Phytic Acid:
A Visual Summary Of The Research On Home Kitchen Remedies For Phytic Acid

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Introduction

Your kitchen is a miniature food processing plant. What you do in your kitchen may make your food taste exquisite, savory, over-cooked, greasy, or salty. You may boil a carrot to oblivion and lose all of its vitamins to the cooking water. You may cook rice in the same water to reclaim some of the carrot minerals. You can, in fact, change the nutrient profile of your food by what you do to it in your kitchen. What you may not realize is that you can also change how your body interacts with that food. With some simple food preparation techniques, you will be able to increase your body’s absorption of key minerals by 100% (or even much higher).

The story in this paper stands as a monument to obsessive detail over one aspect of food preparation. The food preparation techniques I outline here have the potential to increase the nutrients in your family’s diet. However, if you find yourself wondering if a phytic acid remains in your food as you sit to enjoy it, remember that good homemade food deserves to be enjoyed, not analyzed obsessively. The great news is that the techniques I outline will make your food taste even better. They deserve to be savored more than ever. Incorporate some of these tips into your cooking and savor your foods even more.

What Is Phytic Acid? Does It Matter?

Phytic acid is best known as an “anti-nutrient.” It is found most commonly in grains, legumes, nuts, and seeds. It is a compound bound tightly with the calcium, magnesium, zinc, and iron in your food, all bound together to the bran. They escort each other through your digestive tract, unabsorbed by your body. The leach field on our property must be mineral-rich from all the years of eating high phytic acid food. It is too bad I missed out on some of that magnesium.

For a century, food scientists have been concerned about the nutrient-depleting property of phytic acid. While phytic acid is not really a concern when it comes to your home grown heirloom apple or the meats in your diet, if you rely on grains, legumes, nuts, and seeds to provide you with the bulk of your nutrition,
nutritionists become concerned. Grains and legumes are key to your iron and zinc if you are a vegetarian. You need to be sure that your body is absorbing those key nutrients when it can.

It may not all be so bad with phytic acid: researchers are examining its ability to fight cancer by doing such things as keeping you from absorbing too much iron. If you are a middle-aged man, too much iron could be an issue for you. Phytic acid may have other beneficial properties as well taken as a food supplement, not bound to the bran in a wheat kernel. What we do know for sure about the phytic acid in the wheat kernel is that it keeps you from getting all of the minerals from your food.

Phytic acid decreases the minerals you absorb, specifically zinc, magnesium, calcium, and iron. Scientists know that phytic acid inhibits mineral absorption because they have conducted experiments where they have tested the hypothesis directly.

In a study of the impact of phytic acid on iron absorption, for instance, researchers found that if they removed the phytic acid from wheat porridge, the participant absorbed nearly twelve times the iron content in their food (1,160% increase). In oat porridge without phytic acid, participants absorbed eight times the iron. They absorbed five times (496%) the iron in a corn porridge and three times (309%) the iron in a rice porridge compared to porridge with its native phytic acid content.

These iron absorption differences are fairly high and somewhat atypical of the phytic acid literature but they make the important point: if we can reduce phytic acid in our food, we can increase the amount of iron we are absorbing. With the cooking techniques I outline, you can count on increasing your mineral absorption by at least two, if not more.
Omnivores and Vegetarians

If you rely on grains and legumes for these key minerals that are blocked by phytic acid, you must keep reading. You will discover that Vitamin C can reduce the phytic acid problem, but food preparation techniques are a far superior strategy.

It is the case that meat itself will help you absorb the minerals in your grains and legumes. Furthermore, meat tends to have high levels of zinc and iron to start with. If meat is in your diet, you really need not be overly concerned with phytic acid. You will not end up with anemia because you did not sprout your porridge; the animal you are eating is taking care of the problem. However, read on nonetheless and improve the nutrient density of your diet.

Vitamin C will improve your absorption of minerals in a high-phytic acid food. You may have been advised to eat a vitamin C food such as tomato with your vegetarian chili beans to solve your phytic acid problem. My personal feeling is that all chili beans should be eaten with fresh tomato, but not really because Vitamin C solves the phytic acid problem, but because tomato is just so good with chili beans.

Vitamin C does improve your absorption of minerals in a high-phytic acid meal. However, vitamin C is not the heavy-hitter that are the cooking techniques in this paper. In the iron study I cited, researchers added vitamin C to the test meals and absorption rates increased by about 300%. When they removed the phytic acid entirely, absorption jumped another 300% to about ten times the absorption rate of basic wheat porridge with no fancy food science tricks.

By all means, eat tomato with your chili beans and orange slices with your oatmeal, but do not stop there. If you rely on grains, legumes, nuts, and seeds for the core of your diet’s nutrients, you would improve your nutritional status to adopt the techniques in this paper. Even if you are an ovo-lacto vegetarian,
keep in mind that milk itself can inhibit the absorption of iron (as you may note from the figure). You will want to embrace some of these techniques as well, to make up for the effects of milk.

If you eat meat and just like to eat well, you will find these techniques useful as well.
Grains: Mineral Rich With An Asterisk

Whole grains do have a high mineral and you will absorb minerals from them regardless of the way you prepare them. Regardless, to get the most out of your grains, they should be prepared using the techniques in this chapter to reduce the phytic acid, primarily through soaking and sourdough methods.

Cooked Cereal Grains

Cooked cereals are such a popular traditional food for breakfast--most of us have eaten oatmeal or cream of wheat. Health food stores sell mixed grain cereals so that we can easily add fiber to our diets. Dinner provides cooked cereal opportunity as well: couscous and bulgur are used in cooked cereal dishes. Polenta, a cornmeal-based Italian treat, comes to mind. When selecting the cereal grain for a cooked cereal, consult the Top 10 list but also prepare your cereal to reduce the phytic acid content.

To reduce the phytic acid, you need to soak your grains in advance with three principles in mind: **Moisture + Warmth + Time**.

