - 4.38



Image credit: kroger.com



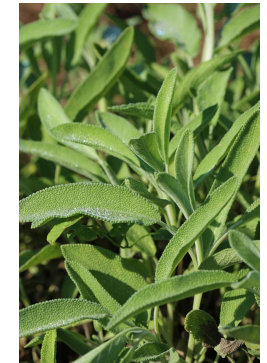
Dry, Ground Spices

Ingredient Added	Percent by weight	Impact on pH (SU)
Red pepper, crushed flakes	5%	0.00
	10%	0.03
	15%	0.06
	20%	0.08
Thyme	5%	0.18
	10%	0.29
	15%	0.47
	20%	0.61
Basil	5%	0.14
	10%	0.27
	15%	0.52
	20%	0.76
Sage	5%	0.10
	10%	0.23
	15%	0.32
	20%	0.43
Oregano	5%	0.05
	10%	0.18
	15%	0.25
	20%	0.36



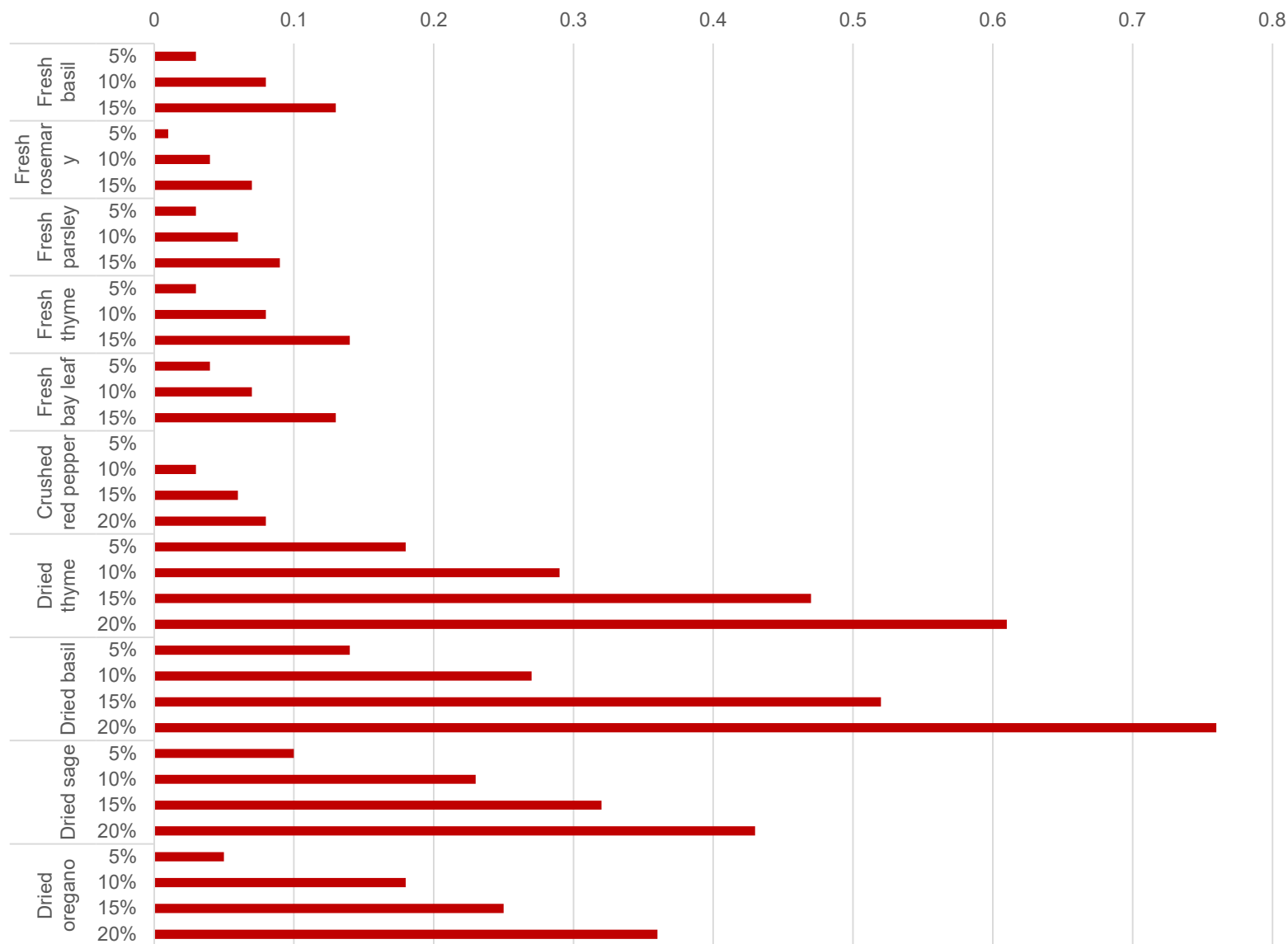
Fresh Botanicals

Ingredient Added	Percent by weight	Impact on pH (SU)
Basil	5%	0.03
	10%	0.08
	15%	0.13
Rosemary	5%	0.01
	10%	0.04
	15%	0.07
Parsley	5%	0.03
	10%	0.06
	15%	0.09
Thyme	5%	0.03
	10%	0.08
	15%	0.14
Bay leaf	5%	0.04
	10%	0.07
	15%	0.13



