Fiberstar Inc.
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Phone: 1 (715) 425 - 7550
Fax: 1 (715) 425 - 7572
713 St. Croix St.
River Falls, WI 54022 USA
www.citri-fi.com
info@citri-fi.com

Product of the U.S.A.

The Citri-Fi User's Guide

Designed by Nature.
Enhanced by Fiberstar.

To improve profit margins, quality, nutrition and label declarations

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In This Document

The Citri-Fi User's Guide is intended to introduce you to all natural Citri-Fi and instruct you how it can be used to:

Improve Profit Margins Improve Quality

Improve Nutrition Improve Label Declarations

Citri-Fi delivers these benefits because of its impressive functional properties that can be used to manage moisture; partially replace oil, fat, egg and meat; replace synthetic ingredients; enhance texture; and thicken and stabilize food emulsions.

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Why Use Citri-Fi?

Our customers use Citri-Fi to improve profit margins, quality, nutrition, and label declarations. Citri-Fi helps accomplish these objectives by tightly binding moisture; improving yields; partially replacing oil, fat, eggs and meat; synergistic yield increases when combined with phosphate and kappa carrageenan; and replacing synthetic ingredients such as phosphates, emulsifiers, stabilizers and complex gum systems.

Moisture Management

Citri-Fi will bind more moisture, more tightly than comparable ingredients through cooking, baking, freezing and product shelf life. Citri-Fi inhibits purge, evaporative and drip loss, moisture migration during storage, ice crystal formation and syneresis upon thawing to improve yields, profit margins and product quality.

Partial Oil, Fat, Egg and Meat Replacement

Citri-Fi is an excellent partial oil, fat, egg and meat replacer used to reduce ingredient costs and improve profit margins, nutrition and ingredient declarations for a wide variety of food products. Citri-Fi and extra water cost less than the oil, fat, egg and meat they replace. Such application of Citri-Fi will also help to improve nutrition by reducing fat, trans fat, saturated fat and calories per serving.

Replacement of Synthetic Ingredients

All natural Citri-Fi improves ingredient declarations while maintaining or reducing costs by replacing synthetic phosphates, emulsifiers, stabilizers and complex gum systems.

Label Friendly

Citri-Fi is a multi-functional food ingredient made from citrus pulp and is all-natural, non-allergenic, GRAS, non-GMO, gluten free, kosher, halal, and has a neutral odor and taste. Citri-Fi is an ingredient, not a food additive, and does not require an e-number in Europe.

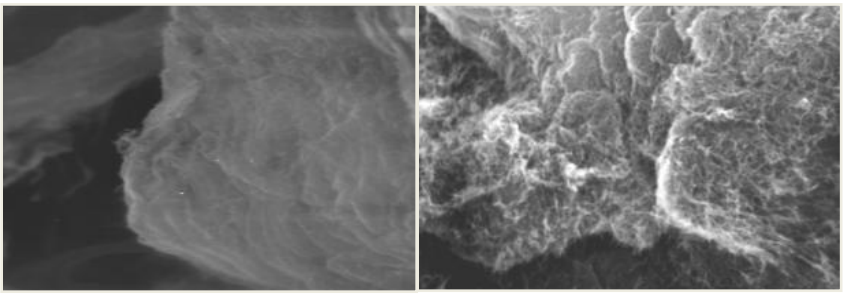
Award Winning

Citri-Fi was recognized with a silver award as one of the most innovative food ingredients at the Food Ingredients Europe show in 2007. The award was given in recognition of Citri-Fi's unique ability to improve profit margins, food quality and nutrition.

The Difference between Citri-Fi and Other Fibers

High surface area is required to bind large amounts of water. Other fibers are generally purified to present primarily insoluble fibers. They are ground to small particle size to increase surface area. Water is held by hydrogen bonding, a relatively weak mechanism which is easily broken during cooking, baking, freezing and storage. Citri-Fi is made differently. It is not purified, but is left holistic to include both soluble and insoluble fiber, protein, sugar and fat. It uses a patented mechanical process that opens this holistic fiber structure to create an open porous fiber matrix that has high internal surface area. This enables Citri-Fi to employ multiple binding mechanisms (lipophilic bonding of the protein to fat, hydrogen bonding of the soluble and insoluble fiber to water, entrapment and surface tension forces exerted by the expanded fiber matrix) to bind and hold more water and oil through cooking, baking, freezing and storage than other fibers. This is the reason that food manufacturers that use Citri-Fi in their formulations enjoy higher yields and profit margins.

Images: 10,000 times magnification



Citrus Fiber before Processing | Citri-Fi after Processing

Citri-Fi Composition

Insoluble fiber	34.9%	Sugar	7.4%
Soluble fiber	33.3%	Other	16.2%
Total fiber	68.2%	Total	100.0%
Protein	8.2%		

Citri-Fi Products

Citri-Fi products are available in three particle sizes: standard grind, fine grind and micro grind. Co-processing Citri-Fi with gums (actual infusion of the gum into Citri-Fi's fiber matrix) generates a synergistic increase in water holding capacity by approximately 30% in a centrifuge and up to 8.0% in a baked or cooked product.

Citri-Fi 100
Available in standard grind, fine grind FG, and micro grind M40

Citri-Fi 200 (Infused with Guar Gum)
Available in standard grind, fine grind FG, and micro grind M40

Citri-Fi 300 (Infused with Xanthan Gum)
Available in fine grind FG and micro grind M40

Standard Grind
Greater than 95% passing 30 mesh

Fine Grind FG
Greater than 95% (±4) passing 100 mesh

Micro Grind M40
Greater than 95% (±4) passing 200 mesh

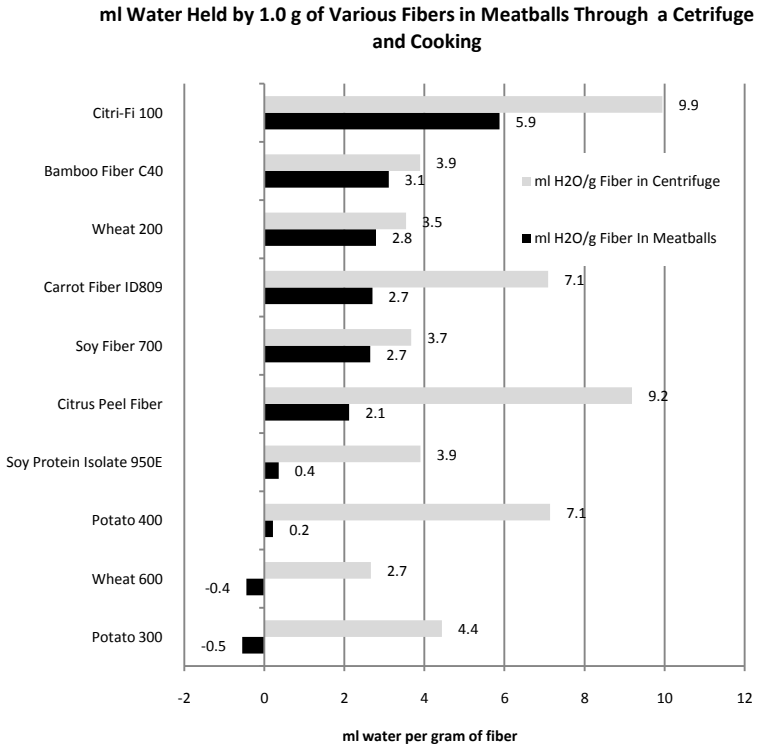
Water Holding Comparative Testing of Various Fibers

Water Holding Capacity of Various Fibers in a Centrifuge

A comparison of the water binding functionality of various fibers measured in ml of water retained per gram of fiber. (AACC - Standard Method # 56 - 30).

Water Holding Capacity of Various Fibers in Meatballs

Citri-Fi was compared to several other fibers to test each ingredient's water holding capacity in a meatball application. Each product was used in otherwise identical meatball formulas. After cooking, the meatballs were weighed to compare yields. Meatballs containing 1.0% Citri-Fi 100 held on to 2.1 times more water than meatballs containing 1.0% wheat fiber. Meatballs made with potato 300 and wheat 600 purged more water than the control meatballs that contained no fiber. Citri-Fi's capacity to bind and hold more water than other fibers during cooking or baking, results from its unique physical and chemical composition. Citri-Fi is an expanded fiber matrix which has a greatly increased internal surface area. In addition to insoluble fiber, Citri-Fi has high levels of both soluble fiber and protein which impart it with additional binding mechanisms including entrapment, surface tension as well as both lipophilic and hydrophilic binding. The result is higher cooked and baked weight yields which mean higher profits.



Objectives and Benefits

Citri-Fi products are primarily used to improve profit margins, quality, nutrition, and ingredient declarations. When food manufacturers and processors use Citri-Fi they experience the benefits of lower costs, lower cooking and baking losses, improved yields and profit margins, reduced purge, reduced moisture migration during storage, less ice crystal formation, less syneresis upon thawing, improved thickening and stabilization in food emulsions, enhanced palatability and texture, cleaner ingredient labels, fewer calories, and improved nutritional declarations. Our customers enjoy these benefits by utilizing Citri-Fi's multi-functional properties to bind moisture, partially replace oil, fat, eggs and meat, replace phosphates, synergize with phosphates and kappa carrageenan, thicken and stabilize food emulsions. Often Citri-Fi achieves several of these functions simultaneously. This page outlines how Citri-Fi benefits food manufacturers and processors.

