**Effects of Incubation Time of Plasma Activated Water (PAW) Combined Annealing for the Modification of Functional Properties of Potato Starch**

Gebremedhin Gebremariam Gebremical1\*, Silvia Tappi1,2, Romolo Laurita3, Filippo Capelli3, Federico Drudi1, Santina Romani1,2, Pietro Rocculi1,2

*1Department of Agricultural and Food Sciences, University of Bologna, Piazza Goidanich, 6047522 Cesena, Italy*

*2Interdepartmental Centre for Agri-Food Industrial Research, University of Bologna, Via Q. Bucci 336, 47522 Cesena, Italy*

*3Department of Industrial Engineering (DIN), University of Bologna, Via Terracini 24, Bologna, Italy*

**Abstract**

The present study investigates the application of annealing and plasma-activated water (PAW) for starch modification, as alternative methods compared to the chemical one. Native potato starch was subjected to PAW, annealing with distilled water (DW-ANN), and the combination of the two (PAW-ANN) at different incubation times (1, 4, 8, and 12h). The changes in rheological, pasting, and thermal properties were evaluated. The results showed that all treatments promoted significant modifications of the investigated parameters. In particular, while the pasting properties of the potato starch remained unchanged after the PAW treatment, G’ (elastic) and G’’ (viscous) of the PAW-treated starch were significantly (p<0.05) higher than those of the native. DW-ANN significantly increased all rheological parameters and reduced peak viscosity, breakdown, and setback and significantly (p<0.05) incremented pasting temperature, holding strength, and final viscosities of the potato starch may be due to cross-linking reaction. The combination of treatment (PAW-ANN) showed a synergistic effect leading to strong gel formation up to 4 hours, while further treatment reduced the possibility of depolymerization. In conclusion, the combined treatment is a promising new green method to modify the properties of starch and improve its stability within a short treatment time.