

Portuguese sprayers inspections: issues to overcome

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Summary

The EN 13790 and agricultural products certification standards stimulated the sprayers inspections in a yearly basis in Portugal. Since 2006 *Centro Operativo e Tecnológico Hortofrutícola Nacional (COTHN)* inspected almost 3000 sprayers throughout the all country, including field crops sprayers, air assisted sprayers for bush and tree crops and a few hand held sprayers for greenhouse crops. In 2009 and 2010, Ambí3Q and A.CANO began with sprayers inspections in the north and south of Portugal, respectively.

The implementation of the article 8 of the European Directive CE 128/09 in all member states is an important step to minimize environmental impacts, protect human health and improve plant protection efficacy. However it is not an easy task due to the characteristics of agriculture and sprayers in use of each country.

The actual legislation concerning the construction and inspection of sprayers was published in the last 3 years. According to the article 8 of the European Directive, the Official Service *Direção-Geral de Agricultura e Desenvolvimento Rural (DGADR)* of the Agriculture Ministry, developed the Portuguese law *Decreto-Lei n.º 86/2010 de 15 de Julho*, in 2010, to impose that mounted sprayers, trailed sprayers and self-propelled sprayers must be inspected and approved before 26 November, 2016.

The sprayers inspections carried out in Portugal should be an important tool to assess the sprayers in use and decide the best action plan to implement the article 8. Despite the sprayers inspections had been done mostly as a consequence of the European and National market rules, and so, the data collected are a rough sample of the real Portuguese situation, it is possible to observe that only one-third, of the sprayers inspected until now, have less than 5 years old. This means that the majority of the sprayers may not be in accordance with the standards and the article 8 of the European Directive.

Introduction

Since 2006 that *Centro Operativo e Tecnológico Hortofrutícola Nacional (COTHN)* has been inspecting sprayers through all country as a consequence of the European and National market rules. *COTHN* started sprayers inspections with orchard sprayers and later field crop sprayers (NUNES, 2010). During the first four years of inspections *COTHN* inspections focused mainly west of Portugal (orchards and vegetable crops), central Portugal (vegetable crops) and south coast of Portugal (vegetable crops and berries fruits).

The data collected during the sprayer inspections in the first four years revealed the first picture and the common damages in orchard sprayers and in field crop sprayers. These reports are important to achieve the best way of implementing the European Directive of sustainable use of pesticides.

The article 8 of the European Directive is an important step to minimize environmental impacts, protect human health and improve plant protection efficacy. That is three important reasons to make all efforts between farmers, technicians, organizations, manufactures and the Official Services.

Material and methods

The data collected during the four years period 2006-2009 was the base to achieve the results presented in these report. During the inspections the flow rate was checked and compared with nozzle manufactures tables as well as pressure gauges.

Although the majority of the sprayers inspections were based in orchard sprayers, field crop sprayers had a considerable representation especially in centre and south cost of Portugal (Fig. 1).

After colleting the data it was analysed and summarized in this report as well as the spatial distribution of the sprayers was used to produce the following maps (Fig. 1).