Improved Profit Margins

- Improved yields from tightly binding water to reduce purge, syneresis, drip and evaporation losses
- Lowered costs resulting from partial replacement of higher priced ingredients (eggs, fats, oils, and meats) with Citri-Fi and water
- Lowered costs resulting from replacement of higher priced complex gum and synthetic stabilizer systems
- Lowered energy and labor costs resulting from faster bake and cook times when fats and oils are partially replaced with Citri-Fi and water

Improved Quality and Texture

- Enhanced palatability due to more uniform distribution of moisture in product
- Reduced moisture migration, ice crystal formation and syneresis upon thawing due to tight binding of free water
- Tightly bound water helps maintain freshness and delay staling due to inhibited moisture migration, reduced syneresis and purge
- Improved flavor due to higher retention of natural juices during cooking
- Better texture, mouthfeel and taste when gums are replaced with Citri-Fi

Improved Nutrition and Ingredient Declarations

- All natural labeling
- Citri-Fi is GRAS, non-GMO, non-allergenic and gluten free
- Reduced calories, fat, trans fat and saturated fat from partial replacement of oil and fat
- Cleaner ingredient label when Citri-Fi is used to replace synthetic emulsifier and stabilizer ingredients, phosphates and complex gum systems
- Reduced cholesterol from partial replacement of eggs

Proven Applications

Following are some proven ways Citri-Fi can be used in a wide range of food applications to benefit manufacturers.

Baked Goods

- Stabilize and tightly bind free water to reduce evaporative loss during baking to extend freshness and improve yields and profits
- Tightly bind added water to extend freshness and improve yields and profits
- Partially replace oil and fat to improve nutrition and reduce costs, saturated and trans fat levels as well as bake time (water transfers heat more efficiently than fat meaning lower energy and labor costs while creating extra plant capacity)
- Partially replace eggs to reduce costs, calories and cholesterol to improve profit margins and nutrition

Beverages

- Stabilize other ingredients in beverages to improve quality
- Impart pulpy mouth feel to beverages to improve quality and texture
- Control viscosity and texture to improve quality

Dairy Products

- Replace higher priced synthetic emulsifiers and stabilizers to reduce costs, improve quality and improve ingredient declarations
- Partially replace fat to reduce costs, saturated fat, trans fat and calories while maintaining quality and improving nutrition
- Control viscosity and texture to improve quality

Fats and Oils

- Partially replace shortening to lower costs, saturated fat, trans fat, and calories
- Solidify edible oils while at the same time lowering costs, saturated fat, trans fat and calories

Frozen Foods

- Stabilize and tightly bind free water to reduce moisture migration during storage, ice crystal formation and syneresis upon thawing to improve quality, yields and profits
- Tightly bind added water in frozen foods to improve yields and profits

Fruits and Vegetables

- Coat fruit pieces to bind free water and reduce syneresis to improve the quality of fruit custards and desserts
- Coat reduced moisture vegetables to bind free water and reduce syneresis to improve quality
- Stabilize fruit fillings when used in baked goods to prevent boil over and improve quality

Meats

- Stabilize and tightly bind free fat and water to reduce purge, drip loss and syneresis to improve quality, yields, and profits
- Tightly bind added water in processed meat products to improve yields and profits
- Replace phosphate salts to make foods more natural
- Synergy with phosphates and carrageenan to improve yields and profits
- Partially replace meat with Citri-Fi, water and vegetable protein to reduce costs
- Partially replace oil and fat with Citri-Fi and water in processed meat products to reduce costs and improve nutrition

Sauces and Dressings

- Partially replace oil to lower costs, saturated fat, trans fat and calories and improve profit margins
- Emulsify and stabilize other ingredients including replacement of higher priced synthetic emulsifiers and stabilizers and gum systems to improve quality and ingredient labels while reducing costs
- Control viscosity and texture to improve quality

Test to Compare Yield, Profit Margin and Lost Profit by Fiber in Meatballs

Citri-Fi and ten other fibers were tested to compare yield, profit margin and lost profit in a meatball application. For this test, Citri-Fi, wheat fiber 200 and 600, potato fiber 300 and 400, citrus peel fiber, bamboo fiber C40, oat fiber, carrot fiber ID809, soy fiber 700, soy protein isolate 950E, and combinations of 0.5% Citri-Fi and 2.0% bamboo fiber C40, 0.5% Citri-Fi and 2.0% soy fiber, 0.5% Citri-Fi and 2.0% wheat fiber 200, 0.5% Citri-Fi and 2.0% carrot fiber ID809, and 0.5% Citri-Fi and 2.0% soy protein isolate 950E were each incorporated into a standardized meatball formula. The percentage of each fiber incorporated into each trial varied between 0.5% and 2.0%. Cooked weight yields, revenues, cost and profit margins of each formulation were compared. When comparing each fiber individually, Citri-Fi 100 at a 1.0% use rate produced the greatest yield and profit. Citri-Fi and bamboo fiber combined gave the greatest increase in profits in the study.

Yield Comparison Methodology:

For these tests, 200 g of 80/20 ground beef and 2 g of salt was used as the standard meatball formula. The ground beef, salt and each respective test fiber were thoroughly mixed. Meatballs were made to weigh approximately 35 g each. A total weight measurement was taken for each of the control and test batches before cooking. The meatballs were then cooked on tin foil in an oven at 400° F (204.4 C°) for 8 minutes and 50 seconds. After cooking the meatballs were removed from the oven and allowed to sit for ten minutes. They were then removed from the tin foil and weighed. The total post cooked weight for each batch was divided by the total precooked weight for each batch to determine post-cooked yield. Several rounds of testing were done and average numbers were recorded. The graph on the next page shows the increase in yield over the control and the composition of the yield increase (added fiber and retained cooking juices).

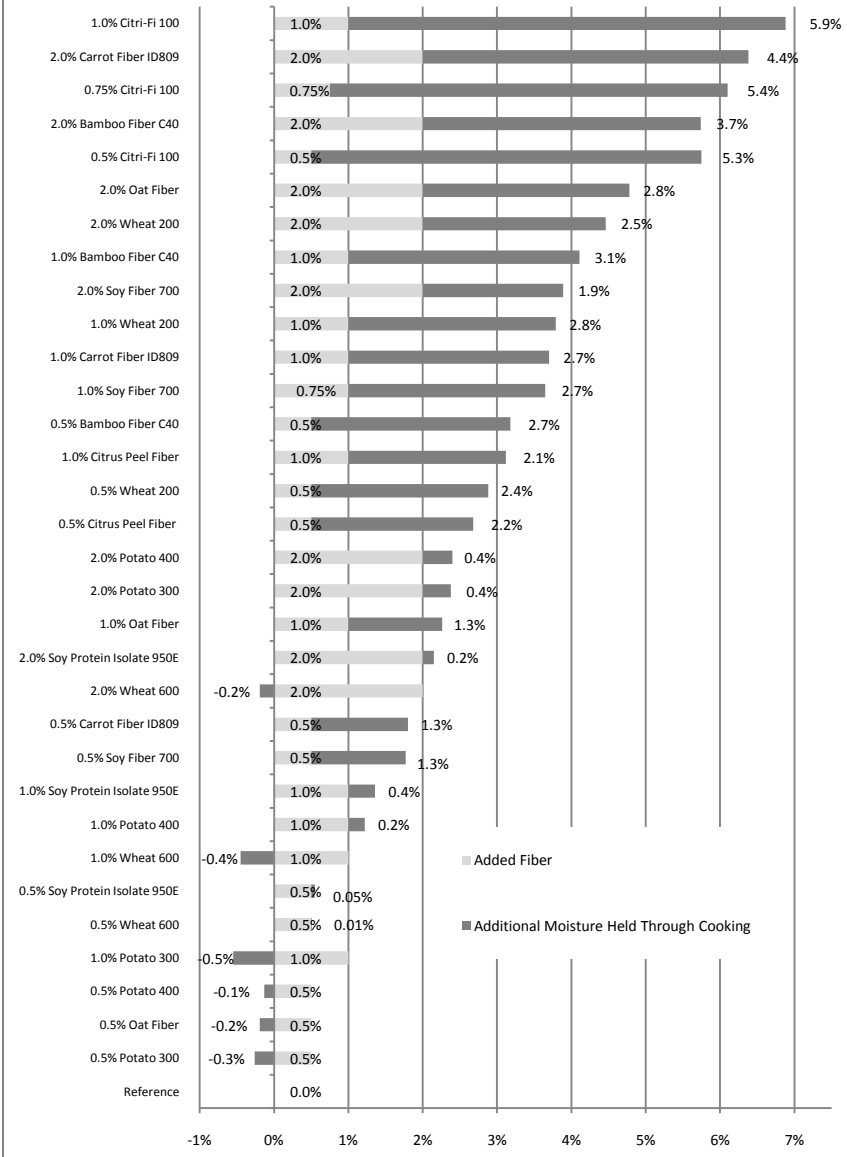
Profit Margin Analysis Methodology:

To determine revenues, a sell price of $5.00/kg was used for finished meatballs. A standard cost of $2.50/kg for the meatball mixture was used to which the estimated fiber costs for each trial were added. The cost comparison was based on 100 kg of pre-cooked weight for each test batch. Profit margins were calculated as the revenue (yield x $5.00) minus the cost for 100 kg of the control and each test. Profit margins are shown as the percentage improvement in profitability over the control.

Conclusion:

When it comes to binding and holding more water through a cooking process, no other fiber can compare to Citri-Fi. Other fibers require two to four times more fiber be incorporated into the formula and even then the bound water is less than the amount held by Citri-Fi. Citri-Fi provides higher yields and lower cost in use than other fibers resulting in larger profit margins. The charts on pages 8 through 12 show Citri-Fi as compared to ten other fibers in terms of improved yield and profitability.

