# Backyards & Beyond

Fall 2013

RURAL LIVING IN ARIZONA

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The University of Arizona

College of Agriculture and Life Sciences

Cooperative Extension

# Featured Plant

Common Name: Sweet Acacia
**Scientific Name:** *Acacia smallii, Acacia minuta, Acacia farnesiana*

Mohamed Al-Deghairi

Curt Peters, Extension Agent, 4-H Youth Development, University of Arizona, CALS Cooperative Extension, Pima County

The versatile Sweet Acacia is a medium sized tree known for its drought tolerance. It is originally found in the Southwestern United States, Caribbean, and Central America and the name comes from the unmistakable fragrance of the ½" bright yellow puff ball flowers when it blooms. The bark is rough and dark colored. Young growth will have numerous straight, whitish thorns, which become less plentiful on old growth. Its leaves are medium green in color and consist of tiny leaflets that give the tree a feathery appearance. Mature trees can reach the height of 30'-35' but are generally found in the 15'-25' range. It is considered semi-deciduous, retaining leaves in warm winters and dropping them in cold winters. Sweet Acacia does best in full sun and tolerates reflected sun and heat. It is adaptable to different soil types but prefers good drainage.

In addition to the showy, fragrant flowers, Sweet Acacia is a popular landscape tree because of its versatility. It can have a single trunk or a vase shaped multiple trunk. It does well with infrequent deep irrigation in a xeriscape (or natural landscape), and also does well in a frequent irrigation setting near turf. It can be used as an accent/specimen tree, in a group, or even as a thicket because of its thorny branches. It also grows well in confined spaces, such as large planter boxes, and parking lot strips, or in wide open spaces.

Tree care consists mostly of pruning. The Sweet Acacia is a fast grower and is prone to producing many sucker branches. Regular pruning is required in order to maintain shape and to thin the canopy to prevent wind damage. Insect problems are infrequent – immature trees may be damaged by sucking insects (e.g. aphids) that produce little lasting damage. Mature trees may be attacked by Acacia beetles which can girdle branches up to 3" in diameter.

There is much debate in the horticultural community about the exact classification of Sweet Acacia. Certain characteristics, such as flowering time and cold hardiness, are so varied that most consider the Sweet Acacia to be two different species. *Acacia smallii/ Acacia minuta* is more cold tolerant (to 15°F) and blooms from February to March. *Acacia farnesiana* is cold hardy to only 25°F and tends to bloom from October through March. Most other characteristics are indistinguishable between the two species, and they are often grown and sold simply as "Sweet Acacia" without regard to the species distinction.

# Featured Bird

Common Name: Barn Swallow
**Scientific Name:** *Hirundo rustica*

Dan L. Fischer

Dan L. Fischer - Author of *Early Southwest Ornithologists*, *1738-1900*, University of Arizona Press

Anyone who is interested in birds generally admire and appreciate the presence, agility and graceful flight of Barn Swallows. They are one of a group of migrating birds that is perhaps most noticeably fixed on our calendar by their arrival and departure. We know within a very few days of their summer appearance to nest and their subsequent exodus to wintering areas southward. Exceptions do occur, however, depending largely on weather and food sources. As insectivores they are very beneficial and depend entirely on their ability to migrate where their food sources are available. Although cosmopolitan in their distribution, some of the birds in the western hemisphere of the Americas have yearly transects that may range somewhere within the extremes of summer nesting above the Arctic Circle in the far north, to wintering areas in Tierra del Fuego in the distant south.

The mystical seasonal comings and goings of swallows have been noted over the centuries in the literature of early fork-lore even during Aristotle's time. It was believed then that swallows in winter "plunge into the mud, become torpid, and hibernate like frogs" or that when "in full flight, suddenly dive under water and disappear beneath the surface." The notions of these actions have long been proven to be false. During this intervening period, however, much has been learned about other birds to the extent that a few other species do indeed become torpid or hibernate during winter.

The distribution of nesting Barn Swallows in Arizona is somewhat limited to the eastern half of the state, especially in the southeastern portion. Arriving in late March or early April these locations are generally near open fields and grasslands where mud and suitable structures are available to build their nests. Their nests are usually placed under an overhang such as eaves and against vertical walls where mud can adhere or on a horizontal ledge or beam. Both sexes build their nest with mud that is generally mixed with straw or horsehair to help bind the mixture together. Feathers line the completed nest. By the end of April the first set of 3-7 eggs are laid, then, quickly following the young fledging, a second set is laid so two broods are raised prior to their departure in early September. During this period the graceful birds spend much of their day in the air, dashing and wheeling through the sky gathering insects. When returning to feed their nestlings, they are met amid much excitement, twittering and loud outcries. The young after leaving their nest and while learning learn to hunt, are often fed in mid-air by their parents.

The Swedish naturalist Carolus Linnaeus, named the "father of biological taxonomy," described the genus of this bird in Latin as hirundo, "a swallow" with the species scientific name rustica, "rustic" or "belonging to the country, rural." He applied this name in 1758, while at same time comparing it to the European House Martin, to which he gave the Latin name of urbica, "pertaining to the city." Both swallows occur in Europe and were the first of several to be recognized and officially named. The common species name for this swallow was applied because of its close association and adaption to barn nesting sites in America.

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Editors
Bryan Chadd
Kim McReynolds
Susan Pater
George Ruyle
Jeff Schalau

Contributing Writers
Cado Daily, Dan L. Fischer, Nobuko Hongu, Jenifer T. Kappico, Jack Kelly, Curt Peters, Asuka Suzuki, James Walworth, Cyndi Wilkins

Graphic Design & Layout
CALS Communications & Technologies

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Dr. Strangelove

# contents



Cover Photo credit: Susan Pater

Tonda

# Recognizing and Treating Iron Deficiency in the Home Yard

**James Walworth Ph.D.**
*Professor And Extension Specialist, Soil Science Department Of Soil, Water And Environmental Science, University of Arizona*

Iron deficiency is a frequent problem for many ornamental plants growing in the low desert areas of Arizona. The underlying cause for this disorder is the high pH levels of our soils. Calcium carbonate ($CaCO_3$) deposits are a common feature of high pH desert soils. Calcium carbonate accumulates in desert soils because precipitation is not sufficient to wash or leach these naturally occurring materials out of the soil. Calcium carbonate may be visible as light colored concretions (lumps) which range in size from less than one inch to several inches across or as a solid layer, ranging from a few inches to several feet in thickness, although calcium carbonate is often present even when it is cannot be seen. If these deposits form solid layers they are known as caliche. When calcium carbonate dissolves in water, it raises pH to 8.0 to 8.5, and this is the pH range of most desert soils. In this high pH environment, iron solubility is greatly reduced. In desert soils there is usually plenty of iron; it just is not soluble enough to provide adequate nutrition to susceptible plants. Over-watering plants growing in calcareous soils can induce or worsen iron deficiency. Additionally, cold winter soils may induce iron deficiency, which often disappears when soils warm in the spring.

