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## Storage Life of Dry Foods In Consultation with Stephen Portela

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## Storage Life of Foods

**Determining the storage life of foods is at best an inexact science as there are so many variables. These range from the condition your food was in when you first purchased it and includes many other factors. This page was written with input by Mr. Stephen Portela who has over 30 years of professional food storage experience. This information should be used as a general guide only, and should not be followed "as the gospel truth" because your results may be different.**

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## Four Factors that effect food storage:

### Factor #1: The Temperature:

Temperature has more to do with how long well dried foods store than anything else. The USDA states, "*Each 5.6 C. (10.08F) drop in temperature doubles the storage life of the seeds.*" Obviously, there is a limit as to how far this statement can be taken. However I expect it basically holds true from room temperature down to freezing. No doubt, the inverse could also be considered true. "*Each 5.6C. (10.08F) rise in temperature halves the storage life of seeds.*" This theory holds true for non-garden seeds as well.

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## Storage Life Differences Depending on Temperature

Constant Storage Temp in degrees F				Storage life In Years
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39.76	-	-	-	40
49.84	-	-	-	30
59.92	-	-	-	20
70.00	-	-	-	10
80.08	-	-	-	5
90.16	-	-	-	2.5
100.24	-	-	-	1.25

**Note:** the above chart is not for a specific food but shows the relationship between temperature and storage life.

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### Lets look at a couple of real life examples of good and poor food storage practices:

About a year ago we got an unopened paper bag of white flour which had been stored at 70 degrees F, in a dry climate. It had been sitting for 3 years in a closet. It made fine looking bread but had such an 'old' and bad flavor that it was difficult to eat. For another example, a couple of years ago in the Puget Sound area we were given a 4 gallon can of wheat that had been stored up high in a garage for about 30 years. This part of the country is not as hot as some places, yet in the summers the average garage still gets up into the 90's. Even though wheat will store for 30+ years under good conditions, the bread from this particular wheat was very bad tasting and after a few batches we ended up throwing the wheat away (something I always dislike doing).

Counter these stories with several examples told by Mr. Stephen Portela, Walton Feed's manager: He stores his long term food storage in his basement where the temperature hovers around 60 degrees F. The experts give brown rice a 6 month storage life because of all the oils in it that go rancid. Yet, Mr. Portela has been eating from a supply of brown rice that has been in his basement over 10 years. It is still wholesome! In another example, there is a family living near him who purchased a supply of food in #10 cans 30 years ago. Their basement hovers around 58 degrees F. After 28 years, Mr. Portela took a sample of many of these items to the Benson Institute at BYU to have it tested. The results can be seen at the bottom of [Mr. Portela's welcome page](#). You will see everything tested had a 'good' to 'satisfactory' rating except for the eggs which

had a 'minimum passing' rating. After 28 years I think it is most interesting that it passed at all. Mr. Portela tells me as 30 years have now passed, their storage is still in very good condition.

The bottom line is even with the very best packaging methods, if you are planning on storing your food in a warm environment, it will only last a fraction of the time it would last if stored in a cool, dry place. You can expect good storage life if your storage temperature is at 60 degrees F or below. Optimum storage temperature is at 40 degrees F or less. It is important you also find a place where the temperature remains constant. Frequent temperature changes shorten storage life. If you don't have a cool place for your food storage, plan on rotating your storage quickly enough to prevent food loss. See our [underground storage area pages](#) for ideas.

### **Factor #2: Product moisture content:**

By looking at the USDA nutritional tables, dry beans, grains, and flours contain an average of 10% moisture. Although it is very difficult and unnecessary to remove all moisture from dry foods, it is imperative that any food be stored as dry as possible. Foods with excess moisture can spoil right in their containers. This is an important consideration when packing food with dry ice as moisture condenses and freezes on the outer surface of the dry ice. For long term storage, grains should have a moisture content of 10% or less. It is difficult to accurately measure this without special equipment. See the [misc.survivalism faqs](#) for a quick and easy way of getting a rough estimate of the water content in your foods. It is also important to know that you can not dehydrate foods at home that reach these levels. Food that is dried to a moisture level of 10% moisture crisply snap when bent. Those of you who dehydrate foods at home know dehydrated foods from your dehydrator are quite pliable when bent, especially fruits. These will not store well long term.

### **Factor #3: Atmosphere the product is stored in:**

Foods packed in air don't store as well as in oxygen free gasses. This is because air contains oxygen which oxidizes many of the compounds in food. Bacteria, one of several agents which make food go rancid also needs oxygen to grow. Food storage companies have a couple of different processes for removing the oxygen:

- **Displacing the oxygen:** This is done by purging out all the air in the product with an inert gas. Nitrogen is almost always used because it is the most inert gas known. People doing their own packing occasionally use dry ice which gives off carbon dioxide gas, and probably works just about as well.
- **Absorb the oxygen:** Oxygen absorber packets do just that. Air contains about 78% nitrogen and 21% oxygen, leaving about 1% for the other gasses. If the oxygen is absorbed, what remains is 99% pure nitrogen in a partial vacuum.