Graph 2
% Yield Increase Comparison of Meatballs Using Various Types and Levels of Fibers
(% Fiber Incorporated) & (% Additional Moisture Held Through Cooking)



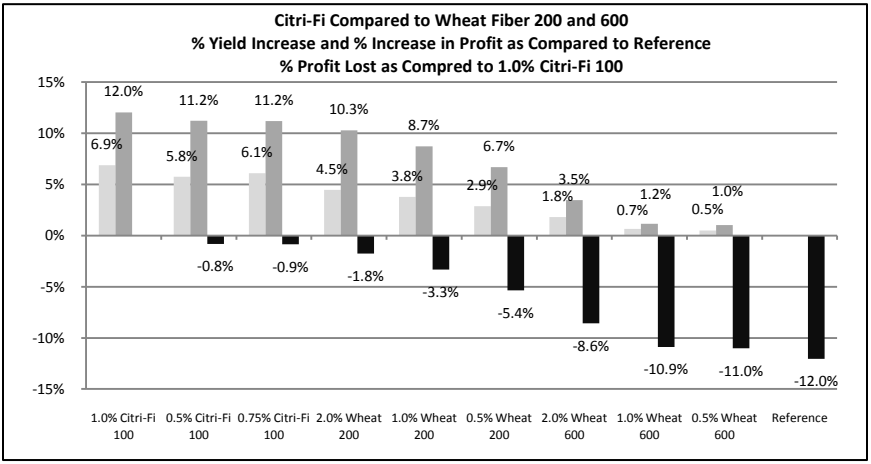
Profit Comparisons of Various Fibers in Meatballs

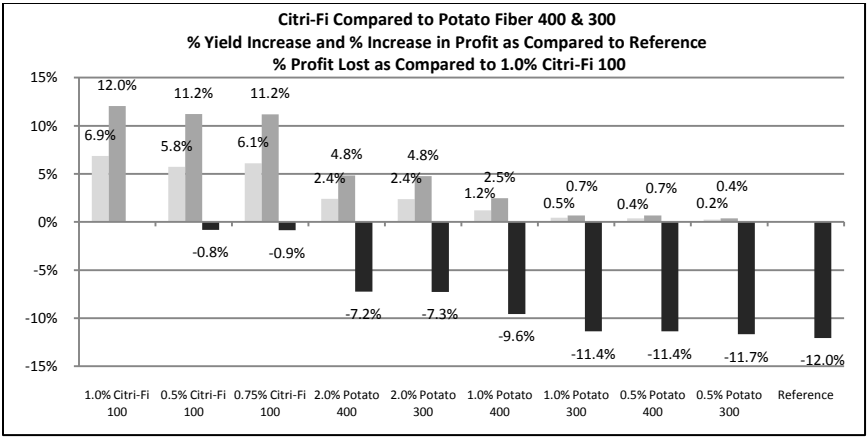
Price List Used for Profit Comparison in USD/kg			
Fiber	Cost	Fiber	Cost
Citri-Fi	$7.00	Bamboo Fiber C40	$3.00
Wheat Fiber 200	$2.30	Oat Fiber	$2.55
Wheat Fiber 600	$3.00	Carrot Fiber ID809	$5.89
Potato Fiber 400	$3.00	Soy Fiber 700	$0.73
Potato Fiber 300	$3.00	Soy Protein Isolate 950E	$2.27
Citrus Peel Fiber	$5.80		

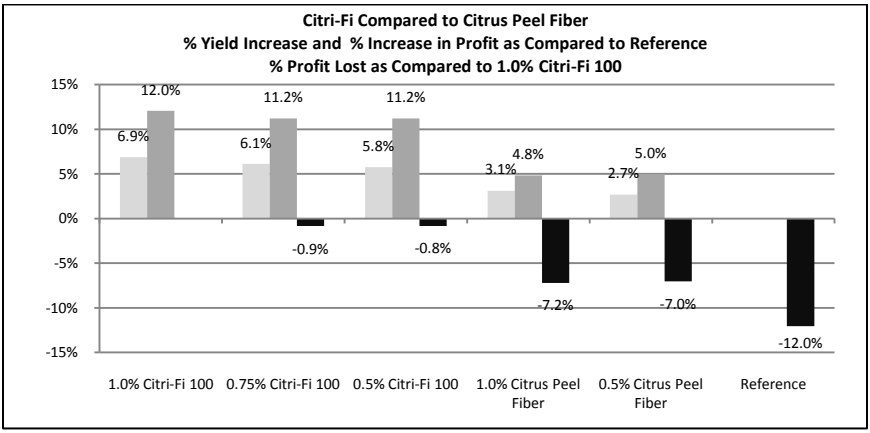
% Yield Increase as Compared to Reference

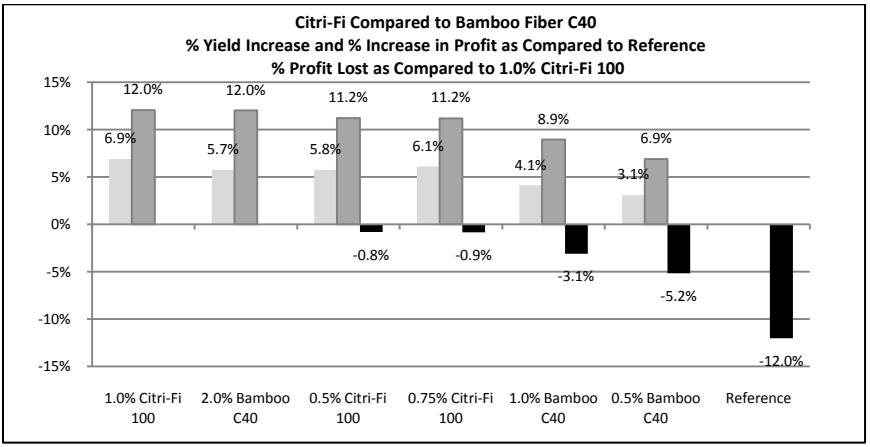
% Increase in Profit as Compared to Reference

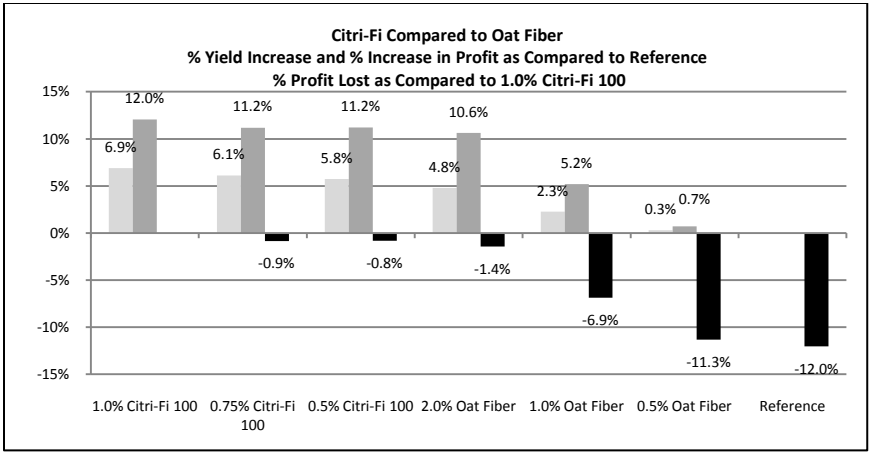
% Profit Lost Compared to Formulation with 1.0% Citri-Fi 100

