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Hibiscus sabdariffa Botany[1]

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The purpose of this publication is to provide an overview of the botanical characteristics of the *Hibiscus sabdariffa* plant. The common names of *Hibiscus sabdariffa* vary by country. Some popular names are sorrel, roselle, and Florida cranberry. This publication will refer to the common name sorrel herein. Sorrel is in the family Malvaceae and grown as an annual. The intended audience includes researchers, students, Extension agents, growers, the brewery industry, and the public.

Leaves

Sorrel leaves are arranged alternately on the stem (Figure 1a). Its juvenile leaves are lanceolate with serrated margins (Figure 1a). On a young plant, the upper leaf surface is dark green, and the lower surface is pale green (Figure 1b). Older leaves are palmate (Figure 1c), with some more deeply lobed than others. The color of the petioles can vary in shades of red or green, or an ombre of red and green, depending on the variety. There is a visible pair of stipules/appendages where the petiole meets the stem (Figure 1d).

Stems

The stems are glabrous/smooth and vary in color from green to red or a combination of both, depending on the variety (Figure 1e). The lenticels/small pores used for the exchange of carbon dioxide and oxygen are visible in high-resolution images (Figure 1f).

Figure 1. Anatomy of sorrel (*Hibiscus sabdariffa*) plant: (a) growth point of the mature plant with young lanceolate leaves; (b) dark green upper surface and pale green underside of a young leaf with serrated margins and ombre (green and red) petiole; (c) palmate leaf located on mid-to-lower portion of the branch; (d) stipule with fruit at different development stages; (e) glabrous dark red stem; and (f) stem with lenticels. Credit: Norma Samuel, UF/IFAS

Flowers

Sorrel has a perfect flower, meaning it has both male and female reproductive parts in a single flower (Figure 2a). The flower is autogamous, meaning it is self-fertile (Zimmerman 2023). Self-pollination takes place before the flower opens. This feature is advantageous as the seeds saved will maintain their variety (Richards and Zimmerman 2023). The sorrel plant is photoperiod sensitive and flowers when days are shorter. Flowering takes approximately three to four months after planting. In Florida, the plant typically blooms in late summer to early fall (between August and September, depending on the location).

Flower buds appear in the axil of the leaf. There are two buds, primary and secondary, at different stages of development in the axil (Figure 1d). When the mature fruit is removed, the younger bud begins to increase in size, and auxiliary/secondary fruiting branches develop in the axil.

Parts of the Flower

- Petals: The initial showy parts of a sorrel flower are the petals. The five petals collectively make up the corolla (Figure 2a). The color of the petals varies with sorrel variety. For example, red varieties have multi-toned color that is light to dark pink and pale yellow with a deep red base (Figures 2b). In green varieties, the color can be light yellowish green with a deep red base. Flowers open predawn and the petals fade, becoming pinkish by midmorning and collapsing by noon.
- Stamen: The male parts, the anther, and the fused filaments collectively make up the stamen. Pollen grains are located on the anther (Figure 2c).
- Pistil: The female parts of the flower collectively are called the pistil and comprise the stigma, style, and ovary (Figure 2d).
- Sepals: These are the red, green, or striped structures at the base of the petals that make up the calyx (singular) and calyces (plural) (Figure 3a). Depending on the varieties, the sepals can have either an open or closed calyx encasing the seed boll (Figure 3b).
- Calyx: This structure consists of sepals fused together at the base surrounding the seed boll/capsule.
- Fruit: The calyx and the seed boll together make up the fruit. The calyces are fleshy and ready for harvest when they reach their maximum size two weeks after flowering. If the fruit is not harvested at this point, the calyx becomes more fibrous while the seeds mature (Richards and Zimmerman 2023). Some mature fruit is covered with short, stiff hairs (Figure 3c).
- Epicalyx: The epicalyx is a set of 10 narrow fleshy bracts (two per sepal) on the outside of the calyx (Figure 3a) that are red, green, or red at the base with green tips.
- Peduncle: The structure at the base of the flower that attaches it to the stem is called a peduncle (Figure 3a).
- Seed boll/capsule: A single seed boll contains approximately 15–25 seeds (Figure 3d). The seed boll has five visible lines where the capsule splits when dry. Fresh bolls are green or red with short, stiff hairs. The tips of the bolls on the red variety are usually red. Fresh developing seeds are white to cream in color. Dried seed bolls are tan in color with dark gray seeds (Figure 3e). The tips of dried seed bolls are sharply pointed and can potentially poke a person.

