

Assessment of sanitation and hygiene of hands, equipment of food handlers by swab test and finding a suitable wash solution to reduce of bacterial load and pesticide residue present in fruits and vegetables

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ABSTRACT

Sanitation and hygiene play an important role in preventing many food borne illness. Regular washing of hands with soap and disinfecting the work area before and after processing minimize the risk and reduce the pathogens which contaminate the food which help in preventing serious health hazards. The present study on “Assessment of sanitation and hygiene of hands, equipment of food handlers by swab test and finding a suitable wash solution to reduce of bacterial load and pesticide residue present in fruits and vegetables.” was done as a part of pilot study in processed fruits and vegetable industries. Sixty pre and post swab samples were taken to determine the total bacterial count present on the hands of food handlers. An experiment was also conducted to determine the total bacterial count present on the surface of tomato by washing and soaking for 15 minutes in different washing solutions like tap water, saline, turmeric solution, chlorine, vinegar solution and two commercial washes like Nim wash and Veggie clean. The mean Pre Total bacterial count was 502.33 ± 118.03 whereas as the mean E coli was 4.066 ± 8.97 . After pouring and rubbing the hands of the food handlers with 70% alcohol based sanitizer the mean total bacterial count came down to 102 ± 29.59 E coli was absent in post swab test. The total bacterial count present on the surface of tomato before wash was 80cfu/g but after washing in tap water it was 55cfu/g, chlorine 22cfu/g, saline 21cfu/g, vinegar 18cfu/g, turmeric 14cfu/g, Nim wash 14cfu/g and Veggie clean was 9cfu/g. Personal hygiene and sanitation should be strictly followed in all processing units to ensure the safety of food products and adopt good handling practices regarding proper washing of fruits and vegetables to eradicate germs and pesticides from the surfaces of fruits and vegetables.

Key Words:-Sanitation, Hygiene, Hazards, Pesticides, Good Handling Practices.

1. INTRODUCTION

The term “hygiene” is employed to talk over with the behaviours or measures, as well as however on the far side the management of human ordure, that square measure accustomed break the chain of infection transmission within the home and community. Whereas the majority acknowledge that hygiene suggests that 'hand laundry. Food hygiene plays a very important role all told the process units. It refers to the practices and safety measures that square measure adopted in any respect stages of production to make sure quality and helps in retentive the period of time of the merchandise. Poor personal hygiene, basically dirty hands has been recognized as a major risk factor contributing to food contamination which results in illness. Hand hygiene plays a vital role in safeguarding food. (Curtis V, et.al (2003)

Personal hygiene and cross contamination are the key factors which promote the transmission of food-borne diseases. Researches have shown that proper handling of food should made mandatory at each stage of processing so as to ensure safe and good quality food. The primary principles of food safety should be practices and implemented in all the processing units.

The fruits and vegetables are loaded with pesticides and chemicals, if they are consumed they create various health hazards in human beings such as damage the nervous system, digestive system and some carcinogenic effects in the body. Thus it comes very important for the food handlers to properly wash the fruits and vegetables before processing so as to eradicate the harmful microorganisms.

OBJECTIVES

- Detect microbial contamination present on hands, equipment, work area and machinery of fruits and vegetables processing industries.
- Find out the suitable wash solution to reduce bacterial load and pesticide residue present in fruits and vegetables.

2. MATERIALS AND METHODS

The pre and post swab tests were taken from the hands and surfaces of fruits and vegetables process units. Pre swab take a look at was done as a surprise check to seek out out that the chosen food handlers had washed their hands before beginning their work. The pre Swab take a look at was done exploitation alkaline organic compound water, agar, sterile H₂O and cotton swab. The cotton swab was swabbed zero.1% organic compound resolution and rolled over the hands. The samples were kept in self-sealing packets and tagged for microorganism assay. Post Swab take a look at was done after rubbing their hands, surfaces with seventy% alcohol primarily based sanitizer. The cotton swab was swabbed zero.1% organic compound resolution and rolled once again on the hands.