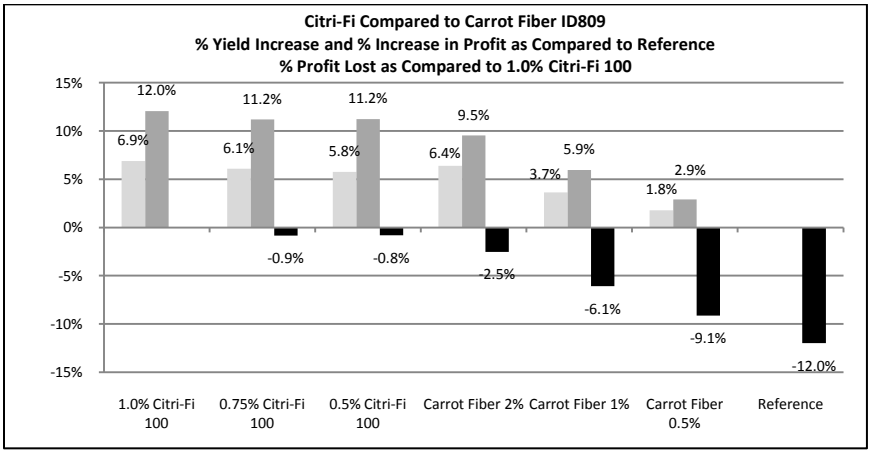


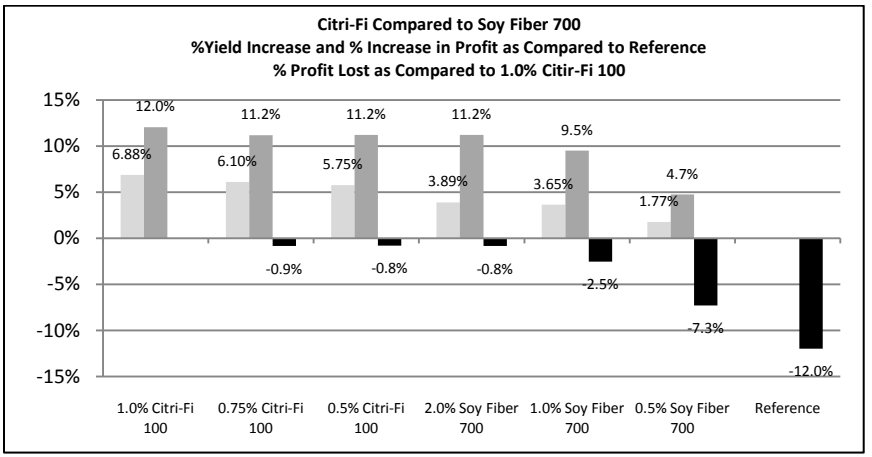

Citri-Fi Compared to Potato Fiber 400 & 300
% Yield Increase and % Increase in Profit as Compared to Reference
% Profit Lost as Compared to 1.0% Citri-Fi 100
15%
10%
5%
0%
-5%
-10%
-15%
12.0%
6.9%
11.2%
5.8%
-0.8%
11.2%
6.1%
-0.9%
4.8%
2.4%
-7.2%
4.8%
2.4%
-7.3%
2.5%
1.2%
-9.6%
0.7%
0.5%
-11.4%
0.7%
0.4%
-11.4%
0.4%
0.2%
-11.7%
-12.0%
1.0% Citri-Fi 100
0.5% Citri-Fi 100
0.75% Citri-Fi 100
2.0% Potato 400
2.0% Potato 300
1.0% Potato 400
1.0% Potato 300
0.5% Potato 400
0.5% Potato 300
Reference

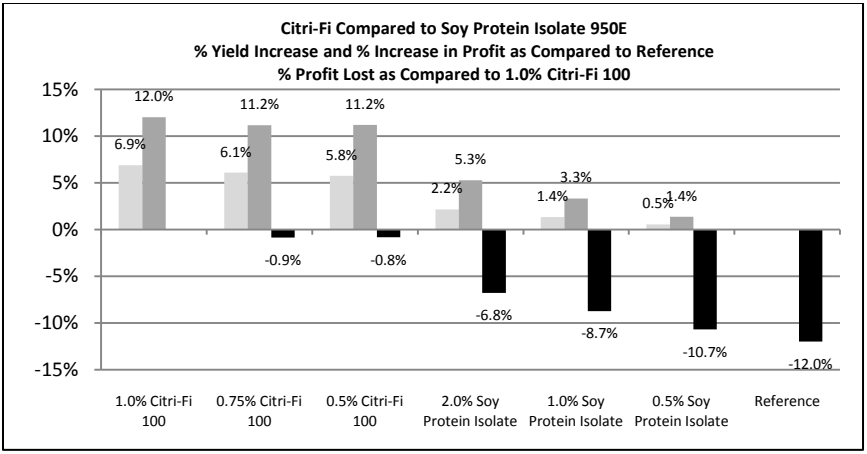

Citri-Fi Compared to Citrus Peel Fiber
% Yield Increase and % Increase in Profit as Compared to Reference
% Profit Lost as Compared to 1.0% Citri-Fi 100
15%
10%
5%
0%
-5%
-10%
-15%
12.0%
6.9%
11.2%
6.1%
-0.9%
11.2%
5.8%
-0.8%
4.8%
3.1%
-7.2%
5.0%
2.7%
-7.0%
-12.0%
1.0% Citri-Fi 100
0.75% Citri-Fi 100
0.5% Citri-Fi 100
1.0% Citrus Peel Fiber
0.5% Citrus Peel Fiber
Reference


Citri-Fi Compared to Bamboo Fiber C40
% Yield Increase and % Increase in Profit as Compared to Reference
% Profit Lost as Compared to 1.0% Citri-Fi 100
15%
10%
5%
0%
-5%
-10%
-15%
12.0%
6.9%
12.0%
5.7%
11.2%
5.8%
-0.8%
11.2%
6.1%
-0.9%
8.9%
4.1%
-3.1%
6.9%
3.1%
-5.2%
-12.0%
1.0% Citri-Fi 100
2.0% Bamboo C40
0.5% Citri-Fi 100
0.75% Citri-Fi 100
1.0% Bamboo C40
0.5% Bamboo C40
Reference


Citri-Fi Compared to Oat Fiber
% Yield Increase and % Increase in Profit as Compared to Reference
% Profit Lost as Compared to 1.0% Citri-Fi 100
15%
10%
5%
0%
-5%
-10%
-15%
6.9%
12.0%
6.1%
11.2%
-0.9%
5.8%
11.2%
-0.8%
4.8%
10.6%
-1.4%
2.3%
5.2%
-6.9%
0.3%
0.7%
-11.3%
-12.0%
1.0% Citri-Fi 100
0.75% Citri-Fi 100
0.5% Citri-Fi 100
2.0% Oat Fiber
1.0% Oat Fiber
0.5% Oat Fiber
Reference


Citri-Fi Compared to Carrot Fiber ID809
% Yield Increase and % Increase in Profit as Compared to Reference
% Profit Lost as Compared to 1.0% Citri-Fi 100
15%
10%
5%
0%
-5%
-10%
-15%
6.9%
12.0%
6.1%
11.2%
-0.9%
5.8%
11.2%
-0.8%
6.4%
9.5%
-2.5%
3.7%
5.9%
-6.1%
1.8%
2.9%
-9.1%
-12.0%
1.0% Citri-Fi 100
0.75% Citri-Fi 100
0.5% Citri-Fi 100
Carrot Fiber 2%
Carrot Fiber 1%
Carrot Fiber 0.5%
Reference

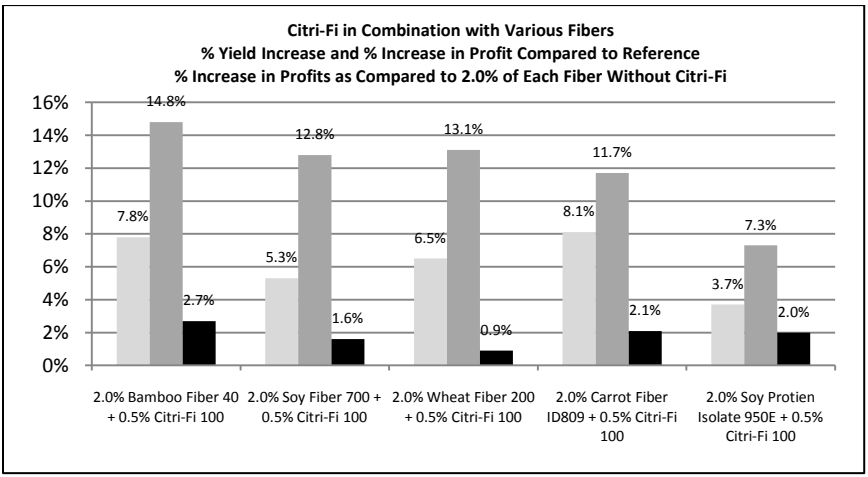

Citri-Fi Compared to Soy Fiber 700
%Yield Increase and % Increase in Profit as Compared to Reference
% Profit Lost as Compared to 1.0% Citir-Fi 100
15%
10%
5%
0%
-5%
-10%
-15%
6.88%
12.0%
6.10%
11.2%
-0.9%
5.75%
11.2%
-0.8%
3.89%
11.2%
-0.8%
3.65%
9.5%
-2.5%
1.77%
4.7%
-7.3%
-12.0%
1.0% Citri-Fi 100
0.75% Citri-Fi 100
0.5% Citri-Fi 100
2.0% Soy Fiber 700
1.0% Soy Fiber 700
0.5% Soy Fiber 700
Reference



% Yield Increase as Compared to Reference

% Increase in Profit as Compared to Reference

% Increase in Profits as Compared to 2.0% of Each Fiber Without Citri-Fi



Partial Replacement of Oil - Cost Saving Analysis

Citri-Fi and water can be used to partially replace oil and fat in a wide variety of food applications. Using Citri-Fi and extra water to partially replace oil and fat can reduce ingredients costs, fat content and calories while improving profit margins and nutrition. When Citri-Fi and extra water are used in this application, the oil/fat is usually replaced with 1 part Citri-Fi and 7 to 10 parts extra water. We compared the cost of Citri-Fi and extra water to the cost of the oils they could replace. See the shaded area for percent savings at typical oil prices. The detailed instructions for partial oil and fat replacement beginning on page 14 make Citri-Fi easy to incorporate into existing formulas.

