RESEARCH ON EVALUATION OF PATHOGEN POTENTIAL OF HOUSEHOLD SOLID WASTE

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Abstract

Biological factors vehiculated by the household waste can enter in the body through the airways, digestive system, skin and may cause contagious diseases.

Investigation and evaluation of the pathogen potential of the household solid wastes and the bacteriological analysis of the air near the garbage are necessary because the street household can station several days and an inappropriate management has a harmful influence to human health.

Keywords: household waste, diseases, micro-organisms.

INTRODUCTION

Knowledge of solid waste generation and composition is necessary for an accurate decision making in the management strategy of urban waste. (Zeng et al., 2005).

Interrelationships between population health protection and environmental protection has long recognized and waste management it is necessary to ensure a climate of healthy lifestyle.

The quantities of generated household solid waste have registered a general tendency of growth determined by the growth in consumption of the population and by increasing of the population served by the public sanitation services in centralized system.

Household solid wastes are one of the most harmful environmental factors due to their large quantity an rich composition in microorganisms.

Inappropriate solid waste operation, storage, collection and disposal practices entail environmental and public health risks (World Resources Institute 1996). Decision making in solid waste management (SWM) requires a sound understanding of the composition and the processes that determine the generation of waste (Acurio et al. 1997).

The problem of domestic waste is drawing increasing attention of the people as huge garbage is lying down uncollected beside the roads, streets dustbins and on the ground which is causing threat to the environment as well as endangering public health.

This waste is generated as consequences of household activities such as the cleaning, cooking, repairing empty containers, packaging, huge use of plastic carry bags. Many times these waste gets mixed with biomedical waste from hospitals and clinics. There is no system of segregation of organic, inorganic and recyclable wastes at the household level. The improper handling and management of Domestic Waste from households are causing adverse effect on the public at large and this deteriorates the environment.

The municipal workers are most affected people by the occupational danger (hazard) of waste handling, they suffer from illness like eye problems respiratory problems, gastro and skin problems. The persons who wander for collecting the discarded things for selling purpose through wastes also suffer from various health problems like respiratory problem from inhaling particles, infection from direct contact with contaminated materials which lead to headache, diarrhea, fever and cough and cold.

The residues can be important vectors in the spread of infection. Waste from hospitals contain a wide range of micro-organisms such as pathogenic agents including viruses, bacteria, eggs of parasites. Pathogenic agents live in the waste days or months where they can enter in soil, in underground, in rivers causing infections, epidemics and degradation of environmental quality.

Contaminated areas are the points of delivery and unloading of waste, sorting stations and processing waste stations.

MATERIALS AND METHODS

The physics, chemical and microbiological analysis of several variants of city household solid waste were carried out in the microbiology laboratory of the Faculty of Environmental Protection of Oradea. The composition of the household solid waste was 90% vegetable scraps (potatoes, carrots, onions, fruits scraps etc.).

The samples of household solid waste were collected in the months january, march and may of the year 2012, in 4 variants. The humidity of household solid waste samples was determined using gravimetrically method by oven-drying fresh soil at 105^0C and pH in 1:10 samples water suspension by pH-meter.

The household solid wastes (10 g) were suspended in 90 ml distilled water. Dilutions (of 10^{-6}) were prepared using distilled water and these were dispersed with a top drive macerator for 5 min. The household solid waste samples taken from suitable dilution were planted in the solid feeding medium as required. Plate count method was used to estimate the total number of microorganisms on a solid nutrient medium containing meat extract (Atlas, 2004).

Total number of yeasts was determined using YPG medium and for the fungi cultivation was used Sabouraud agar.

After incubation the counts obtained were multiplied by the dilution factor to obtain the number of colony forming unit per gramme of soil.

The number of microorganisms of the air near the storage containers for collection was evaluated by culture settling plate technique. The numbers of aerobic plate count (mesophilic aerobic bacteria was determined using plate count agar (PCA) according to methods proposed by APHA. The experiment was conducted with a threefold repetition for each microbiological determination. For the culture settling plate technique, open Petri dishes containing 20 ml of culture media (PCA) were distributed at the processing areas and exposed for about 15 to 30 minutes. The Petri dishes were closed and incubated at 35ºC/ 48 h. The results were calculated after 24 hours.

RESULTS AND DISCUSSION

The largest values of the humidity of the household solid wastes were registered in march and may due to frequent rainfall.

