Practical Application of EM Technology: A Farmer's Perspective

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Introduction

Sunrise Ranch and the Nature Farming Research and Development Foundation have had a working relationship for the past several years. We have been conducting trials with EM since the spring of 1992, and are pleased with the results. We have been using microbial inoculants for many years, but we were attracted to EM by Dr. Higa's description that it is a mixed culture of naturally-occurring beneficial microorganisms found in every healthy soil throughout the world. In a mixed culture, the function of any one group of microorganisms is buffered by the presence of others. EM does not become a destructive influence beyond its immediate application.

The results of our case studies with EM at Sunrise Ranch should not be taken as scientific research but rather as demonstrations that indicate that EM may play a significant role in the transition from conventional to sustainable agriculture. While an organic farmer, such as myself, could find value in including EM in his agricultural program, perhaps the greatest benefit of EM will be in transitional agriculture. So, I wish to present this information as an indication that further scientific research on the North American continent would be useful to demonstrate the validity of EM as an important tool that can help us to achieve a more sustainable agriculture.

The trials we conducted included vegetable crop production, pest management - specifically control of the alfalfa weevil, greenhouse hydroponics and the control of a fungal disease in lettuce, and rehabilitation of livestock suffering from severe parasitism.

Effect of EM 4 on Yield and Quality of Peas

A study was conducted to determine the effect of EM 4 on the yield and quality of English peas. Six rows, 250 feet long were planted for comparison. A 1:400 dilution of EM 4 was applied to three rows at a rate of one gallon of EM per acre, while three rows were untreated (i.e., unsprayed) to serve as a control. The following applications of EM 4 were made on the treated rows:

1st spraying 12 days after emergence;
2nd spraying 28 days after emergence;
3rd spraying 42 days after emergence.

Irrigation was applied immediately after each EM application. The peas were harvested with a mechanical harvester, and shelled with a pea-shelling machine. The yields were: EM-sprayed rows, 613 Ibs.; unsprayed rows, 454 Ibs.

These results were quite dramatic and certainly require replication. Another interesting observation was that the EM-treated peas were far more tender than those of the control. The harvest was late because of wet weather, and the crop was overripe and slightly bitter-tasting. However, the EM-sprayed peas remained tender and sweet.

Effect of EM 5 on Control of *Botrytis* Disease In Lettuce

A greenhouse study was conducted to determine the effect of EM 5 in controlling a fungal disease of lettuce caused by *Botrytis* sp. Our hydroponic greenhouse is a lettuce "factory," turning out 175 to 200 heads of lettuce per week for the Sunrise community. While the nutrients for the system are chemically-formulated, the greenhouse is biologically-managed; i.e., an integrated pest management program is in place. Aphids and white flies are the most common pest problems encountered, and these are controlled through periodic release of ladybugs and lacewings.

However, the *Botrytis* fungus develops occasionally and efforts to control it through biological means have not been effective. The fungus typically affects the leaf edges, causing rot and deterioration. Not only does it reduce lettuce quality, but it severely reduces production. Seedlings are generally affected, and many die off. It is an aggressive disease that spreads rapidly, and always

requires a complete clean-out and sterilization of the greenhouse.
In April of 1992, *Botrytis* began spreading throughout the greenhouse. At that time, production levels were 200-plus heads per week, but as the fungus spread, production dropped markedly to around 135 heads per week. Lettuce-head quality and weight were also reduced.
In an effort to control the disease, EM 4 was added to the nutrient tank at a rate of 3 ml of EM4 per liter of nutrient solution. However, lettuce yield and quality continued to decline into May with EM 4 apparently having no effect. The level of fungal damage was so extensive that a complete shutdown of the greenhouse was imminent.
In June, we made a last desperate effort to control the disease using EM 5 as a foliar spray on both seedlings and benches. EM 5 was added to the nutrient tank at a rate of 3 ml of stock solution per liter of nutrient solution. The solution containing EM 5 was then sprayed on all lettuce plants once a week. The results were dramatic. By late June, the fungus was obviously declining. By the second week of July, there were virtually no losses of seedlings. The vigor and health of seedling plants had returned to near normal. By mid-July, the Botrytis disease had completely cleared up. Therefore, we have continued to use EM 5 routinely in the management of our hydroponic greenhouse.

Effect of EM5 on Control of the Alfalfa Weevil

A study was conducted to determine whether EM 5 could help to control the webworm or alfalfa weevil which can cause extensive damage to this important legume crop. The 1993 season produced a heavy infestation of webworm in all alfalfa stands. Typically, the approach to minimizing webworm damage in an organic operation is to cut alfalfa early thereby preventing a heavy loss in production. *Bacillus thuringiensis* (Bt) had been tried previously but with little effect.
Two side-by-side ten-acre fields were used for this trial. Both fields were fertilized with a foliar spray, which included fish emulsion, kelp, and molasses. For one field, EM 5 was included in the foliar spray at a dilution of 1:300. The other field received no EM and, thus, served as a control.
The results of this trial were dramatic. While both fields suffered infestations of the alfalfa weevil, the extent of damage in the control field with no EM applied was far greater than the EM-treated field. Several areas in the control field were completely defoliated to standing stalks.
Both fields were managed in exactly the same way except for the EM 5 treatment. The fields were harvested on consecutive days at the pre-bloom stage. In terms of yield, the EM5-treated stand yielded approximately 3 tons per acre, while the untreated crop produced less than 2 tons per acre. This was our second trial with EM 5 in webworm infested alfalfa. The first trial was not as dramatic, but the trend was the same.

Effect of EM4 as a Feed Additive for Livestock

Finally, we have been using EM4 in the rehabilitation of livestock with digestive disorders or severe internal parasites. This particular case study involved a small herd of Jersey milk cows. This breed is known for its susceptibility to milk fever (a calcium deficiency which develops at calving time). We have had repeated cases of milk fever frequently followed by digestive complications that lead to rumen shutdown and even ulceration of the stomach lining. While in most cases milk fever is easy to treat, the indigestion, rumen impaction and stomach ulcers have sometimes led to the death of the animal.
Since EM 4 has as one of its primary components *Lactobacillus* bacteria, it is particularly compatible with the healthy bacteria of the bovine rumen. In the spring of 1992, the Jersey herd was introduced to a daily intake of four ounces of EM4 (diluted 1:500) mixed in the grain ration. This procedure has been followed for almost two years, and while the incidence of milk fever is essentially the same, no digestive complications have reoccurred. We attribute this beneficial effect at least in part to the daily ingestion of EM 4 by the cows. Those cows that do contract milk fever now recover quickly after receiving the prescribed calcium dosage. Evidently, rumen health and activity is now strong enough to handle the brief rumen shutdown that used to lead to digestive disturbances caused by milk fever.

Summary and Conclusions

At Sunrise Ranch, we have obtained excellent results using EM to overcome some serious problems in crop production, pest control, and livestock health. While the results of studies reported here might be considered as preliminary and somewhat inconclusive from a scientific standpoint, they do indicate that EM has tremendous potential benefits for agricultural systems. In due course, this will likely be substantiated by conducting statistically-valid scientific research.