



Designation: **D7047–15 D7047 – 15<sup>ε1</sup>**

## Standard Test Method for Swell Volume of *Plantago Insularis* (Ovata, Psyllium)<sup>1</sup>

This standard is issued under the fixed designation D7047; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

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<sup>ε1</sup> NOTE—Editorially corrected referencing in 11.1 in August 2015.

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### 1. Scope

- 1.1 Quantitative test method to determine the swell volume of *plantago insularis* (Ovata, Psyllium).
- 1.2 The purpose of this test method is to provide a means of evaluating the swell volume, millilitres per gram, of psyllium hydrophilic mucilloid.
- 1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information only.
- 1.4 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice **D6026**.
  - 1.4.1 For purposes of comparing, a measured or calculated value(s) with specified limits, the measured or calculated value(s) shall be rounded to the nearest decimal or significant digits in the specified limits.
  - 1.4.2 The procedures used to specify how data are collected/recorded or calculated, in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analysis methods for engineering design.
- 1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- [D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)
- [D1193 Specification for Reagent Water](#)
- [D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)
- [D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing](#)
- [D6026 Practice for Using Significant Digits in Geotechnical Data](#)
- [E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)
- [E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

### 3. Terminology

#### 3.1 Definitions:

- 3.1.1 For common definitions of technical terms in this standard, refer to Terminology **D653**.

### 4. Summary of Test Method

- 4.1 Psyllium substrate is saturated with simulated intestinal fluid and the swell volume recorded after 24 h.

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<sup>1</sup> This test method is under the jurisdiction of ASTM Committee **D18** on Soil and Rock and is the direct responsibility of Subcommittee **D18.25** on Erosion and Sediment Control Technology.

Current edition approved June 1, 2015. Published July 2015. Originally approved in 2004. Last previous edition approved in 2012 as D7047–12. DOI: 10.1520/D7047-15.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

## 5. Significance and Use

- 5.1 The meaning of the test is related to the manufacturing and end use of the material, to determine characteristics of products.
- 5.2 The volume of swell reflects the amount of hydrophilic mucilloid present in psyllium.
- 5.3 A manufacturer of raw psyllium will base the grade of psyllium produced on multiple properties of which swell volume is one.
- 5.4 The higher the grade of psyllium the higher the swell volume, thus a greater percent of mucilloid present. For the erosion control industry, the higher the swell volume of the psyllium the greater it's bonding strength and relative performance.
- 5.5 Erosion control contractors and those writing erosion control specifications will use this test method to evaluate the grade of psyllium being used as a hydraulically applied erosion control product. The swell volume will help determine the application rate of psyllium needed to meet the erosion control performance criteria.

## 6. Apparatus

- 6.1 *Electronic Balance*, as defined in Guide [D4753](#), with a minimum capacity of 100 g and minimum readability of 0.001 g.
- 6.2 *Graduated 250 mL Cylinder*, with stopper.
- 6.3 *1000 mL Flask*.
- 6.4 *60 Minute Timer*, graduated in one minute intervals.
- 6.5 *pH Meter*, calibrated to manufacturer's specifications.

## 7. Reagents

- 7.1 Reagent-grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available.<sup>3</sup> Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.
- 7.2 Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification [D1193](#), Type IV.
- 7.3 Monobasic potassium phosphate ( $\text{KH}_2\text{PO}_4$ ).
- 7.4 Sodium hydroxide (NaOH).

## 8. Sampling

- 8.1 For a commercially available pre-blended and quality controlled product, separate 30 g of psyllium sample from an undamaged bag, one sample per blended lot.
- 8.2 For unblended commercially prepackaged material, separate a 30 g sample from an undamaged bag by taking one third from the top of the bag, one third from the middle of the bag, and one third from the bottom of the bag

## 9. Procedure

- 9.1 *Preparation of Simulated Intestinal Fluid TS (Test Solution):*
  - 9.1.1 Add 900 mL of reagent water to a 1000-mL graduated flask.
  - 9.1.2 Add 6.8 g of monobasic potassium phosphate.
  - 9.1.3 Add 0.896 g of sodium hydroxide.
  - 9.1.4 Adjust the pH to  $7.5 \pm 0.1$  with a 0.5 M premixed sodium hydroxide solution.
  - 9.1.5 Adjust the volume with reagent water.
- 9.2 *Swell Volume:*
  - 9.2.1 Transfer 125 mL of simulated intestinal fluid TS to a 250-mL graduated cylinder.
  - 9.2.2 Add 1.75 g of psyllium substrate, stopper and shake until a uniform suspension is formed. Measure and record the amount of psyllium substrate added to the nearest 0.01 g.
  - 9.2.3 Dilute the fluid to 250-mL with simulated intestinal fluid.
  - 9.2.4 Set the timer for 30 minutes, stopper and shake the graduated cylinder for 1 minute every 30 minutes for 8 hours.
  - 9.2.5 Allow the gel to settle for 16 additional hours (24 hours total) at room temperature.
  - 9.2.6 Measure and record the volume of gel to the nearest 1 mL.

## 10. Calculations

- 10.1 Calculate the swell volume as follows:

$$\text{Swell Volume (mL/g)} = V/G \quad (1)$$