How this product promotes healing and protecting the Xylem layer in fruit trees, olive trees and grapevines.

Black Knot Be Gone, 99.9% pure from nature.

Author: Mark Kelly March 31, 2019

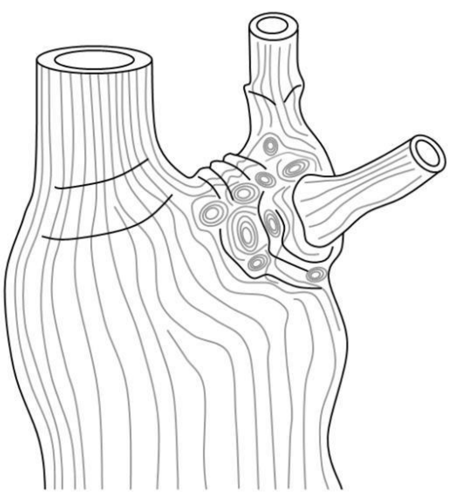
What is the Xylem layer and how it works?

Efficiency of water transport

Why do the leaves need so much water? If it was the case that they only needed a set amount then plant hydraulics would be tuned to supply that amount. However, the water rising in the xylem brings mineral nutrients
absorbed by the roots to the cells of the leaf. Leaves also need to obtain carbon dioxide from the air through pores
in the leaves called stomata. This necessarily exposes the interior of the leaf to the outside air causing water loss

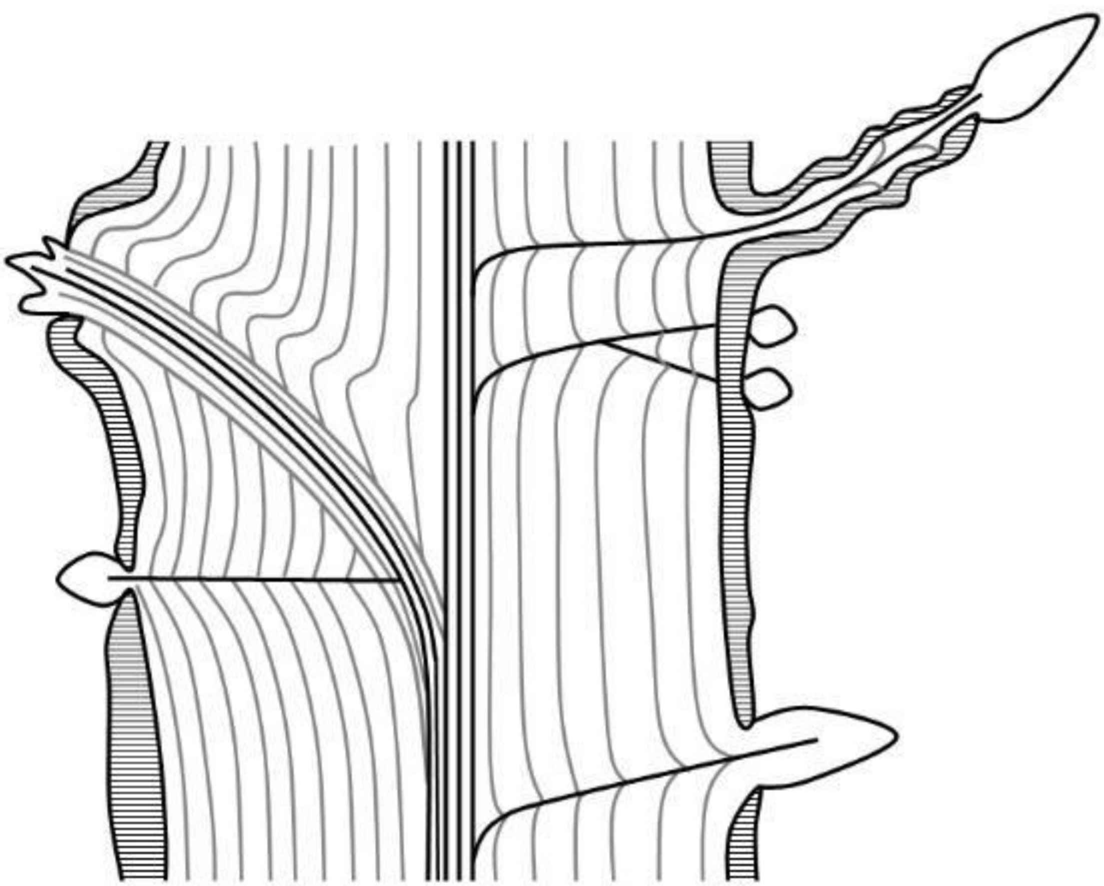
by evaporation (evapotranspiration). This water loss creates the suction (negative pressure gradient) which is mainly responsible for driving water up the xylem in the transpiration stream in the first place. Transpiration is necessary to replace the water lost so that the cells can maintain access to carbon dioxide (if the leaf wilts the stomata close and photosynthesis shuts down). For these reasons, conductivity correlates well to plant growth.

