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TANNIN

Background

On occasion, a dark brown or black substance is seen coming from engineered wood fiber and mulch. The substance can have the appearance of oil and is particularly noticeable when water is present. Typically it is seen during and after a rain shower.

What is it?

The dark brown or black substance has been tested and found to be tannin. Tannins are naturally occurring plant polyphenols and are found in bark, wood, leaves, fruit, roots and seeds. Tannins bond readily with proteins and have been used medicinally, in the food industry and in the making of leather. Most plants, including edible fruits and nuts, naturally contain tannins. For example, tannins are found in grapes, blueberries, chocolate, red wine, coffee and tea. They produce a bitter or astringent taste or reaction, particularly in unripe fruit. As the fruit ripens, its tannin content diminishes. With regard to the constituents of wood, tannins are considered to be an extractive since they can be removed from the wood with water or other solvents. Tannins are typically found in higher concentrations in bark and leaves compared to the wood. Tannins vary by plant part, species, growth conditions and other factors.

Is it safe?

Externally, unless it is in very high concentrations, it is considered to be harmless. A sample of liquid runoff from WoodCarpet has been tested. A copy of the test results are attached. The ph was found to be in the normal range of drinking water. Tannin is considered to be a mild irritant to the eyes and skin. If ingested, it may cause some gastrointestinal discomfort. Persons with pre-existing skin, eye, kidney, liver or respiratory problems may be more susceptible to the effects.

What can I do about it?

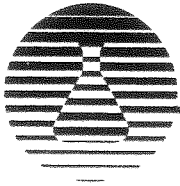
When installing a new playground surface, the most important thing to do is to install an adequate drainage system. As the rain water gradually washes the tannin out of the wood, it will carry it into the drainage system and into the soil in a similar fashion to that which happens on a forest floor. Over time, the tannin content will gradually diminish as rain water washes it out of the wood. Please see our job specifications for more information on drainage systems.

References

Haslam E. 1989. Plant Polyphenols – Vegetable Tannins Revisited. Cambridge University Press, Cambridge, UK.

Khanbabaee K. and van Ree T. 2001. Tannins: Classification and Definition. Natural Products Report.

Miller R. 1999. Wood Handbook – Wood as an Engineering Material. Forest Products Society



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ATTN: Mr. Ted Illjes
Zeager Bros. Inc.
4000 East Harrisburg Pike
Middletown PA 17057

May 29, 2002

MODIFIED
LAB ANALYSIS REPORT

| | | | |
|--------------|------------------------|---------------|---------------------|
| Job Name | : Zeager Brothers Inc. | Customer PO# | : |
| Job Number | : Z2122-TI-MC | Date Sampled | : 05/17/02 12:06 PM |
| Location | : Woodcarpet Runoff | Date Received | : 05/17/02 |
| Sample State | : Water Grab | Date Approved | : 05/29/02 |
| Collector | : TI | Discard Date | : 06/08/02 |

| TEST/PARAMETER | RESULT | UNITS | REPORTING LIMIT | METHOD |
|---------------------------|--------|----------|--------------------|--------|
| ----- | | | | |
| WATER QUALITY | | | | |
| Biochemical Oxygen Demand | 1110 | mg/l | 2 | 5210-B |
| pH | 5.72 | | | 150.1 |
| Specific Conductance | 610 | umhos/cm | 1 | 120.1 |
| Tannin | 520 | mg/l | 0.50 | SM5550 |

A matrix spike was analyzed on this sample as part of the tannin analysis. The spike recovery was below the established acceptance limits of 80-120 %. All other quality control parameters associated with the analysis, including a duplicate analyzed on this sample, were within acceptance limits. AGM 5/28/02

The reporting limit is defined as the lowest level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions. This report was modified on 6/3/02 to add this comment. VLF

This report relates only to the samples as received by the laboratory, and may only be reproduced in full. If you have any questions in reference to this analysis please contact your ALSI coordinator or the laboratory manager listed at the bottom of this report at 717-944-5541.

**** Continued ****



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QUALITY ASSURANCE REPORT

| Q/A PARAMETER | RESULT | | |
|----------------------|--------|------------|-----------|
| WATER QUALITY | | | |
| Specific Conductance | 612 | umhos/cm | Duplicate |
| Tannin | 522 | mg/l | Duplicate |
| Tannin | 52 | % Recovery | Spike |

| TEST/PARAMETER | PRESERVATIVE | TECH | ANALYSIS | |
|---------------------------|----------------------|------|----------|-------|
| | | | DATE | TIME |
| Biochemical Oxygen Demand | See Chain of Custody | RRH | 05/17/02 | 19:10 |
| pH | See Chain of Custody | LLB | 05/18/02 | 01:30 |
| Specific Conductance | See Chain of Custody | LLB | 05/18/02 | 08:30 |
| Tannin | See Chain of Custody | TMP | 05/24/02 | 15:35 |

Respectfully Submitted,

Raymond J. Martrano
Laboratory Manager