



NOODLE APPLICATION RESEARCH

COMPARING THE FUNCTIONALITY OF EGGS TO EGG REPLACERS IN NOODLE FORMULATIONS

NOODLE RESEARCH EXECUTIVE SUMMARY

For this study, egg whites were reduced and/or removed from noodle formulas intended for retort processing in a broth soup application and substituted with commercial egg replacer products at the manufacturers' suggested rates. All the noodle samples were evaluated quantitatively and qualitatively following industry-standard protocols. Overall, not a single product performed as well as or better than real eggs in all attributes assessed, although many of the differences were slight.

The tests confirm some egg replacers may result in acceptable noodle products, while others may be substantially different from Control formulas and may be unappealing to consumers. Manufacturers must test egg replacing ingredients and spend time optimizing formulas for acceptable results.



OBJECTIVE

The purpose of the study was to provide food manufacturers research-based formulation and application information on the use of egg replacers in noodles. Due to the known multi-functionalities of real egg whites in some types of prepared noodles, especially those used in highly processed retort or canned soups and meals, it was hypothesized that no single ingredient would be able to replace the functions provided by egg whites in noodles without affecting product quality. A retort-processed noodle soup was selected for study, consisting of egg-white-fortified noodles in chicken broth.

EGG REPLACING INGREDIENTS

After researching egg replacers, seven egg replacer ingredient companies were selected, based on dollars spent on marketing and advertising in industry publications. A variety of egg replacing ingredients was selected based on their recommended use to reduce or replace eggs whites in noodles. Ingredient specifications, nutritionals, starting formulations and recommended usage rates were collected from the manufacturers and used to create test formulas. Egg replacers not recommended for this application were excluded from testing.

The recommended egg white replacement level varied from 50 to 100 percent. Four of the seven companies selected, recommended removing 100 percent of the egg whites from noodle formulations.

Almost all companies recommended keeping the ratio of moisture to dry ingredients the same. Since the Control gold standard formula was formulated with liquid egg white, but many of the egg replacers recommended a replacement ratio of one-to-one

with dried egg whites, a calculation was needed to determine the appropriate amount of egg replacing ingredients to liquid egg whites. All egg replacers were recommended to be dry blended with the flour before mixing into the dough.

FORMULAS

Control/Gold Standard Formulas

The Control noodle formula consisted of semolina flour, water and egg whites.

Negative Control

A test was conducted with the absence of egg whites or egg replacers to demonstrate the need for the functionality of these ingredients.

Test Formulas

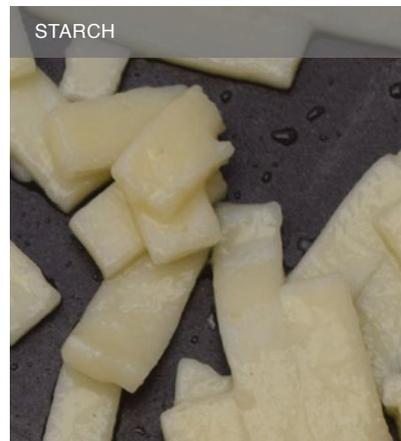
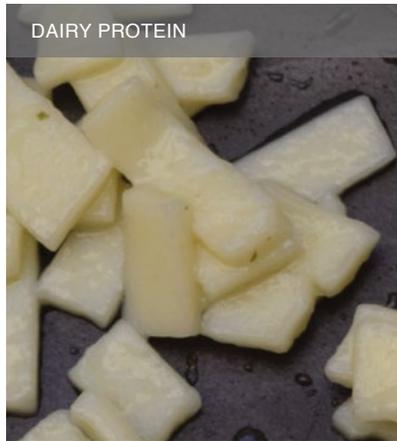
Seven egg replacer ingredients were tested in noodle formulas. Those tested included:

- Legume Protein
- Dairy Protein
- Wheat Protein
- Blends of various ingredients, including starches, proteins, fibers and flours
- Starch

Noodle test formulas were based on the ingredient manufacturer's recommended percent in application and percentage of egg white replacement, which varied widely among products. Formulas were created using the Control gold standard formula, with the addition of egg replacer ingredients and any recommended water adjustments.



NOODLE VISUAL COMPARISON



TESTS

Samples were prepared at the CuliNex Test Kitchen in Seattle, Wash., and were retort processed at the Washington State University School of Food Science Pilot Plant in Pullman, Wash. Samples were all prepared in the same conditions, using the same equipment on the same day. Consistent batching, portioning and processing procedures were used to limit variables. Heat processing was done by mixing reconstituted chicken broth and uncooked dried noodles in retort pouches, then processing in a retort machine. Retort processing was done in three batches and each test saw the same processing conditions

The noodle samples were analyzed using industry standard, category-specific tests. Testing was performed at the CuliNex Test Kitchen and at Medallion Labs in Minneapolis, Minn.

