THE DIFFERENCES BETWEEN PRIMING THE SEED AND COATING THE SEED

And how this Important Difference is often Misunderstood

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What's in this Insight

This Insight (IN) is in response to questions often asked by farmers and growers at trade shows and information sessions. It appears that confusion exists about the fundamental differences of the two 'use of seed' strategies for farmers to access trace elements.

The two strategies are seed priming and seed coating. The coating of seeds with trace elements such as zinc and manganese are common practices used in Australian agriculture to deliver these important elements to the soil. However, RLF's advanced practice of priming the seed delivers a fully balanced broad-spectrum liquid solution of all essential elements directly to the seed.

This IN explains the differences.

The Technical Definitions and Differences

- **Seed Priming**

  A method of seed treatment that improves the performance of the seed. It imbibes seed nutrient directly into the seed to deliver nutrient to the seed for its immediate use. This nutrient continues to be available, via the seed, during the early weeks of the plant's growth and development.

It works so well because it put nutrients inside the seed, in effect fertilising the seed which is very efficient. The process of imbibing nutrient ensures that the uptake of nutrient is immediate, reliable and effective. A Seed Primer can be applied with other seed treatments (such as fungicides, pesticides and herbicides) making it a convenient part of normal farm practice. The process of Seed Priming, or imbibing, takes no more than a few minutes, so it is both time and cost effective.

- **Seed Coating**

Seed coating is coating, or putting onto the seed coat a suspension containing one or two elements. Coated nutrients remain too far from the root exploring sphere, since primary roots generally go down vertically and miss nutrients that are attached to the seed coat.

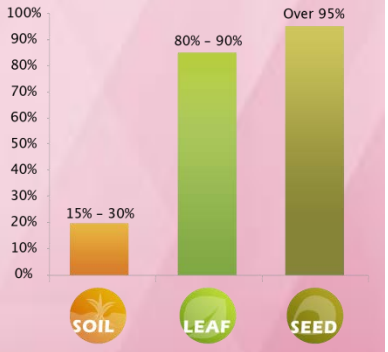
Moreover, there is no improvement in seed nutrient level by coating, therefore any seed that is nutritionally suboptimal will still remain deficient and result in a lower crop yield as compared to a primed seed.

- **Why Fertilising the Seed is more Efficient**

The delivery of nutrient via the seed is proven to be the most efficient and effective process when compared to the delivery of nutrient via the leaf or the soil.

SEED — Seed delivery is low input, functional and can ensure that almost all of the supplied nutrient is given directly to the emerging plant in a usable format to apply for its future growth and development.

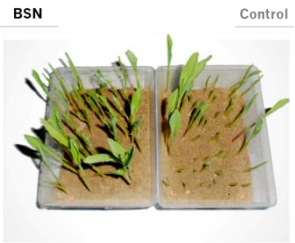
LEAF — When compared to the delivery of nutrient via the leaf – which has a lower efficiency rating due to the incomplete canopy cover – uptake can often be effected by other less manageable variables and the prevailing weather conditions.



SOIL — Soil application of nutrient has been shown to be the least effective means of delivering nutrient to the plant as it is totally reliant on the root structure to intercept the nutrient in the soil – a process that results in much lower uptake due to diffusion and movement of ions being the main limiting factor to supply nutrients to the root system from soil reserves.

STRONG EARLY GROWTH + VIGOUR

CONSISTENTLY HIGHER GERMINATION



STRONGER WITH BIGGER AND HEALTHIER ROOT MASS

- **The Step by Step Process**

The following graphic depicts the typical three step process comparing the two seed treatment processes.

SEED PRIMING

1 AFTER SEED PRIMING

During priming the BSN Seed Primer nutrients are taken up (imbibed) by the seed.

2 AFTER SOWING

When seed is sown, the applied nutrients are within the seed. In early hours of germination, the growing embryo senses the elevated nutrient levels as nutrients are mobilised within the seed.

3 DURING GERMINATION

The root, emerging from germinating seed has already got its share of applied nutrients and is empowered for vigorous searching of soil and nutrients.

SEED COATING

1 AFTER SEED COATING

Seed coating binds fertiliser to seed coat.

2 AFTER SOWING

When seed is sown, some of the coated particles separate from the seed and may sit inaccessible above the seed plane. In early hours of germination, the growing embryo does not sense any of the coated nutrients.

3 DURING GERMINATION

The root, emerging from germinating seed, searches for soil and coated nutrients in the surrounding soil.

