



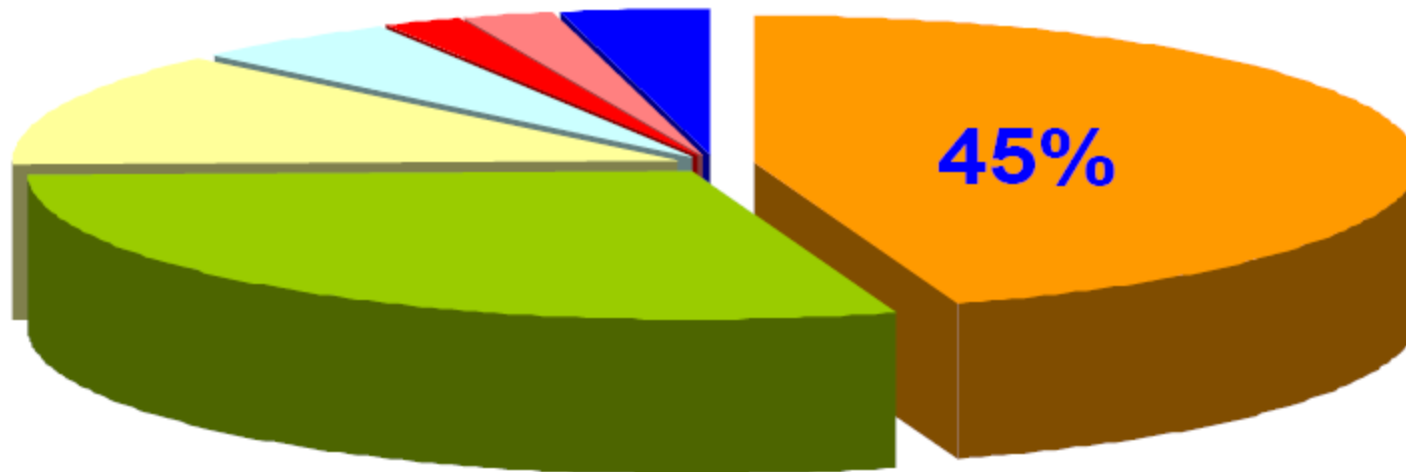
Combination of Organic acids to prevent Salmonella in SBM

