

Formulation and evaluation of tridax daisy and turmeric hand sanitizer

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Abstract

Twelve substitutes for chemical disinfectants. The creation and assessment of a hand sanitizer utilizing Tridax procumbens, also referred to as Tridax daisy, which is known for its antibacterial and wound-healing qualities, is the main objective of this work. Tridax procumbens leaf extracts were added to a gel-based hand sanitizer, and the product's effectiveness against common diseases was evaluated. The presence of bioactive substances such flavonoids, tannins, and alkaloids—which support its antibacterial activity—was verified by phytochemical screening. The hand sanitizer was non-toxic and skin-friendly, and it showed strong antibacterial action on par with commercial products. This study emphasizes Tridax daisy's potential as a sustainable and potent ingredient in herbal hand sanitizers, supporting the utilization of natural resources while also improving public health.

Keyword: infection prevention, hand sanitizer, and hand disinfectants

Introduction

The goal of hand sanitizer is to eliminate or lessen dangerous bacteria on the skin, especially the hands. It is frequently used as a substitute for soap and water and is frequently offered in liquid, gel, or foam form. This is particularly true in circumstances where access to conventional hand washing facilities is restricted or non-existent. Alcohol- active chemicals, like ethanol or isopropanol, are commonly included in the most effective hand sanitizers in concentrations between 60% and 95%. These compounds have been shown to eradicate a variety of bacteria, viruses, and fungi. To avoid skin dryness and irritation from regular usage, several formulas contain hydrating ingredients like glycerine and aloe vera in addition to alcohol. (1)

The popularity and importance of hand sanitizers have grown significantly in recent years, particularly during global health crises such as the COVID-19 pandemic. During such times, hand sanitizers became a frontline defence against the spread of infectious diseases. They are used extensively in public spaces, healthcare settings, educational institutions, offices, and homes. The ease of use, portability, and rapid action of hand sanitizers have made them a convenient and essential hygiene product in everyday life. In addition to their use in personal hygiene, hand sanitizers also play a crucial role in maintaining infection control standards in medical and food service industries. Their ability to reduce microbial presence on the skin helps minimize the risk of contamination and disease transmission, protecting both service providers and the public. While hand sanitizers are highly effective against many pathogens, they are not a complete substitute for handwashing, particularly when hands are obviously oily or filthy. Nonetheless, their role in promoting public health, especially in high-risk environments, underscores their significance in modern hygiene practices (6)

Even though it's generally advised to wash your hands with soap and water, hand sanitizer is a useful alternative in cases where these supplies are unavailable. However, it is less effective against some pathogens, like norovirus and *Clostridium difficile*, because it cannot physically

remove harmful compounds. Some sanitizers with low alcohol concentrations are less effective than others, and improper use—such as wiping off the sanitizer before it dries—can also lessen its efficiency.

Furthermore, dermatitis can result from frequent hand sanitizer use that alters the skin's microbiome (8).

Alcohol concentrations between 60% and 95% are the most effective, and isopropyl alcohol, ethanol, or n-propanol are frequently combined in the composition of alcohol-based hand sanitizers. These flammable sanitizers are effective against a broad range of bacteria, but not spores. Compounds like glycerol may be added to prevent dry skin, and some formulations contain perfumes, though this is not advised because of the possibility of allergic reactions.

Versions without alcohol are less effective and should be used sparingly. Alcohol has been used as an antiseptic since at least 1363, and evidence of its use began to surface in the late 1800s. By the 1980s, alcohol-based hand sanitizers were widely used throughout Europe, and they are now listed as essential medicines by the WHO. (18)

For thousands of years, people have utilized turmeric, a bright yellow spice, as a medicinal herb and as a main ingredient in cookery. It is derived from the root of the ginger-family plant *Curcuma longa*. Turmeric is indigenous to Southeast Asia, especially India, and is well-known for its unique flavour, colour, and possible health benefits. In addition to its culinary applications, turmeric's anti-inflammatory, antioxidant, and restorative qualities have earned it great respect in Ayurvedic and Traditional Chinese medicine. (3)

4. Material And Method:

A)Pre-Formulation Study:

Materials:

- Tridax daisy leaves obtained from the local garden
- Tridax daisy powder, glycerine, ethanol, turmeric, essential tea tree oil, aloe vera gel used to manufacture tridax daisy hand sanitizer [6].

