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Formulation oF Coloured Hand Sanitizer

Osmani Fariha KauserAijaz Ali, Prof.Waghmode.D.M, Dr.Santosh Jain

Student, By Guide, Principal

Aditya Institute Of Pharmaceutical Beed, Beed Tal-Beed Dist-Beed – 43112
Dr.Babasaheb Ambedkar Technological University, Lonere Raigad,
Tal-Mangaon, Dist-Raigad-431122 Maharashtra (India)

Abstract:

The formulation of colored hand sanitizers represents an innovative stride in the realm of personal hygiene products. Traditional hand sanitizers are predominantly transparent or have minimal coloration due to functional or aesthetic considerations. However, the integration of vibrant hues into hand sanitizers not only enhances their visual appeal but also introduces a new dimension to user experience and product differentiation. This abstract explores the formulation process, highlighting the selection of safe and effective colorants, compatibility with active ingredients, stability considerations, and consumer acceptance. The development of colored hand sanitizers involves meticulous formulation to ensure efficacy, safety, and compliance with regulatory standards. Moreover, the psychological impact of color on consumer perception and behavior adds a layer of complexity to formulation strategies. This abstract underscores the importance of innovation in hygiene products and provides insights into the formulation challenges and opportunities associated with colored hand sanitizers.

Keywords : chemical materials, carbopol, Triethamolamine, Isopropyl Alcohol, Perfume, Colour

INTRODUCTION:

Hand hygiene is of utmost importance as it may be contaminated easily from direct contact with airborne microorganism droplets from coughs and sneezes. Particularly in situations like pandemic outbreak, it is crucial to interrupt the transmission chain of the virus by the practice of proper hand sanitization. It can be achieved with contact isolation and strict infection control tool like maintaining good hand hygiene in hospital settings and in public. The success of the hand sanitization solely depends on the use of effective hand disinfecting agents formulated in various types and forms such as antimicrobial soaps, water-based or alcohol-based hand sanitizer, with the latter being widely used in hospital settings. To date, most of the effective hand sanitizer products are alcohol-based formulations containing 62%–95% of alcohol as it can denature the proteins of microbes and the ability to inactivate viruses. This systematic review correlated with the data available in Pubmed, and it will investigate the range of available hand sanitizers and their effectiveness as well as the formulation aspects, adverse effects, and recommendations to enhance the formulation efficiency and safety. Further, this article highlights the efficacy of alcohol-based hand sanitizer against the coronavirus.

Hand sanitizer is made especially with an amalgamation of some types of alcohol such as ethyl alcohol or isopropyl, other moisturizing, gel-like ingredients such as aloe or glycerol. The ingredients also include other ingredients such as fragrances or colours.

In spite of the fact that alcohol always used as an antiseptic, hand sanitizer came into existence just a few decades back. Alcohol is the main ingredient of any hand sanitizer.

Alcohol was used to disinfect wounds in many ancient and medieval cultures around the world. However, it didn't scientifically proved until 1875 when L. Buchholtz performed a test regarding the antimicrobial activity of ethanol. He found that alcohol can eradicate germs by a process called cell lysis.

USES & MARKET POTENTIAL:

India hand sanitizer market is projected to surpass $ 43 million by 2025. Growth of hand sanitizer market in India can be attributed to rising awareness about healthy lifestyle & wellness, shifting consumer preference towards convenient hygiene products and rising disposable income. Moreover, the strong marketing activities by leading brands, in addition to huge endorsements, are some other drivers of hand sanitizer market in India. Moreover, the COVID-19 outbreak has boosted demand for sanitizers like never before across the diverse end user segments. The hand sanitizer market is categorized into Gel, Liquid, Foam and Spray, among which Gel based segment witnessed a faster growth and the segment is expected to grow at a higher rate than other segments throughout the forecast period as well. Gel based segment category held a major part of market share in 2019 due to higher consumer preference. Additionally, due to the strong marketing, and endorsements by celebrities of hand sanitizer products, this category has been witnessing significant growth throughout the historical period and is anticipated to maintain stable growth during the forecast period as well. West India dominated the country's hand sanitizer market in 2019, and the region is expected to maintain its dominance during the forecast period. Some of the major players operating in India hand sanitizer market are Reckitt Benckiser (India) Ltd., Hindustan Unilever Ltd., Dabur India Ltd., Himalaya Drug Company Pvt. Ltd., ITC Ltd., and others

