Associazione Italiana Essiccatori
Stoccatori Raccoglitori
di cereali e semi oleosi

GLM
Gruppo di Lavoro Micotossine

FUMONISINS IN MAIZE AND MAIZE PRODUCTS

CONTENTS

1. **Contamination of Fumonisins in italian maize** with the aim to ascertain the maize quote left below the proposed maximum limits;

2. **Distribution of fumonisins in the maize milling process** with the aim to ascertain the possibility to obtain maize products with levels of Fumonisins below the proposed maximum residual limits (MRLs) and to verify how the milling process influences Fumonisins re-distribution in the milling fractions.

1. CONTAMINATION OF FUMONISINS IN ITALIAN MAIZE

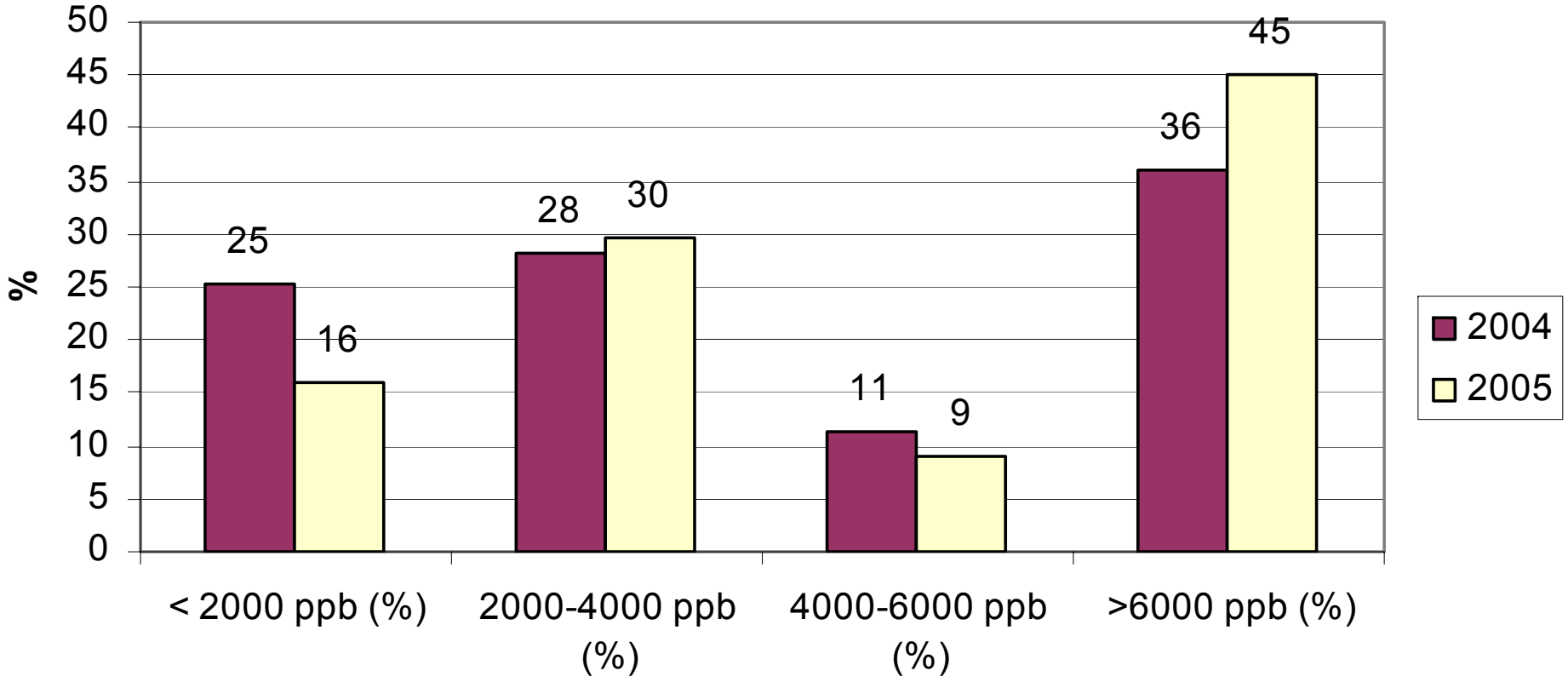
Italian Maize:

- First italian crop with Abt. 1.1 millions of hectars;
- Production over 10 million tons;
- Italy is the second country for maize production in Europe;
- Po plain is the main area for maize production.

Table 1. SURVEYS ON FUMONISINS OCCURRENCE IN ITALIAN MAIZE

	Sampling Area	Sampling points	Sampling methods	Analysis Methods	Scientific reference	No. of samples	No. years
1	Po plain	Drying units; experimental fields	Dynamic methods	ELISA	Reg.Lombardia; CRA; Assincer; AIRES	1468	4 (1999-2004)
2	Po plain	Field	Dynamic methods	ELISA	Syngenta seeds Italia	586	6 (1999-2004)
3	Piemonte	Drying units; experimental and farm fields	Dynamic methods (drying units); 200 ears (fields)	HPLC	Univ. Torino	538	5 (2000-2004)
4	North-Est	Dryng units	Dynamic methods	HPLC	AIRES – ISPA CNR BARI	124	2 (2004-2005)
5	Veneto	Field	Dynamic methods	Liquid-mass HPLC	Regione Veneto	250	2 (2004-2005)
6	Veneto	Field	Dynamic methods	HPLC	Univ. Padova	720	2 (2004-2005)
7	Emilia Romagna	Field	Dynamic methods	HPLC	Università di Piacenza - CRPV	281	3 (2004-2006)
8	Friuli Venezia G	Field	Dynamic methods	ELISA	ERSA – FRIULI VENEZIA GIULIA	54	2 (2004-2005)

Chart 1: AVERAGE LEVELS OF FUMONISINS B1+B2 IN ITALIAN MAIZE YEARS 2004-05



FIRST CONCLUSION

- If proposed MRLs for Fumonisins of EU Regulation no. 1881/2006 will be enforced, over 70% of italian maize will be unsuitable for human consumption.

- Substancial changes of the current contamination levels cannot be expected in a short term because the application of Good Agricultural Practices (GAPs) will not be enough to reduce Fumonisins levels in maize below 2000 ppb.

