

# Non-Timber Forest Products and Implications for Forest Managers



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## Birch Bark Extractives

by Pavel Krasutsky, Natural Resources Research Institute,  
University of Minnesota-Duluth

I will tell you a story about a notoriously beautiful and a remarkably giving tree, the birch tree! You will not find a more famous tree species than the birch. Prehistoric and native people composed legends about this tree. Thousands of beautiful songs, poems and stories were devoted to the birch. My task today is to prove to you that the birch tree deserves this glory.

Native Siberians know that the healthiest kind of shoes are birch bark shoes, which were called LAPTI. LAPTI were recommended for people with ill legs, especially when people had some human fungus problems on the legs.

All these stories contain a lot of hints for scientists who are working with the chemistry of nature. I represent a group of chemists at the University of Minnesota-Duluth Natural Resources Research Institute. The main concept of our lab is to follow the axiom: "nothing in nature was done in vain."

First of all let us go to forest and look at the ground. You can easily find pieces of rotted birch wood, but the bark is untouched by rotting bacteria and fungi. Bark can stay without rotting for years under conditions of rain, freezing temperatures, and sunlight. What makes it resistant to bacteria, fungi, insects, animals, UV, et cetera? The only right answer is: its chemistry. Why not study this chemistry to discover what chemicals in the bark are responsible for all these properties.

Now let us look at this question from a technologic, economic, and environmental point of view. Birch is a very important commercial tree for the paper industry, however, the bark is currently a waste product. Nearly 50 tons of birch bark are burned daily in the average paper mill. I will try to show you that it is not worth it to do this. It is possible to make more useful things. The birch bark may be worth more than the birch wood.

Why is birch bark bright white? Because American paper birch contains nearly 15-17% of betulin. European birch, *Betula verucosa*, contains nearly 25% of betulin. It is a unique situation for nature to have 15-25% of a pure organic natural chemical in the bark. Betulin is an hydrophobic compound.



**Paper birch.**  
(photo by Don Breneman)

The whiteness and the water resistance of betulin protect birch wood from the harmful actions of water and light. Therefore, canoes made from birch bark were the most popular among native Americans. Our biologists at UMD have found that betulin and its derivatives have remarkable antiherpes properties that compare to acyclovir-the antiherpes main drug (\$2.5 billion market).

In birch bark we can also find betulinic acid. This molecule is a natural derivative of betulin. Betulinic acid was found to be very active against melanoma cancer, one of the most dangerous forms of skin cancer. Moreover, the Ron Poulence Company (a drug company in France) patented betulinic acid and its derivative against HIV disease. These events occurred in the last five years.

But this is just the beginning of the story. Birch bark contains different fatty acids bound with natural polymer suberin. In the physiology of the plant, these fatty acids play very important roles. Fatty acids were discovered in many barks and skins of seeds or fruits. If you cut a potato, apple, or some bark, the immune system of the plant switches on the protection signal. After this signal the protective mechanism of plant is working. Some fatty acids are playing the role of this trigger. The importance of these chemicals is hard to overestimate. They could give us new plant hormones and stimulants.

One ton of outer birch bark provides 800 kg of products. To burn birch bark as a waste material may lead people to regret, that for dozens of years, they burned the white gold of birch bark.



**Close-up of paper birch.**  
(photo by Don Breneman)

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