

Effect of Fertilization on Growth of Hybrid Aspen (*Populus tremuloides* x *Populus tremula*) Seedlings Over First Season – Preliminary Results



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Introduction - problems



- ✓ Interest about agroforestry and short rotation woody crops as source of raw material for green energy production is growing.
- ✓ Management of waste product utilization is looking for a cheap and environmentally friendly methods for waste utilization.
- ✓ Recycling of plant nutrient to use stabilized and pre-treated waste products for fertilization of short rotation crops could be one of solutions.

Field trial



Aim of study is to evaluate effect of plant nutrient containing fertilizers – waste water sludge, wood ash and digestate on hybrid aspen growth – increment.

- ✓ Hybrid aspen clone 4 had been planted on loamy soil with fertilization in pit (depth 10-30 cm) doses equivalent to:
 - ✓ 10 t_{DM} ha⁻¹ of waste water sludge,
 - ✓ 3 t_{DM} ha⁻¹ of wood ash,
 - ✓ mix of waste water sludge 5 t_{DM} ha⁻¹ and 1,5 t_{DM} ha⁻¹ wood ash
 - ✓ digestate 25 t ha⁻¹ .

Amount of nutrients turned in by fertilizers



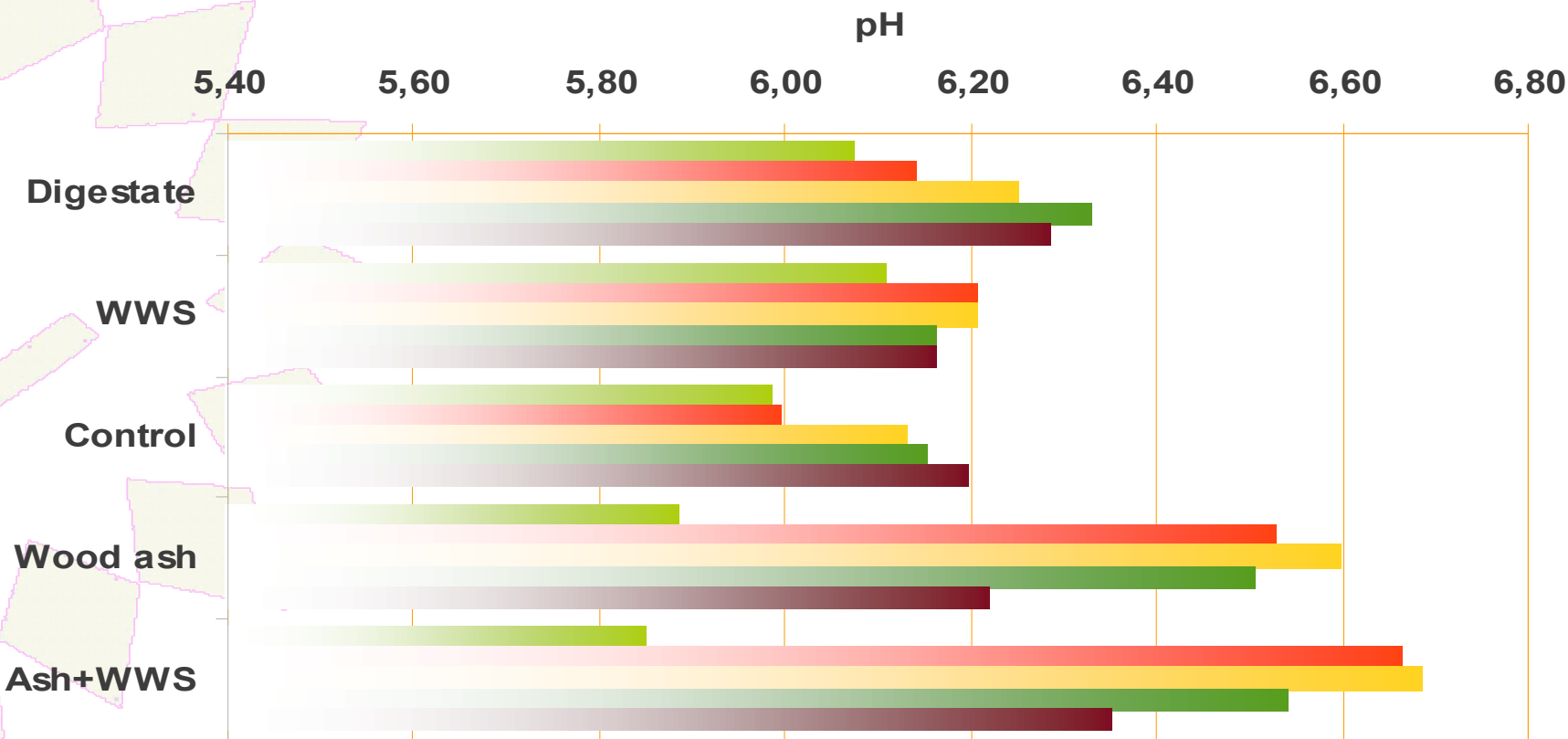
Fertilizer applied	N, kg ha ⁻¹	P, kg ha ⁻¹	K, kg ha ⁻¹
Wood ash	0.7	19.3	164.7
Waste water sludge	324.80	136.00	19.60
Wastewater sludge mix with wood ash	162.75	77.65	92.15
Digestate	9.75	19.00	70.00
<i>Optimum</i>	<i>100-200</i>	<i>20-40</i>	<i>100-200</i>