Soaking your grains in advance is fairly simple and it will actually reduce your cooking time, much like it does with beans. You simply soak the grains in warm water for some hours before cooking and then cook them. For the best results, keep these principles in mind:

- **Moisture**: Place the grain in a bowl with about 50% more water than grain (e.g. one cup of grain to one-and-one-half cup of water). The proportion of water generally matches the required water for cooking the grain.
- **Warmth**: The water temperature should be between 45 and 55 degrees C (113-131 degrees Fahrenheit), just above body temperature.
- **Time**: Let the grain sit in a warm spot for at least two and at best twelve hours. Cover the bowl with a tea towel to keep out the bugs.

Purists may add a bit of lemon juice or apple cider vinegar to their soaking water to improve the pH level. The resulting flavor is often a bit sour, so your mileage may vary with this technique. Many people add yogurt on the advice of Sally Fallon who popularized the notion in America of soaking grains to reduce phytic acid (Fallon, 1999). However, there is some evidence that adding...
calcium to the soaking grains inhibits phytic acid reduction (Hallberg et al., 1991). In our kitchen, we soak our grains in plain warm water.

Cooking the Cereal
You have now soaked your grains and they are ready to cook. With some grains you will notice that all of the water is absorbed. Since you have added the amount of water the recipe calls for and all of that water is absorbed, all you must do now is cook the grain. Place the grain on the stovetop and cook it slowly being careful that the grains do not stick to the pan.

If there is still soaking water with the grain, you have a choice: drain the water and add back to the grain about the same amount of fresh water. This is the most diligent approach because some organic acids that bind to minerals are likely in the water and you can reduce them by changing the water. However, you have already made great progress by soaking the grains and, unless you are really relying on the dietary minerals in the grains, you can just cook the grains with their soaking water.

In my kitchen, I typically soak the grains in the stainless steel pot that I intend to cook them in. If it is a breakfast cereal, I start soaking the grains the night before, leave them on the stovetop above a warm pilot light, and simply turn the heat on the pot in the morning. I do not typically pour off the soaking water in the commotion of my kitchen in the morning.

Your cereal grains will cook up much faster because they have been soaked. Expect them to cook at least twice as quickly.

More Grain Principles
The basic soaking process above will improve your mineral absorption, though there are some more principles that will help you refine your processes if you are relying on grains for your iron.

Ground Is Always Better
Personally, I prefer a cooked cereal of ground grain to a whole kernel cereal. I like the smoothness of the ground grain as it slides down my throat, mixed with a lot of butter, of course. Whole kernel cooked cereals are chunky and clumsy.
small part of me feels extremely traditional when I eat whole kernel hot cereal, like somehow I am in communication with my peasant roots. Reading food science literature, however, vindicates my taste buds and for that I am grateful.

Unless the flavor of a whole kernel breakfast cereal is spectacular, you would be better off grinding it before you prepare it.

Some sixty years ago a nutritionist studied different methods of phytic acid reduction and points to ground grains as key. In a food experiment, he ground half of a sample of wheat, put ground wheat and wheat kernels separately into little incubators and studied the phytic acid reduction. In the ground wheat the phytic acid disappeared in one hour. After twelve hours of monitoring the kernels, nearly one-fifth of the phytic acid still remained.

Some home grain mills allow you to create your own cracked grain cereal from fresh whole kernels – grinding the kernels just a little bit. This is a great option if you can work it into your kitchen routine.

**Not All Grains Are Equal**

Some of my favorite hot cereals prove to be difficult exceptions. The nutritionist who warns us about whole kernels and phytic acid studied various grains as well. He compared grains in their ability to break down phytic acid in his incubator and found key differences. Oats and corn were standouts: you can incubate and incubate and still end up with nearly the same old oats.

In his study, the phytic acid in wheat and rye was reduced entirely in one hour, barley in two hours. Oats and corn were soaked for twelve hours and still retained 75% of their original phytic acid content. Researchers have since found that millet and brown rice can be difficult too.

Some grains are just sticklers and if you like oats and polenta like most reasonable people do and if you rely on them for their minerals, you need some more tricks if you are to benefit from their iron content.
The traditional Mexican diet found some solution to this corn problem with the process of nixtimalization. Corn is placed in a lime bath and turned into masa, otherwise known as the key ingredient that makes tamales the heaven that they are. Enterprising bloggers have used masa as the basis for baked goods to get around this corn problem after taking my tedious (and now defunct) e-mail-based course on phytic acid. And yet, we are left with polenta and oatmeal.

Your key tool in making the most of your polenta and your oatmeal is “complementary soaking.”

The principle in complementary soaking is to add a high-phytase grain to a low one. The reason that the phytic acid declined so appreciably in the wheat, rye, and barley in the experiment above is that they have higher levels of the enzyme phytase that work to break down the phytic acid. There is no list, to my knowledge, of the phytase levels of all major grains, legumes, nuts, and seeds, but some of the more common foods of concern are known. Note in the graph below that the phytase level in rye is exceptionally high. Wheat and buckwheat are high as well. Rice, corn, soybean, and chickpea all have low levels. We can assume oats have fairly low levels as well based on the difficulty researchers have in reducing the phytic acid.

An industrious person intent on getting the full benefit of his or her foods would keep whole rye kernels on hand (or buckwheat in a gluten-free kitchen) and a dedicated coffee grinder. Grind a tablespoon or two of rye kernels in your coffee grinder and add the ground rye to your breakfast cereal. When I say “dedicated coffee grinder,” what I really mean is “a grinder you also do not use for coffee.” I sure do hate to clean out a coffee grinder in a meticulous fashion and do not care for the coffee-oatmeal flavor unless it is somehow more intentional.
Rice

Rice is not exceptionally high in phytic acid but it does have low levels of the enzyme phytase. The fact is that researchers are concerned about the phytic acid in rice, primarily because people in some countries use rice as a core part of their diet.

Scientists specializing in genetic engineering of food worked to create rice varieties low in phytic acid and higher in mineral content. Though people reading this paper are not the demographic of concern to those scientists, it is strange to require such scientific methods to solve a problem which is fairly easily solved in the kitchen.

With rice you need only worry about preparation if it is a whole, brown rice. The white rice you eat with your sushi does not need to be soaked. It is very low in phytic acid and lost about 80% of its minerals when processors scraped off the brown part.