NOTE : *All the nutrient elements contained within a BSN Seed Primer demonstrates the efficiency of Seed Priming in this graphic.*

The Importance of Modern Seed Treatments

Modern seed treatment products offer targeted control of pests and diseases and ensure the establishment of healthy and vigorous plants. Their formulation and functional application also provide many benefits for today's agricultural sector that relies upon advanced products and technical concepts to bring about better crop quality and yield outcomes. These modern seed treatment products are needed if the world's food security targets are to be met. They are also needed to advance the innovation and change required to ensure best practice, and best care, of the cropping lands and systems already in place so that they can continue to produce good quality and high yielding crops into the future.

RLF's Contribution to this Challenge

RLF has pioneered the **BSN** range of Seed Priming products as its response to the crop protection challenges of the future.

These products are proven, and the results and outcomes achieved are all backed up by rigorous evaluation and demonstration trials and data.

BSN Seed Primer is unlike any other fertiliser product on the market today. It can represent a number of direct benefits that substantially differentiate the product from other seed treatments. These are based on plant science and physiology, trial and performance data and the basics of known and accepted agricultural principles.

BSN Ultra

Enhanced for crop and soil types found in certain regions throughout the world.
It can be modified and strengthened for greater suitability to soil and crop type combinations for a better matched product for specific and/or regional use.

BSN Superstrike

Providing optimum levels of seed nutrient in a single application.
It is fast becoming the new world standard in modern farming practice where fertilising the seed is becoming as important as fertilising the soil.

BSN Hybrid

Specially engineered for hybrid seed types.
Providing the same optimum levels of seed nutrition in a single application and is easy to apply.

BSN Seed Primer is a performance product that can provide a combination of benefits as a direct outcome from its application.

The eight primary expected and proven benefits delivered through the use of **BSN Seed Primer** – based solely on the principles of plant and soil science – are as follows :

1. safe transfer of nutrients
2. increased yield regardless of fertiliser rate
3. effective in all soils
4. fixes nutrient variability in seed lots
5. greater root mass
6. early vigour and stronger plant growth
7. higher yield, quality and value
8. good return for the farmer and grower

The Key Advantages of Seed Priming and the important role of Phosphorus

Several published articles have been reviewed that support the direction taken and outcomes sought by RLF with the development of its specialised Seed Priming fertiliser. (The articles referenced are listed in the further reading and links section at the end of this IN).

The key benefits delivered by Seed Priming over that of seed coating include :

- **BSN**, by priming the seed, elevates the level of essential elements of the seed to above optimum level. This ensures the maintenance of nutrient adequacy in the seed because all nutrients are safely transported inside the seed to be utilised by the embryo. The broad spectrum nature of **BSN** means maximum yield potential is set, and that it does not miss out on establishing this response due to suboptimal grain nutrient levels.

- **BSN** has a direct effect on yield, since 100% of the nutrients contained within it are absorbed by the seed. It is very common in untreated seeds for nutrient levels to be at suboptimal levels, and **BSN** has been scientifically tested and demonstrated to improve the seed's internal nutrient concentrations. In part, this is because **BSN** ensures 'plant-available' phosphorous which directly influences yield potential – regardless of fertiliser rates applied to the soil – hence a direct effect on yield achieved through seed priming.

- The importance of the role of phosphorous cannot be over emphasised – it's role is crucial – and this is a significant, ongoing benefit generated by Seed Priming. All added phosphorous delivered by **BSN** is as inorganic (i.e. available phosphorous) and it is known that the seed and plant can only use and metabolise inorganic phosphorous at early stages of germination. In each seed, the typical availability of phosphorus is only about 10% of the total phosphorous *(ref : Batten, 1985)*, which means that the phosphorous available for seed germination and early growth is often too low. Seed Priming with **BSN** provides the seed with inorganic available phosphorous that both the seed embryo and the developing plant can access immediately. The amount of available phosphorous that **BSN** renders can provide up to a 350% increase to the embryo. This early development then goes on to support greater phosphorous utilisation, further providing available phosphorous to the plant for its continued growth. If phosphorous is too low then the opportunity to set high yield potential is lost. Seed Priming with **BSN** overrides these uncertainties and gives certainty to the level of phosphorous required to set the maximum yield potential for the plant.

The interesting time-lapse video that follows shows what happened during a deliberately controlled experimental 'stress' situation, simulated to induce the climate pressures that come with lack of seasonal rainfall. The camera captures the emergence of seed growth and establishment, one with **BSN Seed Primer**, the other without.

Click here to view the time-lapse video

- Utilising the locked phosphorous in soil through Seed Priming (as explained in the previous key point) has a much more practical implication than for trace elements. Whilst the element deficiencies such as those often seen with zinc and manganese, can be simply and effectively overcome with foliar spraying, the same is not true for phosphorous deficiency. If phosphate availability is not good, the crop yield potential would not be recovered by an in-season application of phosphorus. The article by *Hans Lambers, et.al. University of WA*, effectively argues that future agricultural practice should be structured along the lines of *'unlocking soil phosphorous by bringing about changes to the root structure and other physiological functions that unlock more of the soil nutrients'*. The warning comes from the estimates that within the next 20 to 40 years, world phosphorous reserves will be halved. BSN provides the seed with all the inorganic phosphorous it needs to establish strong plant development and growth.