Hand Sanitizer and COVID-19

Hand sanitizer has been an essential part of many people's personal hygiene routines since years. Yet, the market of hand sanitizer has experienced a great boost during the coronavirus virus outbreak. When the COVID-19 pandemic broke out all of the worlds, hand sanitizer was one of the first things to go missing from supermarket shelves.

Currently, to strengthen the footprint in the global market, the leading players of hand sanitizer market have started working on the development and production of hand sanitization products. For instance, in March 2020, DOW, a notable leader in chemicals manufacturer, has launched a project of manufacturing hand sanitizer for hospitals and pharmacies to support the society during the pandemic. The company is planning to produce 300 tons of hand sanitizer per month. In addition to this, in March 2020, Coty, a significant beauty company in cosmetic manufacturers, has started manufacturing hydro-alcoholic gel hand sanitizer amid the COVID-19 outbreak. Production and donations are expected to reach tens of thousands of units per week. The company is planning to produce 10 thousand units of hand sanitizer per week.

Hand sanitizers were first introduced in 1966 in medical settings such as hospitals and healthcare facilities. The product was popularized in the early 1990s.

Alcohol-based hand sanitizer is more convenient compared to hand washing with soap and water in most situations in the healthcare setting. Among healthcare workers, it is generally more effective for hand antisepsis, and better tolerated than soap and water. Hand washing should still be carried out if contamination can be seen or following the use of the toilet.

Hand sanitizer that contains at least 60% alcohol or contains a "persistent antiseptic" should be used. Alcohol rubs kill many different kinds of bacteria, including antibiotic resistant bacteria and TB bacteria. They also kill many kinds of viruses, including the flu virus, the common cold virus, coronaviruses, and HIV. 90% alcohol rubs are more effective against viruses than most other forms of hand washing. Isopropyl alcohol will kill 99.99% or more of all non-spore forming bacteria in less than 30 seconds, both in the laboratory and on human skin.

In too low quantities (0.3 ml) or concentrations (below 60%), the alcohol in hand sanitizers may not have the 10–15 seconds exposure time required to denature proteins and lyse cells. In environments with high lipids or protein waste (such as food processing), the use of alcohol hand rubs alone may not be sufficient to ensure proper hand hygiene.

For health care settings, like hospitals and clinics, optimum alcohol concentration to kill bacteria is 70% to 95%. Products with alcohol concentrations as low as 40% are available in American stores, according to researchers at East Tennessee State University.

Alcohol rub sanitizers kill most bacteria, and fungi, and stop some viruses. Alcohol rub sanitizers containing at least 70% alcohol (mainly ethyl alcohol) kill 99.9% of the bacteria on hands 30 seconds after application and 99.99% to 99.999% in one minute.

For health care, optimal disinfection requires attention to all exposed surfaces such as around the fingernails, between the fingers, on the back of the thumb, and around the wrist. Hand alcohol should be thoroughly
rubbed into the hands and on the lower forearm for a duration of at least 30 seconds and then allowed to air dry.

Use of alcohol-based hand gels dries skin less, leaving more moisture in the epidermis, than hand washing with antiseptic/antimicrobial soap and water.

There are certain situations during which hand washing with soap and water are preferred over hand sanitizer, these include: eliminating bacterial spores of *Clostridioides difficile*, parasites such as *Cryptosporidium*, and certain viruses like norovirus depending on the concentration of alcohol in the sanitizer (95% alcohol was seen to be most effective in eliminating most viruses). In addition, if hands are contaminated with fluids or other visible contaminates, hand washing is preferred as well as after using the toilet and if discomfort develops from the residue of alcohol sanitizer use. Furthermore, CDC states hand sanitizers are not effective in removing chemicals such as pesticides.