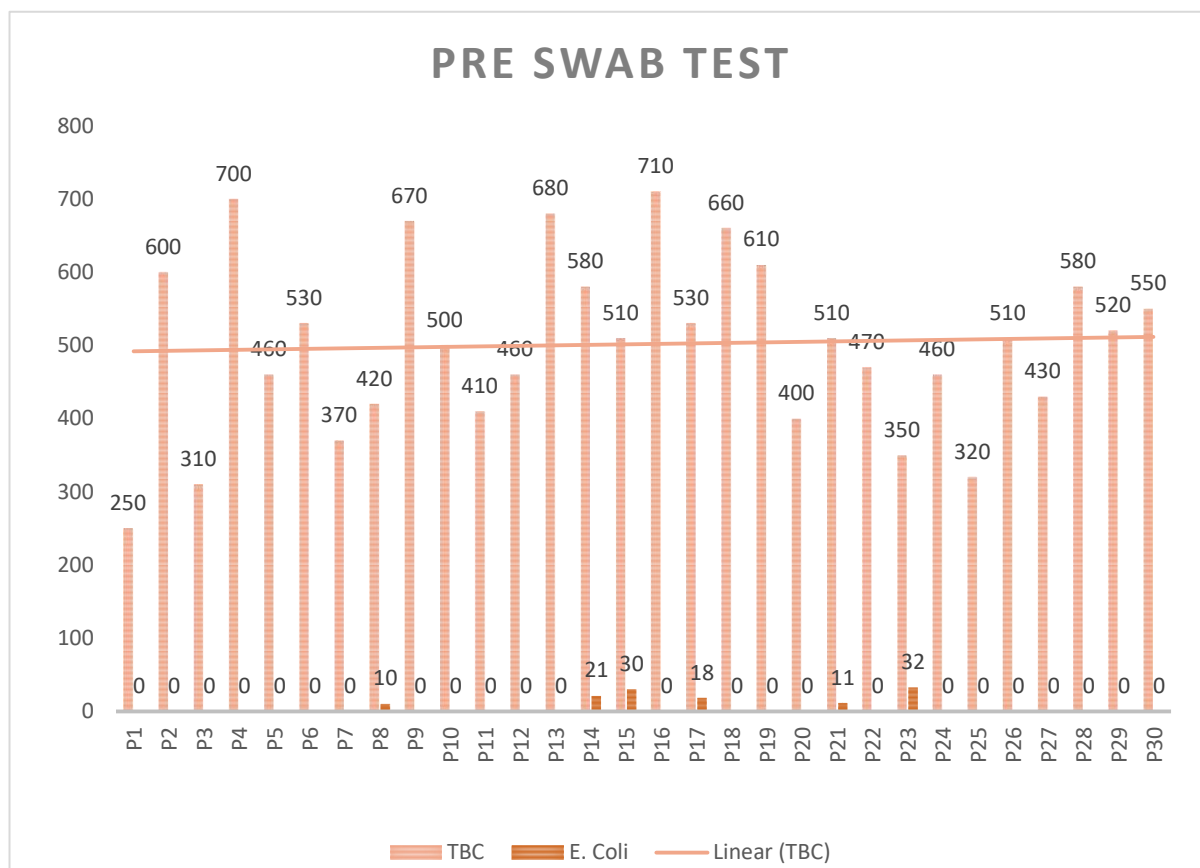
The swab sticks were kept in self-sealing packets and tagged. Sixty Pre and Post Swab samples were collected from the food handlers. The pre and post swab plates were inoculated with agar and was incubated at 35°C to see the full microorganism Count and E Coli.

An experiment was conjointly done out to work out the entire microorganism load on the surface of tomato by laundry in numerous laundry solutions like traditional water, chlorine, saline, vinegar, turmeric answer and two commercial washes of table game wash and green groceries clean. The fruits and vegetables were washed and soaked for quarter-hour to scale back the microorganism load effectively when within the individual solutions. The parts of table game wash area unit citrus fruit extract and tree that helped to get rid of the germs. On the opposite hand green groceries clean was composed of common salt, Na Cocoyl salt, Lauryl glycoside, metal stuff, EDTA and acid, these were delicate surfactants derived from oil kernels that helped to get rid of the pesticides and germs.

