

Effect of Leavening Acid Type and Amount on Whole Wheat Bakery Products

Sharon Book , Lirong (Jenny) Zhou, and Bob Brill
ICL Food Specialties, Saint Louis, MO, USA, 63119



Introduction

Muffins are a common chemically leavened baked good with healthy perceptions. The fiber and other components present in whole wheat flour (WWF) that are absent in all purpose flour (APF) affect the properties of bakery products. Leavening is known to be a functional system that affects final bakery product characteristics.

The objective of this study is to investigate how leavening affects properties in muffin made with APF and WWF.

In this study, three leavening acid systems: Calcium Acid Pyrophosphate (CAPP), Monocalcium Phosphate & Sodium Aluminum Phosphate blend (MCP-SALP) and Sodium Acid Pyrophosphate -28 (SAPP-28), were used at three levels and evaluated in muffins made with 100% APF, 50:50 APF and WWF blend, and 100% WWF.

Muffin Making & Evaluation

Muffin Formula

Ingredient	Bakers %
Flour*	100.00
Sugar, granulated	49.66
Salt	1.51
Soda	Chart on right
Leavening acid	Chart on right
Vegetable Oil	26.46
Egg (liq. pasteur.)	20.35
Milk, 2%	89.56

Baking Soda	CAPP	MCP-SALP	SAPP-28
Low -1.2	2.31	1.30	1.67
Medium - 1.9	3.65	2.07	2.64
High - 2.6	5.00	2.83	3.61