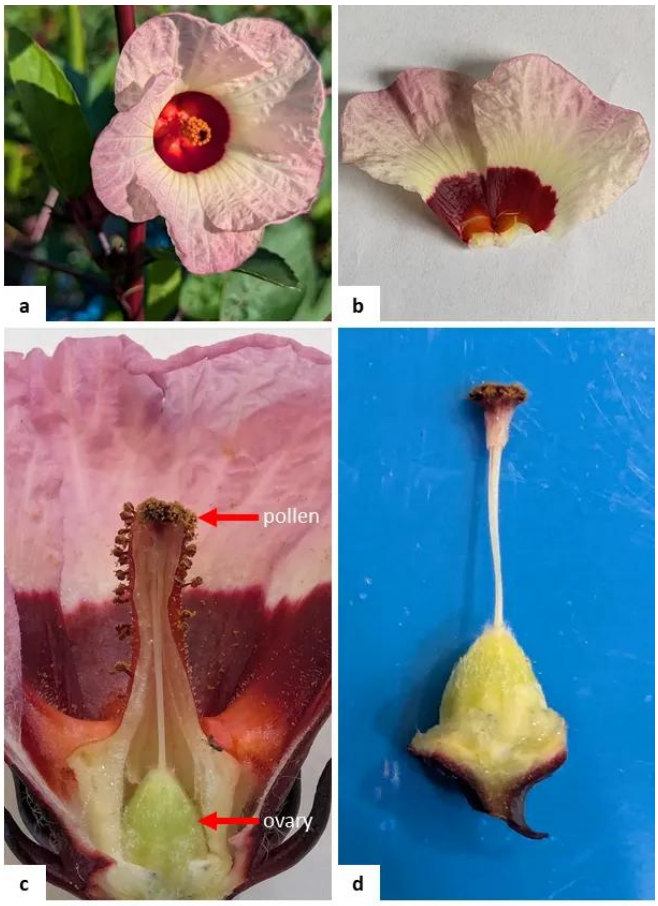

Figure 2. Flower anatomy of sorrel: (a) corolla of red flower variety, (b) petals with structural colors, (c) pollen (male) and the ovary (female), and (d) pistil. Credit: Norma Samuel, UF/IFAS

