



Food safety issues in fresh produce: Bacterial pathogens, viruses and pesticide residues indicated as major concerns by stakeholders in the fresh produce chain

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ABSTRACT

In January 2011, a workshop was organized by the EU FP7 Veg-i-Trade project to capture opinions of stakeholders on food safety issues in the global fresh produce supply chain. Food safety experts from various stakeholder types in the farm-to-fork chain were represented: farmer related organizations ($n = 6$), fresh produce processing and trading companies ($n = 17$), retail ($n = 3$), consumer organizations ($n = 2$), competent authorities ($n = 7$) and lastly research institutes and universities ($n = 19$). The experts who originated mainly from European countries (92.6%) were grouped in nine discussion groups per type of stakeholder and asked to rank food safety issues via a scoring approach according to perceived importance from their stakeholder type point of view. Also information sources for opinion making, appropriate food safety control measures and perceived contextual factors increasingly challenging governance of food safety in fresh produce were ranked according to perceived importance. Although some differences were noted between opinions of the different stakeholders, there was in general an agreement on the main priorities in food safety of fresh produce. Bacterial pathogens were overall considered to be the most important food safety issue for fresh produce, followed by foodborne viruses, pesticide residues and mycotoxins. Alert systems such as the European Commission's Rapid Alert System for Food and Feed (RASFF) were considered as the most important source of information of food safety issues, followed by reports of international organizations (e.g. WHO, EFSA), legislative documents (e.g. EU legislation), national reports (e.g. on monitoring hazards, foodborne outbreaks) and exchange of information between people (informal contacts). Concerning the control measures, the application of good agricultural practices (GAP) was identified to be the most important control measure to assure the safety of fresh produce, followed by the application of good hygienic practices (GHP) and the certification of food safety management systems (FSMS). Increasing international trade and globalization were overall expected to have a large impact on food safety in fresh produce. Other contextual factors perceived to be important were the food safety policies by governments and the (lack of) food safety knowledge by consumers and other stakeholders of the fresh produce supply chain. Although the various stakeholder groups may conceive issues differently from their proper position in the fresh produce supply chain, no deep disagreements emerged. This type of workshop enhances interaction and risk communication between stakeholders and contributes to a better understanding of each other's concerns, constraints and interests to deal with the food safety of the increasingly complex and globalized fresh produce supply chain.

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1. Introduction

Fresh produce is an important part of a healthy diet. Its consumption is known to have a protective health effect against

a range of illnesses such as cancers and cardiovascular diseases (Block, Patterson, & Subar, 1992; Joshipura et al., 2001; Steinmetz & Potter, 1996). In more than twenty countries (e.g. the Netherlands, Spain, Norway, Belgium, the US and Brazil), fresh produce consumption is encouraged by governmental health agency campaigns. They recommend to consume at least five daily servings of fruit and vegetables (Abadias, Usall, Anguera, Solson, & Vinas, 2008). Despite the beneficial health effects of fresh produce, there is a growing awareness concerning its microbial and chemical food safety (Lynch, Tauxe, & Hedberg, 2009; Strawn, Schneider, & Danyluk, 2011). Diseases linked to the sporadic presence of microbial hazards such as *Salmonella* spp., verotoxin producing *Escherichia coli* (VTEC) and norovirus (NoV) increasingly support this allegation (Berger et al., 2010; FAO/WHO, 2008; Sivapalasingam, Friedman, Cohen, & Tauxe, 2004). In the EU in 2009 and 2010, respectively 4.4% and 10% of the foodborne verified outbreaks were linked with the consumption of vegetables, fruits, berries, juices (and products thereof) (EFSA/ECDC, 2012). Such outbreaks have besides very severe consequences for public health also a significant economic impact (Calvin, Avendano, & Schwentesius, 2004; WHO, 2011a). Other food safety issues such as pesticide residues, antimicrobial resistance, wax coatings, nanomaterials and genetically modified organisms are increasingly becoming a concern for the fresh produce supply chain (Domingo & Gine Bordonaba, 2011; Magnuson, Jonaitis, & Card, 2011; Tait & Bruce, 2001). Hence, assuring the safety of fresh produce and alertness to maintain consumer trust in fresh produce as a healthy food is of paramount importance for stakeholders. This is a challenging task in an increasingly globalized and more complex fresh produce food supply chain. It implies a shared responsibility of the stakeholders within the farm-to-fork continuum (producers, processors, trading companies, retailers and consumers) and those closely involved in supporting food safety in the supply chain (competent authorities, industry associations, food scientists). Several studies measured the perceptions of consumers on various aspects of food safety (Grunert, 2005; Nielsen et al., 2009; Soon-Mi et al., 2011; Sparks & Shepherd, 1994; Tonsor, Schroeder, & Pennings, 2009). A limited number of studies on opinions of key stakeholders (experts) on food safety policy are available (van Kleef et al., 2006; Sargeant et al., 2007). However, to the authors' knowledge, a survey with farm-to-fork key stakeholders on priorities and challenges on the safety of the fresh-produce chain is lacking. In the present study it was the objective to capture opinions of fresh produce food safety experts who are member of the EU FP7 Veg-i-Trade consortium (in the project Veg-i-Trade the impact of climate change and globalization on the safety of fresh produce is studied) and several other invited European stakeholders of the fresh produce supply chain. The opinions of interest concerned the perceived importance for public health, economic impact, consumer trust, etc. according to their stakeholder type point of view and their position as an actor within or associated to the European oriented global fresh produce supply chain with regard to four topics: i) food safety issues, ii) information sources for stakeholders to get informed about food safety, iii) appropriate control measures to keep the fresh produce safe and iv) perceived contextual factors impacting on the food safety of fresh produce. Data collection for each of the topics was performed via discussion groups containing food safety experts grouped per type of stakeholder: farmer related organizations, fresh produce processing and trading companies, food safety authorities, food science researchers, retailers and consumer organizations. The obtained information within our study gives insight into the current food safety priorities and challenges of the fresh produce chain and provided an opportunity to exchange opinions between various stakeholders of the fresh produce chain with a focus on the EU situation.