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FIAAP CONGRESS BANGKOK

ARGENTINE SBM COMPLEX: 1st World SBM exporter



Argentina

Brazil

United States

India

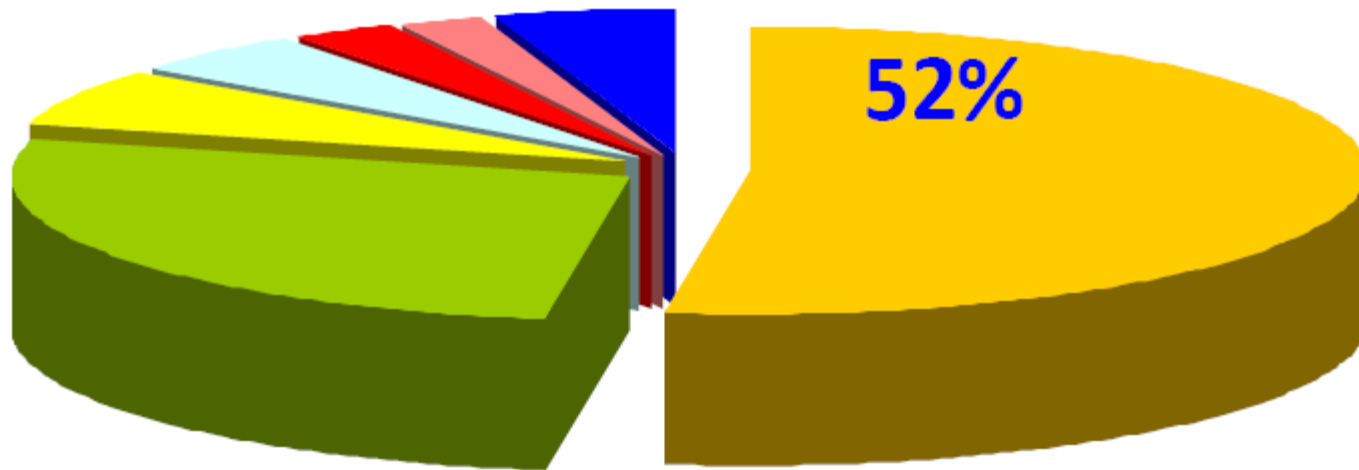
Bolivia

Paraguay

Resto del mundo

Fuente: www.mercampo.com.ar

ARGENTINE SBM COMPLEX: 1st World Soyoil exporter



■ Argentina

■ Brazil

■ United States

■ EU-25

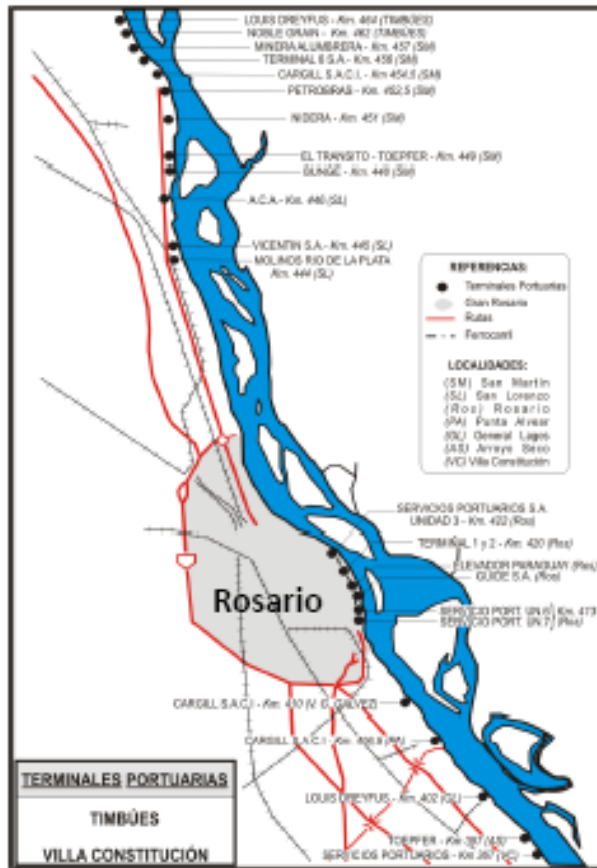
■ Bolivia

■ Paraguay

■ Resto del mundo

Fuente: www.mercampo.com.ar

ARGENTINE SBM COMPLEX: Port complex Up River Rosario



Porcentaje del total de exportaciones argentinas que se embarcan en el complejo

Aceite

98% Soja

50% Girasol

90% Otros

Grano

50% Trigo

85% Maíz

66% Soja

22% Girasol

Harina

97% Soja

63% Girasol

95% Otras

Fuente: Bolsa de Comercio de Rosario



ARGENTINE SBM COMPLEX:



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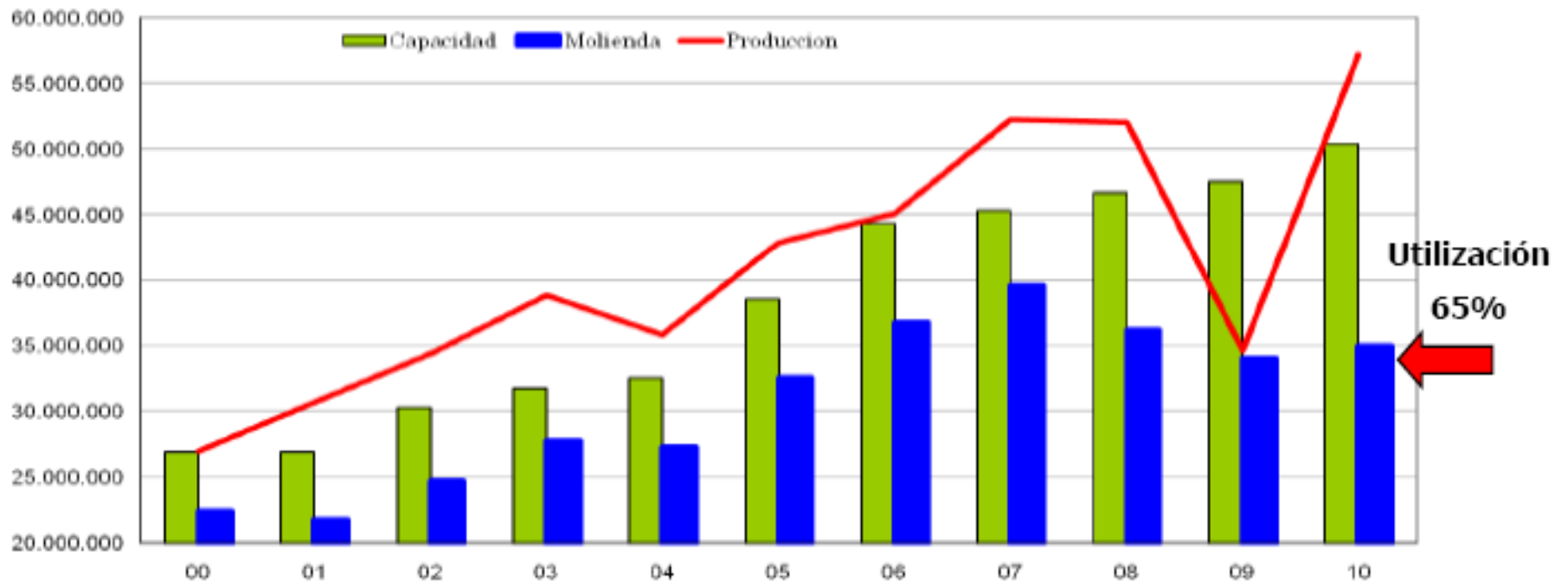


