

Organic Fundamentals

Technical Series



Differences Between Perfect Blend Fertilizers

(Complex Nutrition Enabling Fertilizers)

and Raw Manure, Composted Chicken
Manure & Dyhydrated Manure



Perfect Blend Organics

Many growers have requested a more technical evaluation of the difference between Perfect Blend fertilizers and chicken manure. The most obvious difference is that Perfect Blend is a fertilizer and soil amendment registered in and regulated by 14 different states in the US. It is manufactured using the REUNION process to change the nature of its manure feedstock on a molecular level. The result is a stable, slow release type material that allows the formation of complex nutrition humic substances in the soil that do not tend to migrate once formed. Manures and composts, classified as soil amendments without restrictions as to labeling or content, are essentially unpredictable and difficult to scientifically apply. Recently, we became concerned when we discovered growers sometimes misunderstand the nature of Perfect Blend fertilizers, thinking they were based on either composted or dehydrated manure. We also found instances where growers had been misled by claims from other companies that raw or partially composted manure soil amendments are as effective as Perfect Blend fertilizers.

To put it simply, Perfect Blend fertilizers are based on chicken manure that has undergone a chemically induced molecular alteration that at the instant of reaction forever alters the nature of the manure from a low valued, volatile, totally unpredictable nutrient into a stable, predictable, slow release fertilizer. The finished Perfect Blend fertilizer contains a balanced blend of 15 nutrients and minerals in addition to a full range of stabilized, slow release, carbon based nutrients that include amino acids, phytochemicals, glucose, hormones, and carbon essential vitamins. Raw manure, composted manure, partially composted manure, and dehydrated manure cannot make those statements. Typically, these nutrients cannot be defined as a fertilizer under the laws of many states which require a minimum nutrient level of 15% of total mass before a material can be defined as a fertilizer.

That all said, we do believe that the application of raw, dehydrated, partially composted, and completely composted chicken manure is a valid farming practice when carefully controlled. The problems that result from the use of these materials are well known by most growers. It was to eliminate or completely reduce the problems connected with manure that caused the development of this class of fertilizer.

This evaluation deals with the differences between the use of Perfect Blend fertilizers and the use of raw and partially composted chicken manure such as that found in the State of Washington. Perfect Blend fertilizers were originally developed as a safe, stable alternative to the application of raw or poorly composted manures on agriculture lands. As the research and development work on Perfect Blend fertilizer progressed, and more knowledge became available on the soil bio-sphere, the emphasis on the fertilizer architecture moved away from waste solutions into the design of biologically-active complex nutrition fertilizers. For that reason, those of us at Perfect Blend find it ironic that we must now compare a stable, quality controlled; complete complex nutrition fertilizer that is producing wonderful results for those who have tried it, with what is essentially a waste product. For this reason, we have decided to depend on the research, technical trial results, and observations of recognized third parties to discuss the negative aspects of the use of raw or partially composted manure on grower's fields.

In order for there to be a fair comparison, it is important that we first understand the nature of the product to which we are comparing

Perfect Blend fertilizers.

Question: What is the nature of the chicken compost being sold in Washington with an analysis of 4% nitrogen?

Perhaps the real question is how can a well-composted chicken manure possibly have an analysis of 4% nitrogen. At Perfect Blend we bring in manure from high rise hen houses that is not at all composted. The analysis of this material is 4.0% to 4.8% nitrogen.

Statement: "Composted manures have been rotted before bagging and will have a composition of 1-1-1."

University of Massachusetts – Amherst PLSOIL 120
www.umass.edu/psoil120/guide/chapter3.htm

Statement: "Generally poultry is composted using poultry litter." The nutrient content of this compost is approximated as follows: Poultry – N – 40 lbs – 2% - P – 1% - K 25 lbs. – 1.25%

These amounts equal an N-P-K score of 2-1-1.25 for composted chicken manure.

NCRS – Composting Facility Code 317 – January 2000

A check of high quality chicken composters indicates their inability to achieve a 4% nitrogen level.

Back Hen Composted Chicken Manure – Oxford, FL – www.blackkow.com – Nitrogen 2% Coldspring Compost – Whitewater, WI – coldspringcompost.com – Nitrogen 1.1% Earthworks Soil Amendments – Corona, CA – www.esa.com – Nitrogen 1% Pearl Valley Organix. – Pearl City, IL – www.pearlvalleyorganic.com – Nitrogen 2% Vitiwise – Willunga, Australia – www.vitiwise.com – Nitrogen 1.1%

The reason that we are working to define this question is important to the grower. Some chicken manures sold in Washington State appear to have much higher nitrogen levels than well-composted products produced in other locations in the U.S. and overseas. Chicken manures sold with "high" nitrogen levels are probably not well composted. Instead they appear to be closer in nitrogen content to raw or partially composted manures.