Ingredient used in tridax daisy hand sanitizer:

Sr.no	MATERIAL	USED
1)	Tridax daisy Extract	antimicrobial
2)	turmeric	antimicrobial
3)	Glycerin	Soften &hydrate skin
4)	Ethanol	To kill germs
5)	Essential oil	fragrance
6)	Distilled water	As a solvent
7)	Aloe vera	Skin moisturization

Table No.1 Pre-Formulation Study



Fig No. Tridax daisy plant:

Method:

A) Extraction of *Tridax procumbens*:

- Gathering and getting ready
- New *Tridax* foliage was gathered.
- They were washed thoroughly and shade-dried for 5–7 days.
- The dried leaves were then powdered.

2) Extraction Process:

- maceration method was used.
- The solvent used was ethanol or distilled water, depending on the desired extract type.
- The extraction took six to eight hours to complete.
- After filtering the mixture, the solvent was removed using a water bath or rotary evaporator.
- The concentrated extract was stored in a refrigerator.

3) storage condition

Experimental Work:

6.1 Formulation:

Sr. No	drug	F1	F2	F3*
1)	ethanol	30ml	28ml	30ml
2)	Tridax daisy extract	5ml	2ml	2ml
3)	Aloe vera gel	5ml	5ml	3ml
4)	glycerin	2ml	2ml	2ml
5)	Essential oil	3drop	2drop	2drop
6)	Distilled water	3ml	5ml	9ml
7)	Turmeric	2ml	1ml	2ml

Table no.2 Experimental Work

Physicochemical Evaluation of the tridax daisy :

Physicochemical parameter	F1	F2	F3
PH	5.2	4.6	6,1
viscosity	1350-1380	1380-1420	1375-1430
spreadbilty	5.8-0.2	5.9-0.1	5.7-0.2
Microbial load (CFU/ml)	absent	absent	absent

PH:

Batch 1 (pH 5.2): Closest to ideal. Likely well-balanced extraction and formulation.

Batch 2 (pH 4.6): Slightly more acidic—possibly due to higher concentration of plant acids in the extract.

Batch 3 (pH 6.00): Could be due to dilution, additives (like glycerine or aloe vera), or less acidic extract.

**Fig.No.8 PH**

7.3 Viscosity:

Batch 1 was too thin—prone to dripping

Batch 2 had ideal viscosity for a hand sanitizer, balancing ease of application with skin feel.

Batch 3 was too thick—may feel greasy or take longer to dry. Proper carbomer concentration and pH adjustment is critical for achieving desired

Ostwald viscometer

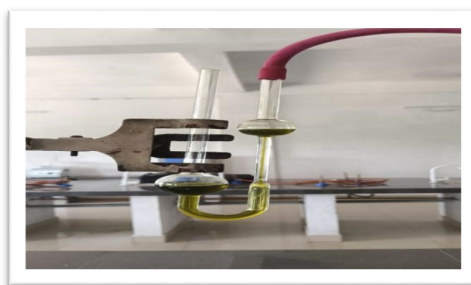


Fig. No.9 Ostwald viscometer

7.2 Spreadability:

Batch B (5.9 ± 0.1 cm) showed the highest spreadability, indicating that it spreads more easily than the other two batches. The smaller standard deviation (± 0.1) also suggests better formulation uniformity.

Batch A (5.8 ± 0.2 cm) had slightly lower spreadability than Batch B but was still within an acceptable range. The higher deviation (± 0.2) indicates slightly less uniform texture, which may be due to minor differences in gel structure or thickening agent dispersion.

