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Resistance to *Fusarium verticillioides* and total antioxidant capacity in Italian maize varieties*

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The market of maize-based foods has recently faced a quick expansion, mainly due to the need to prevent or reduce food allergies like coeliac disease. In this context, it is important to have a qualitative description of the genotypes to be exploited as raw materials, in terms of chemical composition of the grains, presence and amount of molecules with a functional role, and safety characteristics. Therefore, several research projects have been recently devoted to the screening of maize germplasm, particularly local populations. At CRA-MAC over 700 Italian varieties, which were collected in different regions in the 1950s and represent a large part of the numerous ecotypes differentiated over the centuries in our country, are maintained.
A main threat for the safety of maize kernel is the presence of fungal pathogens, in particular *Fusarium verticillioides*, which is the most toxigenic fungus for maize worldwide. It produces mycotoxins (fumonisins) that accumulate in the grain and can be found in the finished products for human food and animal feed. Plants respond to pathogenic attack with a complex network of responses including the activation of antioxidant molecules (Boutigny et al., European Journal of Plant Pathology. 121: 411-413, 2008).
The aims of this research are: i) the evaluation of the resistance or susceptibility to fungal pathogens (*F. verticillioides*) in a set of Italian varieties; ii) the evaluation their grain nutritional quality, with a particular focus on their antioxidant activity.
Twenty-seven maize varieties (Tab.1) were tested in open-pollinated field trials during 2011 and evaluated in terms of resistance or susceptibility to *F. verticillioides* by: i) artificial field inoculation of two toxigenic strains by KIA method (Kernel Inoculation Assay, Ferrari and Balconi, Dal Seme. 1: 38-40, 2008); ii) ear visual rating (number of infected kernels at the inoculation point, NCK); iii) quantification of the fumonisin content in the grain (ELISA). Non-inoculated or sterile water inoculated ears, were evaluated as controls. Varieties were grouped into three classes of infection based on NCK values: i) 0-30 kernels (low), ii) 31-60 (medium), iii) over 60 (high).
Artificial inoculation determined, in susceptible materials, a higher NCK and a wider kernel contamination as compared to controls, confirming to be a useful tool to identify genotypes with differential responses to *F. verticillioides* attack.
The number of contaminated kernels (NCK) after Fusarium inoculation ranged from 11 to 82, with an average value around 40. A similar trend, in terms of susceptibility or resistance, was observed for some genotypes also for fumonisin accumulation (*data not shown*).
Total antioxidant capacity (TEAC), expressed as mmol/kg Trolox equivalent (TE) on a dry matter basis, was also evaluated (Serpen et al., Journal of Cereal Science. 48: 816-830, 2008). Among the genotypes, a large variability was observed for total antioxidant capacity: in particular, for materials inoculated with *F. verticillioides* TEAC values ranged from 13.28 to 24.40 mmol TE/Kg d.m. In most varieties, the ears inoculated with the fungal pathogen showed TEAC values higher than the relative controls; this increase of production of antioxidant molecules could be considered one of the possible responses to the pathogen attack.
Some of the varieties analyzed in this study were characterized by both high total antioxidant capacity and resistance to pathogen attack. Genotypes with such traits could be an interesting

material to be introduced in breeding programs focused on the nutritional quality and safety of maize kernel. These preliminary results will be completed with the analysis of the materials replicated in 2012.

Tab. 1 List of maize varieties analyzed and their origin

Variety	Origin	Variety	Origin
VA56	Marano vicentino	VA109	Ostesa
VA62	Nostrano dell'Isola	VA111	Nostrano
VA63	Nostrano locale	VA112	Pignolino nostrano
VA65	Locale	VA113	Nostrano del Garda
VA66	Locale	VA114	Cinquantino bianchi
VA67	Locale	VA121	Pignoletto d'oro
VA68	Nostrale	VA553	Scagliolo Marne
VA69	Locale	VA572	Nostrano dell'Isola Finardi
VA70	Locale	VA904	Cinquantino 2° raccolto
VA74	Fiorentino	VA1196	Rostrato della Valchiavenna
VA83	Bianco perla	VA1269	Rostrato Esine
VA89	Scagliolo frassine	VA1304	Spinato di Gandino
VA90	Polenta rossa	VA1306	Rostrato Marinoni
VA108	Ostesa		

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