If oxygen absorber packets are used, care must be taken to use a storage container that can stand some vacuum. If it's not air tight, air will be sucked into your container as the oxygen is absorbed, reintroducing more oxygen that must be absorbed. Before long, the oxygen absorbers will have absorbed all the oxygen they can. Obviously, your product won't be oxygen free under these circumstances.

**Seeds store better in nitrogen.** On the other hand, seeds you plan on sprouting, such as garden seed, or seeds set aside for growing your own sprouts store better in air. For this reason Walton cans their garden seed packs in air.

Oxygen absorbers also contain a minute amount of moisture to activate the absorber. Sometimes, with the heat generated by the absorber, they can cause sweating if you use glass bottles or tupperware type containers. **Factor #4: The container the product is stored in:**

To get the best storage life out of your product it must have a hermetic (air tight) seal. Containers that do this well are:

- #10 Cans (Use only cans that are enamel lined, otherwise your food flavor will be tainted by the steel it comes in contact with. An enamel lined can also prevents the inside of the can from rusting.)
- Sealable food storage buckets
- Sealable food quality metal (lined) or plastic drums.

Whatever container you use, be sure it is food grade as your product can be tainted with whatever the container is made from. Plastic sacks are not good air tight containers, for even if they are sealed, the relatively thin plastic 'breathes,' allowing air to pass through. Paper sacks are of course even worse.

There is some concern as to how good a seal is made by the lids on plastic buckets used by food storage companies. Manufacturer studies show an extremely small amount of air transfer. This amount is so small, however, that it can be considered a hermetic seal. It has also been found that the lids can be re-used several times without dramatically degrading the performance of the seal.

People who purchase products from food storage providers are often concerned about receiving their buckets bulging or with one side collapsed in. Collapsed buckets occasionally occur when ordering from Walton's as the elevation of their packing facility is above 6,000 feet. As the buckets are shipped to a lower elevation, the increased ambient air pressure can sometimes push in one side. If a side is popped in, it is a great indication that the bucket is indeed sealed. And this also holds true for buckets that might be under a slight amount of pressure. If either condition concerns you, crack the lid to equalize the air pressure. You can do this without seriously degrading the storageability of the product within the bucket. Remember to re-seal the lid after doing this.

**Bulging cans:** Some bulging cans have been returned to Waltons. In almost every case, these cans held mixes that contained baking powder or soda. It is believed that occasionally the extremely small amount of moisture found in the product interacts over time with the baking powder or soda and creates a small amount of carbon dioxide gas. Oxyten absorbers can also react with the baking powder causing the cans to buldge. These cans have been sent off for bacteria analysis and and in each case came back negative.

## Storage Life Notes About Specific Foods:

The Soft Grains	
Barley Hulled or Pearled Oat	Soft Grains have softer outer shells which don't protect the seed interior as well as hard shelled seeds and therefore won't store as long. Hermetically sealed

Groats  
Rolled Oats  
Quinoa  
Rye

in the absence of oxygen, plan on a storage life of 8 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

## The Hard Grains

Buckwheat  
Corn, Dry  
Flax  
Kamut  
Millet  
Durum wheat  
Hard red wheat  
Hard white wheat  
Soft wheat  
Special bake wheat  
Spelt  
Triticale

The Hard Grains all store well because of their hard outer shell which is nature's near perfect container. Remove that container and the contents rapidly deteriorate. Wheat, probably nature's longest storing seed, has been known to be edible after scores of years when stored in a cool dry place. As a general rule for hard grains, hermetically sealed in the absence of oxygen, plan on a storage life of 15-20 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

## Beans

Adzuki Beans  
Blackeye Beans  
Black Turtle Beans  
Garbanzo Beans  
Great Northern  
Kidney Beans  
Lentils  
Lima Beans  
Mung Beans  
Pink Beans  
Pinto Beans  
Small Red Beans  
Soy Beans

As beans age they lose their oils, resist water absorption and won't swell. Worst case, they must be ground to be used. Storing beans in nitrogen helps prolong the loss of these oils as does cool temperatures. Hermetically sealed in the absence of oxygen, plan on a storage life of 8-10 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored 10-20 degree F cooler temperatures.

## Dehydrated Vegetables

Broccoli  
Cabbage  
Carrots  
Celery  
Onions  
Peppers  
Potatoes

Dehydrated vegetables store well if hermetically sealed in the absence of oxygen. Plan on a storage life of 8-10 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

## Dehydrated Dairy Products

Cheese Powder  
Cocoa Powder  
Powder Eggs  
Butter/margarine pdr  
Powder Milk  
Morning Moo  
Whey Powder

Dehydrated Dairy Products generally store very well if stored dry in hermetically sealed containers with the oxygen removed. Plan on a storage life of 5 to 10 years if stored at a stable temperature of 70 degrees F. They should keep, probably 5 years longer, if stored at cooler temperatures.

