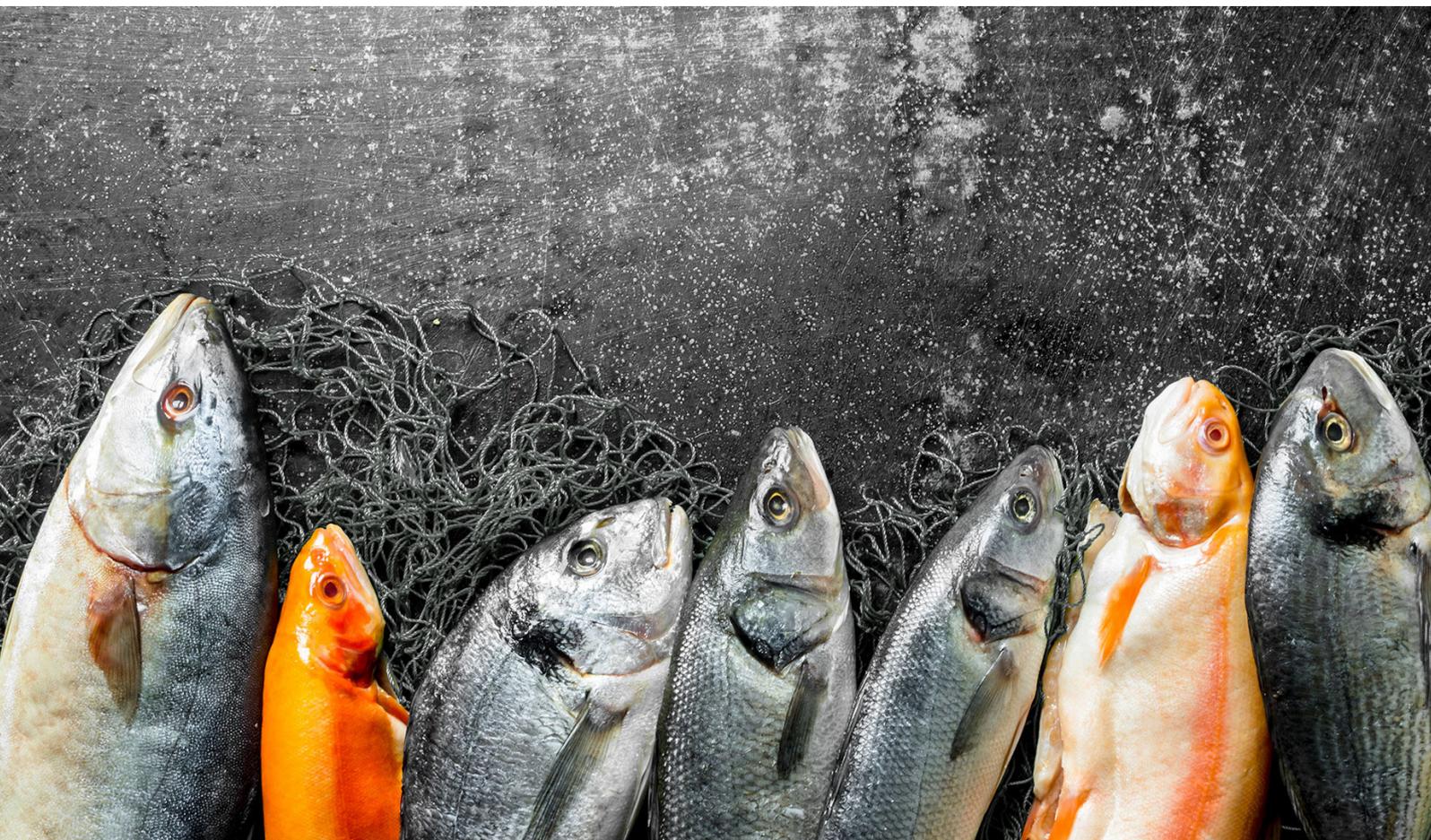


Date: 13. November 2018



Test of Planet Strong in a „fish washer machine“

INTRODUCTION

In cooperation with a leading food company, 170 gutted salmon were treated with Planet Strong. The goal is to reduce germs on the salmon and to create a safer, longer-lasting product. For this, the salmon were 8 minutes treated in a 2% utility solution Planet Strong with 100 ppm of active ingredient.

