

NEOGEN
REVEAL Q+ FOR FUMONISIN
USING ACCUSCAN III, ACCUSCAN PRO, AND ACCUSCAN GOLD
READERS

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GENERAL INFORMATION

The Reveal Q+ for Fumonisin test method provided by the Neogen Corporation is a single-step lateral flow immunochromatographic assay based on a competitive immunoassay format. The test provides quantitative analysis for the presence of fumonisins using a fumonisin-antibody particle complex coated test strip and the Neogen AccuScan III, AccuScan Pro, and AccuScan Gold readers.

The instructions presented in this document cover only the procedure for performing the analytical test for official inspections. For questions regarding this procedure, contact Dr. Ajit Ghosh of the Technology and Science Division by phone at 816-891-0417 or email at Ajit.K.Ghosh@usda.gov.

Refer to the current policies and/or instructions issued by the Policies, Procedures, and Market Analysis Branch (PPMAB) of the Field Management Division for information on use of this test kit in official inspections including sampling, general sample preparation (e.g., grinding and dividing), reporting and certification of test results, laboratory safety, and hazardous waste management. For questions regarding these policies and/or instructions, contact Patrick McCluskey of PPMAB by phone at 816-659-8403 or email at Patrick.J.McCluskey@usda.gov.

Approved Test Kit Information

Test Kit Vendor:	<i>Neogen Corporation 800/234-5333</i>
Test Kit Name:	Reveal Q+ for Fumonisin
Product Number:	8885
Effective Date of Instructions:	09/24/2015
Instructions Revision Number	1
Conformance Range:	0.5 – 5 ppm
Number of Analyses to Cover Conformance Range:	1
Type of Service:	Quantitative
Supplemental Analysis:	Yes
Approved Commodities:	Corn, corn gluten meal, corn grits, dried distillers grains with solubles (DDGS), brewer's rice, rough rice, and wheat
Extraction method:	Shake vigorously 50 gram sample with 250 mL of 65% Ethanol / 35% distilled or deionized water (v/v) for 3 minutes.
Test Format:	Lateral Flow Strip
Detection Method:	AccuScan III, AccuScan Pro, and AccuScan Gold readers

PREPARATION OF TESTING MATERIALS

AccuScan III Reader Set-up:

- (1) The AccuScan III reader must have software version 4.21 or newer to analyze the Reveal Q+ tests. Contact Neogen for more information.
 - a. Launch the AccuScan III program on the reader.
 - b. Select the Mycotoxin Q+ category and Q+ Fumonisin test.
 - c. Enter a sample ID (optional).
 - d. Enter the test kit lot number and A, B, C and D values from the test kit box or select from the history for previously entered lot number details.

Note: Technicians must verify/update test kit lot number in the AccuScan III reader program matches the lot number of the test strips in use before testing.

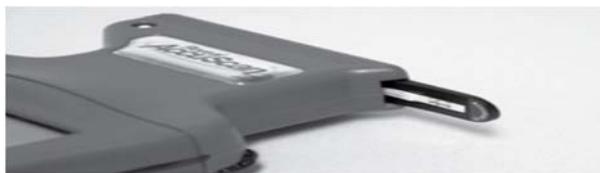
- (2) Reading Test Results with the AccuScan III Reader.

Test strips should be read within 1 minute after completion of the 6 minute incubation period. Refer to Reveal AccuScan III manual for detailed set-up and selection information.

- a. Fully insert the Reveal Q+ test strip into the black cartridge adapter with the sample end first and results facing out.



- b. Insert the cartridge with test strip upside-down into the reader (the test lines will face downward into the reader).



- c. The reader's green light will glow when a cartridge is inserted, and will automatically begin analyzing the cartridge.
- d. The AccuScan III reader will analyze the test strip. Test results will be displayed and stored in the reader.

Note: Refer to the AccuScan III manual for more detailed instructions.

AccuScan Pro Reader Set-up:

The system provides an easy method to objectively read, store, and analyze results from Neogen's line of lateral flow strips.

Note: Please keep and store all packaging materials included in the kit for future storage.



- (1) Set-up: Press the Home icon at any time to return to the main screen.
- a. Plug the outlet of the cord into the power source. Plug the small end of the power cord into the reader.
 - b. This will turn the reader on. To turn the reader off, unplug the reader.

Note: To place in the power down mode, press the small power icon in the lower right corner of the Home screen. The screen will turn white and the reader may then be unplugged.

- c. Plug the USB key into the USB port on the side of the reader.



