26/10/2010 LSFRI “Silava”

International scientific conference on adaptation of trees to forest disturbances

The conference was jointly organized by Latvian State Forest Research Institute “Silava”, [Ministry of Agriculture of the Republics of Latvia] and Insitute of Forestry and Rural Engineering of Estonia University of Life Sciences.

Event included IX international workshop of SNS network Natural Disturbance Dynamics Analysis for Forest Ecosystem Management and European INTERREG IVC project FUTUREforest workshop. Presentations considering predicted changes in different climatic parameters and its impact to natural processes in forest and forest management as well as possible options for adaptation were provided. Scientists from 11 countries (Latvia, Estonia, Lithuania, Sweden, Finland, Norway, USA, Poland, Slovakia, Germany, Spain) provided latest findings in their research fields including climate predictions and possibilities for adaptation via means of forest tree breeding, evaluations of possible climate impacts on landscape scale via ecosystem approach and recommendations for changes in forest management, patterns of storm and fire damages and estimations of survival probabilities of tress, suggestions for management to minimize risks.

The staff of the Latvian State Forest Research Institute “Silava” and of the project “Importance of Genetic Factors on Formation of Forest Stands with High Adaptability and Qualitative Wood Properties” the executive scientific conference attended not only as speakers on the above results of the project, but also take part its organization.

The program of conference in attachment.

Posters (in attachment):

- Provenance differencies in above-ground biomass of Pinus contorta Dougl. var latifolia Engelm. And Pinus sylvestris L.
- Factors influencing development of lamas growth of coniferous trees at the age of 4–6 years
- Differences in shoot elongation pattern and height increment of hybrid aspen (Populus tremuloides Michx. × Populus tremula L.) clones

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International Scientific Conference

Adaptation of Trees and Stands to Forest Disturbances: Management Considerations

Jointly organized by Latvia State Forest Research Institute "SILAVA", Ministry of Agriculture of the Republics of Latvia and Institute of Forestry and Rural Engineering of Estonia University of Life Sciences

And including IX international workshop of SNS network Natural Disturbance Dynamics Analysis for Forest Ecosystem Management and European INTERREG IVC project FUTUREforest workshop

October 18 – 21, 2010

October 18 MONDAY	Arrival and registration in the "Islande Hotel", Riga *(web: www.islandehotel.lv)*
21:00	Welcome dinner
October 19 TUESDAY	Breakfast at "Islande Hotel" Plenary sessions and poster session in the "Islande Hotel"
8:40	The conference opening: **Arvīds Ozols**, director of Forest departments of Ministry of Agriculture of the Republics of Latvia (7 min); **Jurģis Jansons**, director of Silava (5 min); **Ahto Kangur**, coordinator of SNS meeting (8 min)
9:00	Climate change predictions in the territory of Latvian – downscaling the regional climate models: **Uldis Bethers**, (Latvia University)
9:30	Indicators for possible adverse effects of climate changes and options for forest adaptation: **Aris Jansons**, Janis Donis, Agnis Šmits, Tālis Gaitnieks LSFRI Silava
10:30	Coffee break
10:50-13:00	Session 1, moderator: Marek Metslaid
10:50-11:15	Hurricanes and Fire: Interacting disturbances in coastal forests of the southeastern United States. **J. Stanturf**, S. Goodrick, Center for Forest Disturbance Science
11:20-11:35	Survival of Scots pine after wildfires depending on damage degree. **J. Donis**, G. Snepsts, L. Zdors, M. Bicevskis, LSFRI Silava
11:40-11:55	Chemical And Biological Renaturalization of afforested and abandoned arable *Arenosols*. **K. Armolaitis**, J. Aleinikovienė, V. Žėkaitė, Institute of Forestry, Lithuanian Research Center for Agriculture and Forestry
12:00-12:15	Influence of shelter wood cuttings in pine stands on undergrowth and ground vegetation development. **V. Marozas,** Lithuanian University of Agriculture
12:20-12:35	Effects of windthrow disturbance on forest - a northern perspective **H. Kauhanen,** Finnish Forest Research Institute
12:40-12:55	Studying the effect of abiotic and biotic forest disturbing factors that are expected to change with changing environment. **O. Belova**, Institute of Forestry, Lithuanian Research Center for Agriculture and Forestry
13:00	Lunch