Table 2: EFFECTS OF AGRICULTURAL PRACTICES ON MYCOTOXINS CONTAMINATION

Practice	Fumonisine	Zearalenone & DON
Crop rotation		
Tillage		
Hybrid		
Seeding time		
Fertilization		
Weed control		
Insect control		
Irrigation		
Harvest time		

Potential effect on concentration	"1"	< 2	2-4	> 4

Reyneri et al., 2005

2. SURVEY ON DISTRIBUTION OF FUMONISINS IN THE MAIZE MILLING PROCESS

• 15 milling industries involved (milling process represents 90% of maize application in food);

• 23 milling processes analyzed;

• sampling protocol as per EU Regulation no. 401/2006, adapted to the milling process with the co-operation of the University of Torino;

•167 aggregate samples homogenized and analyzed at the same laboratory;

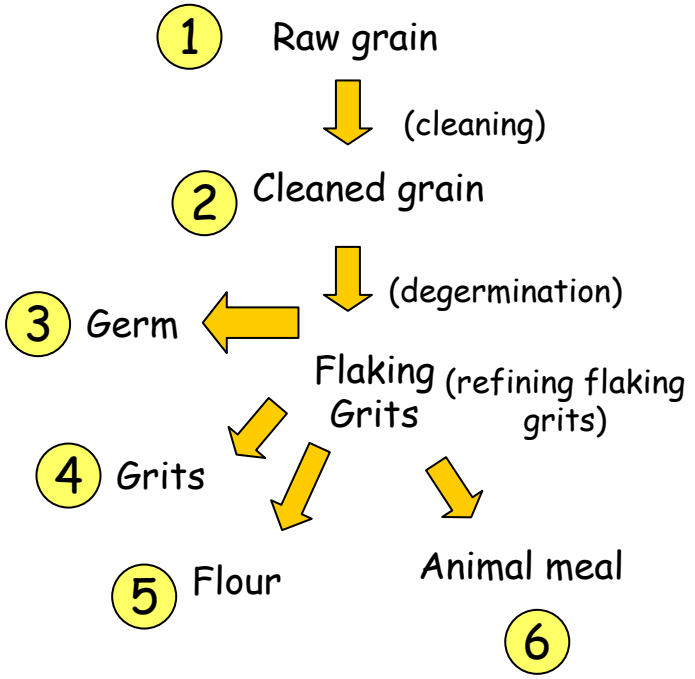
• scientific reliability of data obtained under the supervision of three independent organisms: Universities of Padova, Piacenza and Torino;

N.B. following data does not represent neither the average Fumonisns levels of Italian maize, nor the average residual levels of products thereof, because maize lots processed for the survey have been deliberately selected to represent situations of high, medium and low starting contamination.

MILLING PROCESS

PRODUCTS AND BYPRODUCTS CONSIDERED

PRODUCTS	SIZE (micron)
MAIZE KERNELS	
HOMINY GRITS	> 4000
GRITS	250-1400
POLENTA MEAL /FLOUR	350-850
FLOUR	< 350
GERM	
FEED MEAL	



METHODS OF SAMPLING

1) Identification of products to be sampled;
2) Location of sampling points through each milling process;
3) Evaluation and timing of incremental samples drawing with reference to type of flow and lot size;
4) Calculation of drawing times for reach sampling point making reference to the first sampling point (not cleaned maize) as time “zero”;
5) Sealing, labelling of each aggregate sample and sending to the official laboratory;
6) Aggregate samples collection, milling, homogeneization and analysis at ISAN laboratory of Piacenza University, with the HPLC method, performing as per EU Reg. 401/2006.

METHODS OF SAMPLING

Example: Milling for production of grits

- **Processed maize = 5 t/h**
- **Lot weight = 5 t → 40 incremental samples of 100 grams each**

1 incremental sample every 90 seconds

- **Aggregate sample = 4 kg**

Product	Sampling point	Start of sampling (minute)
Uncleaned grain	1	0
Cleaned grain	2	3
Germ	3	15
Grits	4	15
Corn flour	5	15
Animal meal	6	15