USB, Ethernet, and power cord ports



Start up screen



- (2) Settings:

Press the designated icon to set time, date, volume, remote connection, language setting, and allows the user to review current information.



- (3) QR Codes: 

The reader is capable of reading information from predefined QR codes. Disposable QR codes containing lot specific information are included in each Reveal Q+ kit.



- a. Whenever a new lot is obtained, and before you run a test, you must verify the QR codes. Simply place the QR code card into the QR code cartridge. From the **Home screen**, select the QR code icon and place the QR code cartridge containing the card in the reader. The specific information automatically will be downloaded into the reader.
- b. The specific QR code cartridges are entered into the reader to identify unique users with a five digit user ID code.

Note: Technicians must update or verify reader information (lot number of test strips in use) before official testing. If needed refer to the AccuScan Pro manual for more detailed instructions.

(4) Run test protocol: 

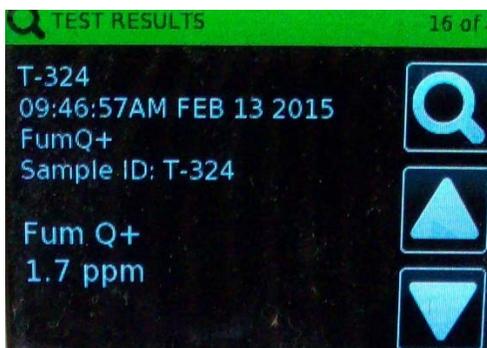
- a. Touch the **Run test** icon, which looks like a test strip, on the **Home screen**.
- b. The test category will display in the first box and the test type will display in the second box. The reader will default to the last test analyzed.
- c. Select the appropriate test category by touching the desired option.
- d. Touch the green check mark to confirm the selection.
- e. Touch the **Test type** icon. Select the desired test by touching the name of the test (e.g., Q+ Fumonisin). To scroll through the test options, use the white up and down arrows. Touch the green check mark to confirm the selection.
- f. Insert the test strip to begin interpreting the test or enter the sample ID by touching the **Sample ID** button. **NOTE:** Strips may be tested without a sample ID. To do this, insert the test strip cartridge containing the test strip into the reader square end first. The reader automatically will begin analyzing the strip.
- g. If entering a sample ID, type the ID in and press the green check mark to continue.

- h. Insert the test strip into the appropriate strip cartridge. Insert the cartridge containing the strip into the slot on the lower left portion of the reader. The reader automatically will begin analyzing the strip.



(5) Test Results:

- a. For a quantitative test, a numerical value will be displayed.
- b. Touch the screen to view additional test information such as test line and control line ratios.



- c. To print, select the **Print** icon. A report will automatically be sent to the attached printer.
- d. To begin/run a new test, select the “**New test**” icon. This will return the user to the test setup screen.

Reader Notes and Cautions:

- Ensure device is fully inserted into cartridge.
- Removing the cartridge prior to completion can result in invalid readings.
- Reading should be made between 6 and 7 minutes. Reading results after 7 minutes may be inaccurate due to over development of the device.

AccuScan Gold Reader Set-up:



- (1) Enter the lot-specific QR code by selecting Scan QR code from the main screen.
- (2) Place the QR code into the white cartridge adapter labeled Cal/QR and insert the cartridge into the reader.



- (3) The valid code will be scanned by the reader and provide information on the lot number and expiry date. Verify this information is correct and then add the lot ID to the reader by pressing Add Lot ID.
- (4) Return to the home screen and select the test strip icon.
- (5) Touch the mycotoxin category.
- (6) Select the Q+ for Fumonisin test type.

Preparation of 1N Sodium Hydroxide (NaOH) Solution:

Note: One can buy premade 1N NaOH from any commercial supplier (e.g., Sigma Aldrich catalog# 72082) or may prepare from solid sodium hydroxide pellets (Sigma Aldrich Catalog# S8045) as described below.

- (1) Add slowly 4 grams of NaOH into 100 mL distilled or deionized water with stirring.
- (2) This solution should be used to adjust the pH of any sample extract that shows pH below 7.0
- (3) Label the container stating the name, date of preparation and initials of technician that prepared the solution.
- (4) Store this solution at room temperature in a tightly closed container under fume hood.

CAUTION! NaOH is corrosive. Addition of solid NaOH pellets into water is an exothermic reaction (produces heat). Stir constantly and add the NaOH slowly.

Preparation of 1N Hydrochloric (HCl) Acid Solution:

Note: One can buy premade 1N HCl from any commercial supplier (e.g., Sigma Aldrich catalog #38283) or prepared from concentrated HCl (Sigma Aldrich catalog #320331) as described below.

