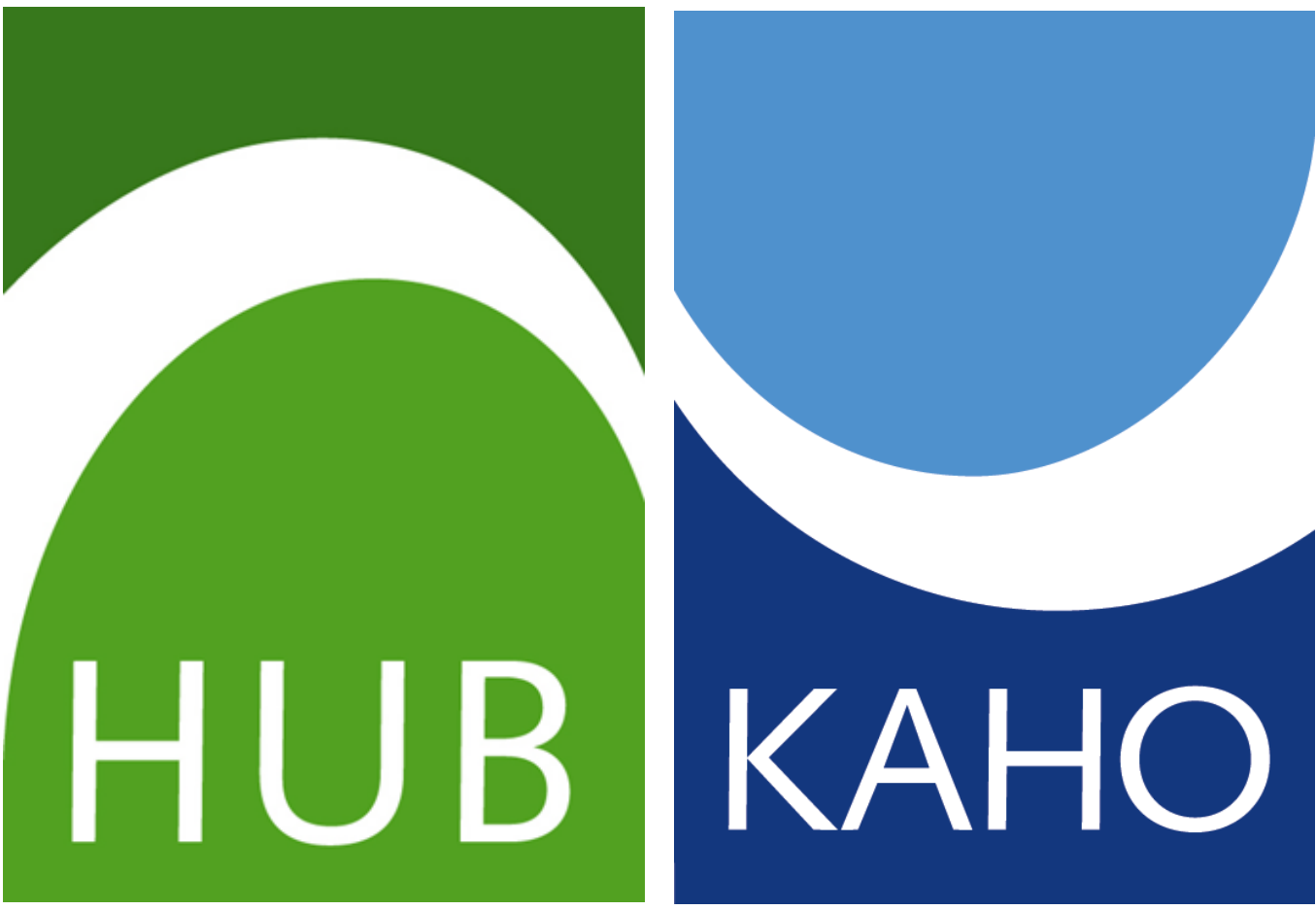# Effect of different housing methods on specific growth rate, survival and cheliped loss in noble crayfish (*Astacus astacus* L.) in a recirculating aquaculture system

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Introduction

Within the context of the technical and economical evaluation of noble crayfish culture in recirculating aquaculture systems by KAHO Sint-Lieven, an experiment comparing different housing methods was conducted. We compared an individual housing setup to 3 setups of grouped housing, using different shelter types in each treatment. The shelters used were filtration bristles, coarse-meshed nets and PVC pipes .

