

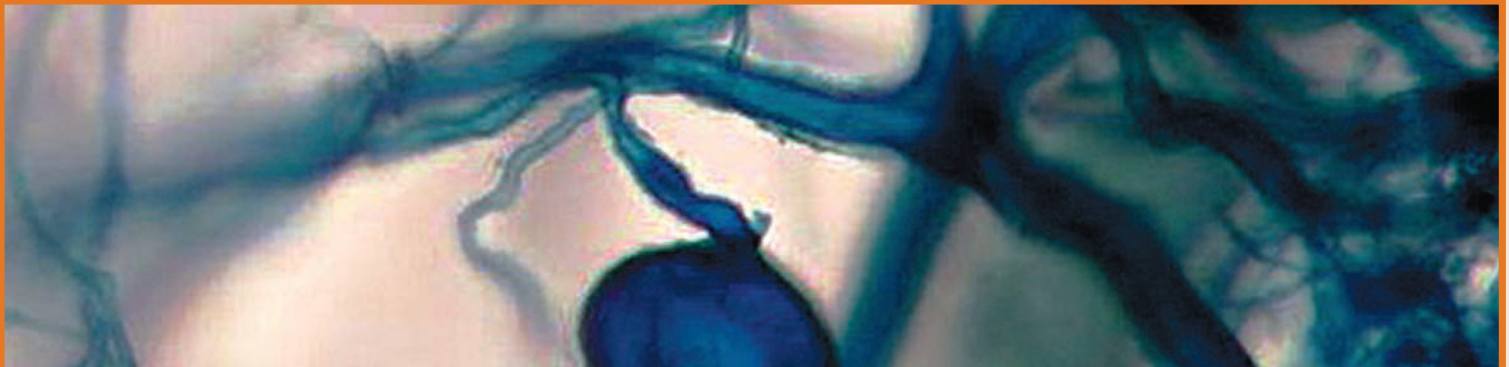


Dr. Mike Amaranthus spent 20 years with Oregon State University and USDA Forest Service where he authored over 50 research papers on mycorrhizae. He is a recipient of the USDA Department of Agriculture

Highest Honor Awards for scientific achievement and has been featured on several major national and international television programs. He is president and chief scientist for Mycorrhizal Applications, Inc.

Nature's Good Fungi Increase Crop Yields

By Mike Amaranthus Ph.D.



Bill Miller used “nature’s good fungi”, to raise his organic flax yield from 3 to 6 bushels per acre. What impressed Bill even more was the additional revenue he reaped with those extra bushels.



With organic prices at \$14-19 per bushel and an increase of 3-6 bushels of flax per acre, Bill’s initial investment in MycoApply® *Seed Inoculant* typically

resulted in an extra \$50-100 per acre.

Bill’s experience is based on replicated plots for the North Dakota Crop Improvement Organization, but other farmers are learning how “nature’s good fungi” can boost alfalfa, corn, wheat, potato and onion yields as well. Refer to the onion crop pictured in figure 1 on the next page.

Bob Pylman’s alfalfa price jumped from \$80 per ton to \$130 per ton in a test conducted in California by United Agricultural Products. In the hot summer period, he found hay quality remained high when treated with MycoApply® compared to the

MYCORRHIZAE INCR



Figure 1

The onion seed in the upper left area was inoculated with mycorrhizal fungi, following fumigation. The lower right area was not treated.

untreated fields where quality continued to decline. Research trials with alfalfa have also documented improved alfalfa seed germination (see figure 2).

Jerry Miller at Agritech tested MycoApply® with corn and bumped up his average yield from 60-70 bushels per acre in non-treated North Dakota fields to 100 bushels/acre. In Canada, Acres Research found increased yields in all 8 out of 8 MycoApply® mycorrhizal-treated plots in Manitoba, Canada.

MycoApply® has also been found to stimulate production of Grasses. *Lonny Warfel* in Halsey, Oregon used MycoApply® when sowing his tall fescue in 2005 and has seen significant improvement in plant vigor (see figure 3).

The widespread use of conventional fertilizers and pesticides has also significantly increased crop yields.

However, expensive chemical fertilizers and pesticides can have detrimental effects on the environment due to high levels of run-off, contamination of lakes, streams, and groundwater, salt accumulation and degradation of soil structure. An attractive alternative tool to diminish the environmental and dollar costs of these inputs is to use “nature’s good fungi”, the appropriate mycorrhizae, as a natural plant growth stimulant.

Most agriculturally important plants form this mutually beneficial relationship with a specific group of “good fungi” called arbuscular mycorrhizal fungi (AMF). The plant-AMF relationship is of high interest as it has been shown to improve plant nutrient uptake, crop yield, and resistance to pathogens and drought. Thus, a source of AMF inoculum provides farmers with an efficient, cost-effective, and ecologically improved agricultural practice.

Companies now offer effective and affordable AMF inocula for agricultural and horticultural purposes.

Mycorrhizal Applications Inc.



Figure 2

Alfalfa germination trial. The pot on the left was treated with MycoApply® Seed Inoculant.

presently the world’s largest producer of diverse, quality mycorrhizal inoculum, produces AMF inoculum in both powder or granular form consisting of mycorrhizal spores (seeds) and mycorrhizal colonized root fragments.

INCREASE CROP YIELDS



Figure 3

Top, control group.
Bottom, Fescue after MycoApply® treatment.

Either powder or granular mycorrhizal materials are added directly into the surrounding soil of seeds and plantlets to form the mycorrhizal relationship. The primary goal always being to get the product in close contact with the seed and the emerging root system to be most effective.