PRELIMINARY TEST

In order to determine a suitable concentration of Planet Strong for the test run, three containers with 1%, 2% and 3% utility solution were previously mixed with water. Two salmon were dipped in these three containers for 10 minutes. Subsequently, the skin and the gills of these fishes were examined.

- 1% utility solution has a pH-level of 8.33
- 2% utility solution has a pH-level of 8.85
- 3% utility solution has a pH-level of 9.15

CONCLUSION OF THE PRELIMINARY TEST

Even with the 3% utility solution, no changes were observed in the fish. The analysis was carried out by the quality assurance of the food company.

For the actual test, we agreed for a 2% utility solution. The application of a higher concentration of Planet Strong would be possible without changing the fish structure.

TEST PREPARATION

On the surface of the fish, the total number of viable cells (TVC) is determined. This value provides a quantitative estimate of the concentration of microorganisms such as bacteria, yeasts or mold spores in a sample. The count represents the number of colonies forming units (cfu) per gram (or per ml) in the sample.

CONSTRUCTION OF THE PLANT "FISH WASHER MACHINE"

For germ reduction, gutted fish are turned over or treated for 8 minutes in the following machine (See Figure 1). Planet Strong disinfects salmon with its antimicrobial action against harmful microorganisms.

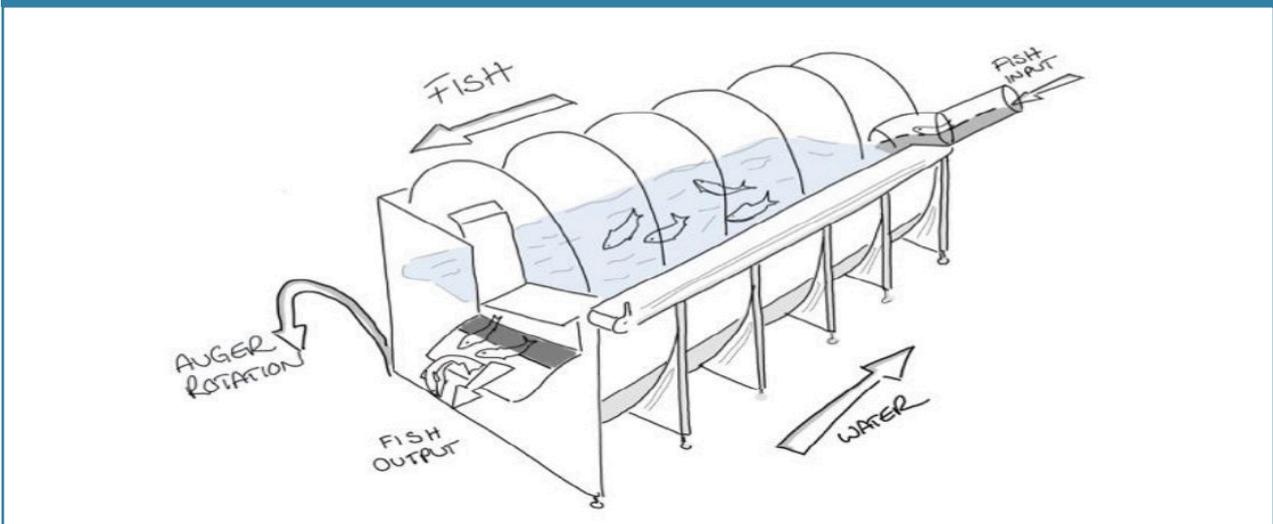


Figure 1 Fish treatment plant

TEST PROCEDURE

Before starting the test, a smear is made on each fish on the skin and in the gills to determine the TVC-level in an independent laboratory.