One exception is Morning Moo. As a new whey based product, it hasn't been tested for long term storage. Plan on rotating this product after 5 years.

Our dairy powders (excluding our sour cream powder) contain no fat, an agent that markedly decreases the storage life of dairy products.

## Flours and Other Products Made From Cracked/ground Seed

All Purpose Flour  
Bakers Flour  
Unbleached Flour  
White Flour  
Whole Wheat Flour  
Cornmeal  
Mixes  
Refried Beans  
Cracked wheat  
Germade  
Gluten  
Wheat flakes

After seeds are broken open their outer shells can no longer protect the seed contents and seed nutrients start to degrade. Don't try to store unprotected flours longer than a year. Hermetically sealed in the absence of oxygen, plan on a storage life of 5 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures. Note: Granola is not a long storing food because of the nuts. They contain high concentrations of oil which go rancid over the short term. Expect granola to last about 6-9 months.

## Pasta

Macaroni  
Noodles  
Ribbons  
Spaghetti

Pasta will store longer than flour if kept dry. Hermetically sealed in the absence of oxygen, plan on a storage life of 10 - 15 years at a stable temperature of 70 degrees F. Pasta should keep proportionately longer if stored at cooler temperatures.

## Dehydrated Fruit

Fruit doesn't keep as well as many dehydrated items. Hermetically sealed in the absence of oxygen, plan on a storage life of 10-15 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

## Honey, Salt and Sugar

Honey, Salt and Sugar should keep indefinitely if stored free of moisture. Watch out for additives in the honey. It is possible to buy honey with water and sugar added. This honey generally doesn't crystallize like pure 100% honey does when stored for a long time. If there are additives, there is no saying how long it will last.

## Peanut Butter Powder

Peanut Butter Powder will not store as long as wheat flour. Hermetically sealed in the absence of oxygen, plan on a storage life of 4-5 years at a stable temperature of 70 degrees F. It should keep proportionately longer if stored at cooler temperatures.

## Brown and White Rices

Brown and white rices store very differently. Brown rice is only expected to store for 6 months under average conditions. This is because of the essential fatty acids in brown rice. These oils quickly go rancid as they oxidize. It will store much longer if refrigerated. White rice has the outer shell removed along with those fats. Because of this, white rice isn't nearly as good for you, but will store longer. Hermetically sealed in the absence of oxygen, plan on a storage life for white rice of 8-10 years at a stable temperature of 70 degrees F. It should keep proportionately longer if stored at cooler temperatures. Stored in the absence of

oxygen, brown rice will last longer than if it was stored in air. Plan on 1 to 2 years. It is very important to store brown rice as cool as possible, for if you can get the temperature down another ten degrees, it will double the storage life again.

## Garden Seed or Sprouting Seed

All viable seeds are hibernating tiny living plants that only need moisture and warmth to sprout. And much like a chick in an egg, all the nutrients this little life needs to spring into existence is contained within it's shell. Like boiling an egg, heating a seed will kill that little life within it. However, unlike an egg, a seed can withstand cold temperatures. As seeds usually remain edible after the life within it dies, we must use different criteria when determining sproutable seed storage life. And again the big deciding factor is temperature. Plan on a storage life of 2 to 3 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures. And remember, you want to store all of these seeds in air. Packed in nitrogen, the [viability](#) of some seeds will last longer than others. This is still to a large degree an unexplored science, and therefore we recommend you store all the seeds you plan on sprouting in air.

**Alfalfa** is a unique seed as it actually germinates better if the seed is 2 or 3 years old. Most any sample of alfalfa contains 'hard' seed and 'soft' seed. Soft seed germinates within two days while hard seed germinates in about a week. The problem is, by the time the soft seed sprouts are ready to harvest, the hard seed may not have germinated yet. As storage time draws on, the hard seed turns into soft seed. Older seed germinates closer together. Stored in cool conditions, alfalfa seed should have a good percentage of germination up until it is 8 years old.

## Total Vegetable Protein

Total Vegetable Protein, made from soy beans, has an unusually long storage life. Hermetically sealed in the absence of oxygen, plan on a storage life of 15-20 years at a stable temperature of 70 degrees F. meat substitute should keep proportionately longer if stored at cooler temperatures.

## Yeast

Yeast, a living organism, has a relatively short storage life. Keep yeast in the original metal foil storage containers. If the seal remains intact, yeast should last 2 years at 70 degrees F.



However it is strongly recommended that you refrigerate it, which should give you a storage life of 5 years. Frozen yeast should store for a long time.

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