Oil	Cost of Oil		Cost of Citri-Fi/Water in a 1 to 7 ratio		(Cost) Savings	Cost of Citri-Fi/Water in a 1 to 8 ratio		(Cost) Savings
	Lb.	Kg.	Lb.	Kg.		Lb.	Kg.	
Soybean	$0.35	$0.76	0.41	0.90	(18%)	0.36	0.72	(5%)
Corn	$0.39	$0.86	0.41	0.90	(4%)	0.36	0.72	7%
Palm	$0.46	$1.01	0.41	0.90	11%	0.36	0.72	21%
Sunflower	$0.52	$1.15	0.41	0.90	22%	0.36	0.72	31%
Citri-Fi	$3.26	$7.20	See Shaded Area for Cost Savings					
	Cost of Oil		Cost of Citri-Fi/Water in a 1 to 9 ratio		Savings	Cost of Citri-Fi/Water in a 1 to 10 ratio		Savings
	Lb.	Kg.	Lb.	Kg.		Lb.	Kg.	
Soybean	$0.35	$0.76	$0.33	$0.72	5%	0.30	0.65	15%
Corn	$0.39	$0.86	$0.33	$0.72	12%	0.30	0.65	25%
Palm	$0.46	$1.01	$0.33	$0.72	25%	0.30	0.65	35%
Sunflower	$0.52	$1.15	$0.33	$0.72	44%	0.3	0.65	43%

Partial Replacement of Egg Cost Saving Analysis

For our egg replacement cost analysis we used a muffin formula that called for 13.0 kg of whole eggs with a 100.0 kg of total ingredients in the formula. Citri-Fi and water were used to replace 15%, 20% and 25% of whole liquid eggs. The ratio of Citri-Fi to water used to replace eggs ranged from one part of Citri-Fi to 17, 19 and 21 parts water. The cost analysis is based on the current cost of eggs at $1.17/kg (2/19/2010 price) and the average price of Citri-Fi at $7.20/kg. Our calculations below show that using Citri-Fi and water to replace eggs creates a cost savings in every scenario! For example, to determine cost savings using a 1:17 ratio, divide the price of Citri-Fi by 18, and compare that to the price of eggs to see an immediate 65.8% savings in egg costs. In the most cost effective scenario, Citri-Fi and water can reduce egg costs by 71.9%. Partially replacing eggs with Citri-Fi and water is an effective method to reduce costs and improve margins and nutrition without reducing quality.

Percent Egg Replacement	Kg of Eggs Replaced (of 13)	Cost of Egg Replaced	Citri-Fi to Water Ratio	Cost of Citri-Fi and Water In Formula	Cost Savings On Eggs Replaced	Percent Cost Savings on Eggs Replaced
15%	1.95	$2.28	1 to 17	$0.78	$1.50	65.8%
			1 to 19	$0.70	$1.58	69.2%
			1 to 21	$0.64	$1.64	71.9%
20%	2.60	$3.04	1 to 17	$1.04	$1.97	65.8%
			1 to 19	$0.94	$2.07	69.2%
			1 to 21	$0.86	$2.15	71.9%
25%	3.25	$3.80	1 to 17	$1.30	$2.50	65.8%
			1 to 19	$1.17	$2.63	69.2%
			1 to 21	$1.07	$2.73	71.9%

Bind and Stabilize Free Water

- Baked goods
- Dairy
- Frozen foods
- Fruits and vegetables
- Processed meats

In Refrigerated and Shelf Stable Products

Use Citri-Fi to improve product quality, yield and profit margins by binding and stabilizing free water and oil.

In Cooked and Baked Products

Use Citri-Fi to improve yield and profit margins by binding and holding more water than other fibers through a cooking or baking process.

In Frozen Food Products

Use Citri-Fi to improve product quality, yield and profit margins while reducing ice crystal formation during frozen storage and syneresis upon thawing.

Improve Quality

By binding and stabilizing free water, reducing purge, inhibiting ice crystal formation and syneresis upon thawing. Improves flavor by capturing natural oils and juices that would otherwise be lost to drip loss.

Improve Yield and Profit Margins

By binding and holding more water than other fibers through a cooking or baking process. Citri-Fi will hold more water than other fibers to improve yields and profits.

Easy to Use

Simply disperse Citri-Fi in formula oil or premix with dry ingredients and follow your standard mixing procedures. No high shear mixing required. Do not pre-hydrate Citri-Fi with water.

Incorporating Citri-Fi into Your Formula For Binding and Stabilizing Free Water

The objective is to find the appropriate Citri-Fi product and the use level that gives the optimum combination of syneresis control, improved yield and sensory characteristics. Use the following directions to help accomplish this.

1) Find the recommended Citri-Fi product for your application or one that is similar in Table 1 on the next page. Recommended Citri-Fi products are located to the right of each application and listed in order of recommendation.
2) Estimate the percent of free water that you want to bind and retain in your product. The percentage should represent the estimated amount of free water as percent of total formula weight.
3) Calculate the amount of Citri-Fi required to bind the percent of free water estimated in step 2.
    a) For Citri-Fi 100 products divide the estimated percentage of free water by 7
    b) For Citri-Fi 200 products divide the estimated percentage of free water by 10
    c) If you are unsure of the percent of free water, use the midpoint of the recommended usage rate range listed in Table 1 as a percentage of total formula weight
4) How to Incorporate Citri-Fi:
    a) Never pre-hydrate Citri-Fi with water. Instead, we recommend that Citri-Fi be dispersed into 2 to 4 times its weight in fat or oil (when possible). In the absence of sufficient formula oil, we recommend that Citri-Fi be pre-mixed with the other dry ingredients in the formula (largest volume possible) before the introduction of liquid ingredients. The far right column on Table 1 recommends which incorporation method to use for each application. For many applications, either method of incorporation is acceptable. After you have incorporated Citri-Fi, follow your standard mixing procedure.
5) Prepare your test samples based on the following guidelines.
    a) Control: Use your original formula
    b) Test 1 (when Citri-Fi 100 is recommended): Use your original formula plus the percentage of Citri-Fi 100 calculated in step 3 (a)
    c) Test 2 (when Citri-Fi 200 is recommended): Use your original formula plus the percentage of Citri-Fi 200 calculated in step 3 (b)
6) Use the following guidelines to make adjustments to each test formula.
    a) If both taste and texture are acceptable, but there is still free water, retest by gradually increasing the amount of Citri-Fi until the free water is bound or until the sensory characteristics become unacceptable, if sensory characteristics become unacceptable, gradually reduce the level of Citri-Fi until sensory results are acceptable

b) If the taste is not acceptable, retest by gradually reducing the amount of Citri-Fi until taste is acceptable

c) If the texture is gritty or if visual particles are detectable, choose a finer grind size until these characteristics are acceptable

Table 1 - Bind and Stabilize Free Water with Citri-Fi

Category	Application	Recommended Citri-Fi Products	Suggested % of CF in Final Formula	Suggested Mixing Method
Meat	Beef patties	200 FG, 100 FG, 200, 100	0.25% - 0.75%	Fat/Dry
	Canned tuna	100 FG, 200 FG	0.25% - 1.00%	Fat/Dry
	Chicken, injected	100 M40	0.25% - 0.50%	Dry
	Ham, injected	100 M40	0.25% - 0.75%	Dry
	Hot dogs	100 FG, 200 FG, 100, 200	0.25% - 0.50%	Fat/Dry
	Italian sausage	100 FG, 200 FG, 100, 200	0.25% - 1.00%	Fat/Dry
	Meatballs	100 FG, 200 FG, 100, 200	0.25% - 1.00%	Fat/Dry
	Meat fillings	200, 200 FG, 100, 100 FG	0.25% - 1.00%	Fat/Dry
	Pet canned food	100 FG, 200 FG, 100, 200	0.25% - 0.75%	Fat/Dry
	Sausage	100, 200, 100 FG, 200 FG	0.25% - 1.00%	Fat/Dry
	Turkey, injected	100 M40	0.25% - 0.50%	Dry
Other	Chicken pasta salad	100 FG, 200 FG	0.25% - 0.50%	Dry
	Coleslaw	100 FG, 200 FG	0.25% - 0.75%	Dry
	Frozen vegetables	200 FG, 100 FG	0.25% - 1.00%	Dry
	Fruit filling	100 FG, 200 FG, 100 M40, 200 M40	0.25% - 1.00%	Dry
	Ganache	100 FG, 200 FG	0.25% - 0.75%	Oil/Dry
	Mashed potatoes	200 FG, 100 FG	0.25% - 0.75%	Oil/Dry
	Salsa	200 FG, 100 FG, 100 M40, 200 M40	0.25% - 1.00%	Dry
	Sauces	100 FG, 200 FG, 100 M40, 200 M40	0.25% - 1.00%	Oil/Dry
	Smoothies	100 FG, 200 FG	0.25% - 1.50%	Dry
	Tomato sauce	100 FG, 100 M40, 200 FG, 200 M40	0.25% - 2.00%	Dry
	Tomato soup	100 M40, 200 M40	0.25% - 0.75%	Dry

For more information visit http://citri-fi.com/product_applications.html

Bind and Stabilize Added Water

Without Increasing Water Activity Level

- Baked goods
- Frozen foods
- Processed meats

In Refrigerated and Shelf Stable Products

Use Citri-Fi and added water to improve product quality, yield and profit margins by binding and stabilizing added water.

In Cooked and Baked Products

Use Citri-Fi and added water to improve yield and profit margins by binding and holding added water through the cooking or baking process.

In Frozen Food Products

Use Citri-Fi and added water to improve product quality, yield and profit margins by increasing the moisture content while decreasing ice crystal formation during frozen storage and syneresis upon thawing.

Improve Quality

Citri-Fi tightly binds and holds added moisture through cooking, baking and storage to maintain more desirable moisture characteristics over time to extend shelf life.

Improve Yield and Profit Margins

Adding extra water and Citri-Fi to your formula will improve baked and cooked weight yields and profit margins. Adding Citri-Fi and extra water is a great way to increase profits while improving or maintaining food quality.

Improve Nutrition

Adding extra water and Citri-Fi reduces fat levels and calories per serving.

Easy to Use

Simply disperse Citri-Fi in formula oil or premix with dry ingredients then follow your standard mixing procedures. No high shear mixing is required. Do not pre-hydrate Citri-Fi with water.

Incorporating Citri-Fi into Your Formula For Binding and Stabilizing Added Water

When using Citri-Fi and added water to improve yields, the objective is to find the appropriate Citri-Fi product, use level, and amount of added water that gives the optimum combination of syneresis control, improved yield and sensory qualities (within product standards of identity regulations).