Dry Spices & Botanicals

Change in pH due to ingredient additions



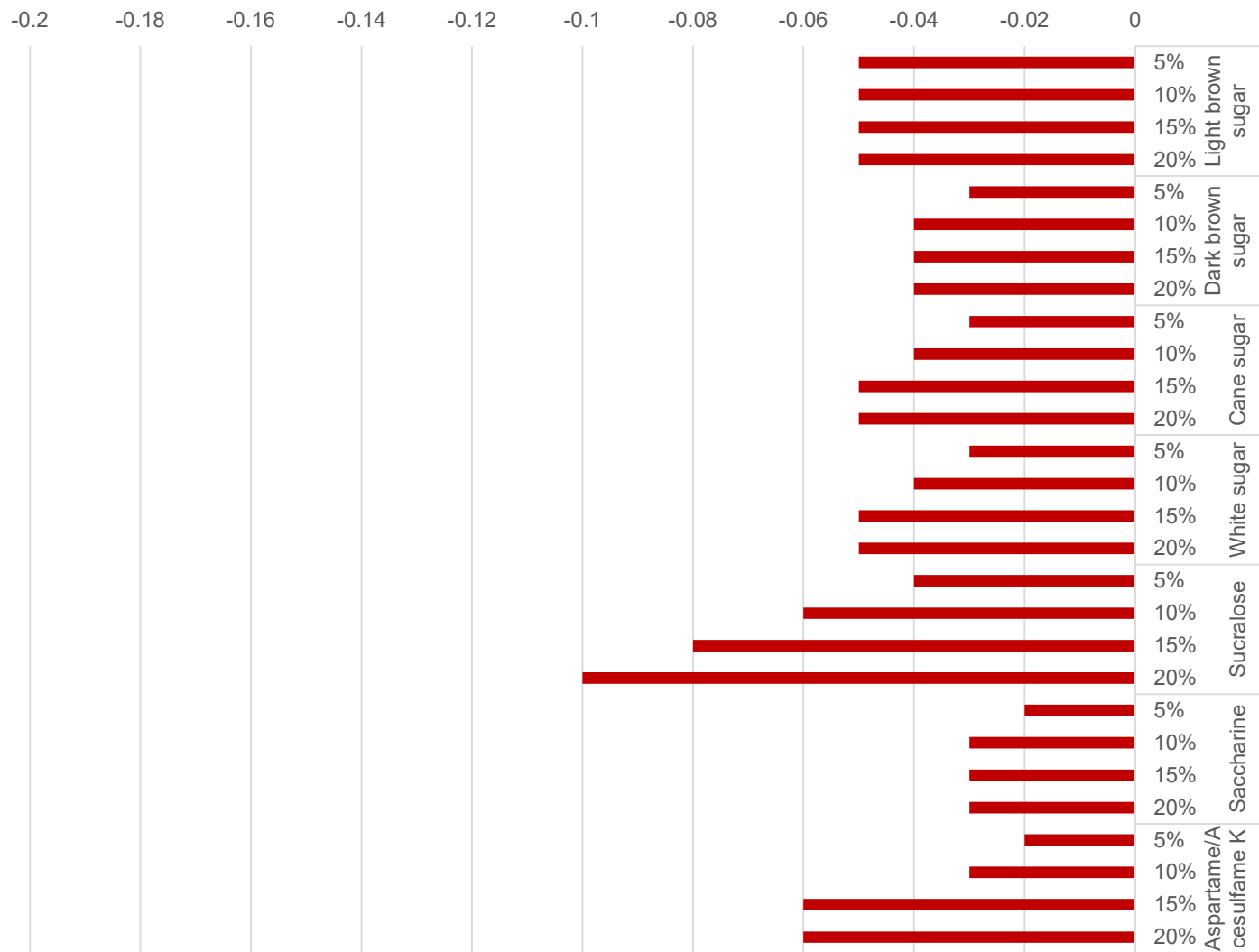
Sweetening Agents

Ingredient Added	Percent by weight	Impact on pH (SU)	Ingredient Added	Percent by weight	Impact on pH (SU)
Light brown sugar	5%	-0.05	Sucralose	5%	-0.04
	10%	-0.05		10%	-0.06
	15%	-0.05		15%	-0.08
	20%	-0.05		20%	-0.10
Dark brown sugar	5%	-0.03	Saccharine	5%	-0.02
	10%	-0.04		10%	-0.03
	15%	-0.04		15%	-0.03
	20%	-0.04		20%	-0.03
Cane sugar	5%	-0.03	Aspartame/ Acesulfame K	5%	-0.02
	10%	-0.04		10%	-0.03
	15%	-0.05		15%	-0.06
	20%	-0.05		20%	-0.06
White sugar	5%	-0.03	 		
	10%	-0.04			
	15%	-0.05			
	20%	-0.05			