Chart 2. CLEANING PHASE

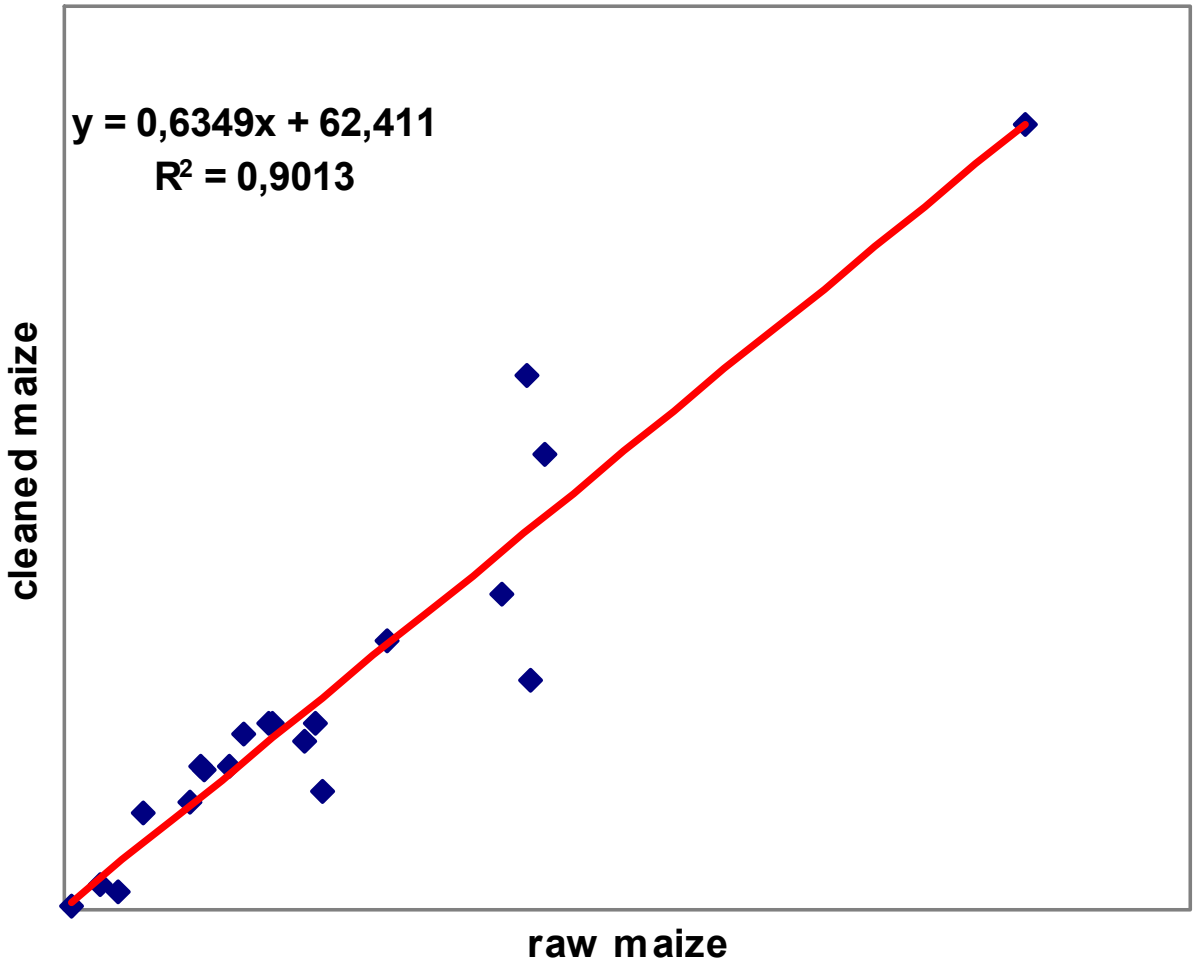
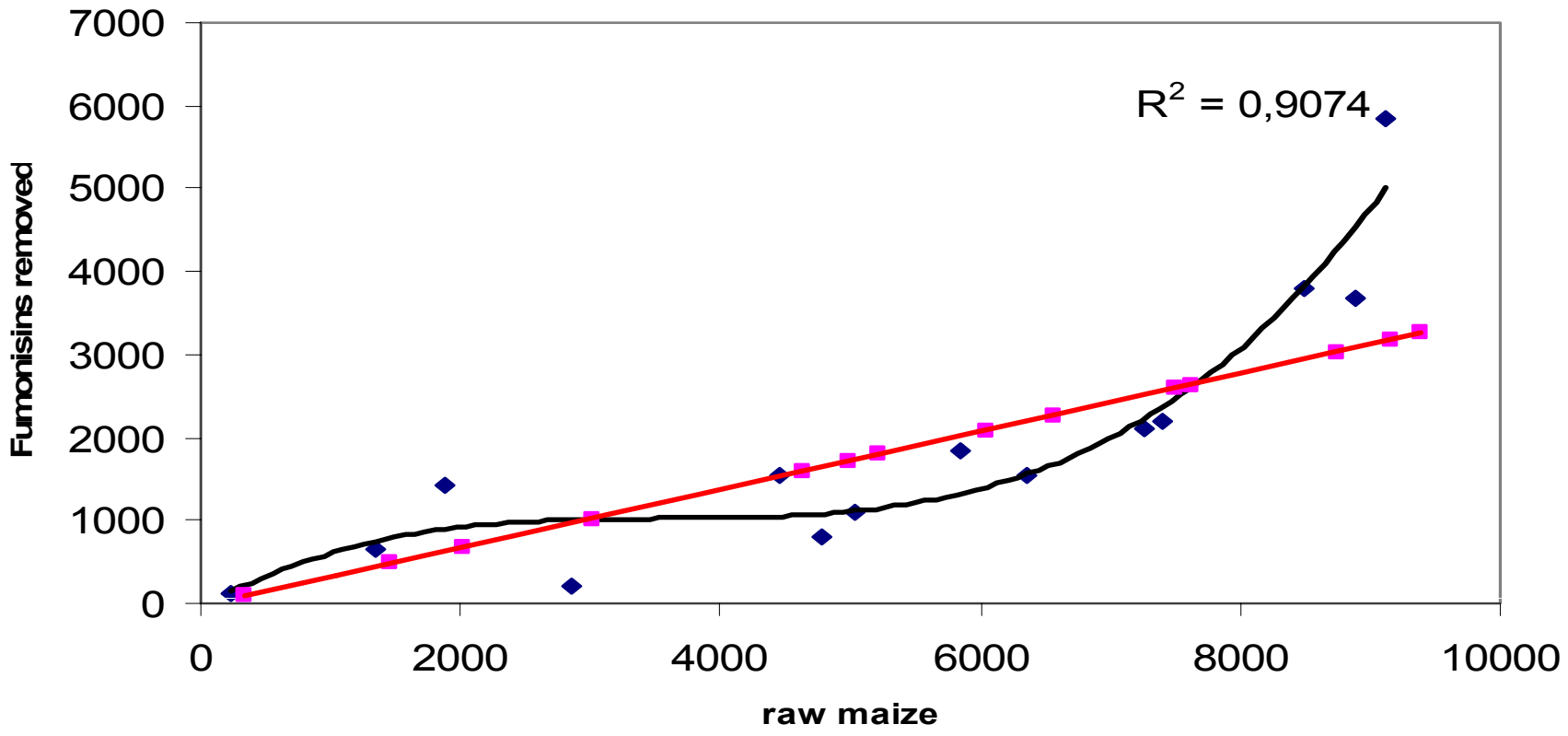


Chart 3. CLEANING PHASE



Regression calculated on experimental data

Theoretic removal of fumonisins calculated on regression between raw maize and cleaned maize.

Three tipologies of milling process have been analysed:

- hominy grits
- grits (grits + flour)
- meal (polenta meal+finest flour+flour)