1) Look for an application similar to yours in Table 2 on the following page. You will find a recommended Citri-Fi product, a suggested percent range of Citri-Fi, and the suggested range of parts extra water per part of Citri-Fi to add to the formula.
2) To calculate the percent of Citri-Fi to add to your formula, use the midpoint of the suggested percentage rate of Citri-Fi. For example, if the suggested range is 0.50% - 1.00%, use 0.75% Citri-Fi in the overall formula as a starting point.
3) To determine how much water to add, use the midpoint of the recommended parts of extra water found in Table 2. For example, if the range is 4-7, then use 5.5 parts extra water per part Citri-Fi calculated in step 2. It is recommended that you pre-test this level of added water and Citri-Fi in your formula to assure that the adjusted products texture and consistency is comparable to the original formula. If it is too thick or stiff, increase the parts of water. If it is too thin or sticky, decrease the parts of extra water.
4) How to Incorporate Citri-Fi:
    a) Never pre-hydrate Citri-Fi with water. Instead, we recommend that Citri-Fi be dispersed into 2 to 4 times its weight in formula oil (when possible). In the absence of sufficient formula oil, we recommend that Citri-Fi be pre-mixed with the other formula dry ingredients (largest volume possible) before the introduction of liquid ingredients. Additional water should be incorporated along with other formula water. The far right column on Table 1 recommends which incorporation method to use for each application. For many applications, either method of incorporation is acceptable. After you have incorporated Citri-Fi, follow your standard mixing procedure.
5) Prepare test samples based on the following guidelines:
    a) Control: Use your original formula
    b) Test 1: Original formula plus the percent of Citri-Fi product and extra water as calculated in steps 2 & 3 above.
    c) Test 2: In this test, vary either the percent of Citri-Fi or the amount of water, but not both. If you decide to use the same percent of Citri-Fi as used in Test 1, then use a "water to Citri-Fi ratio" either 1 part more or 1 part less. If you decided to use the same amount of water as in Test 1, then use 0.10% more and 0.10% less of Citri-Fi. Examples of this method are shown in the following table:

	Test 1	Test 2 Change Water		Test 2 Change Citri-Fi	
% Citri-Fi	0.50	0.50	0.50	0.40	0.60
Water to Citri-Fi Ratio	5.50:1	4.50:1	6.50:1	6.88:1	4.58:1
% Additional Water	2.75	2.25	3.25	2.75	2.75

d) The "water to Citri-Fi ratio" is calculated by dividing the % of additional water by % of Citri-Fi.

e) Making these tests will give you a second perspective and comparison as to when to use more or less Citri-Fi or water to get the same consistency as the control.

6) Compare and evaluate the test results using the following guidelines to make adjustments:

a) For each test, if taste and texture are acceptable, but there is still free water, gradually increase the amount of Citri-Fi until the free water is bound or until the sensory characteristics become unacceptable, then gradually reduce the amount of Citri-Fi until taste is acceptable

b) If the taste is acceptable but the texture is either too moist or too dry, gradually adjust the amount of extra water or the percentage of Citri-Fi until the texture is acceptable

c) If the texture is gritty or if visual particles are detectable, choose a finer grind size until these characteristics are acceptable

d) If the taste is unacceptable, gradually reduce the amount of Citri-Fi and water keeping the same Citri-Fi to water ratio or mask the flavor profile until it is acceptable

Table 2 - Bind and Stabilize Added Water

Category	Applications	Recommended Citri-Fi Product (in priority order)	Suggested % Citri-Fi of Final Formula	Suggested Parts Extra Water Per Part Citri-Fi	Suggested Mixing Method
Meat	Beef patties	200 FG, 100 FG, 100, 200	0.25%-0.75%	4 - 7	Fat/Dry
	Ham, injected	100 M40	0.25%-0.75%	4 - 7	Dry
	Hot dogs	100 FG, 200 FG, 100, 200	0.25%-0.50%	4 - 7	Fat/Dry
	Meat filling	200, 200 FG, 100, 100 FG	0.25%-1.00%	4 - 7	Fat/Dry
	Sausage	100, 100 FG, 200, 200 FG	0.25%-1.00%	4 - 7	Fat/Dry
Bakery	Bagels	300 FG, 100 FG	0.25%-1.00%	3.5 - 6	Dry
	Biscuits	100	0.75%-1.00%	3.5 - 6	Dry
	Fried sweet dough	200 FG, 100 FG	0.25%-1.50%	4	Dry
	Fruit filling	200 FG, 100 FG	0.25%-1.00%	4 - 7	Dry
	Sweet rolls	100 FG	0.25%-1.00%	3.5 - 6	Dry
	White yeast bread	300 FG, 100 FG	0.50%-1.00%	3.5 - 6	Dry
	Yeast raised donuts	100 FG	0.25%-1.00%	3.5 - 6	Dry
Other	Frozen vegetables	100 FG, 100 M40	0.25%-1.00%	4 - 7	Dry
	Salsa	200 FG, 100 FG, 100 M40	0.25%-1.00%	4 - 7	Dry
	Sauces	100 M40, 100 FG, 200 M40, 200 FG	0.25%-1.00%	4 - 7	Dry
	Flour, white	100 FG, 200 FG	1.00%-2.00%	4 - 7	Dry
	Flour, whole wheat	100, 200, 100 FG, 200 FG	1.00%-2.00%	4 - 7	Dry

For more information visit http://citri-fi.com/product_applications.html

Partial Replacement of Oil and Fat

Baked Goods

Partial replacement of oil and fat with Citri-Fi and added water can reduce ingredient costs, calories and bake time while improving profit margins and nutrition in baked goods.

Dairy, Sauces and Dressings

Partial replacement of oil with Citri-Fi and added water can reduce ingredient costs, fat content, and calories while improving profit margins and nutrition.

Processed Meat

Citri-Fi and extra water added to replace fat, when compliant with standards of identity regulations, can improve nutrition and reduce ingredient costs.

Reduce Ingredient Costs and Improve Profit Margins

Use Citri-Fi and water to partially replace oil and fat whenever the cost of Citri-Fi and water is lower than the cost of oil and fat.

Improve Nutrition

Replacing a portion of oil or fat with Citri-Fi and extra water will reduce calories and calories from fat, saturated fat and trans fat.

Easy to Use

Do not pre-hydrate Citri-Fi with water. Simply disperse Citri-Fi in formula oil or premix with dry ingredients and then follow your standard mixing procedure. No high shear mixing required.

Incorporating Citri-Fi into Your Formula For Partial Replacement of Oil and Fat

When using Citri-Fi for the partial replacement of oil and fat, the objective is to find the optimum combination of cost savings, quality, taste, texture and nutritional improvement.

1) To begin, find your application or one similar to yours in Table 4. Immediately above your application list, you will find a recommended Citri-Fi product. In the top row of Table 4 you will find the recommended water to Citri-Fi ratio. In the left hand column of Table 4 you will find the maximum recommended percent of fat replacement for the selected application.

2) To determine the amount of Citri-Fi to add to your reference formula, divide the weight of oil being replaced by the sum of the water to Citri-Fi ratio. For Example: to replace 20 kg of formula oil using a 7 to 1 water to Citri-Fi ratio, the adjusted formula would use 2.5 kg of Citri-Fi (20 kg of oil to be replaced ÷ 8 (the sum of a 7 to 1 water to Citri-Fi ratio) = 2.5 kg of Citri-Fi to be added).

3) To determine the amount of extra water to add to your reference formula, multiply the amount of Citri-Fi determined in Step 2 by the recommended parts of water to Citri-Fi. For example: 7 x 2.5 kg = 17.5 kg of extra water to be added. The sum of extra water in the formula and Citri-Fi should equal the amount fat/oil being replaced (17.5+2.5=20)

4) <u>How to Incorporate Citri-Fi and Added Water into Your Formula</u>
   a) For applications marked with an asterisk * in Table 4, we recommend that the Citri-Fi be dispersed into 2-4 times its weight in formula oil. For other applications, we recommend that Citri-Fi be pre-mixed with the largest volume of other dry ingredients before liquid ingredients are introduced. After you have incorporated Citri-Fi with other formula ingredients as outlined above, follow the mixing procedures of your reference formula. Never pre-hydrate Citri-Fi with water.

5) Prepare three samples based on the following guidelines:
   a) Control: Use your original formula
   b) Test 1: Use the recommended Citri-Fi product and the suggested water to Citri-Fi ratio to replace one-half of the suggested maximum percentage of oil replacement. For example: if the maximum oil replacement is 50%, begin by replacing one-half or 25% of the oil (50% ÷ 2 = 25%).
   c) Test 2: Use the recommended Citri-Fi product and the suggested Citri-Fi to water ratio to replace three-fourths of the suggested maximum percentage of oil replacement. This will give you a second perspective and comparison to determine how much oil replacement is possible for your specific formulation while maintaining the same consistency as the control. If Test 2 is acceptable, then increase the amount of oil replacement as shown as test 3 in Table 3

6) Example: To partially replace oil in Muffins when the original formula calls for 32 kgs of oil. For this application Table 4 recommends a 7 to 1 "water to Citri-Fi ratio" and a 50% maximum percent oil replacement.

Table 3 - Example Formulas for Muffin Application

	Control	Test 1	Test 2	Test 3
Oil	32 kgs.	24 kgs.	20 kgs.	16 kgs.
Percent Oil Replacement	0.0%	25.0%	37.5%	50.0%
Kgs of oil replaced	-	8.0 kgs.	12.0 kgs.	16 kgs.
Kgs of Citri-Fi	-	1.0 kg.	1.5 kgs.	2.0 kgs.
Water to Citri-Fi Ratio	-	7 to 1	7 to 1	7 to 1
Kg of Extra Water	-	7.0 kgs.	10.5 kgs.	14.0 kgs.

