# ANAEROBIC FERMENTATION OF SOLID BIOWASTES

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***Abstract***

*In concurrence on essay of separate collection in house biowaste at urbanization settlement Hvezda (Jindrichuv Hradec) were extracted every month (April - August 2 004) samples of separated biowaste and in experimental 100 l of mixed fermenters was verified in these biowaste biogas production. There were valued the interrelations between biogas production and with analytical values the biowaste quality - fat content, content of hydrolyzed fibers, carbon and the C:N ratio. Close correlative relation were found especially among biogas production, the total fat content, hydrolyzed fibers ( r = 0,947) and among biogas production and carbon content in biowastes.*

**Key words:** biowaste, essay, carbon content, C:N ratio, fat content, biogasification.

## INTRODUCTION

In the year 2004 was realized an extense essay with biowastes in Jindrichuv Hradec on urbanization settlement Hvezdarna. On this urbanization were placed 80 containers for putting off house biowaste (Novak 2004). In the transaction period of separated collection were also provided analyzes of recollected biowastes and was analyzed biogasification of house biowaste. In this note we value biogas production from house biowaste in dependence of qualitative properties, it was especially the fat content, the content of hydrolyzed fibers, carbon and C:N ratio.

## MATERIAL AND METHODS

The valuation of fat content and hydrolyzed fiber were realized according to Henneberg – Stohmann methodology for homogenized and granulated arranged samples of biowastes from Jidrichuv Hradec. The fat determination was realized by the help of soxhlet extractor with the extraction of kerosene for a time of duration at 7 hours. The rest was cook 10 minutes in 8 % of sulfuric acid and in 3 % of soda hydroxide and after evacuation; it was determined non hydrolyzed portion.

Biogasification was determined in mixed 100 l laboratory warming reactors for the duration of 30 days at temperatures of 55°C. Biogas was metered by a dry gas-meter type G (producer East Czech Gas Company), methane content of biogas was determined by an analyzer of dump gas. Biowaste was biogasified like water suspense with a dry matter content of 10 % with addition of inoculates from cattle sewage 5 %.

In total were gradually valued 5 samples of house biowastes taken away in the months from April to August (from sample 1 to sample 5).

## RESULTS AND DISCUSSION

In tab. 1 is a comparison between the biogas production and methane production in biogas gained from separate house biowaste from Jindrichuv Hradec with analytical characteristics of these biowastes, about which we presented pursuant to literary sources (Robertson - Soest 1977, Stewart et al. 1984). According to literary sources anaerobic biomass biodegradability increase with the growth of polymeration level and crystallic cellulose content in biowastes. Into our valuation was included the fat content in biowastes, further the content of hydrolyzed fibers, content of all carbon and C:N ratio. Along valuation was included like further indicator the sum of fat content and hydrolyzed fiber.

At comparison of analytical characteristics in biowaste samples taken gradually away in months from April to August is possible to confirm (tab. 1) that a considerable variability in particular samples at fat content (3,41 + 0,66 % of dry matter) and in the content of hydrolyzed fibers (22,92 + 2,32 % of dry matter). In further characteristics the biowaste samples taken away in particular months did not notably differ and above all offered small variable biogas production (461 + 20, 15 l / kg of dry matter) and the inclusion of methane in that (275,4 + 12,96 l / kg of dry matter).

