



**Canned Food.**  
*The Easy Way to Eat Right.*

The Canned Food Alliance Presents  
Findings from the University of Massachusetts Nutrition  
Study Phase I., Phase II. and Phase III.

**Summary**

The Canned Food Alliance (CFA) commissioned the University of Massachusetts (UMass) to conduct a study to compare the nutritional value and sensory appeal of recipes prepared with canned, fresh and/or frozen ingredients. The study was conducted in three phases and tested 40 recipes that were selected from well-known cookbooks such as *The Joy of Cooking*, *The Betty Crocker Cookbook* and online recipe sources.

**For More Information**

If you have questions or would like a more detailed report of any phase of the three-phase study, contact Michelle Ford at 412/456-3596 or [michelle.ford@ketchum.com](mailto:michelle.ford@ketchum.com).

## **University of Massachusetts Nutrition Study Confirms: Recipes Made with Canned Ingredients Deliver on Health, Taste and Convenience**

### **Study Overview:**

Results from a new nutrition study conducted by the University of Massachusetts (UMass) found that recipes using canned ingredients are similar in nutritional value and sensory perception to those made with fresh and frozen ingredients. This is the first phase of a three-part nutrition study that tested 13 “family- friendly” recipes that appeal to both parents and children and were selected from well-known cookbooks such as *The Joy of Cooking* and *The Betty Crocker Cookbook*, as well as from online recipe sources.

The research analyzed nutritional content of entire recipes, comparing such nutrients as protein, carbohydrates, vitamins and minerals. The researchers also conducted sensory analysis evaluating color, appearance, flavor, aroma, texture and aftertaste of dishes prepared with canned, fresh and/or frozen ingredients.

This is the third and most complex nutrition study commissioned by the Canned Food Alliance (CFA) that extends upon research conducted by the University of Illinois. In 1995, the University of Illinois study compared the nutritional values of canned, frozen and fresh fruits and vegetables. They expanded the research in 1997 by broadening the food categories and extending the nutrition study to compare additional nutrients.

### **Study Methodology:**

The objective of the UMass study, conducted on behalf of the CFA, was to compare both the nutritional value and the sensory appeal of 40 recipes prepared with canned, fresh and/or frozen ingredients. The variable(s) in each recipe was (were) one or more ingredients in canned or in fresh and/or frozen form.

### **Nutritional Analysis:**

Computerized nutrient analysis was done for each recipe (not for individual ingredients) using nutrient composition data from the Nutrient Data Laboratory of the United States Department of Agriculture (USDA). This data was accessed through the Massachusetts Nutrient Data Bank (MNDB). Nutrient content data was derived for recipes prepared with canned and with fresh and/or frozen ingredients.

For some of the recipes (those which require no cooking or further processing), the nutrient content of the recipe was derived simply as the sum of the nutrients from all of the ingredients. For others, adjustments were made on an ingredient-by-ingredient basis to consider losses due to thermal destruction, leaching of water-soluble nutrients into the cooking water (e.g., during the boiling of vegetables), the seepage of water soluble nutrients from frozen foods as they thaw or from meats as they roast. An extensive set of Retention Factors, published by the Nutrition Analysis Laboratory, was used to make these adjustments.

### **How Was The Nutrition Information Analyzed?**

The nutrient content of the recipes was analyzed using the Daily Values for people age two and over as the dietary standard. Daily Values have been established by the Food and Drug Administration under the Nutritional Labeling and Education Act (NLEA). Nutrition content for one serving of each recipe was used for analysis.

### **Sensory Analysis:**

Recipes prepared with canned ingredients were compared for sensory perception and appeal to the same recipes prepared with fresh and/or frozen ingredients, and, when available, to canned-prepared versions. Consumers from around the Amherst, Massachusetts, community participated in a “blind” sampling and did not know the purpose of the study, the details of the ingredient substitutions, or the variables in each recipe.

### **What Sensory Characteristics Were Tested?**

Consumers evaluated the acceptability of each food item for appearance, color, flavor, texture, aroma, aftertaste and overall acceptability using a nine-point hedonic scale (1=dislike extremely and 9=like extremely). Comments were solicited for each product evaluated.

### **Key Findings – Phase I:**

***This study shows that the ingredients you choose, regardless if they are in the fresh, frozen or canned form, are what really determine a recipe’s nutrient content. Recipes prepared with canned foods delivered favorably on taste, appearance, aroma and texture when compared to their fresh and frozen counterparts.***

Please see the attached results for complete findings of each of the 13 recipes.

## University of Massachusetts Nutrition Study – Recipe Analysis of Phase I. Results –

One of the main research questions of the nutrition study was to determine how favorably recipes prepared with canned ingredients compared to the same recipes prepared with fresh and/or frozen ingredients. The following recipe analysis reflects those key findings.

A **good source** is defined as any nutrient that provides 10-20% of the Daily Value per recipe serving. An **excellent source** is defined as any nutrient that provides 20% or more of the Daily Value per recipe serving.

### **Fruit Smoothie**

*Prepared with pineapple, peaches and low-fat yogurt.*

Two versions of the recipe were analyzed – one with canned ingredients and one with fresh ingredients – with pineapple and peaches as the variable ingredients.

- Nutritional Findings: Research concluded that the *Fruit Smoothie* recipe is a low-fat, low-calorie source of many essential nutrients regardless of the ingredient form. The *Fruit Smoothie* provides an excellent source of vitamin C, vitamin B-12, calcium, protein and phosphorus and is a good source of vitamin A, folate, thiamin, zinc and magnesium – regardless of the recipe's ingredient form (canned or fresh).
- Sensory Findings: Consumers rated the canned version of the *Fruit Smoothie* recipe higher in taste and overall acceptability than the fresh version of the recipe.



*Enjoy delicious Fruit Smoothies year 'round with a wide variety of canned fruits, canned at their peak of flavor.*

### **Vegetable Pizza**

*Prepared with a pizza crust, low-fat mozzarella, grated Swiss cheese, mushrooms, asparagus, pineapple, zucchini and carrots.*

Two versions of the recipe were analyzed – one with canned ingredients and one with fresh ingredients – with asparagus, pineapple, zucchini and carrots as the variable ingredients.

- Nutritional Findings: Research concluded that the *Vegetable Pizza* proved to be an excellent source of vitamin A, vitamin C, protein, calcium, folate, thiamin, phosphorus and riboflavin and a good source of iron, niacin, fiber and zinc – regardless of the recipe’s ingredient form (canned or fresh).
- Sensory Findings: Consumers rated the *Vegetable Pizza* made with canned ingredients higher in taste, flavor, texture and overall acceptability than the same recipe made with fresh ingredients.



*Who doesn't love pizza? Instead of loading your favorite pizza pie with greasy sausage or pepperoni, add a variety of flavorful canned vegetables for a healthful twist.*

### **Bean Burrito**

*Prepared with black beans, corn, salsa, fresh peppers and tortillas.*

Two versions of the recipe were analyzed – one with canned ingredients and one with dried ingredients that were soaked and cooked – with garbanzo beans and red kidney beans as the variable ingredients.

