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Fats and Oils

All oils are fats, but not all fats are oils. They are very similar to each other in their chemical makeup, but what makes one an oil and another a fat is the percentage of hydrogen saturation in the fatty acids of which they are composed. The fats and oils which are available to us for culinary purposes are actually mixtures of differing fatty acids so for practical purposes we'll say saturated fats are solid at room temperature (70 F) and unsaturated fats we call oils are liquid at room temperature. For dietary and nutrition purposes fats are generally classified as saturated, monosaturated and polyunsaturated, but this is just a further refinement of the amount of saturation of the particular compositions of fatty acids in the fats.

Buying and Storing Oils and Fats

There is a problem with storing oils and fats for the long term and that is the fact that they go rancid rather quickly. Rancid fats have been implicated in increased rates of heart disease, atherosclerosis and are carcienogenic (cancer causing) so we want to avoid them if possible.

Oxygen is eight times more soluble in fats than in water and it is the oxidation resulting from this exposure that is the primary cause of rancidity. The more polyunsaturated a fat is, the faster it will go rancid. This may not, at first, be readily apparent because vegetable oils have to become several times more

rancid than animal fats before our noses can detect it. An extreme example of rancidity is the linseed oil (flaxseed) that we use as a wood finish and a base for oil paints. In just a matter of hours the oil oxidizes into a solid polymer. This is very desirable for wood and paint, very undesirable for food.

Because of this difficulty in storing fats and oils for any long period of time many books and articles on the subject of food storage make only passing mention of them, if they say anything at all. This is unfortunate because fat contains nine calories per gram compared to the four calories contained by either carbohydrates or protein. This makes fat a valuable source of concentrated calories that could be of real importance if faced with a diet consisting largely of unrefined grains and legumes. For small children, infants and the elderly, they may not be able to consume the volume of food that would be necessary in the course of a day to get all of the calories they would need to avoid weight loss and possible malnutrition. Additionally, fats play an important role in our perception of taste and texture and their absence would make many foods more difficult to prepare and consume. Furthermore, a small amount of dietary fat is necessary for our bodies to properly absorb fat soluble vitamins like A,D,E and K.

Long term storage of fats may be problematical, but it is not impossible. There are some general rules you can follow to get the most life out of your stored cooking oils and fats.

1. Exposure to oxygen, light and heat are the greatest factors to rancidity. If you can, refrigerate your stored oil, particularly after it's been opened. If possible, buy your oils in opaque, airtight containers. If you purchase it in plastic, particularly clear plastic, then transfer it to a gas impermeable glass or metal container that can be sealed airtight. If you have a means of doing so, vacuum sealing the storage container is an excellent idea as it removes most of the air remaining inside, taking much of the oxygen with it. Transparent glass and plastic containers should be stored in the dark, such as in a box. Regardless of the storage container, it should be stored at as cool a temperature as possible and rotated as fast as is practical. Oils and fats with preservatives added by the manufacturer will have a greater shelf life than those without them, provided they are fresh when purchased.

2. Unless they have been specially treated, *unopened* cooking oils have a shelf life of about a year, depending upon the above conditions. Some specialty oils such as sesame and flax seed have even shorter usable lives. If you don't use a great deal of it, try not to buy your fats in large containers. This way you won't be exposing a large quantity to the air after the you've opened it, to grow old and possibly rancid, before you can use it

all up. Once opened, it is an excellent idea to refrigerate cooking fats. If it turns cloudy or solid, the fat is still perfectly usable and will return to its normal liquid, clear state after it has warmed to room temperature. Left at room temperatures, opened bottles of cooking oils can begin to rancid in anywhere from a week to a couple of months, though it may take several more months to reach such a point of rancidity that it can be smelled.

3. Although darker colored oils have more flavor than paler colored, the agents that contribute to that flavor and color also contribute to faster rancidity. For maximum shelf life buy paler colored oils.

4. If you have no particular problem with using it, the culinary fat with the most shelf life as it comes from the store is hydrogenated shortening in its unopened metal or metal lined can. The brand most familiar in the U.S. is probably Crisco (tm), but there are many others. Solid shortening is usually composed of partially hydrogenated vegetable oils, but there are some that also contain animal fats. Some brands will also contain anti-oxidant preservatives as well. All other conditions being equal, those with preservatives will have a longer shelf life than those without. It is not possible to give an exact answer, but it is reasonable to expect an unopened metal can of shortening to have a shelf life of eight to ten years if kept reasonably cool, particularly if it has preservatives in it.

