Arid Zone Times

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Organic Soil Amendments

A common trait shared by nearly all desert soils is the almost complete absence of organic matter. Desert gardeners have long held the belief that the addition of organic amendments (peat moss, manure, compost, wood mulches) to soils, particularly at transplanting, is essential for improving soil structure, water penetration and promoting vigorous plant growth. In recent years many professional desert horticulturists and academics have raised questions about the ability of organic amendments to truly modify arid soils.

Organic matter, by itself, has no inherent ability to improve the physical structure of soil, appreciably increase water penetration or release significant quantities of essential nutrients into the soil. For organic amendments, applied as part of the installation or transplant process, to have a beneficial effect on plant growth they must first be decomposed by soil microbes. The effectiveness of organic materials applied to soils, then, is directly related to the rate of microbial decomposition.

The combination of extremely low levels of native organic matter in uncultivated desert soils (typically less than 1 percent by weight) with the limited availability of moisture, act to suppress the population of soil microorganisms. Even once conditions are reversed, with the application of organic matter and irrigation, it can take weeks and even months to build up sufficient populations of microbes to initiate decomposition and, in some cases, years to complete the process.

To get the fullest benefits of improved soil structure and the release of nutrients from organic matter it must be actively and vigorously decomposing. In order to achieve this level of decomposition, soils would need to be kept far wetter than is advisable or healthy for most desert adapted tree species. In the absence of sufficient moisture and microbial activity, organic matter can serve as a barrier to root establishment.

Studies suggest that improvements observed in soil water holding capacity associated with the application of organic mulches have more to do with inhibiting evaporation of water, not actual changes in soil structure. It is this increased water retention that presents the greatest problem for arid adapted trees. From an evolutionary perspective, most desert species are well adapted to generally porous, low organic matter soils that wet quickly during periodic rains. Water moves through the root profile fairly rapidly and rarely, if ever, fully saturates the soil. To best capture the available rainfall, root systems of desert species tend to be extremely broad. It is estimated the 80% of the feeder roots, root involved in the update of water and nutrients, exist within the first two feet, while 80 % of the anchoring roots grow to a depth of two to four feet. Root distribution can also be affected by soil type, (e.g. sand versus clay), the extent of soil compaction, and the availability of water and oxygen.

The introduction of high levels of organic matter, particularly as a backfill amendment surrounding the root-ball of transplanted trees, can inhibit tree establishment in a number of ways. Changes in soil pore size, caused by incorporation of organic matter, tend to hinder both the lateral and vertical movement of water. Roots spread and colonize new areas by following water migration through the soil. Limiting water movement limits both anchoring and feeder root growth. Increases in water retention, particularly longer periods of soil saturation, can be extremely detrimental to the establishment and growth of desert species. Saturated soils create conditions conducive to the development of root rotting diseases similar to those that damage bedding plants and shrubs.

The benefits of organic and inorganic mulches, as a top dressing, to lower evaporation and reduce weed seed germination are well documented and widely agreed upon. The time, energy and expense associated with the application of organic amendments, applied as backfill, are better directed toward excavating, or at least fracturing, the a wider area of soil around the tree being transplanted.