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Original Article

FORMULATIONS AND EVALUATIONS OF HAND SANITIZER PREPARED FROM GUAVA AND ALOE VERA LEAVES

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Abstract:

This study aimed to create a hand sanitizer using natural materials, emphasizing the importance of hand hygiene in preventing the spread of infections. The results indicated that all the prepared hand sanitizers met the acceptable criteria for organoleptic characteristics. The pH of the formulations ranged from 5 to 6. A study involving 20 human volunteers evaluated the acceptability of the hand sanitizer. It was found that the hand sanitizer had a pleasant smell, providing a positive sensory experience during usage. Among the volunteers, 75% expressed a preference for F3 over F1 and F2. Based on these findings, it can be concluded that F3 was the preferred choice for the majority of the volunteers, suggesting its superiority among all the formulations.

Keywords: Hand sanitizer, Infections, Antimicrobial, Hand hygiene**.**

Introduction:

In 2019, there were reported cases of unidentified viral pneumonia. Upon laboratory testing of the samples, a novel coronavirus was identified as the causative agent (1). Coronaviruses are a group of pathogens known for primarily targeting the human respiratory system. Previous outbreaks of coronaviruses, such as the severe acute respiratory syndrome (SARS) caused by SARS-CoV and the Middle East respiratory syndrome (MERS) caused by MERS-CoV, have highlighted their impact on respiratory health (2).

The transmission of SARS-CoV-2, the virus responsible for the COVID-19 pandemic, occurs primarily through human-to-human contact. This can happen when an asymptomatic or mildly ill individual comes into contact with healthy individuals (3). To mitigate the spread of the virus, the World Health Organization (WHO) recommends the use of alcohol-based hand sanitizers (ABHS). These sanitizers offer several advantages, including rapid action and a broad spectrum of microbicidal activity, effectively protecting against bacteria and viruses (4).

The recommended alcohol-based hand sanitizers by the WHO typically contain ethanol, isopropanol, and various types of hydrogen peroxide (5). These components work together to eliminate a wide range of microorganisms, including enveloped viruses like coronaviruses (6). To ensure their effectiveness, it is important to follow the manufacturer's instructions and use hand sanitizer properly, thereby reducing the risk of infection.

Aim & Objective

The present research deals with the formulations and evaluations of hand sanitizer prepared from guava and aloe Vera leaves.

Material and Methods

Collection and authentication of plants

Collection of leaves of the plant The plants leaves were collected for the preparation of sanitizer from in and around the campus of the Divine college of Pharmacy, Ziradei, Siwan. The specimens have been submitted to the department of Pharmacognosy. The plant selected on the basis of its potent antimicrobial activity reported in research articles. The plants used for the study were *Aloe barbadensis* (Ghrit kumari) and guava (*Psidium guajava*). The plants leaves collected were weighed, washed, cleaned and shade dried in laboratory. After drying plant extract was prepared and used for the preparation of hand sanitizer.

Extraction of Guava leaves

The leaf samples (**Fig.1**) underwent a series of steps for extraction. Firstly, they were rinsed with tap water, dried, and then ground into a powder using a blender. To perform the maceration extraction, four solvents with increasing polarity were utilized: n-hexane (>95%), methanol (>95%), ethanol (>99.5%), and boiling distilled water. Each solvent was combined with the leaf powder to create a 20% concentration mixture.

Fig.1. Collected Guava leaves

To prevent evaporation and light exposure, the mixtures were placed in sterile 125 mL Erlenmeyer flasks, which were wrapped in aluminum foil. These flasks were then kept at room temperature for 3 days on a platform shaker set at 70 rpm. Following the soaking period, the mixtures were transferred to 50 mL tubes and subjected to centrifugation at 4,000 rpm for 10 minutes at 25°C. This process led to the separation of a supernatant, which was carefully collected and stored at 4°C until further use (7)

Extraction of Aloe Vera

Aloe Vera leaf was collected (**Fig.2**) and ensured a thorough washing to eliminate any unwanted particles and dust. Afterward, the Aloe vera leaves were halved, and the inner pulps were separated from the leaves using a knife. The pulps were then ground in a grinder machine, and the resulting gel was carefully placed into a separate bowl.

Fig.2. Collected Aloe Vera leaves

Formulations

Dhamankar, MSS *et* al. conducted a research study in which different ingredients were utilized at varying concentrations. The ingredients employed in the study included spirit , glycerine, aloe vera, and guava leaves (8). This research involved modifying the quantities of the ingredients used. Different formulation has been mentioned in the Table 1.