- (1) Add slowly 8.2 mL of 12.1N HCl (concentrated Hydrochloric acid) into 91.8 mL distilled or deionized water with stirring.
- (2) This solution should be used to adjust the pH of any sample extract that shows pH above 8.0
- (3) Label the container stating the name, date of preparation and initials of technician that prepared the solution.
- (4) Store this solution at room temperature in a tightly closed container under fume hood.

CAUTION! HCL is corrosive. Addition of concentrated acid into water is an exothermic reaction (produces heat). Stir constantly and add the HCl slowly.

SAMPLE PREPARATION AND EXTRACTION PROCEDURES

(1) Sample Preparation

The sample to be tested should be collected according to accepted sampling technique.

- a. Obtain a representative sample.
- b. Grind the sample so that at least 95% of the ground material passes through a 20 mesh sieve, about the particle size of fine instant coffee.

(2) Preparation of Extraction Solvent: Ethanol/Water (65/35, v/v):

- a. Using a 1000 mL graduated cylinder, measure 650 mL of ethanol and carefully transfer into a clean 1000 mL bottle.

- b. Using a 500 mL graduated cylinder, measure 350 mL of distilled or deionized water and add into the bottle containing ethanol. Shake until completely mixed.
 - c. Label the container stating the mixture contained, date of preparation, and initial of the analyst who prepared the solvent.
 - d. Store the solvent in a tightly closed container at room temperature until needed.
- (3) **Extraction Procedures for:** Corn, corn grits, rough rice, brewer's rice, and wheat
- a. Transfer 50 g (\pm 0.2) of ground sample into a whirl pak bag.
 - b. Add 250 mL of extraction solvent, and securely closed the bag.
 - c. Shake vigorously by mechanical shaker (250 rpm) or by hand with similar shaking action for 3 minutes.
 - d. Allow the sample to settle for 1-2 minutes. Then filter 3 – 5 mL of the extract using a filter syringe (Neogen item #9420) into a clean sample collection tube and labeled with the sample identification.
 - e. This is the filtered extract and ready to be used for sample analysis.
- (4) **Extraction Procedures for:** DDGS and Corn Gluten Meal
- a. Transfer 50 g (\pm 0.2) of ground sample into a whirl pak bag.
 - b. Add 250 mL of extraction solvent, and securely closed the bag.
 - c. Shake vigorously by mechanical shaker (250 rpm) or by hand with similar shaking action for 3 minutes.
 - d. Allow the sample to settle for 1-2 minutes. Then filter 3 – 5 mL of the extract using a filter syringe (Neogen item #9420) into a clean sample collection tube and labeled with the sample identification.
 - e. Check the pH of the filtered extract using pH paper (Neogen item #9478) or equivalent. A pH meter may also be used in place of pH paper if available.
- If the pH is not between 7.0 and 8.0, and if it is below 7.0, it needs to be adjusted.
- i. Using a disposable polyethylene transfer pipette, add one drop of 1N NaOH (sodium hydroxide) to the sample extract, vortex to mix, and check the pH.

- ii. If pH is still below 7.0, add another drop of 1N NaOH, mix, and check pH again. Continue this process until the pH falls between 7.0 and 8.0, and then proceed to step f.
- f. This is the filtered extract and ready to be used for sample analysis.

TEST PROCEDURES

a. Analysis Procedure.

- (1) Place the appropriate number of red sample dilution cups and clear sample cups for each test sample in the sample cup rack. Label cups if necessary.
- (2) Using a single-channel pipettor with a new pipette tip, add 200 microliters (μL) of sample diluent to each red sample dilution cup.
- (3) Using a new pipette tip, add 100 μL of sample extract into each red dilution cup containing 200 μL sample diluents. Mix by swirling with the pipette tip and then by pipetting up and down 5 times.
- (4) Transfer 100 μL of diluted sample extract into a new clear sample cup.
- (5) Place a new Reveal Q+ for Fumonisin test strip with the sample end down into the sample cup. Start timer and incubate for 6 minutes.
- (6) At the end of the 6 minute incubation/development period, remove the test strip from the sample cup. Read the test strip within one minute using only Neogen's Reveal AccuScan III, AccuScan Pro, or AccuScan Gold Reader.

b. Reading the Results

- (1) The strips must be immediately read using Neogen's AccuScan III, AccuScan Pro, or AccuScan Gold Reader to analyze test strip. Test results will be displayed and stored in the reader.
- (2) Reading should be made between 6 and 7 minutes. Reading results after 7 minutes may be inaccurate due to over development of the device and should not be reported.
- (3) Fully inserted the Reveal Q+ test strip into the reader specific black cartridge adapter with the sample end first and results facing out.
- (4) Insert the cartridge with test strip side up into the AccuScan and test results will be displayed in ppm and stored in the reader.