Importants of Hand sanitizer :

Effectiveness:

It is observed that hand sanitizers clean your hands more effectively than soap and water, and it also reduces the bacterial burden. Researches have shown that when you clean your hands with a hand sanitizer, they tend to stay clean longer than if you were to clean them using soap and water. The hand sanitizer also prevents the transmission of bacteria from person to another.

No more bacteria:

One of the myth that floats even today about hand sanitizers is that the use of hand sanitizers will make bacteria resistant to treatment. But, the way sanitizers work is based on the cell-membrane disruption caused by the chemicals present in the sanitizers, this is not something that the bacterium can become resistant to. This doesn't cause any physical harm to you and keeps your hands clean and healthy.

Gentle than soap:

Soaps are made from chemicals that can be harsh on the skin if used excessively. However, the basic formula used for hand sanitizers is better for the skin and much gentler than a soap. Many studies across the globe have proven that people who used a hand sanitizer had better skin condition as compared to those who used soap or liquid hand wash and water.

Using a hand sanitizer:

- Before you use the hand sanitizer on your hand, ensure that your hands aren't speckled with visible dirt
- Apply the product on the entire palm and rub it for approximately 20 – 30 seconds
- While you are rubbing the product, apply it between your fingers, under your nails, jewellery, along your wrists, and the back of your hands

- Then, let your hands dry
- Once they are dry, you are good to go Here are a couple of don'ts that you need to follow while using a hand sanitizer:

- Do not wash your hands after you use the hand sanitizer
- Do not wipe your palms dry with a cloth towel or a paper towel

Benefits of Hand Sanitizers

1. Cleanliness:

Hand sanitizers are designed to kill germs and keep hands sanitized. With proper use, hand sanitizers are capable of eliminating 99.9% of germs on the hands. It can be used as an occasional replacement of soap and water.

2. Portability:

Hand sanitizers come in small, portable containers which make it easier to carry in the purse wherever you go. It works perfect when you go for a grab in public places or outside.

3. Lessens risk of diseases:

During the monsoon or a pandemic, frequent sanitization of hands decreases the chances of contracting the disease. Studies also show that the risk of spreading gastrointestinal (stomach) and respiratory infection is decreased by frequent use of hand sanitizer.

4. Softer Hands:

Hand sanitizers without alcohol are beneficial for the skin. It improves the texture of the skin in your hands. Some hand sanitizers comprise emollients which moisturize and soften your hands.

These are the main benefits of using hand sanitizer regularly. Using hand sanitizers on a daily basis guarantees more cleanliness and less diseases.

Disadvantagesh :

The side effects of your hand sanitizer will come down to the formulas you're using. Hand sanitizer typically contains a high amount of alcohol (between 60 and 95 percentTrusted Source) meant to kill germs on your hands. Even if the alcohol content is low, your hand sanitizer may also contain other antiseptic ingredients that have been known to cause side effects.

Dries out your skin

Alcohol is an effective antiseptic, meaning that it's proven to kill bacteria and viruses on organic surfaces. But alcohol is also known to have a drying effect on your skin.When you're applying hand sanitizer to your hands multiple times each day, the product is taking moisture out of your skin. This can result in skin that's dry, flaky, and sensitive to the touch. In addition to being uncomfortable, the American Academy of Dermatology Association says that having dry skin can actually increase your chances of picking up germs.

Can trigger an eczema breakout

You may notice that after hand sanitizer dries on your hands, itchy and red or discolored eczema patches tend to appear. That's because if you have eczema, the chemicals can actually make your symptoms worse. Whether you use a foam, liquid, or a gel-based hand sanitizer, you may see increased eczema symptoms after use.

Can impact your hormones

Hand sanitizer sometimes contains an ingredient called triclosan. According to the FDATrusted Source, Triclosan is intended to kill bacteria, and has been used in products from toothpaste to body wash. The FDA also says some studies have indicated that high exposure to triclosan may disrupt natural hormone cycles and even impact fertility. More research is needed to fully understand triclosan's impact on people, but the ingredient has already been banned from several types of products.