14:00-16:00	Session 2, moderator: Aris Jansons
14:00-14:15	Responding to an uncertain future by forest tree breeding **M. Haapanen**, METLA
14:20-14:35	Adapting Swedish tree breeding and deployment strategies to climatic change. **B. Andersson**, Skogforsk
14:40-14:55	Effect of increased temperatures and carbon dioxide on the annual rhythm of young Scots pines **P. Pulkkinen**, METLA
15:00-15:15	Environmental and genetic effects on lammas growth of Norway spruce. H. Kvaalen, G. Søgaard, **A. Steffenrem**, Norwegian Forest and Landscape Institute
15:20-15:35	Climate effects on the phenology of natural Norway spruce provenances. **A. Steffenrem**, Norwegian Forest and Landscape Institute
15:40-15:55	Growth and growth rhythm in pine and spruce. **J. Westin**, Skogforsk
16:00	Coffee break
16:30-17:45	Session 3, moderator: Ilze Silamikele
16:30	Adaptation of forests to climate change: EU level policy & information project: introduction – INTERREG project FUTUREforest. **G. Wagener-Lohse**
16:55	Stand attributes and location define wind and snow damage in conifer mountain forests in the Eastern Pyrenees **S. Martín-Alcón,** J.R. González-Olabarría, L. Coll, Forest Technology Center of Catalonia
17:20	Solving of actual and expected effects of abiotic and biotic forest disturbances in Slovak Republic. **V. Caboun**, National Forest Centre-Forest research institute.
17:45-18:00	Session closing
18:00	Departure to Research forests, Jaunkalsnava (coffee)
20:30	Check - in and dinner at the hotel "Smeceres krogs" (*web: www.smecere.lv*)
October 20 WEDNES-DAY	Breakfast at the hotel "Smeceres krogs" Presentations indoors and outdoors
8:45-10:30	Session 4, moderator Ahto Kangur Morning session of presentation in "Smeceres krogs" (www.smecere.lv): 5 presentations from Natural Disturbance Dynamics network and probably 1-2 related to tree adaptation
8:45-9:00	Mitigation of disturbance impacts: selection of forest reproductive material on the basis of disturbance dynamics and genetic properties. **T. Maaten,** Estonian University of Life Sciences
9:05-9:20	Fire risk classification of Finnish forests. **H. Lindberg**, T. Heikkilä, I. Vanha-Majamaa, HAMK University of Applied Sciences
9:25-9:40	Response of bryophyte communities following logging, wildfire and spruce budworm outbreak in the Acadian forest region, eastern Canada. **M. Schmalholz,** Stockholm University
9:45-10:00	Vegetation recovery after fire disturbance, **K. Teppo,** Estonian University of Life Sciences
10:05-10:20	Carbon dynamics of aboveground live vegetation of boreal mixedwoods after wildfire and clearcutting. **M. Seedre,** H. Y.H. Chen, Estonian University of Life Sciences
10:30-11.00	Coffee break, check out, departure

11:30	Genetic differences in root rot resistance in context of adaptation – open pollinated progeny trial of Scots pine (**A. Jansons**, T. Gaitnieks)
12:30	Lunch in the forest
13:30	Non-clearcut management of Scots pine (**J. Donis**)
13:55	Departure to forest district of Jaunjelgava
15:00	Influence of regeneration material and method to Scots pine stand development and carbon sequestration (**A. Jansons**, I. Baumanis, A. Lazdins, J. Donis) Coffee in the forest
16:00	Post-fire management considerations (**J. Donis**)
~ 17:00	Departure to Riga
18:00	Check - in the hotel "Islande Hotel"
19:00	Official dinner, closure of the conference

October 21 THURS-DAY	Breakfast at "Islande Hotel" Departures

INTERREG IVC
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LATVIJAS VALSTS MEŽI

Provenance differences in above-ground biomass of *Pinus contorta* Dougl. var *latifolia* Engelm. and *Pinus sylvestris* L.