ARGENTINE SBM COMPLEX:



ARGENTINE SBM COMPLEX:

Evolution of the Crushing capacity

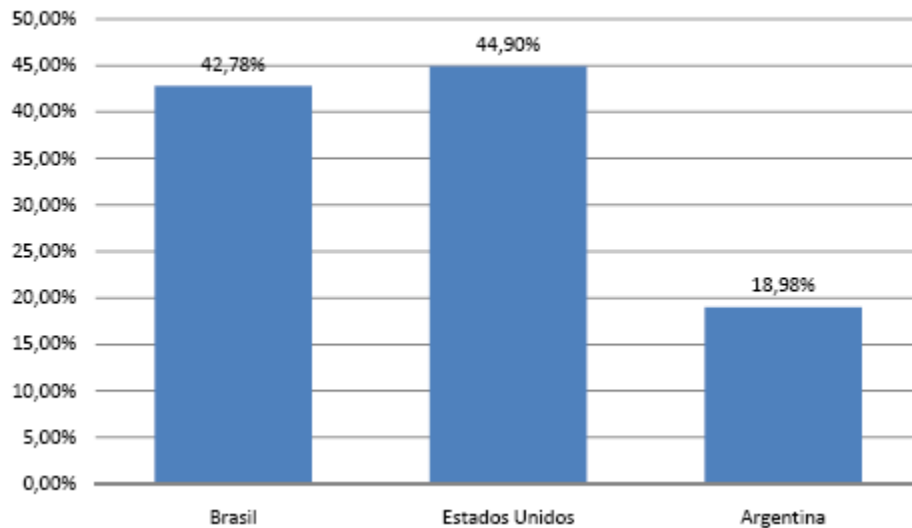


ARGENTINE SBM COMPLEX:

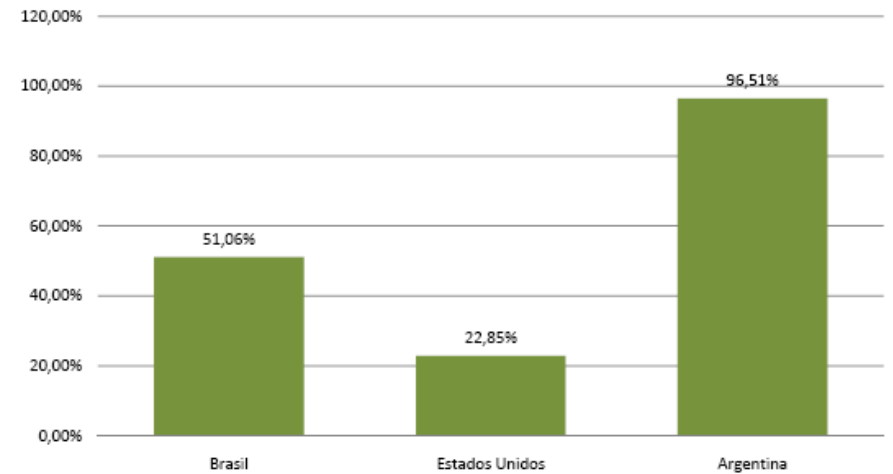
Soybean exports, % of prod

SBM exports, % of prod

Exportaciones de poroto de soja como porcentaje de la producción

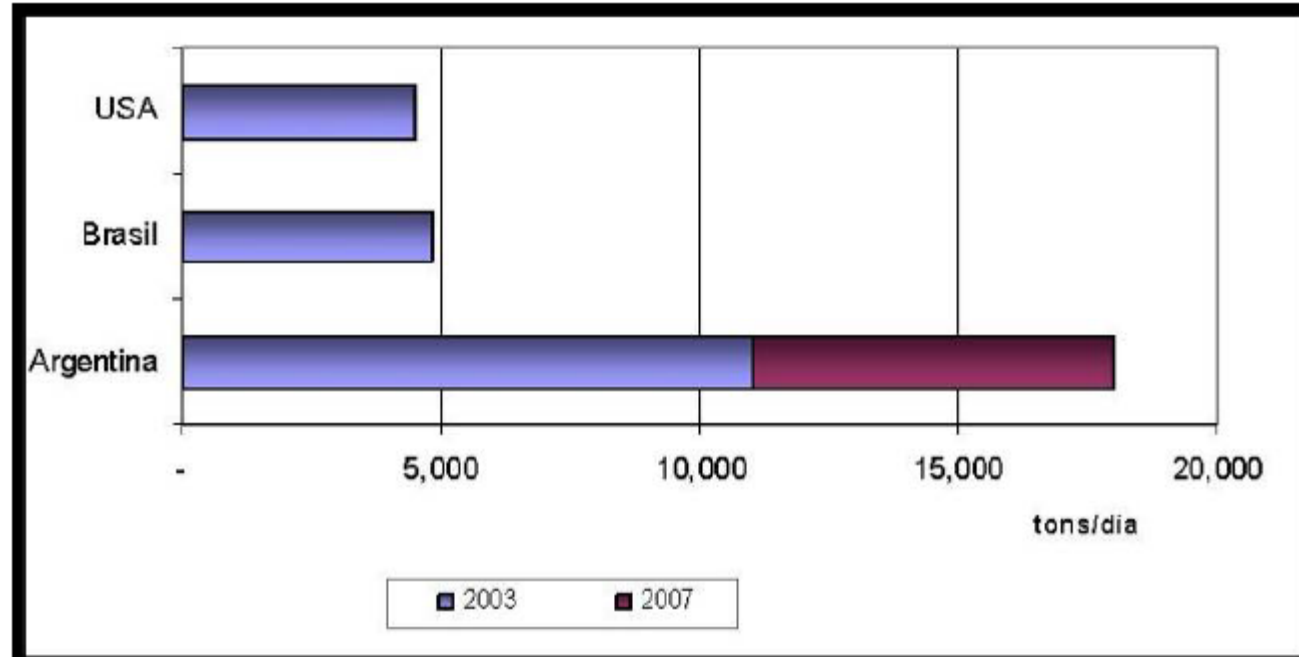


Exportaciones de harina de soja como porcentaje de la producción



ARGENTINE SBM COMPLEX:

Biggest Crushing plants daily capacity



Objective 1: to develop the product

- **To supply the tools to control Salmonella contamination**
- **Safe for the workers**
- **Non corrosive for the production plants**



Objective 2:

- **Treatment of critical points in the plant: To avoid re-contamination.**
- **Treatment of the protein meals**

Product properties creating added value

We developed an ammoniated water-free formic acid mixed with propionic acid (99% active ingredient): AS 2500L

We tested for:

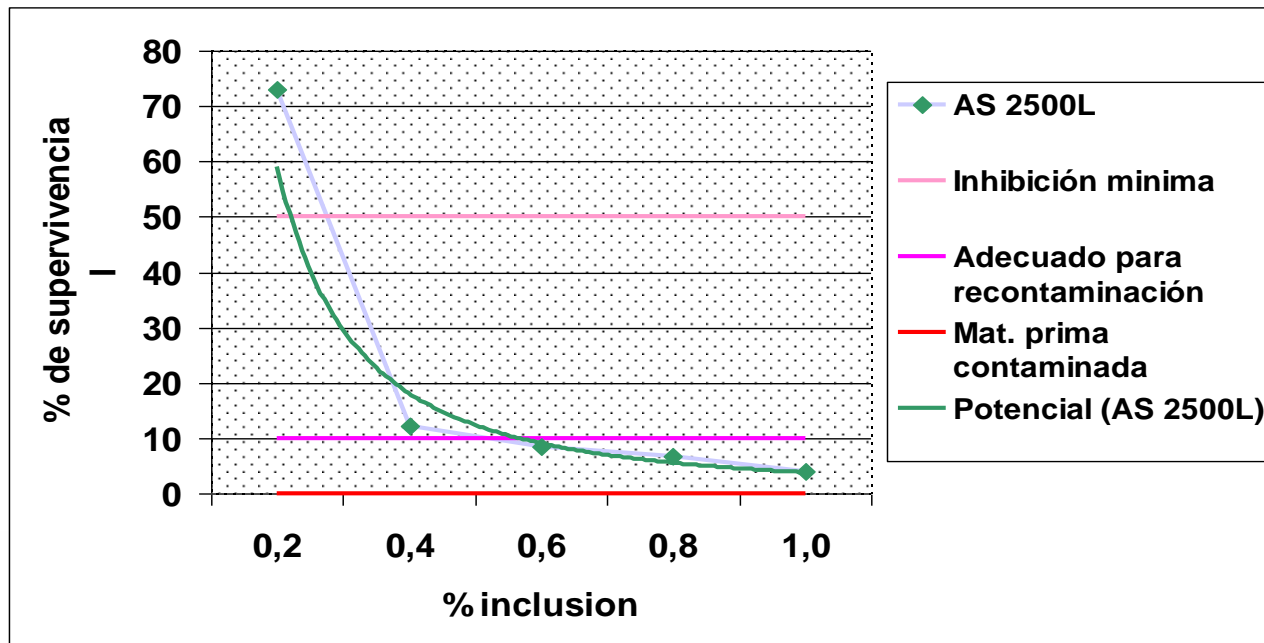
- ✓ Efficacy against Salmonella
- ✓ Corrosivity
- ✓ Physical properties



Effectiveness against Salmonella:

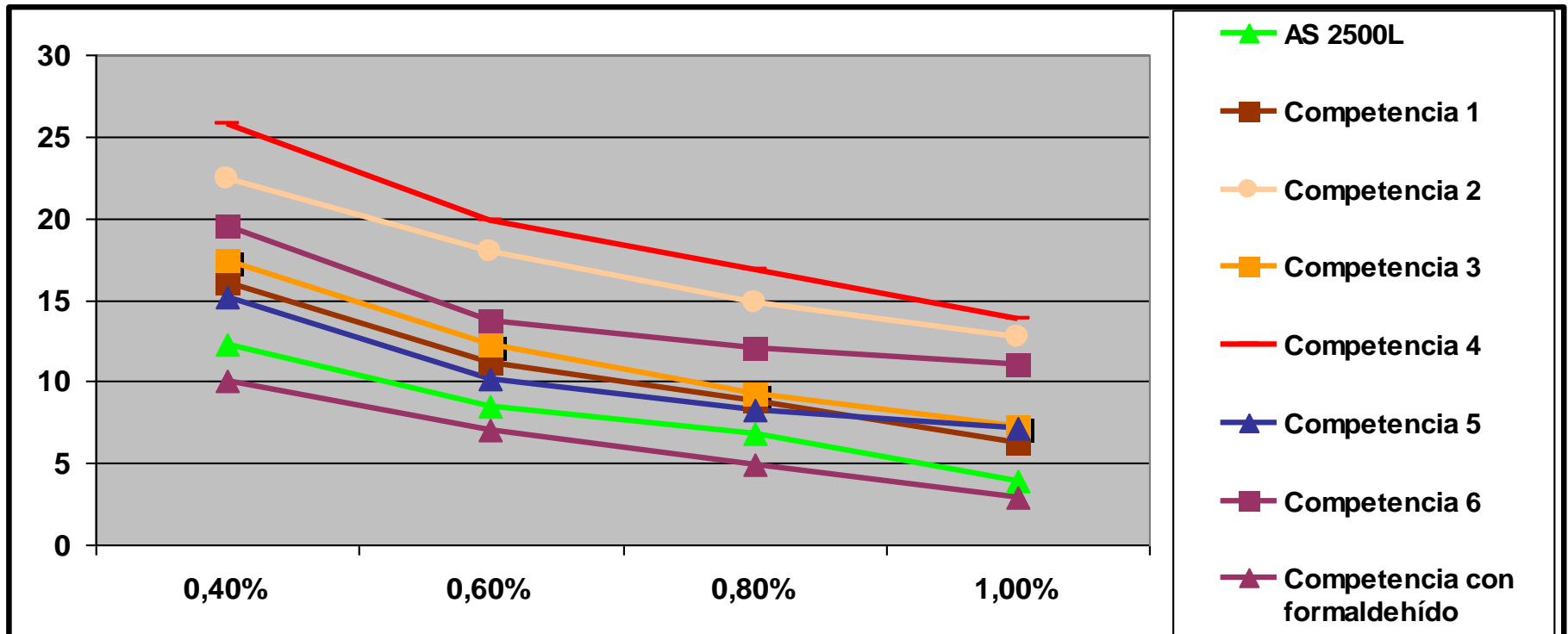
Treating raw materials– how much is enough?