Sweetening Agents

Change in pH due to ingredient additions



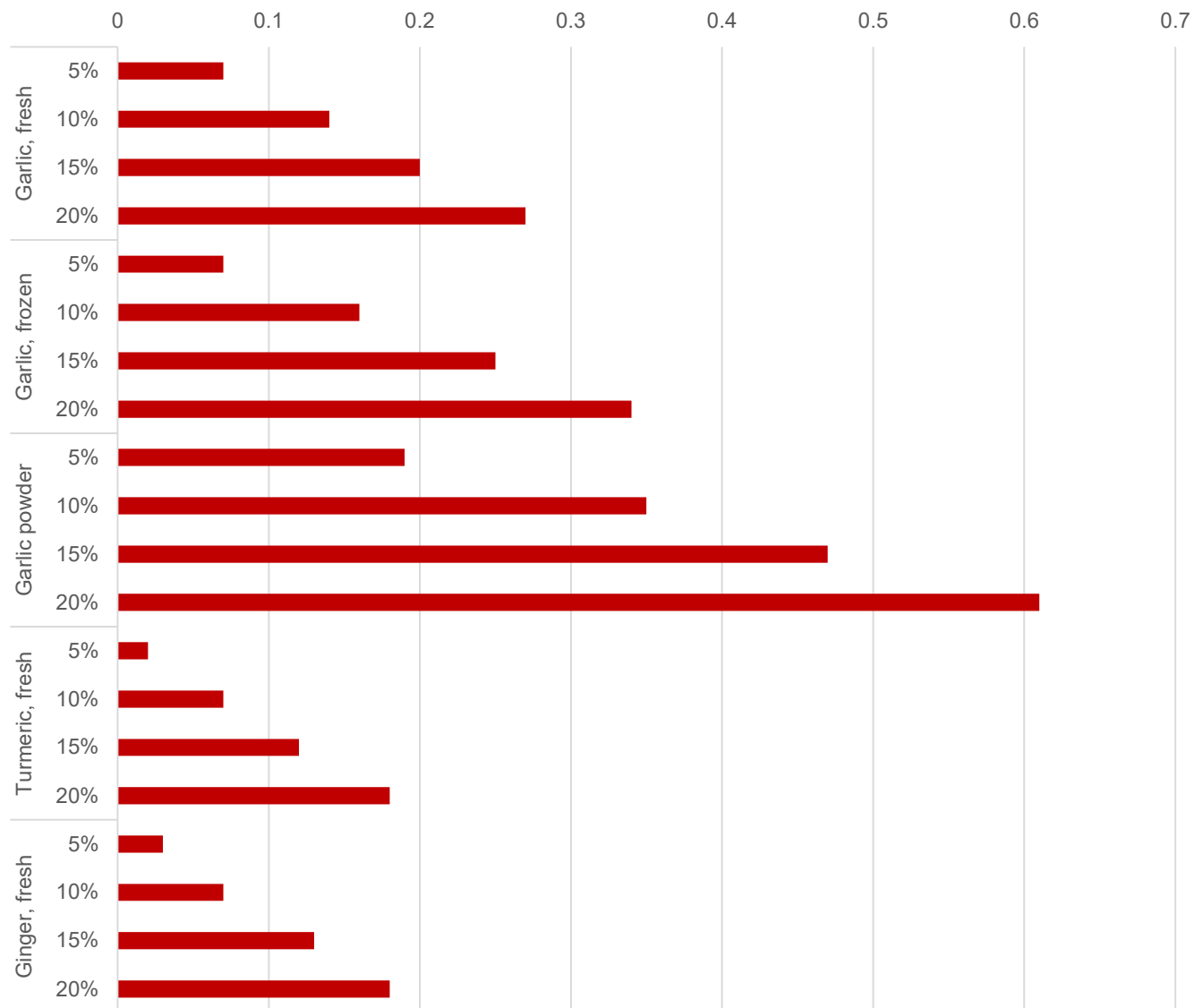
Root Ingredients

Ingredient Added	Percent by weight	Impact on pH (SU)
Garlic, fresh	5%	0.07
	10%	0.14
	15%	0.20
	20%	0.27
Garlic, frozen	5%	0.07
	10%	0.16
	15%	0.25
	20%	0.34
Garlic powder	5%	0.19
	10%	0.35
	15%	0.47
	20%	0.61
Turmeric, fresh	5%	0.02
	10%	0.07
	15%	0.12
	20%	0.18
Ginger, fresh	5%	0.03
	10%	0.07
	15%	0.13
	20%	0.18



