

# Effectivity of hand soap gel ethanol extract acem acem leaves (*Oxalis dehradunensis* Raizada) as pesticide cleaner: Experimental study in Indonesian farmers

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## ABSTRACT

The Karo's farmers use the plant as a substitute for water and soap called *acem acem* (*Oxalis dehradunensis* Raizada) leaves to clean the direct pesticide exposure at their skin. This study was aimed to determine the effective formula of *Oxalis dehradunensis* Raizada leaves extract as hand soap gel preparation to remove pesticide residues. The experimental research was conducted to explore the potential of the leaves as an alternative material for pesticide cleaner. It is a pre and post experiment that was tried by 30 farmers from Karo district, Indonesia. The material used fresh *Oxalis dehradunensis* Raizada leaves, collected from farmer's fields. The extract was gained from the leaves powder was repeatedly extracted by maceration. All farmers used a pesticide with chlorpyrifos content and wash their hands by using handsoap gel extract ethanol *Oxalis dehradunensis* Raizada formula. The water of the farmer's hand wash was check-in the laboratory for screened phytochemicals. The data were analyzed in quantitative and gas chromatography to find the ability of the extract to remove chlorpyrifos pesticide residues, in the farmer's hand wash water as a qualitative test. The results found that *Oxalis dehradunensis* Raizada was formulated into hand soap gel could remove chlorpyrifos pesticide residue from hand wash of the farmers. The ability of hand soap gel with *Oxalis dehradunensis* Raizada concentration of 5% and 7% in binding residue compounds of chlorpyrifos pesticides was considered good. It concluded the *Oxalis dehradunensis* Raizada leaves are effective to clean the pesticide residues.

**Key words:** Extract, hand soap gel, leaves, *Oxalis dehradunensis* Raizada, pesticide cleaner

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## INTRODUCTION

Karo district is a highland area in Sumatera Utara, Indonesia that generally uses pesticides freely as needed without strict supervision. The high rate of pesticide toxicity is a serious problem related to limited knowledge about the pesticide exposure levels. Dominant problem due to direct exposure which occurs due to splashes,

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seepage, and spills that increase severe intoxication by dermal exposure. Poor personal hygiene with lack of water and soap availability could increase the dermal toxicity of pesticides among farmers such as cutaneous melanoma and skin cancer. To reduce the exposure, the farmer used the wild plant called acem acem leaves or *Oxalis dehradunensis* Raizada as a medium to clean the soil impurities and pesticides.<sup>[1-8]</sup>

This research aimed to determine the effective formula is scientifically prove *Oxalis dehradunensis* Raizada as hand soap gel preparation and useful for removing pesticide residues as pesticide cleaner.

## MATERIALS AND METHODS

### Materials

Fresh *Oxalis dehradunensis* Raizada leaves were collected from Karo district, Sumatera Utara, Indonesia. It was collected in 2 h for 15 kg by farmers and directly sent to the laboratory for maceration and extraction process before the identification. The person who identifies the leaves is M. Muhammad together with the authors and laboratory team. There is no voucher specimen ref for the leaves cause it is grown free on the farmer's field as a weed plant. This research needs to prove the efficacy of the leaves cause it used as a farmer's habit to wash their hand after pesticide application to substitute the water and soap availability in the field.

### Methods

The extract was gained by maceration<sup>[9,10]</sup> and then screened phytochemicals of the leaves to determine the leaves using standard procedures.<sup>[11,12]</sup> The extract was produced in the form of hand soap gel made in three types based on the modifications of other gel formulas (F0, F1, F2, and F3). Hydroxypropyl Methyl Cellulose (HPMC)-based hand soap gel was made by dissolving the ethanol extract of *Oxalis dehradunensis* Raizada leaves in a portion of distilled water at each concentration while stirring until a homogeneous gel period was formed.