3. RESULT AND DISCUSSION

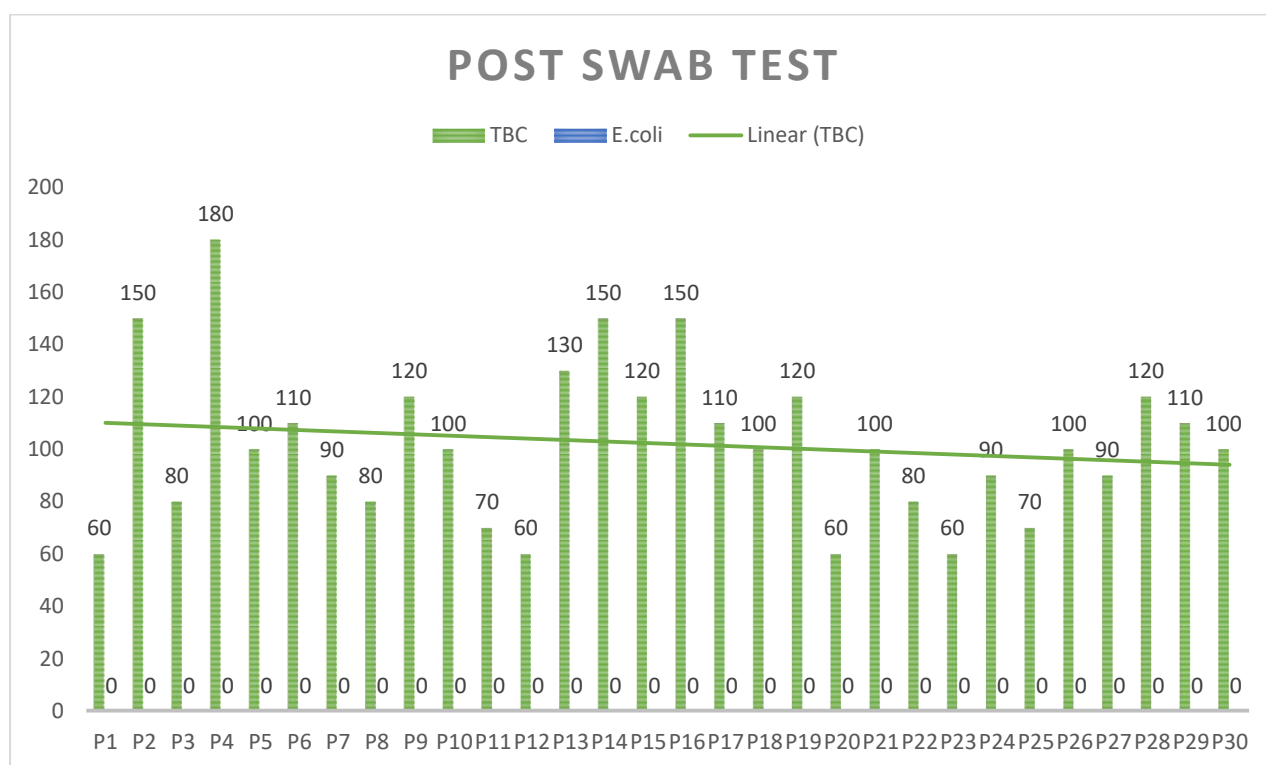
The results of swab samples and microbial analysis of tomato were tabulated in Microsoft excel. Mean, Standard deviation and t test was done using SPSS version 23.

1. Pre Swab



The above graph depicted 30 pre swab test samples which were taken from the hands and surfaces of the food handlers. Total bacterial count was found in all samples whereas E. Coli was found in very few food handlers. The above graph showed the 30 pre swab test which was taken from the hands of the food handlers. The pre mean TBC was $502.33 \text{ SD} \pm 118.03$. The mean E coli was $4.066 \text{ SD} \pm 8.97$.

2. Post Swab Test



The above graph depicted 30 post swab test which were taken from the hands and surfaces of the food handlers. Total bacterial count was found to be less as compared to the pre swab test whereas E. Coli, Coliform and salmonella were absent after using alcohol based sanitizer. The above graph showed the 30 post swab test which was taken from the hands of the food handlers. The post mean TBC was $102 \text{ SD} \pm 29.59$ E coli was absent in post swab test.

Microorganisms	Pre Swab		Post Swab	
TBC	Mean : 502.33	SD : ± 118.03	Mean : 102	SD: ± 29.59
E. Coli	Mean: 4.066	SD : ± 8.97	Mean: 0	SD : ± 0