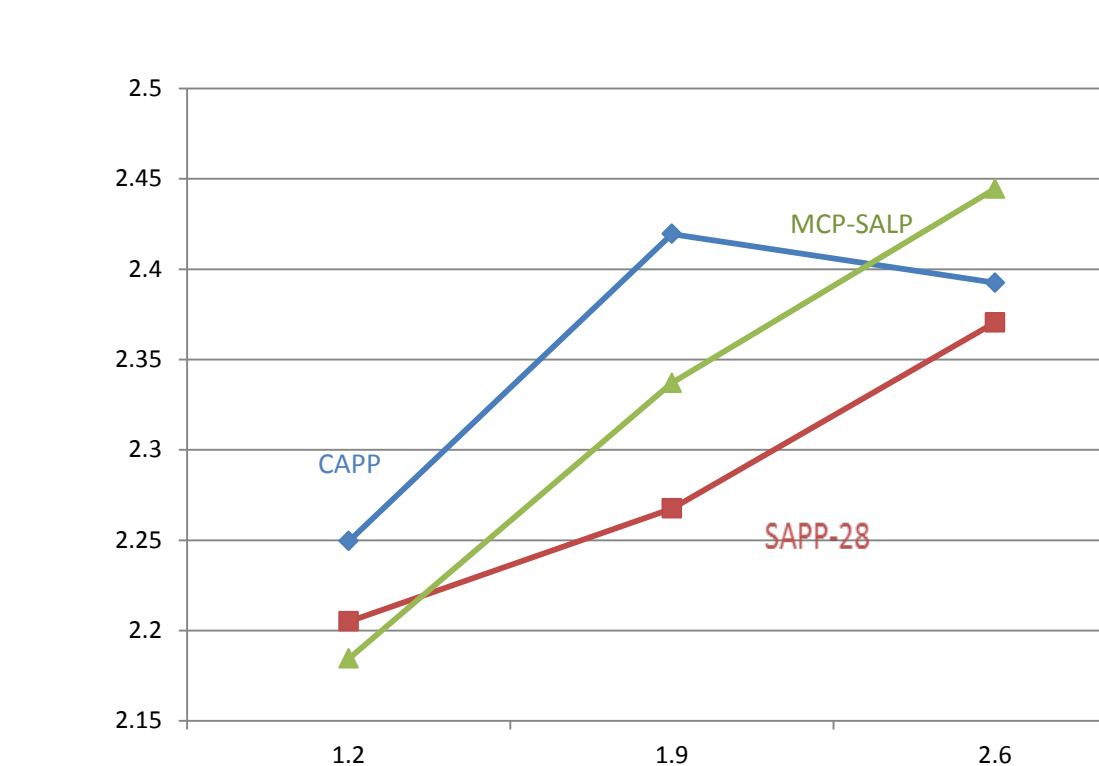
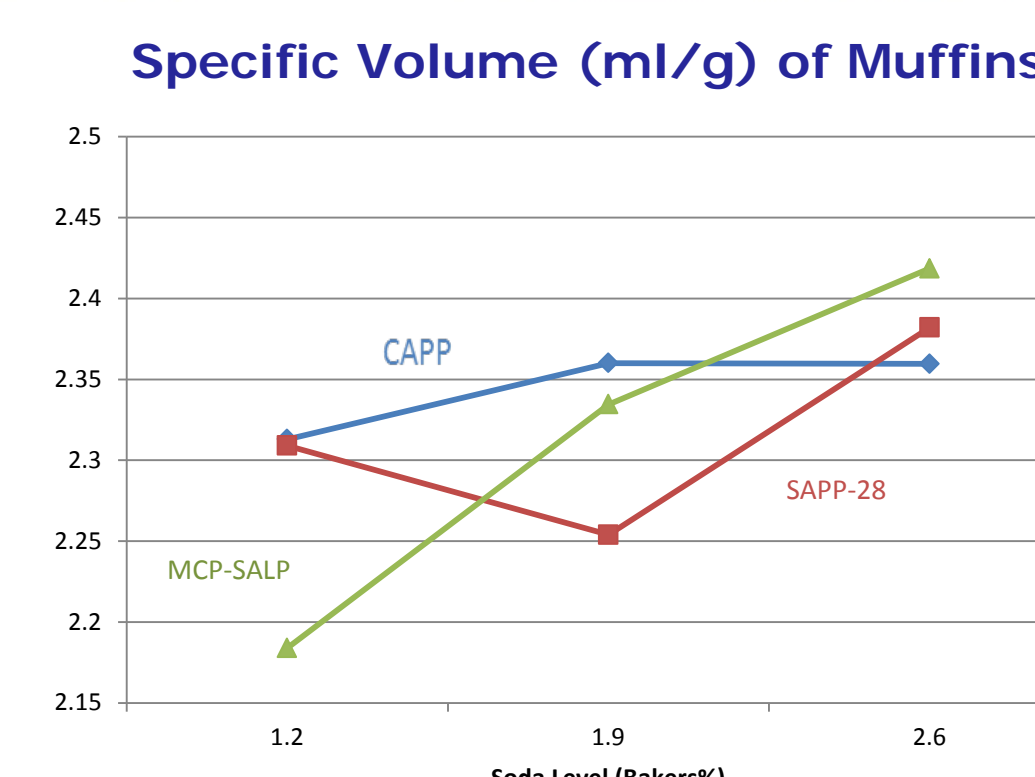
