BIOMASS DISTRIBUTION IN TWO WILLOW SPECIES

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Biomass partitioning in two willows species (*Salix dasyclados- S. das.* and *Salix viminalis- S. vim.*) was studied in Saare short rotation forest plantation in Estonia (58°42'N; 26°55'E). Both species originated from the Swedish Energy Forest Programme (*S. vim.* clone 78183 and *S. das.* clone 81090). The plantation was established in 1993 with the planting density 2 plants per m^2. In the year of measurements the root system was 3 years old and the shoots 2 years old.

Half of the plots were fertilised annually with mineral fertiliser (60 kg N; 0…26 kg P and 0…40 kg K per ha). Shoot and leaf biomass was estimated by using allometric relations between shoot diameter (55 cm above ground) and shoot/leaf dry weight. Shoot number and diameter distribution were measured in 10 stools per plot. The fine root biomass was measured by soil coring (10 cores with diameter 48 mm and length 40 cm per plot). Subsamples were used to estimate the percentage of living fine roots and ash content. The root dry weight was expressed on ashfree basis.

The shoot biomass was 6.9 tons per ha for *S. vim.* and 5.1 tons per ha for *S. das* (Fig. 1). Fertilisation increased the shoot biomass more than twice (13.7 and 13.3 tons per ha, respectively). Fertilisation did not change the ratio of leaf/shoot biomass in *S.vim* (about 0.18 for both fertilised (F) and unfertilised (C) plots). *S. das.* F- plants had significantly more leaves per shoot weight than the C-plants (corresponding ratios 0.24 and 0.14). The amount of living fine roots in *S. vim.* F was higher than in *S. vim.* C (1.7 and 1.1 tons per ha, respectively) (Fig. 2). *S. das.* F had less fine roots than the unfertilised plot (2.9 and 4.6 tons per ha, respectively). The higher productivity of fine roots in C plots during the second half of the growing cycle has been demonstrated with the root ingrowth method (data not shown).

The ratio between aboveground biomass (leaves+shoots) and living fine roots was higher in F plots than in C plots of both studied species (5.6 and 4.1 for *S. vim.* and 5.7 and 1.2 for *S. das.*, respectively) (Table 1).

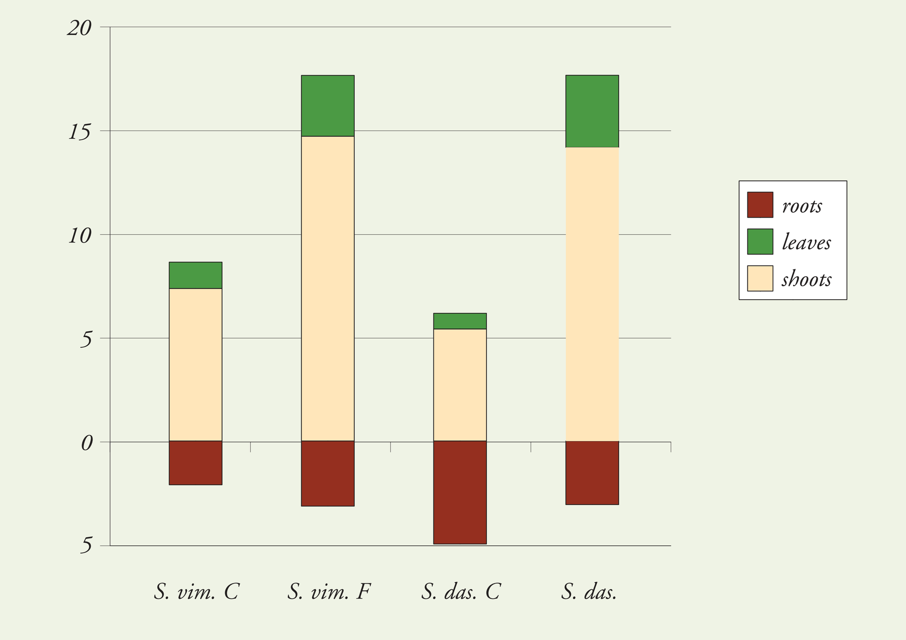


Fig 1. Biomass distribution between main organs (tons DM ha -1).

