

A method for counting cotton mature fibers per seed

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Abstract

Cotton is the most important textile fiber crop in the world. With expect to improve cotton fiber yield, many studies have tried to increase fiber number per seed. Estimating mature fiber number exactly is becoming more necessary, because only about thirty percentages of differentiated fiber cells could develop to mature fibers. To date, there is no method for counting mature fibers, except some ones for early fiber cells. Here, we describe a fast and easy approach for counting mature fibers per seed. That would help us finding the change of fiber number during cotton improvement.

Introduction

In this method, mature fiber number per cotton seed is determined according to the ratio of fiber weight to number. So, to sample representative fibers (with a normal length) is much important to get a precise result. Taking this method, we have counted the number of mature fibers from a cultivar of upland cotton, which is $12,318 \pm 462$ fibers per seed. Three individual tests by different persons demonstrated that this protocol is easy to operate, and the result is reproducible. Moreover, it is suitable for lab use, because a small amount of cotton seeds is needed.

Reagents

45% acetic acid: dilute acetic acid with deionized water to 45%.

Equipment

scissors

forceps

XS105 DualRange, METTLER

MVX-10, OLYMPUS

Procedure

1. Collect the fibers from twenty random cottonseeds and weigh (W1) by XS105 DualRange (METTLER).
2. Pick out six bundles of fibers (each around 1~2 mg) randomly from the fibers gathered.
3. Tease each fiber bundle by hand and weigh (W2).
4. Separate the ring and cap from the body of a micro-centrifuge tube (0.2 ml) by the

knife.

5. Fix fibers of a weighed bundle by fastening the cap to the ring.
6. Put the bundle in boiling water for 10 min then cool it to room temperature. The treated bundle can be stored in 45% (v/v) acetic acid for a short-term (2~3 days).
7. Dry a bundle with dust-free paper then cut in the middle region of the bundle to get three fiber segments (the cutting length is about 1~2 mm).
8. Separate the snippets of each segments in six drops (each around 20 μ l) of 45% (v/v) acetic acid by tweezers.
9. Observe and photograph the snippets of each drop by a stereo-microscope (MVX-10, OLYMPUS).
10. Count the snippet number in each drop by software Image-Pro® Plus. Then the fiber number of a bundle (N2) can be determined [(sum of the snippet number in total 18 drops from three segments of a bundle)/3].
11. Calculate the mature fibers number per seed (N1) according to the equation: $N1 = (W1/20)/(W2/N2)$.

Timing

The whole procedure can be accomplished within 24 hrs.

Troubleshooting

1. The weighing room must be kept in a constant temperature and humidity. Cotton fibers were allowed to stabilize in the weighing room over 24 hrs before weighing.
2. If six drops are not enough for separating the snippets of each segments well, more drops could be adopted.

Anticipated Results

As shown in Figure 1, snippets, cut from a bundle of fibers with the length about 1~2mm, could be easily identified one by one under microscopical observation.

Figures



Figure 1

Snippets separated in a drop of 45% acetic acid

Spatiotemporal manipulation of auxin biosynthesis in cotton ovule epidermal cells enhances fiber yield and quality

by Mi Zhang, Xuelian Zheng, Shuiqing Song, +12

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