If an adequate amount of iron is not available to plants, iron deficiency (iron chlorosis) will result. This condition may be recognized by the nature of deficiency symptoms. The symptoms of iron deficiency appear on the youngest, newest leaves. The area between the leaf veins becomes pale yellow or white (this is called interveinal chlorosis). Usually, no noticeable physical deformity occurs, but in severe cases the youngest leaves may be entirely white and stunted. Iron deficiency symptoms in some common ornamentals are shown in figures 1 through 4. It may be difficult to distinguish iron deficiency symptoms from those of other nutrients, particularly zinc, which has similar symptoms in many plants. In iron deficient leaves, interveinal chlorotic lesions are angular and outlined by the leaf veins, whereas the chlorotic lesions in zinc deficient leaves are more rounded and the edges less sharp (figure 5).

Soil testing can tell you the pH and the calcium carbonate levels in your soil, and laboratory analyses can give you an indication of the amount of plant-available iron your soil contains (see Walworth 2012a, and Schalau, 2010). However, susceptibility to iron deficiency varies greatly between plants, and it is not uncommon to see a plant with severe iron deficiency growing adjacent to one in identical soil with no symptoms at all. Desert plants evolved in high pH soils and are less susceptible to iron deficiency because they have mechanisms that enable them to solubilize and absorb iron from high pH soils. In contrast, plants from regions with acidic soils do not have this ability. Most humid tropical and subtropical regions fall into this category and therefore many of the ornamental and crop plants we have imported from these areas are susceptible to iron deficiency. Examples include citrus, roses, gardenia, crepe myrtle, and many others. Members of the Ericaceae or Heath family such as azaleas, rhododendrons, and blueberries are extremely susceptible to iron deficiency.

The easiest way to avoid iron deficiency is to grow desert-adapted plants such as mesquite, ironwood, palo verde, acacia, agave, yucca, cactus, etc. These plants rarely, if ever, suffer from iron deficiency. Koenig and Juhns (2010) and Tindall et al (1996) contain lists of the degree of iron deficiency susceptibility among crop and ornamental plants.

There are several methods of correcting iron deficiency once it is identified.

### 1. Acidify the soil

The ultimate cause of iron deficiency is high soil pH. Theoretically, this situation can be remedied directly by lowering soil pH, however this solution is not practical under most circumstances. Desert soils with caliche are very well buffered, which means that the pH is extremely difficult to change long-term. Also, it may not be practical to change the pH of soil in which perennial plants are already established because amendments cannot be adequately incorporated into the soil. This remedy is most likely to succeed in containers or beds where only small volumes of soil are treated and plants are replaced frequently (e.g. bedding plants or vegetables).

Adding powdered or prilled (pelleted) elemental sulfur to soil will add acidity. The amount needed

FIGURES

1 Iron deficiency is common in domestic roses.

2 Grapes showing iron deficiency. Note that the older leaves at the bottom of the photograph show normal coloration.

3 Mulberry showing iron deficiency symptoms.

4 Iron deficient purple orchid tree.

Figure 5. Iron deficiency symptoms (top photo) and zinc deficiency symptoms (bottom photo) in pecan leaves.

will vary depending on soil texture and the calcium carbonate content. The following rates are suggested as starting points: one-half ounce (14 grams) per cubic foot of soil in sandy soils, one ounce (28 grams) per cubic foot of soil in silty soils, and two ounces (56 grams) per cubic foot in clay soils. Sulfur should be thoroughly mixed with the soil. Application of too much sulfur can over-acidify the soil, a situation that should be avoided (soil pH should be kept above 6.0). See Hart et al (2003) for additional information on acidifying soils.

Note that not all forms of sulfur will acidify soil. For example, gypsum ($CaSO_4.2H_2O$), which is a useful amendment for soils affected by high levels of sodium, does not acidify soil and will not help correct or avoid iron deficiency. For more information on the use of gypsum see Walworth (2012b).

### 2. Apply iron fertilizer to the soil

Chelated iron fertilizers, in which the iron is combined with an organic chemical called a chelate that helps keep the iron in a plant-available form, are most appropriate for application to the soil. Fertilizing high pH soils with non-chelated iron fertilizers such as ferrous sulfate ($FeSO_4.2H_2O$) is not recommended because this iron will not be available to plants.

Chelated iron fertilizers include Fe-DTPA, Fe-EDDHA, and Fe-EDTA. Iron added in these forms will remain available longer than non-chelated iron, although even these forms of iron will not remain available to plants indefinitely in high pH soils. Fe-EDDHA is more effective in high pH soils than Fe-DTPA or Fe-EDTA. When buying chelated iron, read the fertilizer label to make sure that all the iron is in chelated form. Some fertilizer labels indicate that the fertilizer contains chelated iron, but careful reading of the label reveals that only a few percent of the iron is chelated.

Apply Fe-EDDHA fertilizer at a rate of approximately 2 to 3 lbs/1000 $ft^2$ of soil (3 to 5 oz/100 $ft^2$). This treatment may have to be repeated several times during the growing season. Frequency will depend on soil and plant properties, and is best gauged by observing plant performance.

The chelates discussed above are man-made. Natural chelates can be found in soil organic matter. Practices that increase levels of soil organic matter, such as adding manure to soil, can help maintain iron in a plant-available state.

### 3. Apply iron directly to the plant foliage

An effective means of supplying iron deficient plants with supplemental iron is by spraying fertilizer on the plant leaves. An inexpensive and commonly used material for this purpose is ferrous sulfate ($FeSO_4.2H_2O$). Mix 1 to 2 oz of ferrous sulfate in 1 gallon of water. An equivalent rate of chelated iron can be used instead, but the more expensive chelated forms of iron offer little advantage for foliar application. Adding a couple of drops of liquid dishwashing soap per gallon will help wet the leaves and improve penetration, particularly on plants with waxy or hairy leaves.