Root Ingredients

Change in pH due to ingredient additions

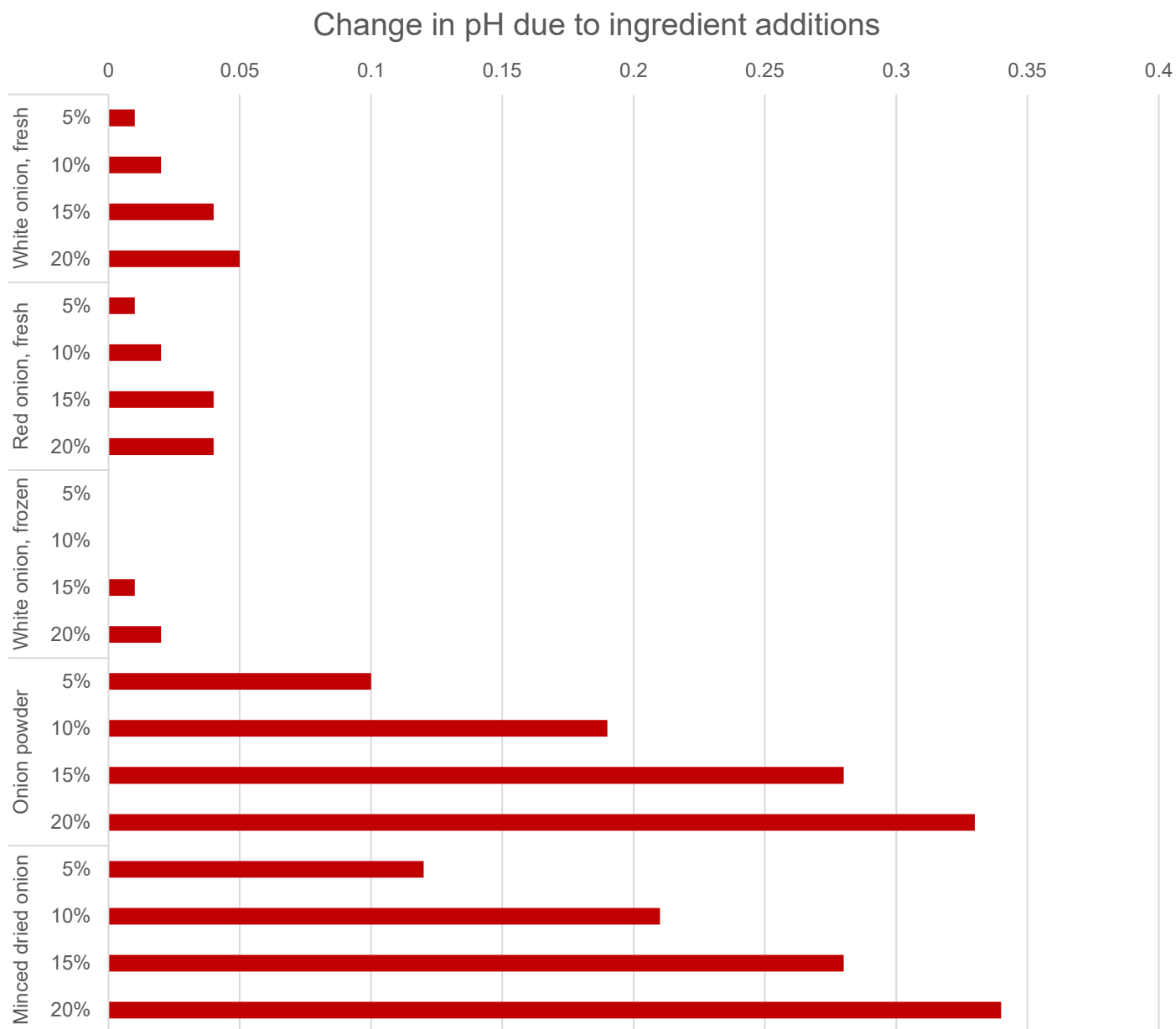


Vegetables – Part 1

Ingredient Added	Percent by weight	Impact on pH (SU)
White onion, fresh	5%	0.01
	10%	0.02
	15%	0.04
	20%	0.05
Red onion, fresh	5%	0.01
	10%	0.02
	15%	0.04
	20%	0.04
White onion, frozen	5%	0.00
	10%	0.00
	15%	0.01
	20%	0.02
Onion powder	5%	0.10
	10%	0.19
	15%	0.28
	20%	0.33
Minced dried onion	5%	0.12
	10%	0.21
	15%	0.28
	20%	0.34

