Ethephon - a Growth Regulator Detected in a Broad Range of Crops

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INTRODUCTION

Pesticides not covered by multi-residue methods (MRMs) require the use of single residue methods (SRMs) or group-specific methods. In 2007 the EU Reference Laboratory for Single Residue Methods (EU-RL-SRM) developed an LC-MS/MS method for a group of highly polar and widely employed pesticides including ethephon, maleic hydrazide, glyphosate (and AMPA), glyfosinate (and MPPA) and fosetyl aluminum *[1].* Currently, very few laboratories check for these compounds on a regular basis and, if so, only a small fraction of the samples entering the lab is typically targeted. The need to intensify the controls for these compounds in food is apparent, not only to check for MRL-compliance, but also in order to assess the risk relevant to food intake.

APPLICATIONS

Ethephon, 2-chloroethylphosphonic acid, is a plant growth regulator with systemic properties. It penetrates the plant tissues, and decomposes into ethylene, which affects the growth processes. It is used to promote pre-harvest ripening in apples, currants, blackberries, blueberries, cranberries, morello cherries, citrus fruits, figs, tomatoes, coffee and capsicums. Furthermore, it is also used to accelerate post-harvest ripening in bananas, mangoes, and citrus fruit; to facilitate harvesting by loosening of the fruit in currants, gooseberries, cherries, and apples; to increase flower bud development in young apple trees; to induce flowering and regulate ripening in pineapples; to increase fruit setting and yield in cucumbers and to improve the robustness of onion seed crops *[2].*

RESULTS

Due to the extremely wide field of applications in the production of fruit and vegetables, CVUA Stuttgart has continued its effort to monitor ethephon residues in order to get an overview as to which commodities should be regularly analyzed for ethephon. From August 2007 to April 2010 a total number of 1888 samples of fruit and vegetables were analyzed for ethephon. Ethephon residues were found in the following commodities: pineapples, pineapple juice, apples, pears, durians, figs, sweet peppers, grapefruits, persimmons, mangoes, oranges, pomelos, plums, peaches, cherries, grapes and tomatoes. In 151 (8 %) of the samples residues of the growth regulator were detectable, with 28 samples (1.5 %) containing ethephon residues above the MRL. Six samples (1 orange, 1 pineapple, 2 tomatoes and 2 sweet peppers) were considered “unsafe” and “unfit for human consumption” according to Article 14 of Reg. (EC) No 178/2002, since the residue levels in the samples led to an exceedance of the acute reference dose (ARfD) calculated for German toddlers (see Figure 1).

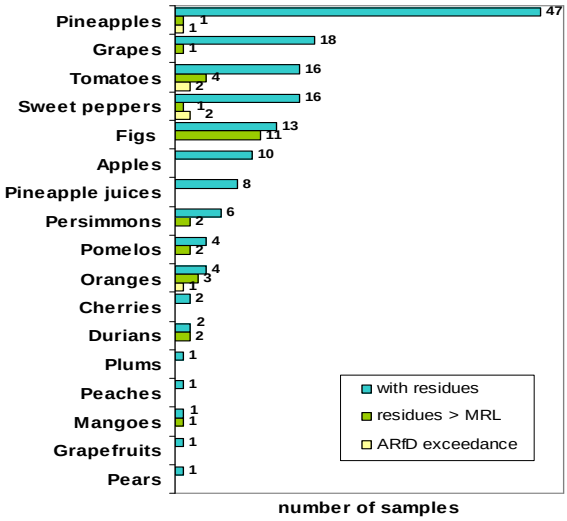

Figure 1 Number of samples with ethephon residues, residues above the MRL and ARfD exceedances (CVUA S 2007- 2010)

Pineapples showed to be the commodity with the most ethephon findings. In 76 % of the samples (47 of 62) ethephon could be detected. Figs showed the highest number of MRL exceedances; 11 fig samples (46 %) contained ethephon residues above the MRL (see Figure 2).

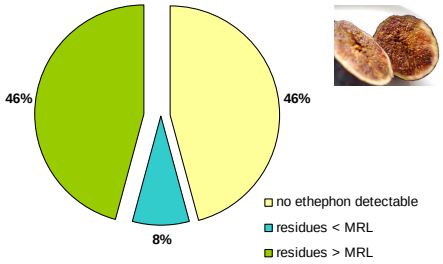

Figure 2 Ethephon residues in 24 fig samples (CVUA S 2007- 2010)

SUMMARY

From August 2007 to April 2010 CVUA Stuttgart analyzed 1258 fruit and 630 vegetable samples for ethephon residues. In 151 (8 %) of these 1888 samples ethephon residues were found, with 28 samples (1.5 %) containing residues above the MRL. The results show that this growth regulator is mainly used in the production of fruit, especially exotic and citrus fruits like pineapples, figs, oranges and pomelos. Concerning vegetables, it was solely detected in tomatoes and sweet peppers. *Additional Information:* The ethephon metabolite *HEPA* (2-hydroxyethyl phosphonic acid) was found in 43 samples.

LITERATURE

[1] www.crl-pesticides.eu, [2] The Pesticide Manual, Editor CDS Tomlin, BCPC 2006, [3] www.cvuas.de

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