Discolored cotton: Identification of the causal agents and the factors that govern its severity

Shtienberg D[1] , Nave C[1] , Vintal H2[1], Kritzman G[1], Gat E[2] and Dinoor A[3]
[1] ARO, the Volcani Center, Bet Dagan ISRAEL
[2] The Israel Cotton Production & Marketing Board, Herzlia ISRAEL
[3] Faculty of Agriculture and Food Sciences, Rehovot ISRAEL
Correspondence author eshel@cotton.co.il

ABSTRACT

The syndrome of discolored, gray cotton increases in its prevalence and intensity in recent years. The chemical property of discolored fibers is altered and their quality is 5-10% below the equivalent uninfected yield. A research was initiated to identify the causal agent/s of the syndrome and to determine the environmental conditions that promote its formation. Twenty-one different species of fungi were isolated from cotton samples taken from fields around the country; the most common were two species of Aspergillus, A. fumigatus *and* A. niger. *Their involvement in the syndrome was verified by completion of the Koch postulates. Naturally discolored fibers were inspected under light and scanning electron microscopes. It was found that fungal mycelia grew on the fibers and sometimes even within the fiber cavities. When fibers were placed in humid conditions, the fungi sprouted abundantly, and dark-colored spores covered the fibers externally. The environmental conditions governing the development of* Aspergillus *sp. on the fibers was studied under controlled environment conditions. It was found that the most important factor was the duration of fiber wetness and the number of wetting events, in alternation of wet/dry regime. In the field, the cause for that wetness is dew that is formed at night or rain, that occasionally occur before the cotton fields are picked. We are currently studying the efficacy of various means to cope with the syndrome.*

Introduction

The syndrome of discolored, gray cotton, increases in Israel in its prevalence and intensity in recent years. The characteristics of discolored cotton are: gray discoloration, alkali pH, reduced fiber strength, higher SFC (short fiber content). The chemical property of discolored fibers is altered and their quality is 5-10% below the equivalent uninfected yield. A research was initiated to identify the causal agent/s of the syndrome and to determine the environmental conditions that promote its formation.

Experimental procedure, Results and Discussion

Twenty-one different species of fungi were isolated from cotton samples taken from fields around Israel; the most common were two species of *Aspergillus*, *A. fumigatus* and *A. niger*. Their involvement in the syndrome was verified by completion of the Koch postulates. Naturally discolored fibers were inspected under light and scanning electron microscopes (Figure1). It was found that fungal mycelia grew on the fibers and sometimes even within the fiber cavities. When fibers were placed in humid conditions, the fungi sprouted abundantly, and dark-colored spores covered the fibers externally (Figure 2). The environmental conditions governing the development of *Aspergillus* sp. on the fibers was studied under controlled environment conditions. It was found that the most important factor was the duration of fiber wetness and the number of wetting events, in alternation of wet/dry regime (Figure 3). In the field, the cause for that wetness is dew that is formed at night or rain, that occasionally occur before the cotton fields are picked (Figure 4). Following the above findings, a model was developed that predicts the intensity of discoloration. Means to cope with the discoloration syndrome could be to shorten the exposure duration of open bolls to humidity and possibly to use properly timed fungicides (Figure 5).

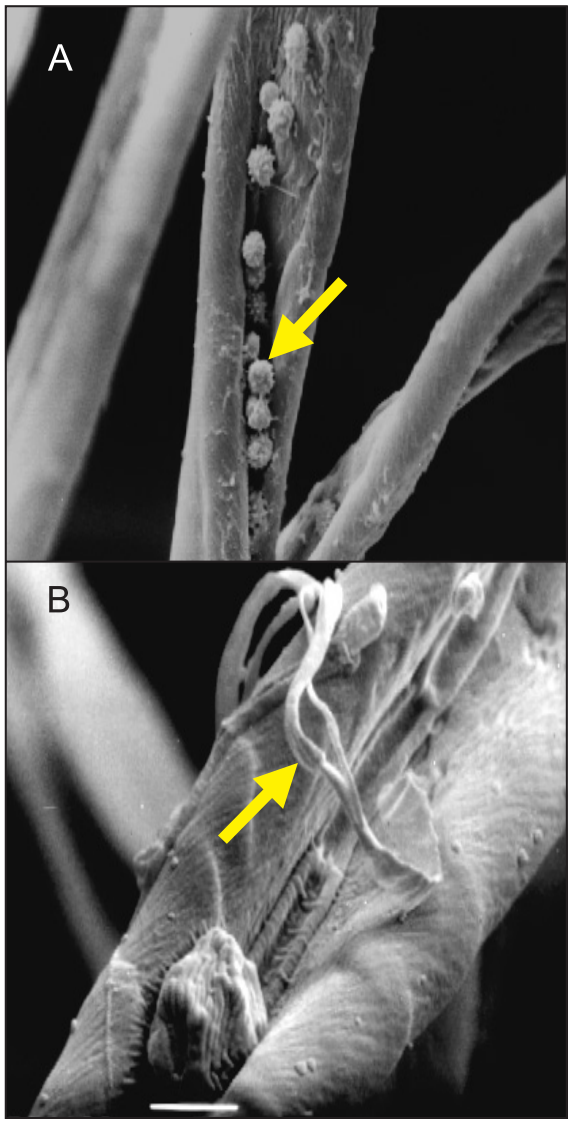

Figure 1. *Discolored fibers and the fungi spores (A) and hyphae (B) under electron microscope.*