Table 1: Formulations of Hand Sanitizer

Material	Quantity		
	F1	**F2**	**F3**
Surgical spirit	75 ml	65 ml	65 ml
Glycerine	7.5 ml	6 ml	8 ml
Aloe Vera pulp	13.5 ml	25 ml	20 ml
Guava extract	3 ml	3ml	4 ml
Perfume	1 ml	1 ml	3 ml

Evaluation parameters

- ***Organoleptic Properties:*** Tests like Colour, Odour and Clarity were carried out (9).
- ***Physical properties*** pH: The formulated solution's pH was determined using a digital pH meter (Labman Scientific Instruments Pvt.td). The pH measurements were determined as the average value along with the corresponding standard deviation (SD) from three replicates (10).
- ***Skin Irritation Study (Acceptability Test):*** To conduct the assessment, a quantity of 1 mL of sanitizer gel was applied to the palm of each volunteer. The gel was then left undisturbed for a period of 5 minutes. All volunteers participating in the study exhibited no clinical signs of dermal abrasion, trauma, or infection. Each volunteer was given a questionnaire to evaluate the acceptability of the sanitizer gel and assess any potential skin irritation. The formulation was rated based on various characteristics, including the appearance of the product, its smell, texture, any reported

sensations of irritation or burning, and the presence of redness following the application of the hand sanitizer gel (10)(11)(12).

Results and Discussion

Evaluation parameters

Organoleptic properties:

To assess the physical appearance of the prepared hand sanitizer formulations, an organoleptic test was conducted. After visually inspecting the hand sanitizer, it was found that all tested formulations exhibited favourable characteristics. The hand sanitizer was clear and was easy to apply. Additionally, they had a light texture, spread smoothly, and maintained a consistent flow (13). The organoleptic properties have been mentioned in **Table 2**.

Table 2: Organoleptic properties

Properties	Appearance
Colour	Green
Odour	Characteristics
Clarity	Opaque

Physical properties:

Table 3: Physical properties (pH)

Formulation	pH
F1	5.33 ± 0.00
F2	5.39 ± 0.00
F3	5.41 ± 0.00

(± indicates SD)

The ideal standards for a pH value of a topical dosage form should be within the broad pH range of the skin, i.e., 4.0 to 7.0, in order to avoid skin inflammation and irritation(**Fig 3**) (14) . On the contrary, when the pH condition of the skin is slightly acidic, it is more conducive for the establishment of normal flora (15). Therefore, the utilization of slightly acidic formulations can provide advantages in antimicrobial applications. These formulations have the potential to exhibit enhanced effectiveness in inhibiting the growth of pathogenic microorganisms, making them particularly valuable in combating microbial infections (16).

Fig.3. Determination of pH-by-pH meter and pH paper

Skin Irritation Study (Acceptability Test)

For hand sanitizers to be considered ideal, they should possess several key characteristics. Firstly, they should have a pleasant smell, providing a positive olfactory experience during use. Secondly, they should feel comfortable when applied, offering a smooth and enjoyable sensation on the

skin. Additionally, they should be easy to apply, ensuring convenience and efficiency in their usage, while avoiding any sticky residue that can be undesirable.

However, some volunteers reported experiencing a slight itching sensation (10)

Fig.4. Product acceptance by the Volunteers

Product acceptance is a critical factor, and in a group of 20 volunteers (n=20), 75% expressed a preference for Formulation 3 over Formulations 1 and 2. Additionally, Formulation 2 garnered acceptance from 20% of the volunteers, while only 5% of the volunteers accepted Formulation 1. **(Fig 4)**

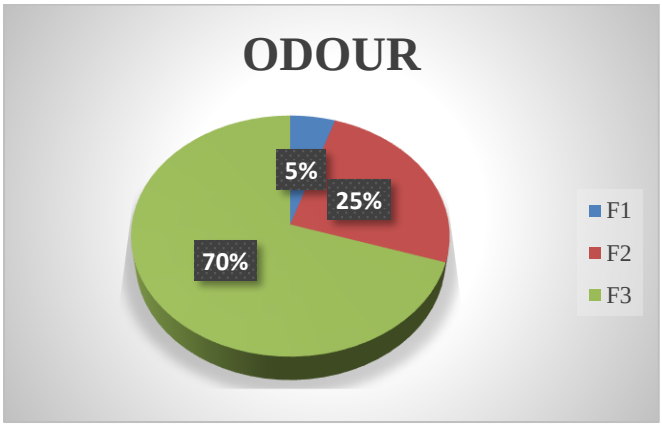

Fig.5. Odour of the product

Among the volunteers, a majority expressed a preference for a light odour in the products, while some preferred a strong odour. Notably, Formulation 3, which contained a light odour, was found to be more widely accepted, with 70% of the volunteers favouring it. On the other hand, 25% of the volunteers liked Formulation 2, while only 5% preferred Formulation 1. **(Fig 5)**

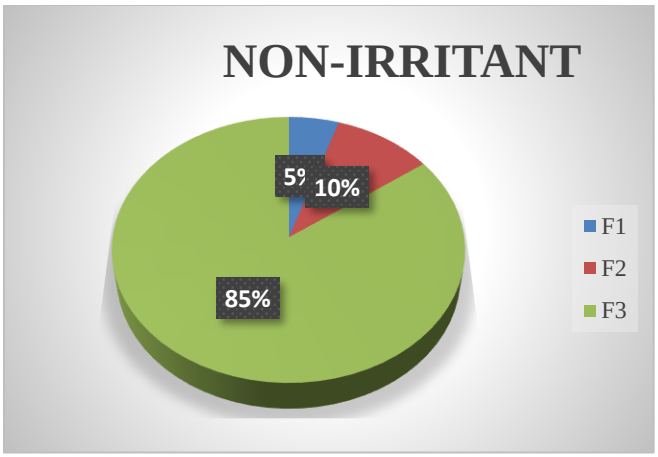

Fig.6. Non- Irritant accepted by volunteers

The role of irritancy is significant, as a product causing irritation is unlikely to be purchased. Upon analysis, it was found that only 5% of the volunteers experienced irritancy with Formulation 1, indicating a potential chance of allergic reactions among those individuals.