The effect of each treatment on growth, survival rate and cheliped loss was assessed. These results will be taken into account in an upcoming economical analysis, evaluating the feasibility of noble crayfish culture in recirculating aquaculture systems in Belgium.

Materials and Methods

- 240 two-summer-old noble crayfish (ABW: 5.44 ± 1.27g), sex ratio: 60% male/40% female;
- Twelve tanks (0.5 m²/0.15 m³ each), connected to a RAS;
- Density = 40 crayfish/m², Water temperature = 20°C; photoperiod = LD 16:8;
- Four types of shelter were tested, with three replicates per treatment:

  - Individual cages, containing a PVC pipe;
  - Grouped housing with filtration bristels;
  - Grouped housing with coarse-meshed nets;
  - Grouped housing with PVC-pipes.

- The crayfish were fed every two days with commercial shrimp pellets (feeding rate: 1.5% BM);
- After 59 days, 71% of the crayfish had moulted and individual weight, cheliped loss and survival rate were measured;
- A non-parametric Kruskal Wallis test (SGR) and logistic regressions (cheliped loss and survival rate) evaluated the effect of housing method on each parameter.

Results

No significant results were found among treatments, although several tendencies were observed (p ≤ 0.10):

- A nearly significant difference was found when comparing SGR only in males (p=0.06), although no significance was found among females (p=0.29);
- Of all treatments, individual housing resulted in the highest growth rates in males (SGR = 0.42±0.16%.day^{-1}) (p=0.06), best survival rate (91.67±7.6%) (p=0.10) and the lowest cheliped loss (3.52±3.06%) (p=0.07);
- Among grouped housing treatments, bristels as shelter showed the highest survival rate (85.00±5.0%), while nets resulted in low survival (73.33±10.4%) (p=0.10);
- PVC pipes resulted in the lowest growth rate (SGR = 0.20± 0.03%.day^{-1});
- Nets for shelter caused the most crayfish to suffer cheliped loss (20.53±7.05%) (p=0.07).

Discussion

We notice that several p-values are just above the 5% level. This lack of significant results was probably due to the high variability in the sample population. In order to estimate the differences between housing methods more precisely, several improvements in the experimental setup should be considered. A higher initial stocking density, more replicates per treatment, lower variation in initial body weight or prolongation of the trial, would most likely result in finding significant results.

For SGR, there's a remarkable difference in p-values between males and females. This could be explained by the faster growth of males, which causes significant differences in their growth to reveal sooner. Therefore it may be advisable to use only males in experiments focusing on growth.