- Zinc availability in alkaline soils is also a key point of difference for Seed Priming. The article by *M Govindaraj et.al. Tamil Nadu Agricultural University, Coimbatore, India* provides some basis for this fact. The added zinc becomes more tied up as pH is raised above 5 and zinc added as sulphate which is available in acid soils will be converted to zinc hydroxide – Zn OH2 – or zinc carbonate – Zn CO3 – that are insoluble and therefore unavailable in alkaline soils. When zinc is insoluble due to high pH those plant species/cultivars that can excrete more acids are able to unlock and utilise the zinc. When soil pH is below 5, zinc availability is good, therefore added zinc to the soil, or fertiliser to the seed as the carrier is largely utilised by plant when soil pH is below 5. The utilisation of zinc (as well as other trace element metals) in alkaline soils can be improved by root growth and root exudation of various organic acids and natural plant chelates, IFM in which seed is treated with BSN Seed Primer together with an Ultra Foliar (broad-spectrum) or specifically manufactured and targeted Foliar Fertiliser from the RLF range of products, enables greater stimulation of the root contact area with zinc as well as stimulating the production of acid and other exudate to unlock both zinc and phosphorous.

- The impact of continuous cereal cropping also gives rise to increased soil pH over time, with the consequence of less available metallic trace elements and phosphorous. IFM (with Seed Priming and Foliar Fertilising), or legume-cropping is the only way to unlock metallic elements and phosphorous in alkaline soils. Other means such as adding elemental sulphur to acidify soils is costly and has aspects of impracticability as well.

Conclusion

The benefits of seed priming over that of seed coating become clear once an understanding of just how the seed is used as a carrier for both seed treatment strategies is explained.

Seed Priming is targeted, completely based on science, and engineered to bring about new generation performance advantages from the very start of the seed's journey into the soil. Seed Priming imbibes essential nutrients directly into the seed for its immediate use. This nutrient continues to be available, via the seed, during the early weeks of the plant's growth and development. Once the vigorous plant and robust root development has been established all the ongoing benefits are then transferred through the enhanced, healthy root systems that support microbial activity and the subsequent production of organic matter – so vital for the ongoing health and productivity of the soil.

Further Reading and Links

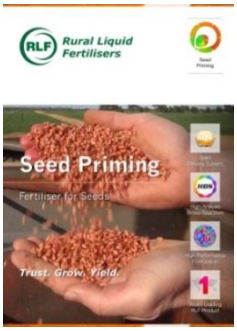
The following three external publications referenced are all useful and informative reading that support both the premise and the development rationale of RLF's BSN Seed Primer.

- **The Uptake and Utilisation of Phosphorus and Nitrogen by Diploid, Tetraploid and Hexaploid Wheats (Triticum spp).**
  GD Batten 1985

- **Root Structure and Functioning for Efficient Acquisition of Phosphorus: Matching Morphological and Physiological Traits**
  Hans Lambers, et.al. School of Plant Biology, University of Western Australia, and Department of Botany, University of Cape Town, South Africa, June 2006

- **Implication of Micronutrients in Agriculture and Health with Special Reference to Iron and Zinc**
  M Govindaraj et.al. Tamil Nadu Agricultural University, Coimbatore, India, August 2011

The following internal publications all give greater understanding of this important seed treatment technology, and advance the body of evidence that is building in support of seed priming as a more beneficial seed treatment over that of seed coating – for all the reasons given above.



SP2015

The current Corporate Brochure explaining the full story of SEED PRIMING, together with results, images and full product details.

Click here to view Seed Priming brochure

SR3

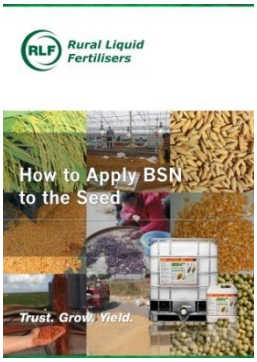
A SR bringing together many published articles, video presentations and bulletins highlighting trial data and research results involving IFM.

Click here to view this Special Report

IFM VIDEO

RLF's Corporate presentation about Integrated Fertiliser Management

Click here to watch IFM video



HOW TO APPLY BSN TO THE SEED

The complete information and instruction booklet giving clear guidelines for the use of BSN Seed Primer.

Click here to view this brochure

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An Insight into the Power of **BSN Superstrike** and what it achieves for real crop and investment outcomes.

Click here to view this RLF Insight