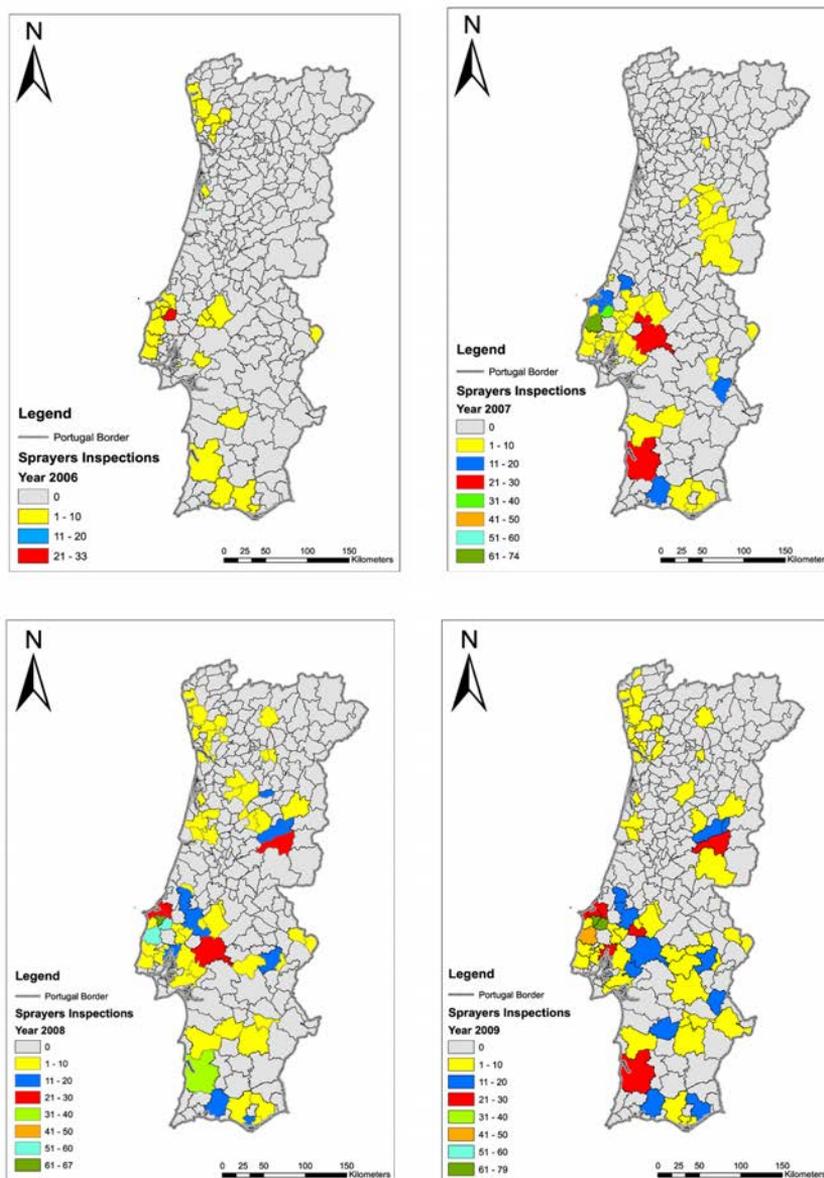


Fig. 1. Sprayers inspections made by COTHN in the four years period in Portuguese regions (MARTINS, 2006a), (MARTINS & NUNES, 2007b), (NUNES & MARTINS, 2008c), (NUNES & MARTINS, 2009).

Results

During the first four years the sprayers' inspections increased significantly. In 2006 COTHN inspected 134 sprayers, in 2007 increased to 430 sprayers inspected, in 2008 were 718 sprayers inspected and in 2009 were inspected 799 sprayers which represent in the four years 2081 sprayers inspections (Fig. 1).

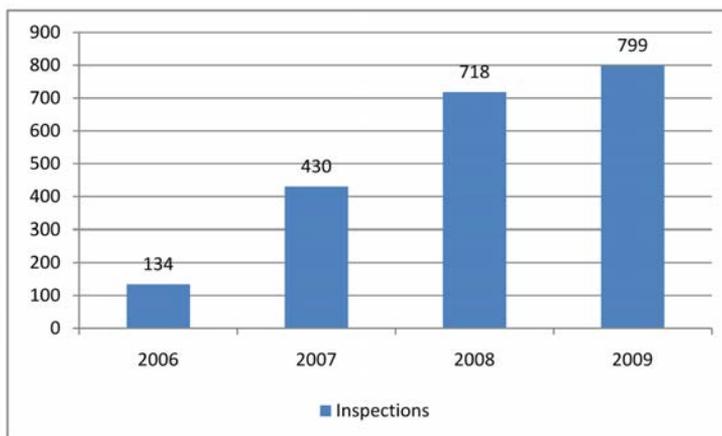


Fig. 2. Progress of certificated sprayers inspections by COTHN in Portugal (MARTINS, 2006), (MARTINS & NUNES, 2007), (NUNES & MARTINS, 2008), (NUNES & MARTINS, 2009).

The sprayers inspected during these four years are mainly for GlobalGAP and national markets requisites. Mainly, those requisites represent more than 60% of the total sprayers inspected until 2009; the other 40% could represent the voluntary sprayers inspected (Fig. 3).

Another important issue, is that sprayers in use could not be in accordance with the most recent legislation, because they were constructed based in older legislation, and therefore the sprayers could need reparation before sprayers inspections to be in accordance with article 8 of the European Directive.