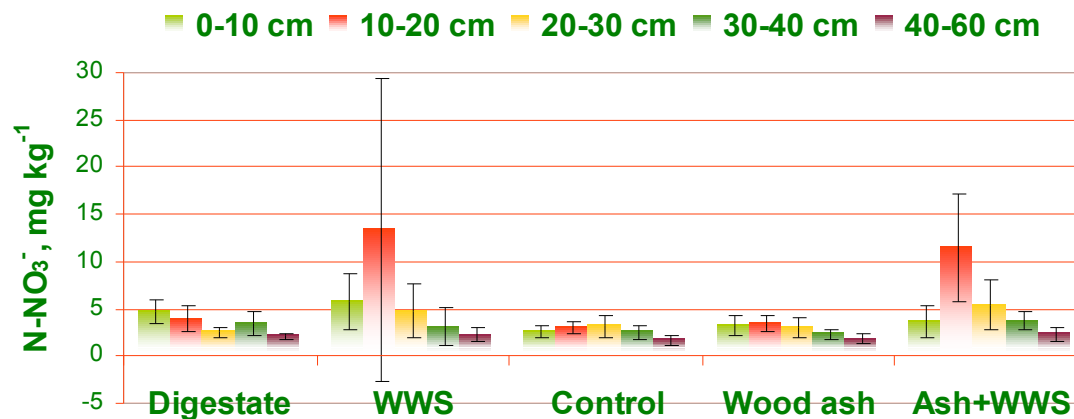
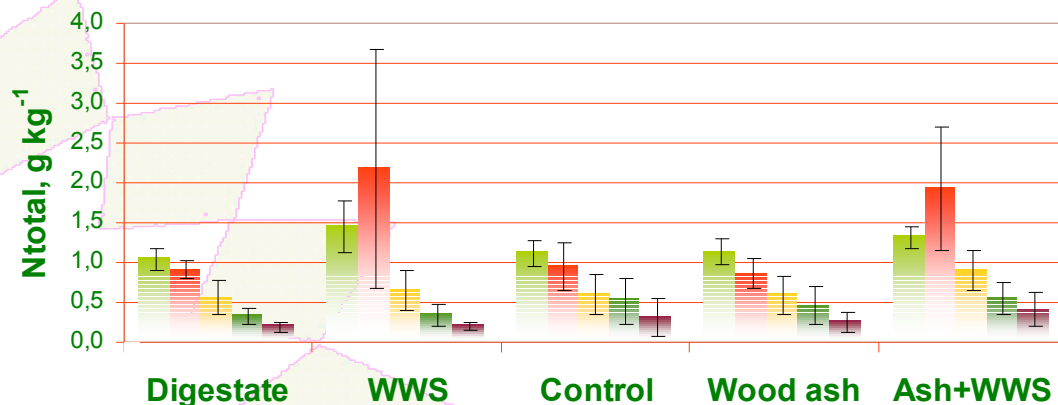
Liming effect of fertilizers