Individual housing showed best results for SGR, survival and growth. Yet, this type of housing is expensive and of high-maintenance. Therefore, it's interesting to compare the results of the three grouped housing treatments. Using filtration bristels as shelter resulted in the best survival rate and lowest cheliped loss of all grouped housing treatments. As these bristels float above the tank bottom, this shelter type is also very practical for siphoning waste and food leftovers.
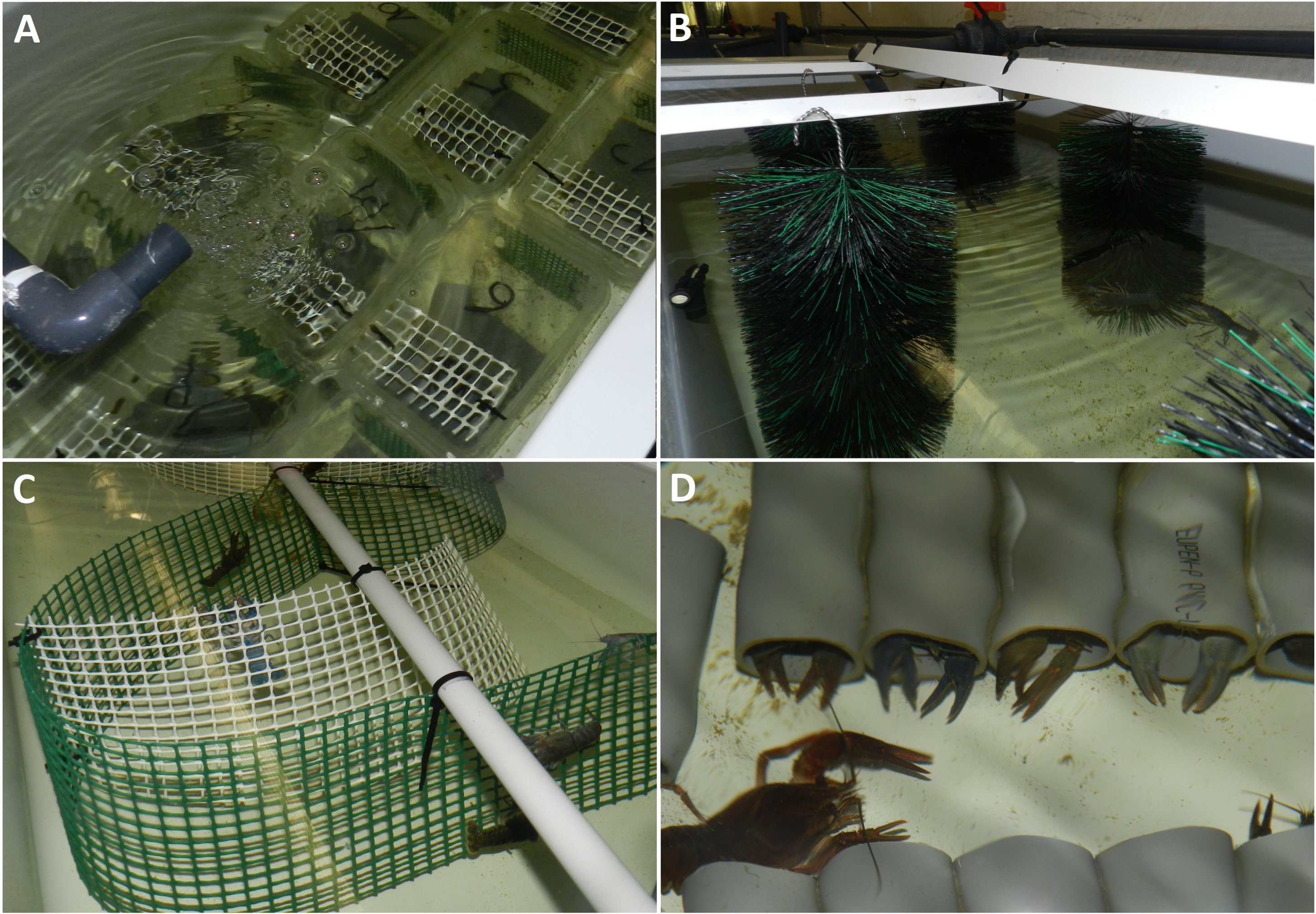

Figure 1: Experimental setup with four types of shelter (A: individual cages, B: filtration bristels, C: coarse-meshed nets, D: PVC pipes)

	Individual housing	Filtration bristels	Coarse-meshed nets	PVC pipes
Survival rate (%)	91.67±7.6	85.00±5.0	73.33±10.4	83.33±11.5
SGR (%.day^{-1})	0.33±0.05	0.24±0.07	0.24±0.12	0.20±0.03
Cheliped loss (%)	3.52±3.06	8.00±9.67	20.53±7.05	12.70±11.25

