ANTIVIRAL-ANTIMICROBIAL HAND SANITIZER FORMULA AND RATIOS.

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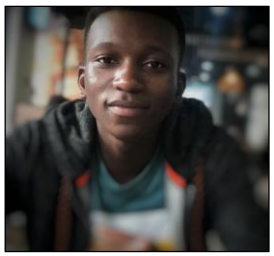

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Abstract. With the drastic increase in the number of COVID-19 cases in developing and developed countries altogether, a concern pertaining to the effective control of this viral and other bacterial infections alike grows with each confirmed case added to the statistics. Through the study of control measures, the researchers managed to come up with, to a degree limited to the depth of research and research tools employed, a formula and ratio to make an antiviral-antimicrobial sanitizer. The ingredients used are found cheaply and some even naturally and can be agriculturally nurtured in gardens. The overall strategy envisioned during the research on the hand sanitizer formula is not only limited to combating COVID-19, but also takes in mind the future possibility of another viral and/or bacterial infection. The ingredients, as well as their sources share a symbiotic relationship and are highly affordable, hence their choice as elements to the sanitizer formula.

Index Terms – Formula, Ratio, Sanitizer, COVID-19

INTRODUCTION

The major problem in rural areas in and outside of Zimbabwe is the lack of access to information as well as medical care services in the times of disease outbreaks. The COVID-19 global pandemic season saw the decline in sanitizer supplies and their low availability in commercial stores at the time they were needed the most. It is, to a greater extent, unanimously true, that in the race to control and find a cure for a disease, even the smallest of scientific findings can leverage the chances of survival of a desperate population group; and though the efforts may result in the saving of a single individual, the fact that a life would have been saved is undoubtedly a worthy cause. This paper seeks to explore this cause and disseminate information on how, with as little resources as possible, a sanitizer can be made without subjecting the reader to an array of technical details that, in relation to them, prove irrelevant.

METHODOLOGY

The Concept Behind an Antimicrobial-Antiviral Sanitizer

All hand sanitizers comprise of two classes of ingredients: Active Ingredients and Inactive Ingredients. More often than not, a typical sanitizer has the following ingredients: Ethyl Alcohol 70.0% v/v (active ingredient), water, carbomer, triethanolamine, glycerine, propylene glycol, fragrance, aloe barbadensis leaf juice and fd&c colourants (inactive ingredients). After a deeper study into the ingredients, the researchers managed, as far as possible, to eliminate the less essential compounds and deduce the most vital ones and the conclusion reached was that only two of these

compounds were essential in annihilating microbes and viruses: Alcohol and Aloe Barbadensis Leaf Juice.

Using 70% as the standard concentration of alcohol per sample solution of sanitizer, a ratio to establish the relationship between Alcohol and Aloe Leaf Juice was pursued and as a result, the following statement brought the conclusion:

Per given sample of sanitizing liquid, the concentration of Alcohol should be at least twice that of the Aloe Leaf Juice for effective antiviral-antimicrobial. The ratio of Aloe Leaf Juice is therefore:

1: 2

The product formed after the following ratio is implemented in the mixing process is still highly volatile due to the high volatility of the Alcohol present though it is the core and most important part of the sanitizer. The scent emitted is also still raw and can be irritating when inhaled in excess. Though not crucial, a third ratio is introduced and the final ratio derived from raw mathematical calculations using an already existing sanitizer sample.