Chart 4. FUMONISINS
HOMINY GRITS PROCESS

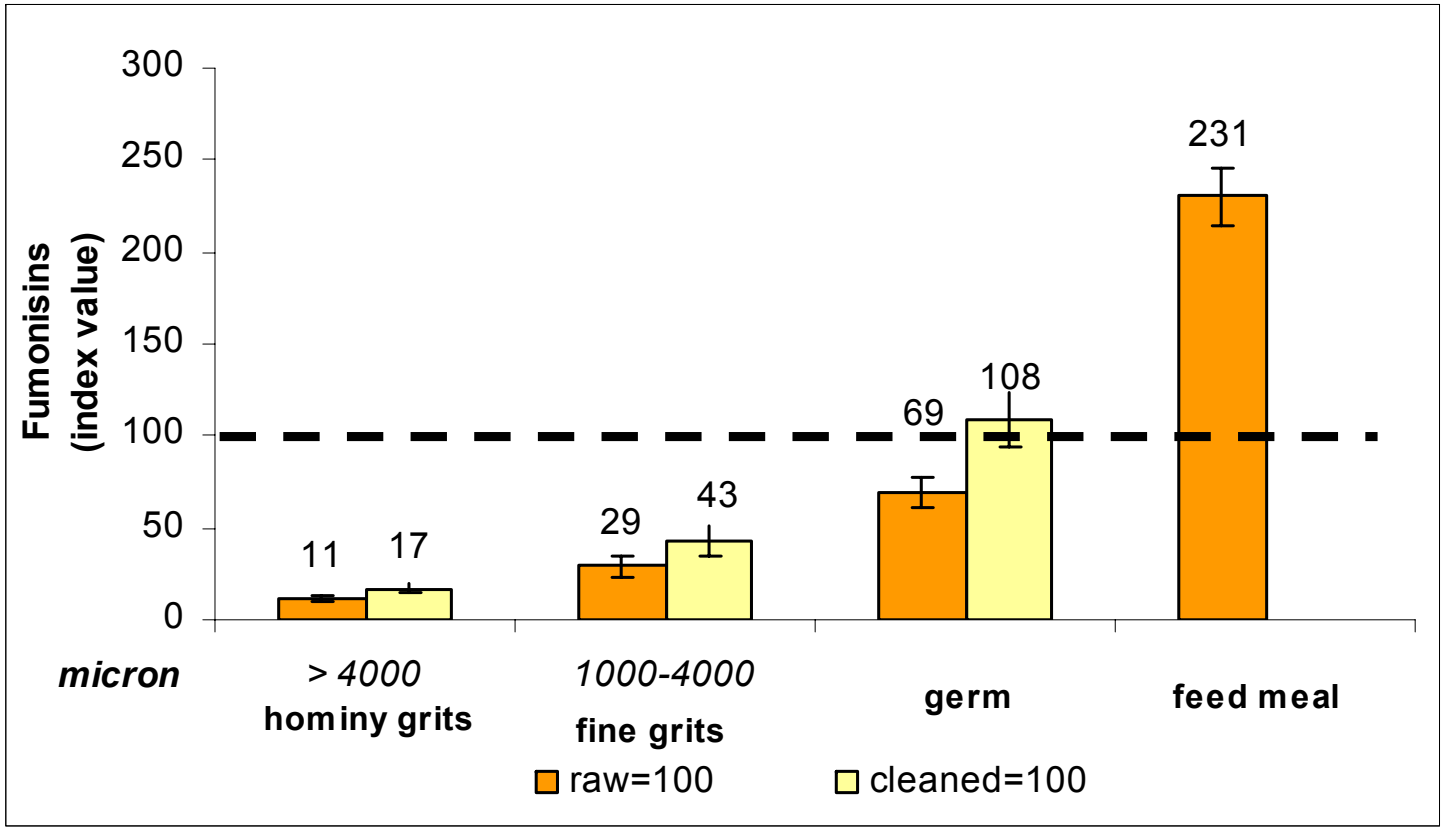


Chart 5. FUMONISINS
GRITS PROCESS

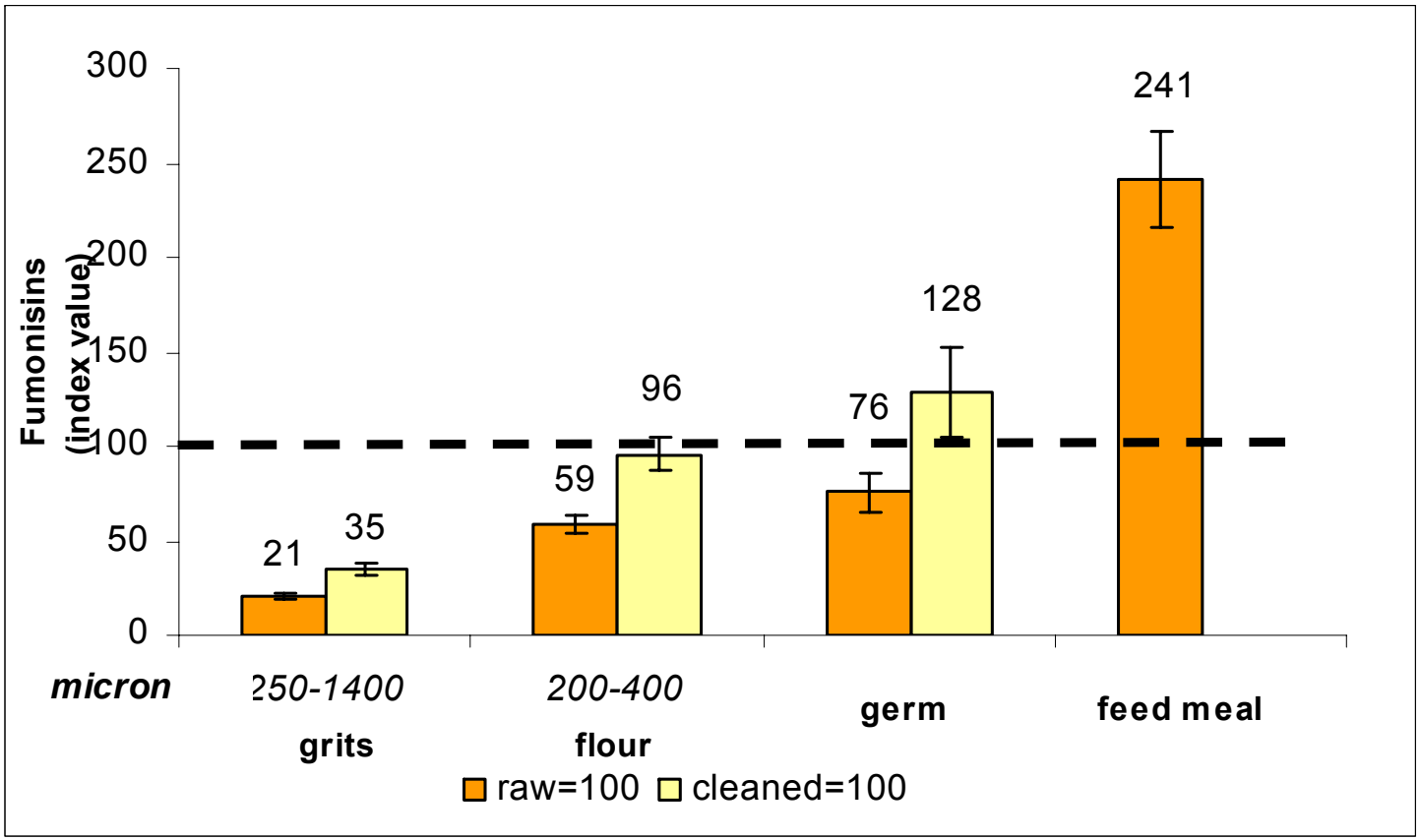
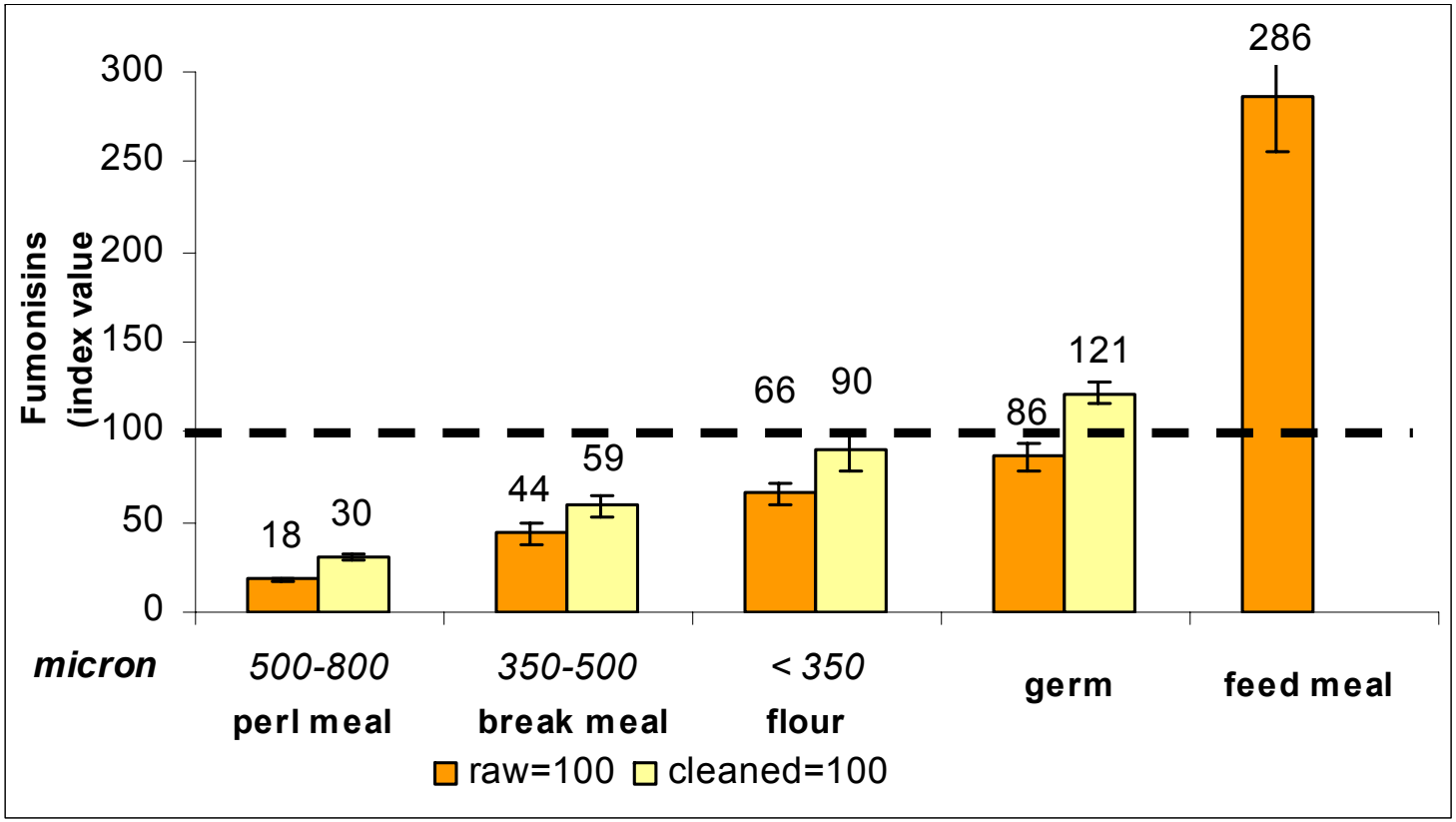