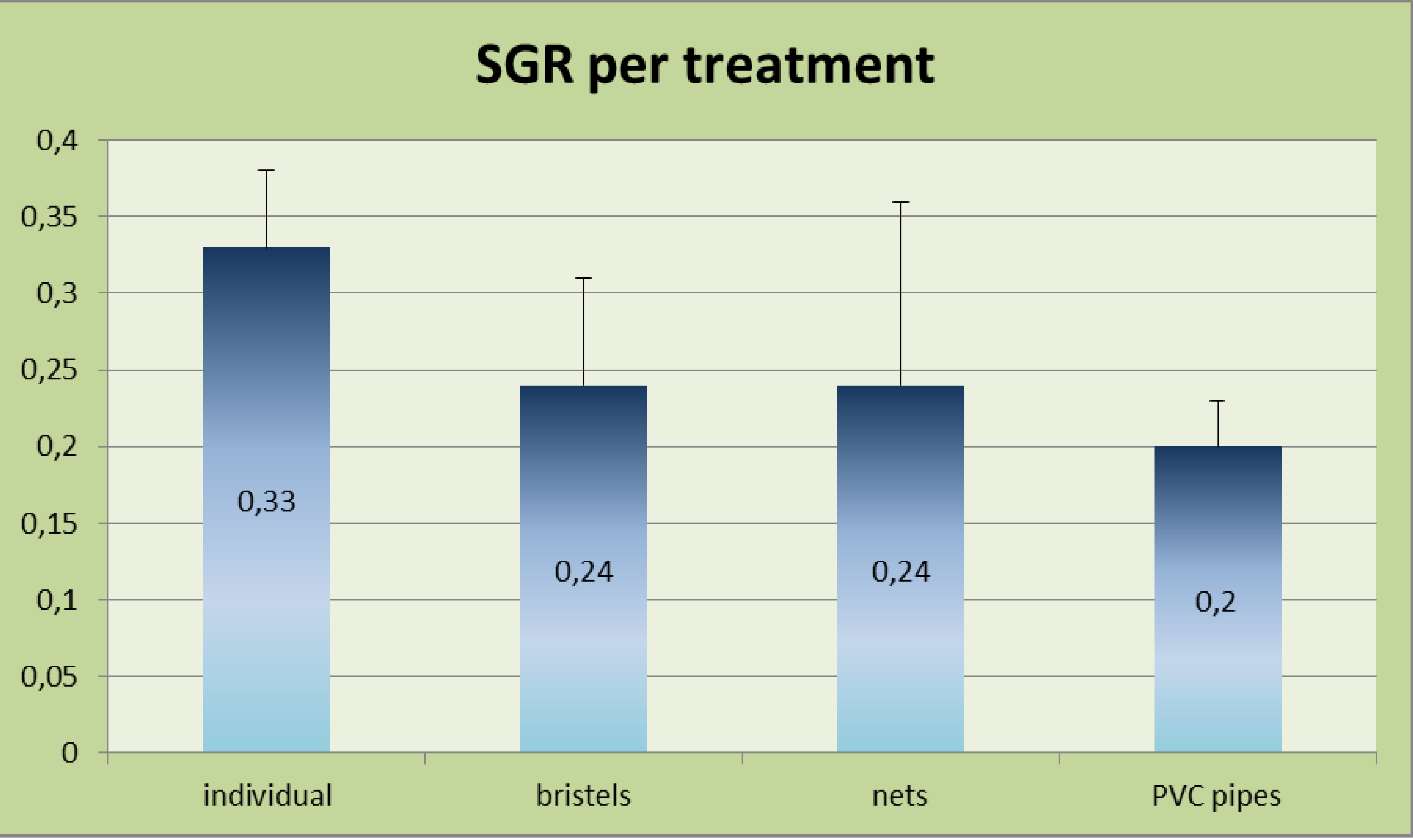Table 1: Final results per housing method (average ± stdev)

Figure 2: Specific growth rate per treatment (%.day^{-1})