A single xylem vessel does not generally extend the whole height of the tree but may be a meter or so in length and communicates with neighboring vessels so that the sap can flow the whole height of the tree from vessel to vessel. The xylem sap is drawn up the tree from the roots by a suction pressure generated by water loss, chiefly through stomata in the leaves of the tree canopy. This loss of water to the atmosphere is **transpiration** and the stream of water flowing through the xylem, carrying valuable mineral salts from the soil, is called the **transpiration stream**. This does mean, however, that the lower branches are nearer the source of the flowing sap and may tap more than their fair share, leaving insufficient sap for the upper canopy which potentially needs it more. To combat this trees have a special architectural feature to slow the movement of xylem sap into the lower branches **- concentric circular vessels**.



Above: the grain in a tree with its bark removed. Note the concentric circular or elliptical vessels at the bases of the lower branches.

An important part of a tree's insurance policy is the production of dormant buds. Most of these buds will never open or develop, but should the canopy become damaged some of them may become active and replace the damaged canopy. Each dormant bud has its own vascular supply which must elongate if the bud is to remain at the surface of the stem as an **epicormic bud**. As new layers of wood are added to the trunk, the vascular traces to the buds elongate to maintain the buds at the surface (some buds may fail to keep up and become buried in the wood).



Above: a longitudinal section of a tree trunk showing the vascular supply to the dormant
epicormic buds. (Based on Busgen and Munch, 1929, in Thomas,2000; trees: their natural
history, Cambridge University Press).

