Limited Water Seed Priming

By A. Douglas Brede, Ph.D

The ideal container for limited water seed priming is the same poly bag in which most seed comes. Photos courtesy Jacklin Seed.

Seven-day growth demonstration of primed and unprimed Glade Kentucky bluegrass.

Visualize the following experiment. It's an experiment I've repeated numerous times over the past eight years, most recently in a field near Lewiston, ID.It's springtime, the weather is good, and the soil is a bit too cool to plant yet. In spite of the temperature, the east side of the field is being seeded with Classic Kentucky bluegrass. On the west side, primed Classic seed is sown.

Under cool soil temperatures, bluegrass seed is slow to germinate and usually procrastinates until warmer conditions arrive. But this time, things are different. After only 10 days, a green fuzz can be seen on the western, primed half of the field. It looks as though all the seed in the field was choreographed to germinate on the same day. At 20 days after planting, the primed seedlings are an inch tall. On the untreated half of the field, seedlings can be seen just starting to break ground.

Seed priming can make a noticeable difference in seed establishment rate. Priming enables seed to germinate in about half the time normally required.

Seed priming is a pre-plant seed treatment that gets seed ready to grow even before it hits the ground. It's a process that involves partially wetting the seed, allowing it to progress through several steps of seed germination, and then drying it back for planting. Priming takes seed past the innate dormancy mechanisms that prevent or slow it from germinating under less-than-optimal conditions.

Seed priming is not the same as pregermination. Pregermination is a process of germinating seed in a tank of water before sowing. After pregermination, roots have already broken the seed coat and an occasional leaf blade may be seen. Pregerminated seed must be planted immediately after treatment or the seed (now seedlings) withers and dies.

There is a subtle but important difference between pregermination and priming. In seed priming, the quantity of water fed to the seed during treatment is limited. Because the seed does not have enough water to fully germinate, the root and shoot do not emerge. But there is enough water to get the seed started through the initial physiological steps of germination.

Another important difference is that primed seed can be dried back and even stored. Because it can be dried, it is easier to plant through conventional spreaders.

Do-It-Yourself Priming

Numerous techniques have been devised for priming seed. Some involve water baths with special chemicals, others combine seed with a moist clay. Most are tricky for the do-it-yourselfer.

All priming methods are alike in one basic concept: seed is fed a limited quantity of water. Priming methods differ in how the water quantity is limited.

Two years ago, while experimenting with tedious water baths, an idea came to me: Why not just mix a limited quantity of water with a given quantity of seed? It worked. I call this process the "limited water priming" method.

The limited water method adheres to the same basic premise of priming as do the other, more complex methods, but it's much easier to perform, especially on a small lot basis. The technique can be used with virtually any quantity of seed. But for simplifying the following explanation of how to do it yourself, I'll assume that you're going to prime a 50-pound bag of Kentucky bluegrass seed.

We found that the best container for priming seed is the same poly bag that most seed comes in. The woven poly allows air and light to penetrate the bag—two elements essential to good priming.

Dry the seed by spreading it on a clean surface, preferably on a sunny day. Turn the seed with a shovel as the top dries. You'll need to dry it all within one day or the seed may begin to sprout.

The first step in do-it-yourself priming is to wet the seed. As a suggestion, dump the seeds into a wheel barrow. Add five gallons of water and stir. A pinch of wetting agent (the non-ionic kind used with ag chemical spraying) helps to wet the seed faster. After the water is absorbed, shovel it back into the poly bag. It should remain in the bag at room temperature for five days.

Each day, you'll notice that some water oozes out of the bottom of the bag. Replace the water as it escapes by pouring it into the top of the bag.

Although it's not absolutely essential, an air delivery system will help supply oxygen to the priming seed. It will also help cool the seed as it primes. All damp organic materials self-heat by spontaneous combustion. You've probably noticed this phenomenon with grass clippings. Clippings left in a pile for several days will become hot and black in the center. The same kind of thing happens with damp, priming grass seed. To cool and ventilate the seed, we've used an air hose, stuck into the middle of the bag. The hose can either be hooked up to your shop air compressor or a small squirrel-cage fan. Very little air quantity is actually needed to keep the seed cool. Too much air will dry the seed prematurely.