- Nutritional Findings: The *Bean Burrito* proved to be an excellent source of folate, thiamin, vitamin C, fiber, selenium, protein and iron and a good source of phosphorus, niacin, vitamin A, magnesium, copper and calcium – regardless of the recipe’s ingredient form (canned or dried).
- Sensory Findings: Consumers rated the *Bean Burrito* made with canned ingredients equal to the same recipe made with dried, cooked ingredients when compared to taste, appearance, flavor and overall acceptability. Out of the 13 recipes that were tested, this recipe received the highest approval scores.



*Unlike dried beans that take hours to soak and cook, canned beans need only to be reheated before they are ready for the table.*

### **Beef Chili**

*Prepared with red kidney beans, peppers and canned tomatoes.*

Three versions of the recipe were analyzed – one with canned ingredients, one with dried ingredients that were soaked and cooked and one canned-prepared version – with red kidney beans as the variable ingredient for the recipes prepared with the canned and dried ingredients.

- Nutritional Findings: The *Beef Chili* proved to be an excellent source of vitamin C, vitamin A, B-12, protein, iron, fiber, manganese, phosphorus and selenium and a good source of niacin, riboflavin, copper, B-6 and thiamin – regardless of the recipe’s ingredient form (canned, dried or canned-prepared).

- Sensory Findings: Consumers rated the *Beef Chili* made with canned ingredients higher in flavor and overall acceptability than the same recipe made with dried ingredients. Consumers also rated the canned-prepared version higher in flavor and overall acceptability than the recipe made with dried ingredients.



*In addition to being healthful, beans also come in all types of colors and shapes, providing variety and color to your recipes. Next time you go shopping let your child select the type of beans for your family's next meal.*

### **Tuna Salad in a Pita**

*Prepared with white tuna, pita bread, celery, finely chopped apples, hard-boiled eggs and mango.*

Two versions of the recipe were analyzed – one with a canned ingredient and one with a fresh ingredient – with white tuna as the variable ingredient.

- Nutritional Findings: The *Tuna Salad in a Pita* proved to be an excellent source of protein, B-12, niacin and thiamin and a good source of riboflavin, folate, iron and fiber – regardless of the recipe's ingredient form (canned or fresh).
- Sensory Findings: Consumers scored the *Tuna Salad in a Pita* made with canned, white tuna equal to the same recipe made with cooked, fresh tuna when compared to taste, appearance, flavor and overall acceptability.



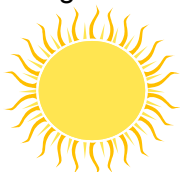
*Often, people don't take tuna beyond the two classics, tuna salad and tuna noodle casserole. Introduce pineapples, peaches or canned chestnuts to your tuna recipes to add flavor, color and variety.*

### **Corn Veggie Salsa**

*Prepared with corn, black beans, onions, chopped mango, cilantro and lime juice.*

Two versions of the recipe were analyzed – one with canned ingredients and one with fresh and dried ingredients – with corn and black beans as the variable ingredients.

- Nutritional Findings: The *Corn Veggie Salsa* proved to be an excellent source of both vitamin C and vitamin A and a good source of fiber, folate and manganese – regardless of the recipe's ingredient form (canned or fresh and dried).
- Sensory Findings: Consumers rated the *Corn Veggie Salsa* made with canned ingredients very similar in taste, appearance, flavor and texture to the same recipe made with fresh and dried ingredients.



*This vegetarian treat not only tastes great, but is also a low-fat and low-calorie snack. Jazz up this wonderful combination of flavors with hot sauce or spices, such as cayenne.*

### **Pasta Marinara**

*Prepared with tomatoes, garlic and seasonings.*

Two versions of the recipe were analyzed – one with a canned ingredient and one with a fresh ingredient – with tomatoes as the variable ingredient.

- Nutritional Findings: The *Pasta Marinara* proved to be an excellent source of vitamin C, vitamin A, fiber, copper and manganese and a good source of B-6, niacin, magnesium, iron and thiamin – regardless of the recipe's ingredient form (canned or fresh).
- Sensory Findings: Consumers rated the *Pasta Marinara* made with canned tomatoes higher in appearance and color to the same recipe made with fresh tomatoes.



*With the limited availability of vine-ripened, fresh tomatoes, use canned tomatoes for a flavorful, easy and nutritious marinara sauce anytime of the year.*

### **Breakfast Sundae**

*Prepared with strawberries, raspberries and blueberries over yogurt and granola.*

Two versions of the recipe were analyzed – one with canned ingredients and one with frozen ingredients – with strawberries, raspberries and blueberries as the variable ingredients.

- Nutritional Findings: The *Breakfast Sundae* proved to be an excellent source of manganese, phosphorous and calcium and a good source of protein, riboflavin, selenium, magnesium, B-12 and zinc – regardless of the recipe's ingredient form (canned or frozen).
- Sensory Findings: Consumers rated the *Breakfast Sundae* made with canned ingredients very similar in taste, appearance, flavor and texture to the same recipe made with fresh ingredients.



*Instead of rushing out of the house on an empty stomach, make canned fruit a part of your daily morning routine. Mix it in plain yogurt, use it as a topping on cereal or waffles or put it in a blender to make a breakfast fruit shake.*

### **Fruit Ice**

*Prepared with pears and grapefruit juice.*

Two versions of the recipe were analyzed – one with a canned ingredient and one with a fresh ingredient – with pears as the variable ingredient.

- Nutritional Findings: *Fruit Ice* proved to an excellent source of vitamin C – regardless of the recipe's ingredient form (canned or fresh).

- Sensory Findings: Consumers rated the *Fruit Ice* made with canned pears very similar in taste, appearance, flavor and texture to the same recipe made with fresh pears.



*No need to go through the effort of peeling fruit and removing the stems and seeds. Eliminate the hassle by using canned fruit recipes.*

### **Vegetable Soup**

*Prepared with tomatoes, carrots, zucchini and potatoes.*

Three versions of the recipe were analyzed – one with canned ingredients, one with fresh ingredients and one canned-prepared version. Tomatoes, carrots, zucchini and potatoes were the variable ingredients in the recipes prepared with the canned and fresh ingredients.

- Nutritional Findings: *Vegetable Soup* proved to be an excellent source of vitamin A and manganese and a good source of fiber, vitamin C, copper, protein and phosphorus – regardless of the recipe’s ingredient form (canned, fresh or canned-prepared). The canned-prepared product provided higher amounts of zinc, manganese and vitamin A than the other *Vegetable Soup* variations.
- Sensory Findings: Consumers rated the *Vegetable Soup* made in three versions very similar in taste, appearance, flavor and texture. The canned version of the recipe scored higher in color.



