WHO International Scheme to Evaluate Household Water Treatment Technologies

SPOUTS Water Purifaaya Filter

Product evaluation report

| WHO performance classification | Targeted protection (bacteria and protozoa only)  
One-star (★) |
| Manufacturer                   | SPOUTS of Water Ltd  
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Katale, Wakiso  
Uganda  
www.spoutsofwater.org |
| Evaluation procedure           | Full laboratory testing |
| WHO report issue date          | Round II, 2018 |
| WHO reference number           | 15/08/2015-R2-26 |

Summary of evaluation

This report summarizes the results of laboratory testing of a ceramic filtration device known by the tradename ‘SPOUTS Water Purifaaya Filter’ under Round II of the World Health Organization (WHO) International Scheme to Evaluate Household Water Treatment Technologies (the Scheme). Testing followed the requirements of the WHO protocol for batch filtration technologies. Testing investigated the ability of the device to inactivate bacteria, viruses and protozoa. Based on the evaluation results, the SPOUTS Water Purifaaya Filter meets WHO performance criteria and is classified as providing Targeted protection (★) against bacteria and protozoa only.
Background

Evaluation under the Scheme is based on performance criteria set out in Evaluating Household Water Treatment Options: Health-based targets and microbiological performance specifications (WHO, 2011). The criteria were determined by applying quantitative microbial risk assessment (QMRA) methods outlined in the WHO Guidelines for Drinking-water Quality (2017) and set log_{10} reduction targets against bacteria, viruses and protozoa as shown in Table 1.

Table 1. WHO performance criteria for household water treatment technologies

<table>
<thead>
<tr>
<th>Performance classification</th>
<th>Bacteria (log_{10} reduction required)</th>
<th>Viruses (log_{10} reduction required)</th>
<th>Protozoa (log_{10} reduction required)</th>
<th>Interpretation (with correct and consistent use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>★★★</td>
<td>≥ 4</td>
<td>≥ 5</td>
<td>≥ 4</td>
<td>Comprehensive protection</td>
</tr>
<tr>
<td>★★</td>
<td>≥ 2</td>
<td>≥ 3</td>
<td>≥ 2</td>
<td>Meets at least 2-star (★★) criteria for two classes of pathogens</td>
</tr>
<tr>
<td>★</td>
<td>Meets at least 2-star (★★) criteria for two classes of pathogens</td>
<td></td>
<td></td>
<td>Targeted protection</td>
</tr>
<tr>
<td>–</td>
<td>Fails to meet criteria for 1-star (★)</td>
<td></td>
<td></td>
<td>Little or no protection</td>
</tr>
</tbody>
</table>

Product description

The SPOUTS Water Purifaaya Filter is a silver-coated ceramic pot filter. Microorganisms are physically removed from water as it filters through the ceramic pot under gravity. The assembled unit set comprises a ceramic pot in a 20 L bucket that serves as a receptacle for the filtered water. The full product description, illustrations and use instructions can be found at: www.spoutsofwater.org.

Test methods

Product-specific test plan: A product-specific test plan was developed based on the manufacturer’s instructions for use; the Harmonized Testing Protocol: Technology Non-Specific V 2.0 (2018a); and the for Gravity-fed Batch Filtration Technology Protocol V 2.0 (WHO, 2018b). Testing was conducted at a WHO-designated laboratory, NSF International, in the United States of America.

Test organisms: Evaluation of the SPOUTS Water Filter investigated its performance in reducing bacteria, viruses and protozoa. The test organisms were Escherichia coli (E. coli); coliphages MS2 and phiX174; and Cryptosporidium parvum (C. parvum) oocysts.

Test waters: The device was tested in two simulated natural waters: General Test Water (GTW), simulating high quality groundwater, and Challenge Test Water (CTW), simulating surface water. Details on physicochemical characteristics of the test waters are provided in the Gravity-fed Batch Filtration Technology Protocol V 2.0.