After priming, the seed is ready for drying. If you're going to plant the seed via a hydroseeder, no drying is needed. Traditional spinner and drop-type spreaders require reasonably dry seed before they'll flow,

Dry the seed by spreading it on a clean surface, preferably on a sunny day. Turn the seed with a shovel as the top dries. You'll need to dry it all within one day or the seed may begin to sprout. Once the seed is dry enough to flow through a spreader, it's ready to use.

Unlike pregerminated seed that has a minimal shelf life, primed seed—if properly dried—can be stored in a cool, dry place for up to two months without major loss of potency.

Each species that you prime will require a different length of priming period. Kentucky bluegrass requires five days of priming, for example, while perennial ryegrass gets by with just two. Dr. Akers, the lettuce priming researcher had a good rule of thumb for determining when to stop priming and dry the seed. On the day you start priming, also start some seeds of the same lot in a germination test. Place a pinch of seeds on a wet paper towel inside a sealed glass jar. As soon as you see the first seeds start to germinate in the jar, immediately cease priming.

Not A Panacea

The Lewiston, ID field described is a good example of how dramatic seed priming can be. It's also a good example of the limitations of priming.

At 10 and 20 days after planting, the effects of priming were clear. Seedlings on the primed, west side of the field emerged in about half the time at the untreated side.

At six weeks, the story was different. The primed half was now about three inches tall and quite thick. But so was the untreated half. Even with close inspection, it was nearly impossible to tell the two halves apart.

Nature is a great equalizer. Priming may give seed a five or 10 day jump in emerging. But all seeds—treated or not—seem to grow equally well after

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emergence. The priming advantage rapidly dissipates.

So, why use primed seed at all?

Priming is not suited to every turf establishment situation. It is useful in three specific cases:

1. Where you need to get a stand established as rapidly as possible—perhaps on an athletic field in advance of the next game.

2. Where you're sowing into soil too cool for germination. Priming tends to override the temperature sensors in seed; it germinates "no matter what."

3. Where you're sowing a mixture of a slower establishing grass with a faster establishing one. Kentucky bluegrass-perennial ryegrass mixtures have been shown to benefit when the bluegrass is primed. Priming equalizes the germination rate of the two species, allowing creation of a more balanced mixture in the mature stand. ❑

Editors Note: Dr. Doug Brede is a research director for Jacklin Seed Company, Post Falls, ID.

Three Commercial Methods Of Seed Priming

Since its inception more than 20 years ago, there have been numerous techniques developed for priming seed. Some have been patented, while others were released by public sector scientists. All of the methods are alike in one key element: a limited amount of water is made available to seed—not quite enough water to allow the seed to germinate. The various priming methods differ in *how* the water is limited.

Water Tank Priming

Priming got its start in tanks of water. Early priming techniques closely resemble pregermination, which had been around for years.

To limit the quantity of water available to the seed, an osmotic agent was added to the water. Polyethylene glycol and salt were typical osmotic agents that prevented the seed from soaking up too much water. Even though the seed is sitting in a tub of water, the osmotic agent prevents too much water from entering the cells of the seed by osmosis.

After priming, the seed is rinsed with clean water to get rid of the salt, and dried back.

Matrix Priming

Matrix priming is a fancy word to describe a simple concept. In matrix priming, you take damp, inert material, such as calcined clay, soil, kitty litter, sawdust, or straw and mix it with seed. Because the inert matter contains only a small amount of water, the seed can only draw a limited quantity. After priming, the inert matter is sieved out and the seed is dried and used.

Limited Water Priming

Perhaps the simplest of the priming methods, the limited water priming method contains the fewest moving parts. Limited water priming entails dousing a given quantity of seed with a given quantity of water. After priming, the seed is then dried and ready to use.