*This family favorite is a low-fat, low-calorie source of many nutrients. Cutting and peeling fresh vegetables takes time, use canned ingredients instead.*

### **Chicken Tacos**

*Prepared with chicken, grated cheddar cheese, salsa, scallions, sour cream and guacamole on a corn tortilla.*

Two versions of the recipe were analyzed – one with canned ingredients and one with fresh ingredients – with chicken as the variable ingredient.

- Nutritional Findings: *Chicken Tacos* proved to be an excellent source of protein, vitamin C, vitamin A, phosphorous, calcium, niacin and B-6 and a good source of fiber, iron, magnesium, zinc, copper, manganese, riboflavin and folate – regardless of the recipe’s ingredient form (canned or fresh).
- Sensory Findings: *Chicken Tacos* prepared with canned and fresh chicken scored well in appearance, color, flavor and taste.



*Canned chicken cuts food preparation time and is convenient for any busy cook.*

### **Chicken Stir-Fry**

*Prepared with chicken, red and yellow peppers, broccoli, carrots, peapods, scallions, ginger and garlic with a sherry and soy sauce.*

Two versions of the recipe were analyzed – one with canned ingredients and one with fresh ingredients – with chicken as the variable ingredient.

- Nutritional Findings: *Chicken Stir-Fry* proved to be an excellent source of vitamin C, vitamin A, protein, niacin and B-6 and a good source of iron, zinc, phosphorous, pantothenic acid, manganese and riboflavin – regardless of the recipe's ingredient form (canned or fresh).
- Sensory Findings: *Chicken Stir-Fry* prepared with canned and fresh chicken scored well in appearance, color, flavor and taste.



*The Chicken Stir-Fry, like the Chicken Tacos, provides an excellent source of many essential nutrients.*

### **Cranberry Oat Squares**

*Prepared with cranberries, oats, marmalade, butter and spices.*

Two versions of the recipe were analyzed – one with canned ingredients and one with frozen ingredients – with cranberry as the variable ingredient.

- Nutritional Findings: *Cranberry Oat Squares* proved to be a good source of manganese – regardless of the recipe's ingredient form (canned or frozen).
- Sensory Findings: Consumers rated the *Cranberry Oat Squares* prepared with canned ingredients very similar in appearance, texture and aftertaste to the same recipe made with frozen ingredients.



*Use a variety of canned berries – cranberries, raspberries and blueberries – to add color and flavor to any number of desserts or snack toppings.*

## Recipes Analyzed/Variable Ingredient(s) Tested:

|                                      |  |
|--------------------------------------|--|
| <b><i>Fruit Smoothie:</i></b>        | Peaches (canned vs. fresh)<br>Pineapples (canned vs. fresh)  |
| <b><i>Vegetable Pizza:</i></b>       | Carrots (canned vs. fresh, boiled)<br>Asparagus (canned vs. fresh, blanched)<br>Pineapple (canned in juice vs. fresh)<br>Zucchini (canned vs. fresh, blanched) |
| <b><i>Bean Burrito:</i></b>          | Red kidney beans (canned vs. dried, soaked and cooked)<br>Garbanzo beans (canned vs. dried, soaked and cooked)   |
| <b><i>Beef Chili:</i></b>            | Red kidney beans (canned vs. dried, soaked and cooked)   |
| <b><i>Tuna Salad in a Pita:</i></b>  | White tuna (canned in water vs. fresh tuna steaks, broiled and flaked)   |
| <b><i>Corn Veggie Salsa:</i></b>     | Black beans (canned vs. dried)<br>Corn (canned vs. fresh, frozen)  |
| <b><i>Pasta Marinara:</i></b>        | Tomatoes (canned vs. fresh, prepared sauce)  |
| <b><i>Breakfast Sundaes:</i></b>     | Strawberries (canned vs. frozen)<br>Raspberries (canned vs. frozen)<br>Blueberries (canned vs. frozen)   |
| <b><i>Fruit Ice:</i></b>             | Pears (canned vs. fresh)   |
| <b><i>Vegetable Soup:</i></b>        | Potatoes (canned vs. fresh)<br>Carrots (canned vs. fresh)<br>Zucchini (canned vs. fresh)<br>Tomatoes (canned vs. fresh)  |
| <b><i>Chicken Tacos:</i></b>         | Chicken (canned vs. fresh breast, boneless, skinless and roasted)  |
| <b><i>Chicken Stir-Fry:</i></b>      | Chicken (canned vs. fresh breast, boneless, skinless and roasted)  |
| <b><i>Cranberry Oat Squares:</i></b> | Cranberries (canned vs. frozen)  |

## **Phase II. of the University of Massachusetts Nutrition Study Reinforces Initial Findings: Recipes Using Canned Ingredients Provide Taste, Convenience and Nutrition**

### **Study Overview:**

Results from Phase II. of a nutrition study conducted by the University of Massachusetts (UMass) found that recipes using canned ingredients are similar in nutritional value and sensory perception to those made with fresh and frozen ingredients. The second phase of the three-part study tested 12 “classic” recipes that were selected from well-known cookbooks such as *The Joy of Cooking* and *The Betty Crocker Cookbook*, as well as from online recipe sources.

The research analyzed nutritional content of entire recipes, comparing nutrients like protein, carbohydrates, vitamins and minerals. The researchers also conducted sensory analysis evaluating color, appearance, flavor, aroma, texture and aftertaste on recipes prepared with canned, fresh and/or frozen ingredients.

The UMass study is the third and most complex nutrition study commissioned by the Canned Food Alliance (CFA) that builds on research conducted by the University of Illinois. In 1995, the University of Illinois study compared the nutritional values of canned, frozen and fresh fruits and vegetables. They expanded the research in 1997 by broadening the food categories and extending the nutrition study to compare additional nutrients.

### **Study Methodology:**

The objective of the UMass study, conducted on behalf of the CFA, was to compare both the nutritional value and sensory appeal of 40 recipes prepared with canned, fresh and/or frozen ingredients. The variable(s) in each recipe was (were) one or more ingredients in canned or in fresh and/or frozen form. Canned-prepared versions, which were as close as possible to the recipe, were also analyzed as appropriate.

### **Nutritional Analysis:**

Computerized nutrient analysis was done for each recipe (not for individual ingredients) using nutrient composition data from the Nutrient Data Laboratory of the United States Department of Agriculture (USDA). This data was accessed through the Massachusetts Nutrient Data Bank (MNDB). Nutrient content data was derived for recipes prepared with canned and with fresh and/or frozen ingredients.

For some of the recipes (those which require no cooking or further processing), the nutrient content of the recipe was derived simply as the sum of the nutrients from all of the ingredients. For others, adjustments were made on an ingredient-by-ingredient basis to consider losses due to thermal destruction, leaching of water-soluble nutrients into the cooking water (e.g., during the boiling of vegetables) and the seepage of water-soluble nutrients from frozen foods as they thaw or from meats as they roast. An extensive set of Retention Factors, published by the Nutrition Analysis Laboratory, was used to make these adjustments.

### **How Was The Nutrition Information Analyzed?**

The nutrient content of the recipes was analyzed using the Daily Values for people ages two and over as the dietary standard. Under the Nutritional Labeling and Education Act (NLEA), the Food and Drug Administration established Daily Values. Nutrition content for one serving of each recipe was used for analysis.