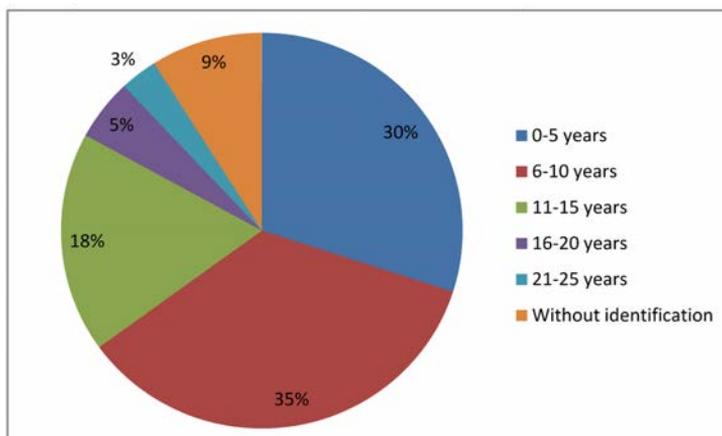


Fig. 3. Sprayers grouped in classes of age (NUNES & MARTINS, 2009).

The inspection of orchard sprayers continue to be, since the beginning, the main requests for inspections during these four years as the graphic show, 59% are orchard sprayers, 25% are boom sprayers an 9% are spray guns (Fig. 4).

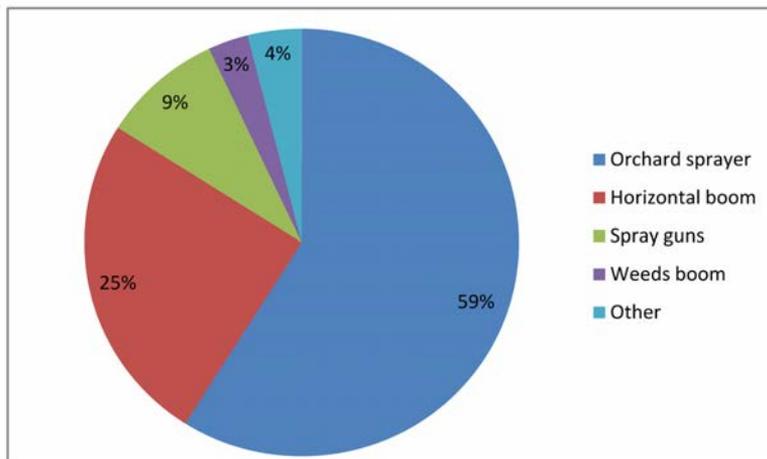


Fig. 4. Type of inspected sprayers (MARTINS & NUNES, 2007).

In sprayers inspections was checked the PTO shaft drive and the power input connection to ensure the operator safety. Nearly 40% of the PTO shaft drives were not protected and exposed the moving parts, which is a significant percentage, considering the danger in which farmers are daily working. The others 60% of the PTO shaft drives were protected.

Another relevant information is the working pressure used in pesticide applications in orchard sprayers. The working pressure amplitude is big which varies between 5 bar and 35 bar. Higher working pressures are more common in sprayers equipped with adjustable hydraulic nozzles and lower pressures more common in sprayers equipped with hollow cone nozzles or Albus ATR nozzles. It is possible that sprayers and sprayers fans are not well dimensioned to orchards, because of the need to project the pesticides to the biological target (Fig. 5).

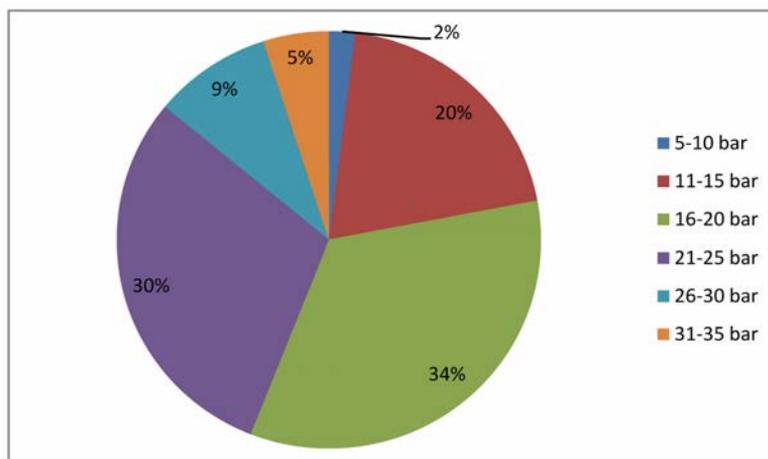


Fig. 5. Working pressures most used in orchard sprayers (MARTINS & NUNES, 2007).