Spray this solution on the plant leaves during cool weather. In hot weather apply in the evening to avoid burning leaf tissue. Do not use a stronger solution that recommended, as leaf tissue is quite sensitive and easily can be damaged. Spraying a small portion of the plant, then waiting a day to check for possible foliar damage may be prudent for high-value plants.

Although foliar iron application is very effective, it is not a permanent solution. Iron sprayed on leaves moves very little within the plant and new leaves that form after foliar iron application may soon begin to show deficiency symptoms. At this time an additional application will be necessary. For rapidly growing plants, sprays may have to be repeated every few weeks. Application frequency can be determined by regular visual inspection of plants.

Iron deficiencies are more easily avoided than corrected. It may be possible to avoid the problem through the use of sulfur during soil preparation for potted plants and making sure adequate drainage is provided, although susceptible species may still exhibit problems. The most successful means of averting iron deficiencies is to avoid sensitive plants. In general, desert species are better adapted to Arizona soils than are plants from other parts of the world. Many plant guides contain information about the susceptibility of plant species to iron deficiency and can help in the selection of appropriate plants.

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# PASSIVE WATER HARVESTING

Rainwater Harvesting for Drylands and Beyond, Volume 2 by Brad Lancaster (C) 2008 Reproduced by permission. www.HarvestingRainwater.com

**Cado Daily**
*Water Resources Coordinator, Appointed Personnel*
**Cyndi Wilkins**
*Instructional Specialist, Senior*
*University of Arizona, CALS Cooperative Extension, Cochise County*

Passive water harvesting is the practice of slowing water down and encouraging it to soak into the ground. With simple land contouring (often called "earthworks") that catch and direct stormwater runoff, stormwater can be used beneficially, encouraging plant growth in landscapes and natural areas, healing erosion cuts, and can even replace the need to irrigate with tap water.

Passive water harvesting systems consist of a catchment area, a distribution system and a landscape holding area. Runoff is directed from the catchment area to the holding area where water can be immediately used by landscape plants. Catchment areas include soil surfaces, roofs, roads and sidewalks. Passive water harvesting can be used along with a rainwater storage system ("active" rainwater harvesting) or can be used alone.

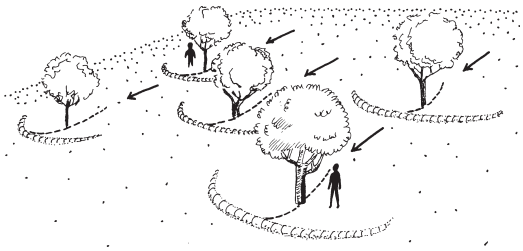
There are several advantages to this type of water harvesting:

- Inexpensive
- Simple to build
- Low maintenance
- Turns your land into a sponge!

Goals of passive water harvesting:
Slow the runoff down
Spread the water out
Soak the water in

Use the following strategies to achieve the goals of passive water harvesting:

Berms and Swales, also known as mounds and dips, are created perpendicular to the flow of water. The ground is shallowly excavated outside the plant drip line to hold water, while the berm helps detain the water a while longer. Plant trees and shrubs in raised areas on or near the basin edge and do not allow water to stand around plant trunks or stems.



Crescent-shaped landscaped holding areas on a slope.

If using a berm with a swale, soil excavated from the swale can be used to build the berm. Berms can be constructed of soil, rock, straw bales, or other materials.

Create infiltration basins. These catchment areas include shallow basins or depressions, sunken beds (called "raingardens") around plantings to supply water to several plants at once, or donut rings around individual plants. Hide these basins under mulch.

# Rainwater Management and Harvesting Principles

*Detailed principles to help create your earthworks*

### START MANAGING WATER AT TOP OF WATERSHED

- Define the site "watershed" including off-site drainages that contribute to or receive runoff from your site
- Manage water at the top, and in small increments throughout the site to reduce the volume and force of water collecting at the bottom
- Work with upstream neighbors to encourage them to conduct water harvesting at their site, or capture their water as it enters your site and put it to use

### CREATE MULTIPLE SUBWATERSHEDS

- Water is easier to manage at many small points than at one large point
- Where possible, use existing topography to create multiple small subwatersheds at your site to collect water
- Where natural topography isn't sufficient, create multiple subwatersheds by altering land slope

### SPREAD AND INFILTRATE THE WATER

- The least expensive place to store water is in the soil
- Channelized, silt-laden water has erosive power, so spread the water out at intervals to slow its flow and allow sediments to drop out of suspension
- Water that is spread out over soil has more places to infiltrate into the soil
- The more water that infiltrates into the soil, the less has to be managed as surface stormwater
- Water stored in the soil should be in locations where it supports vegetation

### PREPARE FOR OVERFLOW

- In the desert southwest, there can be very heavy localized rains that cause extreme flooding
- Water harvesting structures that receive water from moderate to large catchment areas need to allow excess water to flow safely out
- Overflow devices need to be sized to handle extreme events and armored (e.g. lined with rock) to prevent erosion
- Overflow devices need to be maintained

### MULCH TO REDUCE EVAPORATION

- Much of the water that sinks into soil is quickly evaporated in the hot season
- A layer of mulch will reduce evaporation causing the water to stay in the soil where it is available to support plants
- Mulch can be a 3- 6 inch thick layer of organic material (bark, compost, straw) or 2 inch thick inorganic material (rock, gravel)
- Organic mulches help build soil as they decompose, and need to be renewed periodically
- Plants that drop their leaves help build organic mulches for themselves but may still need additional mulch
- If rock is already present at a site this might be a good source for inorganic mulches

### PUT RAINWATER TO BENEFICIAL USE

- Think of the ways you use water at your site and figure out how you can use harvested rainwater for them
- Rainfall is low in salts compared to groundwater and plants grow better with rainwater than with groundwater
- Rainwater stored in soil is ideal for supporting plants

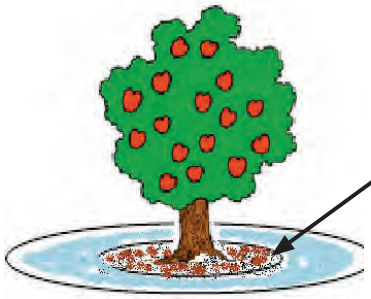
### START SMALL AND ADJUST YOUR SYSTEMS AS NEEDED

- It's best to try out ideas on a small scale first then adjust them as you see how they function when it rains
- Take the lessons you learn from small scale trials into larger scale systems when you are ready
- Inspect and maintain your systems regularly and especially after big rains

*"You have to think like a beaver. If it doesn't work just right the first time, go back and make it better."* Ben Lomeli

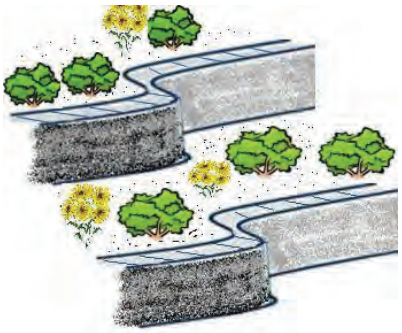
**CREDITS**

Rainwater Management and Harvesting Principles compiled by the teachers of the Sonoran Permaculture Guild in Tucson. For more information visit **www.sonoranpermaculture.org.** Used by persimission.