TBC $t=18.0198$ $df=58$ $p<0.0001$
E.colit= 2.4828 $df=58$ $p=0.0160$

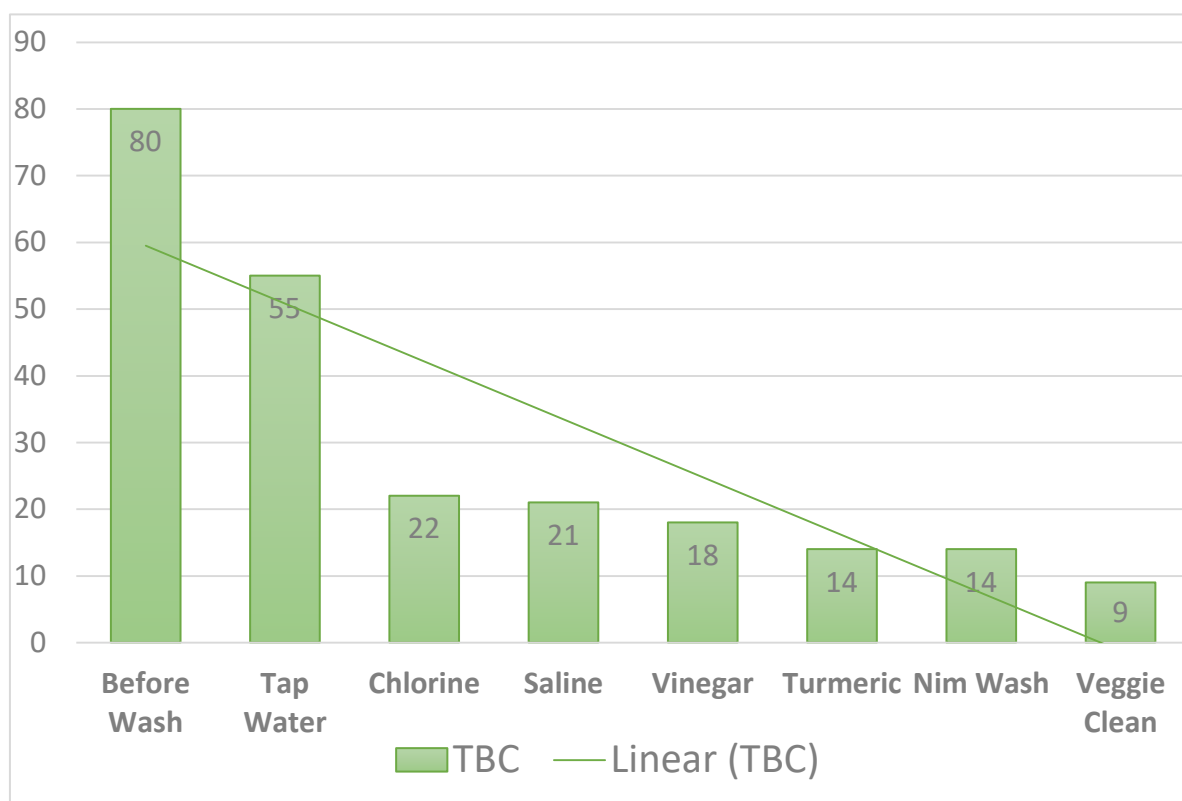
The t value for Total Bacterial count was $t=18.0198$ with a $p<0.0001$ which is considered to be extremely statistically significant, whereas the t value for E coli was $t=2.4828$, with a $p=0.0160$ which is considered to be statistically significant.

3. Microbiological Analysis of Tomato

S. No.	Sample	Wt. of Tomato	Soaking Time	Amt. of Solvent	Volume of Solution	TBC Result
1.	Before Wash	74.40gm	-	-	100ml	80cfu/g
2.	Tap Water	58.63gm	15min	-	100ml	55cfu/g
3.	Chlorine	84.95gm	15min	0.1ml in 100ml water	100ml	22cfu/g
4.	Saline	85.63gm	15min	2gm in 100ml water	100ml	21cfu/g
5.	Vinegar	75.55gm	15min	1:3 (Vinegar: water)	100ml	18cfu/g
6.	Turmeric	63.21gm	15min	1gm in 100ml water	100ml	14cfu/g
7.	Nim Wash	53.75gm	15min	2ml in 100ml water	100ml	14cfu/g
8.	Veggie Clean	64.35gm	15min	0.5ml in 100ml water	100ml	9cfu/g

The above table represents the various solutions which were used to clean fruits and vegetables like tap water, chlorine, saline, vinegar, turmeric, nim wash and veggie clean. Around 88.75% of germs, pesticides were eradicated from the surface of the fruits and vegetables.

Microbiological Analysis of Tomato



The above graph depicted that the total bacterial count before wash of the tomato was 80cfu/g, whereas the total bacterial count after wash using tap water was 55cfu/g, chlorine 22cfu/g, saline 21cfu/g, vinegar 18cfu/g, turmeric 14cfu/g, nim wash which is a commercial wash was 14cfu/g and veggie clean was 9 cfu/g. The composition of nim wash are citrus fruit extract and neem which helped to remove the germs. On the other hand veggie clean is composed of Sodium Chloride, Sodium Cocoyl Glutamate, Lauryl Glucoside, Potassium sorbate, EDTA, Citric acid which helps to remove the pesticides and germs, thereby reducing the total bacterial count from 80cfu/g to 9 cfu/g.

4. CONCLUSION

The study confirmed that the total bacterial count found on the surfaces and hands of food handlers were responsible for causing various food borne illness. Proper hand washing as well as training and creating an awareness on proper handling of fruits and vegetables should be practised to ensure safety and quality processed products. Food safety norms should be

practiced by the food handlers in order to reduce of food borne diseases from food industries and alternative public eating counters.

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AUTHOR CONTRIBUTIONS

Anit James was responsible for the conception, writing, proofreading, editing of the article writing and tables/figure preparation. Thirumani Devi A. is the corresponding author of this article and was involved in writing and reviewing.

CONFLICT OF INTEREST

‘The author(s) declare(s) that there is no conflict of interest.

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