INCIDENCE OF *FUSARIUM* TOXINS IN FEEDS MARKETED IN PORTUGAL

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MONITORIZATION OF FUSARIIUM TOXINS IN THE FEED SECTOR


- PHYSICAL CHECKS AT THE MORE APPROPRIATE STAGES OF PRODUCTION AND MANUFACTURE, THE INTERMEDIATE STAGES PRIOR TO MARKETING, INCLUDING IMPORTATION, AND THE USE OF PRODUCTS

- SAMPLING OF DIFFERENT PRODUCTS NATURE (FEED MATERIALS AND COMPOUND FEEDS)

- ENFORCEMENT MEASURES WHEN NON COMPLIANCE WITH DIR. 2002/32/CE (AFLB1)
PORTUGUESE OFFICIAL FEED CONTROL 

AUTHORITIES INVOLVED
MATERIALS AND METHODS
SAMPLING PROCEDURES

Sampling of feeds with the purpose of physical checks are carried out in order to accomplish the requirements of standard procedures, according to:

- PORTUGUESE STANDARD: NP 3256 (∼ COMMISSION DIRECTIVE 76/371/CEE)
- CEN: EN ISO 6497:2004
METHODS OF ANALYSIS

SAMPLE EXTRACTION

• LIQUID-LIQUID PARTITION
• IMMUNOAFFINITY COLUMNS CLEANUP (IAC)
METHODS OF ANALYSIS

DETERMINATION

• THIN LAYER CHROMATOGRAPHY (TLC)

DON

ZEA
METHODS OF ANALYSIS

DETERMINATION

• HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)

DON
HPLC-UV/DAD

ZEA
HPLC-FI

FB1+FB2
HPLC-FI
### DETECTION LIMITS (LOD)

<table>
<thead>
<tr>
<th></th>
<th>DON</th>
<th>ZEA</th>
<th>FB1</th>
<th>FB2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TLC</strong></td>
<td>100 µg/kg</td>
<td>50 µg/kg</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>HPLC</strong></td>
<td>1 µg/kg</td>
<td>5 µg/kg</td>
<td>50 µg/kg</td>
<td>100 µg/kg</td>
</tr>
</tbody>
</table>
INCIDENCE OF *Fusarium* Toxins

in Portuguese Feed Materials

and Compound Feeds
## MONITORIZATION OF DON, ZEA AND FB1 IN FEED MATERIALS

### (DATA FROM 2000/2003)

<table>
<thead>
<tr>
<th>FEED MATERIALS</th>
<th>DEOXYNIVALENOL*</th>
<th>ZEARALENONE*</th>
<th>FUMONISIN B1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N+/N Level (µg/kg)</td>
<td>N+/N Level (µg/kg)</td>
<td>N+/N Level (µg/kg)</td>
</tr>
<tr>
<td>SOYBEAN</td>
<td>0/26 - nd</td>
<td>-</td>
<td>0/26 -</td>
</tr>
<tr>
<td>RICE</td>
<td>3/17 100-200</td>
<td>nd</td>
<td>1/17 15</td>
</tr>
<tr>
<td>MAIZE</td>
<td>8/58 100-500</td>
<td>nd</td>
<td>12/58 10-300</td>
</tr>
<tr>
<td>WHEAT</td>
<td>8/50 100-200</td>
<td>nd</td>
<td>4/50 10-40</td>
</tr>
<tr>
<td>BARLEY</td>
<td>3/29 100-300</td>
<td>nd</td>
<td>2/29 10</td>
</tr>
<tr>
<td>ENSILAGE</td>
<td>0/13 -</td>
<td>nd</td>
<td>0/13 -</td>
</tr>
<tr>
<td>CORN GLUTEN</td>
<td>2/15 100</td>
<td>nd</td>
<td>0/15 -</td>
</tr>
<tr>
<td>TOTAL</td>
<td>24/208 100-500</td>
<td>-</td>
<td>19/208 10-300</td>
</tr>
</tbody>
</table>

nd – Not detectable  

* Determination by TLC

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BRUSSELS, JANUARY 2008
INCIDENCE OF DON IN FEED MATERIALS

DON's incidence in Feed Materials

- Incidence of DON (%)
- Maximum concentration level detected (ug/kg)
INCIDENCE OF FB1 IN FEED MATERIALS

FB1's incidence in Feed Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Incidence (%)</th>
<th>Concentration level (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soy</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rice</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Maize</td>
<td>20</td>
<td>300</td>
</tr>
<tr>
<td>Wheat</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Barley</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Ensilage</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Corn gluten</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Incidence of FB1 (%)

Maximum concentration level detected (µg/kg)
# MONITORIZATION OF DON, ZEA AND FUMONISINS (FB1 + FB2) IN COMPOUND FEEDS
DATA FROM 2000/2005