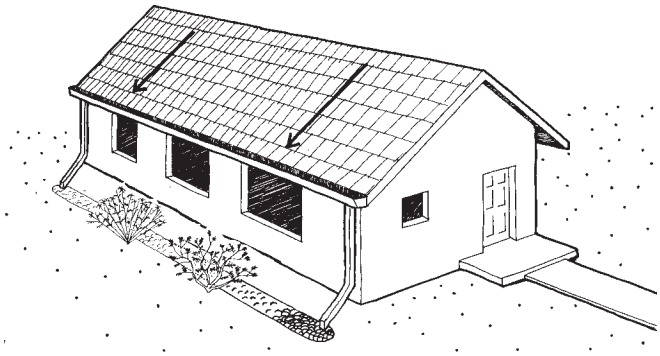
"Donut ring" watering basin

Shallow basins in-between plants



For sloped areas, build **terraces.** The multiple levels will slow runoff for plants and allow it to soak into the ground at each level.

Consider **permeable hardscape** materials like porous pavement, un-mortared bricks or paving blocks with holes in them to prevent runoff and encourage penetration. Use impermeable surfaces to direct runoff to useful areas.



Simple system—Roof catchment, gutters, downspouts and french drain.

**French drains** or dry wells are holes or trenches filled with gravel. Use French drains to direct water away from areas allowing water to infiltrate into the soil in a more appropriate location and supply water to plants. Keep water away from building and wall foundations.

Integrate earthworks by making them multi-functional. If a landscape is designed properly with berms, swales and the right plants, it can be a beautiful, natural landscape that relies solely on harvested rainwater.

**Dry streambeds** meandering through landscapes with rock "speed bumps" along the channel will slow runoff and encourage infiltration for use by nearby plants. Streambeds can have aesthetic value, creating a focal point in your landscape and provide the illusion of water.

## ARIZONA Water Rights

It is OK to capture water that originates on your property. BUT per ARS 45-141, waters of all sources, flowing in streams, canyons, ravines or other natural channels cannot be captured unless you have legal appropriation rights. If you detain appropriated waters with passive harvesting structures, you must allow the water to pass through the structures.

## Resources

UA Publications (http://cals.arizona.edu/pubs/):
- RainScapes, AZ1539
- Harvesting Rainwater for Landscape Use, AZ1344
- Rainwater Collection – Basic Components of a Rainwater Storage System, AZ1565

Additional resources: waterwise.arizona.edu
- Rainwater Collection – Calculating Water Supply and Demand to Estimate Storage Needs

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Rainwater Harvesting for Drylands and Beyond, Vol. 2 B. Lancaster

Harvesting Rainwater for Landscape Use, P. Waterfall

Sonoran Permaculture Guild, Tucson, AZ.

# Manure in the Home Garden

Dr. James Walworth
*Professor And Extension Specialist, Soil Science*
*Department Of Soil, Water And Environmental Science*
*University of Arizona*

Manure has been applied to soil for many centuries by gardeners and farmers to supply plant nutrients and organic matter to the soil and, of course, as a method of animal waste disposal. Organic matter in applied manure helps to build and maintain soil structure, which is important for drainage, root and water penetration, and water storage. Nutrients in manure can supply plants with part or all of their nutritional needs. Animal manures are excellent sources of nitrogen and phosphorus, and are used to replace manufactured fertilizers in organic agricultural production.

The nutrient composition of animal manure is variable, depending on animal species, quality of feed, moisture content, and methods of handling and storage (Table1) but is, in general, much lower than that of commercial fertilizers. Additional manure nutrient content information can be found in the Western Fertilizer Handbook (2002). Moisture content of manure is generally between 50 and 75%. Drier manure tends to have greater nutrient concentrations whereas wet manure has lesser concentrations on a fresh weight basis. During storage manure can lose from 15 to 60% of nitrogen, however nutrient losses can be minimized by covering manure during storage. Roughly half of the nitrogen in manure will be available to plants in the first year after application (the other half will be released slowly over time), although the rate of nutrient release can be extremely variable. As a result, it is difficult to predict the short-term nutrient supplying power of manure.

Salts from feeds, concentrates and water given to the animal are also quite variable and can, if not properly managed, accumulate in soil and damage plants. In general, dairy and beef manures have the highest salt contents, whereas sheep and hog manures have lower salt contents and present the least risk of causing salt damage. Salt level is a function of animal diet as well as species. Salts can be leached below the plant rooting zone by watering the soil with enough water to flow through the soil and carry salts downward.

Ideally, manure should be applied several weeks before planting, incorporated in the crop rooting zone (usually 6 to 10 inches deep), and the soil well watered. Incorporation well in advance of planting and watering are not required, although this practice is helpful for leaching salts, reducing odors and pathogens, and helping manure to decompose,

Table 1. Typical nutrient contents of domestic animal manures, expressed on a fresh weight basis.

| Manure | Nitrogen | Phosphorus | Potassium |
|---|---|---|---|
| | % of moist weight | | |
| Dairy | 0.45 - 1.7 | 0.1 - 0.5 | 0.3 |
| Beef | 0.35 - 2.0 | 0.1 - 0.6 | 0.3 |
| Horse | 0.5 - 0.9 | 0.1 - 0.15 | 0.2 - 0.60 |
| Chicken | 1.6 - 4.3 | 0.5 - 2.0 | 0.9 -2.0 |
| Sheep | 0.7 - 2.0 | 0.2 - 0.6 | 1.0 |
| Hog | 0.4 - 0.5 | 0.15 | 0.4 |

Table 2. Maximum amounts of animal manure to apply to soil.

| Manure | Maximum amount to add (lbs/square foot/year) |
|---|---|
| Dairy | 1 |
| Beef | 1 |
| Horse | 1¼ |
| Chicken | 1/3 |
| Sheep | 2/3 |
| Hog | 2 |

allowing nutrients contained in the manure to be released. Irrigation following manure application also will encourage weed seed to germinate, after which seedlings can be destroyed by tillage or herbicide application. In this way the weed seed contained in manure can be greatly reduced.

