



NATURAL DETHATCH – PRO

Thatch can have either beneficial or detrimental effects on turf depending on the amount present. A thin layer of thatch in lawns ($\frac{1}{2}$ inch or less) is beneficial and provides insulation against temperature extremes and fluctuations in soil moisture. However, if your lawn has more than an inch of thatch, you are likely to develop thatch induced problems!

Thatch is organic debris primarily comprised of stem nodes, crowns and fibers of vascular tissue that develop between the turf shoot and the soil surface. Thatch becomes an issue when turfgrass produces organic debris faster than it can be degraded via indigenous microbial activity. On a molecular level thatch is generally comprised of a complex of 75 % cellulose / hemicellulose (biodegradable polysaccharide) and 25 % lignin (recalcitrant polymer).

Excess thatch can lead to an increase in pest related problems as it tends to harbor populations of pathogenic fungi and insects. Many fungicides and insecticides tend to become bound in thatch, reducing their effectiveness and preventing movement into the soil profile. Excess thatch can also impede air, water, and nutrient exchange, which negatively impacts both plant and soil health.

Some turfgrass cultivars are more prone to thatch buildup than others. Take for example cool-season grasses such as Kentucky bluegrass, creeping red fescue, and creeping bent grass, they produce large volumes of stem tissue as either rhizomes or stolons. These cool season cultivars tend to form more thatch than their warm season counterparts. Conversely perennial ryegrass and tall fescue are characterized as bunch-type grasses, and they tend to not promote excessive thatch layers.

Next to cultivar selection pesticide applications are the primary cause of thatch build up as they kill or negatively impact beneficial, non-target organisms. Pesticide use, especially regular use of fungicides, negatively impacts the naturally occurring, indigenous soil bacteria and fungi responsible for keeping thatch in check. Many insecticides promote thatch development through their negative effects on earthworms. As Earthworms make their way through the soil profile, they produce castings (excrement), which in turn stimulates microbial activity, hence thatch degradation. Multiple studies have shown that insecticide applications can significantly reduce earthworm populations resulting in reduced thatch degradation.

The overuse of nitrogenous based fertilizers, especially water-soluble fertilizers is often a self-inflicted wound that also increases thatch development! Thatch layers develop rapidly when an aggressive nitrogen fertilizer program is implemented. Nitrogenous fertilizers promote thatch development because they essentially cause the turf stand to produce root and stem tissue faster than the indigenous microbial populations can degrade it!

Natural Dethatch Pro is a biologically diverse product specifically formulated to enhance microbial populations and promote rapid thatch degradation. The formulary contains three select microbial consortia to address the degradation of cellulose, hemicellulose, and the more recalcitrant lignin component.

Most dethatch products do not contain adequate biological diversity. Typically, they contain a handful of organisms that degrade cellulose but do little to promote the degradation of hemicellulose and lignin, which makes up a significant portion of the thatch layer. Natural Dethatch Pro contains the requisite biological diversity to degrade all three components of the thatch layer, namely cellulose, hemicellulose and lignin.



Natural Dethatch – Pro utilizes a blend of *Bacillus*, *Cellulomonas* and *Trichoderma* to promote the decomposition of cellulose. These organisms produce a variety of cellulases (enzymes that degrade cellulose), which hydrolyze cellulose into glucose which can then be utilized by the turfgrass to produce structural carbohydrates.

The formula contains select species *Bacillus* and *Cellvibrio* bacteria, which are specifically designed to degrade hemicellulose. Hemicellulose is bound structurally to cellulose by a network of fibers composed of pectin and is more complex, therefore more resistant to degradation. *Bacillus* and *Cellvibrio* produce a myriad of hemi-cellulase enzymes which degrade the hemicellulose component into simple sugars such as xylose, mannose, galactose, rhamnose, arabinose. These sugars can then be utilized by beneficial soil organisms as a carbon source to satiate their metabolic requirements.

That leaves lignin as the remaining thatch constituent requiring degradation. Lignin is a different animal all together as it is extremely recalcitrant in nature (resists degradation). Lignin is a heterogeneous aromatic polymer which is structurally associated with cellulose and hemicellulose to form lignocellulose. Lignocellulose provides plants their rigidity and is most prevalent in woody plants.

Lignin degradation is most often associated with white rot fungi. However, there are multiple species of bacteria and actinobacteria capable of degrading lignin. The first such organisms associated with Natural Dethatch – Pro is *Pseudomonas putida*. *Pseudomonas putida* secretes various enzymes, including reductases, peroxidases, monooxygenases, dioxygenases, oxidases, and dehydrogenases all of which contribute to lignin degradation.

Natural Dethatch – Pro contains two species of *Streptomyces* which have the capacity to promote lignin degradation. The first organism is *Streptomyces griseus* it produces lignin peroxidases (cleave lignin's complex aromatic structure), manganese peroxidases (oxidizes lignin compounds) and laccases (oxidative degradation of lignin). The second actinomycetes involved in lignin degradation is *Streptomyces coelicolor*. This organism secretes a variety of enzymes including endoglucanases, and xylanases, which further reinforce the formula's ability to degrade lignin.

The final lignin degrading organism in Natural Dethatch Pro's arsenal is *Penicillium bilaii*. The biodegradation process of lignin initiated by *P. bilaii* involves a series of oxidative cleavages catalyzed by enzymes such as DyP-type peroxidase and multicopper oxidase. These enzymes facilitate the breakdown of lignin into aromatic monomers and dimers, which are then further degraded by the balance of the formula.

CONTAINS NON PLANT FOOD INGREDIENTS

Active Ingredients

Cellulomonas fimi 100,000,000 cfu per ml, *Cellvibrio gilvus* 100,000,000 cfu per ml,
Trichoderma reesei 100,000,000 cfu per ml, *Pseudomonas putida* 100,000,000 cfu per ml,
Penicillium bilaii 100,000,000 cfu per ml, *Streptomyces griseus* 50,000,000 cfu per ml,
Streptomyces coelicolor 50,000,000 cfu per ml, *Bacillus subtilis* 50,000,000 cfu per ml,
Bacillus licheniformis 50,000,000 cfu per ml, *Bacillus pumilus* 50,000,000 cfu per ml,
Bacillus coagulans 50,000,000 cfu per ml, *Bacillus amyloliquefaciens* 50,000,000 cfu per ml,

Inert Ingredients

75.00 % Water Based Culture Medium