To prepare brown rice, simply soak it in the water you will use to cook it and then cook it. Add two tablespoons per cup of rice of fresh ground wheat, rye, spelt, or buckwheat for good measure. Rice requires about 2 cups of water per cup of rice. I usually warm water in a kettle and then pour it over my rice. I let it soak for a few hours or overnight, all depending primarily on my level of organization. I shoot for twelve hours. From there, it cooks nicely in a rice cooker with simply the rice and soaking water. Purists may add a few tablespoons of lemon juice or apple cider vinegar to their soaking water to improve the pH level of the soaking solution.
The great news about soaking brown rice in advance is that it actually tastes a whole lot better. That fibrous, chewy nature of brown rice almost disappears with this method. I definitely have more of this rice in my own diet now and my children are far more likely to consume it.

**Corn**

Corn deserves a special mention because, like rice above, it is low in the enzyme that breaks down phytic acid. Corn is in many wonderful foods and it would be super if we can benefit from more of its nutrient content. As I mention above, we can use masa as a solution—it is corn that has already been soaked. In my own kitchen, I prefer to take advantage of the complementary soaking idea. I use a grain high in the phytase enzyme (usually rye but wheat will do) in preparing a corn-based dish.

I provide two recipes in the recipes at the end of this book for corn-based favorites in this household. The first, sourdough cornbread, uses wheat flour and corn meal together. The phytase in the wheat will help break down the phytic acid in the corn. Likewise in the polenta recipe, I add a tablespoon of fresh ground rye, spelt, or wheat to each cup of corn grits to create an out-of-this-world dinner treat.
**Baked Bread**

There are many types of bread-making processes and a dozen or more grains and nut flours that you can use in your baking. There is not research on all of these combinations, but I hope that you can take the information from the studies I cite below and apply it to your own kitchen.

To unlock the minerals in your grain, your best bet is to use flours high in phytase such as wheat and rye (and likely the cousins of wheat such as spelt, Kamut®, and triticale). In the gluten-free world, buckwheat is a good high phytase option. Use sourdough preparations to prepare these breads. Sourdough is actually fairly simple and quick but can be intimidating. I provide a beginner’s process for sourdough at the end of this book to help you adopt these methods without adding too much stress to your kitchen workload.

**White Bread**

Most of us have gotten the memo on white bread: it has no nutrients and just tends to raise our blood sugar levels. For those of you who choose to eat it anyway (or if you are like me and sneak it on occasion), I have really great news: White bread does not have phytic acid in it.

Look at the graph at left: when you compare phytic acid levels over the course of bread-making, you find that the phytic acid disappears in the white bread. A large portion remains in the whole wheat bread. If white bread had a mineral content in the first place, we would really have good news. With little native mineral value in the bread to start with, we sure do not gain much from the lack of phytic acid.

You can keep enjoying your phytic acid-free white bread, but you might want to keep one of those glucose monitors in your pocket for other reasons.

**Key strategy:** Add more whole grain flour to your diet to improve the mineral content of your diet.
“Proofing” Does Remove Phytic Acid

Notice from the graph above that compares whole wheat and white flour that in the whole wheat flour, phytic acid is reduced with each stage of proofing the bread. “Proofing” is simply letting the bread sit and rise. Indeed, we know that “soaking” the grain reduces phytic acid and “proofing” is really a variant on “soaking.” The longer your bread can “proof,” the more phytic acid you will reduce.

A classic study on phytic acid in bread making essentially shows the same thing: yeast bread preparations are better at reducing phytic acid than breads that rely on no leavening, such as pastries, or those that rely on baking powder, such as quick breads. Note in the graph at right that pastries retained 100% of their phytic acid and quick breads using baking powder retained 95%. What these two types of breads have in common is that they do not need to rise and, therefore, do not have a soaking process integrated into their creation. Regular wheat bread does require a rise time and is, therefore, partly effective in reducing phytic acid.

A key question for us is: How can we do even better?

Fresh Ground Flour

To improve your own yeast bread, the surest change you can make is to grind your own flour. The enzymes that break down phytic acid are most active in flour that is fresh ground. I realize that the idea of buying a grain mill and milling your own flour may sound a bit like pioneer living, but if you are relying on grains for your dietary minerals, a grain mill is probably your best first investment.

If you have a Kitchenaid mixer you can buy a grain mill attachment and leverage the strong motor in the Kitchenaid which is what I do. This attachment allows you to crack grain as well, a great option for breakfast cereals. Here is an example on Amazon: Kitchenaid Grain Mill.
Stand-alone grain mills are more expensive because you are paying for a powerful motor to grind your grain. These grain mills easily found on Amazon get high reviews from my friends: The Nutrimill and the Wondermill Whisper Mill.

**Whole Grain Sourdough Bread**

To improve your bread-making process, you can also adopt sourdough techniques. Sourdough has the key elements of phytic-acid reduction:

- Moisture
- Warmth
- Time

Sourdough has an additional advantage: a sourdough starter is acidic, another variable that helps reduce phytic acid (and a reason why some people add lemon juice or apple cider vinegar to their soaking cereal grain).

One sourdough experiment in the food science literature compared the breakdown of phytic acid in sourdough bread and in a yeast bread over a nearly six-hour period. They found that the sourdough preparation broke down over 60% of the phytic acid content in the flour while yeast bread broke down about 35%.

The longer the rise with the sourdough bread, the more phytic acid will be reduced in the grain. However, a long, slow rise makes extra-sour bread. As you experiment with sourdough, it is important to create bread that you like. Do not feel obligated to eat extra-sour bread simply to reduce the phytic acid further. You have made great gains already by baking sourdough bread in the first place. Do savor it.

If you have not made sourdough preparations before, there are abundant recipes at the end of this paper to get you started. For other resources on making sourdough bread, find the fabulous book by Sandor Katz, *Wild Fermentation*, a book worth the purchase price just for the stories. The recipes are a bonus. The book is available at Amazon: Wild Fermentation.

**Quick Bread: Zucchini, Banana Bread, And More**

Quick breads such as zucchini bread, banana bread, and pumpkin bread are a treat to bake and to eat. They are indeed “quick,” which gives them a huge
advantage over other breads in terms of preparation turn-around. They are also desserts disguised as breads. We can eat them and feel as though we are not having dessert at all even though we are.

