Rachel R. West, Mason T. MacDonald, and Rajasekaran R. Lada

# Modified Water Filtration Systems and Their Effects on Needle Retention in Balsam fir

## Objective

To evaluate the effect of water filtration on postharvest needle retention in balsam fir trees. Three different filtration systems were evaluated, referred to as A, B, and C.

## Introduction

There are many different signals involved in balsams fir postharvest needle abscission, such as ethylene, ABA, terpenes, catalytic enzymes, and lipids. Several of these changes can be linked to water deficit. There could be many reasons for the decrease in water uptake and apparent dehydration of balsam fir branches. One of these reasons was that the water becomes a breeding ground for bacteria forming biofilms, blocking water supply. In an experiment where the Christmas tree stand water was completely replaced each day, thereby preventing any bacterial build up, needle abscission commencement was delayed by 29% and the time to complete abscission increased by 33%. There appears to be some benefit in providing a continual supply of fresh water to postharvest balsam fir trees.

## Methods

This experiment was designed as a completely randomized design with two factors. The first factor was filtrations, where branches were placed in either standing water (control) or one of three filtration systems. The second factor was genotype (low versus high needle retaining genotype). This experiment was replicated 4 times, which required 32 branches. Branches were monitored daily per week for needle loss. The day needle abscission commenced (NAC) and completed (NRD) were also recorded. Data were submitted to an analysis of variance to determine significant differences in needle loss.

## Results

Abscission began after approximately 12 days in low NAR genotypes, but treatment effect did not become apparent until day 19. On day 19, the control (water only) had lost 35%, system A lost 32%, and system C had lost 37%. Conversely, system B lost only 13% of its needles (Fig. 1A). Abscission also began after 12 days in high NAR genotypes, but the entire progression of abscission was slower (Fig. 1B). There was no difference in abscission between treatments for the first 30 days, but afterwards abscission was significantly lower in system C.

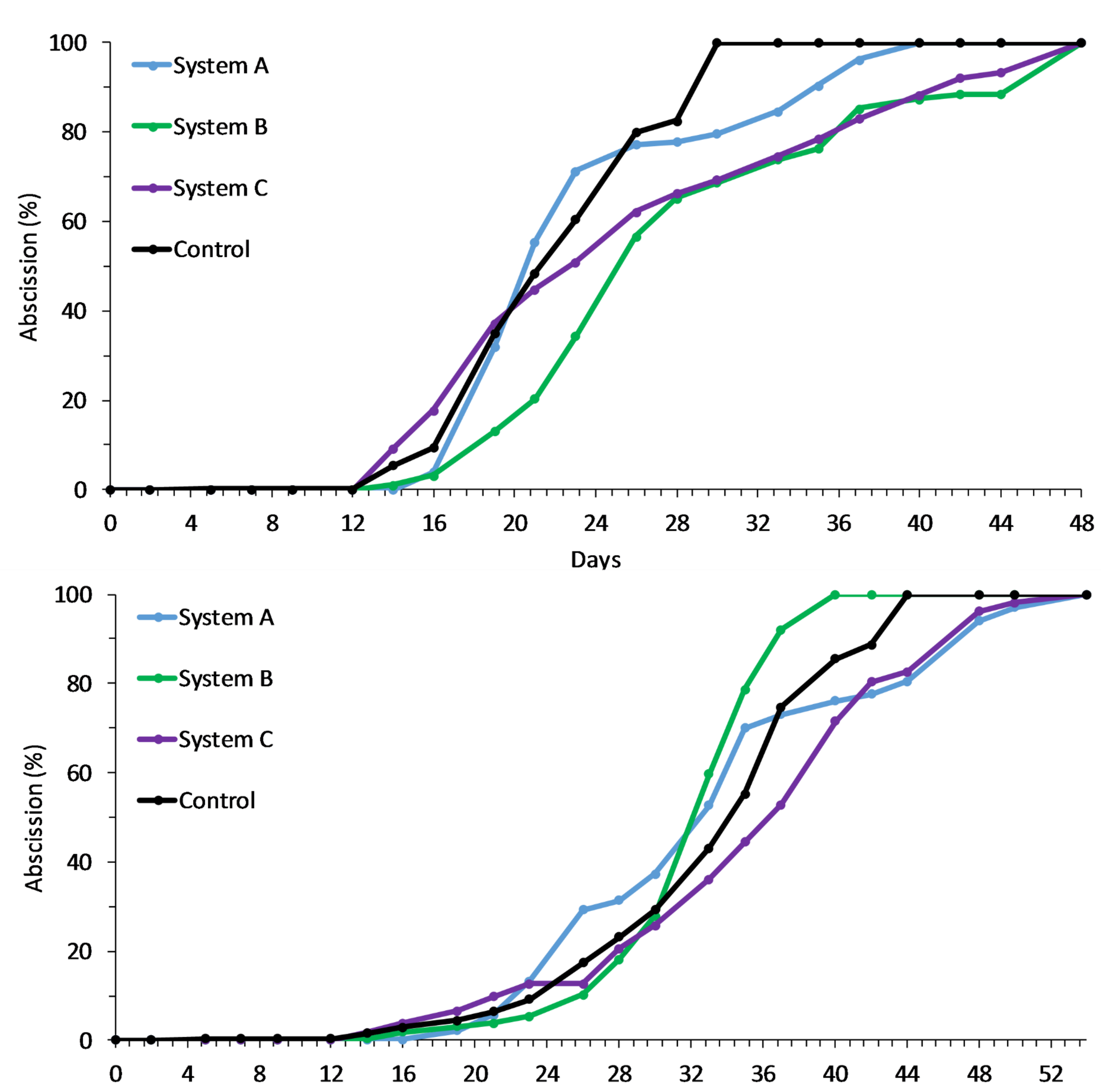


Figure 1: Progression of needle loss of A) low NAR and b) high NAR balsam fir placed in different water filtration systems.

