

## MONOTERPENES IN SCOTS PINE IN RELATION TO BROWSING PREFERENCE BY MOOSE (*Alces alces* L.)

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SELOSTE:

MÄNNYN MONOTERPEENIKOOSTUMUKSEN VAIKUTUKSESTA HIRVEN RAVINNON VALINTAAN

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Monoterpene hydrocarbon contents of needles in Scots pine plants both damaged and untouched by the moose (*Alces alces* L.) were compared in the study. Only minor differences were found between the plant groups. Thus terpenes in pine presumably play no important role in the browsing preference by moose.

### INTRODUCTION

When feeding on a young pine stand, the moose (*Alces alces* L.) has been found to do some selection between the trees. The damage degree of plants differs greatly and even on a badly destroyed plantation completely untouched plants are usually found. The basic reasons for this selection are, however, inadequately understood.

The aim of this preliminary study is to elucidate the role of monoterpene hydrocarbons in Scots pine (*Pinus sylvestris* L.) as a part of screening tests, which are designed to reveal the effect of the chemical composition of trees in relation to browsing preference by the moose.

### MATERIAL AND METHODS

An 8-year-old pine plantation in Jämsänkoski, Central Finland was selected for the study. The seed for the plantation originated in Taipalsaari (N:61°20', E: 28°00') (cf. JUVONEN and HILTUNEN 1972). In the plantation, 17 plant pairs were selected so that the pair consisted of a damaged plant next to an untouched one, both of which morphologically resembled each other. The

damage took place during the previous winter only.

Needle samples for the terpene analyses were taken from the topmost shoot whorl of the plants in the middle of April, 1976, still during the dormant season. The chemical analyses were performed as described in our earlier publication (HILTUNEN and LÖYTTYNIEMI 1978).

## RESULTS AND DISCUSSION

The role of terpenes for the plant is not completely known but it has been suggested that they are involved e.g. in plant-animal relationships (BANTHORPE et al. 1972).

The terpenes may influence the olfaction and thus initial selection of the deer (RADWAN and ELLIS 1975). Terpenes may also play a role in the palatability affecting the feeding preference (LONGHURST et al. 1968). Essential oils also affect the microbial activity of deer rumen (OH et al. 1967, RADWAN 1971). No direct information is, however, available of the effect of terpenes on the moose.

In this study the contents of 17 major compounds in the monoterpene hydrocarbon fraction of pine needle oil were determined. The only difference found between the tree groups were in the contents of  $\beta$ -pinene. The  $\beta$ -pinene content in the damaged trees was approximately 3,1 % and in the untouched trees 5,7 % of the total monoterpenes ( $t = 2,638^*$ ). However, the trees of both rich and low  $\beta$ -pinene content belonged to both tree groups and the same phenomenon existed also as far as the other main monoterpene compounds were concerned.

In this case only needles of pine were

analyzed. However, the moose feeds on the whole shoot and also small branches. One of the main differences in the composition between needle and shoot axis oils in Scots pine has been found to be the higher  $\beta$ -pinene content in the shoot axis (HILTUNEN et al. 1975). Thus the role of  $\beta$ -pinene might have been even more distinct if the whole part of the tree used by moose had been analyzed. However, the relative proportion of  $\beta$ -pinene has been found to be noticeably higher in young pines, which alone are prone to moose damage, than in the old ones (HILTUNEN 1976).

The proportion of low-carene chemotype trees in the study material was 3/17 of the damaged trees and 6/17 of the untouched trees (cf. JUVONEN and HILTUNEN 1972), thus showing no clear difference.

Although some differences were found in the monoterpene content of damaged and untouched young pines, the role of terpene composition in the feeding preference by the moose may be of minor importance, at least when only one site is concerned. Neither was any clear basis found in this study to prove the usefulness of the terpene composition of pine as a genetic marker in the indirect selection of moose resistant pines.

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## SELOSTE:

### MÄNNYN MONOTERPEENIKOOSTUMUKSEN VAIKUTUKSESTA HIRVEN RAVINNON VALINTAAN

Tutkimuksessa on verrattu hirven vioittamien ja koskemattomien männyn taimien neulasien monoterpeenihiilivetykoostumusta. Taimiryhmien monoterpeenikoostumus erosi toisistaan vain vähäisessä määrin, joten terpeeneillä ei olisi tämän alustavan selvityksen perusteella merkittävää vaikutusta hirven tekemään valintaan taimien välillä.