

收割期牧草底部茎秆生物力学性能试验 Experiment on Biomechanical Properties of Bottom Stems of Forage in Harvesting Period

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关键词: 牧草茎秆 抗拉强度 化学成分 显微结构

摘要: 以北方典型多年生豆科牧草紫花苜蓿、小冠花和禾本科扁穗冰草、无芒雀麦收获期底部茎秆为研究对象,在500N微机控制电子万能试验机上试验研究了主要力学性能,并测定了茎秆在不同状态下纤维素、木质素、蛋白质等主要化学成分含量,观测了茎秆的微观组织结构,得到了茎秆扫描电镜下的解剖构造图像。研究表明:4种牧草收割期底部茎秆应力 σ 与应变 ϵ 曲线服从虎克定律,禾本科扁穗冰草茎秆抗拉强度高而弹性小;豆科小冠花茎秆抗拉强度最低,柔韧性强,纤维素质量分数也最低(13.87%)。牧草茎秆是天然高分子复合材料,呈各向异性,其强度和刚度不仅取决于纤维素、木质素的含量及其连接形式和排列方式,还取决于各自机械组织的厚度、维管束的数量以及各组织及其细胞之间的连接形式和连接强度。Four kinds of leguminous and gramineous forage stems in harvesting period were chosen to perform tensile experiments by the electronic testing machine CMT2502. The cellulose, lignin and protein content of forage stems in different conditions were tested. The microstructure was observed. The SEM images of transverse section were got by scanning electron microscopy. The results indicated that, the stress-strain curve of bottom stems obeyed Hooke's law; the tensile strength of *Bromus inermis* was higher than *Coronilla varia*, but the elastic was smaller; the tensile strength and cellulose contents of *Coronilla varia* were smallest (13.87%) in the four species. A forage stem is a natural anisotropic polymeric composite. The strength and stiffness of forage stems depends on the content, linking and sequence of cellulose and lignin, together with the thickness of thick-walled cells, the numbers of vascular bundles and the connection and strength of cells in stems.

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