Preventive role of Cactus *(Opuntia ficus-indica)* cladodes on the toxicity of Zearalenone in Balb/C Mice
Macromolecular Biochemistry and Genetic: BMG

Faculty of Sciences Gafsa
Evaluation of biological activities of Cactus

Opuntia ficus indica

Cladodes, flower, Fruits, roots, seed oil
- Anti-bacterial, anti-fungal activities (Karima et al. 2009)
- Antiulcerogenic effect (Alimi et al. 2010)
- Diuretic effect
- Anti-ER Stress (Souid et al. 2011)
- Protective effects against:
  - Pesticides: Clorpyrifos (N’cibi et al. 2008)
  - Heavy metal: Nickel (Hfaiedh et al. 2008)
  - Methotrexate (MTX) (Amira et al. In press)
*Protective and curative effects of Benzo-(a) Birene, Aflatoxin....
Preventive role of Cactus (Opuntia ficus-indica) cladodes on the toxicity of Zearalenone in Balb/C Mice

Why Zéaralénone?
Zéaralénone

- produced by *Aspergillus* and *Penicillium* species
- High incidence in many important corps intended for human and animal consumptions
  - Cytotoxic effect
  - Genotoxic effect
  - Hepatotoxic, Haematotoxic effects
Objective:

The protective effect of cactus Cladode against:

1- Oxydative stress induced by the Zen
2- The genetoxic effet of the Zen
3- Biochemicals, Heamatologicals and Pathologicals changes
I- Protective effect of Cactus cladode against the oxidative stress induced by Zéaralénone

**Experimental conditions**

- Balb/c mice: 25 g
- 6 groups: 5 mice
- Administration intra-péritoral of:
  - Gpe 1: 100 µl Éthanol/H2O: control 1
  - Gpe 2: 100 mg/Kg of cladode extract: control 2
  - Gpe 3: 40 mg/Kg of Zearalenone (ZEN)
  - Gpe 4: 40 mg/Kg of ZEN + 25 mg/Kg of cladode extract
  - Gpe 5: 40 mg/Kg of ZEN + 50 mg/Kg of cladode extract
  - Gpe 6: 40 mg/Kg of ZEN + 100 mg/Kg of cladode extract
- Sacrificed after 24 heures: liver, Kidney, blood, bone marrow…
Stress Protein: Hsp 70 and Hsp 27 analysis

Liver

1  2  3  4  5  6

HSP 70

HSP 27

Kidney

1  2  3  4  5  6

-1: control 1: Éthanol/H2O
-2: control 2: 100 mg/Kg of cladode extract
-3: Zéralenone 40 mg/Kg
-4: Zéralenone 40 mg/Kg + 25 mg/Kg of cladode extract
-5: Zéralenone 40 mg/Kg + 50 mg/Kg of cladode extract
-6: Zéralenone 40 mg/Kg + 100 mg/Kg of cladode extract
Induction of lipid peroxidation

**Dosage of MDA (malondialdehyde)**

**Liver**

<table>
<thead>
<tr>
<th>MDA / mg de Prt</th>
<th>EOH/H2O</th>
<th>Cactus 100mg</th>
<th>ZEN 8%</th>
<th>ZEN 8%+ cactus 25mg/Kg</th>
<th>ZEN 8%+ cactus 50mg/Kg</th>
<th>ZEN 8%+ cactus 100mg/Kg</th>
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<tbody>
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</tbody>
</table>

**Kidney**

<table>
<thead>
<tr>
<th>MDA / mg de Prt</th>
<th>EOH/H2O</th>
<th>Cactus 100mg</th>
<th>ZEN 8%</th>
<th>ZEN 8%+ cactus 25mg/Kg</th>
<th>ZEN 8%+ cactus 50mg/Kg</th>
<th>ZEN 8%+ cactus 100mg/Kg</th>
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</tbody>
</table>
Protein carbonyl assay

Liver

Kidney
Catalase activity

Liver

- EOH/H2O
- Cactus 100 mg/Kg
- ZEN 8%
- ZEN 8% + cactus 25mg/Kg
- ZEN 8% + cactus 50mg/Kg
- ZEN 8% + cactus 100mg/Kg