Analytical Tests

Thickness
Percent pickup
Texture

Subjective/Sensory Tests

Dough quality
Broth appearance
Noodle appearance
Aroma
Texture – firmness
Texture – cohesiveness
Flavor
Overall acceptability

RESULTS & DISCUSSION

DOUGH QUALITY

Dough Quality

Among the sample doughs, sheeting results varied from ‘as expected’ to ‘dry and difficult.’ These results indicate some egg replacers may change dough quality, and may require water adjustments and/or additional formulation adjustments to sheet properly in production.

Thickness

There were no significant differences between the thickness of the Control and any egg replacer Test noodles. This suggests neither eggs nor egg replacers play a critical role in the water absorption of cooked noodles.

Broth Appearance

Panelists’ comments imply that some egg replacer formulations may affect the broth appearance of the end-product in noodle soup applications, but those differences may not be perceptible to all consumers.

Noodle Appearance

Commentary provided by panelists implies that egg replacer formulation may influence the perception of noodle appearance.

Percent Pickup/Absorption

There were no significant differences between the Control formula and any Test in percent pickup. These results suggest egg whites do not play a critical role in the amount of moisture pickup of noodles (as also shown in noodle thickness tests).



Aroma

Comments regarding noodle soup aroma varied among panelists, but overall many of the Tests were similar in aroma to Control. These results suggest noodle aroma may be impacted by egg white reduction and/or replacement in noodles and varies greatly, depending on the source material of the egg replacer.

Texture

There was some disagreement between texture analysis results and the commentary provided by sensory panelists. Ultimately, there were no samples statistically different from Control in sensory evaluation, but panelists did note some nuanced differences not reflected in texture analysis nor in statistical analysis of sensory ratings. These results suggest egg replacers may play an integral role in the final eating texture of cooked noodles and may be more impactful than solely removing eggs, however these differences may not be perceived by all consumers.

Flavor

It can be concluded that noodles made with reduced egg content and/or egg replacers may result in reduced flavor intensity and/or off flavors, however not all consumers may be able to pick up on these differences.

Overall Acceptability

With all attributes considered, panelists found most of the Tests to be acceptable replacements for Control. However there were some noticeable differences from the established targets set for Control. These results suggest variations in noodles with reduced egg content may be slight, but they are noticeable.

CONCLUSIONS

The use of ingredients to reduce or replace eggs in noodles can be a challenging exercise for pasta manufacturers. The sensory evaluation results on the organoleptic attributes of the noodles made with real egg whites and egg replacers were not always consistent with the analytical test results. The areas of noodle quality most negatively affected when egg whites were removed and/or replaced, included dough quality, broth and noodle appearance, aroma, flavor, and to some degree, texture. Attributes less influenced by egg reduction, included noodle thickness and percent pickup.

Tasters preferred the Control to the Test formulas in almost all attributes assessed. The noodle formula made without eggs, Negative Control, performed moderately well, & while panelists did notice more broken noodles and slight differences in broth appearance, it was generally rated as an acceptable substitute for Control.



Egg replacer performance varied in both analytical tests and sensory evaluation results.

Unfortunately, few generalizations about egg replacers can be made, because they vary vastly from supplier to supplier, but these tests showed that using egg replacers to reduce egg whites in noodle formulations intended for retort applications may result in considerable differences in appearance, aroma, flavor and texture. Even though ingredient manufacturers may have usage rate recommendations and even starting formulations, many do not know how their product performs in a variety of applications. Their recommendations for incorporating egg replacers into formulas can be vague and hard to follow, making product optimization with egg replacers a time-consuming exercise.

Formulators must determine the best ingredients for noodles through hands-on testing on the bench and in the plant to achieve the desired results, balancing cost with functionality and flavor. Ultimately, that may mean using real eggs in noodle formulations.

COMPLETE RESEARCH REPORT & FINDINGS

For a copy of the complete 52-page research report with further study background and detailed findings, please contact Elisa Maloberti at info@RealEggs.org or call **847.296.7043**.





For additional application research summaries, go to RealEggs.org/Research



Research Conducted by **CuliNex**

Supported by **incredible!**
American Egg Board

RealEggs.org

©2017 REAL EGGS. All Rights Reserved.