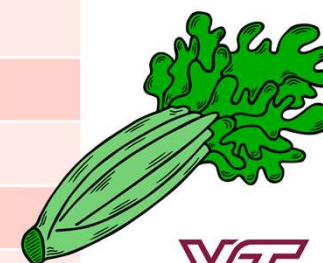
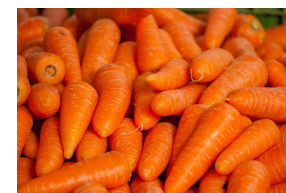
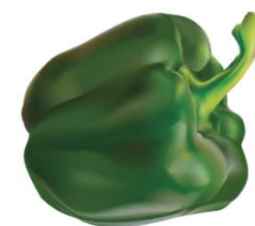


Vegetables – Part 1

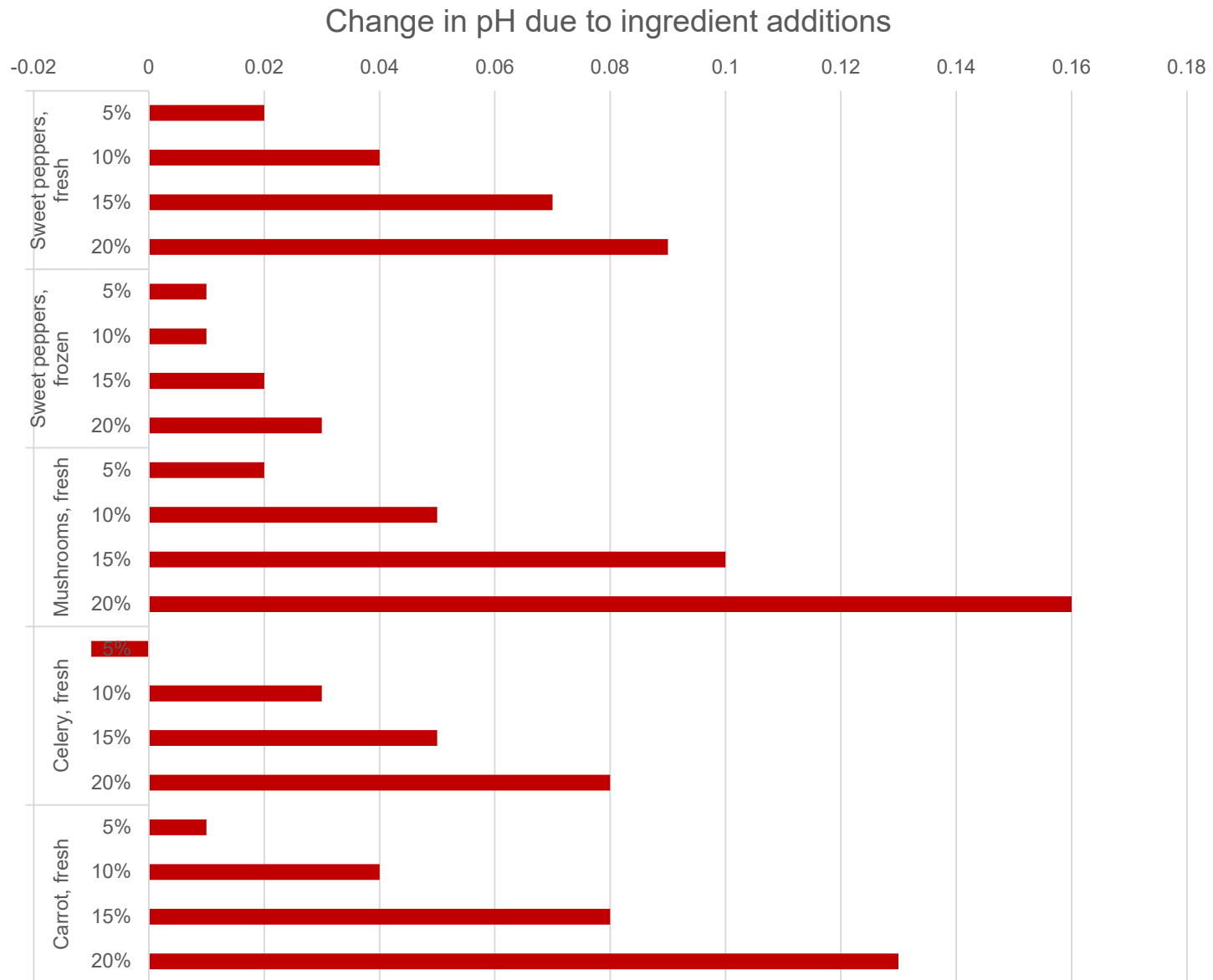


Vegetables – Part 2

Ingredient Added	Percent by weight	Impact on pH (SU)
Sweet peppers, fresh	5%	0.02
	10%	0.04
	15%	0.07
	20%	0.09
Sweet peppers, frozen	5%	0.01
	10%	0.01
	15%	0.02
	20%	0.03
Mushrooms, fresh	5%	0.02
	10%	0.05
	15%	0.10
	20%	0.16
Celery, fresh	5%	-0.01
	10%	0.03
	15%	0.05
	20%	0.08
Carrot, fresh	5%	0.01
	10%	0.04
	15%	0.08
	20%	0.13