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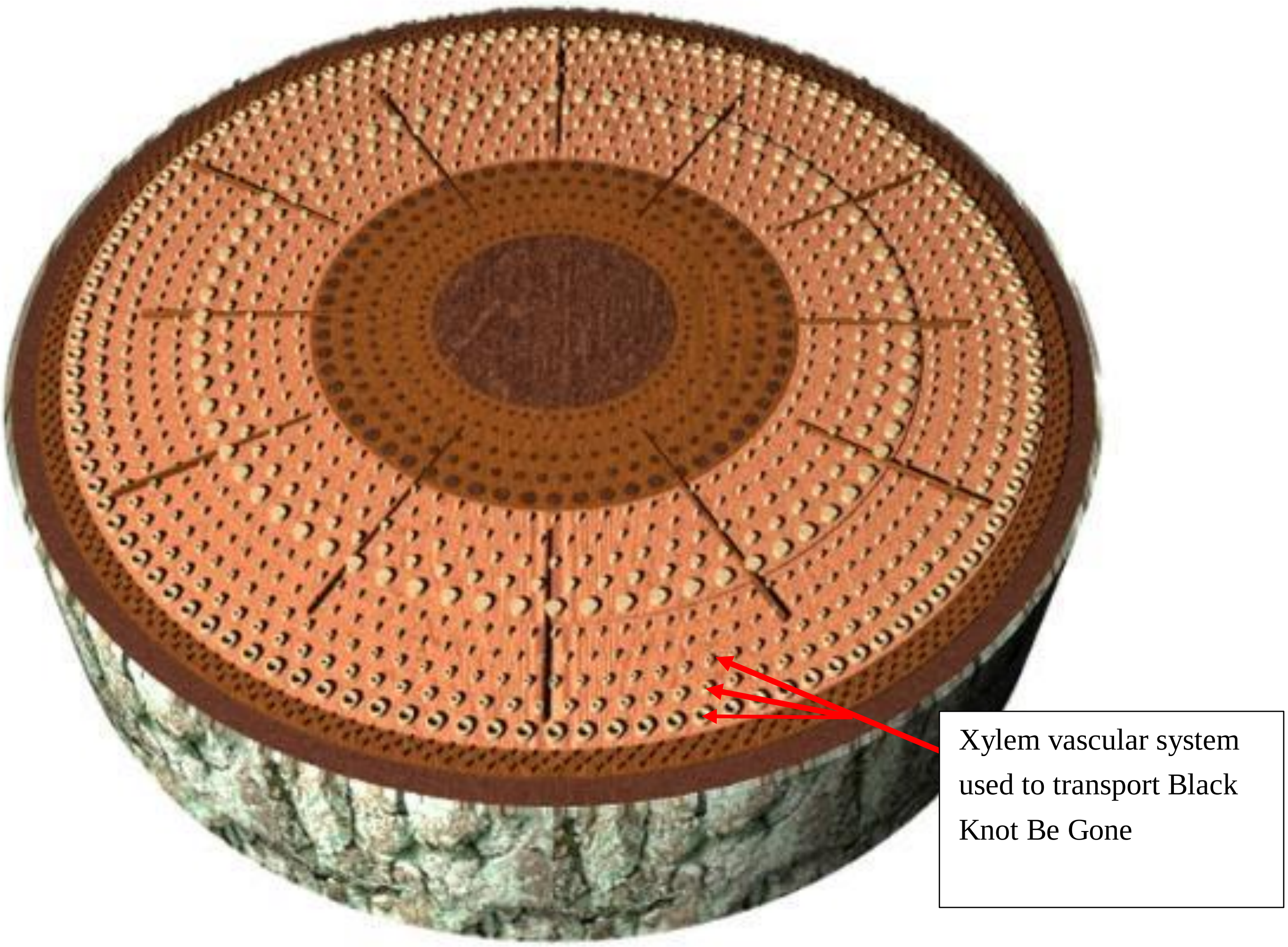
Epicormic buds originally form as normal buds in the axils of leaves on young sheets but which remain dormant. In some trees the majority of such buds remain dormant and some may abort. Trees can also form new buds de nova when they are damaged, from any parenchyma tissue (adventitious buds). Branches also have vascular traces which can be traced to the center of the trunk as a narrowing cone (a 'spike knot'). As new wood is added the growth of the branch keeps pace and the knot consists entirely of wood firmly anchored to the surrounding wood of the trunk. However, if the branch dies then wood added to the trunk will simply grow over it, encasing the dead branch complete with its bark. The bark around the dead wood does not integrate well and such encased knots easily fall out of a plank of cut wood.



Sliced view of an Oak tree displaying the Xylem Vascular system, the application of Black Knot Be Gone must drill into the vascular tubes to distribute the 99.9% pure ingredients.

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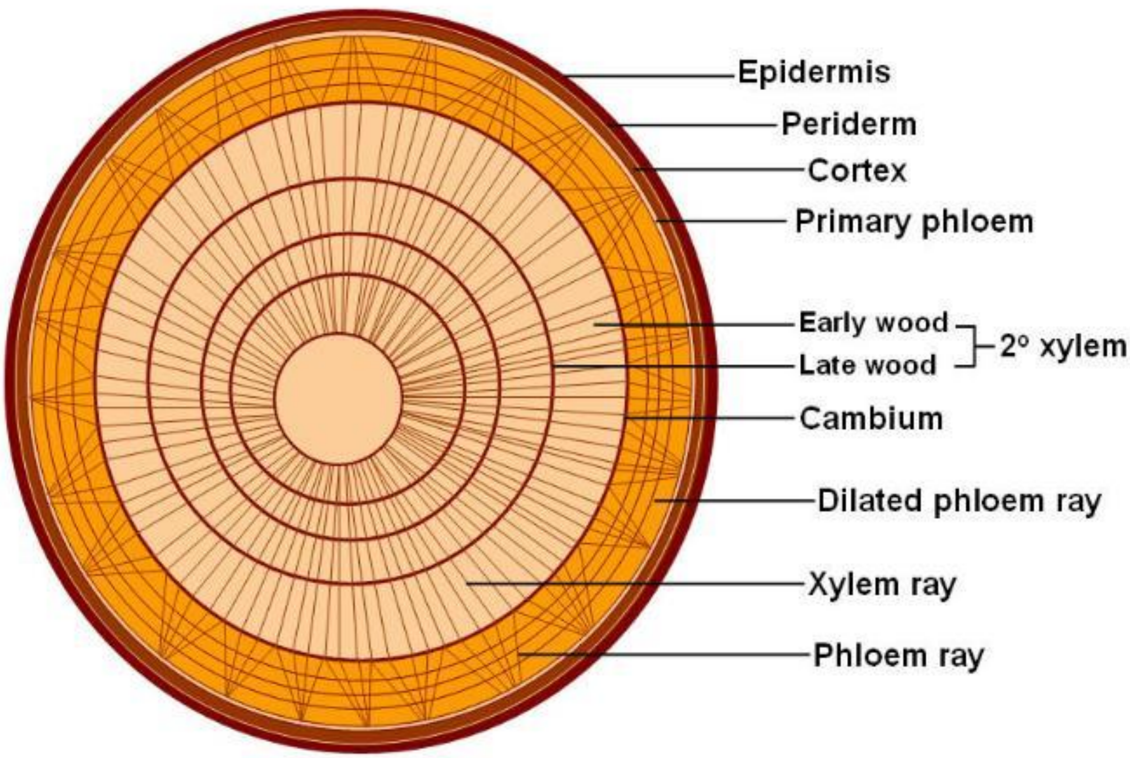
McCulloh, K.A. and J.S. perry, 2005. patterns in hydraulic architecture and their implications for transport efficiency.
Tree Physiology 25: 257-267.