If manure has been properly composted prior to land application, viable weed seed should be considerably lower than in fresh manures. When manure is composted, several additional changes occur. The mass of the manure is reduced as carbohydrates are converted to carbon dioxide and lost to the atmosphere. Depending on the composting conditions, considerable nitrogen and potassium also can be lost from the manure. Because volatile nitrogen is lost during composting, there is less chance of damaging plants by manure application. If properly composted, the number of pathogenic and other microorganisms in the manure will be substantially reduced. For more information on composting, see Composting, National Engineering Handbook.

The optimum amount of manure to be applied varies depending on its composition. Manure application often is calculated on the basis of its nitrogen content such that enough manure is added to provide the nitrogen for growing plants. For example, if 200 lbs of available nitrogen per acre is required (a typical value for many vegetables), then about 400 lbs of total nitrogen per acre each year should be added (based on the assumption that about 50% of the nitrogen will become available in the first year). Thus a typical steer or dairy cow manure containing approximately 1% nitrogen can be applied each year at a rate of 20 tons per acre (40,000 lbs/acre x 0.01 lbs nitrogen/lb of manure = 400 lbs of total nitrogen). One acre is 43,560 square feet, so this is equivalent to about 1 pound manure per square foot of soil. Approximate maximum application rates are given in Table 2, but will vary depending on manure composition.

Manure applied at these rates should supply enough nutrients for most growing plants. However, if large quantities of leaching water are applied nitrogen may be leached out of the rooting zone, and additional nitrogen fertilizer may be required. Phosphorus and other nutrients contained in applied manure are less likely to be lost, and the manure rates listed above should supply an adequate nutrient supply. Application of manure in amounts greater than these may result in damage to growing plants, primarily through excessive nitrogen and salt levels.

Irrigate the soil after incorporating manure with at least 4 inches of water. This will wet the soil to approximately 2 to 4 feet, carrying soluble salts beyond the crop rooting zone, and helping to break down manure as noted earlier. Excessive soluble salts can result in poor seed germination, stunted growth, and a burned appearance on growing plants. Leaves will first appear yellow, then brown around the margins or edges, usually beginning at the tips and then progressing toward the base. Leaves may eventually turn brown and die. If these symptoms occur, additional water should be applied to leach salts below the rooting area.

Some animal manures have considerable levels of sodium, which can cause degradation of soil physical properties over time. If water penetration problems are noticed 1 to 2 tons/acre or 50 to 100 lbs of gypsum/1000 square feet can be added along with annual manure applications. See Using Gypsum and Other Calcium Amendments in Southwestern Soils for more information on use of gypsum.

Animal manures supply plant nutrients and can supplement or replace manufactured fertilizers. Manure also adds organic matter to the soil. Even in desert soils, where organic matter decomposes quickly, addition of manure helps to build and maintain soil structure, improving soil drainage, root and water penetration, and water storage. And lastly, applying manure to soil is a responsible, efficient way of disposing of animal wastes.

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# Is Honey the Same as Sugar?


**Jenifer T. Kappico, B.S.**
*Research Assistant*

**Asuka Suzuki, B.S., R.N.**
*Researcj Assistant*

**Nobuko Hongu, Ph.D., M.Ed., R.D.**
*Associate Specialist*
*Department of Nutritional Sciences*
*College of Agriculture & Life Sciences*
*University of Arizona*


Both honey and sugar are carbohydrate, calorie-dense sweeteners. This article reviews similarities and differences of honey and sugar, then, answers the popular questions: "Is honey better than sugar?" and "What are cooking tips when substituting honey for sugar in recipes?"

## Composition and Nutrition value in Honey and Sugar

Honey and sugar are both made up of a combination of glucose and fructose. In sugar, glucose and fructose are bound together to form sucrose, which comes from sugar beets or sugar cane and is more commonly known as table sugar. In honey, fructose and glucose are primarily independent of each other. Additionally, about 25 different oligosaccharides have been detected in the composition of honey.

One tablespoon of white, granulated sugar contains 49 calories, while one tablespoon of honey has 68 calories, which is the cause of honey having a higher density and weight than sugar. Dietary Guidelines for Americans (2010) and American Heart Association (2009) recommends "Reduce intake of added sugars", without singling out any particular types, such as sugar or honey.

## Digestion of Honey and Sugar

The difference between the digestion of honey compared to the digestion of sugar lies in the composition of enzymes in each of these products.

Sucrose (table sugar) passes through the stomach without any digestion happening because of its disaccharide (a sugar composed of two monosaccharides) composition. This means that the enzymes in the stomach cannot break down the glucose-fructose structure of table sugar until it reaches the small intestine. Then the liver utilizes a few enzymes to convert the molecules into glucose that is able to enter the bloodstream for further use.

Honey is different because of the enzymes that are added to the nectar by bees that divide the sucrose into two simple sugars, fructose and glucose. These sugars are directly absorbed by our bodies and are easier to digest.

## Glycemic Index of Sugar and Honey

The glycemic index (GI) is a measure of how carbohydrates deal with glucose in the blood. A carbohydrate with a low GI allows for only a small increase in blood glucose, while a carbohydrate with a high GI leads to a high blood glucose level. The average glycemic index for honey is 55±5 and this can be compared to the glycemic index of sugar, which is 68±5. Honey is a lower GI than sugar. Research has shown that foods with a low GI, a small increase in blood glucose, may provide reduced risk of coronary heart disease and type 2 diabetes.

## Health Concerns for Infants

Honey is not recommended for infants under one year of age. Infants are susceptible to the disease "infant botulism" which is caused by spores of the bacterium Clostridium botulinum that is present in natural foods. It is difficult to remove bacterium spores from honey. These spores are consumed without harm by children and adults. However, children under the age of 12 months do not have mature enough gastrointestinal tracts to combat the toxins that could come from this bacterium.

