Domestic wastewater characterization by emission source

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Domestic wastewater characterization by emission source

Why this subject? because of the demand of the society

- to better reuse nutrients, metals, treated wastewater,…
- to limit the use of drinking water,
- to help those who make the choice of dry toilets,
- to optimize treatment units, also at the scale of a house,
- …

In France, 20% of the population are concerned by the “on-site treatment”.

In this context, we try to answer to 2 questions:

1- What is the characterization of each source of effluent from the human activity?

2- What is the potential of each effluent to be treated by a biological process?

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Which classification of the sources?

Domestic Wastewater

Blackwater

Greywater
Which classification of the sources?

Domestic Wastewater

Blackwater

Greywater

Yellow water

Brown water

Other

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Urine

Flush water

Faecal matter

Toilet paper / Flush water

Cleaning activities / Spillage

Context | Methods | Results | Conclusion

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Domestic Wastewater

- Blackwater
  - Yellow water
  - Urine
  - Faecal matter
  - Toilet paper / Flush water
  - Cleaning activities / Spillage

- Greywater
  - Brown water
  - Flush water
  - Food and cleaning
  - Personal care

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Which classification of the sources?

Domestic Wastewater

Blackwater

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Yellow water

Brown water

Other

Food and cleaning

Personal care

Urine

Flush water

Faecal matter

Toilet paper / Flush water

Cleaning activities / Spillage

Laundry

Kitchen sink / Dish washer

Bath and shower

Wash basins

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Bibliographic review

Data from

- Scientific support (treatment of domestic wastewater)
- Medical characterization on human excreta
- From the occidental part of Europe (life similar than in France)
~ 100 papers

Specific attention during the critical reading:

- Occupation rate of the house.
- Analysis methods: SS, BOD$_5$, ....................
- What effluent? new, stored? If stored, how?

Datasets are not often detailed. This review is mainly based on averages

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- Other
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Greywater

- Food and cleaning
  - Laundry
  - Kitchen sink / Dish washer

- Personal care
  - Bath and shower
  - Wash basins

For each source: mean, minima and maxima.

3 units:
- Vol: L.(pers)^-1.d^-1
- Concentrations: mg.L^-1,
- Mass: g.(pers)^-1.d^-1.

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Data in the preprint

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The volumes are very different and sometimes very important. They are depending from the habits.

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The number of data are very low. Instead, The 3 types of greywater are still concentrated.

BOD$_5$ = 300-450 mg/L in case of a non-diluted wastewater in a sewerage:

### Food
- 1 data
  - DM = 879 mg/L
  - BOD$_5$ = 756 mg/L

### Personal Care
- 4 - 14 data
  - DM = 477 mg/L
  - BOD$_5$ = 131 mg/L

### Laundry
- 1 data
  - DM = 658 mg/L
  - BOD$_5$ = 567 mg/L

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C (SS, BOD\textsubscript{5}, COD) is the half of effluent from food, mass from laundry is higher than mass from personal care

N: food = laundry = personal care

P: from laundry only, depending on the composition of the wash powder
Nutrient balance for biological treatment based on BOD$_5$::N::P = 100:5:1

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- Urine
- Faecal matter
- Greywater
- Domestic wastewater

TN / BOD$_5$

TP / BOD$_5$

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1- Qualification and quantification by emission source are not well known (<10 data by each source)
It is necessary to complete the basis by new data.
Greywater seem to be very different: food, laundry or personal care

2- Greywater represent an important part of the wastewater
Volume: ~ 70% (and more, if no use of flush water)
C (COD, BOD$_5$, SS): ~ 25-40%
P: ~50%

3- Greywater could show some deficiency in nutrients.
Which are the impact of those lacks on the bacterial growth, necessary for their biological treatment?
In the aim to answer to the society demand (dry toilets, reuse of nutrients,...), technical adaptations have to be defined. They have also to be in adequation with the scale of a “house”.

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Thank you for listening.