Based on the insights gathered from the three pie charts, it can be concluded that Formulation 3 was preferred by the majority of the volunteers. This suggests that Formulation 3 is the most favourable choice among all the formulations **(Fig 6).**

Conclusion

Hand sanitizer has emerged as a viable alternative for maintaining hand hygiene, especially in light of the COVID-19 pandemic. This is particularly crucial when the availability of alcohol for sanitization purposes is at risk. In this study, hand sanitizer formulations were developed utilizing spirit, glycerine, aloe Vera, and guava leaves. The results indicated that the prepared formulations

exhibit pH levels similar to that of the skin. Consequently, these findings suggest that the formulated hand sanitizers are effective and suitable for use.

Product acceptance is a critical factor, and in a group of 20 volunteers (n=20), 75% expressed a preference for Formulation 3 over Formulations 1 and 2.

Formulation 3, which contained a light odour, was found to be more widely accepted, with 70% of the volunteers favouring it. Based on the insights gathered from the three pie charts, it can be concluded that Formulation 3 was preferred by the majority of the volunteers.

However, it was observed that some of the volunteers experienced a slight sensation of skin irritation. However, further research should be conducted in future studies to assess the effectiveness of the formulated hand sanitizer against a wider range of bacterial species.

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Conflict of interest: Author states no conflict of interest.

References

1. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. J Autoimmun. 2020;109:1–4.

2. Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. J Med Virol. 2020;92(4):401–2.

3. Oc C, Surface S. Evaluation of Environmental Stability and Disinfectant Effectiveness. Am Soc Microbiol. 2023;11(2):1–9.

4. Seto WH, Tsang D, Yung RWH, Ching TY, Ng TK, Ho M, et al. Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS). Lancet. 2003;361(9368):1519–20.

5. Kilpatrick C, Allegranzi B, Pittet D. WHO First Global Patient Safety Challenge: Clean Care is Safer Care, Contributing to the training of health-care workers around the globe. Int J Infect Control. 2011;7(2):1–8.

6. Mahmood A, Eqan M, Pervez S, Alghamdi HA, Tabinda AB, Yasar A, et al. COVID-19 and frequent use of hand sanitizers; human health and environmental hazards by exposure pathways. Sci Total Environ. 2020;742:1–32.

7. Sampath Kumar NS, Sarbon NM, Rana SS, Chintagunta AD, Prathibha S, Ingilala SK, et al. Extraction of bioactive compounds from Psidium guajava leaves and its utilization in preparation of jellies. AMB Express. 2021;11(36):1–9.

8. Dhamankar MSS, Dudhe PAR, Rathod MPI. Preparation of Herbal Hand Sanitizer. 2022;7(4):386–92.

9. Shaikh F, Bhosale P, More S. Formulation and Evaluation of Herbal Hand Sanitizer Using Psidium guajava Leaves Extract. Int J Pharm Sci Rev Res. 2020;62(2):37–9.

10. Booq RY, Alshehri AA, Almughem FA, Zaidan NM, Aburayan WS, Bakr AA, et al. Formulation and evaluation of alcohol-free hand sanitizer gels to prevent the spread of infections during pandemics. Int J Environ Res Public Health. 2021;18(12):1–15.

11. Parra JL, Paye M. EEMCO guidance for the in vivo assessment of skin surface pH. Skin Pharmacol Appl Skin Physiol. 2003;16(3):188–202.

12. Rippke F, Schreiner V, Schwanitz HJ. The acidic milieu of the horny layer: New findings on the physiology and pathophysiology of skin pH. Am J Clin Dermatol. 2002;3(4):261–72.

13. Surini S, Amirtha NI, Lestari DC. Formulation and effectiveness of a hand sanitizer gel produced using Salam bark extract. Int J Appl Pharm. 2018;10(Special Issue 1):216–20.

14. Rahmasari D, Rahmasari D, Hendradi E, Chasanah U. Formulation and evaluation of hand sanitizer gel containing infused of binahong leaf (Anredera cordifolia) as antibacterial preparation. Farmasains J Farm dan Ilmu Kesehat. 2020;5(1):23–30.

15. Ali SM, Yosipovitch G. Skin pH: From basic science to basic skin care. Acta Derm Venereol. 2013;93(3):261–7.

16. Korting HC, Hübner K, Greiner K, Hamm G, Braun-Falco O. Differences in the skin surface pH and bacterial microflora due to the long-term application of synthetic detergent preparations of pH 5.5 and pH 7.0. Results of a crossover trial in healthy volunteers. Acta Derm Venereol. 1990;70(5):429–31.

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