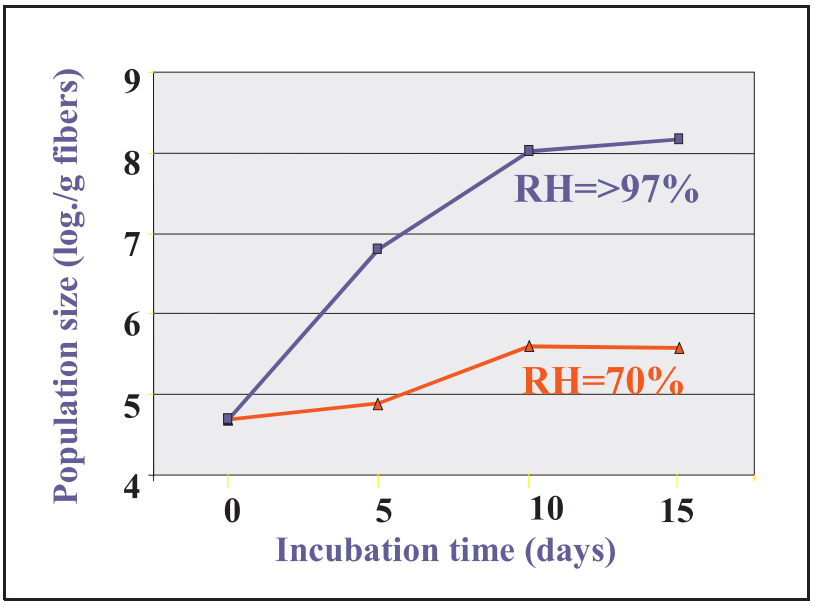

Figure2. *Effects of relative humidity on* Aspergillus *sp. population.*

Figure3.
Effects of dew duration on discoloration intensity.

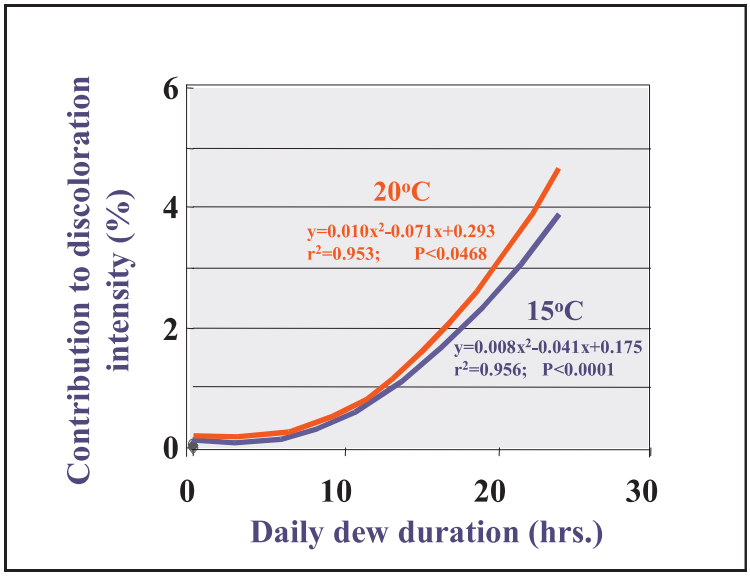

Figure4.
Effects of rain on discoloration intensity.

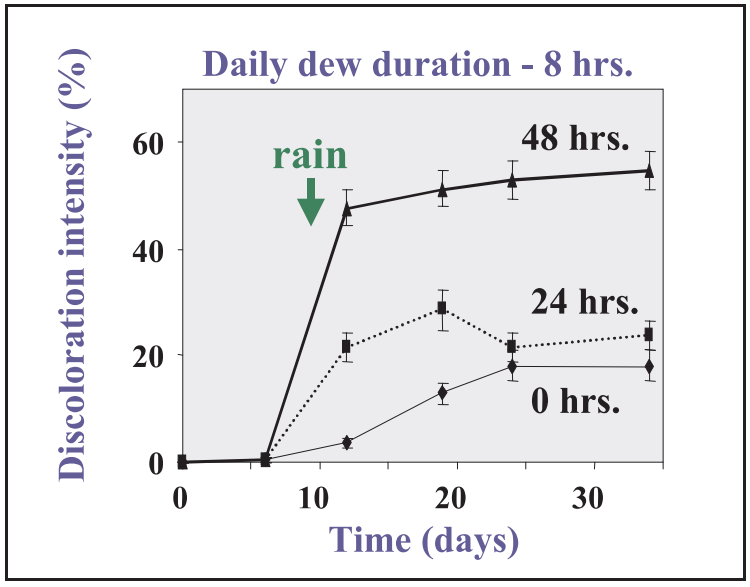

Figure 5.
Intensity of damage predicted by the model developed.