

Investigation into Hemp Hurd-Salt Mixtures for Road De-Icing

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APSC 171

December 2nd, 2022

Introduction

Road salt is commonly used during the winter, preventing both pedestrians and vehicles to safely move over frozen roads. It is estimated that, of the 54,000,000 metric tons of salt that was consumed in 2021, 42% of it was used for road deicing (U.S. Geological Survey [USGS], 2018). Such major use of salt has had a significant impact on local ecosystems by increasing the salinity of waterstreams, threatening the state of the surrounding environment (Kelly et al., 2020). Notably, excess salt can enter lakes and rivers, significantly reducing their biodiversity (Haake et al., 2022). Additionally, salt can also enter fresh drinking water, increasing the salt content such that it meets up to 33% of an adults recommended daily intake (Cruz et al., 2022). Road salt also leads to damages on infrastructure, costing an estimated \$5 billion in repairs (U.S. Environmental Protection Agency [EPA], 2020).

The affects of road deicing have been known for some time now, and many municipalities have investigated reducing the usage of salt. A common tactic is to pre-wet road salt such that vehicle tires do not throw salt off roads (Zhang et al., 2020; Usman et al., 2017). Other techniques include using a salt-sand mixture to increase road abrasion, creating biodegradable mixtures, and making porous pavement parking lots (EPA, 2020). More recently have biodegradable mixtures been explored as suitable alternatives to salt for road deicing. One such mixture suggests combining salt with hemp hurd, proposed originally by high school students in Manitoba (Kavanagh, 2021). This mixture is significant compared to other alternatives because it utilizes and promotes the locally growing hemp industry within the province. Considering the growing hemp industry in Canada, the use of hemp hurd can be seen as an effort to increase the utility output of hemp plants.

Therefore, this study aims to identify the ideal mixture of hemp hurd and salt that works as an affective alternative to traditional road salt. According to an article written by the CBC, the students found that “a third of the salt mixed with hemp hurd successfully melted ice nearly as much as salt on its own” (Kavanagh, 2021). Our investigation will be a repeat of the study done by Bain, Gamayo, and Morant of sorts, where we will focus on testing for the ideal ratio of salt-hemp based on its effectiveness in de-icing.

Method

Our experiment for determining the ideal mixture involves 5 sample mixtures and one control mixture (which will just be salt). The sample mixtures will have the following volumetric ratio of hemp to salt: 1:1, 2:1, 3:1, 4:1, and 5:1. The sample mixtures will contain a third of the salt of the control mixture.

Due to constraints in equipment, the effectiveness of each mixture will be measured by the thickness of ice that it melts. The ice will be grown in small food storage containers in overnight winter conditions. Once the water inside the containers is fully frozen, each mixture will be applied to the exposed ice surface. After 90 minutes, amount of ice melted will be observed.

With consideration for the size of the containers, control sample will have 30 mL of salt. Thus, each experimental sample will have 10 mL of salt and their respective amount of hemp hurd.

Results

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