2. Materials and methods

2.1. Participants and procedure

A total of 54 international experts participated (75 were initially invited) to a workshop that was held on January 28th, 2011 at the Faculty of Bio-Science Engineering, Ghent University (Belgium) as a satellite to the EU FP7 Veg-i-Trade Consortium meeting in Ghent. The participants all have a professional function linked to food safety and quality of fresh produce and were recruited based on their involvement in the global fresh produce supply chain but with a focus on EU production, intra community trade or import/export to or from EU, respectively. Fifty participants (92.6%) were representatives from companies/organizations/institutions from 6 European countries, namely Belgium (31), Spain (3), the Netherlands (9), France (1), Norway (4) and the UK (2). The Netherlands, Spain, Belgium and France are important countries for fresh produce production and trade in EU while Norway and UK are net importers. In addition some of the (mainly Belgian) participants were representatives of fresh produce companies with various production sites in EU, representatives of European fresh produce associations, or from the European Commission. The other 4 participants, all member of the Veg-i-Trade consortium originated from research institutes and universities from India (1), Egypt (1) and South-Africa (2). Among the 54 participants, 27 (from Belgium, Netherlands, Norway, Spain, Egypt, South Africa and India) were member of the EU FP7 Veg-i-Trade Consortium. The food safety experts were divided in nine groups of five to seven persons based on their expertise: one group with experts from fresh produce farmer related organizations [*primary production*], three groups with food safety experts of fresh produce processing and trading companies [*industry*], three groups with food safety scientists from universities and research institutes [*scientists*], one group with experts from food safety authorities [*authorities*] and one group containing food safety experts from retail and consumer organizations [*retail/consumer organizations*]. The number of participants within each group and the countries in which their affiliated companies/institutions/organizations are located are presented in Table 1. Nine separate discussion tables were installed in a large meeting room. Each table was attended by the members of a specific discussion group and a moderator of the scientific research staff of the Association Ghent University (AUGent). The group discussions were run according to a standardized procedure. To facilitate a common starting point, the concepts and a list of choices of i) fresh produce food safety issues and ii) information sources were explained and subsequently two alphabetically ordered short lists containing respectively 16 food safety issues (see Table 2a) and 13 information sources (see Table 2b) were introduced by a AUGent researcher via a PowerPoint presentation. A food safety issue was defined in a broad sense as 'a concept that is wider than the definition of a food safety hazard by the Codex Alimentarius (biological, chemical or physical agent in a food, or the condition of, with the potential to cause an adverse health effect (CAC, 2003))' and included also health, quality and emerging issues. An information source was defined as 'a source of information (e.g. observations, people, reports, organizations) used for food safety opinion making'. The lists with topics were drawn up beforehand by the moderator team of AUGent researchers based on grey and scientific literature: food safety issues (Baert, Van Huffel et al., 2011; EC, 2010), control measures (Jacxsens, Devlieghere, & Uyttendaele, 2009), information sources (EFSA, 2011a) and contextual factors (Baert et al., 2012; Noteborn & Ooms, 2005). After introduction of the short lists, the following questions were asked to each discussion group 'Please rank the 5 most important food safety issues according to your stakeholders group (1 = most important, 2 = second

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