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Saw mill spruce bark – an experimental setup of a storage study

Experimental setups for saw mill spruce bark storage studies were built up 20.2.-21.2.2017. Researchers from Luke, SeAMK and SLU participated in the construction of the bark piles. This study focuses on changes in the chemical composition and physical properties of bark during storage of 24 weeks. The main goal is to provide information for the planning of feasible recovery processes.

VALUABLE EXTRACTIVES IN SPRUCE BARK

The forest industries use annually substantial amounts of wood resources in Finland and Sweden. As a result of this utilization the accumulation of harvesting and manufacturing by-products such as stumps, branches, and bark is significant.

Bark is currently used mainly for producing heat and power. However, it is probable that a considerable amount of it could also be used for manufacturing various value-added products.

Wood bark is a rich source of extractives. For example spruce bark contains about 39 % of extractives in inner bark and 25-34 % of extractives in outer bark, compared to the 1.0-2.5 % of extractives in spruce stem wood [1, 2]. For this reason, it can be considered a potential raw material for refining industry.

However, many initial extracts suitable for potential applications are either rather volatile or chemically unstable. The content of extractives starts to decrease immediately after tree felling and this degradation continues during storage [3, 4]. This also means that the chemical composition of the extractives-based fraction changes gradually.

STORING CHANGES CHEMICAL COMPOSITION

This study focuses on changes in the chemical composition of industrial spruce bark during storage of 24 weeks. In an attempt to decrease the rate of the temperature rise in pile, one of the storage piles was covered with snow.

It is known that the evaporation and decomposition of extractives proceeds faster at higher temperatures [4]. The snow-cover might have also other beneficial effects on raw material preservation when considering the factors accelerating the decomposition reactions in pile (UV-radiation, presence of oxygen, etc.).

Thus, also the measurement of temperatures in pile and monitoring of environmental factors, such as, outside temperature, UV-radiation, rain and wind are made in order to explain partially the rate of the changes in chemical composition and physical properties of bark.

24-WEEK STORAGE STUDY

The bark material consists of spruce (*Picea abies*) bark originating from saw mill. Two 450 m³ storage piles were built. The non-covered pile consisted of bark that was debarked no more than 48 h before the construction of the pile at 20.2.2017. The pile was divided into three sectors in which the thermocouples where placed for the measurement of temperature profile in the pile. The dimensions of the pile and thermocouple locations are shown in Figs. 1 and 2.

The material used in snow-covered pile was debarked no more than 24 h before construction of pile 21.2.2017. The dimensions of pile and thermocouple locations are shown in Fig. 3. At first, the pile was shaped and after that snow was laid on top of the pile (see Fig. 3). The snow layer was finally covered with spruce bark in order to preserve the snow for a longer period of time.

The sampling frequency is (in addition to a sample when establishing the experiment) after 4, 12, and 24 weeks (Table 1). Samples from three different locations are taken at every sampling time (Figs. 1-3).

The sampling locations were chosen based on earlier storage studies in order to represent areas in piles where the temperatures and moisture contents are expected to have great variations [5]. The samples will be analyzed with respect to their extractives and carbohydrate contents. Also, the changes in physical properties and flow properties are analyzed.

Table 1. Sampling from storage piles.

Sample	Sampling date
0-sample from fresh spruce bark	20.2.2017 [1)] 21.2.2017 [2)]
after 4 weeks of storage	20.3.2017 [3)]
after 12 weeks of storage	15.5.2017 [3)]
after 24 weeks of storage	7.8.2017

1) 0 sample from non-covered pile
2) 0 sample from snow-covered pile
3) Samples taken only from non-covered pile

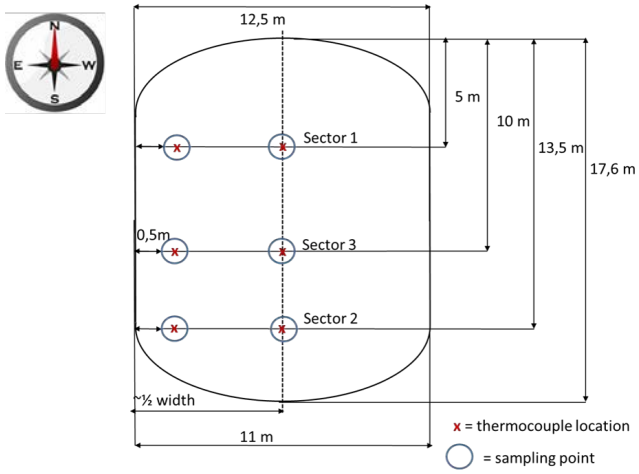

Figure 1. Dimensions of the non-covered spruce saw mill bark storage pile as seen from above.