Table 1.

| Item Name | Quantity | Measure | Weight (g) | Calories (Kcal) |
|---|---|---|---|---|
| Honey, amber | 1 | Tablespoon | 21 | 68 |
| Sugar, white, granulated | 1 | Tablespoon | 13 | 49 |
| Honey, amber | 1 | Ounce-weight | 28 | 92 |
| Honey, clover | 1 | Ounce-weight | 28 | 86 |
| Honey, dark | 1 | Ounce-weight | 28 | 86 |
| Honey, white, org | 1 | Ounce-weight | 28 | 92 |
| Sugar, brown | 1 | Ounce-weight | 28 | 108 |
| Sugar, white granulated | 1 | Ounce-weight | 28 | 110 |

(Reference: The Food Processor® SQL Nutrition Analysis and Fitness Software, ESHA Research, Salem OR)

# Recipe

## Honey Mustard Chicken

*212 kcal, 12g Carbohydrate, 25g Protein, 6g Fat per serving*

### Ingredients: 2 servings

*About ½ lb – Chicken breasts, boneless, skinless*

**Batter:**

*2 teaspoon – Cornstarch*

*1 Egg white*

**Honey Mustard Sauce:**

*1 Tablespoon Honey*

*1 Tablespoon Mustard*

*¼ teaspoon – Soy sauce*

### Directions:

1. Cut the chicken into bite sizes and sprinkled with salt and pepper, and set aside.
2. Beat the egg white in a separate bowl, add cornstarch, and mix well.
3. Add the chicken to the beaten batter mix, tossing to coat.
4. Heat olive oil in the frying pan over low to medium heat. Add the chicken to the pan.
5. Cook each side of the chicken until golden brown and fully cooked (no more pink showing around the edge). Use a cooking thermometer to ensure that the chicken is fully cooked to 165ºF.
6. Mix all the ingredients of honey mustard sauce in a small bowl.
7. Toss with the honey mustard sauce to coat the cooked chicken and serve!

**Cooking Tip:**
The key to success with this recipe is even heat. If the oil gets too hot, the chicken may brown too quickly before fully cooked.

Symptoms of infant botulism include: constipation, a weak cry, and general muscular weakness. Children exhibiting these symptoms should receive medical attention promptly. (NATIONAL HONEY BOARD, Fact Sheet)

## Cooking tips when substituting honey for sugar in recipes

- Use 1 part honey for every 1 ¼ parts sugar.
- Add ½ teaspoon baking soda for every cup of honey to reduce the acidity and weight of honey. (The average pH of honey is 3.9, which is acidic.)
- Honey has a tendency to increase the browning of baked products. Adding ⅛ of a teaspoon of baking soda allows even browning; reducing oven temperatures by 25 degrees helps prevent overbrowning.
- Coating the inside of a measuring cup with water or very thin layer of vegetable oil before measuring honey can minimize the stickiness.

## Glossary Terms

**Antioxidant:** An antioxidant is a chemical that prevents the oxidation of other chemicals. In biological systems, the normal processes of oxidation produce highly reactive free radicals. These can readily react with and damage other molecules, but the presence of easily oxidisable compounds (antioxidants) in the system can "mop up" free radicals before they damage other essential molecules. Antioxidants can be found in vegetables, fruits and plants.

**Enzyme:** Enzyme is a compound that speeds the rate of a chemical process in a body. Almost all enzymes are proteins.

**Flavonoids:** Flavonoids are pigments that are found in many plants. The USDA defines flavonoids as a large group of non-nutrient chemicals in plants called phytochemicals, which have biological activities related to health. A few examples are beta-carotene (found in green leafy and orange vegetables), isoflavones (found in soy foods), anthocyannins (found in berries and other red, pink, blue, and purple fruits and vegetables), and quercetin (found in red wine, tea, green vegetables, and citrus fruit).

**Fructose:** A simple sugar (monosaccharide) found in honey, many fruits, and some vegetables. Fructose linked to glucose is the structure of table sugar, or sucrose.

**Gastrointestinal tract:** The gastrointestinal tract starts with the mouth and proceeds to the esophagus, stomach, duodenum, small intestine, large intestine (colon), rectum and, finally, the anus.

**Glucose:** When you eat, your body turns the food into a sugar called glucose. Glucose provides fuel for your cells. How does it get to the cells? It is carried to them by the bloodstream. The hormone, insulin helps the glucose get to the cells, so it can be used for energy.

**Glycemic Index:** The body breaks down most carbohydrates from the foods we eat and changes them to a type of sugar called glucose. The glucose travels through the bloodstream to reach the cells. After we eat, the glucose from the food gets into the bloodstream fast, slow, or somewhere in between. It depends on the type of carbohydrate and the food that contains it. The glycemic index or GI is a way of measuring how fast this occurs and how a food affects blood glucose levels following consumption of the food. Foods with higher index values raise blood sugar more rapidly than foods with lower glycemic index values do. Glucose has a Glycemic index of 100.

**Nectar:** Nectar is a sugar-rich liquid produced by flowers of various plants, and gathered by bees for making honey.

**Oligosaccharide:** Carbohydrates that contain a few monosaccharide units linked together.

**Sucrose:** Sucrose is a disaccharide, which means that it is made of two molecules, one glucose and one fructose, bonded together. A common variety of sugar found in the juices of many plants, as the sugar cane, sorghum, sugar maple, beet root, etc.

## Quick Facts:

- At present the annual world honey production is about 1.2 million tons, which is less than 1% of the total sugar production.
- In the US, Canada, and Australia, the average per capita of honey consumption is 1.3 to 1.8 pounds/year.
- A typical beehive can make up to 400 pounds of honey each year.
- Honey comes in many forms like crystallized, dried, filtered and raw.
- Honey is primarily 82% carbohydrates with 38.2% being from fructose and 31% being from glucose and is also composed of 17% water.
- Sucrose is composed equally of 50% fructose and 50% glucose.
- Honey contains trace amounts of many B-Vitamins like riboflavin, niacin, folic acid, pantothenic acid, vitamin B6, and vitamin C. It also contains antioxidants called flavonoids, which may have an anti-inflammatory effect on the body. Sugar does not "cool" plug for honey.
- Health promoting properties of honey are only achieved by application of rather high doses of honey such as 2-4 tablespoons per intake. (Bogdanov et al, 2008)

## References


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# Diagnosing Problems of Roses in the Landscape

**Jack Kelly**
*Former Commercial Horticulture Agent*
*CALS Cooperative Extension*
*University of Arizona*

Fig. 1. Tunneling caused by rose cane borer

Fig. 2. Rosebud covered with aphids


Fig. 3. Thrips damage and a thrips (insert)

Desert Southwest gardeners are fortunate to have fewer insect and disease problems on roses than most rose growers in other parts of the country. Some advanced knowledge about potential problems will help you recognize and manage problems before they get out of control. Prevention and early intervention are the key to healthy plants.

