

Research Progress and Prospects on Naturally-colored Cotton

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Abstract: Naturally-colored cotton results from deposited pigments on the fiber cells at the fiber cell wall thickening stage. Nowadays, only two colors, brown and green, have been used in the manufactory industries. With the development of people's living level, more and more people tend to use non-pollution textiles, while naturally-colored cotton just meet this situation and it may solve the problem of pollution in the textile industries. Although naturally-colored cotton have got great achievements as far as the domestic and abroad research present situation, The innovation of the naturally-colored cotton color does not make breakthrough progress. The research contents is concentrated on improving cotton yield and fiber quality. But being lacking of creating new fiber colors. It is very difficult to develop new color type, but it may be possible to reach the goal by bio-technique or gene engineering. 'Ecology production' would become fashionable.

Gemplasm are the basis of developing new cotton varieties. They can be used in studies on crop breeding, culture and biology. Therefore, keeping the quality and quantity of gene resources will affect the deepness and wideness of crop breeding and biology researches. Production and accumulation of the fiber pigment were related to special expression of enzymatic genes for pigment synthesis in fiber cells. Many researches pointed out that natural fiber color of these cottons were governed by one or two pairs of dominant gene, but some thought they were governed by multi-genes. The fiber color of F_1 fell between those of two parents when color fiber parent crossed with white fiber parent, and there were some segregation, white fiber and color fiber, in F_2 . Overall, the fiber color of the F_2 generation was continuously distributed, the result of χ^2 test supported that the proportion of colored to white fiber type was according to Mendel's law of segregation. Thus, the fiber color was controlled by single dominant gene and expressed incompletely dominant. If we use brown cotton cross with blue one's, no matter anti-intersection, it's generation can only depart two types, brown and green, of fiber color plant. So the normal breeding methods can not

be matched with chemistry dyeing technique in color aspect. The traits of natural brown fiber and green fiber were governed by a non-complete dominant gene. Brown color was dominant to white and green color was dominant to brown. The fact that the fiber character of naturally colored cotton is not so good as that of white cotton. The fiber pigment, not only decreased the cellulose content in fiber, but directly participated in the fiber deposition of cellulose in fiber during the fiber development. And during the fiber development of light grown cotton and green cotton, the converting of cellulose is not abundant, which results in that the fiber pigment of light brown cotton becomes light and that for green cotton is unstable. It's different for brown and green cotton in the formation and deposition place. The fiber pigment of brown cotton is deposited in the cavity, and there is a layer of wax in the outer surface of pigment, so the color deepens when being washed. For green cotton, there are also many colored materials in the inner surface of fiber cell walls besides the fiber cavity, so it's apt to change color when being washed.

The research on naturally colored cotton in China began in 1990s and then the program has been admitted into national high technology plan (863 plan). In China, many breeding methods have been used for obtaining innovations in the fiber pigment of naturally colored cotton, these methods include radial inducement, space inducement, ion-bind inducement, chemical inducement and biotechnology besides traditional breeding methods. The planed area of naturally colored cotton in China has been the second largest in the world.

The development of naturally colored cotton is quite powerful and it will bring us a colorful living time. The tendency of naturally colored cotton must further enhance basic genetic study, accelerate gene innovation and understand the mechanism of color fiber formation. At the same time, we also should increase the color types of fiber, improve quality and release some more advanced varieties by combination of traditional and modern techniques. Then, it will be possible to speed up the quality improvement and color innovation of naturally colored cotton and promote the development of naturally colored cotton production.

Key words: naturally colored cotton; genetics