Sodium Hypochlorite Dosage For Rainwater Harvesting System For Potable Use In Gambang, Malaysia
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Abstract
Rainwater harvesting system for potable use is essential in many parts around the world from the aspects of both sustainable water supply and public health. In a remote rural area, rainwater harvesting can be the important or the sole supplementary source when the supply of clean drinking water is limited. However, rainwater can be contaminated by following contact with the catchment surface and could be potential public health risks associated with microbiological and pathogens. Sodium hypochlorite solution NaOCl was used as antiseptic and for disinfection purposes with a specific dosage to eliminate the microbial contamination. Rainwater samples were collected two times a week from the main storage tank of WASHA harvesting system for six months period of time and all rainwater were examined in the environmental laboratory of the Universiti of Malaysia Pahang. The efficiency of sodium hypochlorite solution NaOCl concentration and optimum dosage for disinfection was 3.5 mg/l which was added to rainwater harvesting system to maintain free chlorine residual not more than 0.2 mg/l after one hour of sodium hypochlorite addition and not less than 0.1 mg/l after 24 hours of storage within the approved standard limits of World Health Organization WHO and Center for Disease Control CDC.

Back ground of the study
This study was done in a rural area of Gambang, Pahang near south east coast of Malaysia.
- Malaysia is a tropical country and receiving an average annual rainfall of 1764 mm.
- Rainfall consider one of the main water resources especially in remote rural areas.

Objectives
- To determine the optimum dose of sodium hypochlorite in a project area
- To monitor and evaluate the rainwater harvesting system by treating the household water
- To improve the quality of harvested rainwater projects for rural areas and materials an access to alternative safe clean drinking for people during floods and emergencies according to WHO, EPA and CDC.

Materials and Methods
Water samples were dosed with sodium hypochlorite solution of 3% concentration after dilution at Laboratory and the water samples were dosed with 1.5, 2.5, 3.5 and 4.5 mg/l respectively to 1 liter of rainwater sample. FAC and TC were measured by using APHA DPD 4900-C1 G approved method. FAC residuals were measured for a certain time period (0.5, 2, 4, 8 and 24 hours) to obtain the optimum dose according to WHO and CDC and within range of 0.2 mg/l after 24 hours contact time. Also, chlorine demand was satisfied first.

FAC Residuals Results

Conclusion
The optimum dosage for Rainwater harvesting system was conducted at 3.5 mg/l within the recommendation for WHO program and CDC as it met the requirements of not less than 0.2 mg/l after 24 hours contact time and not more than 0.3 mg/l, after 30 minutes to make sure that the best and easy is acceptable for the consumers.

Recommendations
- For health safety, the harvested rainwater should be treated with optimum chlorination dosage prior to use for drinking purpose.
- Increasing the size of rainwater harvesting tank in WASHA system up to 5000 L capacity.
- To improve the quality of harvested rainwater system, a system that can be dismantled over to avoid any blocking into the gutters.
- Health extension community workers should be trained on maintaining good sanitary conditions of harvested rainwater.

Future Work
- Further future investigation studies should be carried out to assess the quality of harvested rainwater.
- Risk assessment studies more needed on these type of waters as they are uncommon and specific knowledge regarding contamination and how to improve the design and collection of rainwater system.
- More studies should be applied regarding the chlorination for rainwater harvesting systems, the needed concentrations and dosage to be applied and to advise rainwater harvesting systems to people in remote rural areas about how to use the sodium hypochlorite solution FAC to maintain the quality of rainwater harvesting systems to be used in an alternative safe drinking water source especially in natural common disasters and during floods in Malaysia.

Acknowledgments
The work presented in the study would not have been completed without assistance of my Supervisor Mr. Abd Farukh Sh. Razak
My Co. Supervisor Dr. Nurul Ismail Siddique
- Maham Baryal Ziauddin
- The staff laboratory of Universiti of Malaysia Pahang.

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