Kidney

- EOH/H2O
- Cactus 100 mg/Kg
- ZEN 8%
- ZEN 8% + cactus 25mg/Kg
- ZEN 8% + cactus 50mg/Kg
- ZEN 8% + cactus 100mg/Kg
The extract of Cactus cladode has the activity: **Anti-oxydative stress**

Zourgui & al. 2008 *Food and Chemical Toxicology* 46, 1817-1824.
II- Protective effect of Cactus cladode against the genotoxicity induced by Zéaralénone

Objective:

Induced the chromosomal aberrations and DNA damage by the Zen:

- Inter-chromosomic anomaly: (Breaks, Centric Fusions)
- Intra-chromosomic anomaly: (Gaps, Rings)
Results
# Chromosomal aberration assay

## Results: percentage of chromosome aberrations

<table>
<thead>
<tr>
<th></th>
<th>Centric Fusions (%)</th>
<th>Rings (%)</th>
<th>Breaks (%)</th>
<th>Gaps (%)</th>
<th>Total (%)</th>
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</thead>
<tbody>
<tr>
<td>Control 1</td>
<td>2,33</td>
<td>1,67</td>
<td>0,00</td>
<td>0,00</td>
<td>4,00</td>
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<tr>
<td>Control 2: Cactus 100 mg/Kg</td>
<td>3,67</td>
<td>1,67</td>
<td>0,00</td>
<td>0,00</td>
<td>5,33</td>
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<tr>
<td>ZEN 8%</td>
<td>15,33</td>
<td>15,00</td>
<td>5,00</td>
<td>1,67</td>
<td>38,33</td>
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<tr>
<td>ZEN 8% + Cactus 25 mg/Kg</td>
<td>9,67</td>
<td>14,33</td>
<td>3,67</td>
<td>1,00</td>
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<td>ZEN 8% + Cactus 50 mg/Kg</td>
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<td>7,67</td>
<td>2,67</td>
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<td>22,67</td>
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<tr>
<td>ZEN 8% + Cactus 100 mg/Kg</td>
<td>10,67</td>
<td>7,00</td>
<td>1,00</td>
<td>0,00</td>
<td>18,67</td>
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## DNA damage

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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>M</td>
<td>MW</td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>control 1: H2O</td>
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<tr>
<td>2</td>
<td>control 2: Ethanol/H2O</td>
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</tr>
<tr>
<td>3</td>
<td>control 3: 100mg/Kg du Cactus</td>
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<tr>
<td>4</td>
<td>ZEN (8%)</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>ZEN (8%) + 25mg/Kg du Cactus</td>
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<tr>
<td>6</td>
<td>ZEN (8%) + 50mg/Kg du Cactus</td>
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</tr>
<tr>
<td>7</td>
<td>ZEN (8%) + 100mg/Kg du Cactus</td>
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</tbody>
</table>

M: MW

- 1: control 1: H2O
- 2: control 2: Ethanol/H2O
- 3: control 3: 100mg/Kg du Cactus
- **4: ZEN (8%)**
- 5: ZEN (8%) + 25mg/Kg du Cactus
- 6: ZEN (8%) + 50mg/Kg du Cactus
- 7: ZEN (8%) + 100mg/Kg du Cactus
Confirmation results:
- Comet assay
- Frequency of Micronuclei

Conclusion:
Anti-genotoxic activities of cactus caldodes: Preventive of micronuclei, Abberation chromosomic, DNA damages

Zorgui & al. 2009 Journal Food and chemical Toxicology 47, 662-667
III- Protective effect of Cactus cladode against the Pathological changes induced by Zéaralénone

Liver

- Periportal necrotic-inflammatory lesion
- Pericanalair bilary inflammation
- Microvascular steatosis
III- Protective effect of Cactus cladode against the Pathological changes induced by Zéaralénone

Kidney

- necrotic lesions
- limited inflammatory around glomerules and cortico-medullary zones

Control

Zen

Zen + cactus 25mg
III- Protective effect of Cactus cladode against the Biochemical, Hematological induced by Zéaralénone
Cactus (Opuntia ficus indica) cladode extract has a protective effect against toxicity induced by Zearalenone.
The VIIth International Congress on Cactus Pear and Cochineal and The VIIth General Meeting of the FAO-ICARDA International Technical Cooperation Network on Cactus Pear and Cochineal
Agadir (Morocco), October 17-22, 2010