Table 1

The moisture of household solid wastes samples

Determinations	Humidity (%)		
	January	March	May
1	6,8%	10,5%	13,5
2	8,0%	10,8%	14,5
3	9,0%	11,0%	14,8
4	7,8%	11,5%	15,8

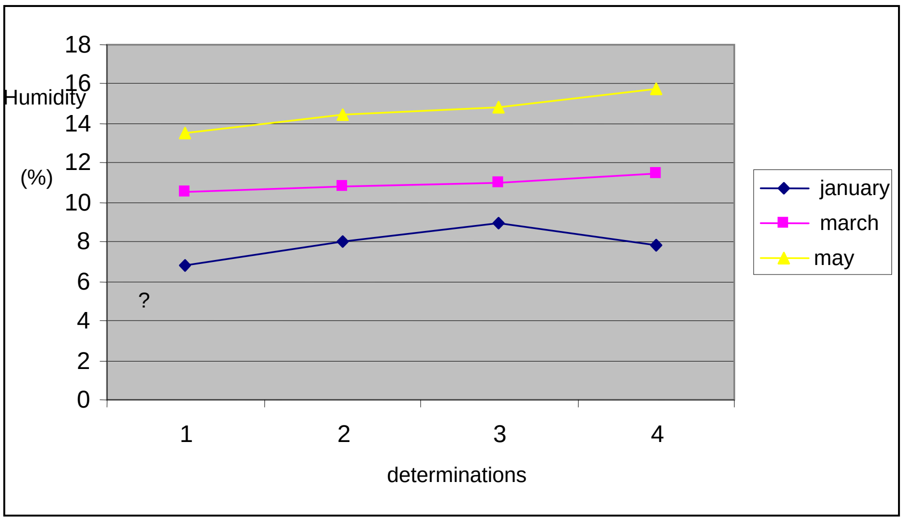

Fig. 1 The humidity (% of weight) content of the household solid wastes samples

The biodegradable activity of the microorganisms has an optimal at 5,5-5,8 of the pH values. Low values of pH involve the development of the fungi. The values of the pH (5,3-6,9) were optimal for the development of the yeast and moulds.

Table 2

The pH of the household solid wastes samples

Determinations	pH		
	January	March	May
1	5,3	6,7	6,3
2	5,8	6,8	6,7
3	6,1	6,9	6,1
4	6,0	6,4	5,9

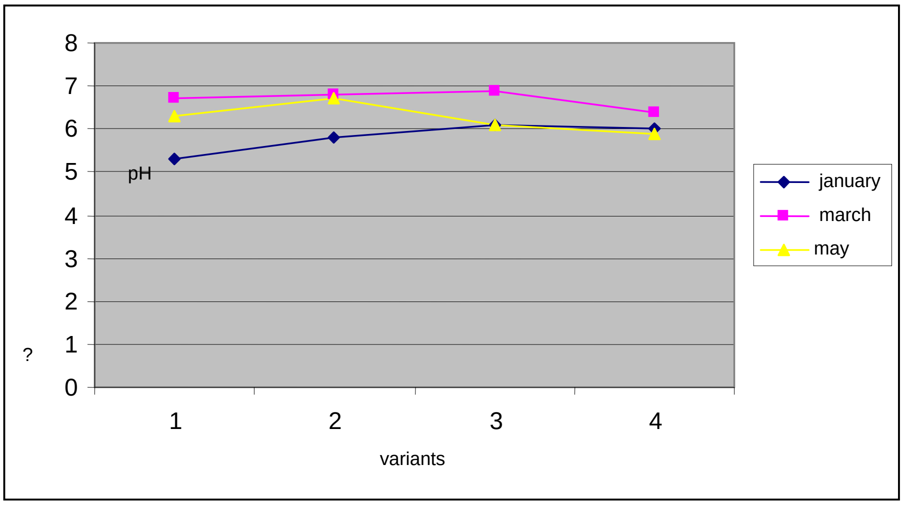

Fig. 2 Variation of the pH of the household solid wastes samples

In may was registered an increase of the total number of microorganisms (109 CFU/g) due to frequent rainfall. The number of microorganisms increased because the household solid waste was'nt promptly collected from the storage containers.

Table 3

Total number of micro-organisms (CFU/g)

Determinations	N.T.G. (CFU/g)		
	January	March	May
1	13	95	109
2	14	88	105
3	11	95	103
4	15	86	108

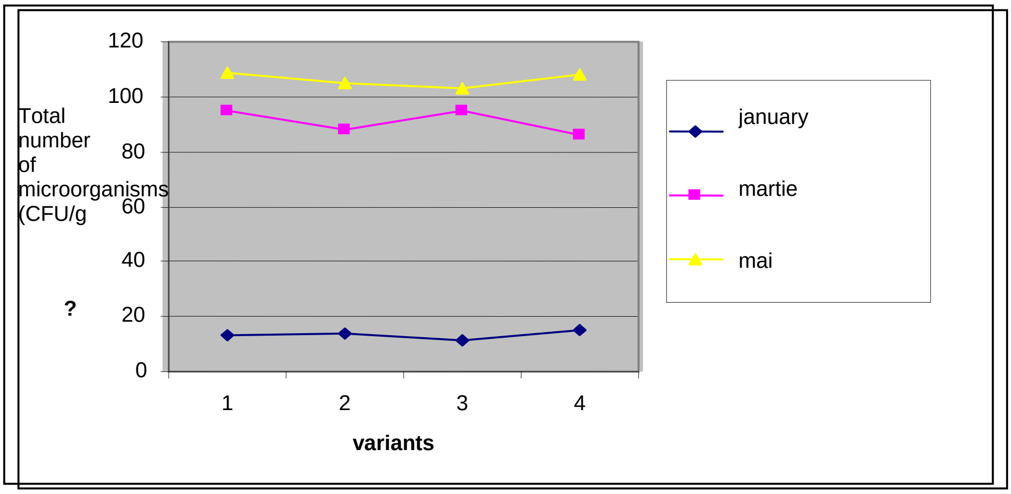

Fig. 3 Total microflora (UFC/g household waste sample)

The yeast and moulds were well represented numerically due to humidity and low pH values.