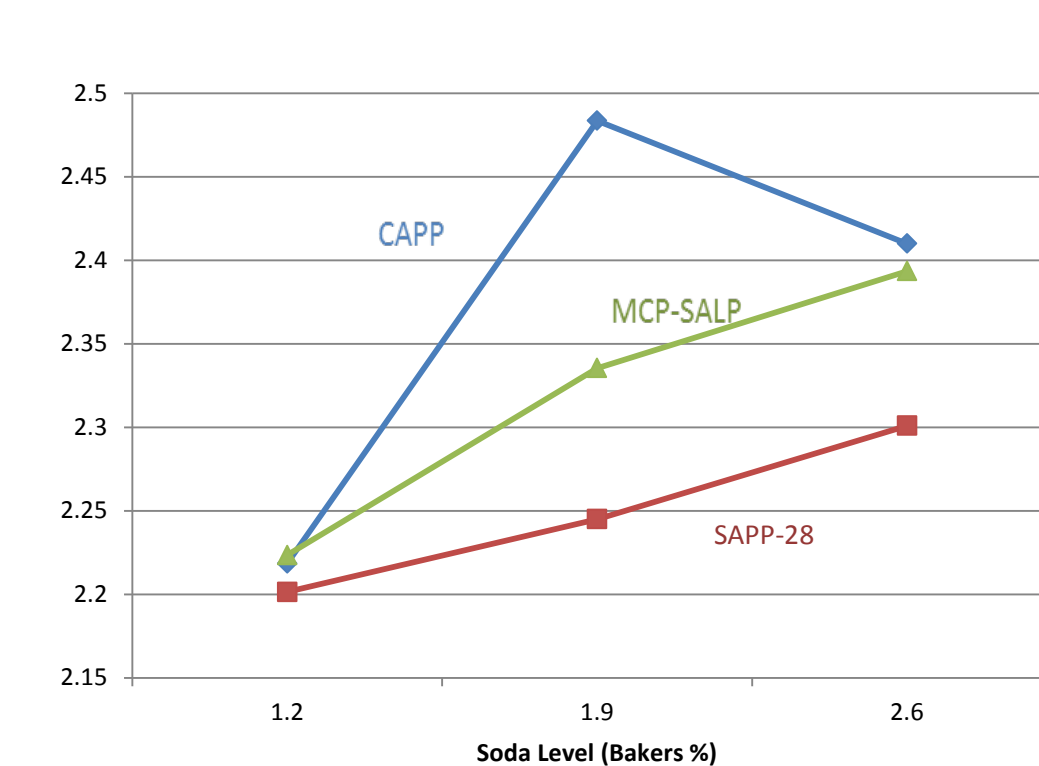
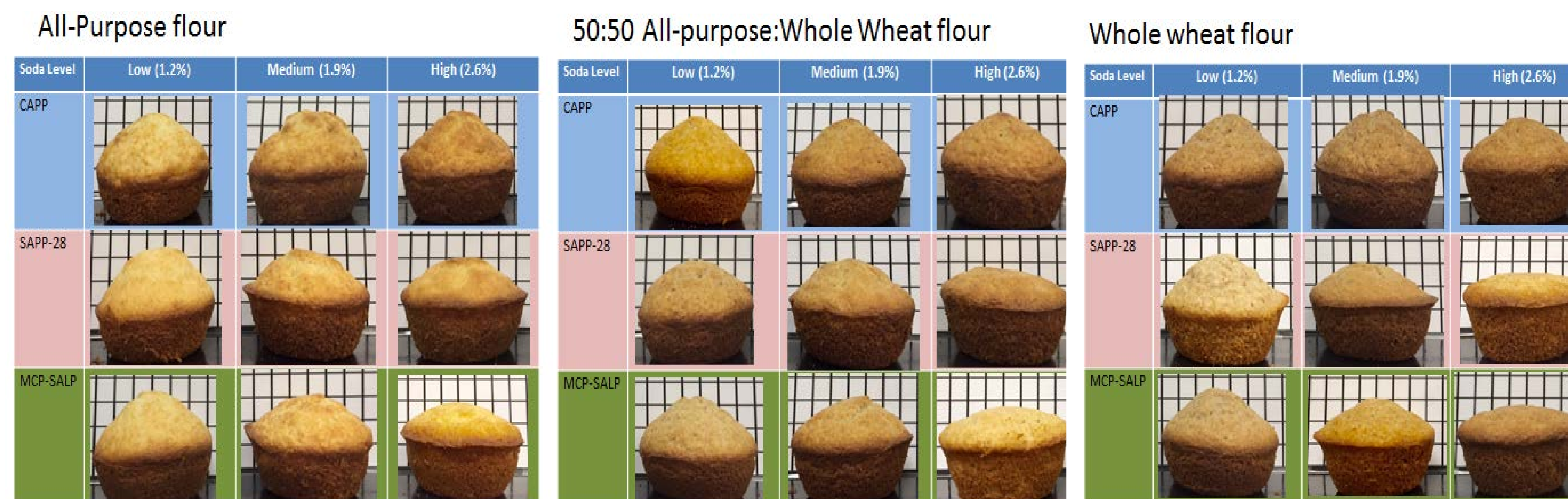
* All Purpose, 50:50 All Purpose:Whole Wheat, or Whole Wheat
(Courtesy of Seimer Milling)