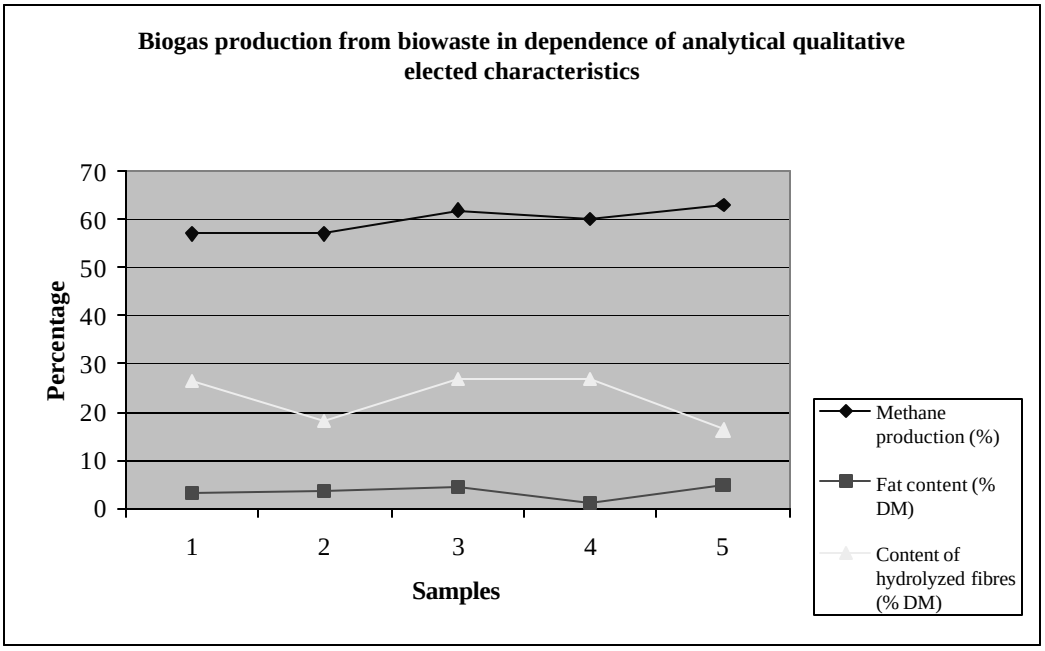
The dependence of biogas production on the contained fat quantity in our statistical set of analytical dates was not possible to prove. The analyzed samples had evidently a low fat content, maximal 4,98 % in dry matter, the major part of all samples were wastes on base of vegetable weavings and the content of kitchen remains from animal origin was the minimum. As well, it wasn't found the dependence among C:N ratio and biogas production. Biogas production was in close dependence on carbon content (r = 0,819), on content of hydrolyzed fibers (r = 0,904) and above all on the summary content of hydrolyzed fiber and fat (r = 0,0947). A close dependence is also among the

produced methane and above-mentioned analytical characteristics (r = 0,733 as far as 0,827).
Engeli, Egger 1998 presented a mean value of biogas production for different biowastes. For kitchen remains presents a value of 245 l/kg for vegetable wastes 90 l/kg and for fat 800 l/kg. Our cited values from fermentative experiments after calculation on base of original waste matter (102 - 186 l/kg) are more inferior to the presented literary values in results of less perfect biogasification appliance.

**Tab. 1. :** biogas production from house biowaste in dependence of elected analytical qualitative characteristics.

| Item | Unit | Biowaste sample | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | Average | Standard error |
| Biogas production | l . kg . d.m$^{-1}$ | 480 | 432 | 520 | 470 | 403 | 461 | 20,15 |
| Methane production | l . kg . d.m.$^{-1}$ | 269 | 250 | 322 | 282 | 254 | 275,5 | 12,96 |
| Fat content | % d. m. | 3,14 | 3,51 | 4,32 | 1,08 | 4,98 | 3,41 | 0,66 |
| Content of hydrolyzed Fibers | % d. m. | 26,48 | 18,24 | 26,75 | 26,82 | 16,33 | 22,92 | 2,32 |
| Fat content and hydrolyzed fibers Total | % d. m. | 29,62 | 21,27 | 31,08 | 27,9 | 21,31 | 26,23 | 2,07 |
| Carbon content (C) | % d. m. | 38,69 | 33,06 | 42,79 | 45,45 | 31,07 | 38,31 | 2,74 |
| C:N ratio | X | 25,45 | 16,2 | 18,21 | 20,33 | 23,36 | 20,72 | 1,67 |

**Fig. 1:** Biogas production from house biowaste in dependence of elected analytical qualitative characteristics .




## CONCLUSION

Anaerobic digestion of communal biowaste is the source of renewable energy for biogas and digestible matter representing organic fertilizer, which proved completely the presented experiment. Even if biogas stations for processing communal biowastes are capital exigent arrangements, the gained renewable energy of biogas warrants a fast backflow of investment (Munoz, Havrland 2004). For its ecological effectiveness is necessary determine anaerobic digestion technology like a technology of sustainable development (Vana, Munoz 2004).

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