In field crop sprayers the working pressure are still higher as the Fig. 6 shows, the majority of farmers are using working pressures above 10 bar, which is an important issue to increase drift in pesticide application. Only one third of the farmers, which had inspected their sprayers with COTHN, confirmed that the working pressures used were below 5 bar (Fig. 6).

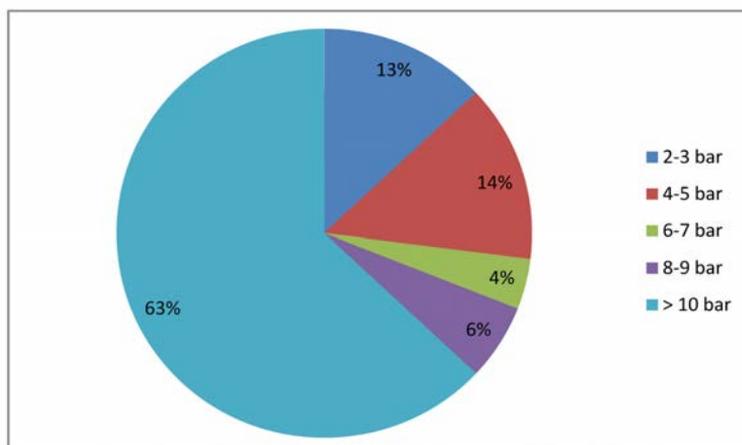


Fig. 6. Working pressures most used in boom sprayers (MARTINS & NUNES, 2007).

In Portugal sprayers are mainly from Portuguese manufactures, they represent 73% of the sprayers inspected. Tomix and Rocha are the Portuguese manufactures leaders with 31% and 29% respectively. Only llemo-Hardi is the international sprayer with more expression in Portugal with 9% of the sprayers inspected and the remaining 18% are represented by international manufacturers like Progroup, Caf-fini, Berthoud, Munckhof, among other (Fig. 7).

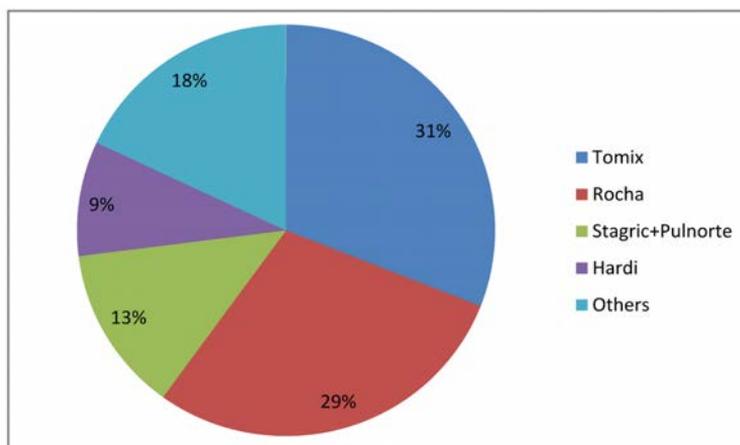


Fig. 7. Most used sprayers divided into manufactures (NUNES & MARTINS, 2009).

The anti-drip valve system is an important tool to protect environment and limit leakages after spraying had been stopped. The EN 13790, the European Directive 2009/128/CE and Portuguese law impose that this system must function well. According to the results of sprayers inspections there are still 39% of working sprayers without anti-drip valve system (Fig. 8). This is one of the aspects that sprayers must repair before sprayers inspections according with the article 8 of the European Directive.