Table 4

Determinations of the total number of yeast and moulds from the household solid wastes

Variants	Total number of yeast and moulds (CFU/g)		
	January	March	May
1	78	95	110
2	84	98	109
3	65	108	125
4	55	106	135

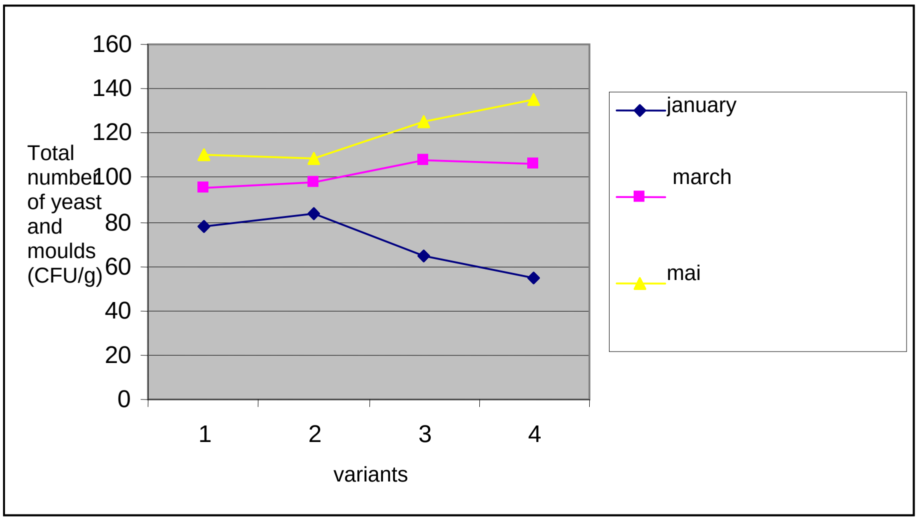

Fig. 4 Variation of the total number of yeast and moulds from the household solid wastes

Because the household solid waste was'nt promptly collected from the storage containers in warm days of the may, with calm atmosphere, unpleasant odors have been propagated and the air near the storage containers of the household solid wastes was heavily microbial loaded.

The lowest values of the total microflora were registered in january when the microbial activity is inhibited by the low temperatures and also the proportion of the biodegradable waste is reduced.

Table 5

Bacteriological analysis of the air near the storage containers of the household solid wastes

Determinations	Total number of microorganisms (CFU/m^3)		
	January	March	May
1	2500	5500	9000
2	1000	5200	7000
3	1700	7500	6500
4	1500	8000	6000

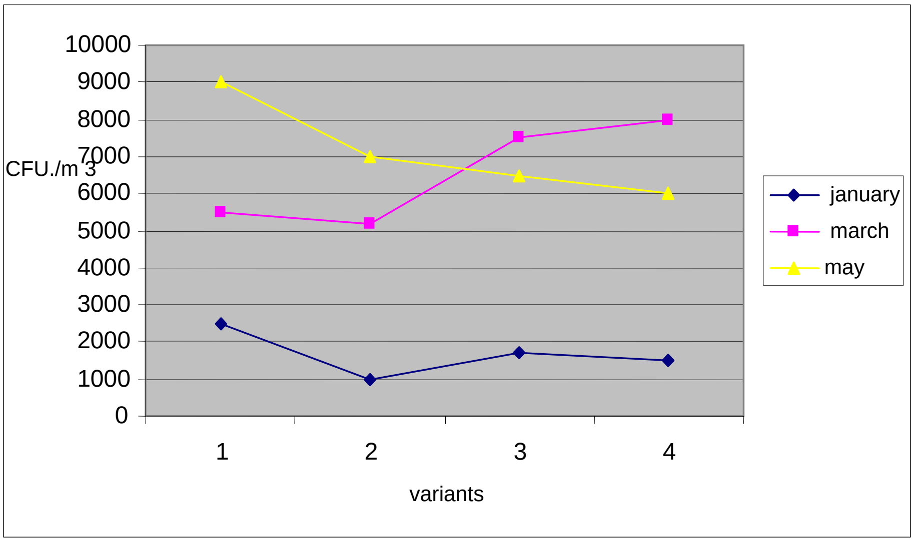

Fig. 5. Variation of the aerobic mesophylic bacteria (CFU/m^3) of the air near the storage containers of the household solid wastes

CONCLUSIONS

The largest values of the humidity of the household solid wastes were registered in march and may due to frequent rainfall.

The values of the pH (5,3-6,9) were optimal for the development of the yeast and moulds.

In may was registered an increase of the total number of microorganisms (109 CFU/g) due to frequent rainfall. The number of microorganisms increased because the household solid waste was'nt promptly collected from the storage containers.

The yeast and moulds were well represented numerically due to humidity and low pH values.

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