www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 306-308

www.thepharmajournal.com
Received: 20-04-2023
Accepted: 29-05-2023

Pratheepa Velumani
Department of Food Safety and Quality Testing, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Mamatha Rani Rangaswamy
Department of Food Safety and Quality Testing, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Venkatachalapathy Natarajan
Department of Food Engineering & Centre of Excellence for Grain Sciences, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Anandakumar Sugumar
Department of Food Packaging and System Development, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Baskaran Nagarethinam
Department of Academics and Human Resource Development, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Vidyalakshmi Rajagopal
Department of Food Safety and Quality Testing, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Corresponding Author:
Vidyalakshmi Rajagopal
Department of Food Safety and Quality Testing, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur, Tamil Nadu, India

Surveillance study of *Salmonella* on selected spices and its products

Pratheepa Velumani, Mamatha Rani Rangaswamy, Venkatachalapathy Natarajan, Anandakumar Sugumar, Baskaran Nagarethinam and Vidyalakshmi Rajagopal

Abstract
Around 23 samples of 5 different spices has been collected at different selling points of Thanjavur and were investigated to determine the presence of *Salmonella.* As per the FSSR, *Salmonell*a should be absent in 25g, out of 23 samples 8 samples were confirmed for *Salmonella*. *Salmonella* was detected in 80% of pepper samples, whereas chili samples were found to be negative for *Salmonella*. Coriander and ginger garlic paste was found *Salmonella* prevalence of 40% and 25% respectively. In cardamom, *Salmonella* prevalence of 33% was found. From this surveillance, study spices might be the source of *Salmonella* contamination in the kitchen. Because of its high resistance to desiccation stress, it can able to persist for a prolonged time in dry products like spices. Maintenance of GMP and pathogen reduction treatments are necessary during growing, harvesting, processing, and storage to reduce contamination.

Keywords: surveillance, *Salmonella*, spices, contamination, prevalence

Introduction
Spices are traditionally used in culinary practices because of their high flavor and aroma characteristics. Spices and their products were well known for their beneficial effects on human health. Globally spices and herbs are one of an important agricultural commodity which has a high market value in imports and exports. *Salmonella* is the important reason of foodborne illness in many foods like eggs, meat, nuts, seeds, etc. Recently *Salmonella* became a major concern in low-moisture foods because of their high moisture resistance. Considering low-moisture foods spices are highly consumed in and around the world has reported for *Salmonella* contamination and sometimes even international trade has been affected because of the *Salmonella* contamination (Witthuhn *et al*., 2005) [12], (UDI, 2005) [11].

Microbial contamination in spices may happen during harvesting, and processing and, in the marketplaces through wastewater, animal & even human excreta and dust. So it might enter the food chain which causes food-borne illnesses. Spices are considered one of the high-risk low moisture food because of outbreaks and recalls reported. The large volume of spices is used as an ingredient in preparing foods like curry, applied over food products like meat, and several other types which involves heat treatment during preparation. And also spices are used as seasonings in small volumes for flavoring after cooking or before eating (Ohtsuka *et al*., 2006) [6]. (Lehmacher *et al*., 1995) [5] reported paprika seasoned potato chips which have *Salmonella* contamination have caused a national outbreak with around 1000 estimated cases.

Raising concern about *Salmonella* in spices, surveillance is required to ensure the safety of spices and also the effective pathogen reduction treatments. Also, the regulatory bodies are concerned about the spice risk associated with *Salmonella*. Some of the surveillance studies on spices have reported the occurrence of *Salmonella* for imported consignments in the US (Kleinmeier *et al*., 2017) [4] (Doren *et al*., 2013) [3], Japan (Ohtsuka *et al*., 2006) [8], Australia (Pafumi, 1986) [9], Italy (Oca *et al*., 2021) [6] and retail spices in India (Banerjee & Sarkar, 2017) [2], etc. *Salmonella*

In this study, the main objective is to survey the *Salmonella* prevalence in packed spices available at retail shops in Thanjavur (Tamil Nadu, India). This surveillance study will give an understanding of the decontamination records of the processed spices.

Materials and Methods

Sample collection

The samples were procured from retailers in Thanjavur, Tamil Nadu, and the samples were stored at 4 ºC. Totally 23 samples (at least 100g) were purchased. The spices included in this study were chili (powder), pepper (whole and powder), coriander (whole and powder), and ginger garlic (paste). All collected spice samples were tested for the prevalence of *Salmonella*.

Microbiological analysis

Salmonella Detection

Salmonella detection was performed according to IS 5887 (part 3):1999. Around 25g of samples was taken from each collected sample with sterile spatulas pre-enriched with buffered peptone water (BPW) (225 ml), incubated at 37 °C for 24 hours as pre-enrichment. Followed by that, selective enrichment was done by adding pre-enriched sample of 0.1ml was added to 10 ml of Rappaport Vassiliadis broth (RV) and undergone 24 hours incubation at 37 ºC for. Then an inoculation loop consist of selectively enriched samples were streaked on Xylose Lysine Desoxycholate Agar (XLD), then incubated at 37 ºC for 24 hours. After that suspected samples colonies were taken for biochemical confirmation.

