

A STUDY OF MICROBIAL CONTAMINATION OF STREET VENDED READY- TO-EAT ALOO-TIKKI IN ALLAHABAD CITY, INDIA

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Abstract: The present study was undertaken to investigate microbiological quality of ready-to-eat street vended aloo-tikki sold in Allahabad, city of Uttar Pradesh, India. A total of 36 samples were collected from 12 major areas which represented whole city. All samples were collected from the vendors in sterilized polythene bags and analyzed within an hour of procurement. Bacterial pathogens were identified by standard bacteriological techniques. Microbiological enumeration of ready to eat street-vented aloo-tikki, revealed a standard plate count ranging from $103.4-247.3 \times 10^{-4}$ cfu/gm, and yeast and mould ranging between $89-168.2 \times 10^{-4}$ cfu/gm. The presumptive coliform test was found to be 86.1% positive. Prominent bacterial pathogens isolated were *Styphylococcus aureus*, *Escherichia coli*, *Bacillus sp.*, and *Salmonella sp.* The presence of such microorganisms indicates poor handling practices, cross contamination and aerial contamination which becomes reason and sometimes important source of food borne illness to humans.

Keywords: Aloo-tikki, microflora, food borne illness, ready-to-eat, poor handling, presumptive coliform test.

I. INTRODUCTION

FAO (2009) defines street food as food sold at various points to ease consumer access at a low cost affordable by the poor. Latham (1997) further notes that millions of people depend on a wide variety, accessible and cheap street food on daily basis. Food safety is the assurance that food will not cause harm to the consumer when prepared and consumed according to its intended use (WHO, 2001). Food safety is a progressively more essential global public health concern (WHO, 2007). WHO (2010) stated that millions of people fall sick or die as a consequence of eating unsafe food. Food borne and waterborne diarrhea diseases are principal causes of illness and globally kill an estimated 2.1 million people per year, mostly children in developing countries (WHO, 2001). WHO (2007) noted that everyone is at risk of food borne illness. Ready to eat foods and food preparation surfaces may be reservoirs for microbial contamination (Mankee *et al.*, 2005; Ghosh *et al.*, 2007; Christison *et al.*, 2008). Various microorganisms of public health concern including faecal coliforms, *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* species and *Bacillus cereus* have been tested in street foods of some African countries. *Escherichia coli* and *Staphylococcus aureus* were recovered in proportions of the food, water, hands and surface swabs tested in Harare, Zimbabwe (FAO/WHO, 2005).

II. MATERIALS AND METHODS

The present study was conducted during the period from 2.09.13 to 12.10.13 at Warner School of Dairy Technology,

Sam Higginbottom Institute of Agriculture, Technology and Sciences, SHIATS, Allahabad, India. All media used during the course of study were obtained from Himedia Laboratories Pvt. Limited, Mumbai, India.

III. COLLECTION OF SAMPLES

Allahabad city was divided into four zones and from each zone 9 samples were taken. A total of 36 samples were collected. All the samples were aseptically collected in sterile containers, and analyzed within an hour of procurement.

A. Isolation and enumeration of microorganisms

Isolation and enumeration of microbes were performed using serial dilution and spread plate technique. One gram of food sample was properly homogenized using a sterile mortar and pestle and the resultant homogenate was added to 9 mL of sterile ringer's solution in a test tube and diluted serially to obtain dilutions upto 10^{-5} . For bacterial isolation 1 mL of the appropriate dilution from each tube was aseptically pipetted out and plated onto different selective medias (*Salmonella Shigella* agar, Eosin Methylene Blue agar, Mannitol salt agar and Nutrient agar) using the spread plate technique. All the bacterial plates were incubated in an inverted position under aerobic conditions at 37°C for 24 to 48 h. For bacterial enumeration the plates were used to determine the number of colony forming units (cfu) per gram of food sample.

B. Identification and characterization of microbial isolates

Following incubation, the isolated colonies were pure cultured and Gram stained. Biochemical characterization and identification was carried out according to Bergey's Manual.

IV. RESULTS

A total of thirtysix samples of aloo-tikki were examined in this study. The samples were collected aseptically in sterile containers and analyzed within an hour of procurement. Microbiological enumeration of ready to eat street-vented aloo-tikki, revealed a standard plate count ranging from $103.4-247.3 \times 10^{-4}$ cfu/gm, and yeast and mould ranging between $89-168.2 \times 10^{-4}$ cfu/gm. Among the samples tested, majority of them revealed pathogenic contamination. The organisms isolated included *Salmonella spp*, *Styphylococcus aureus*, *Bacillus spp* and *Escherichia coli*. *Bacillus spp*. occurred in 100% samples. The presence of such microflora indicates poor handling practices and aerial contamination. The average yeast and mould count recorded was highest at Kalyani Devi

(163.6 ×10⁻⁴ cfu/ml), followed by Daraganj (157.9×10⁻⁴ cfu/ml), Gaughat (156.4×10⁻⁴ cfu/ml), Railway station (148.4×10⁻⁴ cfu/ml), Prayag station (145.8×10⁻⁴ cfu/ml) Baghara (139.5×10⁻⁴ cfu/ml), Tagore town (131.8×10⁻⁴ cfu/ml), Katra (126.4×10⁻⁴ cfu/ml), Rambagh (123.9×10⁻⁴

cfu/ml), Rajapur (120.11×10⁻⁴ cfu/ml), Baihrana (117.6×10⁻⁴ cfu/ml) and Civillines (98.1×10⁻⁴ cfu/ml). The presumptive coliform test was found to be 86.1% positive. The significant results of bacterial enumeration have been presented in Table 1, Table 2 and Table 3.

Table 1: Average values of Standard Plate Count and Yeast and Mould count in Aloo-tikki

Location	Standard Plate Count (10 ⁻⁴ cfu/gm)	Yeast and Mould count (10 ⁻⁴ cfu/gm)
Civil lines	114.2	98.1
Katra	185.7	126.4
Rajapur	193	120.1
Kalyani –devi	197.9	163.6
Railway Station	142.3	148.4
Gaughat	166.8	156.4
Daraganj	184.6	157.9
Rambagh	184.7	123.9
Baihrana	199.7	117.6
George Town	212.1	131.8
Prayag Station	154.3	145.8
Baghara	146.5	139.5

Table 1: Presumptive Coliform Test of street-vended aloo-tikki in Allahabad

Sample	Presumptive coliform test		Total
	Positive (A+, G+)	Negative(A-, G-)	
Aaloo-tikki	31	5	36
% within	86.1%	13.9%	100%

Table 3: Incidence of *Styphlococcus aureus.*, *Escherichia coli* *Salmonella spp.* and *Bacillus spp* in aaloo-tikki samples.

Sample	Total	<i>E.coli</i>	%	<i>Salmonella</i> <i>sp</i>	%	<i>Styphlococcus</i> <i>aureus</i>	%	<i>Bacillus</i> <i>sp</i>	%
Aloo-tikki	36	7	19	16	45	13	36	36	100

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