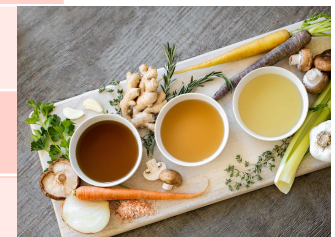


Vegetables – Part 2



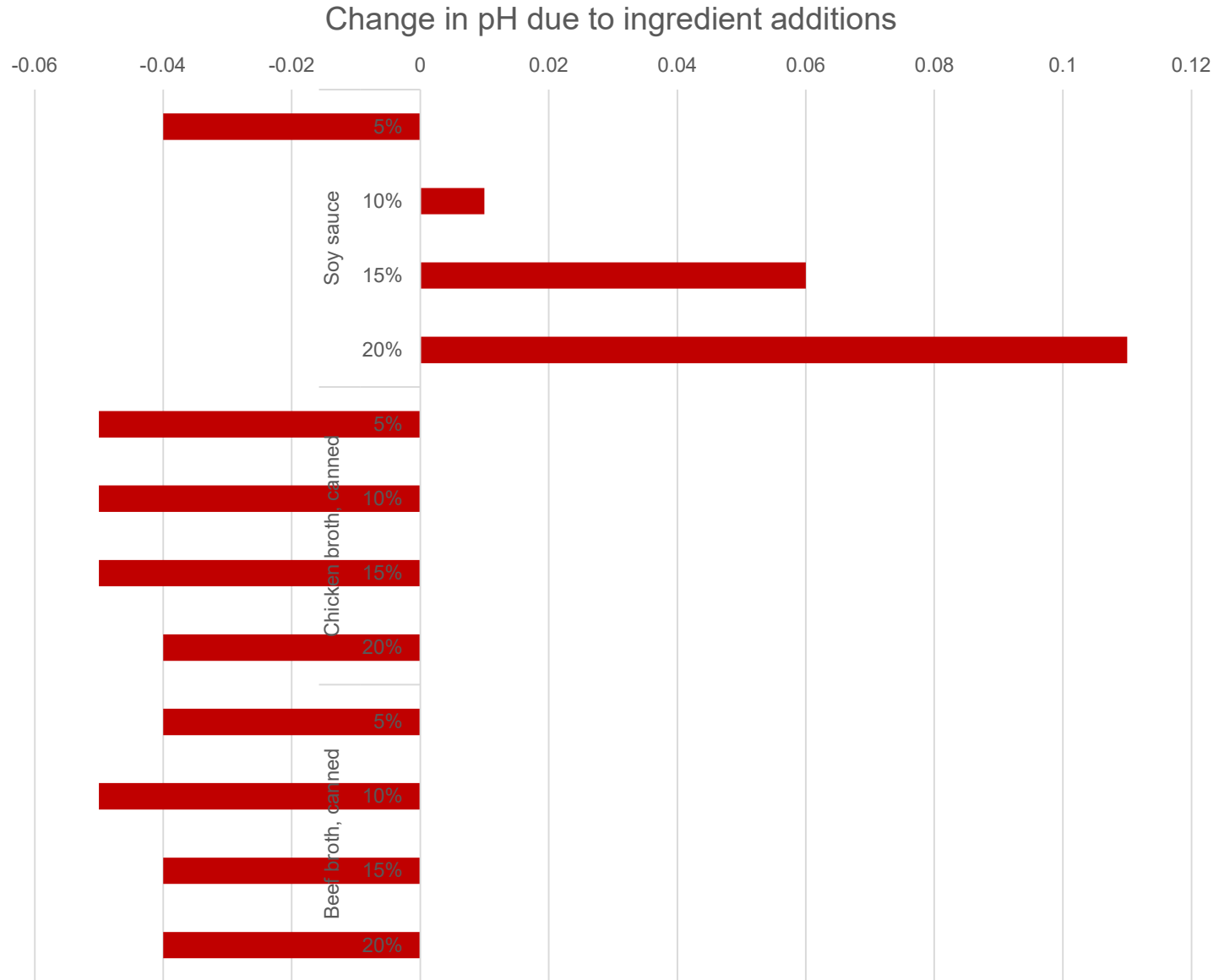
Liquid Ingredients

Ingredient Added	Percent by weight	Impact on pH (SU)
Soy sauce	5%	-0.04
	10%	0.01
	15%	0.06
	20%	0.11
Chicken broth, canned (contains salt, sugar, flavors, dehydrated vegetables)	5%	-0.05
	10%	-0.05
	15%	-0.05
	20%	-0.04
Beef broth, canned (contains salt, yeast, flavors)	5%	-0.04
	10%	-0.05
	15%	-0.04
	20%	-0.04



