

# Macroanalytical Procedures Manual (MPM)

## MPM: V-8. Spices, Condiments, Flavors, and Crude Drugs

### C. Supplemental Method for Nutmegs

Version 2 — March 2026

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## C. Supplemental Method for Nutmegs

### (1) Scope

This method supplements [Section 8.A.](#), by describing procedures specific to whole nutmegs, *Myristica fragrans* Houttuyn. Nutmeg is the seed contained inside a drupe found on a tropical, evergreen tree. The nutmeg is separated from the drupe by an aril that is used to make the secondary spice called mace (Katzer, 2004). Mace is to be examined per [Section 8.A.](#)

### (2) Applicable Documents

- [CPG Sec. 525.600 Whole and Ground Nutmeg - Adulteration with Insect Filth; Mold; Rodent Filth](#)

### (3) Defects

Nutmeg can come under attack by field and storage pest insects. One beetle species which can do extensive post-harvest damage to nutmeg is the coffee bean weevil, *Araecerus fasciculatus* (De Geer) (Rachmanto et al., 2018). Other defects are similar to what has been addressed already in [Section 8.A.](#) See also Figures V-8-C-1 and V-8-C-2 for examples of defects.

### (4) Procedure: Determination of Contamination in Nutmegs Caused by Arthropods, Animal Excreta, and Extraneous Material

**a. Sample Preparation** --The representative sample size consists of six, 500 g subsamples. Examine entire contents of each container.

**b. Visual Examination**-- Examine the product in small amounts with good light and against a white paper or other suitable contrasting background.

- Examine a small portion of the product at a time, by placing a portion in a pile on white paper. Using a spatula or similar tool, move a small amount of product in a thin layer across the paper.
- If possible, use a moving belt or other mechanical device, so that all the material can be seen easily.
- Sifting may facilitate separation and concentration of certain types of objectionable matter. If sifting is performed, size of screens used, and method of use should be stated in the report of results.

Examine material visible to the naked eye up to 10x assisted magnification. After the initial examination, higher magnification may be used to confirm findings as necessary.

If the magnification exceeds 10x in the initial analysis, then it should be stated in the report of the results. Examine for rodent/bird excreta, manure, arthropods, and arthropod debris, mold clumps, miscellaneous objectionable matter, and other evidence of contamination. Note: if sample was received in plastic bags, filth elements may adhere to the bagging through static electricity. Examine the bagging for any adhering filth elements.

