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INTRODUCTION

Continual demand for energy resources and fossil fuel critical impact on environment makes us to look for an alternative energy source. Agroforestry systems are considered as perspective AES, because combination of extensive agriculture and forestry, they provide well-balanced economic and environmental needs. According to Latvian legislation, since 2011 aspens (*Populus spp.*) are eligible agriculture energy crop with rotation period up to five years.

OBJECTIVE

Research aim is to determine productivity of hybrid aspen (*Populus tremula* L. x *P.tremuloides* Michx.) planted in spring 2011 at the fifth year rotation period after managing it as agroforestry system together with perennial crops – reed canary grass (*Phalaris arundinacea* L.), festulolium (*xFestulolium pabulare*) and fodder galega (*Galega orientalis* Lam.) as intercrop and fertilized by fermentation residues (30 t_{DM} ha⁻¹), waste water sludge (10 t_{DM} ha⁻¹) and wood ash (6 t_{DM} ha⁻¹).

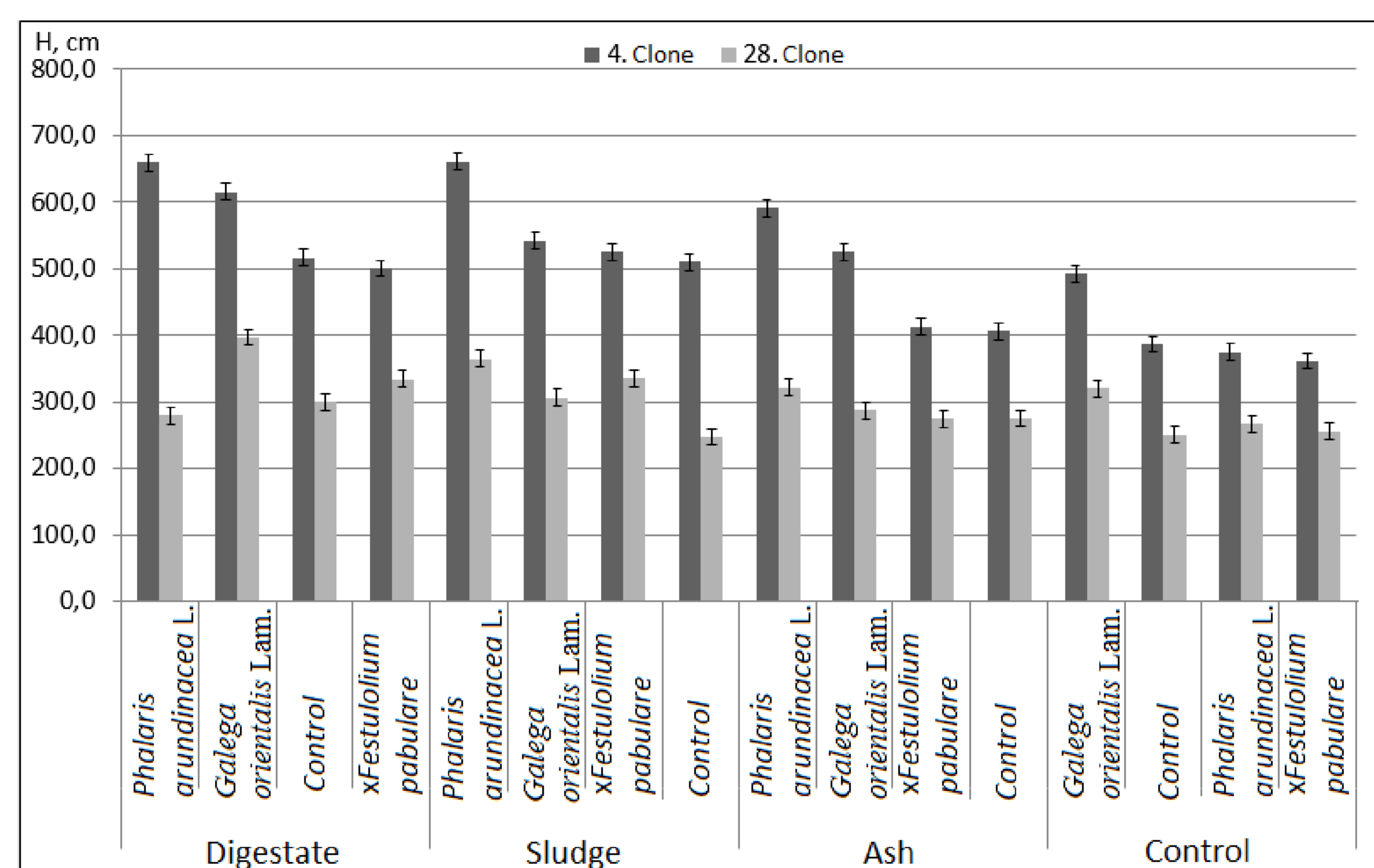
METHODS

The experimental plot is located at central part of Latvia and it is a part of large scale multifunctional plantation. During the study were measured hybrid aspen clones No 4 and No 28. The average distance between the trees are 2,5 x 5m. Plantation is established in 4 replicates and each of them divided in four subplots with different treatment and with 2.5 m wide intercrop stripes between tree rows. Herbaceous plants were collected by using small harvesting machinery *Wintersteiger*.

RESULTS



Phalaris arundinacea L. intercrop



xFestulolium pabulare intercrop



Galega orientalis Lam. intercrop



Populus tremula x *P.tremuloides*

Comparing fertilizers efficiency - it is recognized that the best effect on tree growth for both clones gives fertilizing with biogas fermentation residues (digestate) and waste water sludge, averagely 30–31% better tree height compared to control.

From researched intercrops the best effect on tree growth gives reed canary grass and fodder galega intercrop, comparing to control the average tree height is per 16% higher.

It is concluded that the highest productivity of hybrid aspen plantation provides combination of digestate fertilizer and *Phalaris arundinacea* intercrop.

It is recognized that hybrid aspen clone No 4 is significantly (+33%) more productive than clone No 28.

All kinds of fertilizers significantly increased seed yield of festulolium by 30%, but fodder galega showed positive response just to wood ash fertilization, resulted to +15% of seeds yield.

CONCLUSIONS

Results of the study showed that herbaceous plants can be successfully cultivated along with fast-growing trees. Establishing agroforestry system must be taken into account that the most significant impact on plantation productivity has the selection of hybrid aspen clone, although also relevant impact on the tree growth has been observed for fertilizer application and the type of intercrop too.