The “quickness” of the bread is what gets it into trouble in the phytic acid department. A study I cited above shows little decline in phytic acid in breads that rely on baking powder like quick breads. We can expect the same results with baking soda. The key thing we can do to improve this class of bread is to slow it down using sourdough strategies. We provide recipes for such breads at the end of the book.

If you want to venture out further from the recipes in this book, find sourdough cookbooks to guide you. I happened to find an old sourdough cookbook that includes gems such as banana sourdough bread. Here it is at Amazon. It includes other strange ingredients such as shortening and white flour that apparently someone used to think were healthy. I use the proportions in this good old cookbook but also use a little more wisdom on some of the ingredients. Coconut oil substitutes fairly well for shortening and whole wheat flour is an excellent substitute for white flour in the sourdough context.
**Unleavened Bread - Flatbread**

Tortillas and pita bread, which require no leavening agent such as yeast, baking soda, or baking powder, are the poor cousins of a hearty, whole wheat sourdough bread.

Unleavened bread generally lacks our fundamentals: **Moisture + Warmth + Time**. However, enterprising companies and bloggers have added them. There are some extremely creative people out there who like to eat healthy flat bread.

At some health food stores you can find tortillas from sprouted grains. Sprouting is certainly more effective than not sprouting, but it is still not equivalent in phytic acid reduction to a sourdough method. These are also higher-end food products and so you will pay a premium for the added nutrients.

Home bread makers will want to experiment with sourdough methods for flat breads if they rely on flat breads such as tortillas and pitas for minerals in their diet. If you do not rely on these flat breads for your nutrition, my general advice is to enjoy them with a lot of butter or olive oil just to add extra flavor to that phytic acid. I do include a recipe at the end for an all-time favorite (and easy) flatbread – pizza crust.

The other class of unleavened treats includes pancakes. I provide a recipe at the end (not that any of us would rely on pancakes for our dietary minerals, at least not on most days).
**Sprouted Bread**

Germinating grains and legumes to make "sprouted grains" is a popular food strategy and is fairly effective at reducing the phytic acid content in the grain or legume. To germinate grains and legumes, you soak them first overnight, strain the water, rinse the food, and place it in a sprouting environment. In the first phase of soaking, some mineral content is lost in the soaking water, but the process of germination then increases the mineral content to make up for part of what was lost.

Note from the graph at right, however, that it is the sprouts themselves that are lowest in phytic acid. A grain kernel that has just begun to sprout and is then dehydrated for flour probably still contains quite a lot of phytic acid and a sourdough preparation would be ideal.

In addition to reducing the phytic acid content of grains and legumes, you can add folate and other vitamins to your food, as well through germination. Researchers have found that the vitamin C content of foods increases with germination (Ahmad and Pathak 2000). The folate levels increase as well.

In a study of a grain, ragi, used in India, researchers tested the folate content of the ragi every twelve hours for nearly four days. After the first day of germination, the folate content of the grain increased markedly from 16 mg/100 grams after twenty-four hours to 110 mg/100 grams after 92 hours. Of course, these vitamins are also heat sensitive and reduced in the cooking process.

Most consumers who want to benefit from sprouted grains buy sprouted bread, tortillas, and pizza crust to use at home or they buy sprouted grains to use in their baking. These are expensive strategies but certainly they are an option if you need to maximize the mineral content in
your diet. I tend to prefer sourdough methods for my in-home baking. Sourdough is a better and cheaper strategy than sprouted grain approaches, though combining the approaches would be bread nirvana. I do buy sprouted flatbreads on occasion, breads that I am not all that likely to bake myself.

These are two sprouted grain sources I like:

Alvarado Street Bakery:  [www.alvaradostreetbakery.com](http://www.alvaradostreetbakery.com)

Food for Life:  [www.foodforlife.com](http://www.foodforlife.com)

Both are carried by Whole Foods. Food for Life is carried by Trader Joe's. Trader Joe's also has some private label sprouted grain products.

**Soaked Flour Breads**

Many consumers interested in reducing the phytic acid in their baked goods have heard about it in the *Nourishing Traditions* cookbook by Sally Fallon. Fallon forged the phytic acid path recommending that consumers soak their flour in advance of putting together their bread dough and, specifically, that they soak their flour with the addition of an acid medium. She recommends yogurt, kefir, or buttermilk added to flour (or whole grains for breakfast cereal) in many of her recipes.

As it turns out, there are at least two studies that suggest soaking flour in this way is not optimal in reducing phytic acid. While it is the case that the pH of the soaking medium is key in breaking down phytic acid (and it just makes sense that yogurt would be helpful), the problem is that yogurt, kefir, and buttermilk also contain calcium which researchers find inhibits the reduction of phytic acid in home bread baking (Hallberg et al. 1991; Turk and Sandberg 1991).

Based on this research, there is evidence that soaking grains in yogurt, kefir, buttermilk, whey, or other dairy products is *less effective* than soaking them in warm water. If you have a recipe that calls for milk, a fermented version such as kefir or yogurt would be better than unfermented milk, but no dairy product would be optimal from the point of view of phytic acid reduction.

If you have a soaked flour recipe that does not add a calcium food and requires that the flour or dough sit in a warm place to rise or otherwise ferment, then that recipe is likely to be fairly effective in breaking down the phytic acid in your grains.
In our own household we have not used soaked flour bread recipes for years because sourdough has a much stronger research base in breaking down phytic acid and sourdough recipes simply tend to make much better bread in our experience.

**Breads: The Bigger Picture**

It is easy to get caught up in finding the precise technique that will unlock the most minerals in your food. We can compare different sprouting methods and flatbread recipes and while that analysis has value (and is, in fact, the central exercise in this book) it is easy to miss the forest for the trees.

As you choose bread for your family, find recipes that will simultaneously add more whole grain to the diet and that will unlock the minerals in those grains. What works in our household are the recipes at the end of this book that use 100% whole grain and sourdough methods. As a case in point, I include a recipe for sourdough pancakes that is 100% whole grain and easy to make. Real people like these pancakes and would never guess they were eating a whole grain food.