**c. Classification of Contaminants** – See [Section 8.A\(4\)c](#).

**d. Report** -- Tabulate results adding additional categories as necessary. See [Table V-8-A-2](#).

### **(5) Procedure: Determination of Arthropod-Damaged, Moldy, and Otherwise Reject Nutmegs**

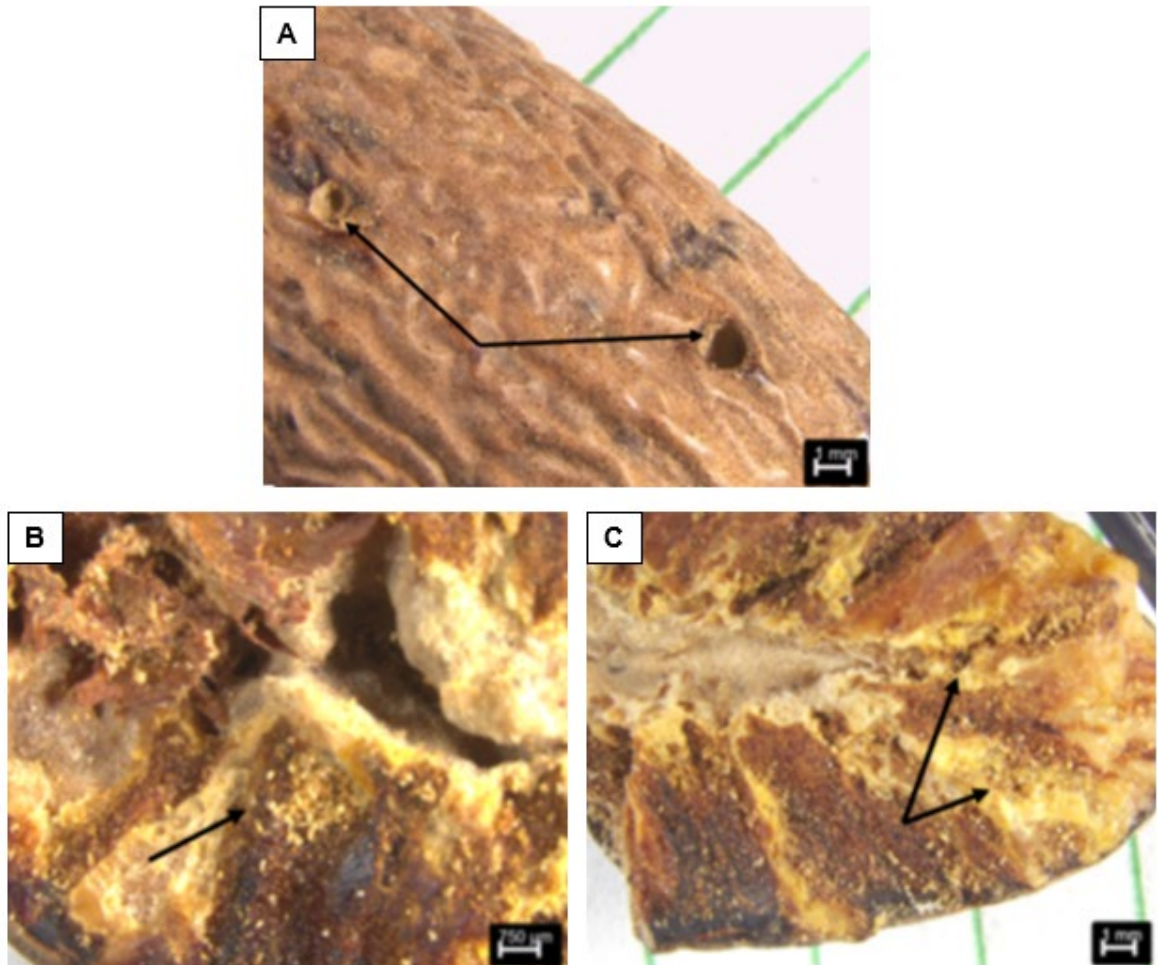
**a. Sample Preparation** -- Examine 100 nutmegs from each of six subsamples. Cut each nutmeg in half lengthwise with a sharp knife, pruning shears, or similar sharp instrument. Using a cracking board is helpful in counting out the 100 nutmegs.

**b. Visual Examination** – Examine the outer surfaces and cut surfaces of each nutmeg for presence of arthropods or signs of arthropod damage (for example, see Figure V-8-C-1), presence of mold (for example, see Figure V-8-C-2), or other evidence of defilement. Examine each analytical unit for reject material visible to the naked eye up to 10x assisted magnification. If the magnification exceeds 10x for the initial examination, this should be stated in the report of the results. Higher magnification may be used for confirmation of findings after the initial examination.