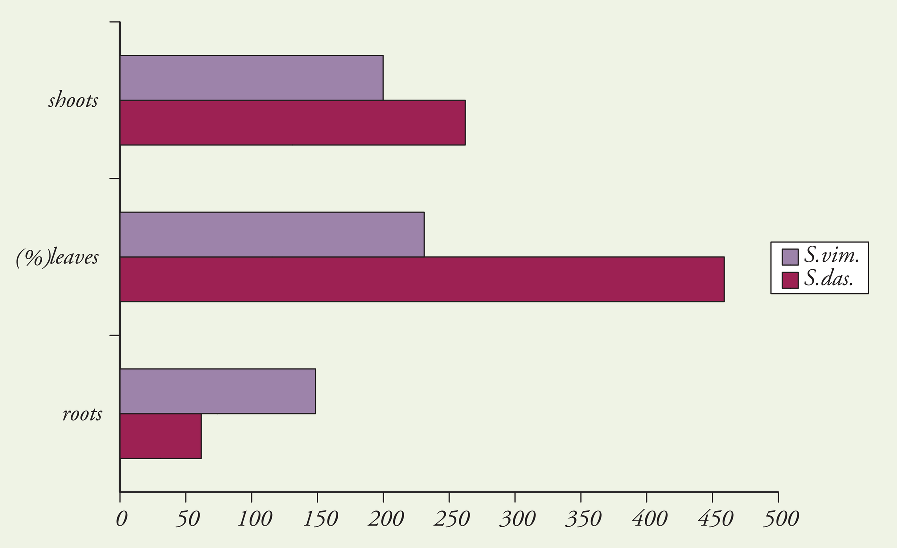


Fig 2. Fertilisation effect on biomass of various plant parts (%) Control plants - 100%.

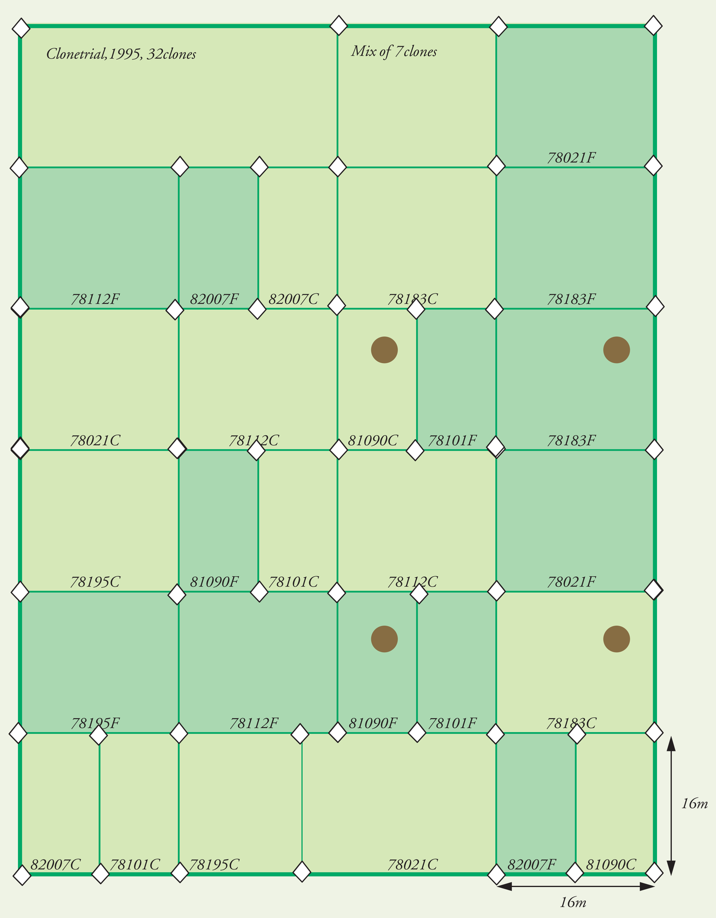
Table 1. Total biomass (t * ha-1) and its allocation ratios between various plant parts.

	S. vim. C	*S. vim. F*	*S. das. C*	*S. das. F*
total biomass	10.0	19.4	10.4	19.4
leaves/shoots	0.17	0.20	0.14	0.25
aboveground/fine roots	4.07	5.61	1.24	5.75

Table 2. Nitrogen content in aboveground plant parts (g * m-2) and amount of aboveground nitrogen per biomass of living fine roots (g * g-1).

	S. vim. C	*S. vim. F*	*S. das. C*	*S. das. F*
shoots	2.0	4.0	1.5	3.8
leaves	3.9	8.9	2.3	10.6
total N	5.8	12.9	3.8	14.4
N/fine roots	0.052	0.078	0.014	0.089

Therefore we conclude that one reason of higher aboveground biomass of fertilised willows is the difference of biomass allocation.



The significantly lower aboveground/fine root biomass ratio in *S. das.* C compared with *S. vim.* C indicates that

S. das.* suffered more from nutrient shortage than *S. vim.

S. das. had higher biomass allocation to above-ground parts mainly due to higher leaf production in the F plots. The increased leaf area, in turn, enhances total growth.

Differences in biomass distribution pattern in C and F plots indicates that growth was limited mainly by nutrient availability and not by water availability. Multiplication of biomass data by the N concentration in shoots (0.29%) and leaves (3.24%) (Table 2) showed that

in F plots 1 gram of fine roots can supply the aboveground organs with 78…89 mg of N (*S. vim.* and *S. das.*, respectively).

These figures can be used as an approximate indicator for evaluating the potential of different species for nutrient uptake in vegetation filters for wastewater purification.