### Research design

The experiment study by the direct trial the hand soap gel *Oxalis dehradunensis* Raizada leaves extract to the farmer's wash hands. The gas chromatography method was used to see the ability of hand soap gel to remove pesticide toxins in the farmer's hands as a qualitative test.<sup>[13]</sup> We selected as many as 30 farmers in October 2020 as the study samples to wash their hands using the ethanol extract of *Oxalis dehradunensis* Raizada that had been exposed to pesticides of Dursban EC50 which containing chlorpyrifos. Before the extract trial to the farmers, all farmers have identified and collected into one field and use the pesticide like daily in 20–30 min. After that, they wash their hand after contact and spraying the pesticide divided into the formula of hand soap gel. This study also fulfilled ethical clearance requirements



**Figure 1:** *Oxalis dehradunensis* Raizada (Acem acem leaves)

number 90/KEP/USU/2020. Informed consent was provided by the farmers.

### Statistical analysis

The analysis was taken by the physical evaluation of hand soap gel supply ethanol extract of *Oxalis dehradunensis* Raizada leaves for the hand soap gel trial. The sample and treated groups were analyzed using the one-way analysis of variance ( $P < 0.05$ ).

## RESULTS

The characteristic *Oxalis dehradunensis* Raizada leaves included in the eudicots class family of *Oxalidaceae* also spreads rapidly with a clover-like leaf shape. Some types grow yellow and pink flowers. The species of these leaves are often used to clean all forms of dirt in farming activities in Karo, Sumatera Utara Province, Indonesia [Figure 1].

Phytochemicals screening found that the leaves contents of flavonoids, tannins, saponins, and steroids/triterpenoids. This compound was possible to make the leaves as a pesticide cleaner in the form of hand soap gel extract. The formula of hand soap gel extract ethanol *Oxalis dehradunensis* Raizada using the HPMC method resulted in a thick extract concentration at 3%, 5%, and 7%.

Pesticide contents found in handwashing water samples detected with the average active ingredient of chlorpyrifos respectively. The retention time of the pure compound and the analysis solution was compared. The result of the retention time of the organophosphate compounds contained in the sample was the same as the retention time of the standard solution of chlorpyrifos, which was 5 min [Figure 2]. It means that the extract has the power to catch the pesticide and to be a cleaner of pesticide exposure.<sup>[14]</sup>

It proves that hand soap gel extract ethanol *Oxalis dehradunensis* Raizada was effective in cleaning the pesticide and reduce the skin pesticide exposure [Figure 3].

The correlation coefficient linearity determination indicated that chlorpyrifos compounds had good linearity of 0.9998, with the best linearity requirement being a value of r approaching 1 ( $r > 1$ ) with a  $V_{xo}$  value of 5% i.e., 0.0827 [Table 1].

The hand soap gel extract *Oxalis dehradunensis* Raizada leaves of 5% and 7% turned out to have a good ability in binding chlorpyrifos compounds because of the high content (ppm) of chlorpyrifos pesticide residue found in hand wash water compared to the other formulas.

## DISCUSSION

The habit of washing hands after spraying can significantly reduce the potential for toxicity caused by pesticide exposure from leaking containers and spills. It needs to implement a health and safety program to protect against contamination caused by pesticide spilt and dispersed.<sup>[15]</sup> Therefore, hand washing media, namely hand soap gel, is more intended for anti-microbial properties. Concerning several studies, hand soap gel use is adapted by technological developments and modified in the form of a hand sanitizer. It is widely used as an antibacterial material. However, several studies have examined the herbal contents of handwashing soap.<sup>[16-21]</sup>

The *Oxalis dehradunensis* Raizada leaves contain flavonoids and saponins has supported the washing process of pesticide

application among farmers.<sup>[22]</sup> The pesticide of chlorpyrifos, was highly lipophilic it will not dissolve easily in water, and requiring surfactants for the washing process. During the washing process using water, the hydrophilic part will interact with water while the lipophilic part will interact with lipophilic contaminants including pesticides. Thus, surfactants act as a bridge and increase the effectiveness of pesticide washing using water.<sup>[23]</sup>