Black Knot Be Gone utilizes the natural vascular flow system in the Xylem layers to reach all the tree through the trunk.



Cross Section of a tree, the depth of the Xylem layer is between 1-2" for an olive tree, grapevine is .3" deep and a Pear or plum tree can be .19" deep. The pictures below are inserting Black Knot Be Gone into the Xylem layer. There was 8 holes drilled at a 45°angle is designed to pool the Black Knot Be gone into the hole. The 8 holes is to connect to the vascular flow system to distribute throughout all the tree.

Why does Black Knot Be Gone promote healing and protection from (Apiosporina morbose) fungus, bacterial pathogens causing leaf scorch or Pierce's disease also known as Xylella fastidiosa?

Black Knot Be Gone formula is proprietary. It does not contain any pesticides or any man-made pharmaceutical products. All the ingredients are 99.9% pure from nature.

These all-natural ingredients have been tested and perform to break up the black knot fungus to reduce it to crumble apart. The picture on page one reflects the black knot breaking down. The black knot can be torn off the branch generally after 3 weeks of the application of Black Knot Be gone. This product promotes healing the Xylem vascular system throughout the tree. The best time to apply the product is early spring till October. The ability to fight bacterium and fungus makes this product is very unique.

See You tube video https://youtu.be/vx0sbMGGMn0

How can Black Knot Be gone perform to protect a healthy tree from infection from airborne pathogens or from insects transmitting a disease into the tree or grapevine.

Black Knot Be Gone opens the Xylem vascular system to absorb nutrients from the soil and includes missing nutrients to promote healing and protection. The insects that carry the bacterium and pathogens only target trees missing key nutrition and are weak. The Black Knot be Gone includes these key ingredients that promote healing and provide protection through nutrition from pests.

Below is an overview of these key strategies from University of Florida.

Mineral Nutrition Contributes to Plant Disease and Pest Resistance[1]

Arnold W. Schumann, Tripti Vashisth, and Timothy M. Spann[2]

Mineral nutrients are essential for the growth and development of plants and microorganisms and are important factors in plant-disease interactions. How each nutrient affects a plant's response to disease, whether positively or negatively, is unique to each plant-disease complex. This publication briefly summarizes plant mineral nutrition and what is known about how different nutrients affect different types of plant diseases (fungal, bacterial, viral, and soilborne) and pests.

In general, nutrient-pathogen interactions are not well understood due to their complex nature and dependence on a number of external factors. Plant nutrient deficiency/toxicity may affect disease susceptibility through plant metabolic changes, thereby creating a more favorable environment for disease development. When a pathogen infects a plant, it alters the plant's physiology directly or indirectly, particularly with regards to mineral nutrient uptake, assimilation, translocation, and utilization. Pathogens may immobilize nutrients in the soil or in infected plant tissues. They may also interfere with translocation or utilization of nutrients, inducing nutrient deficiencies or toxicities. Soilborne pathogens commonly infect plant roots, often damaging the roots and thereby reducing the plant's ability to take up water and nutrients. The resulting deficiencies may lead to secondary infections throughout the plant by other pathogens. Plant diseases can also infect the plant's vascular system and impair nutrient or water translocation. Such infections can cause root starvation, wilting, and plant decline or death, even though the pathogen itself may not be toxic.

