

CRA-MAC

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Analysis of insecticide seed coatings for protection of corn kernels, seedlings and plants.*

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As previously reported (Balconi et al., MNL 84, 2010), in Italy and in other European countries, one of the risk factors for honeybee health and Colony Collapse Disorder (CCD), are supposed to be agrochemical treatments, by the loss of active seed coatings ingredients through the fan drain of pneumatic seed drills during corn sowing operations (Greatti et al., Bulletin of Insectology, a) 56: 69-72, 2003; b) 59: 99-103, 2006); so that a precautionary suspension of use of all the four insecticide active ingredients registered for seed dressing, above mentioned, was established in Italy during 2008-2009-2010. The yield and/or the vigor of a crop can be increased or improved in locations where the level of insect infestation indicates the need for the use of an insecticide for insect control purposes by treating a seed of the plant with a neonicotinoid compound (Bai et al., Pestic. Sci., 33: 197-204, 1998; Nauen et al., Pestic. Sci., 51: 52-56, 1998).

The aims of our research in the frame of the APENET project (Italian Ministry of Agriculture, financed a national research project, Bortolotti et al., APOidea, 6:2-21, 2009), are devoted: i) to compare, in several locations of the Northern-Central Italy, the yield and agronomic traits of a commercial hybrid when grown without any insecticide treatment (as untreated control) with the yield and agronomic traits when grown, in the same location, with the four insecticide seed coatings, under study, (thiamethoxam, imidacloprid, clothianidin, fipronil); ii) to detect the presence of the four insecticide active ingredients registered for seed dressing, in leaves and other corn plant tissues periodically collected from the emerging seedling to the flowering stage.

- i) Agronomic trials were undertaken, in 17 locations during 2009 and in 19 locations during 2010; in each location 30 m²-plots were sown with seeds prepared from a homogeneous lot of commercial maize hybrid seeds coated either with the four active ingredients plus the fungicide, or with the fungicide alone (control). The five treatments were replicated 4 times in each location. The following observations and the standard agronomic measurements were performed: Grain humidity (%) - Yield (t/ha) – Grain Density - Plant height - Ear height – Percentage plants with split stalk - Percentage lodged plants. Statistical analysis performed with ANOVA showed that there are no significant differences among the five treatments for the measured parameters.
- ii) Experimental plots (50 m length) were sown with seeds prepared from a homogeneous lot of commercial maize hybrid seeds coated either with the four active ingredients plus the fungicide, or with the fungicide alone (control). Tests were undertaken to analyze residues of the four active ingredients used for seed coating at various stages of maize plant development, sampling leaf tissues at different phenological stages (2nd-3rd leaf; 7th-8th leaf, 13th -14th leaf). Extraction, separation and detection of thiamethoxam, imidacloprid, clothianidin, fipronil, were performed according to quality assurance criteria, to Good Laboratory Practice (G.P.L. Prot. CH-012-2010-Test Laboratory Prot. CH - 013/2010), by using HPLC coupled to tandem mass spectrometry (APCI-MS/MS) following with modifications Bonmatin et al. 2003, Anal.Chem. , 75, 2027- 2033. The results showed that amount of fipronil sharply decreased at early seedling stage development (2nd-3rd leaf),

while thiamethoxam, imidacloprid, clothianidin decrease was lower (7th-8th leaf); all four active ingredients were non-detectable at 13th -14th leaf stage development.

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