

Optimal container- and growing- system identified for spruce used in afforestation of alpinian shelterwoods

For the first time the grade of resistance the roots of container plants realise could be measured using the „Hangwurzelszugversuch“ developed by Krause – a thesis at the “Fachhochschule Weihenstephan” shows that “Lieto”-containerplants have a higher energy in resisting the pressure of snow

Recent examinations of containerplants used for salvation of alpinian shelterwoods showed deformations of the rooting system. A evaluation of the effects of these deformation on the quality of the rooting system was yet impossible since these examinations only showed that most containerplants have deformed roots. Especially plants of the species spruce are endangered to be pulled out by the pressure of sliding snow in the first years after planting if there rooting system could not provide enough stability for the plants. To minimize the risks of loosing the greater part of the plants it is absolutely necessary to use optimal plants.

Method of examination

The optimal container- and raising system could be identified in a thesis at the “Fachhochschule Weihenstephan” using the “Hangwurzelszugversuch” developed by S. Krause for the species spruce (figure 1). In the testing array the plants are pulled out hilldownwards by using a winch. Changes in distance and power are measured by sensors and so called distance – power graphs (figure 2) can be calculated. Energy and maximum power can be calculated and show the grade of resistance of the plant when pressure of sliding snow occurs.

This method is superior to the measurement of the rooting system since it pro-

vides data for statistical examination and allows more objective descriptions and comparisms between

(“Lieto”, “Sterntainer” and “Vitainer”) and one variations without container. The number of plants in each



Abbildung 1: Versuchsaufbau Wurzelszugversuch

the different container- and growing systems. Another advantage of this method is that it takes only between 4 to 13 minutes per plant. The time per plant is significant less compared to the method of measuring the rooting system.

Sampling areas

Two areas were planted in cooperation of the “Landesanstalt für forstliches Saat- und Pflanzgut in Teisendorf” and the “Funktionsstelle Schutzwaldsanierung Oberbayern Ost in Aschau i. Ch”. waren In 1992 these areas were planted with two year old plants of spruce in four different variations: three different container plants

unit was 25 (three units per variation and area were planted). Both testing areas were located in typical regions which needed planting for shelterwood- salvation (area 1 was located in 1300 m NN, area 2 was located in 1080 m NN, southern exposition, angle 30 – 40 °, shallow soil of the type renzina). To protect the plants from browsing it was necessary to build a fence that could withstand the movement of the snow.

Types of containers

The "Lieco"- container and the "Sterntainer" are solid plastic containers. The "Vitainer" is made of natural fibres. To prevent deformations of the rooting system the "Lieco"- container is equipped with four vertical guiding bars. The "Sterntainer" is shaped like a star to prevent these deformations. The seed was collected at a single area. Differences in growing caused by different genetics could be minimized.

The plants of the variation "Lieco" were raised in optimized soil while the other variations were raised at the LSP in the usually used soil "Lauffen Standard".

When the plants were delivered for planting in 1992 the "Lieco" plants already showed a significant greater average height (380 mm) compared to the other variations (210 – 240 mm).

Main aspects of the examination

In this thesis a sampling test of the ten year old plants was taken. In addition the diameter of the shaft at the lowest point, the total height, the growing height of the last three years and the thickness of the soil was measured for each plant. These data were used to compare the different variations. Correlations between the different data showed statistically proven relations. The quotient of diameter multiplied with height to energy ("DL/E") shows the relative risk for a plant to be pulled out. This risk is the higher the greater the value of this quotient is. In other words the smaller the value of this "DL/E"- quotient is the higher the strength of the

rooting system is in comparison to the stem.

Results

The advantage of high growth of the variation "Lieco" continued till 2000 when the plants were pulled out. The average height of these plants of 576 mm in area 1 and 927 mm in area 2 is 17 – 24 % (area 1) and 33 – 47 % higher than the average height of the other variations. Only in area 2 the variation without container showed greater variations in each unit.

The variation "Lieco" showed the greatest average diameters (measured at the lowest point of the stem), too, although the differences in comparison to the other variations were not

tion "Lieco". The comparison of the graphs calculated for power and distance during pulling out the plants of area 2 show the significant better staying of the plants of the variation "Lieco" (graphs of one unit in area 2 shown in figure 2).

In area 1 the value of the average "DL/E"-quotient is significant smaller for the variation "Lieco" in comparison to the other variations while in area 2 this value was almost identically in all variations.

Another interesting result of this examination is that the thickness of the soil does not affect the strength of the rooting system or the growing of the plants.

Recommendations for the

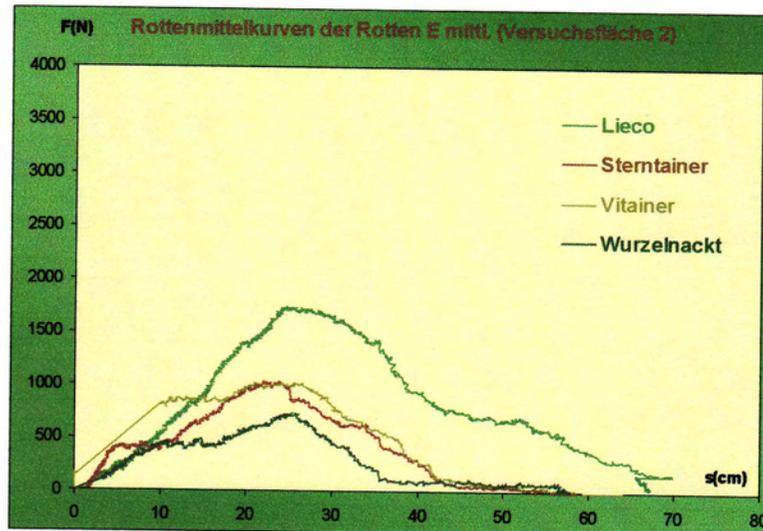


Abbildung 2: Deutliche Unterschiede in den Ausrißkurven

as significant as in height.

Only one unit of plants without container in area 2 had a greater average energy value than the plants of the variation "Lieco" that showed an average energy of 248 N*m (area 1) and 518 N*m (area 2). The average energy of the other variations reached only about 50 % of the values of the varia-

salvation of shelterwoods

At the moment the variation "Lieco" provides optimal plants since the values of all categories are better than the ones of the other variations. The use of optimized soil and raising system, fungizid treatments and fertilizing are possible explanations for the better growing and rooting of these

plants. The plants of the variations "Sterntainer" and "Vitainer" are suboptimal, while the variation without container seems to be strongly affected by differences in the location of each plant.

Since the spruce plants of the variation "Lieco" are superior to the other variations, the raising systems for containerplants in general should make use of the methods of "Lieco Forstpflanzen GmbH, Kalwang, Österreich".

The statements made in this article have to be restricted on the areas examined and should not be overtaken to all other areas of salvation of alpinian shelterwoods.

The thesis can be ordered in 8 cd's for a fee of € 50,00 by e-mail at *kleinschermer@aol.com*.

Jörg Schermer