Question: What is the product being sold in Washington as “chicken manure compost”?

Statement: “You now have a range of products available, some are “composts” in name only, so beware.” Washington State University – Tim Smith, WSU Extension – Compost Trials in Orchards in 1995-97

Statement: “COMPOSTED CHICKEN LITTER is also called DPW – for “Dried Poultry Waste.” It is the stuff used to cover the floors of the vast chicken coops of Western Washington and Oregon. It is composed of lots of wood chips and chicken “droppings”, (and a few decomposed chickens) aged and scratched around under the biddies feet for a few months or so, until the chickens can’t stand it anymore, then piled and turned until it is well composted. This stuff is hot.” (PB Note – Finished compost material is never “hot”.)

Washington State University – Tim Smith,
WSU Extension – Compost Trials

Statement: “We composted a full grown cow in less than 14 days in one of our rows of compost. We could not even find any bones.” Robert Dow – Silver Creek Compost – Fort Worth, Texas as Reported in Bio-Cycle Magazine

The fact that a cow can completely dissolve in an efficient compost operation and that partially decomposed chickens are found in “composted chicken litter” might indicate that there is a less than complete compost practice involved. From statements such as the ones provided above and our own observations, we don’t believe that these “composts” being used in Western Washington are composted – they are instead a concentrated semi-dried raw manure. That would also explain a 4% nitrogen level.

Question: What are the problems identified with using poorly composted or raw manures on agriculture land?

Statement: “Land application of manure at high rates may cause environmental problems by contaminating groundwater, and surface water with nutrients, sediments, and pathogens.” University of Alberta – www.agric.gov.ab.ca/manure/article4.html

The list of problems associated with the use of non-composted manure is well known. Perhaps the greatest problem is that of actual nutrient transfer. Assigning nutrient values to an unstable soil amendment is difficult given the variables of time before planting, weather conditions, and length of time before the manure is covered. Another concern, not very well addressed by research is the actual cost of lost yield due to inconsistent nutrition, nutrient burns and nitrogen immobilization. Savings that may result from using un-composted manures vs. quality controlled organic fertilizers may not exist when the total cost of unpredictable yields, crop kills, and a failure of a crop to reach its full genetic potential is added into the equation.

Nitrate / Nitrite contamination of surface and ground water.

The possibility of nitrate/nitrite contamination of soils has become an issue in the Columbian Basin and in other major agriculture areas. The

nitrogen, potassium, and other nutrients contained in un-composted manures are extremely unstable. This is shown in a chart provided by the University of Massachusetts that reveals nutrient loss of 25% of the relative value of manures for increasing yields of crops within the first 24-hours that the manure is uncovered on the soil.

Time between application and Incorporation (Hours)	Relative Value of Manure
0 Hours	100 %
6 Hours	85 %
24 Hours	75 %
48 Hours	70 %
96 Hours	55%
336 Hours (2 wks)	50%

Most of the nutrients in manure rarely hang around waiting for next spring. Most experts suggest that in order to get maximum benefit of manure that it be applied only two weeks before planting in order for the plant to get maximum advantage of the nitrogen and potassium as it passes through the root zone. For some organic crops, that is impossible as the crops are short growth cycle with harvest within the 120 day non-application period as currently provided for manure products under the NOP. Perfect Blend has no such restriction.

U.S. EPA – Ground Water & Drinking Water
www.epa.gov/safewater/dwh/c-ioc/nitrates.html

Statement: “Nitrogen is lost by leaching, volatilization of ammonia, and denitrification of nitrates. Potassium is leached. Losses of nitrogen are rapid. Half of the nitrogen may be lost in two weeks.” From Management of Farm Manures – University of Massachusetts Amherst PLSOIL 120
www.umass.edu/psoil120/guide/chapter3.htm

Statement: “Since nitrates/nitrites are very soluble and do not bind to soils, they have a high potential to migrate to ground water. Because they do not evaporate, nitrates/nitrites are likely to remain in water until consumed by plants or other organisms” U.S. EPA – Ground Water & Drinking Water
www.epa.gov/safewater/dwh/c-ioc/nitrates.html