Batch C (5.7 ± 0.2 cm) showed the least spreadability, although the difference is minor. It may feel a little more viscous or thicker on the skin but still spreads effectively.



Fig.No.10 Spreadability

7.3 Microbial load CFU/ml:

Batch A –: Absent No microbial growth (bacteria or fungi) was detected. Indicates effective antimicrobial action and aseptic manufacturing. Confirms that ingredients (especially alcohol and Tridax daisy extract) worked as preservatives.

Batch B –: Absent Like Batch A, this batch also showed complete absence of microbial contamination. Suggests good batch-to-batch consistency and controlled production environment. Proves that the formulation remains stable and hygienic.

Batch C –: Absent Again, no microbial load detected. Supports that even the third batch maintains the same microbial safety and preservation quality.

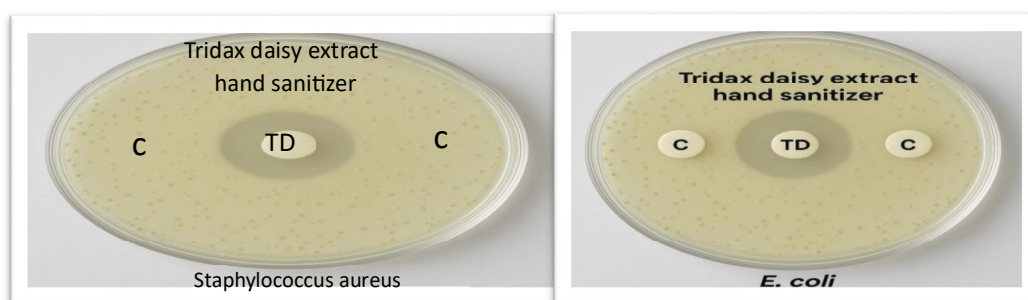


Fig. No. 11 microbial tests



Fig No.12 Hand Sanitizer

8 Summary And Conclusion:

Antibacterial Efficacy: Extracts of Tridax procumbens have demonstrated significant antimicrobial action against a range of microorganisms, such as Staphylococcus aureus, Escherichia coli, The ethyl acetate extract, in particular, showed strong inhibitory effects, attributed to bioactive compounds such as

flavonoids, fatty acids, and sterols. A possible natural substitute for traditional hand sanitizer formulations is provided by the addition of *Tridax procumbens*. Its many qualities—antibacterial, antioxidant, and wound healing—help to maintain good hand hygiene while reducing the possibility of negative side effects from synthetic substances. Regular usage is appropriate for polyherbal hand sanitizers that contain *Tridax procumbens* because they not only guarantee microbiological safety but also support skin health. The incorporation of *Tridax procumbens* into hand sanitizer formulations offers a promising natural alternative to conventional products. Its multifaceted properties—antibacterial, antioxidant, and wound-healing—contribute to effective hand hygiene while minimizing potential side effects associated with synthetic ingredients. Polyherbal hand sanitizers containing *Tridax procumbens* not only ensure microbial safety but also promote skin health, making them suitable for regular use. *Tridax Daisy* extract can be used as an effective antibacterial agent in hand sanitizer formulations. It presents a potential natural alternative to synthetic chemicals.

Tridax Daisy is a valuable plant with a rich history of traditional use and a promising future in modern medicine and research. Its antimicrobial, anti-inflammatory, and antioxidant properties make it an excellent candidate for the creation of novel medications and therapies. To fully explore the plant's potential and create new products and treatments, more research is required.

Tridax procumbens extract shows encouraging antibacterial activity in the formulation of a herbal hand sanitizer, suggesting that it could be a safe and efficient substitute for sanitizers sold in stores. *Tridax daisy* has antibacterial qualities that are greatly enhanced by the presence of bioactive substances including flavonoids and tannins. This herbal sanitizer is affordable, environmentally friendly, and has a low chance of irritating skin, so it's safe to use on a regular basis. Its use in public health and hygiene may be supported by additional research on stability, shelf life, and large-scale manufacturing.

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