Chart 6. FUMONISINS MEAL PROCESS



Remarks

- The finer the granulation size of the flour, the higher the residual fumonisins level. Therefore, being flour, meal and grits grouped in the same category at point. 2.6.2 of EU Reg. 1881/2006, the MRLs should consider the finer product (maize flour) as a reference;

- Germ has much higher contamination than flour, grits or meal;

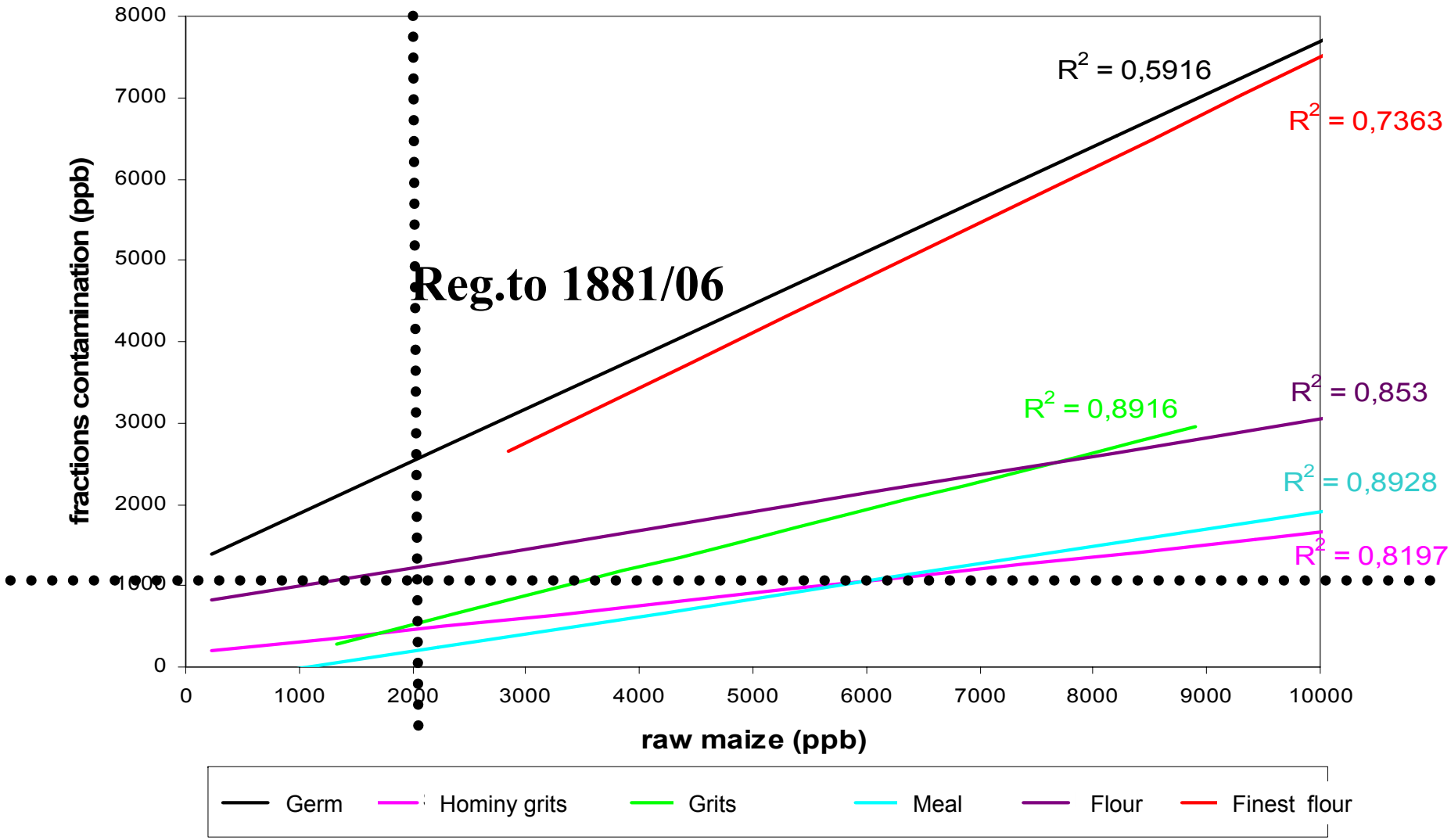
- High variability in germ contamination levels has been observed, very likely as a consequence of different germ extraction tecnologies throughout the various milling processes;

