

Sapling vitality and establishment of hybrid poplar on former sewage plantations

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Introduction

This study accompanied the establishment of 160ha of SRC on a former sewage plantation south of Berlin. During the first year it became apparent that site preparation was not effective but that, above other site specific factors, competing vegetation was the main influence hampering tree establishment and that growth loss could not be compensated the years following planting. Water stressed individuals seemed also more prone to leaf discoloration, shoot dieback and fungal infection.

Following these preliminary results we were interested if vitality as well as survival rates of saplings could simply be improved with improved soil water management by means of plant material and removal of competing vegetation and further, how contamination levels would factor in under these improved conditions.

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I would also like to thank all my student workers withstanding all weather conditions but keeping a good spirit anyway.

Field Experiment



Pictures show the preparation and planting of sub-plots with two competition levels and two rod lengths; **left to right:** trial 3 after herbicide treatment, soil preparation of planting rows, rod planting with soil auger, and planting of cuttings by hand

We tested two rod lengths within two competition levels, for two clones during their first year in two locations within the plantation. Trials were planted as rods (60cm) and cuttings (20cm). Ground vegetation was removed by application of glyphosate, plant rows were harrowed one week before planting. During the season no-competition plots were kept de-vegetated by hand.



Left hand: no competition and competition plot before planting trial 3; **middle:** Trial 3 summer 2nd year, in front "competition" treatment (yellow arrow), in the back "no competition" treatment; **right hand:** rod plantings within "competition" treatment

Data collected

- tree inventory in April, June, and October
- in situ air temperatures, relative humidity and precipitation
- volumetric water content and matric potential of soil (FDR profile weekly and rooting zone cont.) and pF at wilting point (lab)
- monthly soil water collection: 9 lysimeter points at 20cm and 100cm soil depth
- biomass inventory of ground vegetation
- Scholander and Porometer measurements (August)
- nutrition status (leaf sampling August)
- root stock collection (after 1st and 2nd year)

Some Results

Survival and growth performance by treatment and location

Vegetation treatment had a greater effect on survival rate than length of cuttings. Growth performance was significantly lower due to competition with ground vegetation but also hampered by contaminants when soil water supply was not yet limiting (Table 1, Figure 1).

Planted as:	Trial 1				Planted as:	Trial 3			
	rods		cuttings			rods		cuttings	
Treatment	NC	C	NC	C	Treatment	NC	C	NC	C
shoot appearance [%]	100	100	80	90	shoot appearance [%]	97,5	100	100	100
survival 1st year [%]	100	92,5	77,5	5	survival 1st year [%]	97,5	100	97,5	80
height [cm]	139,9	45,9	56,1	15	height [cm]	204,2	80,1	171,2	44,8
Estimated yield [t _{DM} /ha]	0,7 (0,87)	-	-	-	Estimated yield [t _{DM} /ha]	1,52 (1,9)	-	0,85 (1,06)	-

Table 1: Survival and growth performance of rods and cuttings plots with no competition (NC) and plot with competing ground vegetation

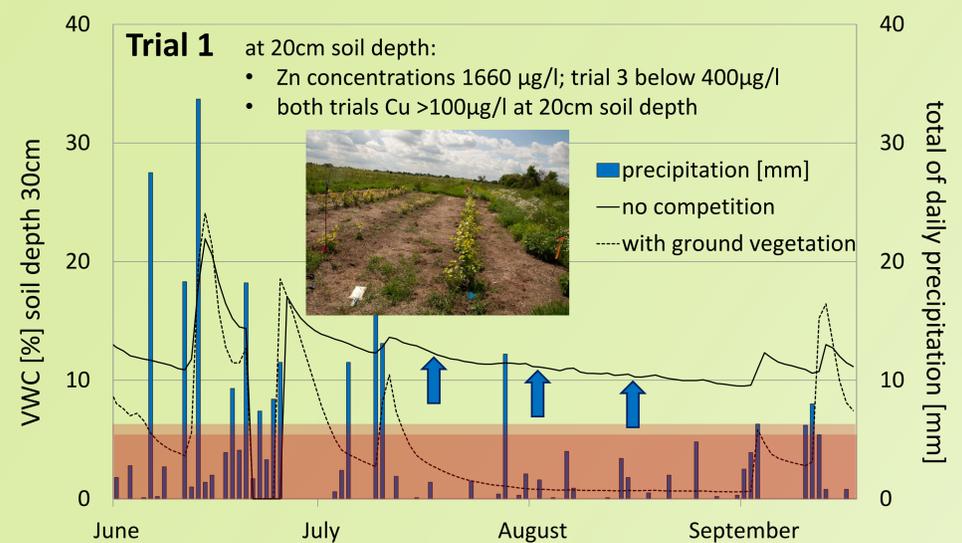


Fig. 1: Seasonal soil water supply in no competition and competition plots, red area marks the wilting point

Root development

Vegetation treatment had a drastic effect on root growth. There was evidence that poplar roots develop poorly at the main rooting depth of competing vegetation, suggesting that poplar is very sensitive to root competition. Accordingly, vegetation treatment had a greater effect on root growth than the length of plant material. High contamination levels hampered root development also under well watered conditions. Rods performed better than cuttings, while roots developed generally poorly within the organic soil surface, where contamination levels are higher compared to mineral soil strata. There was some indication that this was compensated in rod plantings, where root growth was greater at depth. During the first year differences in roots were not equally translated in above ground performance.