## Insect Problems

### Cane Borers

The first problem that might crop up in January is the cane borer, an insect that tunnels into the cane soon after roses are pruned in winter. Cane borers can be stopped by sealing all newly cut canes with white wood glue or other commercial preparations available. Their presence can be detected by a hole in the end of the cane (Fig. 1). Cut the cane back an inch or two at a time until the hole is no longer visible. Seal the cane with the wood glue.

### Aphids

When tender new growth appears on roses in February, aphids are not far behind. The rose aphid is a soft-bodied pink or light green insect that sucks the sap out of new growth and buds (Fig. 2). Aphids are best controlled with a forceful spray of water from the hose. A second line of defense is to use a soapy water spray (mix one tablespoon of dish detergent per gallon of water). Do not use a citrus based soap or scented detergents and always spray one or two leaves and check their reaction before you spray the entire plant. Spraying with water or soapy water can be repeated daily, if necessary, to control aphid populations. If you monitor the rose bushes regularly and take action as soon as aphids start appearing, it should not be necessary to use a chemical insecticide. Beneficial insects such as lady beetles and green lacewings will soon appear to feast on the aphids.

### Thrips

As the flower buds start to form on roses, look for thrips. Thrips are slender, brownish-yellow winged insects, barely visible to the naked eye. They hide inside newly opened buds and munch on the flower petal edges, causing them to turn brown (Fig. 3). The damage is cosmetic and won't harm the bush. Some gardeners don't experience problems from thrips and report thrips are eaten by the same beneficial insects that consume aphids. Gardeners trying to cultivate the perfect blooms for competition may choose choose to use a chemical control for thrips,

spraying the buds before opening (use an insecticide labeled for thrips on roses). Spray only the unopened bud, not the entire bush. Otherwise, you may destroy beneficial insects that will consume these pests.

### Spider Mites

When the weather becomes hot and dry (May through September), be on the lookout for spider mites. The lower leaves will become fuzzy yellow with red specks (mites), with webbing on the underside of the foliage. Shake the leaves over a white sheet of paper, look closely, and the mites can be seen scurrying around. Spider mites can be controlled by washing off the plants with a strong stream of plain or soapy water every two or three days. Soapy water may be more effective. There are miticides available that are labeled for roses.

### Leaf Cutter Bees

Circular or half-moon-shaped leaf cuts are caused by leaf cutter bees (Fig. 4). This is only aesthetic damage and is not detrimental except for roses that will be entered in competitions. Many gardeners see the hole left by a leaf cutter bee as a badge of honor, a testament to the health of their garden. Since the cutter bees use the leaves to make a nest and do not ingest the plant tissue, it is impossible and unnecessary to control them with chemicals. Try covering show roses with floating row cover or cheese cloth to keep cutter bees at bay.

## Disease Problems

### Powdery Mildew

Powdery mildew will show itself about the same time as the aphids appear. It is a seasonal problem that thrives with cool, damp nights,warm daytime temperatures in the 70's degrees F. or above, moderate to high humidity, and poor air circulation. Powdery mildew may first appear as small blisters on the upper surface of leaves, followed by white or gray powdery spots. The spots merge and eventually cover the entire leaf surface (Fig. 5). Leaves may become twisted and distorted. Powdery mildew can attack stems, leaves, petals and buds. The growing tips and buds may die if the condition is severe, but it seldom results in the plant's death.

The incidence of powdery mildew can be lessened considerably by simply using good gardening practices. When planting, provide sufficient space among bushes to allow air circulation and sunlight. Always clean up old leaves from the roses after pruning and discard them. Periodically wash down the leaves of the roses with water from the hose.

Sulfur or fungicides can be applied to the foliage as a preventative or to treat powdery mildew. To avoid burning the foliage, do not use sulfur when the temperatures exceed 90 degrees F.

Rosarians who exhibit in shows usually begin their management program before powdery mildew appears because it is difficult, if not impossible, to eradicate once it becomes established. They spray with a fungicide immediately after pruning in January or February. Fungicides work better as a preventive measure early in the season before the mildew takes hold. As with any product, follow the instructions exactly. It is also a good idea to test a few leaves first before spraying the entire plant.

### Crown Gall (Agrobacterium tumefaciens)

Due to stringent screening by many rose growers, crown gall is not commonly found in rose plantings. This destructive disease causes a warty looking gall at the base of the canes that can vary from the size of a pea to the size of a fist. (Fig. 6). Gall development causes gradual plant decline. The bacteria may arrive on contaminated nursery stock and once introduced, the bacteria persist in the soil for several years. Infection takes place through wounds. To prevent the disease, examine plants for galls carefully prior to purchase and prevent injuries during transplanting. There is no treatment. Remove and destroy infected plants. Do not replant roses, pyracantha or stone fruits in a place where crown gall is present