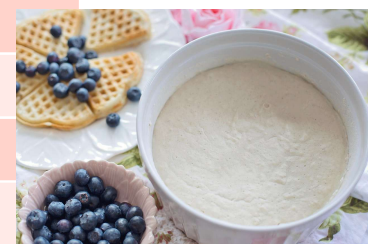


Liquid Ingredients



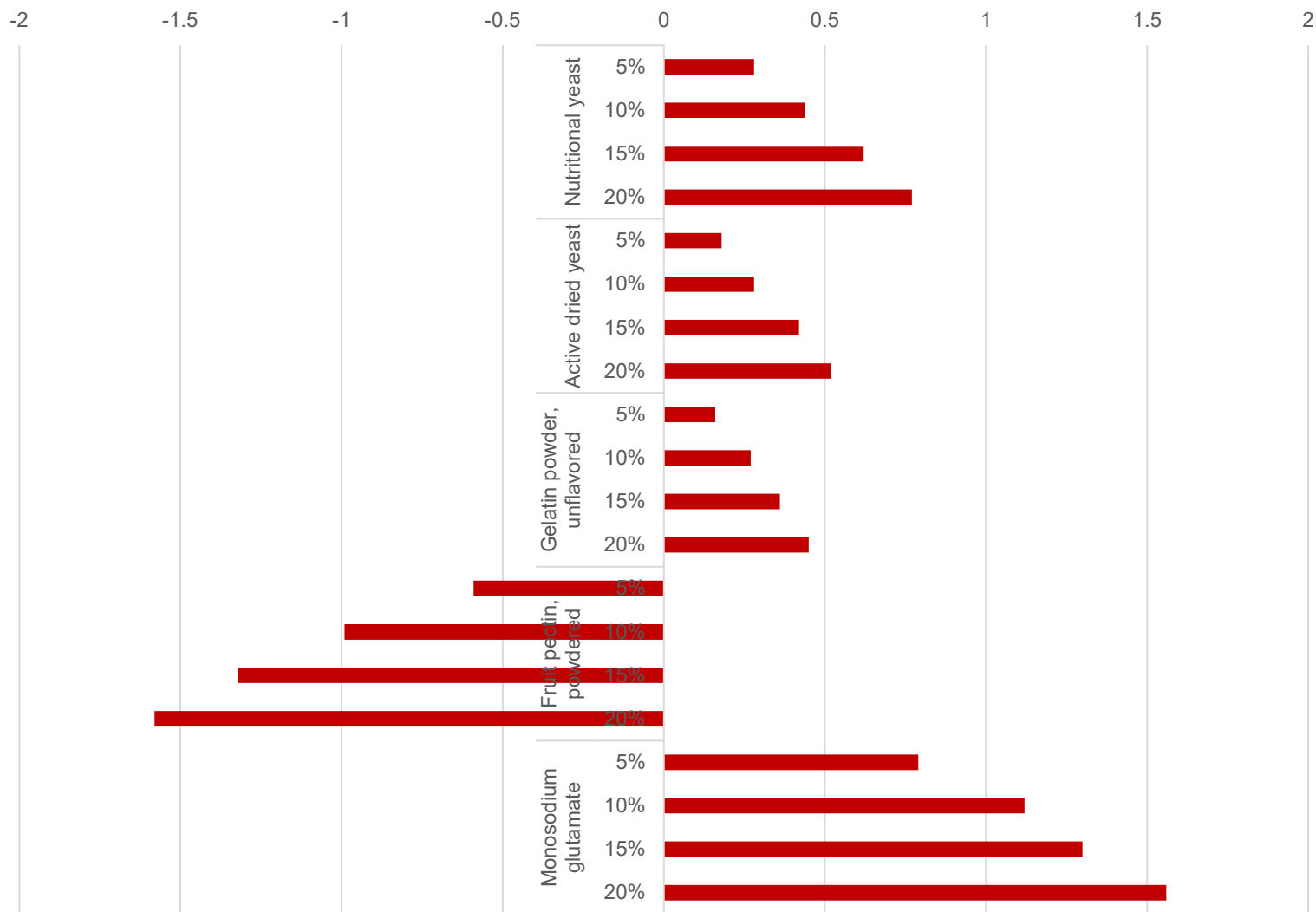
Dry Ingredients

Ingredient Added	Percent by weight	Impact on pH (SU)
Nutritional yeast	5%	0.28
	10%	0.44
	15%	0.62
	20%	0.77
Active dried yeast	5%	0.18
	10%	0.28
	15%	0.42
	20%	0.52
Gelatin powder, unflavored	5%	0.16
	10%	0.27
	15%	0.36
	20%	0.45
Fruit pectin, powdered	5%	-0.59
	10%	-0.99
	15%	-1.32
	20%	-1.58
Monosodium glutamate	5%	0.79
	10%	1.12
	15%	1.30
	20%	1.56