A key point here is that the recipes I use are tasty, easy, and effective at unlocking the minerals in the grains. If it does not fit in your kitchen preparation time to created sprouted sourdough crackers, by all means do not feel bad about it. Find an easier process if you rely on grains for your dietary minerals.
Beans, Legumes, Pulses

Beans are so tasty and inexpensive. We have a five-gallon stainless steel cooking pot that we fill with beans, vegetables, and meat to create the most fantastic meals. Back when I relied on beans to provide my core nutrition, I should have known better how to prepare them.

If you could just cook phytic acid out of beans, cooking would not be nearly so adventuressome. Researchers have examined the phytic acid level in cooked beans compared to the original phytic acid content in their uncooked state. One study found between sixty-three and ninety-three percent of the phytic acid remaining in the beans.

Beans have some of the fundamentals going for them: **Moisture + Warmth + Time.**

They cook in hot water usually over some hours, depending on their size.

We can get fancy with beans and sprout them to add more time to the equation. Sprouting tends to increase the nutrient content of food, but it is not actually the most effective method to reduce the phytic acid in beans. One study of chickpeas and lentils found that after five days of germination, the beans still had between forty and sixty percent of the original phytic acid content.

What we can do to decrease the phytic acid in the beans further is to soak the beans before they cook. My mom used to
soak her beans so that they would cook much more quickly. It saved her cooking time and, unbeknownst to her, it increased her mineral absorption because it reduced the phytic acid content.

One study examined phytic acid levels in soaked beans, specifically great northern beans, pinto beans, and kidney beans. Soaking the beans for 18 hours at room temperature was certainly better than simply cooking the beans. But food scientists have shown us how we can do even better: we can soak them in really warm water.

One study soaked California small white beans for three hours at various temperatures. Temperatures too hot or too cold were not very effective at reducing phytic acid. The most effective soaking temperature was 140º Fahrenheit.

Keep in mind that the temperature study soaked the beans for only three hours. The soaking study soaked them for 18 hours. At 140º Fahrenheit the temperature study reduced in three hours about the same percentage of phytic acid as the soaking study that soaked beans for 18 hours at room temperature.

Both time and temperature matter.

Soak your beans overnight in very warm water in a warm space in your house.

With a small amount of preparation, you will save cooking time and you will give your body more health-building minerals.
**My Bean Method**

Warm your water in a kettle and combine boiling water with your filtered or tap water. Cover the beans with water and put them in a warm place. I begin to soak my beans in the morning on the day before I plan to cook them. As they absorb water, I add more warm water. I do not pretend to achieve or maintain 140° Fahrenheit, but I give the beans plenty of soaking time to make up for my lack of temperature monitoring. You will find that with this method, you will digest the beans better, too.

A reader reported maintaining the beans at 140 degrees for many hours and she began a process of spontaneous fermentation that she had not intended. Her story is either evidence for or against soaking your beans at 140 degrees depending on how adventurous you feel in your kitchen.

After soaking, I rinse the beans and cook them according to the recipe. They will cook much more quickly than a recipe that starts with beans that are not soaked.

**For the purists: pH levels**

Purists concerned about the phytic acid level will also add something acidic to the water like lemon juice or apple cider vinegar. An acid pH will be more effective at breaking down the phytic acid. However, I do not tend to go in this direction because by doing so, you sacrifice flavor and texture.

We conducted an experiment with a recent batch of beans. We soaked them both as described above but we added some cultured milk to one to make the soaking solution more acidic.

Both batches cooked fairly well, though the acid solution beans were a bit more crunchy. Furthermore, in a blind taste test, both my mom and I picked the regular water beans as the standout in flavor. The herbs and spices used in seasoning permeated the beans much better if they were soaked in plain water. With a long soaking time and a warm temperature, there is no reason to sacrifice flavor.
A reader has recommended adding kombu to the beans and insists that the flavor is good. Experimental cooks may also add fresh-ground rye or wheat to their beans at the soaking stage.

**Canned Beans**
Canned beans are low in phytic acid because they essentially sit soaking in a can. Canning as a food processing technique does tend to reduce some of the nutrients of the original bean, though it does not tend to affect the mineral content except by making some like iron better absorbed because of the reduction of phytic acid.

![Graph showing Phytic Acid in Cooked and Canned Beans](Image)
**Soybeans: An Exception**

On its face, soy has an exceptional mineral content and it is such a versatile food. In the phytic acid department, unfortunately, soy is problematic. It is a high phytic acid food and low in the enzyme phytase. It turns out that you really need to eat it fermented if you are going to benefit from its minerals.

Back in 1985, some enterprising researchers tested the phytic acid level in soy after different stages of preparation. I provide the phytic acid levels in the figure here. Keep in mind that the activities I list in the figure are successive: the researchers boil the beans, pour off the water, soak them again, dehull them, steam them, drain them, and cool them. The phytic acid levels change very little with all of this effort.

It is only when they ferment the beans in the form of tempeh that the phytic acid levels reduce to about 45% of the levels of the soaked soybean. Fried tempeh is an improvement still, but if the tempeh is stored for two weeks at 5°C and then fried, the researchers reached the optimal (but not perfect) reduction of the phytic acid. A 2003 study also found that the phytic acid level decreased by only 31% by fermenting soybeans (Egounlety and Aworth 2003).

Keep these results in mind as you shop for soymilk and tofu. Soybeans in soymilk are soaked, strained, and cooked. Tofu has an additional step - a coagulant is added. Both soymilk and tofu retain nearly 100% of the original phytic acid in the soybean. You will still absorb some minerals from these items because they contain a great deal of minerals to start with, but not nearly as much as you would hope. If you rely on soybeans for minerals, I strongly recommend fermenting your own or purchasing tempeh and miso that are made with traditional fermentation techniques. I do not see this move as a big sacrifice since both miso and tempeh are pretty tasty.
Nuts And Seeds

Nuts and seeds can be a fairly good source of dietary minerals. The most mineral-rich are seeds such as sesame seeds, pumpkin and other squash seeds, and sunflower seeds. However, nuts and seeds have phytic acid just as do grains and legumes. The food science literature on them is not as voluminous, probably because nuts and seeds are not the staple foods that grains and legumes are.

Following the lead of the food science research, if your diet does not have a lot of nuts and seeds, do not worry too much about the phytic acid content. Enjoy your food just as it comes off the tree or the plant. If you rely on foods like nut milks, you may want to consider fermenting them before drinking them. I would consider using water kefir grains to make a fermented nut milk much like I describe for vegetable juice.