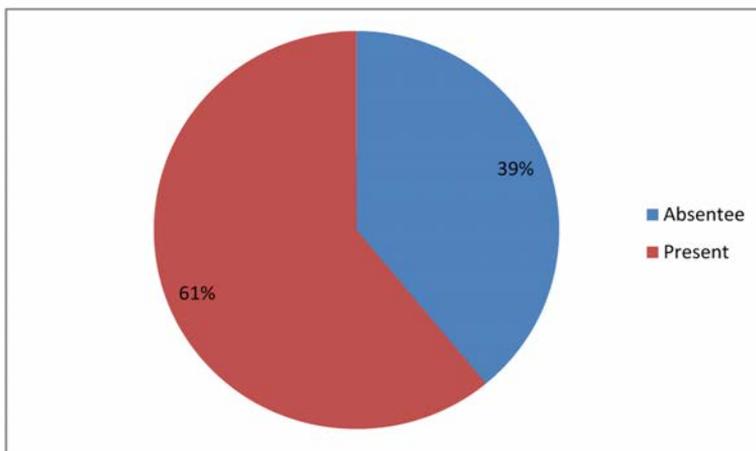


Fig. 8. Anti-drip valve system in inspected sprayers (MARTINS & NUNES, 2007).

Orchard sprayers had 50% of the pressure gauge with defects and field crop sprayers had 36% with defects. When the defects of the pressure gauges are higher like the Fig. 9 shows, it could represent wrong calculations to determine the correct dose of pesticide to apply in the biological target.

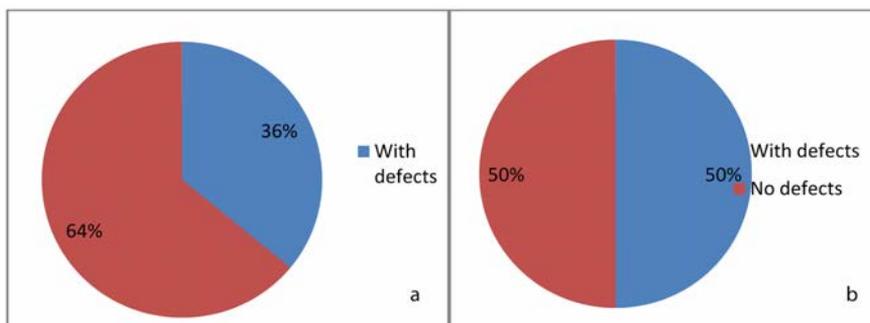


Fig. 9. Defects in pressure gauges of field crop sprayers (MARTINS & NUNES, 2007a), defects in pressure gauges of orchard sprayers (MARTINS & NUNES, 2007b).

The sprayers inspections have the possibility to show farmers the flow rate of the nozzles in use, and it illustrates that more than 50% of the nozzles are not working right leading to bad pesticide application. According with Fig. 10, 31% of the nozzles inspected are deteriorated and 15% were obstructed, confirming that the flow rate of those nozzles was not according with manufactures tables. The adjustable hydraulic nozzles are still preferred by 8% of the farmers, which had, their sprayers inspected by COETHN (Fig. 9).

The use of adjustable hydraulic nozzles are important to farmers because they could adjust the hollow cone and the flow rate to each situation, even the distribution are not respected. Most of the adjustable hydraulic nozzles inspected presented differences between the symmetric nozzle, which could present bad distributions of the pesticide in orchards (MOREIRA, 2006).

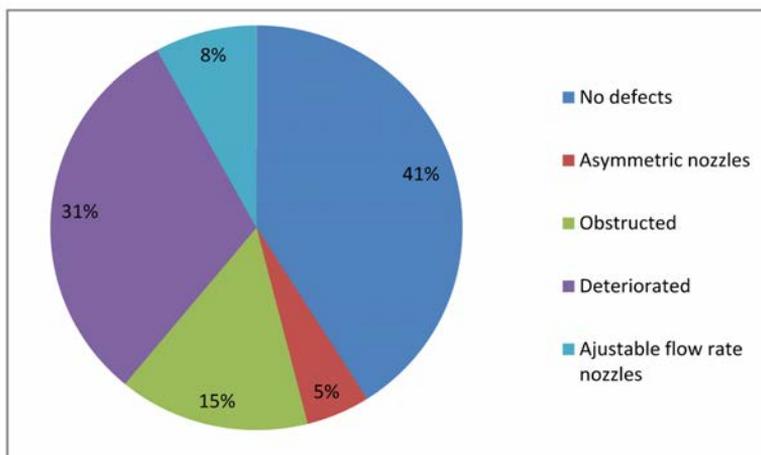


Fig. 10. Most common defects in nozzles (MARTINS & NUNES, 2007).