- Typically used to prevent recontamination during the process and storage, it is accepted as result from inclusion in general <100 %.
- We have chose to eliminate 50% in 48 hours as "minimal inhibition" and 90% in 48 hours as "adequate to prevent from recontamination"



Effectiveness against Salmonella: comparison with typical formulations, incl. Formaldehyde based product.

Survival of Salmonella tiphymurium at 48hs post application

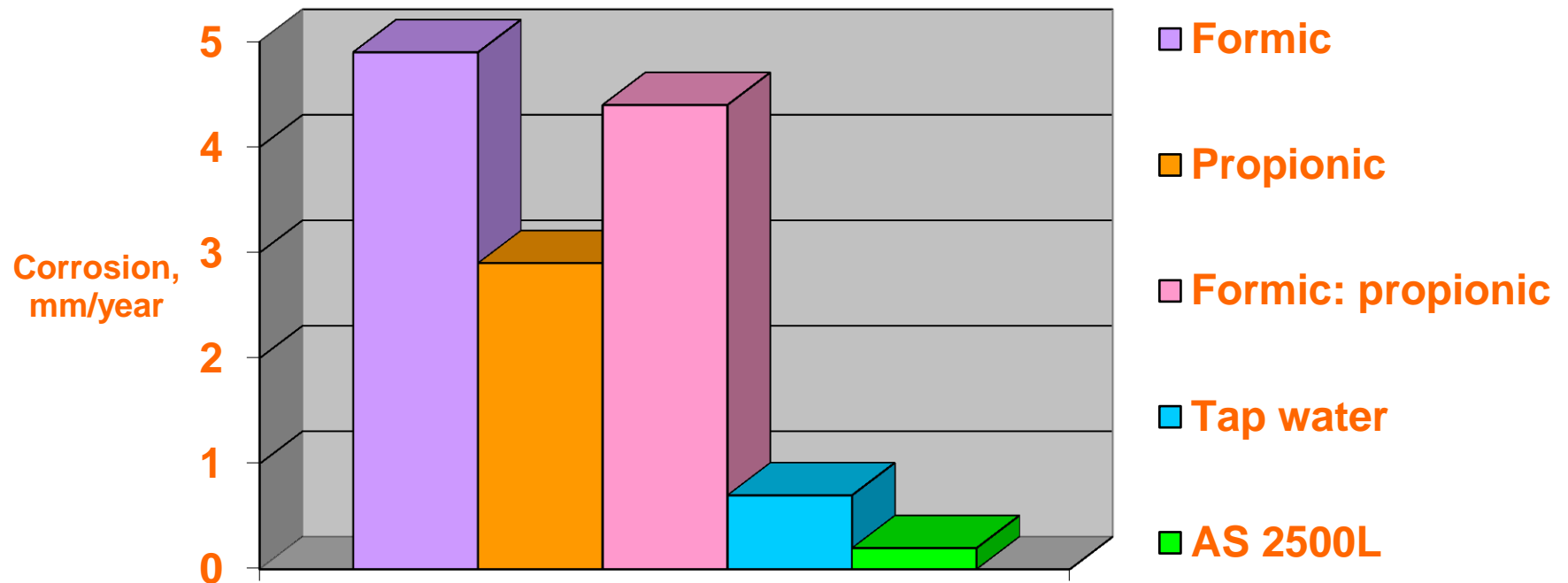


Effectiveness against Salmonella:

- **The inclusion of 0.22% AS2500L for minimal inhibition.**
- **Inclusion of 0.5-0.6% AS 2500L is required for $\geq 90\%$ reduction of salmonella in feeds within 48 hours, while about 1% to the average of the competing products is required for the same effect.**
- **The effectiveness of AS 2500L in the feeds was superior to other commercial product of organic acids mix: potent molecule ammoniated water-free formic acid + higher active ingredient concentration.**
- **Almost similar to the performance of a formaldehyde based product.**



Corrosion in soft steel submerged in agitated liquid.



