

ELISA AND HPLC ANALYSES OF DEOXYNIVALENOL IN DURUM WHEAT VARIETIES GROWN IN ORGANIC FARMING IN ITALY

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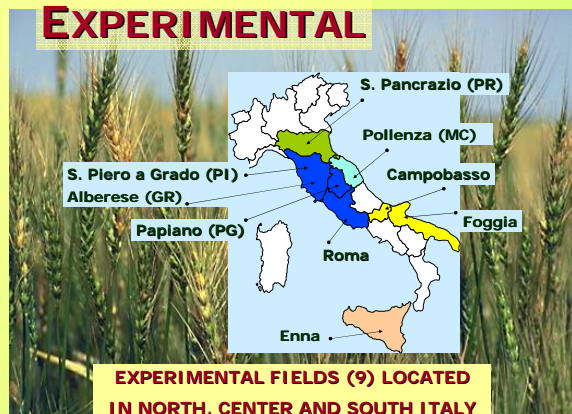
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INTRODUCTION

- **DEOXYNIVALENOL (DON)** is a widespread mycotoxin of wheat and wheat products known to be implicated in animal and human toxicity. The occurrence of mycotoxins in **CEREAL FOODS PRODUCED ORGANICALLY** or conventionally is an extremely controversial issue on theoretical grounds. So far, it cannot be concluded which type of farming leads to increased risk of mycotoxin contamination. Information on the contamination of organic durum wheat with DON is limited
- **THE AIM OF THE PRESENT STUDY** (performed within the framework of the Italian National Project "BIOCER") was to investigate the natural occurrence of DON in durum wheat grown with organic agro-techniques in Italy

EXPERIMENTAL



- ❖ The survey was carried out over three **CROP SEASONS (2004-2006)**
- ❖ **Durum wheat VARIETIES** were grown with organic agro-techniques in experimental fields located in the **North, Center and South of Italy (Table 1)**

Table 1: Number of experimental fields and wheat varieties grown in 2004-2006

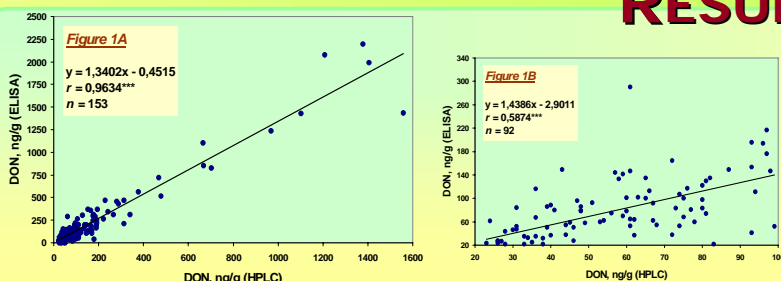
	2004	2005	2006	COMMON (2004-06)
Experimental fields	12	17	15	9
Varieties	12	12	16	10

- ❖ **612 durum wheat samples** were initially analysed with a commercial **ELISA** kit
- ❖ **74 negative samples** and **228 positive samples** (containing more than 20 ng/g DON) were further quantified using a **HPLC/immunoaffinity cleanup method**

RESULTS

COMPARISON HPLC AND ELISA METHODS

- A good correlation ($r=0.9634$, $P<0.0001$) was found between **ELISA** and **HPLC** methods (**Figure 1A**)
- **Low correlation** ($r=0.5874$) was found for positive samples ranged from 20 to 100 ng/g DON (**Figure 1B**)
- **ELISA method overestimated DON content** (30%) and produced **false-positive samples** (33%)
- **No false-negatives** were found