7) If the results of Test 2 are acceptable but Test 3 gives unacceptable results, the optimal oil replacement level for your specific formulation will be between 37.5% and 50%. Continue to refine the oil replacement level until the optimal fat replacement level is reached for your product.

8) REMINDER: In yeast raised dough products, bake times must be shortened to avoid over baking or cooking the product. The reason being that water transfers heat more efficiently than fat and products containing more water will bake or cook faster.

9) Compare and evaluate the test results using the following guidelines to make adjustments:
   a) If the consistency, taste and mouth feel are acceptable, use this type of Citri-Fi product, percentage of fat replacement and water to Citri-Fi ratio

   b) If the consistency is too thick or stiff, increase the water to Citri-Fi ratio and run another test. If the consistency is too thin or sticky, decrease the water to Citri-Fi ratio and run another test.

   c) It is recommended that you continue to adjust the percentage of oil and fat replacement (up or down) and water to Citri-Fi ratio (up or down) until you find the optimum combination of cost savings, quality, taste, texture and nutritional improvement.

Table 4 – Partial Oil and Fat Replacement

Recommended Ratio of Water to Citri-Fi		4:1	6:1	7:1
Suggested Maximum Percentage of Fat Replacement	50%	**CF 100** - Reduced shortening sweet dough* - Tortillas	**CF 100** - Biscuits - Nutritional bars	**CF 100** - Muffins - Brownies - Honey bun - Layer cake - Magdalenas - Pizza crust - Bread, buns **CF 100 FG** - Ranch dressing* - Alfredo sauce* - Hot dogs - Compound butter* - Natural cheese **CF 200** - Chocolate layer cake - Chocolate icing **CF 200 FG** - Frozen yogurt - Imitation mozzarella cheese*
	40%			
	33%		**CF 200 FG** - Butter in laminated roll-in product* - Croissants - Reduced fat frosting	**CF 100 FG** - Ranch dressing - Cured bratwurst **CF 200 FG** - Cream filling - Frozen yogurt - Ice cream - Soft serve ice cream
	30%		**CF 200 FG** - Cake donuts (reduced oil absorption)	
	25%			
	10%			

8:1	9:1	10:1	12:1
CF 100 - Cinnamon smear - Yeast raised donuts		**CF 100 M40** - Cheese sauce* **CF 200** - Reduced bake times with white bread and buns	**CF 200 FG** - Thousand Island salad dressing*
	CF 200 - Corn dog batter		
			CF 100 M40 - Mayonnaise*
		CF 100 FG - Pie crust	
	CF 200 - Batters for fried meat products	* Denotes the recommendation to disperse Citri-Fi in oil before incorporation. In applications with no asterisk, Citri-Fi should be premixed with dry ingredients.	

Phosphate Replacement

In Injected Meat and Poultry Products

Use Citri-Fi to replace Tripoli-, disodium and other phosphates to create a healthier and label friendly products while eliminating purge and maintaining similar yield and organoleptic qualities. Applications include injected ham and poultry products

In Processed Meat and Poultry Products

Use Citri-Fi to replace sodium phosphate in reformed chicken nuggets and similar products to create a healthier and label friendly products while maintaining original organoleptic qualities.

Improve Nutrition and Ingredient Labels

Citri-Fi will provide similar functionality as phosphates in injected and processed meat and poultry applications while providing an all natural solution for water binding and maintaining yield and organoleptic qualities in these types of products.

Incorporating Citri-Fi into Your Brine Formula

In Injected Meat and Poultry Products

1) Citri-Fi 100M40 can be used to replace phosphate on a one to one basis up to 0.5% level in the pre-cooked (post injected/pre-cooked) product. If there is a slight drop in the post-cooked yield observed in the test product, then it is suggested that rice starch be added up to 1.0% level in the pre-cooked (post injected/precooked) product.
2) To calculate from scratch, a 15% injection level into 100 kg of chicken with a target of 0.5% of Citri-Fi in the pre-cooked product would require 0.575 kg. of Citri-Fi 100M40 (100 kg of chicken + 15 kg of brine = 115 kg x 0.5% = 0.575 kg of Citri-Fi 100M40). If rice starch is needed, then add 1.15 kg of rice starch to the brine (100 kg of chicken + 15 kg of brine = 115 kg x 1.0% = 1.15 kg of rice starch).
3) To calculate the percent of Citri-Fi 100M40 in the brine, divide 0.575 kg of Citri-Fi 100M40 by 15 kg (amount of brine in the formula), which equals 3.8%.
4) To calculate the percent of rice starch in the brine, divide 1.15 kg of rice starch by 15 kg (amount of brine in the formula), which equals 7.6%.
5) Incorporate Citri-Fi into the brine solution so that there are no Citri-Fi lumps or fish eyes in the brine, which means either
    a) pre-mix Citri-Fi with dry ingredients before mixing into the brine
    b) use high shear mixing to fully disperse any clumps
    c) caution: do not use a level of Citri-Fi so high that the mixture gets too thick so it does not flow through the injection system.
6) When using Citri-Fi, it is important to keep the brine under constant agitation to ensure that the insoluble fibers contained in Citri-Fi do not settle out of suspension. For more information and a video demonstration of the recommended method of incorporating Citri-Fi into the brine, please follow this link http://www.fiberstar.net/CitriFiBrine.html.

In processed meat and poultry products

Use Citri-Fi 100FG in the formula at the level between 0.25%-0.75%. In reformed chicken nuggets/patties, the best results are achieved using 0.6% of Citri-Fi 100FG to replace 0.5% of sodium phosphate in the original formula. Citri-Fi provides comparable binding and water holding capabilities to that of phosphates.

When to add Citri-Fi

Citri-Fi should be added to the meat and/or fat before they are minced together to form a homogeneous mixture. This is done to assure that the Citri-Fi comes in direct contact with fat before it comes in contact with water. This method results in better emulsification and yields.

In Combination with Phosphates

In Injected Meat and Poultry Products

Citri-Fi 100M40 will help to improve post-cooked yields in injected meat and poultry products when used in combination with phosphates.

Improve Yield and Profit Margins

Citri-Fi will help retain more moisture in the post-cooked product as compared to phosphate alone. This means higher yields and profit margins while maintaining or improving organoleptic qualities.

Incorporating Citri-Fi 100M40 with Phosphates

Citri-Fi can be added on top of the original brine formula to further improve yield. The recommended amount of Citri-Fi 100M40 should fall between 0.2% - 0.4% in the post-injected/pre-cooked product, while phosphate levels should remain the same. This results in post-cooked yield improvements of 3% to 7%. For recommended procedures of incorporating Citri-Fi into the brine and how to calculate percent of Citri-Fi in the brine please refer to the instructions on the previous page.

Partial Egg Replacement

For Baked Goods, Partial Whole Egg Replacement, Partial Egg White Replacement & Total Egg Replacement for Eggless Mayonnaise

Reduce Costs and Improve Profit Margins

Use Citri-Fi, extra water and emulsifier (in certain applications) to partially replace whole eggs and egg whites in baked goods whenever the cost of Citri-Fi, water and additional emulsifier is lower than the cost of the eggs they replace.

Improve Nutrition

Replacing a portion of formula egg with Citri-Fi, extra water and emulsifier (in certain applications) can reduce total cholesterol level and calories to improve nutrition.

Easy to Use

Citri-Fi should be dispersed into oil, but may also be premixed with dry ingredients. Then follow your standard mixing procedures. Do not pre-hydrate Citri-Fi with water.

To Use Citri-Fi in Your Products

When Using Citri-Fi for the partial replacement of eggs the objective is to find the optimum combination of quality, cost savings, and nutritional improvement.

In Baked Goods (cakes, cookies, muffins, pie crust, etc)

General

The "General" guidelines apply to all partial egg replacement applications. In addition to the general guidelines there are instructions to "Partially Replace Whole Eggs" and to "Partially Replace Egg Whites." Follow the recommendations in the "General" category and either "To Partially Replace Whole Eggs" or "To Partially Replace Egg Whites"

- Recommended products are Citri-Fi 200 and Citri-Fi 200FG
- Citri-Fi is best used at 0.05 times the amount of egg replaced
- To incorporate into formulation disperse Citri-Fi into formula oil
- Additional water should be added at 17 to 21 times the amount of Citri-Fi
- Add additional water with liquid ingredients from the original formula

- We recommend starting at lower levels of egg replacement, 10% for partial whole egg replacement and 10% for partial egg white replacement. Gradually increase the percent of replacement to arrive at the optimum level where cost savings, quality and nutritional improvement objectives are met.

To Partially Replace Whole Eggs

- The maximum level of whole egg replacement is 25%
- When replacing high amounts of whole eggs (20%-25%) extra emulsifiers must be added to the formula
- We recommend 0.15% to 0.20% SSL (Sodium Stearoyl Lactylate) depending on the amount of egg replaced

To Partially Replace Egg Whites

- The maximum suggested level of egg white replacement is 25%
- When replacing egg whites no additional emulsifier is necessary
- In some formulations, such as yellow cake, up to 50% of egg whites have been successfully replaced

Eggless Mayonnaise

- Recommended product is Citri-Fi 300 M40
- Citri-Fi usage level (dispersed in oil) at 1.0% - 3.5%
- Xanthan gum can be added for any additional body that is needed

Thickening and Emulsion Stabilization

For Beverages, Dairy Products, Frozen Sauces, Oven Marinades, Salad Dressings and Sauces.