✓ **Low corrosivity - equipment friendly:
just 4-5% from formic/propionic mix
corrosiveness**

Other properties:

Ammoniated water-free formic acid mixed with propionic acid (99% active ingredient):

- ✓ **Non classified - non-harmful**
- ✓ **No pungent smell**
- ✓ **Good storing properties**



Treatments developed:

- **Identified critical points inside crushing plants:**
 - Exit of the toaster
 - Fines recovery
 - Pelleting
- **Treating surfaces of cells of storage and warehouses.**
- **Included these treatments in HACCP programs**



Treatment of protein meals:

- To treat protein meals in belts (conveyor), either prior to loading of vessels or to storage



More than 6 years of experience in SBM treatment!!

New Efficacy trials 2011: how low we can go?

7.2. Poder bactericida según European Standard EN 1040 Chemical disinfectants and antiseptics. Basic bactericidal activity. Test method and requirements (phase 1))

Action time 30 min

| Product & Concentration Kg/ton | Time | | Destruction (%) |
|--------------------------------|--------------------------|--------------------|-----------------|
| | Initial | Final (30 min) | |
| | Salmonella Count (FCU/g) | | |
| Competitor 1,00 | $3,6 \times 10^6$ | $>1,6 \times 10^5$ | <95,555 |
| AS2500L 1,00 | $3,2 \times 10^6$ | $<1,0 \times 10^1$ | >99,999 |
| Competitor 0,75 | $3,6 \times 10^6$ | $>1,6 \times 10^5$ | <95,555 |
| AS2500L 1,00 | $4,1 \times 10^6$ | $3,4 \times 10^2$ | >99,991 |
| Competitor 0,50 | $3,5 \times 10^6$ | $>1,6 \times 10^5$ | <95,555 |
| AS2500L 0,50 | $4,1 \times 10^6$ | $7,6 \times 10^2$ | >99,981 |

Note: Concentration of formic acid and salts: AS2500L 81%; Competitor: 40%

✓ **In recent trials we used the EN 1040 methodology:**

It was determined that the 0.05% dose AS 2500L (0.5kg/ton) reduced $\geq 99\%$ of salmonella in 30 min, 4 log reduction of bacteria concentration vs 0.1% (or 1kg/ton) of a competitive product, that just fell 1 log starting from the same inoculum



New Efficacy trials 2011

Bactericidal power: For the direct application of the products, undiluted, on the SBM (11% moisture content)

Counts of Salmonella in CFU/g of SBM inoculated and treated with the reference products, at the concentrations indicated below

| | dosis, % | day | | | | |
|-------------|----------|-----|-----|-----|-----|-----|
| | | 0 | 1 | 2 | 3 | 7 |
| Competition | 0,01 | 770 | 760 | 550 | 510 | 410 |
| | 0,10 | 630 | 830 | 440 | 420 | 350 |
| | 0,20 | 740 | 780 | 320 | 380 | 440 |
| AS2500L | 0,01 | 620 | 700 | 450 | 380 | 270 |
| | 0,05 | 570 | 850 | 500 | 390 | 230 |
| | 0,20 | 520 | 390 | 250 | 240 | 160 |

Note: Concentration of formic acid and salts: AS2500L 81%; Competitor: 40%

The same results were found when SBM was inoculated for 2, 3 y 7 days.