Make-Up & Evaluation

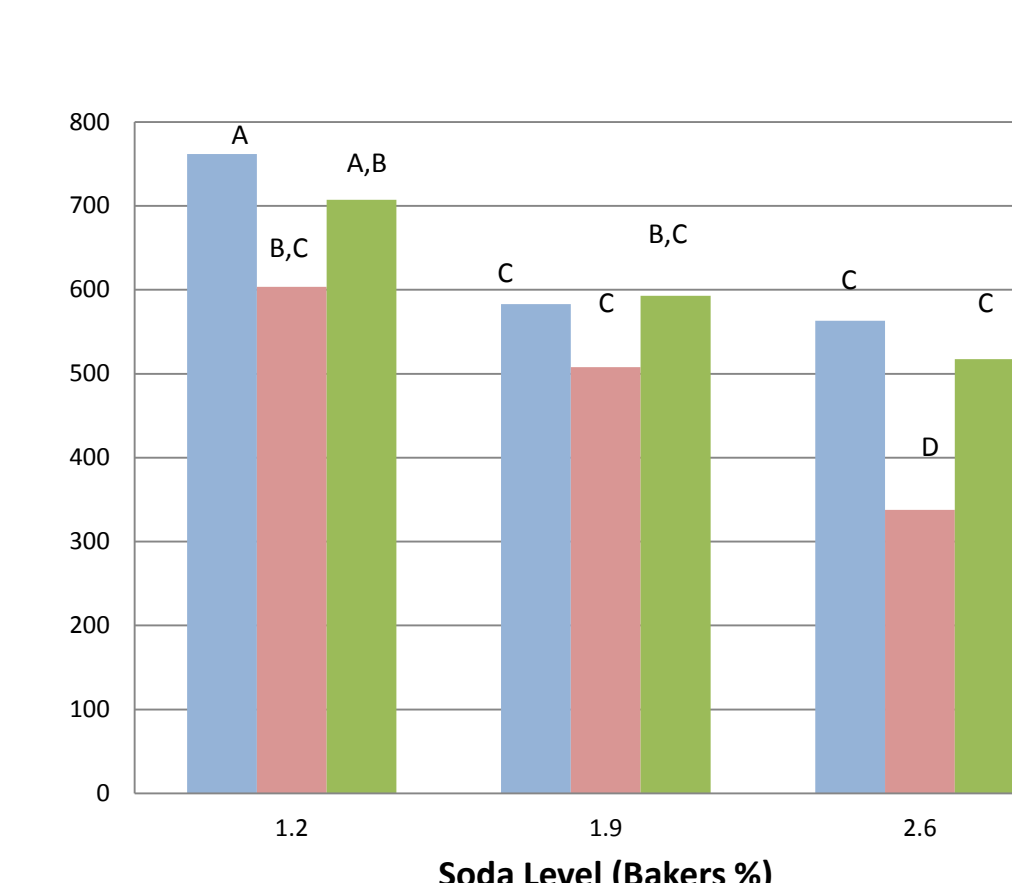
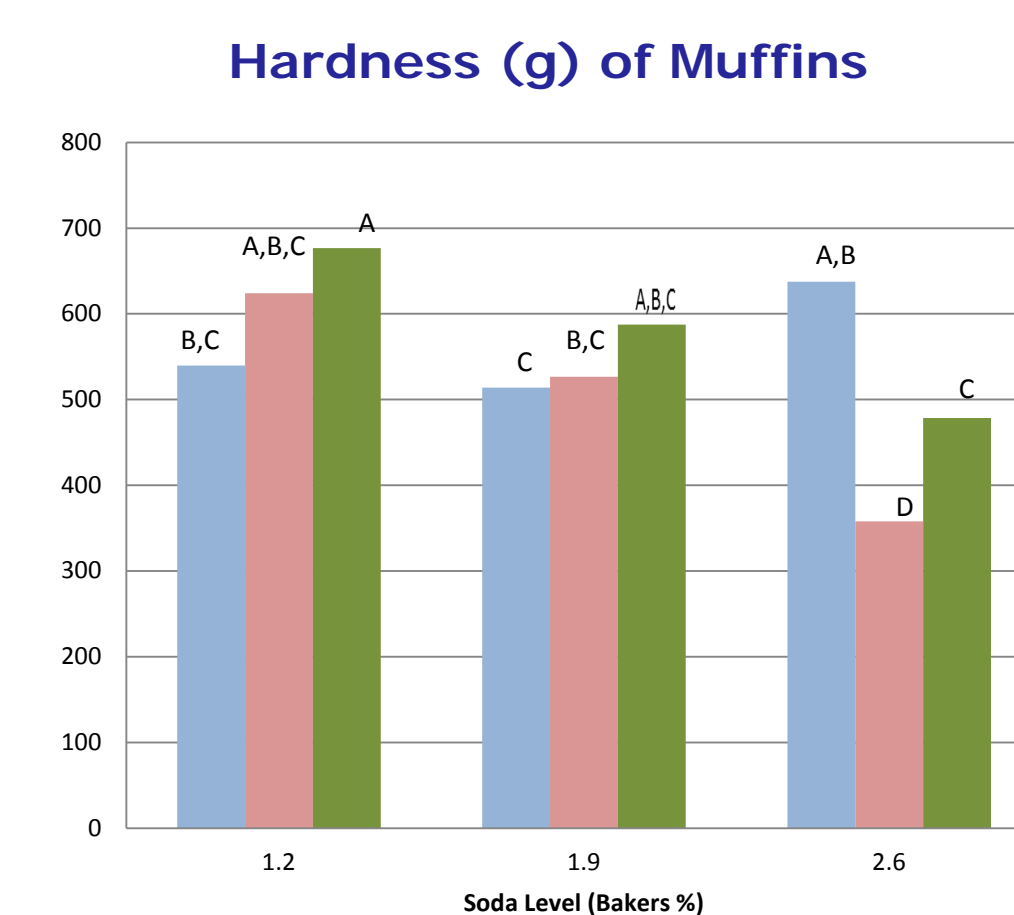
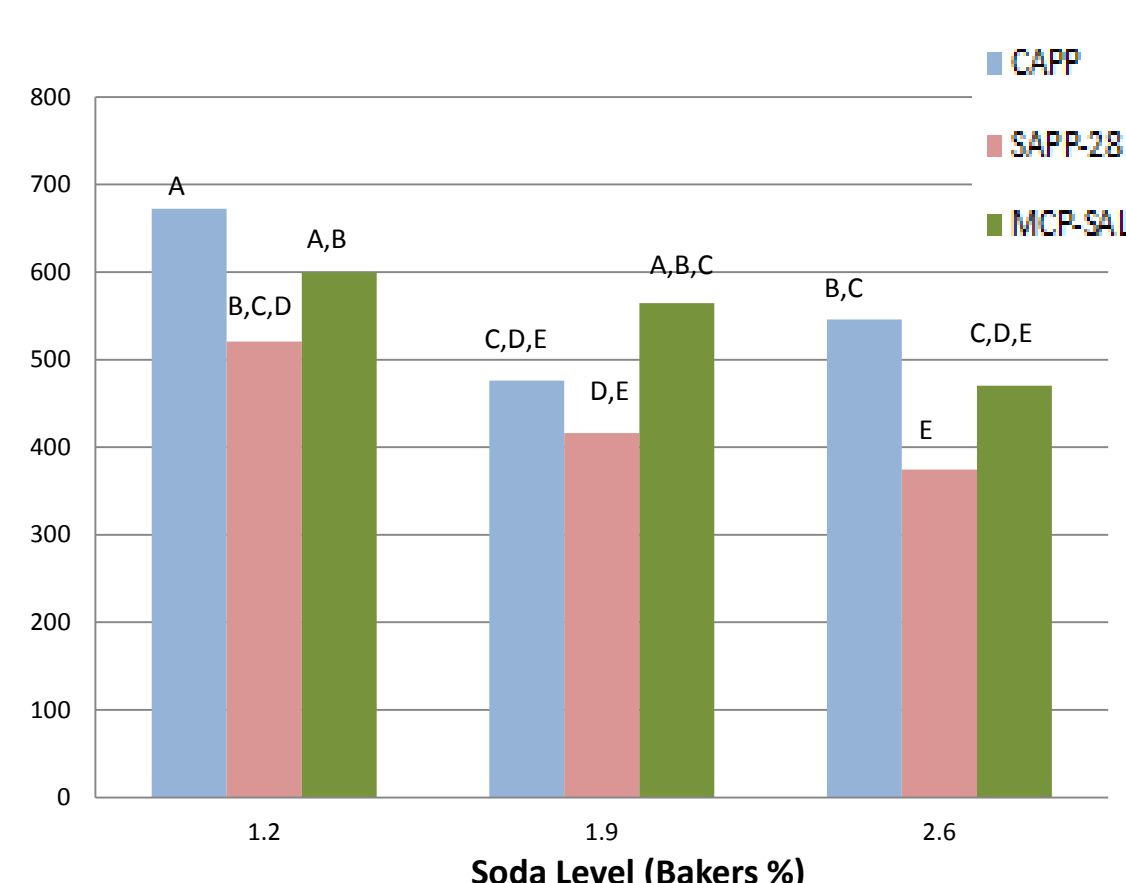
- Dry and wet ingredients were mixed separately, then combined 30 strokes.
- 50 g batter placed in greased muffin cups
- Baked for 18 minutes 400°F
- Cooled 10 minutes, removed from pans cooled 2 hours before analysis.