SUPPLEMENTAL ANALYSIS

Supplemental analysis is a procedure followed when a result is observed above the upper limit of the concentration range used in GIPSA's test kit performance evaluation. The range for performance evaluation of quantitative Fumonisin test kits is 0.5 – 5 ppm. Therefore, supplemental analysis would be performed for a result above 5 ppm. In supplemental analysis, the filtered extract is diluted so the resulting concentration is between the lower and upper limits of the test kits evaluation range, and a correction for dilution is applied to derive the final result.

Supplemental analysis is performed only at the request of the applicant.

a. Dilution

- (1) Dilute the sample extract that tested above 5 ppm in 65% ethanol. For example, a 1 to 2 dilution can be done by using a separate tube - combine 1 mL of the sample extract with 1 mL of 65% ethanol for a dilution factor of 2.
- (2) Mix or vortex well.
- (3) Proceed to test the diluted sample following the test procedure.

b. Test Procedure

- (1) Follow the Test Procedure above.

c. Interpreting Results

- (1) Read test results and multiply all results by 2 to calculate the actual ppm for a 1 to 2 dilution.

Example: Neogen's AccuScan Reader results:	4.0 ppm
Times dilution factor:	<u>x2</u>
TOTAL:	8.0 ppm

A final result less than 3.5 ppm is indicative of a problem, and troubleshooting is needed. Verify the procedure is being followed properly. Perform the procedure for the sample extract (non-supplemental analysis) and only perform the supplemental analysis again if the value is greater than 5 ppm.

REPORTING AND CERTIFYING TEST RESULTS

Refer to the current instructions issued by the Policies, Procedures, and Market Analysis Branch of the Field Management Division for reporting and certification of test results. For questions regarding these instructions, contact Patrick McCluskey (816-659-8403) or Patrick.J.McCluskey@usda.gov.

STORAGE CONDITIONS AND PRECAUTIONS

a. Storage Conditions

Store the kit components at room temperature (18-30°C, 64-86°F) to ensure full shelf life. Test strips should remain capped in their original tubes until used to ensure optimal performance.

b. Precautions

- (1) Do not use test kit components beyond the expiration date.
- (2) Test strip development times, other than those specified in Test Procedures section, may give inaccurate results.
- (3) Treat all used liquids, including sample extract, and labware as if contaminated with Fumonisin, gloves and other protective apparel should be worn at all times.
- (4) To avoid cross-contamination, use clean glassware for each sample and thoroughly wash all glassware between samples.
- (5) Ensure the device, lot number and curve details match the lot ID number selected on the reader. Failure to update the lot-specific QR code within the AccuScan reader will cause inaccurate results.

EQUIPMENT AND SUPPLIES

a. Materials provided in test kits.

- (1) 25 Reveal Q+ for Fumonisin test strips, 25 red sample dilution cups, 25 clear sample cups.
- (2) 1 Bottle of sample diluent.

b. Materials required but not provided.

- (1) Timer. (Neogen item #9426), Reveal Sample rack (Neogen item #9475)
- (2) 100 µL pipettor (or equivalent) with pipette tips, Sample collection cups with lids. (Neogen item #9428)
- (3) Reveal AccuScan III Reader (Neogen item #9590), Reveal AccuScan Pro Reader (Neogen item #9565), Reveal AccuScan Gold Reader (Neogen item #9595)
- (4) 65% Ethanol, reagent grade or better (Neogen item #8073, #8074)
- (5) Dispensing pump or graduated cylinder. (Neogen item #9448, #9447)
- (6) Disposable polyethylene transfer pipettes, Filter syringe (Neogen item #9420)

- (7) Sample grinder, Scale capable of weighing 5 – 50 grams, Bottle, 1 Liter. (Neogen item #9472)
- (8) pH paper (Neogen item #9478)
- (9) Sodium Hydroxide pellets (NaOH) Sigma Aldrich Catalog#S8045

REVISION HISTORY

Revision 0 (07/27/2015)

Revision 1 (09/24/2015)

- Corn gluten meal, corn grits, dried distillers grains with solubles (DDGS), brewer's rice, rough rice, and wheat were approved as additional commodities. Test procedure for these additional commodities are incorporated in this revision.