Fertilizer Nutrients

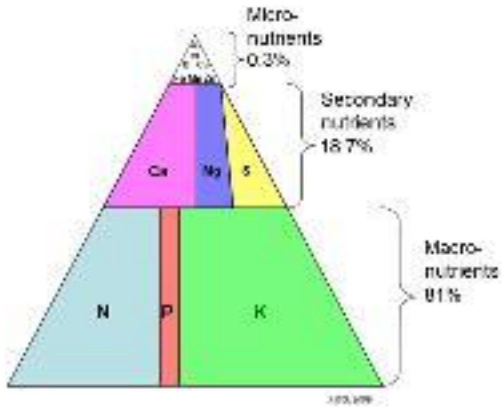
In addition to carbon (C), hydrogen (H), and oxygen (O), which plants take up from the surroundings via leaves and roots, there are 13 mineral nutrients that are essential for normal plant growth and development. These nutrients, their general relative abundance in plants, and their roles in plant biology are listed in Table 1. These nutrients are often viewed simply as plant food necessary for better plant growth and yield. However, mineral nutrition also influences growth and yield by affecting plant resistance or susceptibility to pathogens and pests.

Although disease resistance is genetically controlled, it is considerably influenced by environmental factors. Some disease resistance genes in plants are only activated by specific environmental stimuli. Mineral nutrition is an environmental factor that can be easily controlled in agricultural systems, the effects of which can be substantial.

In order to complement disease and pest control methods, it is helpful to know how mineral nutrients affect disease resistance in plants. Altering how plants respond to pest or disease attacks can increase resistance. Mineral nutrition can affect two primary resistance mechanisms:

1. The formation of mechanical barriers, primarily through the development of thicker cell walls.
2. The synthesis of natural defense compounds, such as phytoalexins, antioxidants, and flavanoids, which provide protection against pathogens.

A balanced nutrient supply, illustrated for citrus in the form of a "nutrient pyramid" (Figure 1), ensures optimal plant growth and is usually considered optimal for disease resistance as well. As a rule, plants with an optimal nutritional status have the higher resistance (tolerance) to pests and diseases compared to nutrient deficient plants. Susceptibility increases as nutrient concentrations deviate from this optimum. The interaction between plants and disease organisms and pests is complex. However, the roles of mineral nutrients are well established in some areas of host-disease interaction. The goal is to recognize these interactions and see the possibilities and limitations of disease and pest control by mineral nutrition and fertilizer applications.

1. 

Fungal Diseases

Thinner, weaker cell walls leak nutrients from within the cell to the apoplast (the space between plant cells). This can create a fertile environment that stimulates the germination of fungal spores on leaf and root surfaces. Mineral nutrient levels directly influence the amount of leakage as well as the composition of what is leaked.

For instance, potassium (K) is essential for the synthesis of proteins, starch, and cellulose in plants. Cellulose is a primary component of cell walls, and K deficiency causes cell walls to become leaky, resulting in high sugar (starch precursor) and amino acid (protein building blocks) concentrations in the leaf apoplast. Calcium (Ca) and boron (B) deficiencies also cause a buildup of sugars and amino acids in both leaf and stem tissues. Nitrogen (N) is a key component of amino acids; therefore, an excessive supply of N can bring about higher amounts of amino acids and other N-containing compounds in plant tissues. These mineral imbalances lower resistance to fungal diseases by creating a more favorable environment for pathogens.

Most fungi invade the leaf surface by releasing enzymes, which dissolve the middle lamella (the "glue" that bonds adjacent cells). The activity of these enzymes is strongly inhibited by Ca, which further explains the close correlation between the Ca content of tissues and their resistance to fungal diseases.

As stated previously, plant tissues contain and produce a variety of defense compounds, which hinder fungal attacks. Boron plays a key role in the synthesis of these compounds. Borate-complexing compounds trigger the enhanced formation of a number of plant defense chemicals at the site of infection. The level of these substances and their fungistatic effect also decreases when the N supply is too high.

Mineral nutrition also affects the formation of mechanical barriers in plant tissue. As leaves age, the accumulation of silicon (Si) in the cell walls helps form a protective physical barrier to fungal penetration. Excessively high N levels lower the Si content and increase susceptibility to fungal diseases.