### **Sensory Analysis:**

Recipes prepared with canned ingredients were compared for sensory perception and appeal to the same recipes prepared with fresh and/or frozen ingredients, and, when available, to canned-prepared versions. Consumers from around the Amherst, Massachusetts, community participated in a “blind” sampling and did not know the purpose of the study, the details of the ingredient substitutions or the variables in each recipe.

### **What Sensory Characteristics Were Tested?**

Consumers evaluated the acceptability of each food item for appearance, color, flavor, texture, aroma, aftertaste and overall acceptability using a nine-point hedonic scale (1=dislike extremely and 9=like extremely). Comments were solicited for each product evaluated.

### **Key Findings – Phase II.:**

***This part of the study reinforces the results of Phase I. and shows that the ingredients you choose, regardless of whether they are fresh, frozen or canned, are what really determine a recipe’s nutrient content. Recipes prepared with canned foods delivered favorably on taste, appearance, aroma and texture when compared to their fresh and frozen counterparts.***

Please see the attached results for complete findings of each of the 12 recipes.

## University of Massachusetts Nutrition Study – Recipe Analysis of Phase II. Results –

One of the main goals of the nutrition study was to determine how favorably recipes prepared with canned ingredients compared to the same recipes prepared with fresh and/or frozen ingredients, and as appropriate, canned-prepared versions. The following recipe analysis reflects those key findings. Comprehensive results and data on the UMass Nutrition Study will be posted on [www.mealtime.org](http://www.mealtime.org) the week of September 11.

A **good source** is defined as any nutrient that provides 10-20% of the Daily Value per recipe serving. An **excellent source** is defined as any nutrient that provides 20% or more of the Daily Value per recipe serving. See the recipe for ingredient amounts and serving sizes.

### **Chicken à la King**

*Prepared with chicken, chicken stock, mushrooms, half-and-half, pastry shells, sherry, butter, flour and nutmeg.*

Two versions of the recipe were analyzed – one using a canned ingredient and the other using a fresh ingredient – with chicken as the variable ingredient.

- Nutritional Findings: Research concluded that a serving of the *Chicken à la King* recipe is a good source of riboflavin and phosphorus and provides an excellent source of protein, niacin and selenium, regardless of the form of the ingredient (canned or fresh) in the recipe.
- Sensory Findings: Consumers rated the *Chicken à la King* recipe prepared with canned or fresh chicken equally based on overall acceptability, aroma, flavor, texture and aftertaste.



*Give this recipe a splash of color by opening a can of mixed vegetables – it will not only enhance its appearance, it will add nutrients and flavor.*

### **Chicken Salad**

*Prepared with chicken, seedless grapes, celery, yogurt, sour cream, lemon, sugar and salt.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with chicken as the variable ingredient.

- Nutritional Findings: Research concluded that a serving of the *Chicken Salad* recipe is a good source of vitamin B-6, vitamin C, phosphorus and selenium and provides an excellent source of protein, regardless of the form of the ingredient (canned or fresh) in the recipe. The recipe using canned chicken is also a good source of niacin while the recipe using fresh chicken is an excellent source.

- Sensory Findings: According to consumers, both versions of the recipe – canned and fresh – were equally acceptable overall, specifically in appearance, color, aroma, flavor, texture and aftertaste.



*Using canned fruit eliminates a lot of time and energy. Try canned pitted cherries or Mandarin oranges in your next batch of chicken salad. Or go a different route altogether and replace the chicken in your recipe with canned crabmeat or shrimp.*

### **Chicken Noodle Soup**

*Prepared with chicken, chicken broth, onions, carrots, celery, egg noodles, butter, lemon juice and parsley.*

Three versions of the recipe were analyzed – one using canned chicken, one using fresh chicken and a canned-prepared version – with chicken as the variable ingredient.

- Nutritional Findings: One serving of the *Chicken Noodle Soup* is an excellent source of vitamin A, niacin and protein – regardless of the form of the ingredient (canned, fresh or canned prepared) in the recipe. All three versions of the recipe are a good source of riboflavin, while the canned and fresh versions are good sources of phosphorus, thiamin and folate. The canned version is also a good source of iron and phosphorus. The recipe made with fresh chicken is also a good source of vitamin B-6.
- Sensory Findings: Consumers rated overall acceptability and then aroma, flavor, texture and aftertaste of the two versions of Chicken Noodle Soup (prepared with fresh chicken and with canned chicken) equally. The recipe prepared with fresh chicken and the recipe prepared with canned chicken were rated higher in acceptability than the canned-prepared version.



*Be sure to keep your pantry stocked with plenty of canned vegetables (even onions!). That way, you can make your own homemade version of chicken soup in a hurry!*

### **Tuna Noodle Casserole**

*Prepared with tuna, egg noodles, mushrooms, red bell pepper, onions, milk, flour, cheddar cheese, crackers, parsley, salt and black pepper.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with tuna as the variable ingredient.

- Nutritional Findings: A serving of the *Tuna Noodle Casserole* recipe, regardless of the form of the ingredient (canned or fresh) in the recipe, is an excellent source of protein, riboflavin, niacin, calcium and phosphorus and a good source of vitamin C, folate, iron, magnesium and zinc. Also, the recipe using canned tuna provided an excellent source of vitamin B-12 and the recipe prepared with fresh tuna provided a good source of vitamin B-12. While the *Tuna Noodle Casserole* made with canned foods is a good source of vitamin B-6 and thiamin, the recipe made with fresh tuna provided significantly higher amounts and is an excellent source of both vitamins.
- Sensory Findings: Consumers rated the *Tuna Noodle Casserole* prepared with canned tuna higher in overall acceptability and flavor than the same recipe prepared with fresh tuna. Consumers rated the two versions similarly with regard to appearance, color, aroma, texture and aftertaste.



*Give your tuna noodle casserole a little crunch with a can of water chestnuts – and canned pimento will give you flavor and color if you don't have a red bell pepper.*

### **Harvest Beef Stew**

*Prepared with beef pot roast, beef broth, onions, carrots, celery, turnips, potatoes, pepper, flour, garlic, bay leaf, Worcestershire sauce and marjoram.*

Three versions of the recipe were analyzed – one using canned ingredients, one using fresh ingredients and one canned-prepared version – with carrots and potatoes as the variable ingredients for the recipes prepared with the canned and fresh ingredients.

- Nutritional Findings: A serving of the *Harvest Beef Stew* is an excellent source of vitamin A, protein and a good source of zinc – regardless of the form of the ingredient (canned, fresh or canned prepared) in the recipe. Also, the recipe using fresh ingredients and the recipe prepared with canned ingredients are both good sources of iron, phosphorus, vitamin C, vitamin B-6, vitamin B-12 and niacin. The canned-prepared version is a good source of dietary fiber.
- Sensory Findings: Consumers found that all three versions of the *Harvest Beef Stew* (canned, fresh and canned prepared) were similar in overall acceptability, appearance, color, aroma, texture and aftertaste.