Āris Aris Jansons[1,2], Linards Sisenis[1], Janis Jansons[2]
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Introduction

Increasing demand for wood as a renewable resource in past decade in Latvia and Globally ensures a importance to study different options to increase wood production. One of them being – to establish plantation of high-yielding species and provenances.
Mostly recommended options for establishment of biomass plantations – hybrid aspen and other *Populus* or *Salix* clones – are not suitable for all soils and conditions, therefore also other options needs to be considered.
Recent analysis of *Pinus contorta* provenance trials in Latvia suggests, that this species have lower branch quality than *Pinus sylvestris*, but presumably higher biomass. Aim of this study was to calculate above-ground biomass of *Pinus contorata* based on empirical data and estimate its potential in comparison to *Pinus sylvestris*.

Test site

Study is based on results from experiment, established in central part of Latvia, that consists of 15 open-pollinated families of *Pinus contorta* from 3 provenances and one open-pollinated *Pinus sylvestris* control lot. Trees are located in *Vacciniosa* forest type in 4 replication, using 60 tree block plots. Initial spacing 1x2m, no thinning carried our prior to measurements at the age of 26 years. Trial is affected by root rot and animal damages.
Aboveground biomass (stem, green branches, dead branches) was measured during January and February, 2010 (fig.1), for 323 trees that does not have notable damages, double leader or large spike knots.

Results and conclusions

Analysis indicate, that on average 73% of total tree naturally moist above-ground biomass is in stem, 7% - in dead branches and 20% - in green branches and needles. This relationship was is similar for both species even if earlier study found notably higher number of branches per meter for *Pinus contorta*.
Correlation analysis reveal, that stem biomass is related almost equally with tree height and diameter (r=0.80 and r=0.88 respectively), but branch biomass (especially for dead branches) is tightly related just with tree diameter (r=0.76) and less with tree height (r=0.53).
Relationship among tree diameter and components of above ground biomass (fig.2) was used to calculate the total naturally moist above-ground biomass per ha in real conditions and potential (fig.3), assuming no root-rot influence (average survival 68%).
Results reveal up to two-fold differences in total above-ground biomass among *Pinus contorta* families indicating the importance of selection of appropriate plant material for establishment of biomass plantation. Based on sample analysis it was estimated, that average relative moisture of the material is 57%. Considering that, biomass production capacity of *Pinus contorta* on average is $3.5 t_{dry}$ $ha^{-1}y^{-1}$. That is notably lower than the figures mentioned for hybrid aspen or Salix clones, but almost 2.5 times higher than for *Pinus sylvestris*.
Even higher biomass could be obtained, if the plantations would not be affected by root rot (potentially on average $4.0 t_{dry}$ $ha^{-1}y^{-1}$) .
Further studies, considering the differences in moisture content in different height of stem and branches as well as fact, that high proportion of trees (on average 55%) have double leaders or large spike knots, would improve the accuracy of presented estimates.

Figure 1. Weighting of stem biomass in *Pinus contorta* experiment

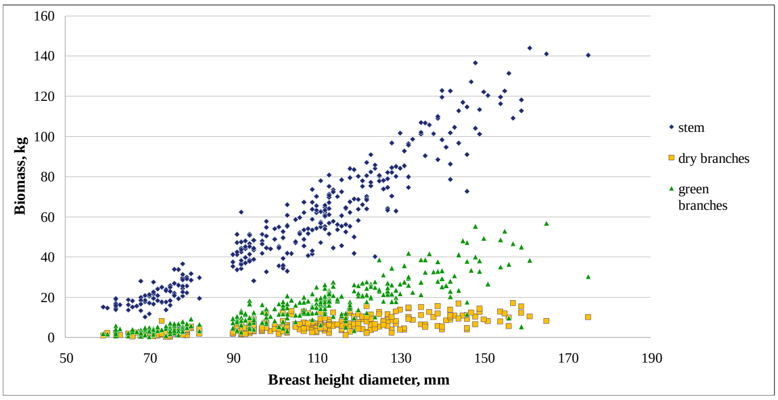
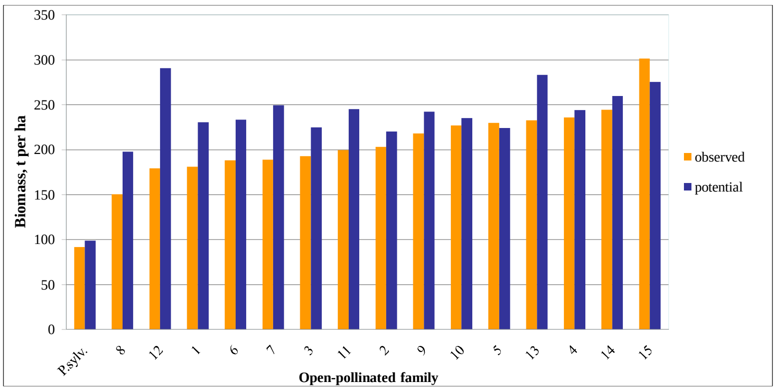