The “fish washer machine” is filled with 8500 liters of process water from production and 170 liters of Planet Strong (concentrate with 5900 ppm). This corresponds a utility solution of about 2% and about 110 ppm of active ingredient at the start of the test.

The process water contains a mixture of water, blood and salmon remnants.

TEST START

170 salmon are treated or disinfected in groups of five with the plant.

It can be assumed that Planet Strong in use gradually decomposes and breaks down again into the starting components (water and salt).

Therefore, in later operation, a small and continuous addition of Planet Strong may be useful, to maintain a two percent concentration. The degradation rate of Planet Strong depends on the organic load of the process water of the temperature and the germ load.

After the test an independent laboratory determined the TVC-level on the skin and in the gills of the salmon.

MEASUREMENT RESULTS																	
Before cleaning, 13.11.					Between 3 and 4 gill covers		Between 1 and 2 gill covers		After cleaning, 13.11.					Between 3 and 4 gill covers		Between 1 and 2 gill covers	
Nb.	Material	Serie	Group			Listeria monocytogenes	TVC 30°C	Nb.	Material	Serie	Groupe			Listeria monocytogenes	TVC 30°C		
1	5 fish	0	0	Before cleaning	Gills	Not detected	100	1	5 fish	0	0	After cleaning	Gills	Not detected	70		
2	5 fish	1	1	Before cleaning	Gills	Not detected		2	5 fish	1	1	After cleaning	Gills	Not detected	10		
4	5 fish	1	3	Before cleaning	Gills	Not detected	70	4	5 fish	1	3	After cleaning	Gills	Not detected	0		
5	5 fish	1	4	Before cleaning	Gills	Not detected	0	5	5 fish	1	4	After cleaning	Gills	Not detected	0		
6	5 fish	2	1	Before cleaning	Gills	Not detected	30	6	5 fish	2	1	After cleaning	Gills	Not detected	0		
7	5 fish	2	2	Before cleaning	Gills	Not detected	10	7	5 fish	2	2	After cleaning	Gills	Not detected	10		
8	5 fish	2	3	Before cleaning	Gills	Not detected	0	8	5 fish	2	3	After cleaning	Gills	Not detected	0		
9	5 fish	2	4	Before cleaning	Gills	Not detected	0	9	5 fish	2	4	After cleaning	Gills	Not detected	0		
10	5 fish	3	1	Before cleaning	Gills	Not detected	10	10	5 fish	3	1	After cleaning	Gills	Not detected	0		
11	5 fish	3	2	Before cleaning	Gills	Not detected	0	11	5 fish	3	2	After cleaning	Gills	Not detected	0		