In terms of eating the basic nut, with little research on the most effective methods for reducing the phytic acid in nuts and seeds, we must make inferences from what research tells us about grains since grains are the seeds of grasses. We know from the grain research that it is much more difficult to reduce the phytic acid content of a whole kernel of grain, compared to ground grain.

To reduce the phytic acid, there are three general methods depending on the product you are trying to make.

Soak them
Soak the whole nut or seed just as you would your grains. Strain them. Spread them on a cookie sheet and dehydrate or roast them in your oven. After about 24 hours you will have a very crunchy nut that tastes better than any roasted nut you can buy. Some people add salt to their soaking water. This may be a good option for flavor; there is no evidence it helps with breaking down phytic acid. In fact, an acid medium would be better but it does seem strange to add lemon juice or apple cider vinegar to nuts (an addition I have mentioned elsewhere). Purists may consider adding fermented liquid like kombucha or water kefir to their soaking solution. Personally, I just use warm water.

Soaking will not work well for very tiny seeds, particularly if you plan to dehydrate them and use them whole. They turn to mush fairly quickly. I would use sesame seeds and sunflower seeds simply toasted instead.
**Germinate them**
Germinate the nut or seed: Soak overnight, drain soaking water, rinse nuts or seeds, sprout in sprouting environment for two days or more. Before the shoots get longer than you desire, dry them out in your oven for about 24 hours for a good crunch, or let them continue to germinate and use them as sprouts.

**Grind Them**
Grind the nuts slightly before soaking. Follow the directions above to dry the nuts out. I use this method for making almond butter. I do not grind them into flour. I just increase the surface area of the nut in my food processor and then soak them and dry them. They dry much more quickly than the whole nut and I immediately turn them into nut butter. I would not go to this much trouble if it were not for my son who, on some days, has lived only on this food item.

If you are drying the nuts and seeds (not just making sprouts), dry them in a food dehydrator or in an oven at a low temperature to preserve the enzymes (preferably under about 120 degrees F). This method will help with your overall digestion. During the summer I actually put cookie sheets of nuts on my car in the full sun. I cover them with sheer fabric to keep the birds away and bring them in at night to keep the raccoons off of them. My kitchen does not heat up as a result and I save some fossil fuel.
Recipes

Sourdough Tips
I offer ideas for sourdough baking but keep in mind that all kitchen environments are different. If your dough rises faster, if it requires more water, if the recipe is a bit soggy, adapt it to your own kitchen. Add the water. Check the bread to make sure it is done. If it is soggy, cook it for longer. For the most part, these recipes are extremely forgiving and you can adapt them to your own tastes and needs.

Rise times for phytic acid reduction
Many people aware of phytic acid soak their flour for a certain amount of time before baking it. With sourdough, a scientific method for phytic acid reduction, the behavior of the dough will determine when it is ready to be baked. When your dough is bubbly and smells yeasty (or has doubled in size if the recipe calls for doubling), it is ready for its next step.

Types of flour
Use whole grain flour, preferably wheat, spelt, or rye, grains high in the phytase enzyme. Buckwheat is high as well but has a rather strong flavor. All of the recipes here call for 100% whole grain flour (not the white stuff). Grind them fresh in your kitchen for the best results.

Temperature of ingredients and bowl
Keep your ingredients and bowls at room temperature or you will slow down your rise times.

Cover your dough
Rising bread should always be covered with a tea towel to keep out the bugs and, at the same time, allow the dough to breath. I often use waxed paper with starter only because starter can be extra messy.

Too much/too little flour
Bread baking is part art because your kitchen climate will affect the outcome of your bread. Temperature, altitude, and air bacteria affect your dough. In some instances, you may find your dough to be a little too dry or too moist. In the pizza crust recipe, for instance, we provide a recommended amount of flour that will work for most people, but do add flour a little at a time until you have soft dough. If you find it drying, you have added plenty of flour already. This
will be an issue with the whole grain sourdough recipe and pizza crust recipe. It is not an issue with the sweet bread recipes because they do not require handling. As a result, the sweet bread recipes are very good places to start if you are a beginner bread baker.

**How to check if bread is done**
Insert a sharp knife into the center of the loaf to check if the bread is done. It is done when the knife comes out of the loaf clean. If knife has batter clinging to it, bake it for longer.

**Yeast purchase and storage**
If you are using the Cheater’s Starter described below, you can purchase baker’s yeast at any grocery store in the baking section. Check the expiration date before you purchase it. At home, store your yeast in an airtight container in the refrigerator to maintain its viability and freshness.

**Sourdough Starters**
Sourdough starter is flour, water, and bacteria. It is the lactic acid bacteria action that breaks the bond between the phytic acid and your minerals. The best grain to use will be one high in the phytase enzyme, notably rye and wheat. Spelt is an excellent choice as well. Buckwheat may be a good gluten-free option, but I have never tried it.

Adventuresome bakers will make sourdough with wild starters, flour and water that is “activated” by catching bacteria from the air. Beginners really should use the “Cheater Starter” method and make no apologies for it.

**Wild Starter**
Use a carefully scalded container, cooled to room temperature before using. To two cups flour, add enough lukewarm water (about body temperature) to make a thick batter, about one cup. Let the mixture stand uncovered for four or five days until it becomes bubbly. The starter should smell “yeasty”; a rotten smell is a bad sign.

Alternatively, buy a wild starter online to get you started.
Cheater’s Starter
The Cheater’s Starter is a great way to begin baking sourdough bread. If you get into sourdough baking, you can experiment with a wild starter, your best bet in reducing the phytic acid in your grains.

Two cups of flour
One packet of dry yeast (one heaping tablespoon), stirred into the flour
Add enough lukewarm water (about body temperature) to make a thick batter, about one cup.

