Air flow characteristics – proposed as mandatory requirement for airblast sprayers

Z. Czaczyk[1], G. Bäcker[2], R. Keicher[2], R. Müller[2]

[1] Poznań University of Life Sciences, Institute of Biosystems Engineering, Wojska Polskiego 28, 60-637 Poznań, Poland, zbicza@gmx.net

[2] Geisenheim University, Institute of Engineering, Brentanostrasse 9, D-65366 Geisenheim, Germany, rainer.keicher@hs-gm.de

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Introduction

The biological efficacy and environmental safety of pesticides application is worldwide more and more restricted. In European Community of 28 countries (EC28) since 2009 the Directive 2009/128/EC required governmental control of Plant Protection Products (PPP) use (Czaczyk 2010). According that since beginning of 2014 an Integrated Pest Management (IPM) was int-roduced as mandatory part of Integrated Plant Production (IPP). In EC28, according to this re-quirements, mandatory technical control of sprayers should be introduced till December 2016. The technical requirements concern new sprayers, and also sprayers in use.

Usually orchard and vineyard sprayers are equipped with air fan. It generate air flow for trans-portation of generated spray droplets of tank mix to the target. From different sources is known, that the air flow characteristics also at the same type (from the same manufacturer) of airblast sprayers is significant different (is not reproducible) (Triloff 2005, Triloff 2014).

The vertical liquid distribution from airblast sprayers strong depends on an air flow characte-ristics Hewitt 1993, Czaczyk 2012, Fritz et al. 2014). Because the air flow is invisible, it is di-fficult to evaluate its characteristics. According to new requirements for environmental safety of PPP application, the parameters influenced liquid distribution should be used to improve of the sprayer working quality. With aim to identify this problem, four different orchard sprayers with axial fun produced in Poland were tested. The non symmetric airflow characteristics were documented. It depends on the fan construction and also on rotational speed of propeller. According to the different air characteristics also liquid vertical distribution is influenced, and the changes of the target coverage and drift potential should be described by the manufacturer.

Methods

Special equipment for reproducible measurement of air flow characteristics were completed (fig. 1). An isosonic anemometer has continuos horizontal movement with constant speed. Also position (level) in vertical direction can be adjust continuously. But the scanned area is operated spatial – each 10 cm of height. The coordinates acquisition of isosonic sensor position is simultaneously conducted with the air flow results.

The operational software were created in own technical laboratory, with use of LabVIEW (Laboratory Virtual Instrument Engineering Workbench) system - design platform.

The air flow speed and direction are measured.

Fig. 1. View of air flow characteristic measurement unit based on isosonic anemometer.

Results

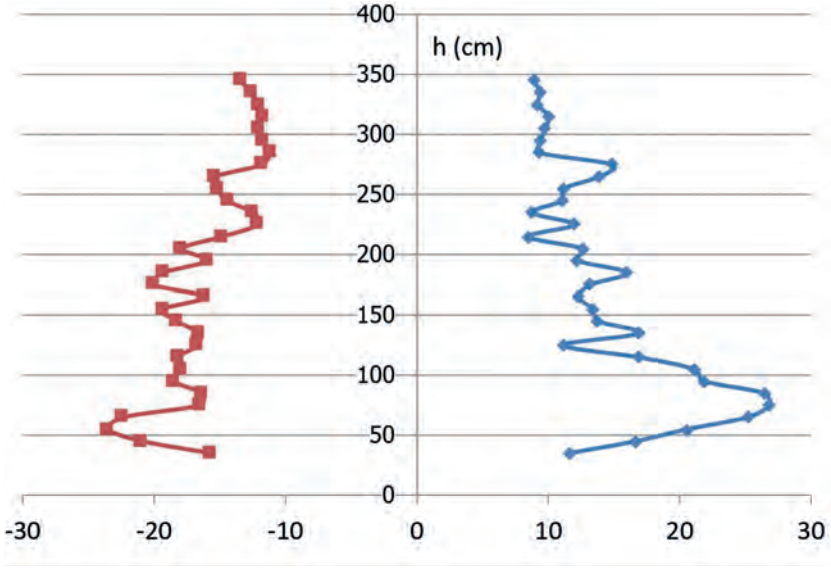

Fig. 2. Example of air flow velocity (m/s) of sprayer A.

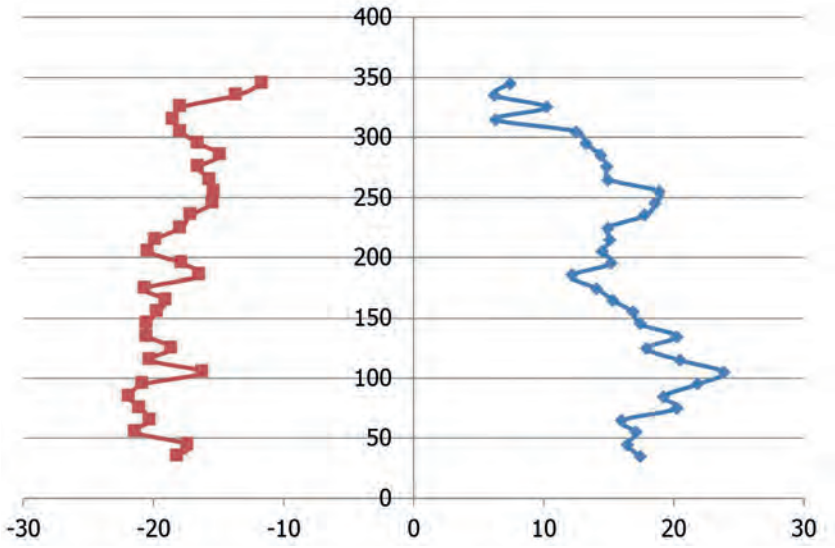

Fig. 3. Example of air flow velocity (m/s) of sprayer B.

Conclusions

The air flow from air blast orchard and vineyard sprayers influenced the drift potential signifi-cantly. The symmetry and characteristics of air flow usually is without any technical control during and after production of such sprayers.

The technical information about air fan adjustment for orchard and vineyard sprayers are very pure, and such technical information should be delivered more detailed and comfortable form for user.

The international standards (e.g. EN 13790-2, ISO 22369-1-3, ISO 5682-1-3) are useful for the working quality determination of sprayers. It improve the technological control and envi-ronmental safety of equipment supplied to the market. It influence in consequence also the technical level of sprayers used in practice.

The actual available standards for air blast sprayers should be improved with additional tech-nical regulations according to air fan characteristics and working safety.

The information about correct air flow adjustment should be include into the mandatory technical control of air blast sprayers, and also into the teaching material and training program for orchard and vineyard sprayers operators, users and advisors in crop protection.

Delivering of the air flow characteristics and the range of spraying range, should be required from sprayer manufacturer in technical information of each type of airblast sprayer.

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