AMF filaments are much smaller than roots, so they can easily penetrate into smaller spaces between soil particles, where they release powerful enzymes that dissolve tightly bound minerals like phosphorus, iron, and absorb all the major and minor nutrients used by plants (figure 4 – “Mycorrhizal Filaments”). The nutrients are absorbed by the mycorrhizae and transported back to the plants themselves. Recent research by the Agricultural Research Service has also documented the importance of mycorrhizae for the uptake of nitrogen.

AMF provide many other benefits to plants. The fungal filaments take up and store water, decreasing drought stress during dry periods (see figure 5 picture of “Corn Treated and Untreated”). They also bind soil particles

into larger aggregates with organic glues such as humic compounds. The resulting soil structure allows air and water movement into the soil, encouraging root growth and distribution.

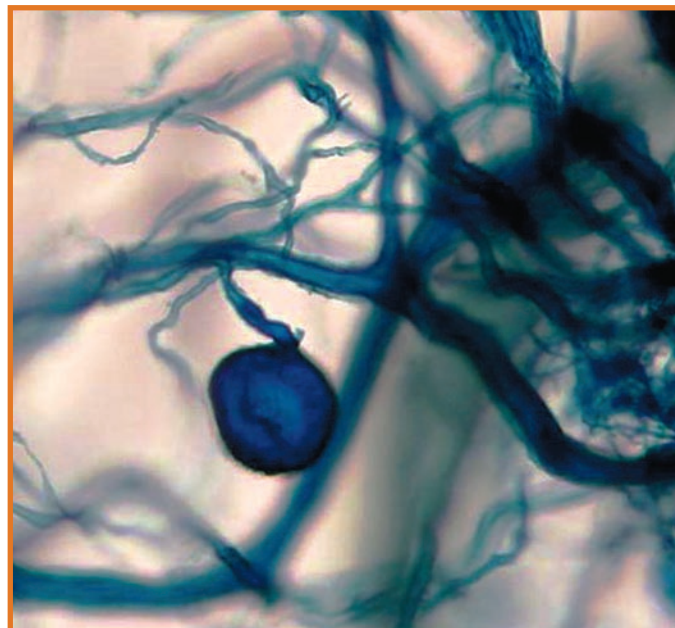


Figure 4

Mycorrhizal filaments and spore emanating from root.

Mycorrhizal fungi protect roots against disease organisms that enter the root zone in several ways. Some produce antibiotics that attack diseases or produce structures that prevent diseases from entering roots. Other, more active, mechanisms are used

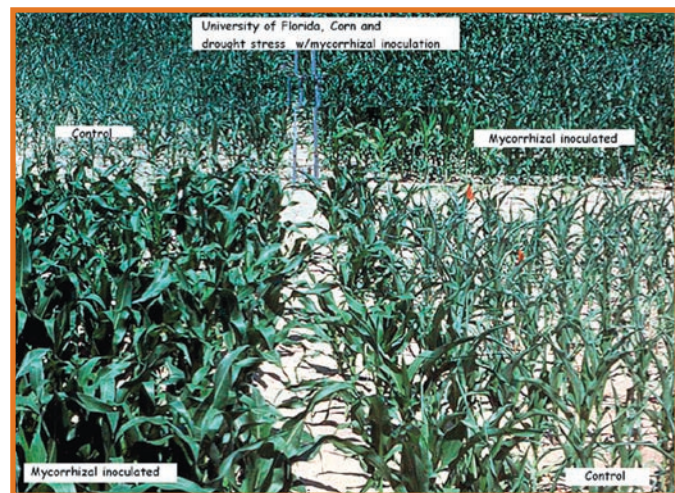


Figure 5

Mycorrhizal inoculated corn tolerates drought.

by mycorrhizal fungi to control parasitic nematodes. Mycorrhizal fungi even trap root-feeding nematodes in a “hangman’s noose” and strangle them (see video clip at www.mycorrhizae.com).

Mycorrhizal Applications Inc. in Grants Pass, Oregon produces and sells over 400,000 pounds of mycorrhizal products a year. Sales to the agriculture industry have increased greatly over the past several years. The Mycorrhizal Applications Inc. product called MycoApply® *Seed inoculant* is a formulation of four species of AMF. The company’s objective is to offer crop tailored products that are easy to use, improve seed germination, nutrient availability, nutrient uptake, and help crops use less water.

Mycorrhizae provide an energy boost and better access to soil resources for abundant flowering and fruiting. Tiny filaments of the fungi attach and penetrate between and within the outer cells of the plant’s root cortex to do their work. Crops shown to benefit from mycorrhizae in more than 50,000 published studies include alfalfa, apples, carrots, cherries, corn, grapes, onions, potatoes, and wheat — to name only a few (see figure 6). A more extensive list of plants that benefit and do not benefit from mycorrhizae is available at: www.mycorrhizae.com.

When you’re talking about a product that can significantly boost yields and provide a 20 to 30% reduction in fertilizer and pesticide needs, it makes a tremendous impression. For example, over 10,000 acres of potatoes and onions have already been inoculated this year with MycoApply® *Seed Inoculant*.

Using AMF on the farm is borrowing from nature’s template. Natural, undisturbed areas contain a rich profusion of these mycorrhizal fungi. Many of these natural ecosystems are the most stable and productive on earth, achieving great plant productivity and longevity without irrigation, fertilization or the use of pesticides. How do they do it? A healthy, robust, living soil

conserves, transforms and utilizes soil nutrients, water and protects plants from diseases and environmental extremes. Farmers can now put nature’s “good fungi” to work in their own fields by using mycorrhizal inoculum at the time of planting. For more information, visit www.mycorrhizae.com, or call (541) 476-3985.



Figure 6
Potato trial. The potato plant on the right was inoculated with MycoApply® seed inoculant



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