Place your starter in a ceramic or glass bowl in a warm spot for 12-24 hours, depending on the temperature. In hot months your starter will get “yeasty” very quickly and will be ready to use. Cover the bowl with something to keep the flies out. I use waxed paper for easy disposal. You may use a hand towel to cover your starter, but you will find that it is quite difficult to wash starter off of a towel.
Sourdough Pancakes: Your Easy First Sourdough Attempt

I love this pancake recipe because I can make it with 100% whole wheat flour and the pancakes still come out light and fluffy. It is also fairly easy to whip up and guests think I slaved in the kitchen. If you have never used sourdough in your cooking, this is a good place to start. Use the Cheater’s Starter to make it even easier.

Stage 1
2 cups starter
1 cup whole grain flour (wheat, spelt, rye)
1 cup warm water

Mix these the night before. Cover and set in a warm place. (Or just make 1 ½ batches of the Cheater’s Starter above. This recipe is very forgiving on proportions.)

Stage 2
In the morning, stir up the batter a bit (do not over-stir) and add:
2 tsp salt
1/3 cup melted butter or coconut oil
2 eggs, well beaten
½ tsp baking soda (Dissolve it in warm water and add it just before making the pancakes.)

Variation: Add 3-4 egg whites for additional fluff and nutrition.
**Sourdough Cornbread**

**Stage 1**
Melt and cool 2 tablespoons of butter

Blend together:
- 1 cup starter
- 1 cup whole flour (wheat, spelt, rye)
- ½ cup cornmeal
- ½ teaspoon salt
- 1 tablespoon sugar (white or Rapadura)

Blend together butter and flour mixtures. Cover and set in a warm place until it gets bubbly (usually two hours).

**Stage 2**
In a separate container, add:
- ½ teaspoon cream of tartar
- ½ teaspoon baking soda
- 4 tablespoons boiling water

To your sourdough mixture, add:
- 2 eggs, well beaten
- 1 tablespoon of vinegar
- Cream of tartar and soda mixture

Stir batter enough to mix ingredients. Do not over-stir or your bread will lose some of its fluffiness.

Add batter to a greased and floured loaf pan (butter works well). Bake at 350° F for about 40 minutes. Check it with a fork. It is done when the fork comes out clean.
**Sourdough Whole Wheat Bread**

This is a good, hearty bread recipe that has two rising stages, providing the flour with a whole lot of time to work out its phytic acid. It is a good project for a cooking day when you have a lot of projects going. The process is a long one from start to finish, but the steps are pretty easy.

**Ingredients**

1 cup starter  
1 tablespoon dry yeast (add two if your starter is not very active)  
½ cup of warm water  
1 ½ cups milk, room temperature or slightly warmed  
½ cup brown sugar (or Rapadura or Sucanat)  
2 tablespoons salt  
2 ½ tablespoons melted butter or coconut oil  
¼ cup molasses (or honey)

6 cups whole grain flour (wheat, spelt, rye)

(For “Cheater Starter” users use one batch Cheater’s Starter, reduce this bread recipe by one cup of flour, but add the extra tablespoon of yeast for insurance.)

**Stage 1**

Dissolve the yeast in the warm water (room temperature or body temperature). Stir in all other ingredients except the flour. Blend in a warm bowl for added insurance. Gradually add the flour. Put dough on floured board and knead 100 times. (Mom kneads right in her bowl.) Place in greased bowl. Cover. Leave the dough in a warm (but not too hot) spot, covered with a tea towel, until the dough has doubled in size. Your rise time may vary from one to two hours depending on your room temperature.

**Stage 2**

Punch down the dough with several good punches. Divide in the dough two and put in two greased loaf pans. Cover and let rise again until they double in size. Rise time may be about 45 minutes.
Stage 3

Bake at 400°F for five minutes and then reduce to 375°F for 30-45 minutes. For a nice finish, consider ten minutes before the loaf is done glazing with egg yolk. Mix one egg yolk with two tablespoons of water. Paint the egg mixture on the loaf tops with a pastry brush. Return loaves to oven for their final ten minutes.

Cool your loaves for ten minutes in their pans and then pop them out of the pans and place them on a baking rack to finish cooling.

This bread works well for sandwiches or any sort of eating. Slice it as you use it to avoid drying it out.
Quick Bread Replacement Recipes

We have worked at adapting quick bread recipes to reduce the phytic acid content. However, the easier approach is definitely discovering sourdough preparations. With insight from a wonderful old book on sourdough, we slow down our quick breads. We end up with sweet dessert-like bread that has a rich sourdough flavor. Our favorite sourdough book is *The Complete Sourdough Cookbook* by Don and Myrtle Holm. It is available from used book vendors.

With your starter you will be ready to make many different “quick” breads, but they will not be as quick because of the 12-24 hours your starter has already been working. They are easy, but slowed down significantly in their in-kitchen processing time, to help us digest them better.

**Gingerbread**

**Stage 1**
Blend:
½ cup brown sugar ½ cup molasses
1 cup melted coconut oil or butter

Blend:
½ cup whole grain flour ½ cup warm water
½ teaspoon salt 1 cup sourdough starter
(Or mix up a batch of Cheater’s Starter and add salt)

Combine sugar and flour mixtures. Set aside in a covered bowl until bubbly.

**Stage 2**
Sprinkle on batter and mix gently:
1 teaspoon ginger 1 teaspoon cinnamon

Gently mix in:
1 egg, well beaten

Dissolve 1 teaspoon baking soda in 2 tablespoons hot water.
Gently mix soda into batter just before spooning batter into pans.
Bake in a greased and floured pan at 375°F for about 30 minutes (or until done).

**Variations:** These make mean muffins or cake. Chocolate frosting adds to the decadence, as does whipped cream or ice cream.
Banana Bread

1 cup sugar (white, Rapadura, or Sucanat for a stronger flavor)
1/3 cup melted butter

1 ½ cups whole flour (wheat, spelt, rye)
2/3 cup mashed banana (about 1 ½ banana)
1 teaspoon vanilla (or heaping teaspoon orange or lemon rind)
½ teaspoon salt
1 cup starter

1 egg, well beaten
1 teaspoon baking soda
2 tablespoons hot water

Step 1
Cream together sugar and melted butter (this will cool the butter so that it does not overheat your starter). Add flour, banana, vanilla, salt, and starter. Stir well.

Let mixture sit covered in a warm spot until it is bubbly (about two hours in the summer, overnight in the winter).