## Results

There was no significant difference in NAC due to genotype (Fig. 2A). The only significant improvement when compared to a control was found in high NAR genotypes in system A, where the pump treatment took 62% longer for abscission to begin. System B and system C took significantly longer than the control to complete abscission in low NAR genotypes (Fig. 2B). Branches in system B took 30% longer to complete abscission and branches in system C took 39% longer to complete abscission in the low NAR clones. Only system C took longer to complete abscission in high NAR genotypes.

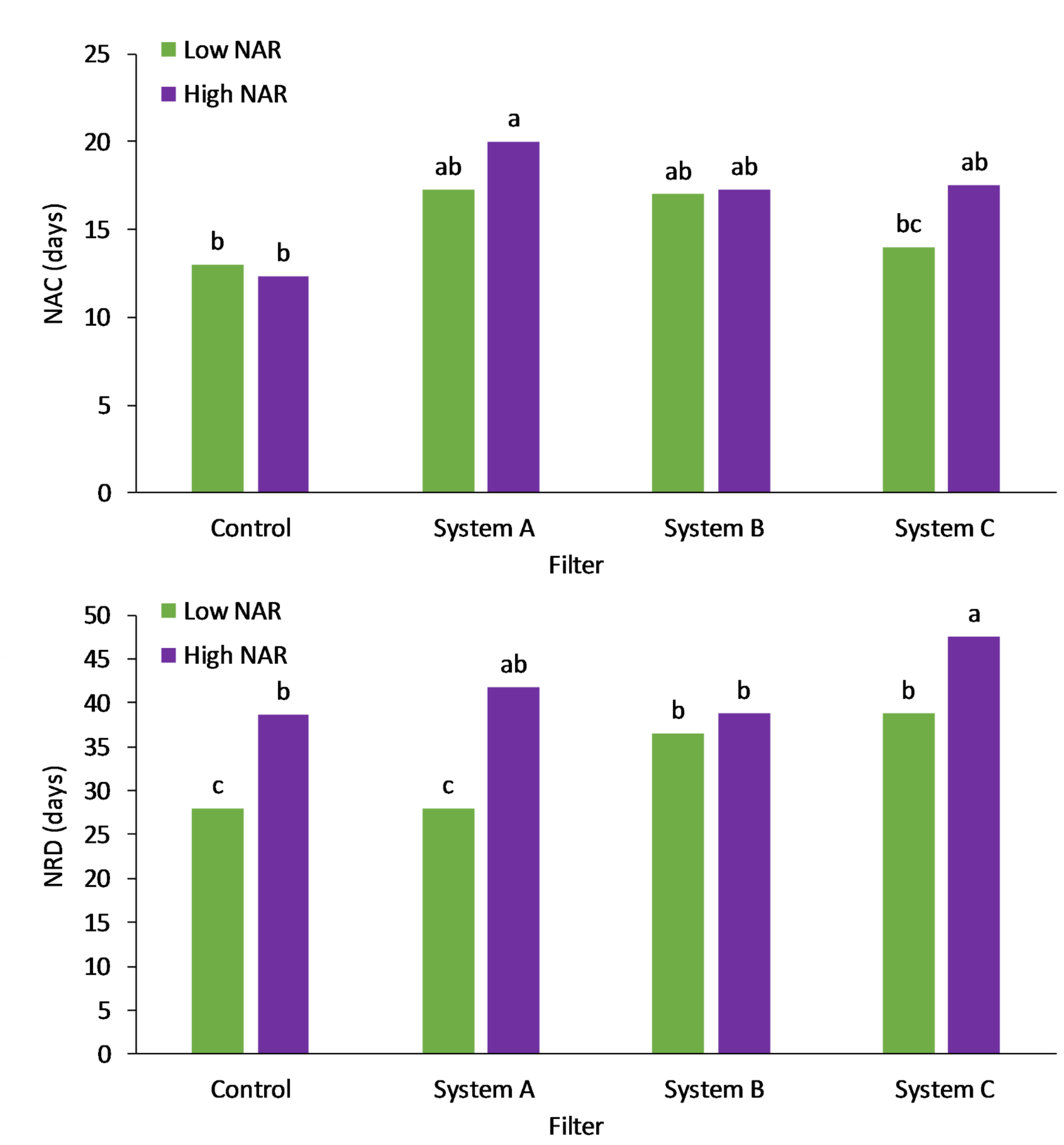


Figure 2: A) Needle abscission commencement and B) needle retention duration of balsam fir placed in different water filtration systems.

## Conclusions

Systems B and C delayed abscission in low NAR genotypes. Only system C delayed abscission in high NAR genotypes. Water filtration in general proved useful to increase postharvest needle retention in balsam fir.

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