

ALTERNATIVES TO YEAST?: EXAMINING EFFECTS OF LEAVENING AGENT ON DENSITY, TEXTURE, AND ACCEPTABILITY OF FRENCH-STYLE BREAD

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INTRODUCTION

This experiment explores potential substitutes for traditional bakers' yeast in French-style loaf bread. Might alternative leavening agents be sufficient to produce a leavened French-style bread in the standard home if yeast is unavailable? Baking powder & baking soda plus lemon juice served as variables compared to yeast. Comparison based on loaf density, texture, and sensory panel acceptability allowed a comprehensive analysis of substitutability for the leavening agents. A sensory panel of ten peer evaluators ranked the desirability, texture, flavor, and overall acceptability of examined variables. Volume and density readings of each variable helped determine the rising rate of the different leavening agents. The interchangeability of potential leavening agents may have implications on breadmaking in both household and commercial settings.

METHODS

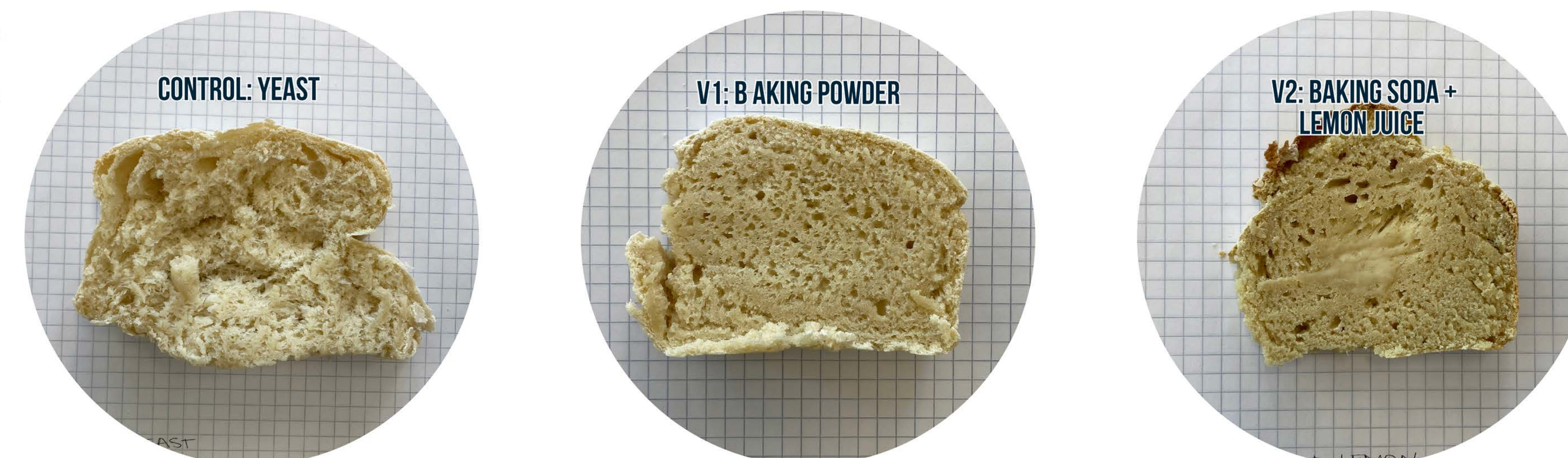
A basic French-style bread recipe was utilized. In total, six loaves were made, producing two yeast loaves (control), two baking powder loaves, and two baking soda+lemon juice loaves. Each variable trial was mixed, kneaded lightly, and left to rise for 15 minutes. After the first rise, the dough was separated into two loaves and left to rise for 15 additional minutes before baking. After baking for 25 minutes at 350 degrees Fahrenheit, the loaves sat to cool for 15 minutes on a cooling rack. Objective data collection occurred via a. Cellular structure evaluation of size and frequency using a 1x1 cm baseline graph. b. Seed displacement to determine volume. c. Mass of loaves and slices to determine density difference between variables. Following objective evaluation, sensory evaluation via a 10-part volunteer panel collected more nuanced data on satisfaction and acceptability of the alternative leavening agents. The sensory panel ranked samples of each variable on exterior color, interior texture, tenderness, and flavor acceptability.

RESULTS

The sensory evaluation panel revealed an average acceptability of 2.94, 2, and 1.8 for control, Variable one, and variable two respectively. The sensory panel additionally revealed average unacceptability with the exterior color of all three variables. The yeast control leavening agent resulted the least dense, followed by variable one and then variable two. The average cell size for the control loaf was the largest of the three variables, again followed by variables one and two. Visual appearance also revealed differences between the loaves. The control loaf stood much taller in height than the variable loaves. In color, variable two appeared much darker in tone, with a brown color.

LEAVENING AGENT	DENSITY	VOLUME	ACCEPTABILITY AVERAGE
YEAST BREAD	2.30 G/CC	210 CC	2.94/5
BAKING POWDER	3.12 G/CC	207 CC	2/5
BAKING SODA + LEMON JUICE	3.75 G/CC	184 CC	1.8/5

CELL SIZE



CONCLUSION

Results demonstrate that subjective acceptability was highest in the control loaves leavened by yeast. The control loaves had a much lower density than the other variables, indicating more effective leavening. The volume of the loaves leavened by baking powder proved to be quite similar to that of the control. The baking soda plus lemon juice leavened loaves' ranked smallest in volume and the densest of the three variables. The cell size of the three variables indicated the highest frequency of large air cells in the yeast-leavened loaf, aligning with density results. Our results indicate a generally low acceptability of alternative leavening agents. The alternative leavening agents resulted in more dense loaves with smaller air cells, which subjective tests revealed as undesirable. Further experimentation with baking powder & baking soda plus lemon juice, as well as other potential alternative leavening agents, may reveal other desirable applications for yeast replacements.

