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STRAW FILTRATION AIMING TO REDUCE THE ECOLOGICAL DAMAGE TO THE ENVIRONMENT THROUGH INTENSIVE FISH FARMING

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A b s t r a c t. The ecological damage to the environment through fish farming could be reduced by using wheat straw mattress for filtration the sewage.

Dryness, nitrogen and phosphorus impact by means of sewage from intensive fish farming could be reduced about 50 %. The chemical need of oxygen requirement which causes the sewage fee could be reduced about 20 % that means there are likewise economic advantages if straw filter is used.

In addition the remain left over the filter and the straw which built up the compost could be used for plant production. The similar structure and small costs make a possibility to use straw filter in small fish farms for reducing environmental impacts.

K e y w o r d s: fish farming, straw filtration, ecological damage

INTRODUCTION

Intensive fish farming causes inveritably through non taken food and metabolism products an impact of nutritment in stretch of water. Because of this it comes partly to enormous changes in its natural gradients especially smaller stretches of water are concerned.

A conditioning of sewage from intensive fish farming to a minimization of nutrition impact in water is therefore indispensable.

Apart from chemical and biological methods the following physical treatments are used: gravitation sedimentation [1,6,9], centrifugal treatment [5,11], flotation [6], filtration with wire metting and revolver [5,6]. The treatments mentioned show sufficient effectiveness concerning the cleaning of sewage. However, they are usally expensive and need much space. In addition a waste product emerges which is similar in its features to slurry and needs a further treatment [4].

The intention of the experiment was the development of a simple but mechanically effective purifying system with less need of space and costs and with fully recycable products. Because of the suitability of straw as a medium of filtration for slurry [8] it seemed reasonable to use straw for the filtration of sewage from intensive fish farming. In addition it seemed effective to use the remain left over the filter for plant production [10].

METHOD

Rainbow trouts (*Salmo gaidneri* R.) were kept in self-purifying basins at a temperature of 12-15 °C and oxygen saturation in influx (1 l/min/kg fish). The sewage flowing from the basin was transmitted to the filter which consisted of a wheat straw mattress. The straw was pressed between metal grids with 30x30 mm meshes. The pressure was about 35 N. Two fodder with known digestibility were fed. The straw mattress was in regard to its depth and the length of the

used straw optimized. To use chaff straw (straw 1) was effective because of a mattress depth about 35-40 mm and to use normal straw (straw 2) was effective because of a mattress depth of 120-150 mm. Features of the straw used for filtration are collected in Table 1.

Two types of filter have been used (Fig. 1) type 1 worked in horizontal position, type 2 in vertical position.

The remains consisting of faeces and feed rests were caught in the straw mattress until the filter has been filled up and the sewage cross was not sufficient anymore. Consequently the straw mattress had to be renewed. Then remains and straw mattress were composted together for more than four months. The compost was analysed for its nutrient content.

The following features and parameters were defined:

$$\text{Effectiveness (\%)} = \frac{\text{faeces in remain (g)}}{\text{total faeces (g)}} 100$$

The effectiveness has been ascertained for the following parameter: dryness (T), phosphorus (P), nitrogen (N), chemical oxygen demand (COD).

$$\text{Capacity} = \frac{\text{used fodder (g)}}{\text{used straw for filtration (g)}}.$$

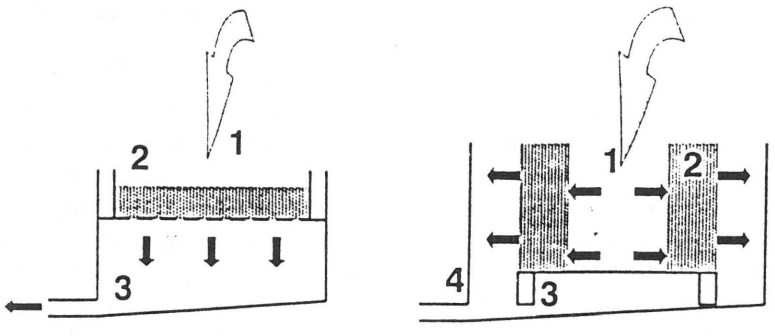
RESULTS

Effectiveness in regard to its environmental impacts is shown in Fig. 2.

The average capacity was 2.5, which means 1 t straw was needed for the filtration of fodder rests and metabolism products from 2.5 t

Table 1. Features of the straw used for filtration

Conditioning	Chaff		Normal lenght	
Description	All stalk 4-6x crackes		No. cracked stalk	
Average stalk width (mm)	2		3	
Average diameter (mm)	0.2		3.5	
Length spread (%)	< 1 mm	< 1	< 30 mm	< 1
	1 - 10 mm	5	30 - 50 mm	5
	11 - 20 mm	10	50 - 100 mm	10
	21 - 40 mm	60	100 - 150 mm	10
	41 - 60 mm	25	150 - 200 mm	25
			200 - 250 mm	35
			> 250 mm	10



filter type 1 filter type 2

Fig. 1. Working positions of the filters. 1 - sewage influx; 2 - wheat straw mattress; - efflux; 4 - box.

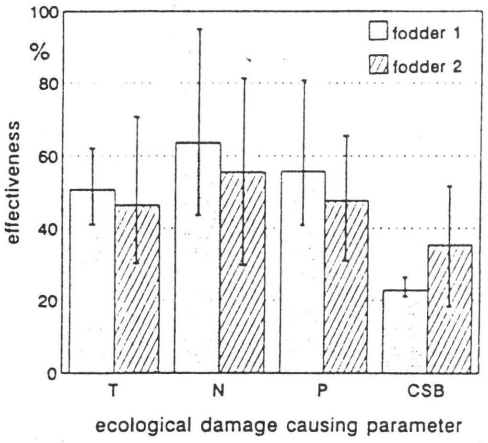


Fig. 2. Effectiveness in regard to its environmental impacts.

fodder with the descripted effectiveness.

Horizontal and vertical filtration showed in regard to its effectiveness and its capacity nearly the same results. There were no statistically differences between both fodder.

Table 2 presents features of the 4 months old compost.

Table 2. Features of the four-month old compost

Composition	Value
Dryness (%)	15.6
C : N	14.8 : 1
Nutrients (g/kg T)	
C_{total}	370.7
N_{total}	25.6
P_2O_5	31.6
K_2O	4.4

CONCLUSIONS

The ecological damage to the environment through fish farming could be reduced by using wheat straw mattress for filtration the sewage.

Dryness, nitrogen and phosphorus impact by means of sewage from intensive fish farming could be reduced about 50 %. The chemical oxygen demand which causes the sewage fee could be reduced about 20 % that means there are likewise economic advantages if a straw filter is used.

In addition the remain left over the filter and the straw which built up the compost could be used for plant production.

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