BIOGAS FROM DIFFERENT FEEDSTOCKS

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Introduction

Biogas is an environmentally advantageous energy source which is mostly comprised of CH4 (60%) and CO2 (35–40%) in addition to NH3, H2S, H2, O2, N2, and CO. Biogas is the gas evolved from anaerobic digestion, for the transformation of waste materials to energy sources through the treatment of various organic waste such as municipal solid waste, food waste, industrial waste, sewage sludge, animal manure and agricultural residues, known as biomass. The anaerobic digestion of different feedstocks is one of the more promising ways to meet the European objectives. Infect the yields into methane depends on the amount of basic organic components (fats, proteins, carbohydrates) and on percentage of the dry substance and volatile solids present in the dry matter.

Objectives

The aim of this work is to evaluate the biogas production from different feedstocks, because it is the main index to be considered in a process economic evaluation and it gives a measure of efficiency for an anaerobic digestion.

Materials and methods

In this research several biomasses are characterized through analysis of total solids, organic substances and elementary analysis (CHN-SO). Agro-industrial wastes, agricultural residues, livestock wastes are the analyzed biomasses.

Figure 1. Heater fixed at 378 K used for the analysis of total solids

Figure 2. Mitten fixed at 723 K for the analysis of organic substances

Figure 3. Elemental analyzer CHNS/O

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Results

These results as m3-biogas/t-biomass are obtained: candies 231, carrots 27, corn 221, barley 219, tomatos 9, watermelon 12, pork (50%)-candies (50%) 186, corn (50%)-candies (50%) 226, pork (50%)-tomatos (50) 75, bovine 62, pork 142.

Results show that substrates such as candies have an high content of organic substance, so they have an high potential to produce biogas; however the content of total solids is high so it is necessary a co-digestion with biomass whit a low content of total solids.

Diet	Candies	Carrots	Corn	Barley	Tomatos	Watermelon	Bovine	Pork
Dry substance (%)	94.32	11.56	88.63	89.46	4.77	5.84	25.89	57.57
Organic substance (%)	97.88	92.02	99.64	98.08	72.38	84.45	95.8	98.67
Total waste (tons/years)	10450	90600	10930	11000	279500	195500	38900	17000
Daily yield of dry (kg/day)	27004	28694	26540	26961	36526	31280	27592	26813
Dry organic matter (%)	97.88	92.02	99.64	98.08	72.38	84.45	95.8	98.67
Yield of dry organic matter (kg/day)	26431	26404	26445	26443	26438	26416	26433	26457
Specific yield of biogas (m^3/kg of dry organic matter)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Theoretical yield of biogas (m^3/day)	13216	13202	13222	13221	13219	13208	13217	13228
Produced theoretical biogas (m^3/year)	4823742	4818793	4826192	4825830	4824905	4820913	4824110	4828367
Demolished dry organic matter (%)	50	50	50	50	50	50	50	50
Produced biogas (m^3/year)	2411871	2409396	2413096	2412915	2412453	2410456	2412055	2414184

Table 1. Experimental results for different diets

Diet	Pork(50%)-Candies(50%)		Corn(50%)-Candies(50%)		Pork(50%)-Tomatos(50%)	
	Pork	Candies	Corn	Candies	Pork	Tomatos
Dry substance (%)	57.57	94.32	88.63	94.32	57.57	4,32
Organic substance (%)	98.67	97.88	99.64	97.88	98.67	72.38
Total waste (tons/years)	6500	6500	5350	5350	16000	16000
Daily yield of dry (kg/day)	10252	16797	12991	13825	25336	2091
Dry organic matter (%)	98.67	97.88	99.64	97.88	98.67	72.38
Yield of dry organic matter (kg/day)	10116	16441	12944	13532	24901	1513
Specific yield of biogas (m^3/kg of dry organic matter)	0.5	0.5	0.5	0.5	0.5	0.5
Theoretical yield of biogas (m^3/day)	5058	8220	6472	6766	12450	757
Produced theoretical biogas (m^3/year)	1846140	3000414	2362317	2469571	4544346	276202
Demolished dry organic matter (%)	50	50	50	50	50	50
Produced biogas (m^3/year)	923070	1500207	1181159	1234786	2272173	138101

Table 2. Experimental results for different diets in co-digestion

Conclusions

Biomasses with higher carbon content and therefore with higher yield of methane are from livestock wastes, while lower levels are obtained for agro-industrial wastes.