



RESEARCH PAPER

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Microbiological characteristics of fresh fish in traditional market of Tual City and Southeast Maluku Regency

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Abstract

Market conditions in Tual City and Southeast Maluku Regency that lack sanitation and hygiene allow cross-contamination of fishery products sold, especially fresh fish, so it needs to do microbiological testing of Total Plate Total (ALT), *Escherichia colidan Salmonella*. The results showed that the total number of fresh fish tested showed that the number of bacterial colonies was 3.2×10^3 CFU/g to 8.7×10^4 CFU/g has not exceeded the SNI set limits, for Coliform 20 APM/g to 1100 APM/g in fish samples and for water 240-1100 APM/gt but no *E. colidan Salmonell* content was found in all samples tested.

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Introduction

The marketing process of fishery products in traditional markets in Tual City and Southeast Maluku Regency is less sanitary and hygienic. This is reflected from market conditions that are still far from reasonable standards in terms of construction, facilities, and equipment used so that it can be a source of bacterial cross contamination in fresh fish sold. Clean water facilities that are not available in locations around the market cause sellers to take advantage of seawater taken from the waters near the fish market used to clean the table where the sale, wash the boat where ordinary fish are placed even sometimes watering the fish, thus increasing the likelihood of occurrence of contamination especially residential settlements around the waters. This is due to the lack of attention to aspects of sanitation and hygiene as well as lack of knowledge about the quality of fresh fish from the sellers.

Captured fish are obtained from fishermen in remote villages, transported using pickup trucks by way of fish placed in large-size plastic buckets and not closed and without ice so that during the course of the fish will be exposed to sunlight that speed up the process of degradation and cause bacteria to develop rapidly. This is supported by the view of consumer societies who assume that ice-fed fish has declining quality/freshness, although the fish is organoleptically fresh so that people tend to buy fish that have not been ice and fish will be ice when approaching decay.

This condition can lead to bacterial contamination to fish and can cause disease for humans who consume them. Some pathogenic bacteria are found in foodstuffs such as *Escherichia coli* and enteropathogenic bacteria, *Salmonella*, *Vibrio cholera* and *Yersenia* which can cause disease. According to Fardiaz, 1993, typhoid by *Salmonella typhi*, paratufus by *S. paratyphi*, dysentery by *Shigella*, salmonellosis by other *Salmonella* and cholera by *Vibrio cholerae* also *Escherichia coli* which are all.

Salmonella infections (Salmonellosis) invade the gastrointestinal tract that includes the stomach, small intestine, and colon or colon.

This bacterium is a bacteriophipogen causing abdominal pain, diarrhea, blood poisoning and fever. Endotoxin produced by *Salmonella* spp., In the form of lipo-polysaccharides to be secreted when the bacterium is dying (Frazier and Wheshoff, 1988; Irianto, 2006; Gamman and Sherrington, 1994; Pelczar, *et al.*, 1986).

Some of these bacterial strains are pathogenic with infectious mechanisms producing diarrhea, one of which is known as Enterotoxigenic *Escherichia coli* (ETEC) which produces toxin with an incubation period of 24-72 hours (Fratamico and Smith, 2006; Bhunia, 2008, Todar, 2008). Therefore, this research is aimed to test microbiologically that is Total Plate Total Test (ALT), *Escherichia coli* and *Salmonella*.

Materials and methods

Samples were taken randomly for 5 species of the same fresh fish then put into cool box containing ice cubes next under to the laboratory of Microbiology Polytechnic of Fisheries Negari Tual and LPPMHP Dumar to be tested and performed once a week simultaneously. Fresh fish samples were taken from Masrum market in Tual city and Langgur market in Southeast Maluku regency.

Sampling was done 3 times. Microbiology test, Total Plate Total (ALT) test Indonesian National Standard 01-2332.3-2006, *E. coli* (Indonesian National Standard 01-2332-1991) and *Salmonella* test (Indonesian National Standard 01-2332.2-2006b).

Results and discussion

Total Bacterial Colony Testing (ALT) Calculation of ALT with microbial cell count method that multiply and form colonies can be seen directly without using a microscope.

Total bacterial colonies (ALT) in fresh fish taken from 2 sites showed a range of 3.2×10^3 CFU/g to 8.7×10^4 CFU/g. The highest ALT value was obtained from samples of anchovies taken from the Tual market of 8.7×10^4 CFU/g and the lowest value was obtained from the overpass in the Langgur market. Test results can be seen in Table 1.