Fig. 4. Foliage damage caused by leaf cutter bee

Fig. 5. Powdery mildew damage

Fig. 6. Crown gall on rose stem

# Trouble Shooting Guide for Roses

| Symptoms | Possible Causes | Recommendations |
|---|---|---|
| **Entire Plant** | | |
| Failure to Thrive | Dead or damaged prior to planting | Purchase new plant |
| | Roots dried out during planting | Purchase new plant |
| | Inadequate or excessive irrigation | Adjust irrigation |
| | Poor soil drainage | Move rose to site with drainage |
| **Stems** | | |
| Canes browning & dying back | Cane Borer | Remove the cane a few inches at a time until damaged wood is gone. Seal cane with wood glue. Prevent by sealing all rose pruning cuts with glue. |
| | Insufficient water | Adjust irrigation |
| | Over fertilization | Water heavily to leach remaining fertilizer, remove damaged wood. |
| Brown & black blotches | Stem Canker | Prune out diseased wood |
| Wart-like growth at the base of plant | Crown Gall | Remove and destroy plant, do not place another rose in this spot for several years. |
| New canes dramatically different from old | Suckers coming from rootstock rather than grafted rose | Remove suckers at point of origin |
| **Leaves** | | |
| White powdery substance on leaves, leaves may be distorted | Powdery Mildew | Sulfur, Fungicide; space plants appropriately, wash down leaves to prevent establishment |
| Brown leaf margins | Salt Burn | Deep water to leach away salts, adjust water schedule to prevent build up of salts |
| Become progressively more yellow, beginning with older leaves and progressing to the new leaves. | Lack of nitrogen | Fertilize according to the instructions on the container |
| Leaves gray or with tiny speckled pattern | Spider Mites | Wash off with plain or soapy water, miticide |
| Circular holes in leaves | Leaf Cutter Bee | No control necessary |
| Tiny insects on the tips of new growth | Aphids | Wash off with plain or soapy water |
| Leaves yellow between the green veins | Iron deficiency | Apply chelated iron |
| Lower leaves yellowing on tips leaving a green arrow head shape in the center | Magnesium deficiency | Apply epsom salts |
| **Flowers** | | |
| Blooms fewer than normal | Too much shade<br>Insufficient or excess fertilizer or water<br>High temperatures | Remove shade, or move plant<br>Adjust to recommended rates<br>Wait for seasonal change |
| Bloom a different color | If the stem originates below the ground it is coming from root stock rather than the grafted rose.<br>If the stem originates above the ground (the stem with the flower of a different color originates on a cane that also has stems of the normal color), it is a sport. | Remove the cane at the point of origin<br>Marvel at the wonders of nature |
| Color Fades | Intense heat, bright sunlight<br>Characteristic of some varieties | Provide shade or wait for seasonal changes<br>If you don't like the color, replace with a different variety |
| Blooms distorted with brown tips | Thrips | Insecticide |
| No fragrance | Characteristic of some varieties | Replace with different variety |
| Petals damaged, blackened stub | Frost Damage<br>Heat Damage | Wait for new growth<br>Wait for new growth |

# Other Problems

## Salt Burn

Symptoms include the edges of the leaves turning brown. This common problem is caused by a buildup of salts in the soil and subsequently in the plant tissue. Salts can accumulate from inefficient watering practices or if an excessive amount of fertilizer is used. Symptoms typically are the browning of leaf margins of browning of the entire leaf (Fig. 7). Avoid this problem by periodically watering slowly and deeply to leach
salts past the root zone. Also, carefully follow the instructions on fertilizer containers and do not over apply. ("If a little bit is good, then a lot must be better", does not hold true for fertilizer!) By applying the fertilizer in a 'split application', i.e. applying half the recommended amount in two applications timed about 2 weeks apart will minimize the potential for fertilizer 'burn'. Water thoroughly before and after fertilizing to help prevent burn.

# Nutrient Deficiency

In the Southwest, the alkaline soils are typically high pH (8.0 to 8.5). Ideal pH for growing roses is from 6.0 to 6.5. If the pH of the soil is either too high or too low, some nutrients may become unavailable for uptake by the plant roots. A nutrient imbalance can cause symptoms of nutrient deficiency.

Nitrogen deficiency causes a general yellowing of foliage, beginning with older leaves, then appearing on younger leaves (Fig. 8). Leaves turn light green and progressively more yellow. Reduced growth and leaf size, weak and spindly stems, and small flowers are other symptoms. Prevent a nitrogen deficiency by fertilizing regularly. However, don't apply too much nitrogen, which will show up as abundant foliar growth and very few blooms.

Magnesium deficiency is manifested by older leaves which turn yellow at the edge leaving a green arrowhead shape in the center of the leaf (Fig. 10). To prevent this condition, apply one-quarter cup of magnesium sulfate (epsom salts) to the rose bush two or three times per year. Do not over-apply.

# Nutrient Toxicity

Frequently, over fertilizing is the problem. Follow the directions on the bag, using no more than the prescribed amount. If an excess is spilled, recover as much as you can and water heavily to dilute and leach the rest of the fertilizer away from the roots.

Chemical pest control is utilized by many rose enthusiasts. Only use chemical controls after non-chemical methods have been tried. There are numerous products available that are labeled specifically for roses and specific rose pests. Always read and follow the labeled instruction to minimize damage to plants and beneficial insects.

# Acknowledgement

Fig. 10 used with permission of UF/IFAS, Nutrition Deficiency Symptoms of Woody Ornamental Plants in South Florida, IFAS Pub#ENH1098. Author: Timothy K. Broschat. University of Florida IFAS Extension, March 2008.
Figs. 1, 2, 4, 5: Ursula Schuch
Figs, 3, 6, 7, 9: Jack Kelly
Fig. 8: Kathryn Hahne

Fig. 7. Salt damage to rose foliage

Fig. 8. Nitrogen Deficiency

Fig. 9. Iron deficiency on rose

Fig. 10. Magnesium deficiency on rose

# After you touch ducklings or chicks, wash your hands so you don't get sick!

- Contact with live poultry (chicks, chickens, ducklings, ducks, geese, and turkeys) can be a source of human *Salmonella* infections.
- *Salmonella* germs can cause a diarrheal illness in people that can be mild, severe, or even life threatening.
- Chicks, ducklings, and other live poultry can carry *Salmonella* germs and still appear healthy and clean.
- *Salmonella* germs are shed in their droppings and can easily contaminate their bodies and anything in areas where birds live and roam.

## Protect Yourself and Your Family from Germs

**DO:**

- Wash your hands thoroughly with soap and water right after touching live poultry or anything in the area where they live and roam.
  - Adults should supervise hand washing for young children.
  - If soap and water are not readily available, use hand sanitizer until you are able to wash your hands thoroughly with soap and water.
- Clean any equipment or materials associated with raising or caring for live poultry outside the house, such as cages or feed or water containers.

**DON'T:**

- Don't let children younger than 5 years of age, elderly persons, or people with weak immune systems handle or touch chicks, ducklings, or other live poultry.
- Don't let live poultry inside the house, in bathrooms, or especially in areas where food or drink is prepared, served, or stored, such as kitchens, or outdoor patios.
- Don't snuggle or kiss the birds, touch your mouth, or eat or drink around live poultry.

For more information, call **1-800-CDC-INFO** or visit **www.cdc.gov.**

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## eXtension.org - Selected Resource Highlight

### Small and Backyard Flocks Resource

The small and backyard flock resource (http://www.extension.org/poultry) on eXtension has information on getting started as well as poultry anatomy, behavior, biology and management. The group produces webinars to help learn about small and backyard poultry flocks. The upcoming webinars, as well as those available on demand, are listed at http://www.extension.org/66284.

Information on Human Salmonella linked to backyard chickens: http://www.extension.org/69059

Information on Salmonella: http://www.extension.org/13217

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ANN PO

ALEX BRAMWELL

JERRY WILLIS

ARIZONA
COLLEGE OF AGRICULTURE AND LIFE SCIENCES
COOPERATIVE EXTENSION