

TERMS AND DEFINITIONS COMMITTEE  
SUBMISSION REQUEST FORM

Submission Date: 12/19/2017

CONTACT INFORMATION

Name: Gary R. Orr, PhD

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Category:    New Fertilizer Material     New Term    Soil Amendment    Beneficial Substance

Submission's Proposed Definition:

**Maleic – Itaconic Copolymer, Sodium Salt – A substance composed of a partial sodium salt of maleic – itaconic copolymer that can be applied to granular phosphate fertilizers.**

AOAC or Equivalent Method(s) of Analysis (if applicable):

**See attached summary. Methods listed there are included in this application by reference.**

Submitted Research: (Minimum of 3 required)

**See attached summary. Research on efficacy listed there is included in this application by reference.**

Additional Research Citations:

**See attached summary. Research on mode of action listed there is included in this application by reference.**

Can this material be posted to the Secure Site of the AAPFCO Website? (For control officials only.)

Can this material be posted to the AAPFCO Website for everyone to see?

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Category:    New Fertilizer Material     New Term    Soil Amendment    Beneficial Substance

Submission's Proposed Definition:

**Maleic – Itaconic Copolymer, Ammonium Salt – A substance composed of a partial ammonium salt of maleic – itaconic copolymer that can be mixed with liquid phosphate fertilizers.**

AOAC or Equivalent Method(s) of Analysis (if applicable):

**See attached summary. Methods listed there are included in this application by reference.**

Submitted Research: (Minimum of 3 required)

**See attached summary. Research on efficacy listed there is included in this application by reference.**

Additional Research Citations:

**See attached summary. Research on mode of action listed there is included in this application by reference.**

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**Bibliography of Documents Submitted<sup>1</sup> in  
Support of AAPFCO Applications for Terms  
for AVAIL**

**Proposed AAPFCO Terms**

- Term 1: Maleic – Itaconic Copolymer, Sodium Salt – A substance composed of a partial sodium salt of maleic – itaconic copolymer that can be applied to granular phosphate fertilizers.
- Term 2: Maleic – Itaconic Copolymer, Ammonium Salt – A substance composed of a partial ammonium salt of maleic – itaconic copolymer that can be mixed with liquid phosphate fertilizers.

**AOAC or Equivalent Methods of Analysis**

1. Enforcement Analytical Methodology for AVAIL and NutriSphere-N Polymeric Fertilizer Enhancement Products – Recipe and Example Chromatography.
2. Validation of “Aqueous gel permeation/size exclusion chromatography (GPC/SEC) analysis procedure for selected AVAIL and Nutrisphere-N products” method following AOAC Guidelines (Revised 12/21/2015) – Validation Data.
3. APHA/AWWA Standard Methods for the Examination of Water and Waste Water Method 4500-NH<sub>3</sub>, available at <https://www.standardmethods.org>.
4. AOAC Official Method 965.09 Nutrients (Minor) in Fertilizers- Atomic Absorption Spectrophotometric Method, available at <https://www.aoac.org>.
5. AOAC Official Method 983.04 Sodium in Fertilizers Atomic Absorption Spectrophotometric Method, available at <https://www.aoac.org>.
6. ASTM Method E203 – 08 Standard Test Method for Water Using Volumetric Karl Fischer Titration, available at <https://www.astm.org>.
7. Trathnigg, Bernd. "Size-exclusion chromatography of polymers." Encyclopedia of analytical chemistry (2000). R.A. Meyers (Ed.) Copyright John Wiley & Sons Ltd.

**Submitted Research**

*Published Efficacy Studies for AVAIL*

8. Gordon, W.B., Murphy, L. and Wiatrak, P. Kansas State University, Department of Agronomy; Murphy Agro; and Clemson University, School of Agricultural, Forest and Environmental Sciences, 2014. “Improving Phosphorus Nutrition of Cotton.” Am. J. Agric. Biol. Sci., 9: 379-383. DOI : 10.3844/ajabssp.2014.379.383.
9. Wiatrak, P. Clemson University, School of Agricultural, Forest and Environmental Sciences, 2013.

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<sup>1</sup> Each listed document is being submitted as part of the two AAPFCO applications for terms for AVAIL, except documents 3-6, which are available on the websites indicated above.

"Influence of Phosphorus Application with AVAIL on Following Soybeans in Southeastern Coastal Plains." *Am. J. Agric. Biol. Sci.*, 8: 287-292. DOI : 10.3844/ajabssp.2013.287.292.

10. Guertal, E.A. and Howe, J.A. Auburn University, Department of Agronomy and Soils, 2012. "Influence of Phosphorus-Solubilizing Compounds on Soil P and P Uptake by Perennial Ryegrass." *Biol. Fertil. Soils*. 49:587–596. DOI : 10.1007/s00374-012-0749-3.
11. Stark, J.C. and Hopkins, B.G. University of Idaho and Brigham Young University, 2012. "Fall and Spring Phosphorous Fertilization of Potato Using a Dicarboxylic Acid Polymer (AVAIL)." *Journal of Plant Nutrition*. 2012 Sep; 2012-0384.

*Published Mode of Action Study for AVAIL*

12. Doydora, S., Hesterberg, D, and Klysubun, W. North Carolina State University, Department of Crop and Soil Sciences, 2017. "Phosphate Solubilization from Poorly Crystalline Iron and Aluminum Hydroxides by AVAIL® Co-Polymer." *Soil Sci. Soc. Am. J.* 81:20–28.

**Additional Research Citations**

*Efficacy Meta-Analyses for AVAIL – Submitted for Publication*

13. Hopkins, B.G., Fernelius, K. and Hansen, N., Eggett, D.L., Brigham Young University, 2018. "Avail Phosphorus Fertilizer Enhancer: Meta-Analysis of 503 Field Evaluations." *Agronomy Journal*, 110:389-398. DOI: 10.2134/agronj 2017.07.0385
14. Jenkins, T.A., Randhawa, P., and Jenkins, V. Centre for Sustainable Agricultural Technologies, 2016. "How well do fertilizer enhancers work?" Accepted for publication by the *Journal of Plant Nutrition*, March 2017.

*Mode of Action Presentations*

15. Chapters 3 and 4 drawn from Pierzynsky, J. Kansas State University, College of Agriculture, Department of Agronomy, 2016. "The Effects of P Fertilizer Addition on P Transformations on High-P Fixing and Grassland Soils" (Doctoral dissertation), available at <http://krex.k-state.edu/dspace/handle/2097/34586>.
16. Tindall, T. A., et al. J.R. Simplot Company; Kansas State University; and Specialty Fertilizer Products, 2013. "Improving Fertilizer Phosphorus Use Efficiency with Fertilizer Applied AVAIL® (Polymers) for Brazil and Idaho Soils" as presented at the International Fertilizer Association Enhanced Efficiency Conference. March 11-13, 2013 Rio de Janeiro, Brazil.
17. Mooso, G., et al. J.R. Simplot Company and Kansas State University, 2013. "Phosphorus Use Efficiency in Crop Production", as presented at the Western Nutrient Management Conference, March 11-12, 2013, Reno Nevada.

Except where otherwise noted, each of these supporting documents is available in the zip file accompanying this submission.