

A COMPARISON BETWEEN BATTERY- AND PETROL-POWERED CHAINSAWS IN TERMS OF NOISE AND VIBRATIONS EXPOSURE

FRANCESCO NERI¹; ANDREA LASCHI^{2}; LUCIA BERTUZZI³; GIOVANNI GALIPÒ⁴; NICCOLÒ FRASSINELLI¹; FABIO FABIANO¹; ENRICO MARCHI¹; CRISTIANO FODERI¹; ELENA MARRA¹*

¹Department of Agriculture, Food, Environment and Forestry (DAGRI) - University of Florence; ²Department of Agricultural, Food and Forest Sciences (SAAF) - University of Palermo; ³Department of Prevention, Tuscan Agency of Public Health; ⁴Arma dei Carabinieri–Raggruppamento Carabinieri Biodiversità– Reparto Biodiversità di Vallombrosa.

Corresponding author: andrea.laschi@unipa.it

ABSTRACT

The use of chainsaws in forestry is still common worldwide. In fact, felling, delimiting and cross-cutting operations are commonly made by chainsaw in many areas. It is universally known that forest operations are very dangerous for professional workers, in particular those made by chainsaw. In fact, the accident rates and severity, together with the medium and long-term occupational diseases, are very high on average and it is difficult to reduce this negative effect. Nevertheless, considering the low investment needed and its versatility, chainsaw continues to be the main tool used in forestry in many contexts. Also for this reason, the main producers of chainsaws made huge investments in the last years to develop a new generation of machines, powered by electric engines instead of endothermic ones. In this context, in the last years the use of battery-powered chainsaws rapidly increased, also in professional activities, especially gardening and tree maintenance. Moreover, the last models of chainsaws, characterised by similar performance in terms of power of cutting efficiency in comparison with “traditional” models, have been noticed by forest operators that started to ask if it would be possible to use battery-powered chainsaws in substitution of petrol-powered machines in forestry. In fact, first studies demonstrated that differences in terms of cutting performances and productivity are very low, null in some cases. The most important disadvantage is currently the battery duration and the problem of on-field recharging. On the other side, battery-powered tools are considered as a better alternative to petrol-powered systems in terms of noise and vibrations, contributing to reduce accident rates but especially occupational diseases. For these reasons, in this study noise and vibrations exposures were investigated, comparing the latest model of battery chainsaw and its correspondent powered by petrol. The comparison was made considering both hardwood and softwood, a forest operator made a series of cross-cutting on black pine and beech logs, alternating the two tested chainsaws: the Stihl MS 300-A and the Stihl MS261-CM. Four logs of pine and four logs of beech were used, characterised by diameters from 25 to 30 cm. During this operation, both noise and vibrations were measured according to ISO 11201 and to ISO 5349, respectively. Regarding vibrations, the results showed that, on average, the peak value of vibrations using battery chainsaw is about half of the value obtained by using the petrol-powered one. It is interesting to notice that the peak value on battery chainsaw has been obtained on the right handle, while on petrol chainsaw on the left one. Considering noise exposure, there is a significant difference between battery and petrol chainsaws, with a lower value of