Note: For an extremely comprehensive study on nitrogen loss in fall and spring applications, you can go to : http://res2.agr.ca/initiatives/manurenet/env_prog/gp/gpres/report/rep14sum.html This study entitled Transformations in Soil: Crop Response to Nitrogen in Manures with Widely Different Characteristics. This \$9,700,000. research program, funded by the Government of Canada is probably the most comprehensive study on manure applications available



.Nitrate / Nitrite contamination - PERFECT BLEND FERTILIZERS

Perfect Blend fertilizers are stabilized using an organic chemical reaction. This stabilization changes the nature of the organic material by sealing nutrients inside the material to make it a slow release organic nutrient source. It also balances the pH to a neutral to slightly acid level. This is directly opposite to the raw and partially composted unstable manures which are so unstable that 90-percent of key ingredients such as potassium and nitrogen can be lost in a short period after rain followed by a hot sun. Perfect Blend is a completely balanced stable fertilizer that slowly releases its sixteen key ingredients to the soil providing for a stored resource for plants to draw upon when they require nutrition.

You Can Easily Smell The Difference

A simple side-by-side test that demonstrates the difference between manure, or partially composted manure, and Perfect Blend fertilizers is to slightly wet a sample of each. The smell of the manure, or partially composted unstable manure, will be very strong as CO₂, methane, sulfur dioxide, and ammonia immediately off-gas. The Perfect Blend fertilizer will have a slight ammonia smell as a portion of the 1% ammoniacal nitrogen is released. The difference in the amount and smell of volatilized nutrients is the difference in the stability of the nutrients.

We have visited with growers that complain of the smell of raw chicken manure on their soils. If you can smell the manure for days then consider this. The smell is that of greenhouse gases, methane, ammonia, sulfur dioxide plus elements of a volatilized benzene ring particular to chicken manure – all of these smells are from nutrients volatilizing. Volatilized nutrients do little to benefit plants.

Arsenic contamination of ground and surface water.

Statement: *“Organic arsenic compounds are extensively added to the feed of broiler chickens to control coccidial intestinal parasites. Roxarsone is the most commonly used feed additive. Very little Roxarsone is retained in chicken meat with most Roxarsone excreted unchanged. Ongoing studies have indicated that Roxarsone degrades rapidly and that the arsenic (V) species was the only species detected in amended soils.”*

J.R. Garbarino and others – U.S. Geological Survey – Denver, CO.

Statement: *“Although the relative amount of arsenic being added to soil by chicken manure is a small percentage of the total arsenic in the soil, it has a higher mobility in water due to the sorption characteristic of arsenic in organic matter compared to arsenic sequestered by metal oxides. This may lead to higher arsenic in water leaching from fields treated with arsenic containing chicken manure until such time that this arsenic can be bound by metal oxy-hydroxides.”*

J.R. Garbarino and others – U.S. Geological Survey – Denver, CO.

Arsenic contamination - PERFECT BLEND FERTILIZERS

Feeding Roxarsone to broiler chickens on litter is an established poultry practice. For that reason Perfect Blend uses caged layer hen manures as feedstock for its formulations. Perfect Blend has very low arsenic

levels. Perfect Blend contains an arsenic level of about 1.5 ppm that is rendered into a slow release molecule and is not the rapidly degrading Arsenic (V) found in raw manure samples.

Crop Burns

The fact that non-composted chicken manure in high concentrations will kill young crops is well known by growers.

Crop Burns - PERFECT BLEND FERTILIZERS

There have not been any reports of burning by organic Perfect Blend fertilizers during the almost 14 years of research and development except in cases where the fertilizer is massively over applied. Perfect Blend fertilizers are pH balanced and stabilized. This fertilizer can be injected directly into the root zone in almost all cases.

Inconsistent Applications

The fact that achieving an even application of chicken manure over a field may, in many cases, be difficult is well known by growers and needs no additional comment.

Inconsistent Applications - PERFECT BLEND FERTILIZERS

The dry, free-flowing nature of Perfect Blend fertilizers allows the use of conventional fertilizer spreading equipment. Perfect Blend fertilizers may be banded, spinner-spread, or drilled using equipment designed originally for chemical fertilizers. Inconsistent applications are rarely an issue with Perfect Blend fertilizers.

Nitrogen Immobilization

Statement: *“An immature compost with difficult to decompose woody material may lead to nitrogen immobilization.” Nitrogen Mineralization Study: Biosolids, Manures, Composts University of Washington, College of Forest Resources Cowley, Thompson, Henry*



Partially dried broiler house manure concentrates typically have a high proportion of wood shavings mixed with the manure. Nitrogen immobilization may easily occur with this product if the nitrogen in the manure is drawn down by exposure, rain, or a combination of adverse occurrences before the requirements of the plant are met. If the plant and the microbes are competing for the same nitrogen, the microbes will prevail.