Use Citri-Fi to thicken and stabilize food emulsions to reduce costs and improve quality in any of the following ways:

- Thicken and stabilize food emulsions
- A thickener and stabilizer in one product
- Cost effective with low rates of use
- Emulsions are stable through freezing, cooking and baking
- Provides clean non-gummy mouthfeel
- Provides great flavor delivery
- Clean ingredient label by replacing complex gum systems and synthetic emulsifiers

Getting Started

Citri-Fi tightly binds oil and water to stabilize long lasting emulsions in a wide variety of foods. In thickening and stabilization applications, Citri-Fi often provides multiple benefits at the same time. For example in butter, layering fat and margarine, Citri-Fi is used to replace fat to improve profit margins and nutrition, and thicken and stabilize food emulsions while replacing chemical emulsifiers to improve label declarations.

Incorporating Citri-Fi into Your Formula

Table 5 provides suggested thickening and emulsion stabilization applications. The example applications show how much Citri-Fi to use and recommend specific Citri-Fi products to match the desired mouthfeel and texture. After you have created a basic formula using Citri-Fi, adjust the outlined variables to achieve the desired results.

Easy to Use

When using Citri-Fi for its thickening and emulsion stabilization functionalities, simply disperse Citri-Fi into at least two times its weight in formula oil prior to incorporation with other ingredients. For applications marked with an asterisk * we recommend you disperse the Citri-Fi into dry ingredients. After this adjustment, follow your standard mixing procedures. No high shear mixing is required. Do not pre-hydrate Citri-Fi with water.

Variables to Adjust For

- **Viscosity** - Adjust viscosity by increasing or decreasing the amount of Citri-Fi.
- **Mouthfeel** - Citri-Fi products come in three particle sizes. If your test formula has a gritty mouthfeel, try using a smaller particle size. Standard grind Citri-Fi products are greater than 95% passing 30 mesh, fine grind (FG) products are greater than 95% ± 4% passing 100 mesh, and micro grind products (M40) are greater than 95% ± 4% passing 200 mesh.
- **Enhanced Functionality** - If you want a cleaner label declaration choose from the Citri-Fi 100 product line. Citri-Fi 200 is co-processed with guar gum for enhanced water binding capacity and Citri-Fi 300 is co-processed with Xanthan gum to further improve functionality.

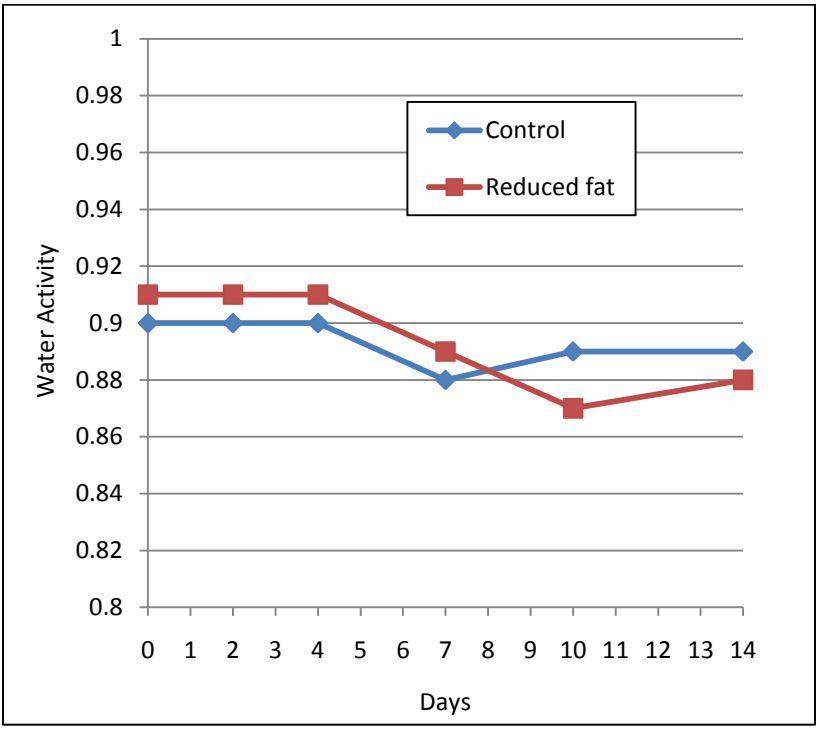
Table 5 – Thickening and Emulsion Stabilization

Application	Recommended Product	Suggested % of Total Formula
Butter	100 M40	0.25% - 1.50%
Cream Based Sauce	200 FG	0.25% - 1.50%
Dairy Stabilizer	100 M40	0.25% - 1.50%
Flavor Suspension	100 or 300 M40	0.25% - 1.50%
Ice Cream*	100 M40	0.25% - 1.50%
Layering Fat	200 FG	0.25% - 1.50%
Margarine	100 FG	0.25% - 1.50%
Mayonnaise	300 M40	0.25% - 1.50%
Salad Dressing	100 M40	0.25% - 1.50%
Tomato Sauces*	100 M40	0.25% - 1.00%

Water Activity

When Citri-Fi is used at recommended levels to bind added water into a formula, the water activity ("a_w") of the product to which Citri-Fi is added should remain similar to the a_w of the control. However, if the a_w increases, then the water to Citri-Fi ratio should be decreased. If the a_w decreases, then the water to Citri-Fi ratio can be left the same or increased, your choice. The following graph compares the water activity of a control muffin to a reduced fat muffin that incorporates one part Citri-Fi to seven parts water to partially replace 25% of the original formula oil.

Water Activity in Muffins



For More Information Visit www.citri-fi.com

Please see our website at www.citri-fi.com for additional information. The following pages outline frequently requested information and where to find it.

Citri-Fi Users Guide Digital Copy

The Citri-Fi User's Guide is also available online. The online User's Guide is available in html or as a PDF download. With the User's Guide online you will always have a clean available copy of this important document, as well as one that is easy to share with colleagues. The online User's Guide can be found at:

- **www.citri-fi.com/library.html**

Material Safety Data Sheets

Links to the MSDS sheets for each Citri-Fi product can be found at:

- **www.citri-fi.com/library.html**

Technical Data Sheets

Technical data sheets for each product include analytical test results, nutritional, food safety and physical property information. Links to the Technical Data Sheets for each product can be found at:

- **www.citri-fi.com/library.html**

GRAS Notification

A letter from the Food and Drug Administration confirms Citri-Fi's status as a substance generally regarded as safe can be found at:

- **www.citri-fi.com/GRAS.html**

USDA Non-Objection Letter for Whole Muscle Meat and Poultry

A letter from the Food Safety and Inspection Service of the USDA that verifies Citri-Fi's approval for use in injected and tumbled whole muscle meat and poultry in the USA can be found at:

- **http://www.citri-fi.com/fsisimage.html**

Non-Allergen Statement

An independent letter discussing Citri-Fi's status as a non-allergenic food ingredient can be found at:

- **http://www.citri-fi.com/allergen.html**

Application Sheets

Our website has a comprehensive list of product application sheets. Our application sheets give specific recommendations for sample formulas and recommended methods of incorporation for a wide variety of different food products.

- **http://www.citri-fi.com/product_applications.html**

The Citri-Fi Showcase

The Citri-Fi Showcase is our quarterly newsletter designed to share new and exciting information with our global network of distributors, brokers and customers. The Citri-Fi Showcase can be found at:

- **http://www.citri-fi.com/pressreleases.html**

Upcoming Events

Fiberstar, our brokers and distributors exhibit at many events. You can find what events we will be attending at:

- **http://www.citri-fi.com/events.html**

Sales and Distribution Contact Information

Use our website to search by global location to find the distributors, brokers and sales team members who can help serve you.

- **http://www.citir-fi.com/contact.html**

About Fiberstar, Inc.

Fiberstar, Inc. is a privately owned research and development company focusing on improving food freshness and nutrition through technological innovation. It also operates manufacturing facilities that produce its Citri-Fi® line of products.

Fiberstar holds an exclusive worldwide license for patented bio-technology developed at the University of Minnesota. Its investment in research over the past seven years has led to the development of unique products that will improve the physical and functional characteristics of a wide variety of foods for which industry solutions are currently being sought.

Trademark, Copyright and Patent Disclosure

 Citri-Fi and its process of manufacture may be covered by one or more of the following U.S. patents and pending patent applications: 7,074,300 and 7,094,317.

Notes

Notes

For assistance and answers to questions, please contact Fiberstar's Global Technical Sales and Marketing Team

info@citri-fi.com

Each technical-sales staff member knows the language, culture and cuisine of his or her respective countries. They work together at our Innovation Center and are available by phone and email to assist our global network of distributors and customers in their product and market development work. Our technical sales staff also travels globally several times a year to conduct commercial visits and training with our distributors and customers.

Brock Lundberg
V.P. of Technology
Language - English
(715) 425 - 7550 (ext. 102)

Laura Valverde (European Union)
Food Scientist
Language - English and Spanish
34 (93) 889 - 0365

Shriraj Sawant
Food Scientist and Engineer
Languages - English and Hindi
(715) 425 - 7550 (ext. 109)

Eric Secrist
Global Logistics Manager
Language - English
(715) 425 - 7550 (ext. 104)

Nick Kovalenko
Director of Sales and Marketing
Languages - English, Russian and Ukrainian
(715) 425 - 7550 (ext. 105)

+1 (715) 425-7550 Mon-Fri 8:30 A.M. to 5 P.M. Central Time USA