EFFECT OF THE SCREW CONFIGURATION ON PHYSICAL PROPERTIES OF STARCH BIOPLASTICS

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Extrusion technology has been widely used to manufacture thermoplastic materials. Recently, the use of natural polymers for producing plastic is in evidence. The objective of this work was to investigate the effect of screw configuration on the physical properties of bioplastics made from starch. Mixtures of corn and cassava starches (13 % moisture) and glycerol (37.8 g/100g starch) were processed in a 1000 mm long twin screw extruder fitted with a flat die (30 x 1 mm) running at varied screw speed of 135 to 155 rpm and constant temperature profile: 20, 30, 40, 50, 60, 90, 100, 100, 80, 80 ºC. Two screw configurations were evaluated, by changing one forward element by a reverse screw element (20 mm length) near the die outlet in order to increase starch breakdown. The extrudates were cut into small pellets of 5 g, compressed with a 5 ton-force at 90 ℃ for 30 s and bioplastics were produced. Output rate (OR) and specific mechanical energy (SME) varied from 6.45 to 7.36 kgh^{-1} and 317.91 to 568.86 $Whkg^{-1}$ respectively. Treatments processed with reverse screw element showed higher values of SME and lowest values of OR. The results of contact angle and opacity of bioplastics were evaluated using Tukey test ($P<0.05$). The results indicated a more hydrophilic character when SME was higher, whereas the use of the reverse screw element increased the opacity of the bioplastics. This work clearly showed that the change of a single screw element on extrusion process produced bioplastics with different characteristics.