12	5 fish	3	3	Before cleaning	Gills	Not detected	0	12	5 fish	3	3	After cleaning	Gills	Not detected	0		
13	5 fish	3	4	Before cleaning	Gills	Not detected	10	13	5 fish	3	4	After cleaning	Gills	Not detected	0		
14	5 fish	4	1	Before cleaning	Gills	Not detected	10	14	5 fish	4	1	After cleaning	Gills	Not detected	0		
15	5 fish	4	2	Before cleaning	Gills	Not detected	0	15	5 fish	4	2	After cleaning	Gills	Not detected	0		
16	5 fish	4	3	Before cleaning	Gills	Not detected	0	16	5 fish	4	3	After cleaning	Gills	Not detected	20		
17	5 fish	4	4	Before cleaning	Gills	Not detected	10	17	5 fish	4	4	After cleaning	Gills	Not detected	0		
19	5 fish	1	1	Before cleaning	Skin	Not detected	60	19	5 fish	1	1	After cleaning	Skin	Not detected	0		
21	5 fish	1	3	Before cleaning	Skin	Not detected	0	21	5 fish	1	3	After cleaning	Skin	Not detected	0		
22	5 fish	1	4	Before cleaning	Skin	Not detected	30	22	5 fish	1	4	After cleaning	Skin	Not detected	0		
23	5 fish	2	1	Before cleaning	Skin	Not detected	10	23	5 fish	2	1	After cleaning	Skin	Not detected	10		
25	5 fish	2	3	Before cleaning	Skin	Not detected	70	25	5 fish	2	3	After cleaning	Skin	Not detected	10		
26	5 fish	2	4	Before cleaning	Skin	Not detected	20	26	5 fish	2	4	After cleaning	Skin	Not detected	0		
27	5 fish	3	1	Before cleaning	Skin	Not detected	50	27	5 fish	3	1	After cleaning	Skin	Not detected	20		
28	5 fish	3	2	Before cleaning	Skin	Not detected	150	28	5 fish	3	2	After cleaning	Skin	Not detected	0		
29	5 fish	3	3	Before cleaning	Skin	Not detected	10	29	5 fish	3	3	After cleaning	Skin	Not detected	0		
30	5 fish	3	4	Before cleaning	Skin	Not detected	30	30	5 fish	3	4	After cleaning	Skin	Not detected	10		
31	5 fish	4	1	Before cleaning	Skin	Not detected	70	31	5 fish	4	1	After cleaning	Skin	Not detected	0		
32	5 fish	4	2	Before cleaning	Skin	Not detected	70	32	5 fish	4	2	After cleaning	Skin	Not detected	0		
33	5 fish	4	3	Before cleaning	Skin	Not detected	40	33	5 fish	4	3	After cleaning	Skin	Not detected	0		
34	5 fish	4	4	Before cleaning	Skin	Not detected	10	34	5 fish	4	4	After cleaning	Skin	Not detected	0		
35	Water tank			before sampling	Water	Not detected	1	35	Water tank			after sampling	Water	Not detected	10		
Average:							29								Average:		5

