CHAPTER IV
CONCLUSIONS

From the study of the mixing process of starch-based HDPE blends, it can be concluded that tapioca starch provides more homogeneous blends with better dispersion and more uniform distribution of the starch particles than the rice starch. Addition of the starch filler stiffens the blends due to the high rigidity of the starch particles compared to that of HDPE. Furthermore, during the blending process the torque increases with increasing starch content. In addition, higher torque is required for blending rice starch with HDPE than for blending tapioca starch due to the existing rice starch agglomerate structure. Blending rice starch with HDPE required extended mixing times in order to break down its agglomerate structure. Scanning electron micrographs of the blends revealed that interfacial bonding between the starch particles and the HDPE matrix was either very poor or non-existant.

The mechanical properties of starch-based HDPE blown films showed tapioca starch-based HDPE blown films to be superior over rice starch-based HDPE blown films. With increasing starch content there was a general decrease in tear resistance, tensile strength at yield, and elongation at yield – with the exception of tear resistance of tapioca starch-based HDPE blown film at low starch concentrations. The tear resistance of tapioca starch-based HDPE blown film was found to increase with increasing starch content up to a maximum loading of 7.5%. This strengthening effect was attributed to crazing, that was thought to occur, caused by the rigid starch particles. The mechanical properties of rice stach-based HDPE blown film were strongly influenced by the large, poorly adhered, rice starch agglomerates.

Tensile strength of the films when measured parallel to the machine direction (MD) was consistently higher than when measured in the transverse direction (TD). This suggests that the HDPE chains had a preferential orientation in the MD.

The water and moisture absorption of both the rice starch-based and tapioca starch-based HDPE blown films increased with increasing starch content. Films containing rice starch absorbed more water and moisture than films containing tapioca starch suggesting that the rice starch has a higher water affinity than tapioca starch.