- Specific Volume with Volscan Profiler
- Texture Profile Analysis (TPA) with Texture Analyzer
 - Hardness, Springiness, Cohesiveness
- Color L*a*b values with Minolta Colorimeter

Results



* Difference between means is significant if greater than the critical difference of 0.12

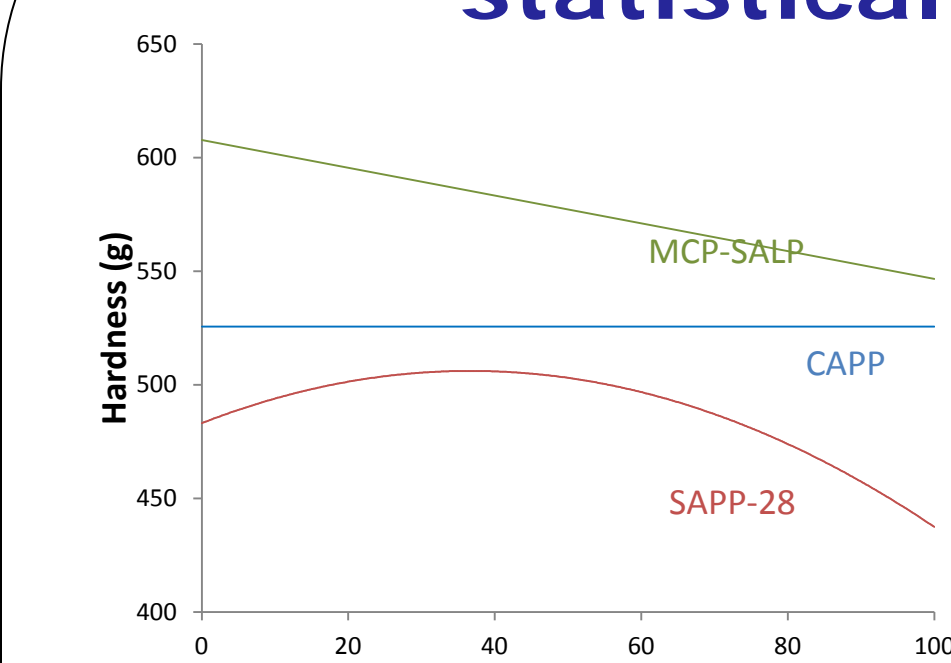


* For each graph, bars with the same letter are not significantly different

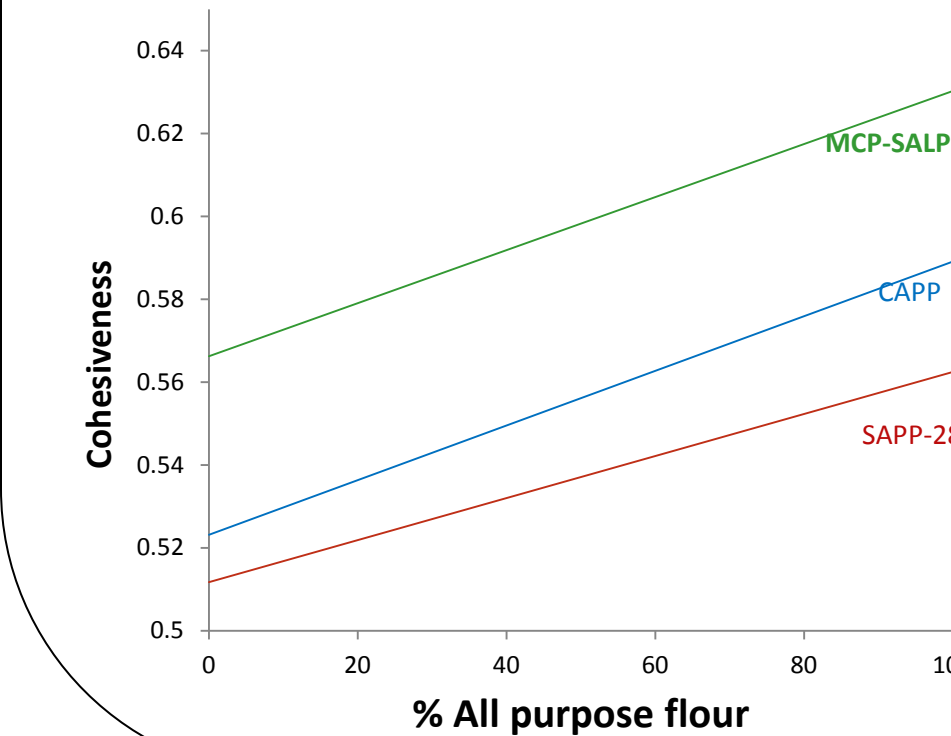
Flour	Color parameters			Texture Characteristics	
	L value	a value	b value	Cohesiveness s	Springiness s
All Purpose	68.4	-1.1	15.6	0.597	0.934
50:50	60.1	3.7	16.4	0.568	0.908
Whole Wheat	54.2	5.9	16.7	0.537	0.881
Critical difference*	2.8	0.59	0.97	0.037	0.032

* Difference between means is significant if greater than the critical difference

Texture – statistical models



Hardness was more affected by type of leavening acid than type of flour.



Whole wheat flour makes muffins more crumbly. Choice of leavening acid can minimize the effect

Conclusions

- Shape of muffin is influenced by type of leavening acid and amount of leavening system. CAPP gave more rounded tops. Increasing amounts of SAPP or MCP-SALP resulted in flat-top muffins.
- CAPP results in the largest muffin at the 1.9% level; at lower or higher amounts, acid does not affect volume.
- Type of leavening acid effect hardness of muffin depending on amount. More leavening is softer. SAPP-28 is softest
- WW flour can make this muffin formula harder depending on acid. WW flour does decrease springiness and cohesiveness (more crumbly). MCP-SALP improves cohesiveness.
- Color was impacted by flour – WW makes the muffin darker and more red.