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棉纤维超微结构的研究

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应用X射线衍射技术研究了棉纤维的超微结构,其结果是:棉纤维细胞壁微晶区沿纤维轴方向的长度为12.7nm,垂直于纤维轴方向的宽度为6.6nm;沿纤维轴方向的畸变为0.69%,垂直于纤维轴方向的畸变为3.28%。棉纤维在生长过程中其细胞次生壁S₂层的平均微原纤螺旋角随花后生长天数的增加逐渐减小;纤维素微晶粒间的取向度逐渐增加;花后5-14天结晶度缓慢增加;14-17天陡然增加,17天后极缓慢地趋向稳定值。微原纤螺旋角随果枝位变化自下而上略有增加,随果节位变化由里向外略有增加;微晶取向度随果枝位变化自下而上略有减小,随果节位变化由里向外略有减小。研究表明:棉纤维的宏观品质性状和微观取向参数存在着显著的相关性或呈强相关,并建立了它们间的相关式。棉纤维的品质性状差异主要由取向参数的差异决定。

A STUDY ON ULTRASTRUCTURE OF COTTON FIBER

Ultrastructure of cotton fiber was studied by X-ray diffraction technique. The results were: Crystallite size in fiber axis direction and direction of normal to fiber axis are 12.7nm and 6.6nm respectively, Distortion in these direction are 0.69% and 3.28% respectively. The mean microfibrillar spiral angle of S₂ secondary cell walls of cotton fiber during development declined with days of post-anthesis, and orientational degree of cellulose crystallites increased with days of post-anthesis. Crystallinity increased slowly and steeply which did in 5-14 days and 14-17 days respectively. Later it increased very slowly and became stable. The microfibril spiral angle increased in the upper level fruit branches and the outer fruit nodes. The relative orientational index decreased slowly as the ordinal number of fruit branches increased from below, and decreased slowly as the ordinal number of fruit nodes increased from inside. This research demonstrated that qualitative characters were significant correlated with orientational parameters of cotton fiber and relationship between them was developed. Qualitative characters of cotton fiber depended mainly on the orientation parameters.

关键词

棉纤维(Cotton fiber); 超微结构(Ultrastructure); 品质性状(Qualitative characters); 取向参数(Orientalional parameter); X射线衍射(X-ray diffraction)