*Cans make it simple to create a pot of beef stew – use canned carrots, potatoes, onions, green beans, squash, peas, corn and any other of your favorite veggies. When you use canned veggies, the cleaning and cutting are done for you!*

### **Seafood Okra Gumbo**

*Prepared with shrimp, blue crab, oysters, okra, onions, tomatoes, butter, flour, salt, garlic, cayenne, Worcestershire sauce and hot pepper sauce.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with seafood (shrimp, crabmeat, oysters) as the variable ingredient.

- **Nutritional Findings:** A serving of *Seafood Okra Gumbo* is an excellent source of zinc, folate and vitamin B-12, and a good source of protein, iron, thiamin and phosphorus – regardless of the form of the ingredients (canned or fresh) in the recipe. The recipe using canned ingredients is also a good source of phosphorus, while the recipe using fresh ingredients is a good source of niacin.
- **Sensory Findings:** Consumers rated the *Seafood Okra Gumbo* made with canned seafood higher in flavor, texture and overall acceptability than the same recipe made with fresh seafood. Both versions of the recipe were equally acceptable in appearance, color, aroma and aftertaste.



*Canned vegetables (okra, tomatoes, onions, corn) are a tasty and easy addition to any gumbo.*

### **Pineapple Orange Slush**

*Prepared with pineapples and Mandarin oranges.*

Two versions of the recipe were analyzed – one using canned ingredients and one using fresh ingredients – with pineapple and oranges being the variable ingredients.

- **Nutritional Findings:** The *Pineapple Orange Slush* proved to be an excellent source of vitamin C and thiamin – regardless of the form of the ingredient (canned or fresh) in the recipe.
- **Sensory Analysis:** Consumers scored the *Pineapple Orange Slush* made with canned pineapple and oranges equal to the same recipe made with fresh pineapple and oranges with regard to overall acceptability, appearance, color, aroma and texture. However, the *Pineapple Orange Slush* prepared using canned pineapple and oranges was found to be significantly less acceptable in flavor and aftertaste in comparison to the *Pineapple Orange Slush* made with fresh ingredients.



*Have fun mixing and matching your own fruit slush at any time of the year with the array of fruits available on your supermarket shelf: canned mango, berries, papaya, kiwi, oranges, pineapples, cherries, peaches and pears, to name a few!*

### **Peach-Cherry Crisp**

*Prepared with peaches, sweet cherries, dry oats, sugar, brown sugar, flour, butter and cinnamon.*

Two versions of the recipe were analyzed – one using canned ingredients and one using fresh ingredients – with peaches and cherries as the variable ingredients.

- Nutritional Analysis: A serving of *Peach-Cherry Crisp* is a good source of vitamin A regardless of the form of the ingredients (canned or fresh) in the recipe. Also, the recipe using fresh ingredients is a good source of dietary fiber.
- Sensory Analysis: Consumers rated the *Peach-Cherry Crisp* made with canned peaches and black cherries very similar in appearance, flavor, color, aroma, texture, aftertaste and overall acceptability to the same recipe made with fresh peaches and black cherries. The ratings were very positive for both versions.



*You can make a fruit crisp with almost any kind of fruit. Try pears, mangoes, apples and apricots for starters.*

### **Green Bean Casserole**

*Prepared with green beans, cream of mushroom soup, milk, french-fried onions, tamari soy sauce and pepper.*

Three versions of the recipe were analyzed – one with a canned ingredient, one with a fresh ingredient and one with a frozen ingredient – with green beans as the variable ingredient.

- Nutritional Findings: A serving of the *Green Bean Casserole* recipe for all three versions (canned, fresh or frozen) contributed a wide variety of nutrients that don't meet the criteria of a "good" serving (10 to 19% daily value).
- Sensory Findings: Consumers rated the *Green Bean Casserole* made with canned ingredients similar in appearance, color, aroma, flavor, aftertaste and overall acceptability to the same recipe made with fresh and frozen ingredients.



*To add some extra "crunch" – top the green bean casserole with a can of Chinese noodles.*

### **Boston Baked Beans**

*Prepared with navy beans, dark molasses, dry mustard powder, onions, bay leaves, salt and salt pork.*

Three versions of the recipe were analyzed – one using fresh (dried, soaked and cooked) ingredients, one using canned ingredients and one canned-prepared version – with navy beans as the variable ingredient.

- Nutritional Findings: A serving of the Boston Baked Beans is a good source of protein, iron, magnesium and phosphorous – for all three versions (recipe with canned beans, recipe with fresh beans and the canned-prepared version). A serving of the canned-prepared and fresh versions are also excellent sources of fiber, while the recipe containing canned beans is a good source of fiber, thiamin and folate. The canned-prepared version is also a good source of folate.
- Sensory Findings: Consumers rated *Boston Baked Beans* made with canned ingredients similar in appearance, color, aroma, flavor, texture, aftertaste and overall acceptability to the same recipe made with dried beans. However, the canned-prepared version of *Boston Baked Beans* scored significantly higher in all categories measured, including overall acceptability, than the recipes made with dried or canned beans.



*Add a little variety to your meals once in a while by choosing a different variety of baked beans. Several variations of the old favorite are available at your supermarket.*

### **Three-Bean Salad**

*Prepared with green beans, yellow wax beans, red kidney beans, green bell pepper, onions, cider vinegar, sugar, pepper, salt, vegetable oil and tarragon.*

Three versions of the recipe were analyzed – one using canned ingredients, one using fresh ingredients and one using frozen ingredients – with all three types of beans as the variable ingredients.

- Nutritional Findings: A serving of *Three-Bean Salad* is a good source of vitamin C – regardless of the form of the ingredient (canned, fresh or frozen) in the recipe.
- Sensory Findings: Consumers scored all three versions of the *Three-Bean Salad* recipe (canned, fresh and frozen) equally in appearance, color, aroma, flavor, texture, aftertaste and overall acceptability.



*Experiment with different combinations of beans – even make it a five or seven-bean salad! Look for black, kidney, pinto, navy and white beans as well as green and yellow wax beans. And it's ok to use a combination of the canned, fresh and frozen varieties.*

### **Minestrone Soup**

*Prepared with kidney beans, chickpeas, onion, cabbage, garlic, leek, zucchini, carrots, green peas, tomatoes, beef broth, salt, salt pork and olive oil.*

Three versions of the recipe were analyzed – one using canned ingredients, one using fresh ingredients (dried, soaked and cooked) and a canned-prepared version – with kidney beans and chickpeas as the variable ingredients.