Remarks

- Differentiation between milling processes mainly concerns the germ extraction procedure and the finer fractions classification;

- The germ is a byproduct addressed to the oil refining process. There is no reason to include it in the same category of finished products. It was not included in the the EU Regulation 856/2005. Moreover germ is not a foodstuff by itself: only refined oil is addressed to human consuption and there is no carryover of fumonisins in it.

Chart 7. According to the surveyed data, it is possible to calculate the regression between Fumonisins in maize and residual levels in products thereof



Remarks

in the case of MRLs enforcement, a huge no. of operators will be forced to close down their activity and a significative portion of the products of the mill (flour and germ) will dramatically reduce its economic value;

The overall impact of the MRLs enforcement on the maize business is estimated in 800 milions of Euro (oil excluded);

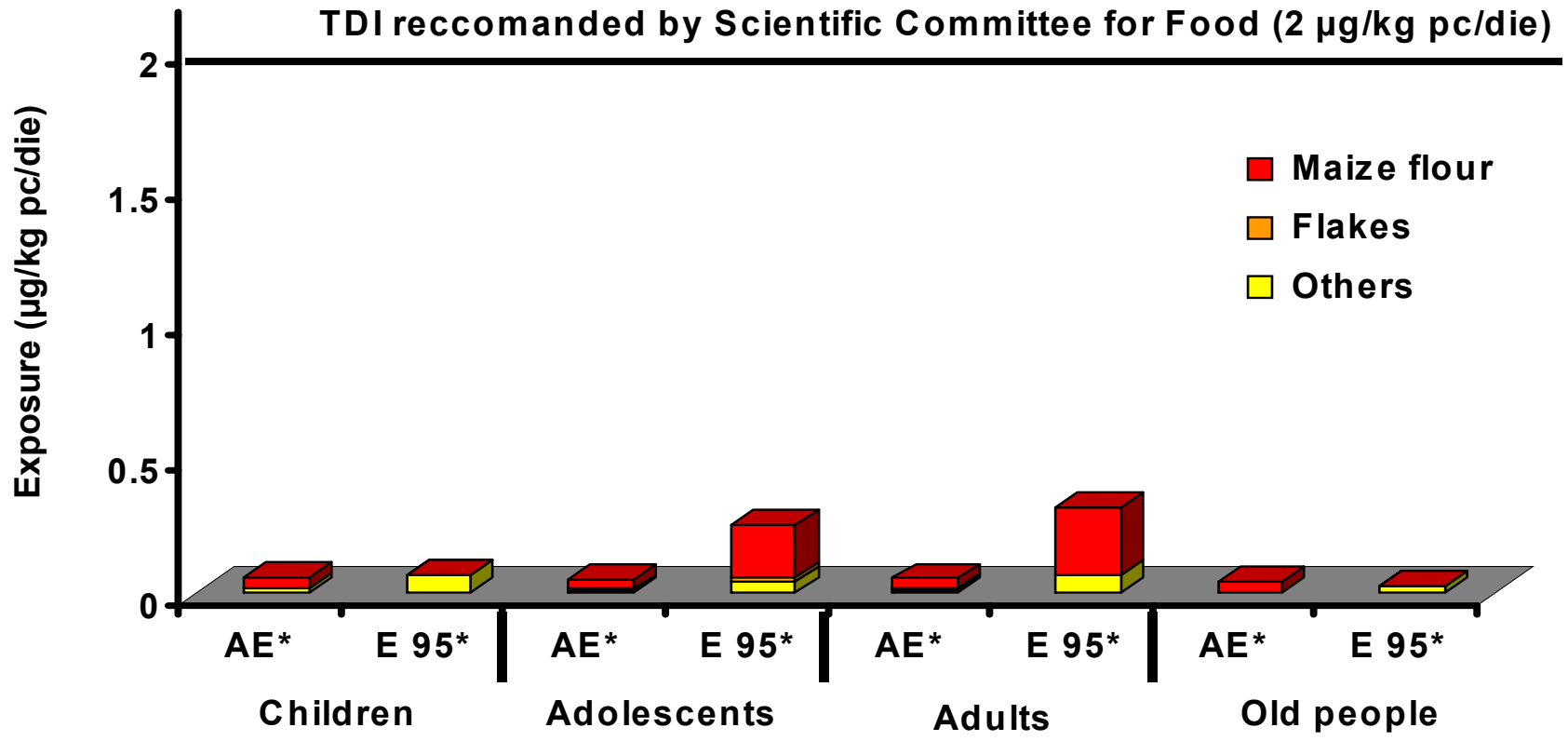
To safeguard this market segment it is necessary to increase the MRLs;

<u>This must be done without putting the consumer's health under risk.</u>

Official Toxicological studies (EU Scoop Task 3.2.10 and Italian Ministry of Health) evidence that, taking into consideration the current levels of contamination, consumer's exposure to Fumonisins risk is extremelly lower than the Tolerable Daily Intake (TDI);

Chart 8. Exposure to Fumonisins B1 (µg/kg pc/day) of groups of Italian population