Dry Ingredients

Change in pH due to ingredient additions

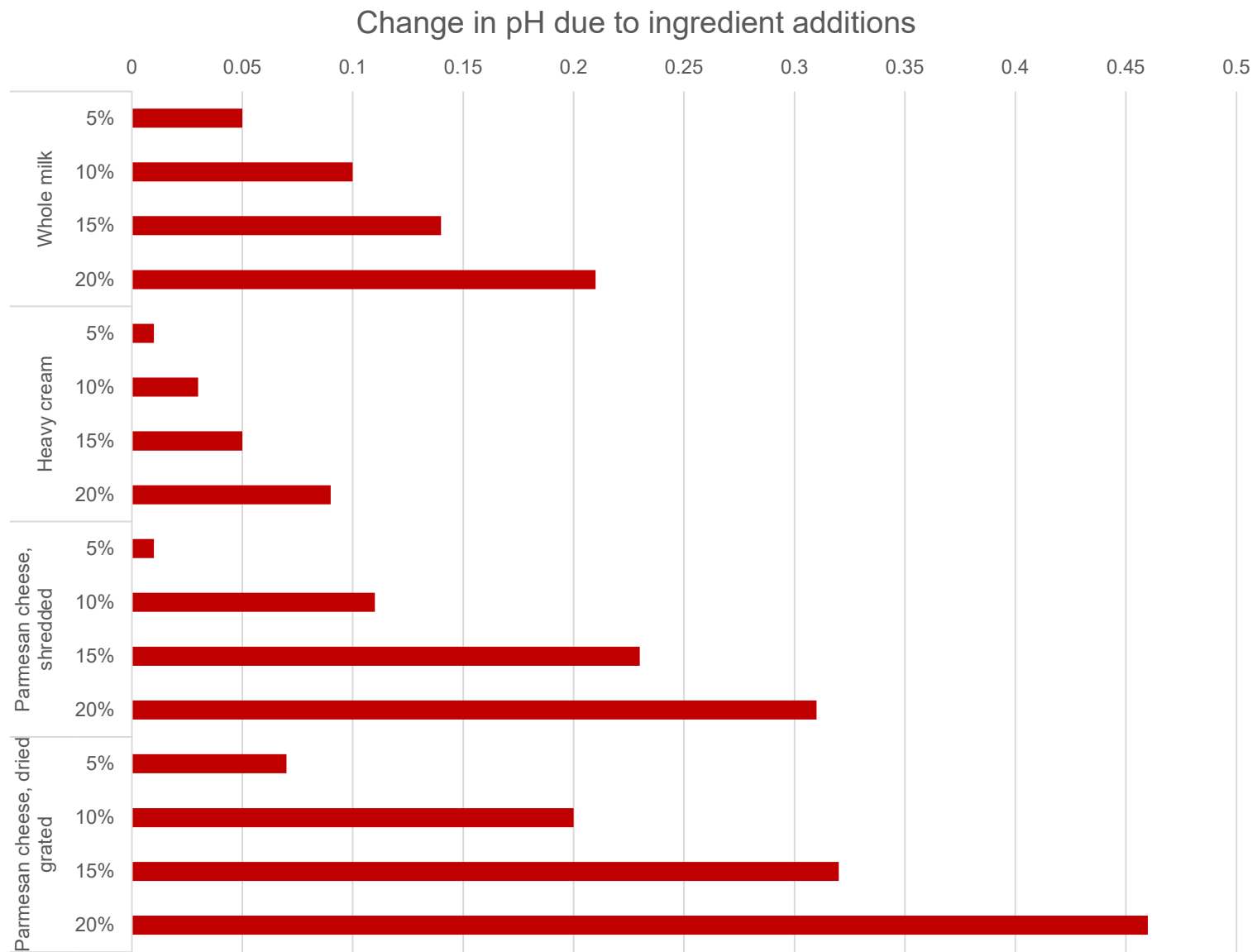


Dairy Ingredients

Ingredient Added	Percent by weight	Impact on pH (SU)
Whole milk	5%	0.05
	10%	0.10
	15%	0.14
	20%	0.21
Heavy cream	5%	0.01
	10%	0.03
	15%	0.05
	20%	0.09
Parmesan cheese, shredded	5%	0.01
	10%	0.11
	15%	0.23
	20%	0.31
Parmesan cheese, dried grated	5%	0.07
	10%	0.20
	15%	0.32
	20%	0.46



Dairy Ingredients



And all this matters, why?

- In my professional opinion, small to mid-size food producers, especially those that are home-based (under cottage law) are better off not having to file with the FDA as acidified food producers and take Better Process Control School (as it currently exists). If I can provide science-backed process guidance, including classifying their products as anything except acidified, I will certainly do so.



- Most importantly, it satisfies the nerd in me that keeps asking “what if” questions every time I am in the grocery store or see a formulation/ingredient I am unfamiliar with or unsure about.



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and Technology

Product assessment-related
questions: foodbiz@vt.edu