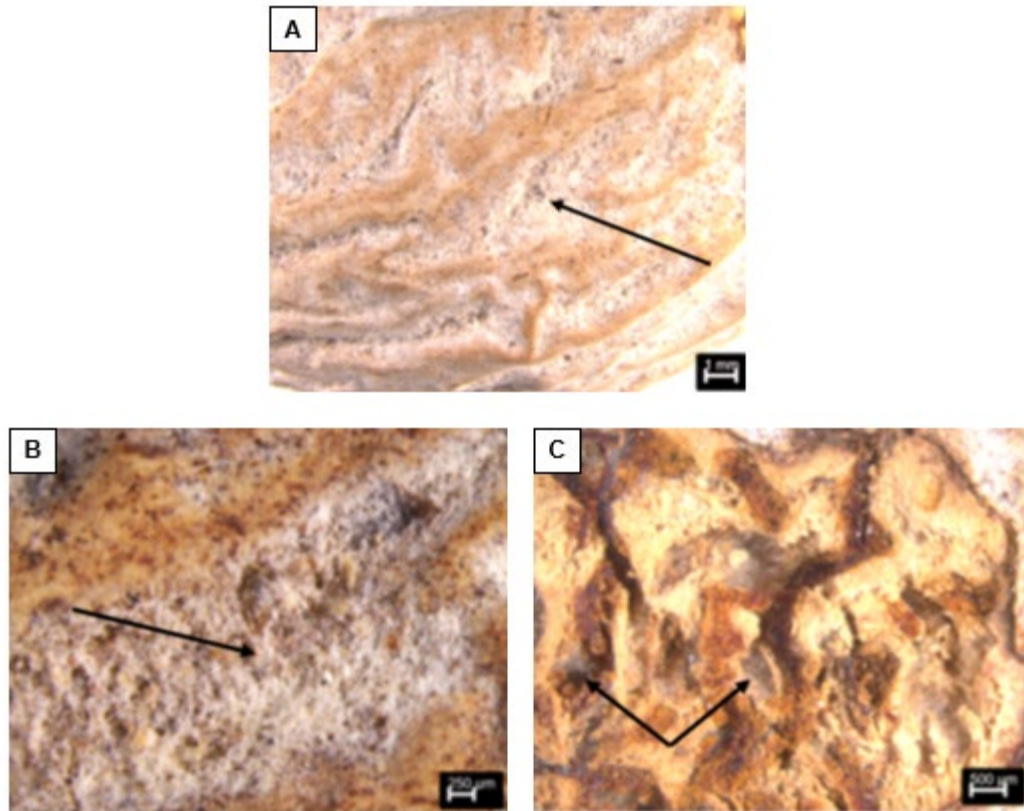
**c. Classification of Reject Material** – See [Section 8.A\(5\)c](#). Report findings by count and percentage.

**d. Report** - Tabulate results. See [Table V-8-A-3](#).

## Figures



**FigureV-8-C-1.** Nutmeg, *Myristica fragrans* Houttuyn with insect damage. **A.** Insect bore holes indicated by arrows. (scale bar: 1mm). **B.** Insect excreta pellets. (scale bar: 750 µm). **C.** Insect feeding damage indicated by arrows. (scale bar: 1mm). (Source: Photos courtesy of H. Loechelt-Yoshioka, FDA).



**FigureV-8-C-2.** Nutmeg with mold. **A.** External white mold indicated by the arrow. (scale bar: 1mm). **B.** Close-up of external white mold with arrow pointing to mold hyphae. (scale bar: 250  $\mu$ m). **C.** Internal mold indicated by arrows. (scale bar: 500  $\mu$ m). (Source: Photos courtesy of H. Loechelt-Yoshioka, FDA).

## Acknowledgements

The editors are grateful for the following USFDA staff members for their input and review of this document: Roger Burks, Jr., Heather Hawk, James Madenjian, Amy Miller, and Monica Pava-Ripoll.

## References

Katzer, G. (2004). Gernot Katzer's Spice Pages: Nutmeg and Mace *Myristica fragrans* Houttuyn.

Rachmanto, D., Wagiman, F. X., Indarti, S. (2018). Optimalization of Temperature to Control *Araecerus fasciculatus* de Geer (Coleoptera: Anthribidae) on Nutmeg. *Journal Perlindungan Tanaman Indonesia*, 22 (1):33-42.

## Additional Information

Informational articles not cited in the above section, but still useful:

American Spice Trade Assn. Inc., *Cleanliness Specifications for Unprocessed Spices, Seeds and Herbs*, ASTA, 580 Sylvan Ave., Englewood Cliffs, NJ 07632, Jan. 1983.

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Dahlan, S. A., Ahmad, U., Subrata, I. D. M. (2018). Visual Method for Detecting Contaminant on Dried Nutmeg Using Fluorescence Imaging. *IOP Conference Series: Earth and Environmental Science*, 147: 1-6.

Fendiyanto, M. H., Satrio, R. D., Pratami, M. P., Nikmah, I. A. (2021). Short Communication: Identification of Spoilage Fungi in *Myristica fragrans* Using DG18 and CYA Media. *Asian Journal of Tropical Biotechnology*, 18(2):51-54.

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## Revision History

Version No.	Purpose of change	Date
V0	New process	1984
V1	Electronic Version	1998
V2	Added defect images and references, Acknowledgments	2026