Other micronutrients play a role in disease resistance, too. Copper (Cu) is a plant nutrient that is widely used as a fungicide. The amount required, however, is much higher than the nutritional requirement of tree. The action of Cu as a fungicide relies on direct application to the plant surface and the infecting fungi. From a nutritional perspective, Cu deficiency leads to impaired defense compound production, accumulation of soluble carbohydrates, and reduced lignification (wood development), all of which contribute to lower disease resistance.

Bacterial Diseases

Mineral nutrition affects susceptibility to bacterial infections in much the same way that it affects fungal infections. Potassium and Ca play key roles in forming an effective barrier to infections. When K, Ca, and, often, N levels are deficient, plants are more susceptible to bacterial attacks. A frequent symptom of B deficiency is the development of "corky" tissue along leaf veins and stems as a result of the irregular (misshapen) cell growth that occurs when B is deficient. These irregular cells are more loosely bound than normal cells, essentially producing wounds through which bacteria can enter.

Adequate N levels increase plant resistance to most bacterial diseases; however, excessive N can have the opposite effect. As a rule, parasites that live on senescing (dying) tissue or that release toxins in order to damage or kill the host plants thrive in low N situations. However, some bacteria actually increase under high N conditions. These bacteria usually depend on food sources from living tissue.

Disease relationships to K content are more consistent. A review of 534 research articles found that K reduced bacterial and fungal diseases 70% of the time and insects and mites 60% of the time. Unlike for other nutrients, the generalization can be made for K that ***an adequate supply usually results in an increased resistance to attack by all parasites and pests***. Potassium deficiencies created by overapplication of dolomite or magnesium lower this resistance.

Calcium affects the incidence of bacterial disease in a variety of ways. First, Ca compounds play an essential role in the formation of healthy, stable cell walls. Adequate Ca also inhibits the formation of enzymes produced by bacteria and fungi, which dissolves the middle lamella, allowing penetration and infection. Calcium deficiencies trigger the accumulation of sugars and amino acids in the apoplast, which lowers disease resistance. Fruit tissue that is low in Ca is also less resistant to bacterial diseases and physiological disorders that cause rotting during storage.

In general, similar principles govern the effect of both micronutrients and macronutrients on disease resistance: ***Any*** nutritional deficiency hinders plant metabolism and results in a weakened plant, which lowers disease resistance.

For instance, the lack of one small ounce of molybdenum (Mo) per acre can lower disease resistance by impeding the production of nitrate reductase. This is an enzyme that contains two molecules of Mo, and it is required to convert nitrates to proteins. This example also illustrates the importance of ***balanced*** nutrition—no nutrient functions in isolation from the others. ***All*** essential nutrients are critical for the proper metabolic functioning of higher plants.

Viral Diseases

Nutritional factors that favor the growth of host plants also favor virus multiplication. This holds true particularly for N and phosphorus (P). However, despite the rapid multiplication of the virus, visible symptoms of the infection do not necessarily correspond to an increase in mineral nutrient supply to the host plant. In fact, symptoms of viral infections sometimes disappear when N supplies are large, even though the entire plant is infected. Visible symptoms are dependent upon the competition for N between the virus and the host cells. This competition varies with different diseases and can be influenced by environmental factors, such as temperature.

Soilborne Fungal and Bacterial Diseases

Mineral nutrition affects soilborne diseases in many different ways. A micronutrient-deficient plant usually has depressed defense capabilities against soilborne diseases. However, in some cases, nutrients can have direct effects on soilborne pathogens. For example, soil-applied manganese (Mn) can inhibit the growth of certain fungi. Also, nitrites are toxic to some

Fusarium and ***Phytophthora*** species. Nitrites are formed from ammonium nitrogen in the nitrogen cycle as it is converted to nitrates by beneficial soil bacteria.

Pests

Pests are organisms such as insects, mites, and nematodes that are harmful to cultivated plants. In contrast to fungal and bacterial pathogens, visual factors such as leaf color are important factors in pest susceptibility. Nutritional deficiencies discolor leaf surfaces and increase susceptibility to pests. The Asian citrus psyllid, ***Diaphorina citri***, for example, tends to settle on yellow reflecting surfaces (i.e., surfaces that appear yellow in color to the human eye).