Brera C., Debegnach F., Grassi S., Miraglia M. - ISS

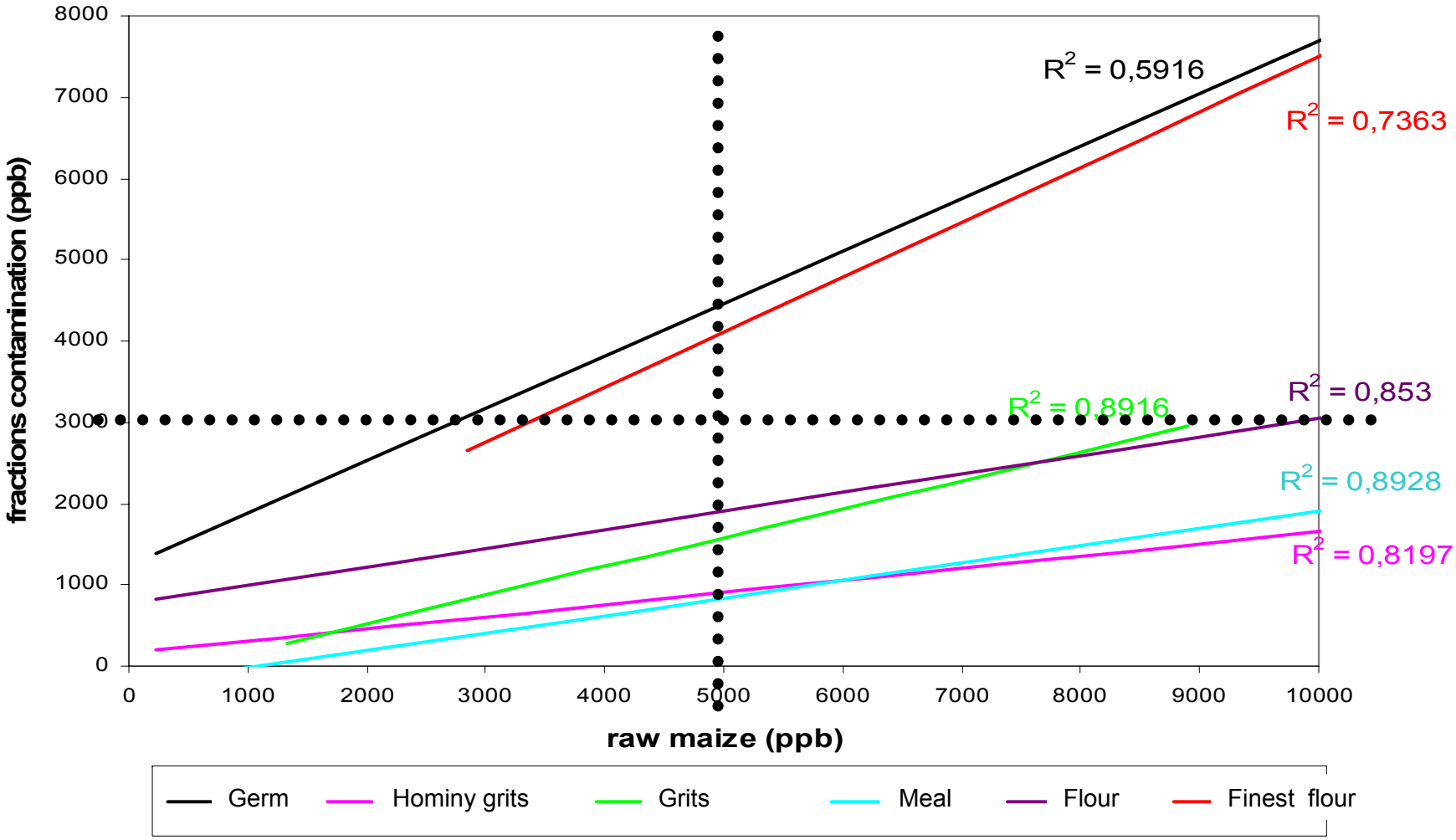


** AE: Average exposure*
** E 95: Exposure 95 percentile*

There are objective reasons to ask for higher Fumonisins MRLs than those proposed by EU Reg. 1881/2006

Without putting under risk the consumer's health.

Chart 9. residual contamination in the milling fractions compared to the starting contamination in maize



Remarks

• The MRLs increase will not allow the maize chain operators to accept the current situation, on the contrary it will require a great committment toward agricultural practices improvement;

• Milling industries are already selecting their maize supply by means of cultivation contracts, GAP's protocols and production controls.

Chart 10. Processed maize deriving from the application of Good Agricultural Practices

