Development of Calcium Alginate Bioplastic for Bale Wrap

Rost, Jolyn (School: Baker High School)

Net wrap is used to preserve hay bales for livestock, but is not biodegradable and harms livestock when ingested. It also causes pollution when it is not removed from the bale. Even after removal, it needs to be disposed of in a landfill or burned, which can release harmful chemicals. A biodegradable, ingestible net wrap would be safer for cattle and produce less pollution, while still preserving the bale. In this study, a calcium alginate bioplastic was produced and compared to net wrap. The null hypothesis was that the calcium alginate would be the same as the net wrap in tensile force, stretchability, biodegradation, and photodegradation. The calcium alginate was tested alone, and was also coated on cotton gauze thread, and tested along with net wrap and plain cotton gauze. The null hypothesis was rejected. The net wrap had the weakest tensile strength and the lowest stretchability. The calcium alginate bioplastic had higher tensile strength and stretchability than net wrap. The calcium alginate coated cotton gauze had the highest tensile strength and higher stretchability than net wrap. The calcium alginate bioplastic lost 3-27% of its mass during the biodegradation and photodegradation tests, which the net wrap did not. There was also a loss of tensile strength in these tests in the calcium alginate bioplastic in the biodegradation test (11%) and the photodegradation test (58%). However, the tensile strength was still similar to that of the netwrap. This material has potential to be used as a viable alternative to net wrap and should be developed further to be used in the livestock industry.

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