Three primary pest defenses of plants are:

1. Physical surface properties: color, surface properties, hairs
2. Mechanical barriers: tough fibers, silicon crystals, lignification
3. Chemical/biochemical: content of attractants, toxins, repellents

Mineral nutrition affects all three defense systems. Generally, young or rapidly growing plants are more likely to suffer attack by pests than older, slower-growing plants. Therefore, there is often a correlation between N applications (stimulation of growth) and pest attack. Boron deficiency reduces the resistance to pest attack in the same ways it reduces resistance to fungal infections. It is used in the synthesis of flavanoids and phenolic compounds, which are a part of the plant's biochemical defense system.

Summary

In the game of baseball, no home runs are scored without touching first base. In the strategies of integrated pest management, mineral nutrition is first base. Optimizing mineral nutrient levels—especially at critical stages when pest populations are threatening—is both cost effective and agronomically sensible.

Acknowledgments

The authors wish to thank Mr. Timmy Mann for his significant contributions to and critical review of this document.

Table 1.

The 13 essential mineral nutrients required by all plants for normal growth and development.

Nutrient	Chemical symbol	Relative abundance (%)	Function in plant
Nitrogen	N	100	Proteins, amino acids
Potassium	K	25	Catalyst, ion transport
Calcium	Ca	12.5	Cell wall component
Magnesium	Mg	8	Part of chlorophyll
Phosphorus	P	6	Nucleic acids, ATP
Sulfur	S	3	Amino acids
Chlorine	Cl	0.3	Photosynthesis reactions

Nutrient	Chemical symbol	Relative abundance (%)	Function in plant
Iron	Fe	0.2	Chlorophyll synthesis
Boron	B	0.2	Cell wall component
Manganese	Mn	0.1	Activates enzymes
Copper	Cu	0.01	Component of enzymes
Zinc	Zn	0.03	Activates enzymes
Molybdenum	Mo	0.0001	Involved in N fixation

Footnotes

1.

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2.

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How does Black Knot Be Gone promote healing and protection from bacterial pathogens causing leaf scorch or Pierce's disease also known as Xylella fastidiosa in grapevines?

Understanding the grapevine and the Xylem vascular system.

Grapevine Structure and Function

Edward W. Hellman

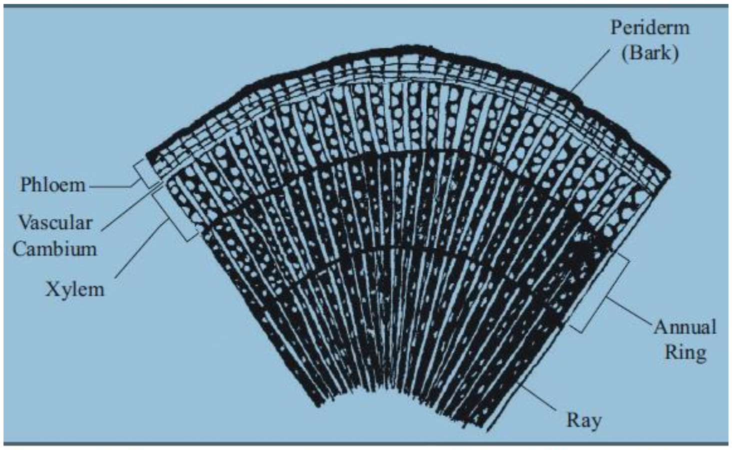

Figure 1. Cross section of 3-year-old grapevine arm. Redrawn from Esau (1948) by Scott Snyder.