The majority of the pumps had no significant defects according to the 84% of the inspected sprayers, but 72% did not have the proper air pressure in the pneumatic pressure pulsation damper resulting in pulsations of spraying liquid as well the 9% which needed to replace the damper membrane. There were 18% of the pumps, which required to be repaired, and 1% had leakages (Fig. 11).

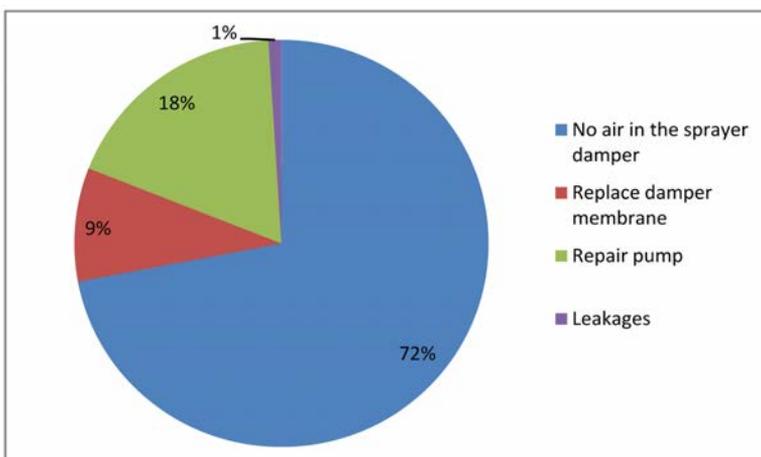


Fig. 11. Most common defects in pumps (MARTINS & NUNES, 2007).

According with the 60% of the sprayers inspected (Fig. 12), farmers does not pay attention to clean the pump suction filter as well as the pressure system filter which leads to differences of pressure on both sides of the sprayer and differences of the flow rate of the nozzles. In 21% of the sprayers they had to replace the filter, because it was damaged and was not working well and in 13% the sprayers had no pressure system filter.

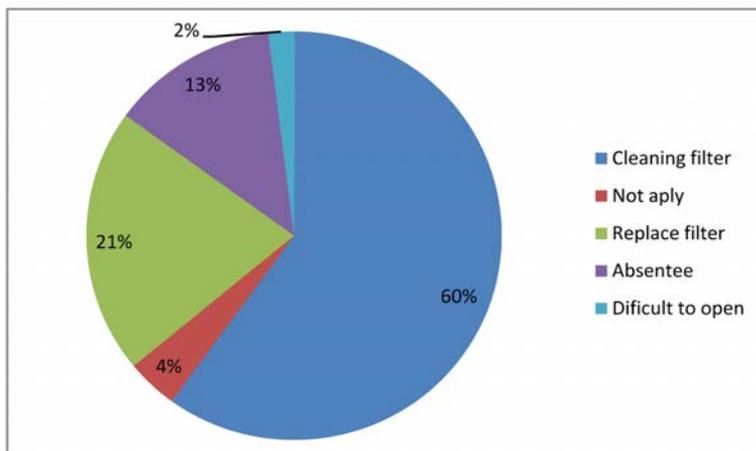


Fig. 12. Most common defects in filters and an example of pump suction filter (MARTINS & NUNES, 2007).

In 42% of the sprayers inspected the pipes system was deteriorated, needing substitution, 33% had differences in the internal diameters of the pipes, which interfere in the pressure at which nozzles are working and 25% of the pipes, had leakages.

The rinse tank is important to clean the internal system of sprayer after the pesticide application, however it is only present in 51% of the sprayers inspected.

Conclusions

During the four years of sprayers inspections was found that the low accuracy of the pressure gauges used, the nozzles deterioration and low uniformity of the distribution can be decisive in the success of the application and amplify serious doubts in the efficiency of the pesticides usage.

It is therefore important to use strategies to motivate farmers to reduce their mistakes in pesticides application, promoting calibration and maintenance of the sprayers to reach the objectives for a safer agriculture in the use of pesticides.

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