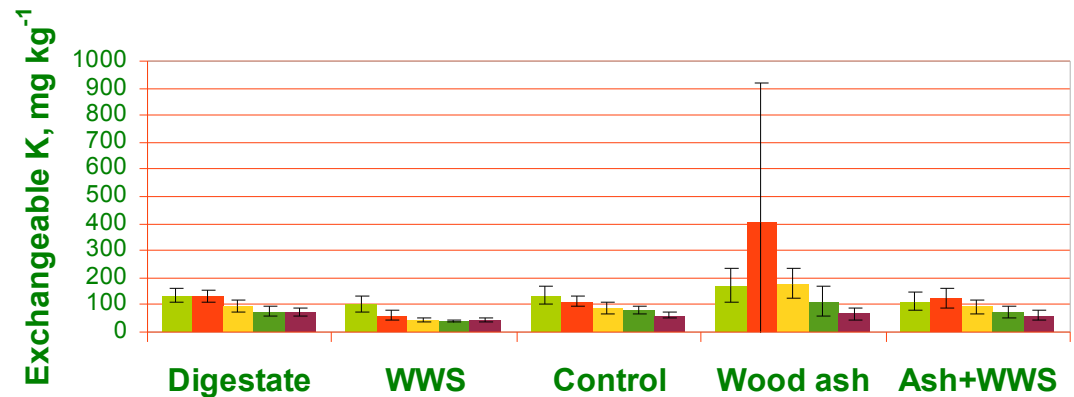
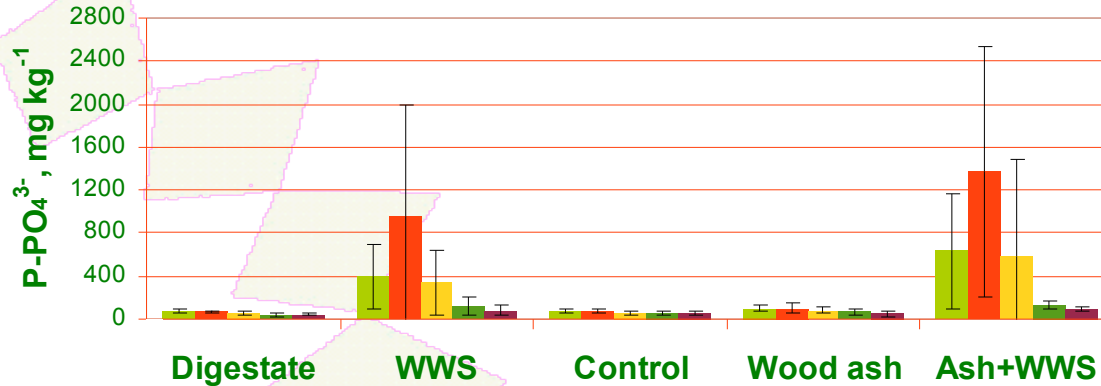
■ 0-10 cm
 ■ 10-20 cm
 ■ 20-30 cm
 ■ 30-40 cm
 ■ 40-60 cm



