Biomass estimates of boreal dwarf shrubs in relation to their percentage cover and the number of samples

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Introduction

Ericaceous dwarf shrubs form a significant part of the understorey vegetation of boreal forests (Reinikainen et al. 2000). Clonal growth is widespread in this group of plants; e.g. *Vaccinium vitis-idaea* and *V. myrtillus* allocate more biomass to the below- than to the aboveground parts (Kivenheimo 1947). Rhizomes and roots of dwarf shrubs may account for a considerable portion of the carbon stores in the organic layer, especially in northern forest ecosystems. The annual litter production of dwarf shrubs affect the formation of the organic layer and carbon and nutrient cycling in boreal forests.

In this poster we present preliminary results on

1) the distribution of the biomass of two *Vaccinium* species into above- and belowground compartments,
2) the relationship between the visually assessed aboveground cover (%) and the above- and belowground biomass of dwarf shrubs, and
3) coefficients of variation (CV%) for estimates of the average biomass of dwarf shrubs as a function of the number of samples

Material and methods

The data were collected from six Scots pine and six Norway spruce plots in Finland (see details in the poster "Above- and belowground biomass of boreal understorey vegetation"). The sample points consist of 30 cm x 30 cm squares, seven squares on each side of the plot, giving a total of 28 sample points per plot. The sample squares were photographed and the cover % of the individual plant species was estimated visually before removing the sample square. The biomass fractions of different plant species were dried at 70^{o}C/2d and weighed.
Linear regression models (without intercept values) were used for predicting the biomass on the basis of the cover %. The bootstrap method (Resampling stats software) was applied in relating the CV% values to the number of samples.

Results

Vaccinium vitis-idaea and *V. myrtillus* allocated 60 - 80 % of their biomass to the belowground parts depending on the site type and latitude.

The aboveground biomass of the dwarf shrubs was predicted relatively well on the basis of the cover values (R^2 of the models ranged from 0.53 to 0.74). On the other hand, there was more variation in the belowground biomass in relation to cover values, and the linear regression models had lower R^2 values (0.02 - 0.48).

The slopes (b coefficients) of the regression models predicting above- or belowground biomass were higher in the data of the northern than of the southern plots.

The relationship between the cover and the aboveground biomass was relatively similar in the pine and spruce stands in the north, whereas the slope of the model for pine stands was steeper than that for spruce stands in the south.

The coefficient of variation (CV%) of the estimate of the average aboveground biomass decreased the steepest when the sample number increased from 1 to 5. The CV % did not change significantly when the sample number was over 10. Similarly, the CV% of the average belowground biomass levelled off when the sample number increased from 5 to 10.

Conclusion

The relationship between the cover and biomass values of dwarf shrubs varied between north and south Finland. Thus, when the cover data of understorey vegetation is used in predicting above- and belowground biomass/carbon content, the development of separate models for southern and northern areas would increase the accuracy of the estimates.

References

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