Nitrogen Immobilization - PERFECT BLEND FERTILIZERS

Perfect Blend is a slow nutrient release class "A" fertilizer. It cannot be an agent in nitrogen immobilization unless combined with a high carbon mulch or compost.

High salt levels

Statement: "The material in manure that remains after we subtract out the nitrogen, phosphorus, and potassium is for the most part undesirable salts which can prevent seed germination and burn plants. Soil tests performed in Amador County soil over-fertilized with poultry manure have measured salt nutrient levels 100,000 times normal.

University of California Co-op Extension Amador County-1992

Statement: "Manures commonly contain 4 to 5% soluble salts (dry weight basis) and may run as high as 10%. To illustrate, an application of 5 tons of manure containing 5% salt would add 500 lbs of salt. Normally, irrigation and rain water will sufficiently leach well-drained soils to prevent damaging salt accumulations. However, one should be cautious with poorly drained soils, soils with existing salinity problems, or unusually high application rates, especially when concentrated near young plants.

University of California Cooperative Extension,
Tulare County NG7-97

High Salt Levels - PERFECT BLEND FERTILIZERS

Perfect Blend fertilizers are not concentrated in the manner of composted or partially composted materials. Compost is a concentrated material with concentrated salts. Producers of high quality compost typically may reduce 100 tons of compost feedstock into only 25 or 30 tons of finished compost. Perfect Blend fertilizers are low in salt since the manure feedstock is never composted. Perfect Blend fertilizers are also low in salt due to the fact that Perfect Blend is made out of layer hen manures instead of broiler manure. Broiler manure may contain additional levels of salts contained in bedding materials. It is not unusual for broiler raisers to add salt to drinking water and food to force the broilers into increase food consumption and weight gain.

Carbonates

Statement: "Using an overly acidic compost won't usually do any long-term damage to your soil, but using one that's too alkaline might. High-pH composts often contain carbonates, usually in the form of lime (calcium carbonate). If you have naturally alkaline soil (most common in drier regions) or if your soil is acidic and you already apply lime to reduce the acidity, you should avoid using a high-pH compost. "Once a soil contains

too much carbonate, other nutrients, such as phosphorus and zinc, will become unavailable. There is no easy way to bring the soil back into balance".

The Intervale Foundation – Burlington, Vermont

Statement: Manure analysis – Composted Chicken Manure – 9.1 pH
1999 Report Vegetable Research
Vancouver Research & Extension Unit – WS

A 9.1 pH is considered a very strong alkaline. The scientist who performed the research confirmed the pH level. We know that not all partially composted chicken manures in Washington have a pH that is so strongly alkaline. We included this example to illustrate the problems associated with some products.



Carbonates - PERFECT BLEND FERTILIZERS

Perfect Blend is a balanced fertilizer that will not leave excessive calcium on a grower's soil. All Perfect Blend fertilizers are pH balanced to a range between six and seven – slightly acidic to neutral. This completely eliminates any concerns about carbonates. Carbonates are compounded in composts in the same manner as salts.

Pathogens

Statement: "Animal manures and composted animal wastes are reported to harbor disease causing microorganisms. Even after composting, manure mixes have been shown to harbor such disease causing organisms. Animal wastes contain pathogens to which humans are vulnerable including Salmonella and Cyptosporidium.

Curtis E. Swift, PhD CO State University Cooperative The Use of Manures As Soil Amendments

Statement: "Raw animal waste is not accepted as an organic fertilizer, because it has an offensive odor and is unsanitary and biologically unstable."

Indonesian Journal of Crop Science, 1999,

Vol. 14, No. 3 Pathogens - PERFECT BLEND FERTILIZERS

All Perfect Blend fertilizers have undergone two separate kinetic processes to eliminate pathogens. Immediately after processing, tests of Perfect Blend fertilizers show almost sterile plate counts for total coliform, fecal coliform and streptococcus MPN.

Weed Seeds & Spores

Statement: "Introduction of weed seeds is a concern when using animal manure as a nutrient source on croplands. The viability of weed seeds can be reduced through composting."

USDA Agriculture Research Service

Viability of Weed Seeds Following Manure Composting

The weed seed question on raw manure and partially composted chicken manure is problematic given the mixed research on the subject. Many researchers believe that with modern day broiler houses and the feedstocks for such houses (at least in some parts of the US) eliminates the probability of most weed seeds. On the other hand, we found many references concerning the need to compost to eliminate weed seeds. We decided to include the single USDA quotation above to be on the safer side of the question and so as not to be on the side of misinformation.