Test set up: Three production units were used in the test, with daily test volumes of 10 L. All units were operated according to the manufacturer’s use instructions. Pretreatment and posttreatment water grab samples were analysed using methods identified in the product-specific test plan. Testing was conducted over four days (in GTW on Days 1 and 2 and in CTW on Days 3 and 4), resulting in a total of 12 sample points for each organism (i.e. 2 days × 2 test waters × 3 test units). Posttreatment silver residual samples were collected and analysed. According to the Guidelines for Drinking-water Quality (2017), when silver salts are used to treat drinking-water, a concentration of 0.1 mg/L can be tolerated without risk to health.  

1 The 0.1 mg/L is a health advisory rather than a guideline value.
Results

Fig. 1 presents the results of the bacterial, viral and protozoan testing for the three units in GTW and CTW. All test water characteristics were within specifications.

The SPOUTS Water Purifaaya Filter achieved mean $\log_{10}$ reductions of 5.7 for E. coli; 0.4 for MS2; 2.3 for phiX174; and 5.6 for C. parvum. Performance across the three units tested was generally consistent for all organisms tested, and in both test waters. All units met the minimum performance targets for bacteria and protozoa; none met the 3 $\log_{10}$ target for viruses.

Posttreatment residual silver concentrations ranged from 0.022 to 0.066 mg/L, and were below the 0.1 mg/L health advisory value in the *Guidelines for Drinking-water Quality* (2017).

Interpretation and application of results

Each production unit should consistently meet or exceed the performance target for each microbial group in both test waters (GTW and CTW). However, a maximum deviation of 0.2 $\log_{10}$ is acceptable for 25% of sample points at the two-star performance tier and of 0.4 $\log_{10}$ at the three-star performance tier. This means that for classification as a three-star product, up to three of the 12 sample points can achieve a reduction of 3.6 $\log_{10}$ for bacteria or protozoan cysts (instead of 4 $\log_{10}$) or of 4.6 $\log_{10}$ for viruses (instead of 5 $\log_{10}$). Each phage is treated separately for evaluating acceptable allowance; the overall claim for viruses is based on the lower performing phage.

Performance is classified in three ascending tiers: ★ (one-star), ★★ (two-star) and ★★★ (three-star), as shown in Table 1. Both three- and two-star products provide Comprehensive protection against all three microbial groups. One-star products meet performance targets for only two of the three microbial groups, providing Targeted protection.

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2 The maximum reduction that can be demonstrated is limited by the pretreatment challenge concentration delivered. For each organism tested, the pretreatment concentration must be sufficient to allow for the demonstration of the performance targets in the table showing the performance criteria. Due to the complexity of using viable organisms, there may be variation in these pretreatment concentrations above what is sufficient, which may lead to demonstrated reductions reported that far exceed the performance targets. However, the emphasis is on whether the performance target has been met and not the extent by which the target was exceeded.

3 These cut-off values were determined using QMRA modelling and selecting ranges that still resulted in appreciable health gains within a specific performance tier.
Performance classification

The SPOUTS Water Purifaaya Filter met the minimum performance targets for bacteria and protozoa, and did not meet the performance target for viruses. As such, it is classified as providing Targeted protection (★) against bacteria and protozoa only.

Considerations for product selection

<table>
<thead>
<tr>
<th>Microbial conditions</th>
<th>Use where contaminant of concern is known to be bacterial / protozoan microbes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicochemical water characteristics</td>
<td>Suitable for all water quality conditions</td>
</tr>
<tr>
<td>Product information and labelling</td>
<td>Check that the device is appropriately labelled and has clear instructions for use</td>
</tr>
</tbody>
</table>

References


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The results in this report reflect the performance level that the product was found to meet at the time of testing. WHO cannot represent that the products reported herein will continue to meet the stated performance levels. Furthermore, the results contained in this report may not be used by manufacturers, suppliers or any other parties for commercial or promotional purposes.

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