OAK GALLS

Galls are abnormal growths of plant tissue that are caused by the reaction of plant growth regulating chemicals on a plant's cells. There are many plants that are susceptible to the formation of galls and there also are many different types of galls. There are also many different organisms that can cause the formation of galls. This article is limited to the galls commonly found on oak trees in the Oak Forests of Southern Arizona. The galls that are most likely to draw the attention of southern Arizona hikers are the stem gall (there are different varieties of stem galls) and the Oak Apple Gall with the Oak Apple being the most obvious. This hiker found an Oak Tree on Bear Saddle (on the Green Mountain Trail) in the Catalina Mountains that contained a serious infestation of both a type of stem gall and the Oak Apple Gall. Another kind of stem gall (see Figure 1) was found on trees in the Corral Nuevo area of the Atascosa Mountains. This article will concentrate primarily on the Oak Apple Gall since it is the type of gall that Green Valley Hiking Club hikers are most likely to spot as they hike the trails.

Figure 1. A Type of Stem Gall – Atascosa Mountains
Photo by T. Johnson

Figure 2. Oak Gall Wasps.
Photo from Wikipedia Web Site

Oak Apple Galls: The Apple Gall gets its start when a small female wasp (See Figure 2) selects the underside of a newly growing leaf and injects an egg into the mid-rib (central vein) of the leaf. The resulting larva (it is small and round) hatches out and secretes plant growth-regulating chemicals that interact with certain plant chemicals to produce abnormal growths in the plant. The first abnormal growth that is evident has the appearance of a small red fuzzy ball on the underside of the leaf (see Figure 3). This growth is usually difficult to see without careful examination since it is the topside of the leaves that are generally the most visible as you are hiking along a trail. Stand under an Oak tree though and look up and you will be surprised at how many examples of this stage of the Oak Apple you may find.

The next stage in the development of the Oak Apple is that the insect continues to extract nutrients from the plant and excrete the plant growth chemicals that result in the transformation of the red fuzz-ball leaf combination to a spherical thin paper-like shell that provides protection for the growing larva. This "apple" is actually a mutated leaf.

The galls are live tissue, are part of the plant, are very nutritious and provide sustenance to the larva. As the larva eats and grows so does the "apple". When the larva is full-grown, it pupates (resting stage) and then turns into an adult wasp. These adult wasps are small and dark and have wings and can be either male or female. A wasp discovered in an "apple" on the Super Trail in Madera Canyon was black with yellow markings. They exit the "apple" by drilling a small hole in the shell and escaping. Figure 4 shows the progression from the "fuzz ball" stage to the developing "apple" to the mature "apple".

It is interesting to note that some scientists have theorized that the above stated gall-formation process of an Apple Gall constitutes only one phase in the life cycle of the Gall Wasp. It appears that the wasps that emerge from the Oak Apples mate, then fall to the ground where the females burrow into the soil and inject eggs into the roots of the oak tree. The larvae that result feed on the tree roots for a year and then pupate. The wingless female wasps emerge from the soil in early spring and climb up the tree trunk looking for the right leaf to inject a single egg into the vein of the leaf to start the process defined above. This completes the second phase of the continuing saga of the life cycle of the Oak Apple Gall Wasp.

Figure 3. The first evidence of the formation of an Oak Apple.
Photo by T. Johnson

Figure 4. Three stages in the growth of an Oak Apple.
Photo by T. Johnson

Summary prepared by T. Johnson in May 2014 from the web sites of Wikipedia, the Universities of Minnesota, Penn State, Kentucky and Illinois and from an article by Professor Eileen Buss.

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