May contribute to antibiotic resistance

The FDATrusted Source says that triclosan is intended to kill bacteria, but overuse of this ingredient in consumer products may be contributing to the rise in antibiotic-resistant bacteria. A 2015 research reviewTrusted Source of how triclosan is contributing to antibiotic resistance concluded that more research is necessary to determine how this chemical is actually impacting human health.

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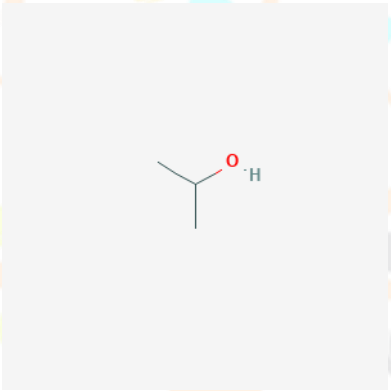
PLAN OF WORK

- Selection of Materials
- Materials And Methods
- Formulation of Coloured & Hand Sanitizer
- pH

- Skin Irritation
- Stickiness
- Temperature Variation
- Light Exposer

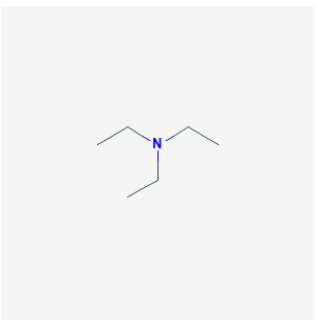
- Result & Discusion
- Conclusion
- Reference

Materials:
ISOPROPYL ALCOHOL
Structure:



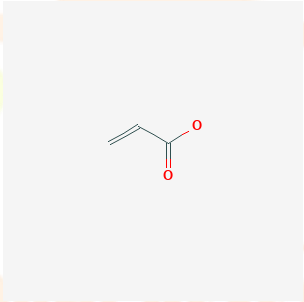
Chemical name:
propan-2-ol
Molecular Formula:
C3H8O or CH3CHOHCH3 or (CH3)2CHOH
Isopropyl Alcohol is an isomer of propyl alcohol with antibacterial properties. Although the exact mechanism of isopropanol's disinfecting action is not known, it might kill cells by denaturing cell proteins and DNA, interfering with cellular metabolism, and dissolving cell lipo-protein membranes. Isopropanol is used in soaps and lotions as an antiseptic.
Volatile, colourless liquid with a sharp musty odour like rubbing alcohol. Flash point of 53°F. Vapours are heavier than air and mildly irritating to the eyes, nose, and throat. Density approximately 6.5 lb / gal. Used in making cosmetics, skin and hair preparations, pharmaceuticals, perfumes, lacquer formulations, dye solutions, antifreezes, soaps, window cleaners. Sold in 70% aqueous solution as rubbing alcohol.
Propan-2-ol is a secondary alcohol that is propane in which one of the hydrogens attached to the central carbon is substituted by a hydroxy group. It has a role as a protic solvent

TRIETHYLAMINE:
Structure:



Chemical name:
N, N-diethylethanamine
Molecular formula:
C6H15N
Triethylamine appears as a clear colourless liquid with a strong ammonia to fish-like odour. Flash point 20°F. Vapours irritate the eyes and mucous membranes. Less dense (6.1 lb / gal) than water. Vapours heavier than air. Produces toxic oxides of nitrogen when burned. Triethylamine is a tertiary amine that is ammonia in which each hydrogen atom is substituted by an ethyl group. Acute (short-term) exposure of humans to triethylamine vapor causes eye irritation, corneal swelling, and halo vision. People have complained of seeing "blue haze" or having "smoky vision." These effects have been reversible upon cessation of exposure. Acute exposure can irritate the skin and mucous membranes in humans. Chronic (long-term) exposure of workers to triethylamine vapor has been observed to cause reversible corneal edema. Chronic inhalation exposure has resulted in respiratory and haematological effects and eye lesions in rats and rabbits. No information is available on the reproductive, developmental, or carcinogenic effects of triethylamine in humans. EPA has not classified triethylamine with respect to potential carcinogenicity.
The pKa of protonated triethylamine is 10.75, and it can be used to prepare buffer solutions at that pH. The hydrochloride salt, triethylamine hydrochloride (triethylammonium chloride), is a colourless, odourless, and hygroscopic powder, which decomposes when heated to 261 °C.
Triethylamine is soluble in water to the extent of 112.4 g/L at 20 °C.[10] It is also miscible in common organic solvents, such as acetone, ethanol, and diethyl ether.
Laboratory samples of triethylamine can be purified by distilling from calcium hydride.
In alkane solvents triethylamine is a Lewis base that forms adducts with a variety of Lewis acid such as I2 and phenols. Owing to its steric bulk, it forms complexes with transition metals reluctantly.

