

Wild Rice/Ground Beef Mixtures

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INTRODUCTION

Many consumers are interested in, and indeed purchase, unique food products. Most, if not all, consumers are interested in nutritious food products.

Wild rice is a unique Minnesota food considered by many to be an "upscale" product. Wild rice grain has the following approximate composition: water, 8.5%; protein, 14.1%; fat, 0.7%; carbohydrate, 75.3% and ash, 1.4%.

Ground beef is a popular food throughout the U.S. Ground beef contains high quality protein (essential amino acid balance), heme iron and B vitamins. However, raw ground beef, lean ground beef and extra lean ground beef may contain up to 30, 22 and 15% fat, respectively. Consequently, ground beef is frequently criticized because of the high percentage of its calories being derived from fat, as well as its lack of carbohydrates.

A study was therefore undertaken to evaluate wild rice/ground beef mixtures. A goal was to identify a palatable combination that also possessed nutritional advantages over 100 percent ground beef. The study was supported by grants from the Minnesota Beef Council and the Minnesota Wild Rice Council.

DESIGN

The study evaluated three levels of fat (low, intermediate and high) in ground beef, each mixed with three levels of hydrated, cooked wild rice, resulting in mixtures containing 0, 15 and 30% wild rice.

Grade A Minnesota wild rice was hydrated (cooked) in boiling water to 300%, i.e., one pound of dry wild rice yielded

three pounds of cooked wild rice. The cooked wild rice was chilled below 50°F before mixing with the ground beef. Commercially available beef trim with 10 or 50% fat was ground through a 3/16-inch plate, blended to the three fat levels and ground again through a 5/32-inch plate. The ground beef was mixed with the appropriate amount of wild rice. Salt, at 0.2%, was added during mixing. Patties, weighing approximately 4 ounces, were formed on a Holly 500 Patty Machine, blast frozen at -33°F for ten minutes and stored at 0°F.

RESULTS

Chemical analysis was conducted on the raw patties after 48 days of frozen storage. The results are shown in table 1.

Analysis of uncooked ground beef/wild rice mixtures indicated proportional decreases in % protein, fat and ash and increases in % carbohydrate as the level of added wild rice increased. No significant effects on pH were observed between treatments. TBA values were disproportionately lower as the level of wild rice increased, suggesting possible antioxidant effects. The decrease in TBARS values was greater than could be accounted for by merely diluting ground beef with wild rice.

Patties were defrosted after frozen storage, fried in an electric skillet at 325°F to an internal temperature of 158-167°F, and served to 106 untrained panelists for sensory evaluation. Panelists rated each of the nine combinations for overall desirability on a visual analogue scale ranging from "Dislike Extremely" to "Like Extremely," and later referenced to a scale of 1 to 9, respectively. The average values of the 106 scores for each mixture are listed in table 2.

Table 1. Chemical analysis of uncooked ground beef/wild rice mixtures.

Level of lean/ wild rice	Percent						pH	TBARS.ppm ^b
	Protein	Moisture	Fat	Ash	Carbohydrate ^a			
Low fat								
0% wild rice	19.9	69.0	9.9	1.1	0.1	5.94	1.66	
15% wild rice	17.8	69.4	8.8	1.0	3.0	5.93	0.61	
30% wild rice	15.2	69.3	7.3	0.9	7.3	5.94	0.36	
Intermediate fat								
0% wild rice	17.4	59.8	21.8	1.0	0	6.00	0.52	
15% wild rice	15.5	61.0	18.6	0.9	4.0	5.99	0.30	
30% wild rice	13.7	62.9	15.5	0.8	7.1	5.97	0.27	
High fat								
0% wild rice	16.6	56.5	26.0	0.9	0	5.91	1.27	
15% wild rice	15.7	59.0	21.8	0.9	2.6	5.89	0.42	
30% wild rice	12.8	60.8	18.2	0.8	7.4	5.95	0.29	

^aCarbohydrate determined by calculation.

^bTBARS is a test for oxidative rancidity. Higher number corresponds to a greater degree of rancidity, with detectable rancidity usually occurring at values of 1.00 and higher.

Table 2. Consumer panel scores of cooked ground beef/wild rice mixtures.

Fat Level in Ground Beef	% Added Wild Rice		
	0%	15%	30%
Low	4.94	5.44	5.67
Intermediate	5.37	5.79	5.63
High	5.10	5.53	5.57

The addition of 15 or 30% Minnesota wild rice to ground beef was preferred ($P < .02$) by taste panelists over patties without wild rice. As shown in table 2, addition of 15 or 30% wild rice resulted in a large increase in preference at all three fat levels. There was no significant difference in panel scores between the samples containing 15 and 30% wild rice. Wild rice was effective in improving scores at all three fat levels.