Sample: 237 ml hand sanitizer comprising of 70% Alcohol

From the information given, we are able to find the amount of ml of Alcohol in the sample:

$$V_{alc} = (70*237)/100$$

$$= 165.9 \text{ ml of Alcohol}$$

Since the ratio 1:2 suggests that half the volume of the Alcohol is equal to the volume of Aloe Leaf Juice, we surmise that:

$$V_{alo} = 165.9/2$$

$$= 82.95\text{ml of Aloe Leaf Juice}$$

The addition of the above mentioned values of Aloe Leaf Juice and Alcohol gives a value greater than 237ml and this proves that the manufacturer did not use the 1:2 ratio to get the amount of Aloe Leaf Juice to be mixed with the Alcohol to make the sanitizer. To compensate for this figure, a balance value was extrapolated by the researchers which deduces to a 3 value ratio without compromising the 1:2 relationship shared between the Alcohol and the Aloe Barbadensis Leaf Juice.

$$\text{Volume of sanitizer} - (V_{alc} + V_{alo})$$

237 – (165.9 + 82.95)

= - 11.5ml (Balancing Value)

With the 3rd value derived from the balancing value, a 3 value ratio is made in the following manner:

165.9 : 82.95 : 11.5

Alcohol : Aloe Leaf Juice : (Water + TEA + Glycerine)

Dividing all values by 11.5 we get:

1 : 7 : 14

(Notice how the 1: 2 (7:14) relationship is still shared between the Aloe Leaf Juice and Alcohol respectively)

Sources of Aloe Barbadensis Leaf Juice and Alcohol

Aloe Barbadensis

Aloe Barbadensis Growth Conditions

Aloe Barbadensis is a spike-leafed plant found in most African regions and grows optimally in outdoor conditions under the following growth factors:

Watering:

It's a succulent plant that stores water in its leaves and hence is greatly affected by overwatering which can lead to Root Rot. Make sure that soil is dry first between all watering intervals.

Light:

Grow best in outdoor conditions but also tolerate artificial light when grown in doors since they are autotrophs. For potted plants, a south facing window is most ideal as it is likely to receive more hours of sunshine on that particular placement.

Soil:

A mixture of sandy and loam soil is ideal to offer both rich nutrients and a lower water retention.

Pest Control:

Aloe rarely has issues with pest attacks and diseases spread by vectors. In the event of pest attacks, alcohol can be used on aloe leaves to safely protect the plant's anatomy.

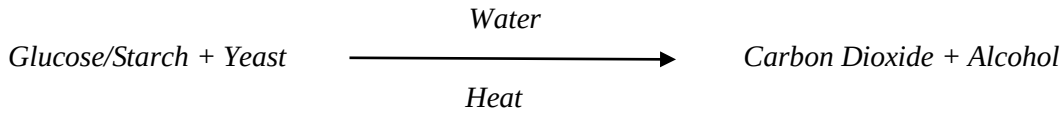
Temperature:

Optimum temperatures from 27°C to 35 °C improve the growth rate of Aloe by boosting enzyme activity. Temperatures far below 27°C lead to slower enzyme action and those far above 35°C denature the Aloe's enzymes' active sites.

Fermentation of Sugars: Alcohol Synthesis

For the synthesis of alcohol, the researchers found the fermentation of starches and sugars as the most suitable given the popularity of the starch diet in most developing countries. Alcohol can be made by fermentation of saccharides under anaerobic conditions with the enzymatic assistance of yeast in the presence of moisture and heat not exceeding 36.5°C. A carefully researched overview of the conditions in the process is highlighted below:

1. The sugars being in solution.
2. The presence of yeast (which acts a catalytic enzyme).
3. A temperature of approximately 36.5°C (blood temperature).
4. The exclusion of air to create anaerobic conditions which provide lower oxygen concentrations.



Once the concentration of ethanol reaches 14-15% by volume, the yeast can no longer survive, and the fermentation process stops.

CONCLUSION

This study succeeds to decipher, and disclose to the public, an amalgamation of gathered data relating to the manufacture of the two most vital ingredients in a sanitizing agent. Once the two respective ingredients are made, a mixing process follows using the ratio 1:7:14 of Water and Glycerine (from lotion and creams), Aloe Leaf Juice and Alcohol. The process should be done in airtight conditions to prevent the escape of gaseous alcohol as it is a highly volatile compound at s.t.p. This proposed alternative system of making sanitizing agents is suitable for both people living in urban and most importantly those living in rural areas given their limited access to commercial hand sanitizers.

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