   Outside of the U.S., hydrogenated vegetable shortening may be tricky to find. A product that *may* be similar is copha, a solid, mostly saturated coconut fat. If packaged in a similar manner as the vegetable shortening above it might keep for a similar length of time, providing the manufacturer used good technique and fresh raw material. Again, any preservatives added to it will extend the shelf life. I have no experience with copha and am going on what I have read of the product. If anyone can send me factual information I'll gladly use it.

Extending Shelf Lifes by Adding Anti-Oxidants

If obtaining the maximum shelf life in your cooking oils is important to you, it is possible to add anti-oxidant preservatives to the fat after you have purchased it. If used in conjunction with a gas impermeable container, either opaque in color or stored in a dark place, and cool storage temperatures (70 F or less) then shelf life can be extended to about five years, possibly longer.

The anti-oxidant in question is Butylated HydroxyToluene (BHT). It is used in the food industry to slow the development of off-flavors, odors and color changes

caused by oxidation, mostly in foods that are high in fats and oils. BHT is on the U.S. Food and Drug Administration's Generally Recognized As Safe (GRAS) list as a common preservative. The FDA limits the use of BHT to 0.02% or 200 parts per million (ppm) of the oil or fat content of a food product. The directions that I will be giving below will be for the FDA limit, but there are those who choose to use up to ten times that amount as part of their life extension programs. The level you choose is up to you.

BHT is available over the counter in the retail trade, but you have to know where to look for it. The only retail distributor of the anti-oxidant that I am thus far aware of is Twin Laboratories (TwinLab), Ronkonkoma, NY 11779. Their BHT comes in the form of 250 mg gelatin capsules. I've been able to find their product in several local health food stores. It is also available through mail order sources, but I don't have any names or addresses for that avenue yet.

To get the best results you will need the freshest oil you can find. Purchasing it from a large, busy supermarket will probably suffice. You'll also need containers that are gas impermeable such as glass jars, or metal cans. There may be plastic containers made of thick High Density PolyEthylene (HDPE) that will also serve, but I cannot knowledgably say about this. Make sure your containers are clean, dry and dust-free.

Each 250 milligram capsule is sufficient to treat 47 fluid ounces of cooking oil (as per the GRAS guidelines mentioned above). If you have an accurate means of weighing this works out to be 5.3 mg of BHT crystals to every 1 fl oz of oil. If you're using a scale calibrated in grains, such as a reloading powder scale, you may use the following table.

BHT in Grains	**Oil**	**BHT in Milligrams**
0.1	1 fl oz	5.3
0.7	8 fl oz (1 cup)	42.4
1.3	16 fl oz (1 pint)	84.8
2.6	32 fl oz (1 quart)	169.6
5.2	64 fl oz (1/2 gal)	339.2
10.3	128 fl oz (1 gal)	678.4

NOTE: The grain weight measurements have been rounded up to the nearest tenth grain since most powder scales will not accurately measure less than one tenth of a grain.

IMPORTANT NOTE: If you are using a reloading powder scale, be sure the pan is clean and the balance has been calibrated recently with a reliable set of check weights.

Remove the BHT crystals from their gelatin capsules and weigh, if you're going to. Once you have the appropriate amount, add the crystals to a pint or so of the oil, shaking vigorously. It may take several hours for the preservative to dissolve completely. Bringing the oil up to a warm, NOT hot, temperature will speed the process. Once completely dissolved, pour the anti-oxidant laden oil into the rest of the oil and mix thoroughly. Once mixed, the oil can then be poured into its storage containers leaving approximately 1/2 inch of headspace. If you have a vacuum sealer the jars or cans may be vacuum sealed to remove most of the oxygen from the container, otherwise just seal the lid. Store in a cool place and if using transparent jars, be certain to put them in a larger container such as a box to keep the contents in the dark. Don't forget to label and date the jars.

There are other preservatives in food industry use that will also work, but I have not yet discovered how they are used or where to get them. I'm currently looking for information on Butylated HydroxyAnisole (BHA), propyl gallate, vitamin E (the tocopherols, natural and synthetic), ascorbyl palmitate (a fat soluble form of vitamin C), citric acid and mono-Tertiary-ButylHydroQuinone (TBHQ). Additionally, certain herbs and spices like cloves, rosemary, oregano, sage and vanilla also have antioxidant properties, sometimes quite strong ones. Being strongly flavored, they are not suitable as preservatives in fats meant for general use, but will lend their protective properties in any recipes that calls for them.

Before I close out this section on fats and oils, please allow me to reemphasize that no amount of preservatives that can be added to your stored fats will substitute for proper storage and rotation. The more I research the chemistry and physiological effects of rancid fats the more I come to believe they are bad news for long term health, particularly as we grow older. Don't sit on your oil supply for years without rotating it. Just a little bit rancid is just a little bit poisonous. `Nuff said.

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