Macronutrients - N_{tot}; NO₃⁻, spring



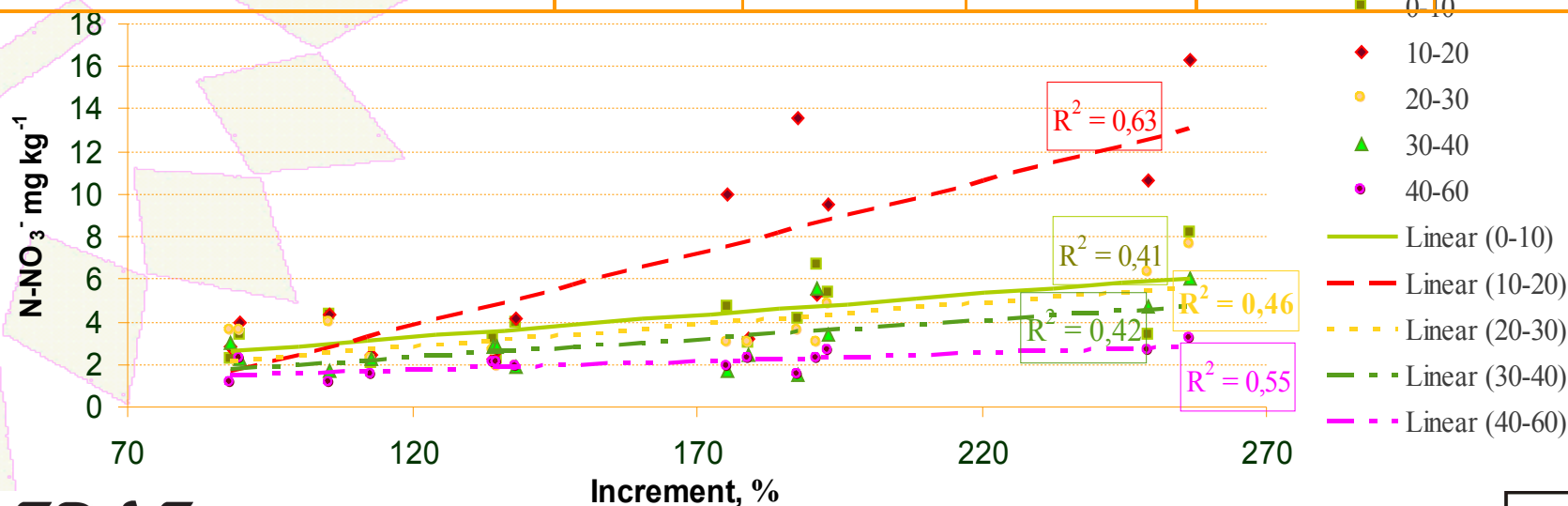
Macronutrients P and K



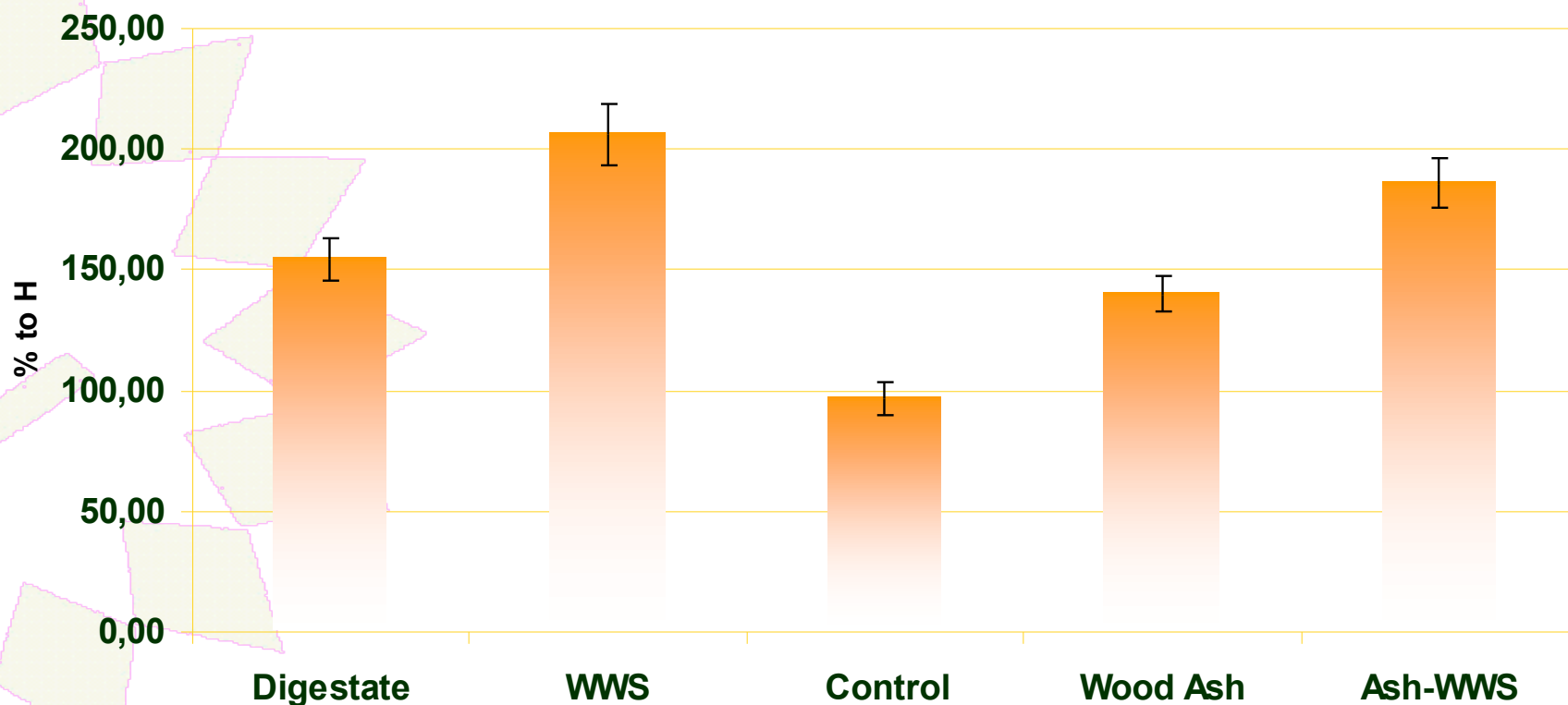
Pearson correlations of soil chemical properties with plant annual increments