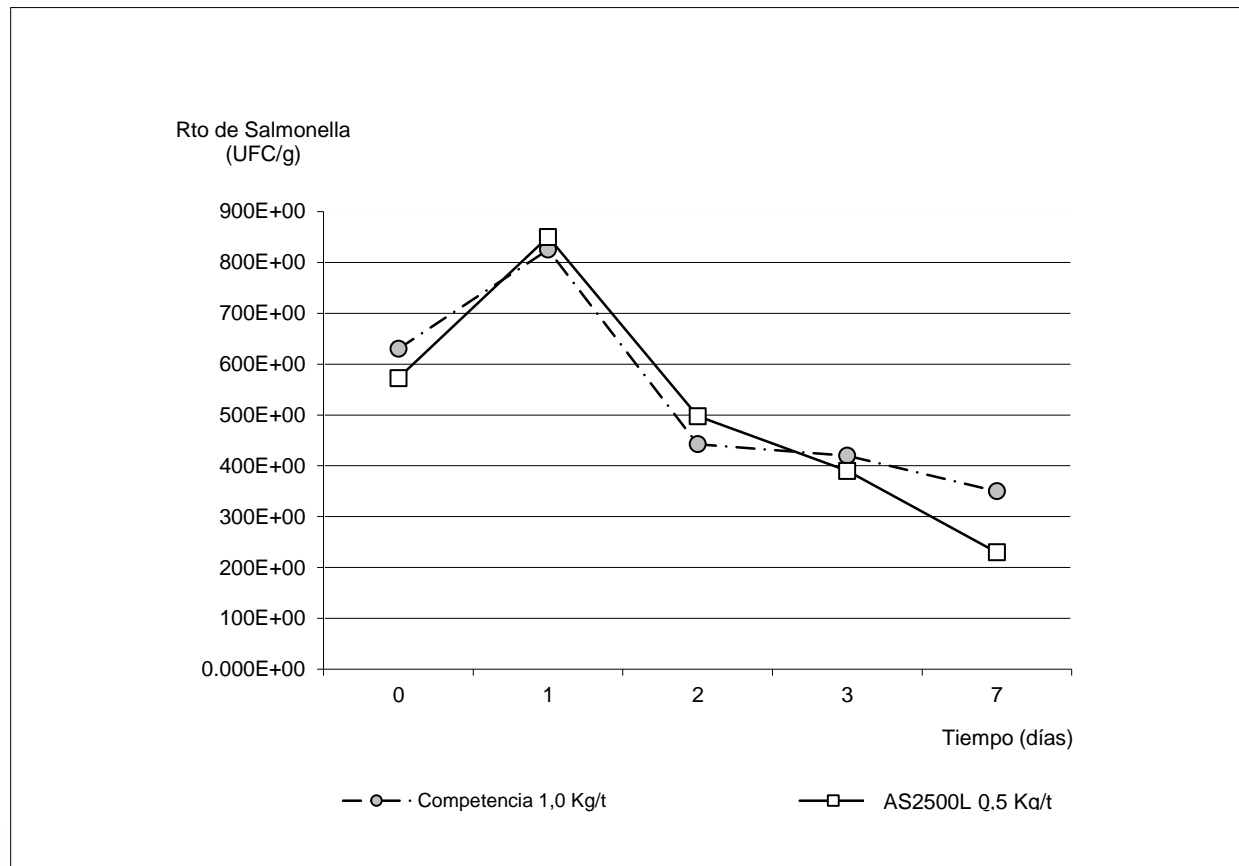
It can be observed even better effect at 7 days!



New Efficacy trials 2011

Bactericidal power: For the direct application of the products, undiluted, on the SBM (11% moisture content)

Counts of Salmonella in CFU/g of SBM inoculated and treated with the reference products, at the concentrations indicated below



Note: Concentration of formic acid and salts: Bolifor 81%; Competitor: 40%

New research trials 2012: anti-mould effect?

- Highly contaminated maize grains were submitted to the following treatments:

| Treatments | Total mould Count (FCU/g) | Incidence of Fusarium spp. |
|-------------------|---------------------------|----------------------------|
| Disinfectant | 140,93 a | 75,83 a |
| AS2500L 2,50 kg/T | 5,53 b | 4,72 b |
| Negative control | 128,09 a | 70,46 a |
| CV % | 11,13% | 8,35 |

- Other moulds:

| Treatments | Fusarium spp. | Aspergillus flavus | Aspergillus niger | Rhizopus spp | Penicillium spp |
|-------------------|---------------|--------------------|-------------------|--------------|-----------------|
| Disinfectant | 76,00 | 2,00 | 2,00 | 32,50 | 29,00 |
| AS2500L 2,50 kg/t | 5,0 | 0,50 | 0,00 | 0,50 | 0,00 |
| Negative Control | 70,46 | 3,00 | 1,00 | 25,00 | 29,00 |

We could conclude that this molecule is also very powerful to control moulds in grains, specially Fusarium!

CONCLUSIONS:

The formulation of ammoniated water-free formic acid+ propionic acid demonstrated compared to typical organic acids blends:

- **Highly efficient to control Salmonella in large scale plants**
- **Being safe for the workers and non-corrosive.**
- **0.22% AS2500L for minimal inhibition, but still very efficient at 0.05%!**
- **And more recently: it is also efficient to control moulds.**



FOOD HYGINE IMPLICATIONS:

- **SBM industry and the whole feed industry has a potent tool to ensure their customers Salmonella control of their products formaldehyde free.**
- **More and more European market is requesting a anti-salmonella control in SBM exports after these results.**
- **We want to prevent mycotoxins development treating with AS2500L (specially T2, DON most harmful from Fusarium complex)**
- **More work should be done!**



THANK YOU!

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