Figure 2. Weight of components of above-ground biomass in relation to tree diameter for *Pinus contorta* at the age of 26 years



P.sylv. – *Pinus sylvestris*

Figure 3. Observed and potential (assuming no mortality from root rot) naturally moist biomass of *Pinus contorta* and *Pinus sylvestris* at the age of 26 years

Factors influencing development of lamas growth of coniferous tress at the age of 4-6 years

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Introduction

Lamas growth – development of second height increment at the end of vegetation period (fig.1) – can be an important problem for productivity (higher probability to suffer in autumn frosts and decrease growth) and quality (increased number of branches per meter, increased probability of double leader, spike knots) of trees.
In forest plantation increased frequency of coniferous trees with lamas growth have been observed in recent years, probably reflecting the fact, that vegetation period has increased in last decade. The trend is predicted to continue and by the end of century vegetation period is predicted to be by 1-1.5 month longer. Aim of the study was to understand the severity of already existing problems with lamas growth and obtain data about its causes, that could be used to prevent or minimize this effect.

Test site

Data have been collected in 6 open pollinated progeny trials (3 pine and 3 spruce) at the age 4-6 years, located in central and eastern part of Latvia. Presented results are form one of the Norway spruce experiments and reflects the trends observed also in other test sites.
Experiment consists of 60 open pollinated families in 4 replications, planted in *Hilocomiosa* forest type, initial spacing 2x3m. On average 20 trees per family, no shorter than 80 cm and without animal damages, have been assessed during 6th growing season.

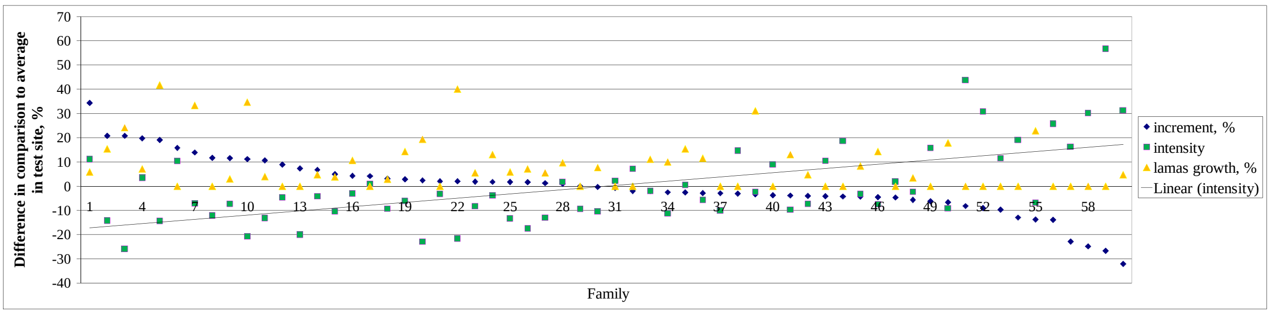
Results and conclusions

Proportion of trees with lama growth in family varied widely: from 0 to 42%. At individual tree level lamas growth was not related to tree height at the beginning of vegetation period, length of height increment or proportion of total height growth, that is formed in period with highest growth intensity (r<0.1). Some families had significantly (p=0.05) higher proportion of trees with lamas growth (36% on average) and some - significantly lower proportion (<4%).
Spatial distribution of families with high proportion of lamas growth does not reveal any trends, that could suggest influence of specific environmental conditions (fig. 2).
Analysis at family mean level reveal, that proportion of trees with lamas growth was weakly correlated to height increment (r=0.2-0.3), tree height (r=-0.1) or length of used vegetation period (r=0.1), but strongly – to proportion of total height growth, that is formed in period with highest growth intensity (r=-0.5). This trait, in turn, had a negative correlation with height increment (r=-0.6-0.7).
Results suggest, that families with higher proportion of trees with lamas growth tend to have more intensive and shorter period of formation of height increment, that, in turn, might lead to more time between end of height increment and beginning of winter conditions, if the autumn is warm .
Despite the general trends, described above, it is possible to select families, that have low proportion of trees with lamas growth, high height increment and relative large proportion of it formed during the period with most intensive growth (fig. 3).