- Nutritional Findings: A serving of the *Minestrone Soup* is an excellent source of vitamin A for all three versions – the recipe using canned beans and chickpeas, the recipe using dried, soaked and cooked beans and chickpeas and the canned-prepared version. A serving of the recipe made with fresh ingredients is also a good source of protein, folate and vitamin C; the canned version is a good source of vitamin C; and the canned-prepared version a good source of thiamin and folate.
- Sensory Findings: Consumers scored the *Minestrone Soup* prepared from canned or fresh vegetable ingredients equal to the canned-prepared version with regard to aroma, flavor, aftertaste and overall acceptability. Consumers scored the *Minestrone Soup* prepared with canned vegetables equal to the same recipe made with fresh vegetables with regard to appearance and color. However, the canned-prepared version of the *Minestrone Soup* recipe scored higher in appearance and color than the recipes using canned and fresh vegetables.



*Canned vegetables can help you make a quick homemade version of minestrone.*

**Recipes Analyzed/Variable Ingredient(s) Tested:**

|                                       |   |
|---------------------------------------|---|
| <b><i>Chicken à la King:</i></b>      | Chicken (canned vs. fresh)  |
| <b><i>Chicken Salad:</i></b>          | Chicken (canned vs. fresh)  |
| <b><i>Chicken Noodle Soup:</i></b>    | Chicken (canned vs. fresh vs. canned prepared)  |
| <b><i>Tuna Noodle Casserole:</i></b>  | Tuna (canned vs. fresh)   |
| <b><i>Harvest Beef Stew:</i></b>      | Carrots (canned vs. fresh vs. canned prepared)<br>Potatoes (canned vs. fresh vs. canned prepared)   |
| <b><i>Seafood Okra Gumbo:</i></b>     | Shrimp (canned vs. fresh)<br>Crabmeat (canned vs. fresh)<br>Oysters (canned vs. fresh)  |
| <b><i>Pineapple Orange Slush:</i></b> | Pineapples (canned vs. fresh)<br>Oranges (canned vs. fresh)   |
| <b><i>Peach-Cherry Crisp:</i></b>     | Peaches (canned vs. fresh)<br>Cherries (canned vs. fresh)   |
| <b><i>Green Bean Casserole:</i></b>   | Green Beans (canned vs. fresh vs. frozen)   |
| <b><i>Boston Baked Beans:</i></b>     | Navy Beans (canned vs. dried, soaked and cooked vs. canned prepared)  |
| <b><i>Three-Bean Salad:</i></b>       | Green Beans (canned vs. fresh vs. frozen)<br>Yellow Wax Beans (canned vs. fresh vs. frozen)<br>Red Kidney Beans (canned vs. fresh vs. frozen) |
| <b><i>Minestrone Soup:</i></b>        | Kidney Beans (canned vs. dried, soaked and cooked vs. canned prepared)<br>Chickpeas (canned vs. dried, soaked and cooked vs. canned prepared) |

## **Phase III. of the University of Massachusetts (UMass) Nutrition Study Reinforces Initial Findings: Recipes Using Canned Ingredients Provide Taste, Convenience and Nutrition**

### **Study Overview:**

Results from Phase III. of a nutrition study conducted by the University of Massachusetts found that recipes using canned ingredients are similar in nutritional value and sensory perception to those made with fresh and frozen ingredients. The third phase of the three-part study tested 14 traditional American holiday recipes that were selected from well-known cookbooks, online recipe sources and popular magazines.

The research analyzed nutritional content of entire recipes, comparing nutrients like protein, carbohydrates, vitamins and minerals. In addition, the researchers conducted sensory analysis evaluating color, appearance, flavor, aroma, texture and aftertaste of recipes prepared with canned, fresh and/or frozen ingredients.

The UMass study is the third nutrition study commissioned by the Canned Food Alliance (CFA) that builds on research conducted by the University of Illinois. In 1995, the University of Illinois study compared the nutritional values of canned, frozen and fresh fruits and vegetables. They expanded the research in 1997 by broadening the food categories and extending the nutrition study to compare additional nutrients.

### **Study Methodology:**

The objective of the UMass study was to compare both the nutritional value and sensory appeal of 40 recipes prepared with canned, fresh and/or frozen ingredients. The variable(s) in each recipe was (were) one or more ingredients in canned or in fresh and/or frozen form. Canned-prepared versions, which were as close as possible to the recipe, were also analyzed as appropriate.

### **Nutritional Analysis:**

Computerized nutrient analysis was done for each recipe (not for individual ingredients) using nutrient composition data from the Nutrient Data Laboratory of the United States Department of Agriculture (USDA). The data was accessed through the Massachusetts Nutrient Data Bank (MNDB). Nutrient content data was derived for recipes prepared with canned and with fresh and/or frozen ingredients.

For some of the recipes (those which require no cooking or further processing) the nutrient content of the recipe was derived simply as the sum of the nutrients from all of the ingredients. For others, adjustments were made on an ingredient-by-ingredient basis to consider retention factors: losses due to thermal destruction, leaching of water-soluble nutrients into the cooking water (e.g., during the boiling of vegetables) and the seepage of water-soluble nutrients from frozen foods as they thaw or from meats as they roast. An extensive set of Retention Factors, published by the Nutrition Analysis Laboratory, was used to make these adjustments.

### **How Was The Nutrition Information Analyzed?**

The nutrient content of the recipes was analyzed using the Daily Values for people ages two and over as the dietary standard. Under the Nutritional Labeling and Education Act (NLEA), the Food and Drug Administration established Daily Values. Nutrition content for one serving of each recipe was used for analysis.

### **Sensory Analysis:**

Recipes prepared with canned ingredients were compared for sensory perception and appeal to the same recipes prepared with fresh and/or frozen ingredients and, when available, to canned-prepared versions. Consumers from the Amherst, Massachusetts community participated in a “blind” sampling and did not know the purpose of the study, details of the ingredient substitutions or the variables in each recipe.

### **What Sensory Characteristics Were Tested?**

Consumers evaluated the acceptability of each food item for appearance, color, flavor, texture, aroma, aftertaste and overall acceptability using a nine-point hedonic scale (1=dislike extremely and 9=like extremely). Comments were solicited for each product evaluated.

### **Key Findings – Phase III.:**

***This part of the study reinforces the results of Phase I. and II. and shows that the ingredients you choose, regardless of whether they are fresh, frozen or canned, are what really determine a recipe’s nutrient content. Recipes prepared with canned foods delivered favorably on taste, appearance, aroma and texture when compared to their fresh and frozen counterparts.***

Please see the attached results for complete findings of each of the 14 recipes.

## University of Massachusetts (UMass) Nutrition Study – Recipe Analysis of Phase III. Results –

One of the main goals of the nutrition study was to determine how favorably recipes prepared with canned ingredients compared to the same recipes prepared with fresh and/or frozen ingredients, and as appropriate, canned-prepared versions. The following recipe analysis reflects those key findings.

A **good source** is defined as any nutrient that provides 10-20 percent of the Daily Value per recipe serving. An **excellent source** is defined as any nutrient that provides 20 percent or more of the Daily Value per recipe serving. See the recipe for ingredient amounts and serving sizes.

