Optimization of a new knife crusher to increase olive oil quality

Claudio Perone1\*, Antonia Tamborrino2, Antonio Berardi2, Roberto Romaniello1, Maurizio Servili3, Alessandro Leone2,

1 Department of Agriculture, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy;

2 Department of Agricultural and Environmental Science (DiSAAT), University of Bari Aldo Moro, via Amendola, 165/a, 70126 Bari, Italy;

3 Department of the Science of Agriculture, Food and Environment, University of Perugia, via S. Costanzo, 06126 – Perugia, Italy.

Correspondig author: Claudio Perone (claudio.perone@unifg.it), Tel. +39 0881 589 120.

**Keywords.** Hammer crusher, knife crusher, phenolic compounds, olive paste temperature, impact energy

**Abstract.**

Olive crushing is an important phase in the continuous extraction process of olive oil. This operation has the purpose of breaking the olives, creating a paste made up of all the vegetable parts, suitable for subsequent processing. The way in which the olive paste is prepared has a significant influence on the quality of the final product. The crushers hit the drupe violently, transferring part of their kinetic energy. However, the shape, geometry and speed of the crusher tool can also produce a different way of breaking up plant tissues due to the different combination of compressive, shear and friction forces. In addition, the violence of the operation could lead to an undesirable increase in the temperature of the olive paste, with consequence on the quality of the end product. Therefore, temperature control plays a fundamental role in the final result of extra virgin olive oil as it keeps the nutritional properties of the olive intact, and its flavor.

To increase the performance of this stage, a new knife crusher was studied. Specifically, a new knife rotor was studied to replace the hammer rotor and implemented in a traditional crusher. The aim was that of a preliminary optimization of the specific energy based on a new configuration of the blades to crush the olives, so to avoid an excess of temperature increasing into the grid. As a reference the results obtained were compared with those of a traditional hammer crusher.

Test results reported an increase of increase in the phenolic and volatile component when knife rotor has been used, while about the percentage extractability of the olive oil no significative difference was found.