Figure 1. Tree with lamas growth in open-pollinated progeny trial in end of August

	5339	5214	5067				
5205		5021	5058				
5204	5068	5280	5221				
5182	5065	5265	5201	5348	5205		
5180	5163	5260	5014	5326	5153		
5164	5037	5239	5010	5301	5128		
5157	5033	5214	5008	5290	5085		
5200	5067	5278	5028	5371	5139		
5181	5063	5264	5017	5339	5130		
5178	5048	5242	5012	5302	5263		
5160	5036	5218	5009	5294	5095		
5029	5068	5153	5204	5280	5371		
5028	5058	5139	5200	5278	5348		
5021	5065	5134	5182	5265	5058		
5017	5063	5130	5181	5264	5326		
5014	5059	5128	5180	5260	5302		
5012	5048	5113	5178	5242	5301		
5010	5037	5099	5164	5239			
5009	5036	5095	5160	5218	5294		
5008	5033	5085	5157	5214	5290	5205	
5371	5301	5326	5348	5280	5294	5302	5339
5181	5200	5204	5218	5180	5182	5201	5058
5068	5095	5113	5130	5067	5085	5099	5128
5009	5012	5017	5028	5008	5010	5014	5205
5239	5260	5264	5278	5221	5242	5263	5265
5139	5157	5163	5178	5134	5153	5160	5164
5033	5037	5059	5065	5029	5036	5048	5063
5280	5290	5294	5301	5302	5326	5339	5348
5221	5239	5242	5260	5263	5264	5265	5278
5180	5181	5182	5200	5201	5204	5214	5218
5134	5139	5153	5157	5160	5163	5164	5178
5067	5068	5085	5095	5099	5113	5128	5130
5029	5033	5036	5037	5048	5059	5063	5065
5008	5009	5010	5012	5014	5017	5021	5028

Figure 2. Locations of open-pollinated spruce families with higher than average (red) and lover than average (blue) proportion of trees with lamas growth



Increment, % height increment in comparison to total tree height at the beginning of vegetation period
Intensity – proportion of increment, formed during the period of most intensive height growth
Lamas growth, % - proportion of trees per family with lamas growth

Figure 3. Avearage values of traits for particular open-pollinated spruce families

Differences in shoot elongation pattern and height increment of hybrid aspen (*Populus tremuloides* Michx. x *Populus tremula* L.) clones

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Introduction

Crossing, selection and testing of hybrid aspen (*Populus tremuloides* x *P. tremula* L.) clones for establishment of short rotation plantation recently has gained more attention in Latvia. On of important traits for selection is productivity of certain clone, reflected in part by height increment.
Climatic data indicates an increase in length of vegetation period, if compare to early 1970th, and this trend is predicted to continue in this century. Therefore it is important to gain more understanding on how much there are differences among hybrid aspen clones in length of used vegetation period and how that relates to total height increment in order to suggest efficient indicators for selection of clones, that would be productive also in future climate.

Test site

Progeny trial of 15 hybrid aspen clones, represented by 24 ramets with initial spacing 3x3m, has been established in former agricultural land in central part of Latvia. Inventory of phenology and measurements have been carried out in 5th growing season, starting from end of April, with an interval of 1 week on average (fig.2).

(a) (b) (c) (d)
Figure 1. Clones with early (a) and late (b) bud flush and early (c) and late (d) autumn leaf coloration

Results and conclusions

Bud burst differs among clones from 12 days at earliest stages of this process to 4 days in latest. Clones with earlier bud burst tend to gave slightly higher height increment (fig. 2).
End of the growing season (indicated by leaf color at the beginning of October) also differs among clones. Those clones with longer growth in autumn tend to have slightly higher increment in most of the measurement periods and also total increment (fig. 3).
Length of used vegetation period varies between 172 and 178 days for particular clones and that is notably more than known for common aspen in Latvian conditions (140 days on average). Total height increment is related to length of used vegetation period (r=0.55, fig.4). In context of predicted climatic changes this finding that is stressing the need to select clones with long used growth period in order to ensure high productivity of hybrid aspen plantations.
Further studies needs to be carried out in larger set of material, applying more exact measurements for determination of start and end of growth period, in order to obtain precise data about length of used vegetation period and ensure, that the conclusions can be generally applied. Detailed analysis in context with meteorological information will provide more insides in the most important factors during the formation of the height increment of hybrid aspen. It will serve as basis to increase efficiency for tree breeding activities and suitability of selected material to climatic conditions, predicted in future, in order to ensure high productivity of hybrid aspen plantations.