### **Chicken Quiche**

*Prepared with chicken, bacon, onion, Gruyere cheese, Parmesan cheese, egg, milk, heavy cream, nutmeg, salt, pepper and prepared pastry.*

Two versions of the recipe were analyzed – one using a canned ingredient and the other using a fresh ingredient – with chicken as the variable ingredient.

- Nutritional Findings: Research concluded that a serving of the *Chicken Quiche* recipe is an excellent source of protein, calcium, phosphorus, selenium and riboflavin and provides a good source of zinc, thiamin, niacin and vitamin A, regardless of the form of the ingredient (canned or fresh) in the recipe. Also, the canned version qualifies as a good source of vitamin B-12.
- Sensory Findings: Consumers rated the *Chicken Quiche* recipe prepared with canned or fresh chicken equally based on appearance, color, aroma, flavor, texture, aftertaste and overall acceptability.

### **Crab Dip**

*Prepared with crabmeat, onion, cream cheese, mayonnaise-type salad dressing, Worcestershire sauce, hot pepper sauce, black pepper and salt.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with crabmeat as the variable ingredient.

- Nutritional Findings: Research concluded that a serving of the *Crab Dip* recipe is a good source of protein, copper, and selenium, regardless of the form of the ingredient (canned or fresh) in the recipe. The recipe using canned crabmeat is also a good source of phosphorus.
- Sensory Findings: According to consumers, the version using canned crabmeat was significantly more acceptable than the fresh version based on flavor, texture and overall acceptability. Consumers rated both the canned and fresh version of the *Crab Dip* equally acceptable based on appearance, color, aroma and aftertaste.

### **Tuna Bruschetta**

*Prepared with tuna, tomatoes, olive oil, red wine vinegar, basil, garlic, salt, and Italian bread.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with tuna as the variable ingredient.

- Nutritional Findings: One serving of the *Tuna Bruschetta* is an excellent source of niacin and a good source of manganese and vitamin C, regardless of the form of the ingredient (canned or fresh) in the recipe. The fresh version is an excellent source of protein, while the canned version has slightly less and qualifies only as a good source. Also, the fresh version is an excellent source of thiamin, while the canned version is a good source of vitamin B-12.
- Sensory Findings: Consumers rated both versions (canned and fresh) equally based on appearance, color, aroma, flavor, texture and overall acceptability. The recipe prepared with canned tuna was found to have a significantly less acceptable aftertaste than that prepared with the fresh tuna.

### **Salmon Salad with Vinaigrette**

*Prepared with salmon, celery, green cabbage, red cabbage, green bell pepper, green onions, oil-and-vinegar dressing, paprika, and black pepper.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with salmon as the variable ingredient.

- Nutritional Findings: A serving of the *Tuna Salmon Salad* recipe, regardless of the form of the ingredient (canned or fresh) in the recipe, is an excellent source of protein, selenium, niacin, vitamin B-12 and vitamin C and a good source of magnesium, potassium and vitamin B-6. Also, the canned version provides an excellent source of calcium while the fresh version does not. The fresh version qualifies as a good source of thiamin.
- Sensory Findings: Consumers rated both the canned and fresh version of the *Salmon Salad* equally acceptable based on appearance, aroma, flavor, texture, aftertaste, and overall acceptability. However, consumers found the color of canned salmon to be significantly less acceptable than fresh salmon.

### **New England Clam Chowder**

*Prepared with clams, salt pork, onion, potatoes, butter, heavy cream, flour, parsley, bay leaf, thyme, and black pepper.*

Three versions of the recipe were analyzed – one using a canned ingredient, one using a fresh ingredient and one using a frozen ingredient – with clams as the variable ingredient.

- Nutritional Findings: A serving of the *New England Clam Chowder* is an excellent source of iron, phosphorus, potassium, copper, vitamin C, manganese, selenium, protein, folate, vitamin B-6, vitamin B-12, thiamin, niacin, and vitamin A, regardless of the form of the ingredient (canned or fresh) in the recipe. The *New England Clam Chowder* prepared from canned concentrate is an excellent source of vitamin B-12 and a good source of protein and five vitamins and minerals. Nutritional values were not available for the frozen version.
- Sensory Findings: Consumers found the *New England Clam Chowder* recipe prepared with canned clams equally acceptable to the recipe prepared with fresh clams based on appearance, color, aroma, flavor, texture, aftertaste and overall acceptability. Both the canned version and the fresh version were rated significantly more acceptable on all characteristics measured than the recipe prepared with frozen clams.

### **Cranberry-Maple Sauce**

*Prepared with cranberries and maple syrup.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a frozen ingredient – with cranberries as the variable ingredient.

- Nutritional Findings: A serving of *Cranberry-Maple Sauce* is an excellent source of manganese. The version of the recipe using fresh cranberries is a good source of zinc and fiber.
- Sensory Findings: Consumers rated the *Cranberry-Maple Sauce* recipe made with canned whole-berry cranberry sauce equally acceptable based on flavor, aftertaste, and overall acceptability as compared to the frozen version. However, consumers found the recipe using canned whole-berry cranberry sauce less acceptable in appearance, color, aroma and texture compared to its frozen counterpart.

### **Baked Fruit Compote**

*Prepared with pineapple, Mandarin oranges, sweet cherries, apricots, brown sugar, and macaroon cookies.*

Two versions of the recipe were analyzed – one using canned ingredients and one using a mixture of dried, fresh and frozen ingredients – with pineapple, Mandarin oranges, sweet cherries and apricots being the variable ingredients.

- Nutritional Findings: The *Baked Fruit Compote* proved to be an excellent source of manganese, vitamin C, and vitamin A and a good source of fiber and copper, regardless of the form of the ingredient (canned or a mixture of dried, fresh and frozen) in the recipe. Also, the fresh version is an excellent source of potassium, while the canned version qualifies as a good source.

- Sensory Analysis: Consumers scored the *Baked Fruit Compote* made with canned fruits equal to the same recipe made with a mixture of dried, fresh and frozen fruits with regard to overall acceptability, appearance, color, aroma, flavor, and aftertaste. However, the *Baked Fruit Compote* prepared using canned pineapple, Mandarin oranges, sweet cherries and apricots was found to be less acceptable in texture in comparison to the *Baked Fruit Compote* made with fresh ingredients.

### **Scalloped Corn**

*Prepared with corn, bread crumbs, crackers, green bell pepper, onion, flour, butter, reduced-fat milk, egg yolk, paprika, dry mustard powder, cayenne and salt.*

Three versions of the recipe were analyzed – one using a canned ingredient, one using a fresh ingredient, and one using a frozen ingredient – with corn as the variable ingredient.

- Nutritional Analysis: A serving of *Scalloped Corn* is an excellent source of vitamin C and a good source of thiamin, riboflavin, niacin, folate, vitamin A, calcium, iron, phosphorus, manganese, and selenium, regardless of the form of the ingredient. The fresh version has slightly more fiber than the canned and frozen versions and barely qualifies as a good source.
- Sensory Analysis: Consumers rated the *Scalloped Corn* made with canned corn similarly in flavor, aroma, texture, aftertaste and overall acceptability to the same recipe made with fresh and frozen corn. The recipe using canned corn was equally acceptable in appearance and color as recipes containing fresh and frozen corn. However, using fresh corn resulted in a recipe that was less acceptable in appearance and color than the recipe using frozen corn.