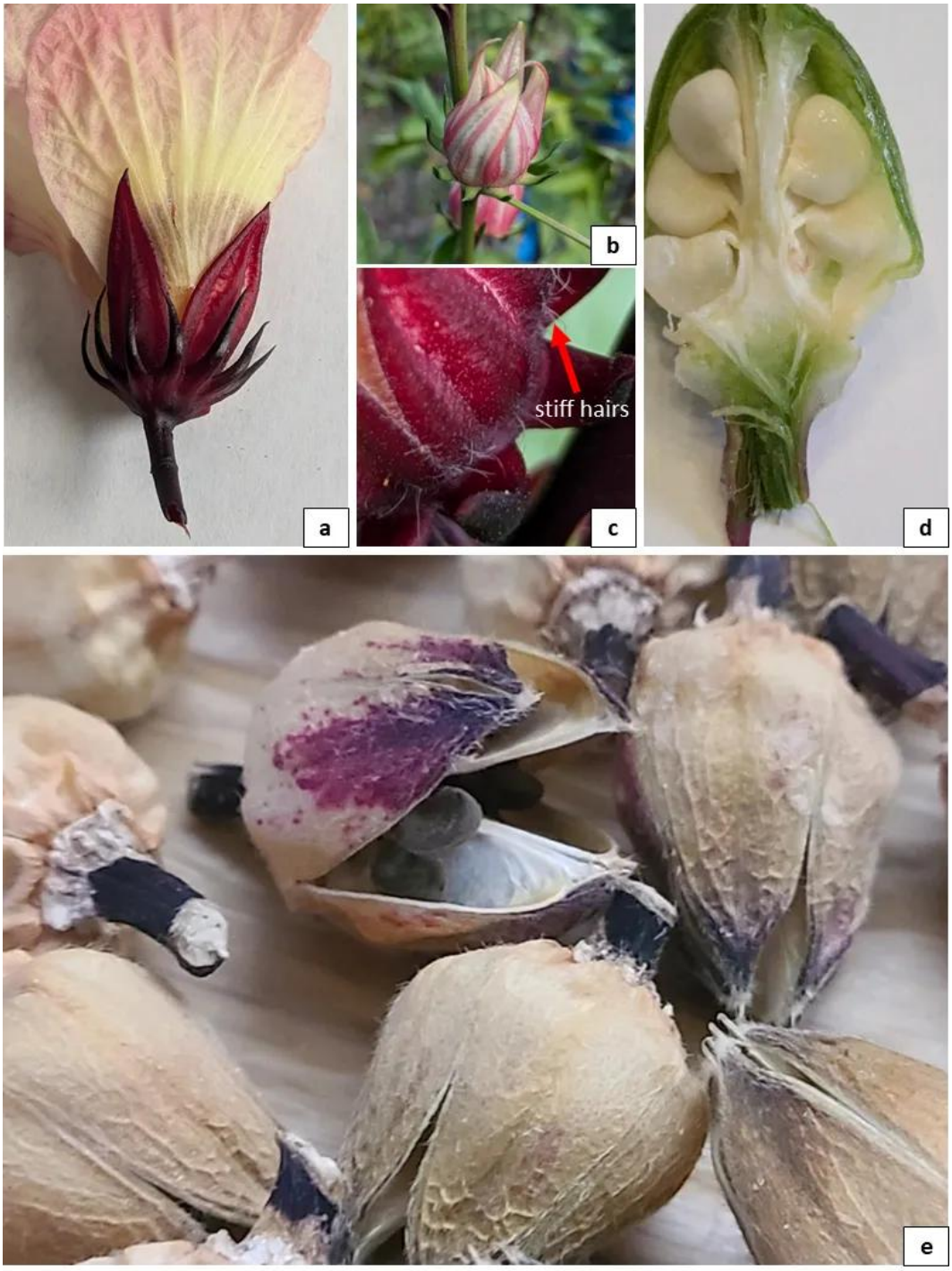

Figure 3. Anatomy of sorrel fruit: (a) flower showing petals, sepals, bracts/epicalyx, and peduncle; (b) closed calyx with hidden seed boll; (c) stiff hairs; (d) mature seed capsule; and (e) dried opened seed bolls.
Credit: Norma Samuel, UF/IFAS

Roots

Sorrel has a taproot system, consisting of a primary/main root from which lateral roots grow (Figure 4). The root system of a fully grown sorrel can span several feet in diameter and up to 1 foot deep. This deep root system makes the plant quite drought tolerant. The roots prefer well-amended, well-draining soil that is watered regularly until established.

Figure 4. The root of a sorrel plant.
Credit: Norma Samuel, UF/IFAS

Summary

This publication will provide an understanding of the morphological characteristics of sorrel to people who lack any training in botany. This will be helpful when reading publications on how to grow the crop.

References

Richards, D. A., and T. W. Zimmerman. 2023. "*Hibiscus sabdariffa* Use in the US Virgin Islands Beverage Industry." In *ISHS Acta Horticulturae: III International Symposium on Beverage Crops* 1387: 321–324. https://doi.org/10.17660/ActaHortic.2024.1387.45

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