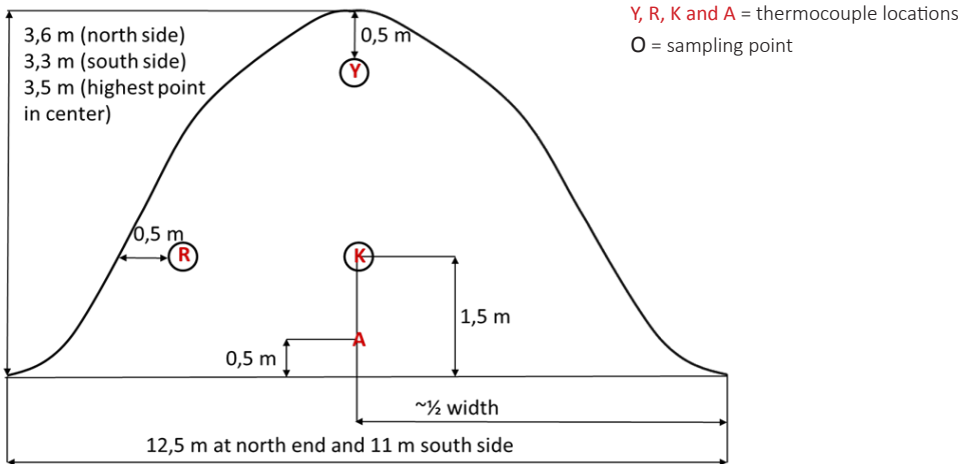

Figure 2. Dimensions of the non-covered spruce saw mill bark storage pile as seen from the end of the pile.

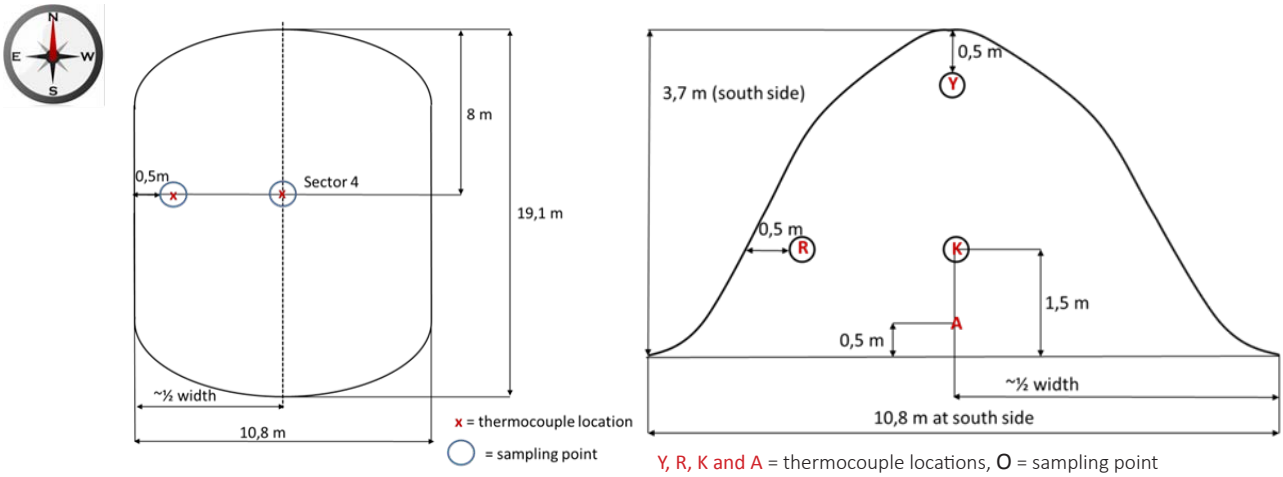

Figure 3. Dimensions of the snow-covered spruce saw mill bark pile as seen from the above and end of the pile.

Figure 4. Construction of snow-covered pile, where a) and b) covering the pile with the layer of snow, and c) and d) covering the snow-layer with spruce bark which is hoped to insulate the layer of snow and prevent it from melting.

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