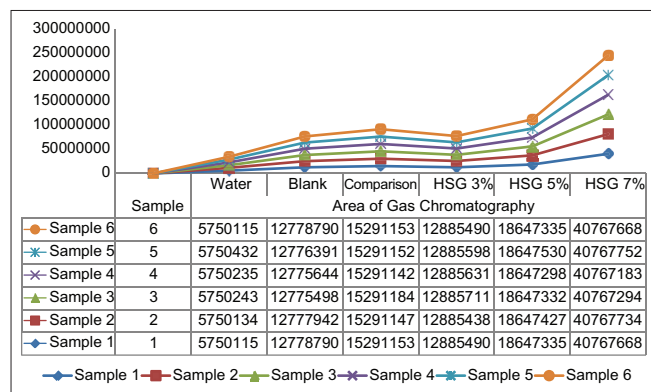
The terms of the appearance of the ethanol extract gel are stable in storage. The gel content was also evenly distributed or homogeneous with the pH value still meeting the ideal skin pH value at 4.5–6.5. The concentration of hand soap gel content of extract *Oxalis dehradunensis* Raizada leaves has the greater viscosity, greater spread and less dispersion is produced compared to the lowest concentration of the preparation. In other words, the hand soap gel sample with a concentration of 7% has low dispersion compared to samples with concentrations of 3% and 5%. On the examination of skin irritation, the results showed none for all samples.<sup>[24-26]</sup>

The samples were declared stable if the colours, smells, and shapes do not change visually during storage from the moment after completion, to after 7–14 days of storage. It showed that all hand soap gel properties in stable physically and did not experience significant changes after 14 days of storage confirming that the preparations were stable in storage.<sup>[27]</sup>

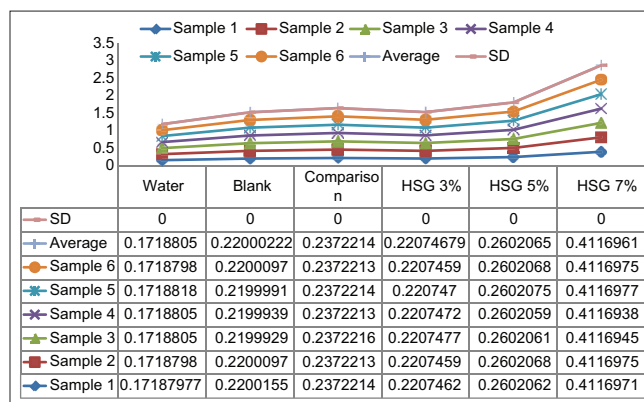
**Table 1: Statistical results of one-way ANOVA**

Sample	Significant	P-value*	CL**
Water	0,269	$P < 0.05^*$	
Blank	0,362	**Correlaion	
Comparison	0,146	<5%	
Hand soap gel extract ethanol of <i>Oxalis dehradunensis</i> Raizada Leaves 3%	0,724	0.0827	
Hand soap gel extract ethanol of <i>Oxalis dehradunensis</i> Raizada Leaves 5%	0,374		
Hand soap gel extract ethanol of <i>Oxalis dehradunensis</i> Raizada Leaves 7%	0,122		

Figure 2 showed that gas chromatography plays a specific role due to the selective and sensitive detection for organic halogen compounds and organophosphate life look the retention time (tR) in the same or stable tool conditions. The levels of pesticide residues from all data were statistically tested and showed significant differences. The use of pesticides leaves residues on soil, water, and products with detrimental effects. Uncontrolled use of pesticides will have an impact on the farmer’s health and the environment in general and increase the prevalence of poisoning.<sup>[28-30]</sup>



**Figure 2:** Chlorpyrifos pesticide residue analysis results with area of gas chromatograph



**Figure 3:** Chlorpyrifos pesticide level analysis as pesticide cleaner

The chlorpyrifos pesticide most of used by the farmers and potential to contact caused the poor safety practice. The health effects included nausea, vomiting, dizziness and itching of the skin are followed cause by chlorpyrifos exposure. In another study, some pesticides could reduce by rinsing, but chlorpyrifos was not. It means that *Oxalis dehradunensis* Raizada could be the solution to the farmers where they have the best local raw potential that proven as a cleaner of pesticide exposure.<sup>[31-33]</sup>

## CONCLUSION

We concluded that the hand soap gel of *Oxalis dehradunensis* Raizada leaves extract is effective to clean the pesticide residue and improve the farmer's personal hygiene while using pesticide. It can bind the chlorpyrifos pesticide residue shown in the handwashing water of farmers in the Karo district. The hand soap gel containing *Oxalis dehradunensis* Raizada extract with a concentration of 5% and 7% had a good ability in binding residues compounds of chlorpyrifos pesticides.

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## Conflicts of interest

There are no conflicts of interest.

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