

Title Physical properties of cubes from fractionated sun-cured and dehydrated alfalfa chops
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Abstract

Physical properties of cubes manufactured from fractionated sun-cured and dehydrated alfalfa chops were studied using a single cubing unit. A hydraulic cubing machine having a maximum capacity of 14.0 MPa was used to apply compressive pressures on the fractionated chops. Separation of alfalfa into leaf and stem fractions was achieved using a forage particle separator. The fractions were re-combined to get five different samples each for sun-cured and dehydrated alfalfa with leaf content ranging from 0% to 100% in increments of 25%. The effect of chop moisture content (6, 10 and 14%), leaf content (0, 25, 50, 75 and 100%), chop preheat temperature (50, 75 and 100°C), cube die temperature (75, 90, 150 and 200°C), applied pressure (2.5, 5.0, 7.5, 9.0, 10.0, 12.0 and 14.0 MPa) and chop residence time in the cubing unit (10, 12, 15 and 30 s) on cube quality was studied. Cube quality was assessed based on its density, color, long fiber content, durability and hardness. Results were subjected to statistical analysis to determine the effect of processing and material variables on cube quality. Chop moisture content of 10% (wb) was considered as an optimum value. A chop preheat temperature below 100°C was deemed appropriate to avoid vapor pocket formation inside a cube, leading to cracks on a cube surface. The density of dehydrated and sun-cured cubes increased with an increase in pressure, residence time, leaf content and cube die temperature. Cube hardness increased with an increase in pressure and residence time. Cube durability increased with an increase in pressure, residence time and die temperature. The change in leaf content had an insignificant effect on cube durability, except for dehydrated alfalfa at 50% leaf content and sun-cured alfalfa at 100% leaf content. Cube greenness decreased with a decrease in leaf content and residence time, however, greenness increased with an increase in die temperature.