Weed Seeds & Spores - PERFECT BLEND FERTILIZERS

The kinetic processing used in manufacturing Perfect Blend fertilizers to destroy pathogens also destroys weed seeds and spores.

Moisture Levels

Statement: "There is a variable amount of waste in compost. It often has 50-60 percent water by weight even when a product seems fairly dry."

Washington State University – Tim Smith,
WSU Extension – Compost Trials

The raw chicken manure that we receive at the Perfect Blend manufacturing facility is typically in the 45% to 55% moisture range.

Moisture Levels - PERFECT BLEND FERTILIZERS

The moisture in Perfect Blend fertilizers is carefully lowered during the entire manufacturing process. Sustained exposure to high heat is avoided as high heat that could volatilize nutrients are critical to the soil scientific principles behind Perfect Blend performance. All Perfect Blend fertilizers are shipped with a 10% moisture content.

Dehydrated Chicken Manures

Commercial dehydration is a current "innovation", in the handling of chicken manure. This ancient process has been updated by the use of commercial dryers and pellet mills. It does result in an easily handled product. However, dehydrated chicken manure has, in our opinion, a reactive nature that is little removed from that or raw manure. That is to say that dehydrated manure, once wetted reacts to quickly release nutrients in the same manner as raw manure. Dehydration provides no stabilizing alteration of the molecules of the manure in the manner the REUNION process used by Perfect Blend.



The Problem With Composting

Composting is a method that is efficient in eliminating organic waste. Anyone promoting composting as an effective method of creating a nutrient base for agriculture is being less than realistic. Consider the fact that one must destroy approximately 100 tons of valuable organic nutrients in order to create 30 tons of finished compost. Take nutrient levels of 100 tons of organic waste before composting. Even simple nutrients (N-P-K) may constitute 10% of the total mass. That would mean that N-P-K alone would account for about 10 tons of nutrients. During composting the N-P-K nutrients are reduced by a combined chemical and micro-organism process to about 3% of the total. However, since the total mass is reduced at the same time to, say, 30 tons, then the total amount of nutrients available will be $3\% \times 30 \text{ tons} = .9 \text{ tons}$ of nutrients. An astounding 97% reduction in total mineral nutrients are simply destroyed during the composting process.

Along with the destruction of mineral nutrients, almost all of the valuable organic nutrients which comprise the complex nutrition that is essential to plants and soil are lost as well. These nutrients, the carbon component of organic waste, are not easily replaced as their accumulation and synthesis are the end result of millions of hours of plant growth.

Plants, and the soil that plants grow in, are complex organisms that require complex nutrition to grow. Our human bodies are composed

of about 30,000 genes. Some plants contain 10 times that amount. Even a rice plant can contain 50,000 genes in their genome. Plants, and the micro-organisms in the soil around them require complex carbon based nutrition that can be easily provided by the transformation of organic matter into complex humic substances.

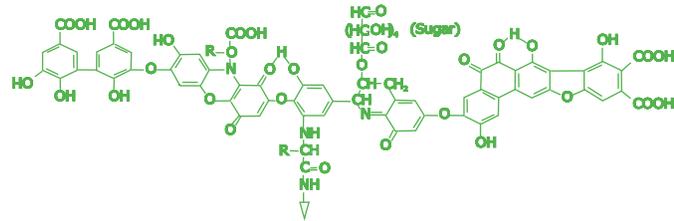
Composted organic waste does not contain these valuable nutrients as typically the nutrients have been volatilized into the atmosphere during the process or leached into the ground under the composting pile. To somewhat duplicate the effects of the compost process at home put a perfectly good plate of food in an oven at 135 – 155 degrees F. for two to four weeks. At the end of that time survey the results. You will discover black ash – the same material that results from composting. This ash is all that is left from the valuable organic nutrients.

Consider that when you have composted 100 tons of valuable organic nutrients you have effectively destroyed the bulk of the valuable carbon based nutrition contained in the organic nutrients while reducing mineral nutrition by 93%. Composting is a terrible waste of valuable assets. Downstream plumes of composting gases are unhealthy and have been linked to disease and birth defects by studies undertaken by Texas A&M University. The rationale behind composting has largely come from those who wish to avoid placing green waste into “sanitary” landfills. Fortunately, there is now an alternative process that can convert manure waste into valuable organic based fertilizers.



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and Raw Manure, Composted
Chicken Manure & Dyhydrated Manure



For more information please visit our website,
<http://www.perfect-blend.com>



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