Chemical analysis was also conducted on the cooked patties after 48 days of unprotected frozen storage. The results are presented in table 3.

Cooked, Minnesota wild rice/ground beef mixtures resulted in proportional decreases in percent protein, fat, and ash, and mg cholesterol/100g meat mixtures and an increase in percent carbohydrate as the level of wild rice increased (table 3). Moisture and pH tended to increase slightly with the addition of wild rice.

Additional studies were conducted using low and high fat ground beef produced from one cow carcass. Each fat level was combined with 0, 15 and 30% wild rice, resulting in six different mixtures. Approximately two pounds of each mixture was placed in trays, overwrapped with polyvinyl chloride (PVC) film and stored at 41°F to simulate refrigerated retail storage. Samples were removed at 0, 3 and 6 days for microbial analysis. No significant difference in microbial growth rates was observed between 100% ground beef and 30% wild rice ground beef samples over the 6-day period in either low-fat or high-fat ground beef mixtures. Low-fat ground beef had significantly higher growth rates on day 3 and day 6 of the study. However, high-fat ground beef had significantly lower growth rates on day 0 and day 3 than the 100% ground beef and 30% extended ground beef in each mixture based on fat content. Thus, no conclusion can be reached regarding the effects of wild rice levels on bacteria numbers during refrigerated storage.

Low- and high-fat ground beef, obtained from the same process as described above, each with 10, 15 and 30% wild rice, were placed in linear, low density, polyethylene meat bags, sealed and placed in frozen storage at -10°F. At 1, 2 and 3 months, samples were removed and the TBARS test for rancidity was performed. The various fat level/wild rice level combinations had varying TBARS value patterns as storage time increased. However, at the end of 3 months, regardless of fat level, TBARS values were indirectly proportional to rice level. Thus, addition of wild rice resulted in a less rancid product after 3 months of frozen storage.

CONCLUSIONS

When compared to 100% ground beef, wild rice/ground beef mixtures:

1. Contain less fat, protein and cholesterol.
2. Score higher in taste panel evaluations.
3. Become less rancid during frozen storage, especially when unprotected by packaging.

MANUFACTURING PROCEDURE

1. Place 4 quarts of water in a metal container and bring to boil.
2. Add one pound of Grade A wild rice. Continue boiling for 55 minutes.
3. Drain excess liquid from container.
4. Chill the approximately 3 pounds of cooked wild rice to at least 50°F, preferably 40°F, by rinsing with cool water and/or spreading in a shallow pan in a cooler.
5. Place 12 pounds of 20% fat fresh ground beef in mixer. (Note: processors may have customers who prefer the mixture containing 10% fat ground beef or 30% fat ground beef.)
6. With mixer on, add the 3 pounds of cooked, hydrated, chilled wild rice. (Note: this gives a wild rice percentage in the final mixture of 20%. When pan fried, mixtures containing 30% wild rice tended to break apart.)
7. Add 0.5 ounces of salt (0.2% of 15 lbs.)
8. Mix for approximately 2 minutes or until wild rice is uniformly distributed throughout the mixture.
9. Sell, in the following unfrozen forms:
 - bulk
 - trayed with PVC overwrap
 - patties
10. If the mixture has been displayed two days, remove from case, package in chub form and blast freeze for sale in the frozen case.

Table 3. Chemical analysis of cooked ground beef/wild rice mixtures.

Level of lean/ wild rice	Percent						Cholesterol mg/100g ^b
	Protein	Moisture	Fat	Ash	Carbohydrate ^a	pH	
Low fat							
0% wild rice	26.4	60.4	12.3	1.3	0	6.14	74.5
15% wild rice	21.3	63.4	9.9	1.2	4.2	6.16	64.0
30% wild rice	18.9	64.0	8.3	1.1	7.7	6.20	54.5
Intermediate fat							
0% wild rice	23.9	56.1	18.9	1.2	0	6.35	79.5
15% wild rice	19.4	57.8	18.3	1.1	3.4	6.34	68.5
30% wild rice	15.7	58.7	16.1	0.9	8.6	6.33	56.5
High fat							
0% wild rice	25.0	54.6	19.6	1.3	0	6.19	82.0
15% wild rice	21.0	54.3	19.0	1.1	4.6	6.21	73.0
30% wild rice	17.4	56.2	17.2	1.0	8.2	6.24	62.0

^aCarbohydrate determined by calculation.

^bMilligrams of cholesterol per 100 grams (3½ ounces) of patty.



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