EFFECT OF SEASON OF GROWN, GEOGRAPHICAL ORIGIN AND VARIETIES ON DON CONTAMINATION

Table 2: DON OCCURRENCE IN DURUM WHEAT GROWN IN THREE CROP SEASONS

	2004-06	2004(*)	2005	2006
Positives/Total	141/588	45/156 12 var x 12 loc	39/204 12 var x 17 loc	57/240 16 var x 15 loc
Incidence	24%	31%	19%	24%
Mean ± SEM (ng/g) (1)	96 ± 6	84 ± 7	121 ± 13	89 ± 10
Range (ng/g)	25 - 479	25 - 190	30 - 339	23 - 479

(1) Mean of positive samples; (*) With the exclusion of one field in the North of Italy

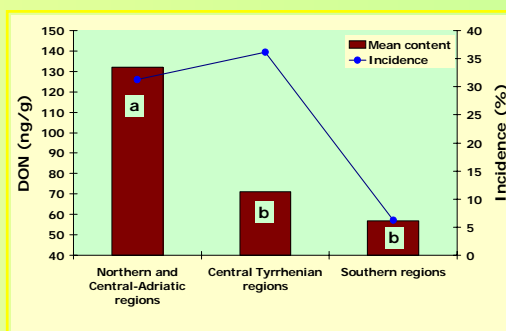


Figure 2: PRESENCE OF DON IN DURUM WHEAT OF DIFFERENT GEOGRAPHIC ORIGIN

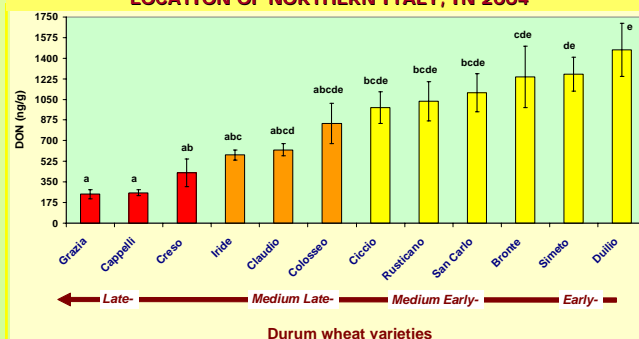
Table 3: DON OCCURRENCE IN DURUM WHEAT VARIETIES (WITH DIFFERENT GROWING CYCLE) GROWN IN DIFFERENT REGIONS OF ITALY

E=early- M=medium- L=late- maturing varieties

Varieties	Cycle	Mean content of DON (ng/g)			Total 44 Locations
		Northern and Central-Adriatic 14 Locations (*)	Central Tyrrhenian 14 Locations	Southern 16 Locations	
Ciccio	E	123	78	67	92
Dulio	E	141	78	35	104
Iride	ME	132	90	61	98
Simeto	ME	164	104	67	118
Rusticano	ME	116	77	65	93
San Carlo	ME	140	99	70	109
Claudio	M	130	93	neg	115
Grazia	ML	84	61	neg	73
Creso	L	118	62	neg	90
Cappelli	L	109	57	neg	83

(*) With the exclusion of one location in the North of Italy, in 2004

Figure 3: OCCURRENCE OF DON IN DURUM WHEAT VARIETIES (WITH DIFFERENT GROWING CYCLE) GROWN IN THE SAME LOCATION OF NORTHERN ITALY, IN 2004



THE RESULTS OF THIS STUDY INDICATE A LOW POTENTIAL FOR DON CONTAMINATION IN ORGANIC DURUM WHEAT IN ITALY

- Most samples showed a **negligible DON contamination** (<500 ng/g) (**Table 2**). **No durum wheat sample was found noncompliant with the maximum permitted level for DON** (1750 ng/g) with the exclusion, in 2004, of one field located in the North of Italy where Good Agriculture Practices were not observed
- Samples collected in the **Northern and Central-Adriatic regions of Italy** showed incidence and levels of contamination higher than those collected in the Central-Tyrrhenian and in the Southern regions (**Figure 2**)
- The **later-maturing varieties** (especially **Grazia, Cappelli, Creso**) showed a trend towards lower DON accumulation (**Table 3, Figure 3**)