<table>
<thead>
<tr>
<th>FEED</th>
<th>DEOXYNIVALENOL</th>
<th>ZEARALENONE</th>
<th>FUMONISINS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N+/N</td>
<td>N+/N</td>
<td>N+/N</td>
</tr>
<tr>
<td></td>
<td>Level (µg/kg)</td>
<td>Level (µg/kg)</td>
<td>Level (µg/kg)</td>
</tr>
<tr>
<td>PIGS</td>
<td>5/261 100-500</td>
<td>-</td>
<td>0/285</td>
</tr>
<tr>
<td>POULTRY</td>
<td>-</td>
<td>-</td>
<td>3/52 24-34</td>
</tr>
<tr>
<td>HORSES</td>
<td>15/50 100-320</td>
<td>0/50</td>
<td>-</td>
</tr>
<tr>
<td>PETS</td>
<td>3/20 100-130</td>
<td>-</td>
<td>3/20 12-24</td>
</tr>
<tr>
<td>TOTAL</td>
<td>20/331 100-500</td>
<td>0/50</td>
<td>6/357 12-34</td>
</tr>
</tbody>
</table>
INCIDENCE OF DON IN COMPOUND FEEDS

DON’s incidence in compound feeds

Incidence (%) vs. Concentration level (μg/kg)

- Incidence of DON (%)
- Maximum concentration level detected (μg/kg)

Swine
Horses
Pet

500
35
30
25
20
15
10
5
0

0
100
200
300
400
500
600

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INCIDENCE OF FB1+FB2 IN COMPOUND FEEDS
CO-OCCURRENCE OF DON AND ZEA
IN FEED MATERIALS MARKETED IN PORTUGAL
# Co-Occurrence of DON and ZEA in Feed Materials Marketed in Portugal (Data from 2006/07)

## Sample Nature

<table>
<thead>
<tr>
<th>Sample Nature</th>
<th>Co-Occurrence DON and ZEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize and Maize-Based Products</td>
<td>30/132 (22.7)</td>
</tr>
<tr>
<td>Wheat and Wheat-Based Products</td>
<td>8/82 (9.8)</td>
</tr>
<tr>
<td>Barley</td>
<td>2/25 (8.0)</td>
</tr>
<tr>
<td>Soybean</td>
<td>5/53 (9.4)</td>
</tr>
<tr>
<td>Sunflower</td>
<td>1/8 (12.5)</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>0/7 (0.0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>46/307 (15.0)</strong></td>
</tr>
</tbody>
</table>
### CO-OCCURRENCE OF DON AND ZEA IN FEED MATERIALS MARKETED IN PORTUGAL (DATA FROM 2006/07)

<table>
<thead>
<tr>
<th>CO-OCCURRENCE</th>
<th>DON CONCENTRATION LEVELS</th>
<th>ZEA CONCENTRATION LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DON+ZEA</td>
<td>0.001* – 17.9 mg/kg</td>
<td>0.005* – 0.9 mg/kg</td>
</tr>
<tr>
<td>N+/N</td>
<td>N*</td>
<td>N*</td>
</tr>
<tr>
<td></td>
<td>N+/N (%)</td>
<td>N+/N (%)</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td>46/307 (15.0)</td>
<td>84</td>
<td>84/307 (27.3)</td>
</tr>
<tr>
<td></td>
<td>0.071</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>171/307 (55.8)</td>
<td>0.23</td>
</tr>
</tbody>
</table>

* (LOD): ≥Detection Limit is considered positive
CO-OCCURRENCE OF DON AND ZEA IN CROPS MARKETED IN PORTUGAL vs MAXIMUM DON CONTAMINATION LEVEL DETECTED

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CO-OCCURRENCE OF DON AND ZEA IN CROPS MARKETED IN PORTUGAL vs MAXIMUM ZEA CONTAMINATION LEVEL DETECTED
BRIEF CONCLUSIONS

✓ THE OCCURRENCE OF *Fusarium* TOXINS HAS BEEN DETECTED IN FEED MATERIALS AND COMPOUND FEEDS MARKETED IN PORTUGAL

✓ LEVELS OF CONTAMINATION INDICATES THAT SYSTEMATIC CONTROL IS REQUIRED

✓ INCIDENCE OF DON, ZEA AND FB1 IS HIGHER IN MAIZE AND MAIZE BY- PRODUCTS

✓ IN AT LEAST ONE CASE THE CONTENT EXCEEDED RECOMMENDATION 2006/576/EC

✓ CO-OCCURRENCE OF DON AND ZEA WAS VERIFIED IN 15 % OF THE TOTAL OF SAMPLES ANALYSED
FURTHER STRATEGIES

- IDENTIFICATION AND EVALUATION OF NATIONAL FACTORS RELATED TO FUSARIUM TOXINS OCCURRENCE AT CULTIVATION, STORAGE AND FEED PROCESSING PHASES

- SUPPORT TO FEED BUSINESS OPERATORS IN WHAT CONCERNS TRACEABILITY AND HACCP IMPLEMENTATION FOR FEED SAFETY AWARENESS

- FOLLOW UP OF COMMISSION RECOMMENDATION 2006/576/EC

- T-2 AND HT-2 TOXINS MONITORIZATION (ANALYTICAL METHOD IMPLEMENTATION)

- BETTER COOPERATION BETWEEN FOOD AND FEED SECTORS

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BRUSSELS, JANUARY 2008
ACKNOWLEDGMENTS

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