Table 1. Results of Total Plate Number Analysis (CFU / g) on Fresh Fish.

| Types of fish | Langgur market | Tual market |
|---------------|-------------------|-------------------|
| Tongkol | 7.1×10^3 | 5.9×10^3 |
| Layang | 3.2×10^3 | 4.2×10^3 |
| Teri | 5.3×10^4 | 8.7×10^4 |
| Kakap | 4.1×10^3 | 5.2×10^4 |
| Kembung | 3.5×10^4 | 5.3×10^3 |

Ilyas (1983) explained that the wetter fish bacteria conditions range from 10^2 to 10^5 in every square centimeter of skin. In general, ALT values for all samples of fresh fish taken show the highest yield on the Tual market location, this may be caused by the location of the fish which is far from the sale location and in the course of the fish is not given ice, other than that the lack of clean water facilities so that sellers take sea water around the sale location for use resulted in the contamination of fish sold. However, referring to the quality standard for fresh fish, fresh fish taken in both locations is still below the established quality standard of 5.0×10^5 CFU/g (SNI, 2006a). When viewed the total value of microbes in fresh fish sampled, it can be said that the sample is still safe microbiologically. Huss (1995) requires a

range of bacterial counts 10^3 - 10^7 CFU/gr for fresh fishery products that can still be consumed. Because total microbial testing of food products is carried out for a number of purposes, which is to ensure the safety of biological microorganisms, to know the sanitary conditions during processing and to know the storage of products (Fardiaz, 1992).

Total Bacteria *Escherichia coli* and *Salmonella*

Analysis of *E. coli* bacteria using MPN method. The results of the test by MPN method on fresh fish samples found microbes capable of fermenting lactose by producing positive bacteria Coliform which means there are microbes that can produce gas, which is characterized by the presence of acid, gas in tube durham and the color is cloudy with the number of high Coliform bacteria is 1100 APM/g for sampling location of Tual market and Langgur market with combination number 2-0-2 then the number of coliform bacteria is 20 APM/g as the lowest value. Corresponding table of APM index with 95% confidence level. Presumptive test results and confirmation tests can be seen in Table 2.

Table 2. Presumptive Test Results and Confirmation Test for Coliform

| Sample | Presumptive <i>Coliform</i> | | Confirmation <i>Coliform</i> | |
|--------|-----------------------------|-------------------|------------------------------|-------------------|
| | Indeks (APM/100 g) | Value (APM/100 g) | Indeks (APM/100 g) | Value (APM/100 g) |
| T1 | 460 | 4.6×10^2 | 460 | 4.6×10^2 |
| T2 | 460 | 4.6×10^2 | 460 | 4.6×10^2 |
| T3 | 1100 | 1.1×10^3 | 1100 | 1.1×10^3 |
| T4 | 160 | 1.6×10^3 | 460 | 4.6×10^2 |
| T5 | 280 | 2.8×10^2 | 150 | 1.5×10^2 |
| L1 | 20 | 2.0×10^1 | 20 | 2.0×10^1 |
| L2 | 16 | 2.4×10^2 | 93 | 9.3×10^1 |
| L3 | 120 | 1.2×10^3 | 120 | 1.2×10^3 |
| L4 | 35 | 3.5×10^1 | 35 | 3.5×10^1 |
| L5 | 28 | 2.8×10^1 | 28 | 2.8×10^1 |

The highest contamination of fecal coliform is obtained from anchovy samples from the Tual market. This can happen because the sellers usually take seawater from around the market place to clean up the fish selling places. Apart from fresh fish samples, coliform bacteria testing is also performed on water samples used by sellers. Test results can be seen in table 3. For testing of *Salmonella dari* bacteria all types of fresh fish taken as samples are not found contaminated by *Salmonella* bacteria.

From the table above shows that each tested water sample contains coliform > 1100 MPN/100 ml where the APM index indicates that 100 ml of water sample contains > 1100 ml coliform cells for Tual market location and has exceeded standard quality standard. According to Kep-KEPMEN L.H. No.179 year 2004 regarding seawater quality standard, maximum requirement of *E. coli* is allowed <200 cfu/100ml. From this result shows that these waters contain many coliform bacteria.

The presence of coliform bacteria in parairan is caused by the presence of pollutant substances such as garbage from houses and household waste discharged into the sea.

So need to watch out for the presence of coliform in a waters show poor water quality and potential to bring disease. The contamination of these bacteria indicated that poor sanitation (Supardi and Sukanto, 1999). The continuation of the predicted test of the positive tube is by strengthening testing.

Table 3. Test result of coliform bacteria by method of MPN.

| Sampel | Acid and gas production | | | | | | Results | | | Indeks MPN |
|----------------|-------------------------|---|---|---|---|---|----------------|---|---|-----------------|
| Seri 1 (0,1ml) | Seri 2 (1 ml) | | | | | | Seri 3 (10 ml) | | | |
| PL | + | + | + | + | + | + | - | - | - | 3-3-0 240/ml |
| PT | + | + | + | + | + | + | + | + | + | 3-3-3 >11000/ml |

Classification of *E. coli* when IMViC reaction is + + - - or - + - - and gram stain shows gram negative and not berspora forming gas in LST broth at incubation for 48 ± 2 hours. Based on test results of IMVC confirmation test in Table 2 and 3 and matched with biochemical classification table based on SNI 01-2332-1991, it can be concluded that there is no contamination of *E. coli* on all samples of fresh fish taken at test sites which means that fresh fish at the site are safe for consumption.

Conclusion

Fresh fish sold in Langgur market and Tual market show the value of ALT content shows the range of 3.2×10^3 CFU/g to 8.7×10^4 CFU/g but amandikanonsumsi because under the standard set by the SNI that is 5.0×10^5 CFU/g. Untuk coliform bacteria contaminate fish and waters around the sale location with value > 200 MPN/100 ml while for bacteria *E. coli* and *Salmonella* not found existence.

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