### **Sweet Potato Pie**

*Prepared with sweet potatoes, egg, sugar, light cream, butter, lemon juice, vanilla extract, cinnamon, nutmeg, salt and prepared pie crust.*

Two versions of the recipe were analyzed – one with a canned ingredient and one with a fresh ingredient – with sweet potatoes as the variable ingredient.

- Nutritional Findings: A serving of the *Sweet Potato Pie* recipe is an excellent source of vitamin A, vitamin C, and manganese. Also, both versions are good sources of selenium, phosphorus, pantothenic acid, and vitamin B-6. The canned version also qualifies as a good source of iron.
- Sensory Findings: Consumers rated the *Sweet Potato Pie* recipe made with canned sweet potatoes significantly less acceptable based on all characteristics evaluated than the recipe made with fresh sweet potatoes.

### **Carrots with Parsley and Mint**

*Prepared with carrots, brown sugar, butter, parsley and mint.*

Three versions of the recipe were analyzed – one using a canned ingredient, one using a fresh ingredient and one using a frozen ingredient – with carrots as the variable ingredient.

- Nutritional Findings: A serving of the *Carrots with Parsley and Mint* is an excellent source of vitamin A, regardless of the form of the ingredient. Both the canned and frozen versions are also a good source of manganese.
- Sensory Findings: Consumers rated *Carrots with Parsley and Mint* made with canned ingredients significantly less acceptable based on all characteristics measured when compared to the versions containing fresh carrots. The same was found for the *Carrots with Parsley and Mint* recipe made with frozen carrots except in regards to flavor. Consumers found the recipe using canned carrots and the version using frozen carrots equal in flavor.

### **Pumpkin Soup**

*Prepared with pumpkin, butter, sugar, reduced-fat milk, salt and black pepper.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh ingredient – with pumpkin as the variable ingredient.

- Nutritional Findings: A serving of *Pumpkin Soup* is an excellent source of vitamin A, regardless of the form of the ingredient (canned or fresh) in the recipe, although the canned version has more than ten-times as much vitamin A as the fresh version. Also, both versions are good sources of calcium, phosphorus, and riboflavin.
- Sensory Findings: Consumers found the canned version of *Pumpkin Soup* significantly more acceptable than the recipe containing fresh pumpkin based on appearance, color, flavor, texture, and overall acceptability. Aroma and aftertaste were found to be equally acceptable for both the canned version and the fresh version of the *Pumpkin Soup*.

### **Cold Cherry Soup**

*Prepared with sour red cherries, oranges, honey, flour, sour cream, water, and cinnamon.*

Two versions of the recipe were analyzed – one using a canned ingredient and one using a fresh (dried) ingredient – with cherries as the variable ingredient.

- Nutritional Findings: A serving of the *Cold Cherry Soup* using canned cherries is a good source of vitamin A, while the fresh version qualifies as an excellent source.

- Sensory Findings: Consumers scored the *Cold Cherry Soup* prepared with canned cherries significantly more acceptable in appearance, color, aroma, aftertaste and overall acceptability than the version prepared with fresh (dried) cherries. Consumers rated both versions equally acceptable based on flavor and texture.

### **Brazilian Beans and Rice**

*Prepared with black beans, onion, celery, tomatoes, green bell peppers, oranges, garlic, cilantro, bay leaves, hot pepper sauce, black pepper, salt, water and white rice.*

Two versions of the recipe were analyzed – one using canned ingredients and one using dried ingredients – with beans as the variable ingredients.

- Nutritional Findings: A serving of *Brazilian Beans and Rice*, regardless of the form of the ingredient (canned or dried), is an excellent source of vitamin C, fiber, folate, and manganese and a good source of protein, iron, magnesium, phosphorus, potassium, copper, thiamin, and vitamin B-6. Both the canned and cooked-from-dried beans versions of the recipe are very similar in their nutrient contributions.
- Sensory Findings: Consumers found the canned version of *Brazilian Beans and Rice* significantly more acceptable in appearance than the recipe containing dried beans. Both versions (canned and dried) were scored equally acceptable based on color, aroma, flavor, texture, aftertaste, and overall acceptability.

### **Jewel Fruit Salad**

*Prepared with ruby grapefruit, red grapes, green grapes, and Mandarin oranges.*

Two versions of the recipe were analyzed – one using canned ingredients and one using fresh ingredients – with ruby grapefruit and Mandarin oranges as the variable ingredients.

- Nutritional Findings: A serving of *Jewel Fruit Salad*, regardless of the form of the ingredients (canned or fresh), is an excellent source of vitamin C although the fresh version has slightly more than double the amount of vitamin C than the canned version.
- Sensory Findings: Consumers rated the *Jewel Fruit Salad*, regardless of the form of the ingredients (canned or fresh), equally acceptable based on appearance, aroma, texture and overall acceptability. The version using canned fruits had a significantly more acceptable color, but less acceptable flavor and aftertaste than the version using fresh fruit.

**Recipes Analyzed/Variable Ingredient(s) Tested:**

|  |  |
|--|--|
| <b><i>Chicken Quiche:</i></b>                | Chicken (canned vs. fresh)   |
| <b><i>Crab Dip:</i></b>                      | Crab (canned vs. fresh)  |
| <b><i>Tuna Bruschetta:</i></b>               | Tuna (canned vs. fresh)  |
| <b><i>Salmon Salad with Vinaigrette:</i></b> | Salmon (canned vs. fresh)  |
| <b><i>New England Clam Chowder:</i></b>      | Clams (canned vs. fresh vs. frozen)  |
| <b><i>Cranberry-Maple Sauce:</i></b>         | Cranberries (canned vs. frozen)  |
| <b><i>Baked Fruit Compote:</i></b>           | Pineapple (canned vs. fresh)<br>Mandarin Oranges (canned vs. fresh)<br>Sweet Cherries (canned vs. frozen)<br>Apricots (canned vs. dried) |
| <b><i>Scalloped Corn:</i></b>                | Corn (canned vs. fresh vs. frozen)   |
| <b><i>Sweet Potato Pie:</i></b>              | Sweet Potatoes (canned vs. fresh)  |
| <b><i>Carrots with Parsley and Mint:</i></b> | Carrots (canned vs. fresh vs. frozen)  |
| <b><i>Pumpkin Soup:</i></b>                  | Pumpkin (canned vs. fresh)   |
| <b><i>Cold Cherry Soup:</i></b>              | Sour Red Cherries (canned vs. dried)   |
| <b><i>Brazilian Beans and Rice:</i></b>      | Beans (canned vs. dried)   |
| <b><i>Jewel Fruit Salad:</i></b>             | Ruby Grapefruit (canned vs. fresh)<br>Mandarin Oranges (canned vs. fresh)  |