Table 1: Measured values (measurement errors were removed from the table)

DATA ANALYSIS

The measurements in Table 1 show an average of twenty-nine TVC at 30°C before treatment. After the treatment, the TVC average drops to five at 30°C. From this it can be seen that a germ reduction by Planet Strong has been carried out. By using Planet Strong, the TVC could be reduced to zero at 30°C in 13 single values. The effect of Planet Strong becomes even clearer, if the initial TVC values are higher than in this example.

The trend lines in Figure 2 illustrate the effect of Planet Strong on the total number of viable cells (TVC). The orange trend line (after the treatment with Planet Strong) shows a gradient towards zero of the TVC at 30°C.

SINGLE MEASUREMENT RESULTS

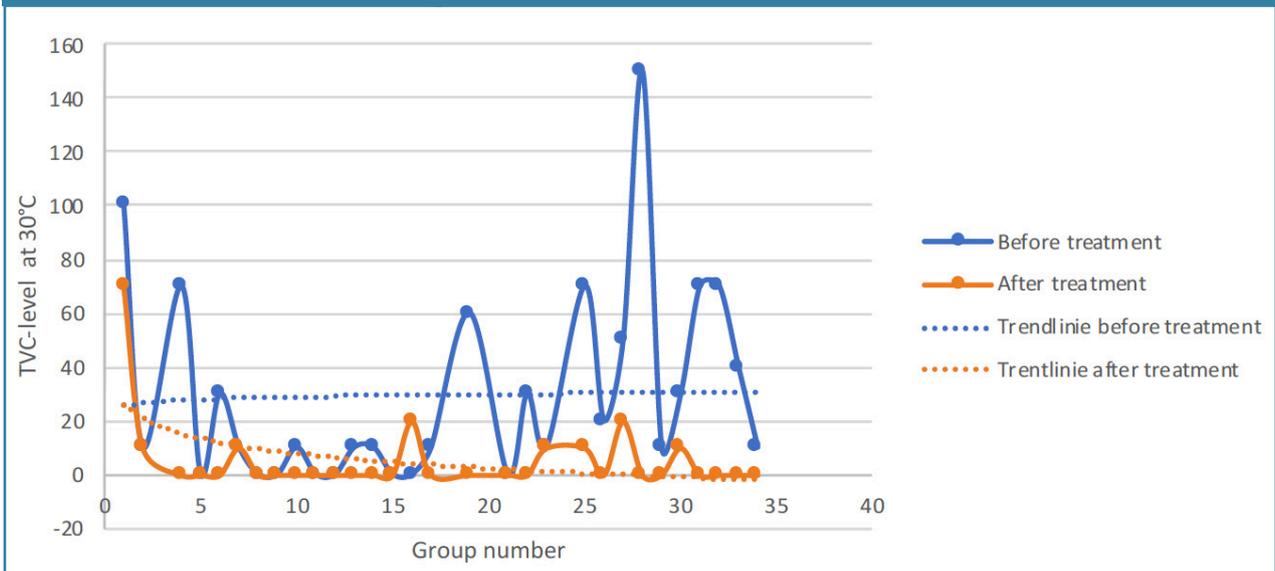


Figure 2: Single measurements before and after the treatment

The salmon were not infected with *Listeria monocytogenes* on November 13th. Therefore, in this test, no statement can be made about the effectiveness of Planet Strong over *Listeria monocytogenes*. However, own experiments show that Planet Strong is also effective against *Listeria monocytogenes*.

The 8500 liters of process water had a pH-level of 7.65 before the addition of 170 liters of Planet Strong. After addition of Planet Strong, the pH-level increased to 8.72.

After the initiation, a change in the color of the water was seen from red to white.

Over the four-hour test period, the pH-level dropped to 8.45 in the first thirty minutes.

In the subsequent three and a half hours, the pH-level falls very slowly to 8.33.

A reaction between the process water and Planet Strong takes place during mixing. This can be explained in addition to the color change by the first drop of the pH-level.

CONCLUSION

Planet Strong can reduce the bacterial count on the surface and the gills of fish without changing the quality of the product.

EFFECTS OF PLANET STRONG AFTER 7 DAYS STORAGE:

Examination by an independent laboratory revealed large differences between the salmon without treatment and treatment by Planet Strong.

Figures 3 & 4 show the total viable counts of the viable cells (TVC) on the scales and gills of the salmon after 7 days storage at 2°C.

Without treatment, the measurements on the scales give a TVC level at 30°C of 22000 and in the gills of 38000. In contrast, the salmon treated with Planet Strong are on the scales at 60 TVC and in the gills at only 50 TVC.

In the gills, a germ reduction by Planet Strong in the storage test is therefore 760%.

On the skin, the germ reduction in the same test is 367%.

These results are due to the fact that low concentrations of Planet Strong remain on the surface of the fish and are active until they have reacted with microorganisms and destroyed them. We from Planet Innovation call this effect "depot effect".

This may extend the sell-by date of products. The goods stay fresh longer thanks to the use of Planet Strong.