Results and Discussion

Table 1: Existence of *Salmonella* in Procured spices

S. No	Samples	Totality of samples	Existence of samples – positive (Absent/g)	% prevalence
1	Chili powder	6	-	-
2	Black pepper	W- 3 P -2	4	80
3	Coriander	W- 3 P-2	2	40
4	Ginger garlic paste	4	1	25
5	Cardamom	3	1	33

*W- Whole, P-Powder

The *Salmonella* surveillance outcomes and its prevalence percentage for collected spice kind is given in the Table 1. *Salmonella* was detected in 8 out of 23 samples. The whole and powder form of pepper samples were shown positive and *Salmonella* prevalence was 80%. The analyzed chili samples were found to be negative for *Salmonella*. Around 40% of the samples were positive for coriander. In the case of ginger garlic paste *Salmonella* occurrence was about 25%. Cardamom showed about 33% of *Salmonella* occurrence. This data demonstrate that *Salmonella* contamination in pepper and coriander samples has a high positive percentage. (Oca *et al*., 2021) [6] reported in their study, both black pepper and sesame seed has a wide range of *Salmonella* prevalence chances. The observed results from this surveillance study on *Salmonella* contamination in spices can be compared with some of the studies, even if bound to few samples (Kleinmeier *et al*., 2017) [4], (Oca *et al*., 2021) [6], (Bakobie *et al*., 2017) [1], (Sagoo *et al*., 2009) [10].

Purchased samples were ready-to-use products, in which some of the positive samples were secondary processed samples like pepper powder and coriander powder. Raising the concern of *Salmonella* on spices surveillance is required to ensure the safety of spices and also the effective pathogen reduction treatments. Also, the regulatory bodies are concerned about the spice risk associated with *Salmonella*. This surveillance study showed some of the spice samples were positive for *Salmonella.* These data do not estimate the logarithmic reduction, involved during processing and at a retail point because of the uncertainties involved. After being purchased from retail establishments, the spices can be used while cooking instead of kept on the table for seasoning to reduce the adverse health effects because of S*almonella* (Ogur, 2022) [7]. Results from the present study suggest that spices can be a source of the potential hazard for *Salmonella* infection even from the kitchen.

Conclusion

This surveillance study showed some of the tested spice samples were positive for *Salmonella*. Black Pepper showed a high *Salmonella* prevalence percentage whereas all chili samples showed negative for *Salmonella*, maybe because of proper decontamination treatments or its chemical nature. Both whole and powdered forms of spices have been found *Salmonella* positive in analyzed samples. So ensuring Good manufacturing, hygienic practices, and pathogen reduction treatments may reduce the contamination of *Salmonella* in spices.

Reference

1. Bakobie N, Addae AS, Duwiejuah AB, Cobbina SJ, Miniyila S. Microbial profile of common spices and spice blends used in Tamale, Ghana; c2017. https://doi.org/10.1186/s40550-017-0055-9
2. Banerjee M, Sarkar PK. Microbiological quality of some retail spices in India Microbiological quality of some retail spices in India; c2017. p. 9969. https://doi.org/10.1016/S0963-9969(02)00194-1
3. Doren JM, Van Blodgett RJ, Pouillot R, Westerman A, Kleinmeier D, Ziobro GC, *et al*. Prevalence, level, and distribution of Salmonella in shipments of imported capsicum and sesame seed spice offered for entry to the United States: Observations and modeling results. Food Microbiology. 2013;36(2):149-160. https://doi.org/10.1016/j.fm.2013.05.003
4. Kleinmeier D, Ziobro GC, Melka D, Wang HUA, Brown EW, Strain E, *et al*. Prevalence of Salmonella in 11 Spices Offered for Sale from Retail Establishments and in Imported Shipments Offered for Entry to the United States. 2017;80(11):1791-1805. https://doi.org/10.4315/0362-028X.JFP-17-072
5. Lehmacher A, Bockemuhl J, Aleksic S. A nationwide outbreak of human salmonellosis in Germany due to contaminated paprika and paprika-powdered potato chips; c1994-1995 July. p. 4-8.
6. Oca MCD, Di AM, Bartolotta A, Parlato A, Nicastro L, Sciortino S, Cardamone C. and salmonella inactivation by gamma irradiation useommecioneral. 2021;10:45-49. https://doi.org/10.4081/ijfs.2021.8914
7. Ogur S. Microbiological Quality and Safety of Some Dried Spices Obtained from Markets, Spice Shops, and Homes; c2022. p. 65.
8. Ohtsuka K, Onoue Y, Otomo Y, Furukawa I, Yamaji A, Segawa Y. Salmonella Prevalence and Total Microbial and Spore Populations in Spices Imported to Japan. 2006;69(10):2519-2523.
9. Pafumi J. Assessment of the Microbiological Quality of Spices and Herbs. 1986;49(12):958-963.

10. Sagoo SK, Little CL, Greenwood M, Mithani V, Grant KA, Mclauchlin J, *et al*. Assessment of the microbiological safety of dried spices and herbs from production and retail premises in the United Kingdom. Food Microbiology. 2009;26(1):39-43. https://doi.org/10.1016/j.fm.2008.07.005
11. UDI. Annual Report; c2005. p. 3-38.
12. Witthuhn RC, Engelbrecht S, Joubert E, Britz TJ. The microbial content of commercial South African high-moisture dried fruits. Journal of Applied Microbiology. 2005;98(3):722-726. https://doi.org/10.1111/j.1365-2672.2004.02500.x