6 Oregon Viticulture

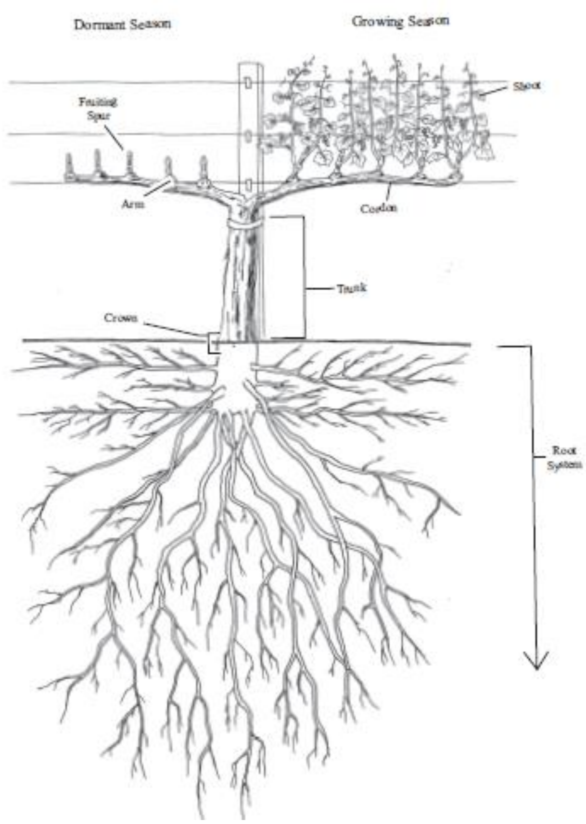

Figure 2. Grapevine structures and features: self-rooted vine. Drawing by Scott Snyder.

Vascular System

The interior of all the plant parts described below contains groups of specialized cells organized into a *vascular system* that conducts water and dissolved solids throughout the vine. There are two principle parts to the vascular system: *xylem* is the conducting system that transports water and dissolved nutrients absorbed by the roots to the rest of the vine, and *phloem* is the food-conducting system that transports the products of photosynthesis from leaves to other parts of the vine. The xylem and phloem tissues each consist of several different types of cells, some of which create a continuous conduit throughout the plant, and others provide support functions to the conducting cells, such as the storage of food products in xylem cells. A group of specialized cells are arranged in narrow bands of tissue called *rays*, which extend out perpendicular from the center of a stem, through the xylem and phloem. Ray cells facilitate the radial transfer of water and dissolved substances between and among xylem and phloem cells and are a site for storage of food reserves. The vascular system constitutes the *wood* of older stems, and the thick cell walls of the xylem provide the principal structural support for all plant parts.

Absorption of Water and Nutrients

Water. The suction force of transpirational water loss is transmitted throughout the unbroken column of water in the xylem all the way to the roots, providing the major mechanism by which water is taken up from the soil and moved throughout the vine. Water is pulled into the root from the soil. Young roots absorb the majority of water, primarily through root hairs and other epidermal (outer layer) cells. But older suberized ("woody") roots uptake water at a lower, but constant, rate. Water then moves through the cells of the inner tissues of the root and into the xylem ducts, where it continues its movement upward, reaching all parts of the vine, and is eventually lost via the stomata.
The effect of transpiration on the rate and quantity of water uptake is obvious, but new root growth is also necessary because roots eventually deplete the available water in their immediate area and soil water movement is slow at best. Therefore, conditions that influence root growth affect the rate of water uptake.
Nutrients. Mineral nutrients must be dissolved in water for uptake by roots. Nutrient uptake often occurs against a concentration gradient; that is, the concentration of a mineral nutrient in the soil solution is

usually much lower than its concentration in root cells.

Thus an active process, consuming energy, is required to move nutrients against the concentration gradient. Active transport is a selective method of nutrient uptake, and some nutrients can be taken up in much greater quantity than others. Nitrates and potassium are absorbed several times as rapidly as calcium, magnesium, or sulfate. There are also interactions between nutrient ions that influence their absorption. For example, potassium uptake is affected by the presence of calcium and magnesium. In rapidly transpiring vines, nutrient uptake also occurs by mass flow (a passive process) with water from the soil solution (Mullins et al., 1992).

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Black Knot Be Gone promotes healing of the Xylem Vascular system in a grapevine same as it does for a fruit or olive tree. The depth to drill to reach the Xylem layer is about .250 inches.

How to apply Black Knot Be Gone and place an order.

Package Video https://youtu.be/ZcBwyOitXSc click here to read directions listed on the packaging. The best time of year to apply is March through October. Please note the depth to drill in an olive tree is 2" and the grapevine is .250"

Order 30 ml bottle good for one tree at https://www.blackknotbegone.com/collections/frontpage/products/black-knot-be-gone-™-safely-promotes-healing-of-the-whole-tree-for-black-knot-disease-all-organic-plant-ingredients $23.99 per bottle. Large orders for municipalities and orchards please contact me for a quote and set up an account at blackknotbegone@gmail.com

Use discount code BKBG13 by April 30 for $6.00 of if you purchase 2 bottles. Large volume discounts please email your requests.

Mark Kelly Founder

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