Carbopol:
Structure:



Poly(acrylic acid) (**PAA**; trade name **Carbomer**) is a synthetic high-molecular weight polymer of acrylic acid. The IUPAC name is poly(1-carboxyethylene). They may be homopolymers of acrylic acid, or crosslinked with an allyl ether of pentaerythritol, allyl ether of sucrose, or allyl ether of propylene. In a water solution at neutral pH.
PAA is an anionic polymer, i.e. many of the side chains of PAA will lose their protons and acquire a negative charge. This makes PAAs polyelectrolytes, with the ability to absorb and retain water and swell to many times their original volume.
Dry PAAs are sold as white, fluffy powders that are frequently used as gels in cosmetic and personal care products. Their role in cosmetics is to suspend solid in liquids, prevent emulsions from separating and control the consistency in flow of cosmetics. Carbomer codes (910, 934, 940, 941, and 934P) are an indication of molecular weight and the specific components of the polymer.
For many applications PAAs are used in form of alkali metal or ammonium salts, e.g. sodium polyacrylate. In the dry powder form, the positively charged sodium ions are bound to the polyacrylate, however in aqueous solutions the sodium ions can dissociate. Instead of an organized polymer chain, this leads to a swollen gel that can absorb a high amount of water.
Polyacrylic acid is a weak anionic polyelectrolyte, whose degree of ionisation is dependent on solution pH. In its non-ionised form at low pHs, PAA may associate with various non-ionic polymers (such as polyethylene oxide, poly-N-vinyl pyrrolidone, polyacrylamide, and some cellulose ethers) and form hydrogen-bonded interpolymer complexes In aqueous solutions PAA can also form polycomplexes with oppositely charged polymers such as chitosan,

METHOD OF PREPARATION:
AIM:
FORMULATION OF COLOURED HAND SANITIZER
REQUIREMENTS:
CARABOL, TRIETHANOLAMINE, WATER, ISOPROPYL ALCOHOL, COLOUR.
MEASURING CYLINDER, PIPETTE, SITTIER.

First of measure all the ingredients accurately.

Chemicals	Quantity
Water	20 ml
Carbopol	02 gm
Triethanolamine	5 ml
Isopropyl Alcohol	75 ml
Perfume	Q.S.
Colour	Q.S.

Place the beaker below stirrer and stir up to the gel formation.
Add colour and fragrance as per required and transfer the sanitizer to the bottle.

Final Product :

Results

Most alcohol-based hand sanitizers are effective at inactivating enveloped viruses, including coronaviruses. With what is currently known in the literature, one may not confidently suggest one mode of hand sanitizing delivery over the other. When hand washing with soap and water is unavailable, a sufficient volume of sanitizer is necessary to ensure complete hand coverage, and compliance is critical for appropriate hand hygiene.

Conclusion:

The formulation of colored hand sanitizers represents a promising innovation that combines practical hygiene with aesthetic appeal. By integrating vibrant colors into sanitizing products, manufacturers can not only enhance their visual attractiveness but also cater to diverse consumer preferences. Throughout the formulation process, careful consideration of colorant selection, compatibility with active ingredients, stability, and regulatory compliance is essential to ensure product efficacy and safety. Moreover, the psychological impact of color on consumer perception underscores the strategic value of colored hand sanitizers in modern hygiene practices. Moving forward, continued research and development in this area will be crucial to meeting consumer expectations for effective, safe, and visually appealing hygiene solutions. As the market evolves, colored hand sanitizers are poised to play a pivotal role in shaping the future of personal hygiene products.

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