Chemical properties	Soil depth				
	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-60 cm
Average - Ntot., g kg ⁻¹	0,73	0,45	0,51	0,14	0,19
Average - N-NO ₃ , mg kg ⁻¹	0,64	0,80	0,68	0,65	0,74
Average - P-PO ₄ ³⁻ , mg kg ⁻¹	0,32	0,34	0,31	0,56	0,60
Average – Exchangeable K mg kg ⁻¹	-0,37	-0,17	-0,26	-0,27	-0,28
Average - pHCaCl ₂	0,00	0,21	0,08	-0,04	-0,05



Annual increments of plants 2010



Conclusions presented at paper

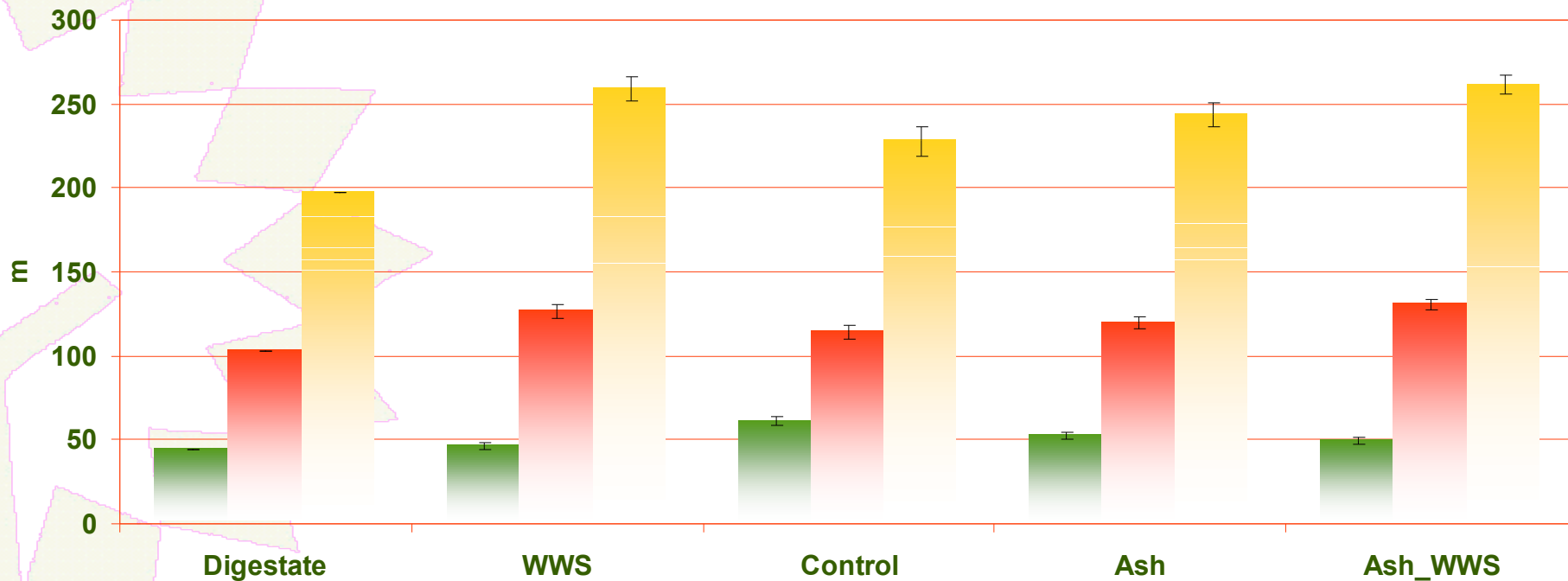


- ✓ Higher content of nitrogen leach-able salts - nitrates as well phosphates stimulates growth of Hybrid aspen annual increment.
- ✓ Waste water sludge mix with wood ash could provide optimal macro-nutrients NPK concentration for SRC.
- ✓ Plants fertilized with waste water sludge containing fertilize at doses $10-5 t_{DM} ha^{-1}$ significantly increases annual increment of hybrid aspen.

Some new results - growth



■ H 2010 May ■ H 2010 October ■ H 2011 October



Summer 2011



Autumn 2011