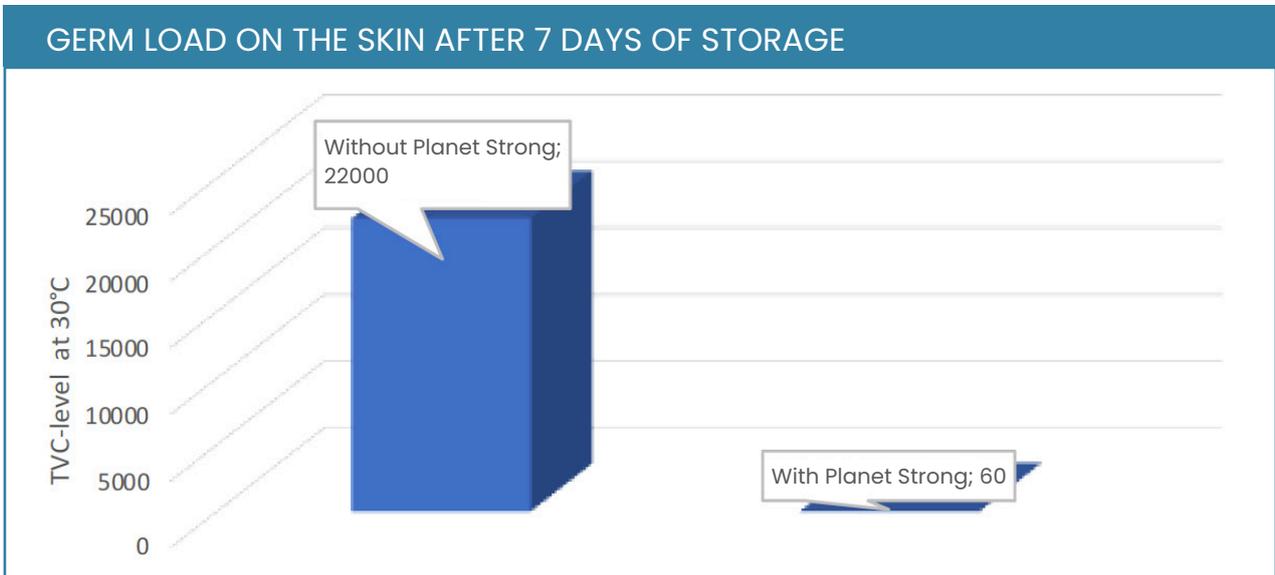


Figure 3: Germ load on the skin after 7 days of storage

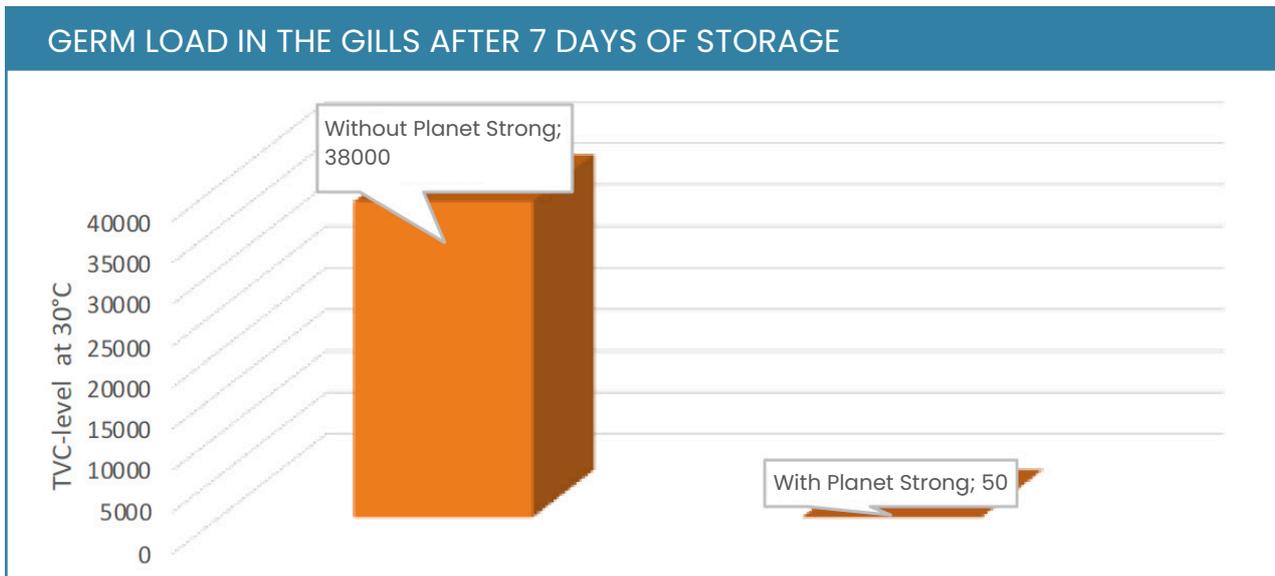


Figure 4: Germ load in the gills after 7 days of storage