Step 2
Stir in well-beaten egg. Gently mix.
Grease and flour your pans.
In the final step, add baking soda to the hot water and dissolve well. Add to batter. Gently mix.

Bake for 50 minutes in a 350° F oven in one loaf pan or until done.

Variations:
(1) Add ½ cup unsweetened coconut
    1 tablespoon lemon juice (add both to first step)
(2) Add ¼ cup rum
    2 tablespoons flour (add both to first step)
(3) Add 1 cup chopped walnuts sprinkled on top, just before baking.
Zucchini Bread

1 cup sugar (white, Rapadura, or Sucanat for a stronger flavor)  
1/3 cup melted butter  

1 1/2 cups whole flour (wheat, spelt, rye)  
2/3 cup grated zucchini  
1 teaspoon vanilla (or heaping teaspoon orange or lemon rind)  
1/2 teaspoon salt  
1 cup starter  

3/4 teaspoon cinnamon  
1/4 teaspoon nutmeg  
1 egg, well beaten  

1 teaspoon baking soda  
2 tablespoons hot water  

Step 1
Cream together sugar and melted butter (this will cool the butter so that it does not overheat your starter). Add flour, zucchini, vanilla, salt, and starter. Stir well.

Let mixture sit covered in a warm spot until it is bubbly (about two hours in the summer, overnight in the winter).

Step 2
Sprinkle cinnamon and nutmeg on the batter. Gently mix.
Stir in well-beaten egg. Gently mix.
Grease and flour your pans.
In the final step, add baking soda to the hot water and dissolve well. Add to batter. Gently mix.

Bake for 50 minutes in a 350° F oven in one loaf pan or until done.

Variations:
(1) Add 1/2 cup chopped dried pineapple  
1/2 cup chopped walnuts (add both to first step)  
(2) Add 1/2 cup chopped almonds  
1/2 cup chopped dates (add both to first step)
Pumpkin Bread
1 cup sugar (white, Rapadura, or Sucanat for a stronger flavor)
1/3 cup melted butter

1 ½ cups whole flour (wheat, spelt, rye)
2/3 cup mashed pumpkin (fresh or canned)
1 teaspoon vanilla (or heaping teaspoon orange or lemon rind)
½ teaspoon salt
1 cup starter

¾ teaspoon cinnamon  1 teaspoon baking soda
¼ teaspoon allspice  2 tablespoons hot water
1 egg, well beaten

Step 1
Cream together sugar and melted butter (this will cool the butter so that it does not overheat your starter). Add flour, pumpkin, vanilla, salt, and starter. Stir well.

Let mixture sit covered in a warm spot until it is bubbly (about two hours in the summer, overnight in the winter).

Step 2
Sprinkle cinnamon and allspice on the batter. Gently mix.
Stir in well-beaten egg. Gently mix.
Grease and flour your pans.
In the final step, add baking soda to the hot water and dissolve well. Add to batter. Gently mix.

Bake for 50 minutes in a 350° F oven in one loaf pan or until done.

Variations:
(1) Add ½ cup raisins
   ½ cup chopped walnuts (add both to first step)
(2) Add ½ cup chopped walnuts
   1 heaping tablespoon orange rind (add both to first step)
(3) ½ cup sesame seeds added to the top just before baking
Applesauce Bread
1 cup sugar (white, Rapadura, or Sucanat for a stronger flavor)
1/3 cup melted butter

1 1/2 cups whole flour (wheat, spelt, rye)
2/3 cup applesauce
1 teaspoon vanilla (or heaping teaspoon orange or lemon rind)
1/2 teaspoon salt
1 cup starter

1/2 teaspoon cinnamon  1 teaspoon baking soda
1 egg, well beaten  2 tablespoons hot water

Step 1
Cream together sugar and melted butter (this will cool the butter so that it does not over-heat your starter). Add flour, applesauce, vanilla, salt, and starter. Stir well.

Let mixture sit covered in a warm spot until it is bubbly (about two hours in the summer, overnight in the winter).

Step 2
Sprinkle cinnamon on batter. Gently mix.
Stir in well-beaten egg. Gently mix.
Grease and flour your pans.
In the final step, add baking soda to the hot water, dissolve well. Add to batter. Gently mix.

Bake for 50 minutes in a 350° F oven in one loaf pan or until done.

Variations:
(1) Add 1/2 cup chopped dried apples
    1/2 cup chopped pecans (add both to first step)
(2) Add 1/2 cup chopped walnuts
    1/2 cup raisins (add both to first step)
(3) 1/2 cup dried cranberries, 1/2 cup chopped walnuts (add to first step)
**Polenta**

2 cups coarse cornmeal  
4 heaping tablespoons fresh ground rye, wheat, or spelt  
6 cups warm water (100-120°F)  
1 teaspoon salt

Optional: ¼ pound butter, ¼ pound Mozzarella cheese

Mix together cornmeal, grain, water, and salt. Purists may add a few tablespoons of lemon juice or apple cider vinegar to their soaking water to reduce the pH level of the soaking solution. Cover and sit it in a warm spot until dinnertime. (I shoot for eight hours.)

Put cornmeal and soaking water into saucepan over low flame. Stir often. Polenta burns easily. The polenta is ready when the water is absorbed into the grain (about 15-20 minutes).

Lovers of fine food will recognize the key value in polenta: it is a sponge for butter, cheese, and other fats. The finest Italian cook I know inspired me to add butter and cheese to mine. These will help the polenta firm up. Serve with an Italian sauce and salad.
**Pizza Crust**

This small collection of recipes would not be complete without this very simple flatbread recipe: pizza crust. This recipe makes one large pizza.

1 cup starter 1 tablespoon salt
1 tablespoon melted butter (cooled)
1 cup whole grain flour (wheat, spelt, rye)

Mix all ingredients together, working in the flour little by little until you have a soft, workable dough. If you add too much flour, you will have dry dough, so add just enough to make it workable. Let your dough sit and rise until it doubles in size. Punch your dough down, put it onto your greased pizza dish or cookie sheet, and roll it out or press it into a pizza shape that is about ½ an inch thick. Bake at 425° F for about five minutes.

After baking, add pizza sauce, cheese, and toppings. Bake your pizza at 425° F for 20-30 minutes until the cheese is melted and bubbly.
Works Cited


