

Mulching and Organic Matter - Keeping Your Plants Happy

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While it is important to know what practices work best on your farm for growing blueberries or any other crop, it is also valuable to understand why these practices work. Most important to the subject of this talk is an understanding of the characteristics and growth of blueberry roots, and the conditions that are important in maintaining a healthy blueberry root system.

In nature, blueberry plants, whether highbush or lowbush, are found in soils with a relatively high organic matter content. Highbush blueberries typically grow in bog areas on hillocks, while other species such as lowbush often grow as a forest understory where humus and leaf litter cover a mineral soil. Both highbush and lowbush blueberries are also found on sandy soils covered by a layer of organic matter. Usually (though not always), these sites also have a good supply of moisture.

Roots are often considered less frequently than the above-ground portions of the plant, probably because they are less obvious. However, it is important to remember that the foundation for a healthy blueberry plant lies in a healthy root system, and if the roots aren't growing well, the rest of the plant won't grow well. Blueberry roots are very fine, and grow best wherever they find organic matter. Therefore, they are usually shallow, and can dry out easily. Roots in general grow best at cool soil temperatures, and blueberry roots in particular have been found to grow best at soil temperatures of 54 - 62 degrees F, with grow rate slowed as the soil temperature becomes further from this range. It is then easy to recognize that organic matter is important to blueberry plants for a number of reasons. First, organic matter increases the ability of the soil to hold and retain water, and keep roots, especially shallow ones, from drying out. Surface organic matter, in the form of mulch, insulates the soil and mitigates changes in soil temperature, so extremes are not reached that would slow the growth of the roots. Organic matter also holds nutrients in place, especially nitrogen, and can be a reservoir of other gradually-released nutrients as well. This helps in decreasing leaching of nutrients into water sources. Organic matter also helps to buffer the soil pH, and improves the soil structure.

One basic principle which should be understood, because it determines when nitrogen in organic matter become available, is that of the carbon:nitrogen ratio. As one can guess from the name, this is the amount of carbon in the organic matter as compared to the amount of nitrogen. The two critical number when considering C:N (carbon:nitrogen) ratios are 30:1 and 20:1. Organic matter sources with a C:N ratio greater than 30:1 will tie up nitrogen. If the C:N ratio is less than 20:1, the mulch will be a source of nitrogen for the plants. Mulches with C:N ratios between these two will neither tie up nor release nitrogen. The C:N ratio for any material decreases as it decomposes. C:N ratios for legumes range from 9:1 to 19:1, so they are a nitrogen source for plants. The C:N ratio for peat moss is approximately 45:1. The C:N ratio for various types of straw can be anywhere from 20:1 to 50:1; for aged, dark brown, hardwood sawdust is around 60:1; and for fresh sawdust ranges from 300:1 to 700:1. This is one of the reasons that fresh sawdust should not be applied to plants, and is why additional nitrogen usually needs to be applied when plants are mulched with sawdust, even when it is aged.

So, considering all of this, which practices utilizing organic matter are best for optimizing the growth of blueberry plants?

First, amending the planting hole during planting is valuable. Research studies that have tracked where blueberry roots grow can be summarized quite simply. Generally, the roots tend to grow where the organic matter is found. In plantings where the planting holes have been amended, blueberry roots tend to grow more deeply, but spread out less. Peat moss is the material that has most consistently improved yields in this use. If amending the planting hole with peat, make sure to moisten the peat first! Compost can also be used, but the compost should be analyzed at an analytical lab first to find out the pH, C:N ratio, and levels of nutrients that are being applied with the compost. Some labs that do soil testing also run a compost analysis, but for a higher fee as the analysis is more complete. While sawdust can be used to amend the planting hole, it is more likely to tie up nitrogen and has less consistently shown improvements in yields than peat moss for this use. Addition of nitrogen to the planting hole if sawdust is used is not recommended as a way to circumvent this problem, however, as the fertilizer would be likely to burn the young roots.

Second, yields have almost always been improved by mulching the blueberry plants, though there have been a few exceptions, possibly related to sources of sawdust used. However, it is important to remember that since the roots grow where they find organic matter, (i.e., mulching will tend to make the roots grow more shallowly), organic matter applied as a mulch needs to be consistently replenished at least every two years. With highbush blueberries, 4-6 inches at planting, followed by 1-3 inches per year for replenishment, should be applied to maintain a consistent depth of mulch. Amounts greater than this that would allow the mulch depth to increase should not be used, as the roots will tend to be produced higher on the stem, and eventually the entire root system may be located in primarily in the mulch alone. Mulching, once started, should not be discontinued. Mulch generally is not added to lowbush blueberry plantings, though it has been found to improved establishment of young lowbush plantings if used lightly (2-3 inches at planting).

What sources of mulch are recommended (or not)? Rotted sawdust (not fresh) tends to fare better in improving yields when used as a mulch as opposed to being used for amending the soil in the planting hole. The difference is likely due to less nitrogen tie-up, as growers usually fertilize their plantings with nitrogen (lightly when the plants are young), making the tie-up of nitrogen in the mulch less critical than in the planting hole. Either hardwood or softwood sawdust (or bark mulch) can be used, though red maple and beech have been reported to have negative effects. Depending on location, growers sometimes find sawdust that has been used as a bedding material, usually for horses, is much more readily available than sawdust alone. This used bedding material often has a high nutrient content, and higher salt concentration than what is acceptable. In addition, there are health concerns and regulations to be considered concerning the use of animal manures. However, this material has been used successfully, if it is allowed to decompose for at least a year (away from the blueberry plants), exposed to rain so that salts can be leached out. The pH level should be checked, and the material also should be analyzed for nutrients so that the maximum amount that should be applied per year can be calculated. This may be less than the recommended 1-3 inches/year. Fertilizer rates can be adjusted downward to compensate for its use. Fresh sawdust should not be used, as the danger of nitrogen deficiency and leaching of toxic compounds from fresh sawdust, depending on the species of tree, is too great to be worth the risk. Mushroom compost, widely marketed in PA and surrounding states, is not recommended, as it has a high pH (often 8.0 or greater), and a high salt concentration, of which blueberries are intolerant. Other types of composts, or a mixture of compost with rotted sawdust, have been found to work well. If compost is used, the compost

should be analyzed, and fertilizer application rates adjusted downward to compensate for the nutrients applied in the compost, as with bedding materials. Compost should be applied as early in the spring as possible, and not in the fall, as it may encourage succulent growth on the plants, thereby increasing the occurrence of winter injury. Peat, though acceptable, is expensive, tends to dry out on the surface, and is difficult to re-wet, so it is not often used for this purpose. Straw can be used, and is perfectly acceptable from the plants' point of view, but tends to decompose rapidly. Other locally-available sources such as ground corn cobs, pine needles, or leaves can be used, but little is known about their particular characteristics.

Trickle irrigation lines should be located underneath the mulch (especially if peat or sawdust are used), and of a sufficiently heavy type to avoid problems from rodents chewing through the lines. Use of any mulch can increase the local population of small rodents.

If possible, the pH of the organic matter used should be checked before application. If the pH of the organic matter is high (>6.0 or so), either another source should be found if possible, or, if the material is used, the soil pH should be monitored yearly. Using ammonium sulfate as a nitrogen source will usually compensate for application of a mulch with a higher-than-ideal pH. A foliar nutrient analysis should also be conducted at least every other year, a good practice in general, to monitor potential nutrient deficiencies or excesses.