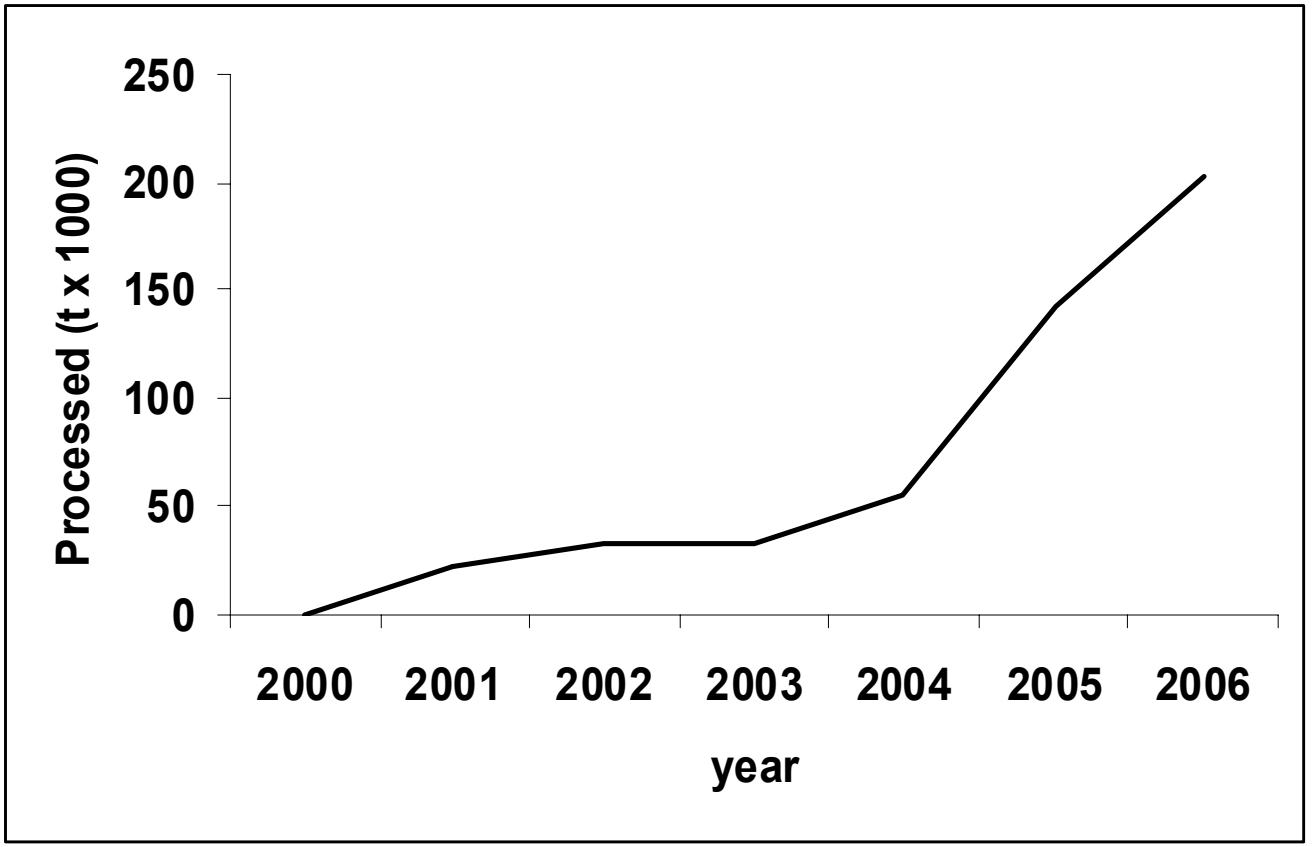
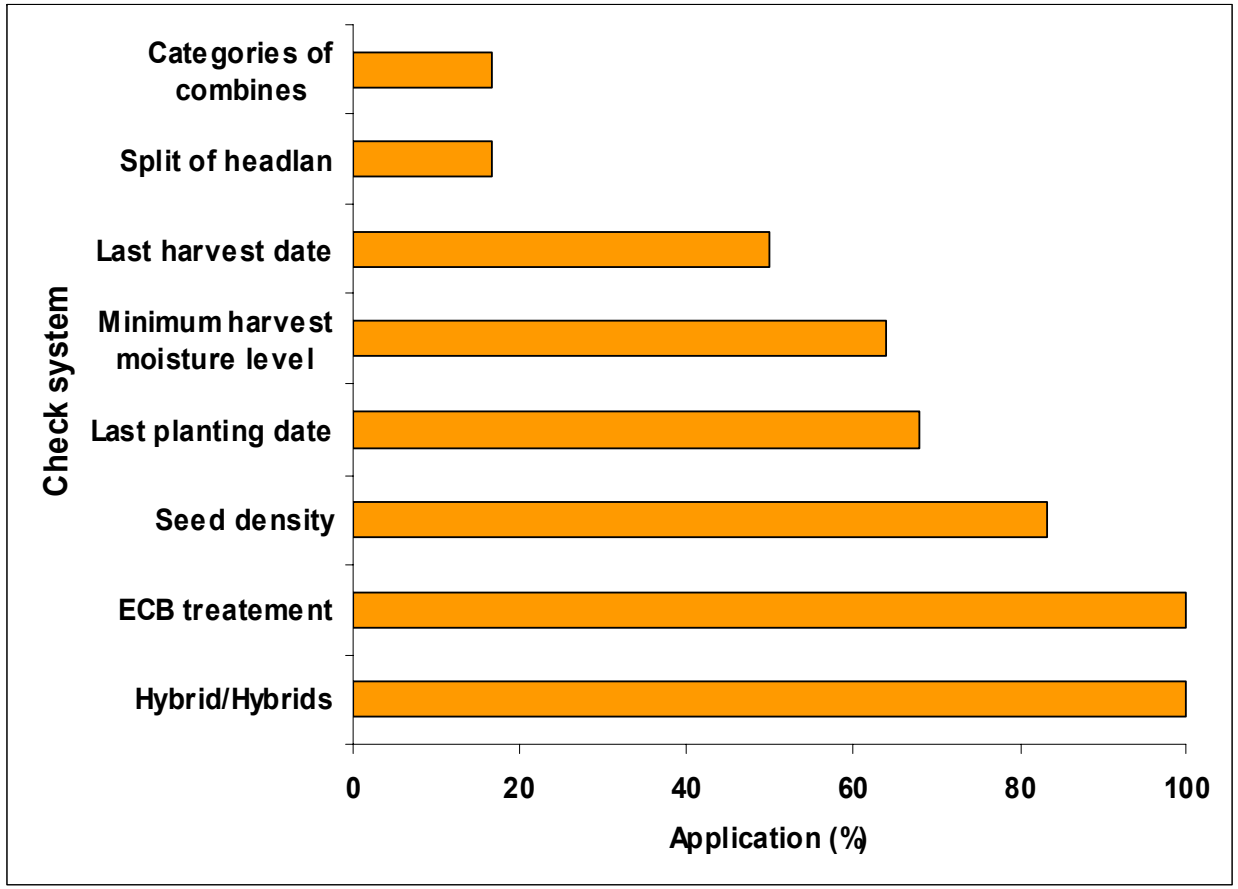


Chart 11. GAP's protocols implemented by the Italian Milling Industries



Conclusions:

- On one hand MRLs currently proposed by EU Reg. 1881/2006 for Fumonisins will give an over protection to the consumers. On the other hand it will have an economic impact of 800 million Euros on the Italian maize business;

- With the enforcement of MRLs, over 70% of Italian maize will be unsuitable for human consumption;

- Processing of maize within the current maximum limit of 2000 ppb, about 25% of milling products (flour and germ) will exceed the MRLs set for their category and will be unsuitable for human consuption ;

- The inclusion of maize germ in the same cathegory of flour and oil is unjustified because germ is a by product of the milling industry addressed to the oil refining process.

Italian milling industries and corn growers, here represented by A.I.R.E.S. GLM, according to what provided by preamble no. 36) of Eu Reg. 1881/2006 and on the base of the objective data reported by the above survey,

DEMAND

1) The increase of the MRLs for Fumonisins for unprocessed maize and products thereof as per the following table;

Unprocessed maize	5000 ppb
Maize flour, maize meal, maize grits and refined maize oil	3000 ppb
Maize based foods for direct human consumption, excluding foods listed in 2.6.2 and 2.6.4	1500 ppb
Processed maise based food and baby foods for infants and youngh children	No increse (200 ppb)

2) The removal of germ from the product cathegory of point 2.6.2. because germ is a by product of the Milling Industry addressed to the oil production.