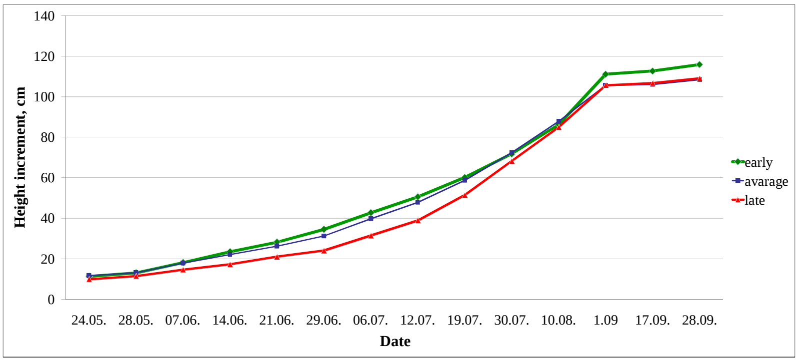

Figure 2. Development of height increment of clones with different bud burst phenology pattern

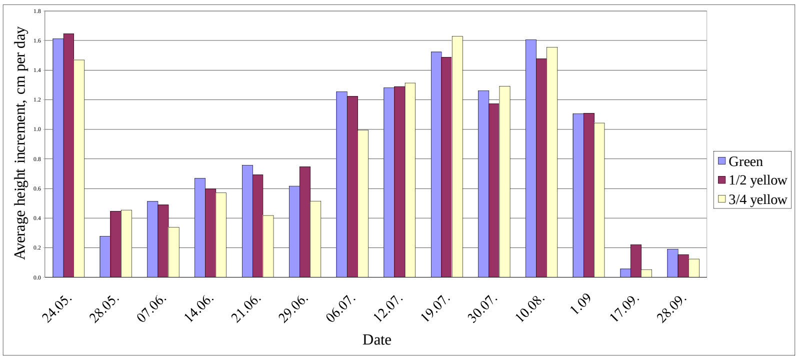

Figure 3. Intensity of height growth of clones with different autumn leaf coloration level at the beginning of October

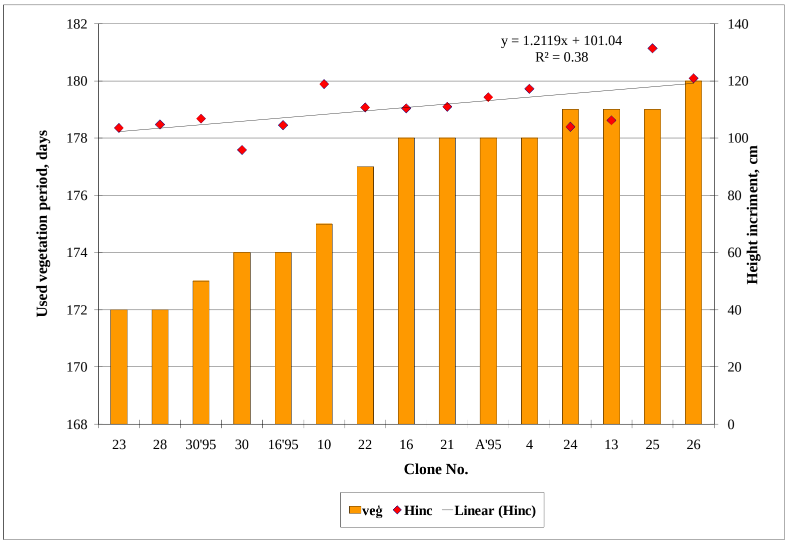

Figure 4. Total length of height increment (Hinc) and length of used vegetation period (veg) for particular hybrid aspen clones