



Amaranth Pro ECT and Amaranth S ECT meet the standards for ecological and organic cosmetics according to ECOCERT (www.ecocert.com).

Amaranth Pro ECT

Hydrolyzed Amaranth Protein Peptide Based on Organic Amaranth

SAP Code#: 138420

Assigned INCI Designation: Hydrolyzed Amaranth Protein

Amaranth S

Natural Foaming Peptide Based on Organic Amaranth

SAP Code#: 138360

Assigned INCI Designation: Sodium Cocoyl Hydrolyzed Amaranth Protein

Background

Amaranth (*Amaranthus caudatus*) is a beautiful, highly nutritious plant with a colorful history used in various cultures in some unique ways. The name amaranth hails from the Greek word for “never-fading flower.” The plant is actually an herb, not a “true” grain and is a relative the garden plant known as Cockscomb, and the common wild plant known as lamb’s-quarters.¹



Typical Amaranth plants are bushy, growing 5 to 7 feet tall, with broad leaves and displaying a bright, showy flower head of small, red or magenta, clover like flowers which constitute the plant’s exquisite, feathery plumes. The seed heads are quite striking as well; resembling corn tassels, but are somewhat fuller. Aside from Amaranth being such an attractive plant it is extremely adaptable to adverse growing conditions, resisting heat and drought and extremely easy to grow.

Due to this robust nature, Amaranth was a staple food in the diets of pre-Colombian Aztecs, who believed it had supernatural powers and, therefore, incorporated it into their religious ceremonies. In Mexico it is popped and mixed with a sugar solution to make a confection called “alegria” (happiness). In India amaranth is known as “rajeera” (the King’s grain) and is used in confections called “laddoos,” which are similar to Mexican “alegria.” Peruvians

Key Product Attributes – Amaranth Pro ECT

- Organically based hydrolyzed amaranth protein
- Film forming
- Moisturizing
- Non-GMO based
- Good compatibility in all cosmetic formulations

Key Product Attributes – Amaranth S

- Organically based secondary surfactant
- Soft, gentle feel with no irritation
- Non-GMO based
- Good compatibility with a broad range of cationic, non-ionic and anionic surfactants
- Excellent co-solubilizing agent for cationic polymers
- Compatibility in wide pH range



use fermented amaranth seed to make “chicha” or beer. In the Cusco area the flowers are used to treat toothaches and fevers and as a food colorant for maize and quinoa. In Nepal, amaranth seeds are eaten as gruel called “sattoo” or milled into flour to make chappatis. In Ecuador, the flowers are boiled then the colored boiling water is added to “aquateinte” rum to create a drink that “purifies the blood.”^{1,2}

Amaranth has been gaining popularity in the U.S. and although it is now grown in Colorado, Illinois, Nebraska, and other states, it is still not a mainstream food. It is found in many natural food stores and the flour is often used in baked goods.

Introduction

Due to consumers’ growing awareness of naturally derived ingredients in finished products, they are constantly seeking out ‘green’ alternatives to standard, synthetic based formulations. **Amaranth Pro ECT** is hydrolyzed amaranth protein, while **Amaranth S** is a natural foaming peptide which functions as a secondary surfactant, ideally suited to meet consumer’s expectations.

Both **Amaranth Pro ECT** and **Amaranth S** are based on an organic source of amaranth grain from Peru, which is high in colloidal peptides and carbohydrates.³ Organic sources of materials are an important healthy choice as they are produced without the use of antibiotics, added growth hormones, or pesticides. According to research published in the Journal of Agricultural and Food Chemistry, organic foods have 50% to 60% higher levels of antioxidants compared to non-organic foods.⁴ Amaranth is free of allergenic gluten and is a good source of vitamins and minerals, offering nine essential amino acids that cannot be synthesized by skin or hair.⁵

Product Information

Comparison of Nine Essential Amino Acid Profiles of Whole Milk and Amaranth

These essential amino acids are required for promoting wound healing, antioxidant properties, lipolysis, water balance, immune stimulation, and skin revitalization.⁶ They collectively act to prevent hair from becoming dry and dull as one ages. In fact, the National Academy of Sciences called amaranth one of the best sources of vegetable protein available, having a better amino acid profile than cow’s milk or soy!⁷

Nine Essential Amino Acids	% w/w per 100g product based	
	Whole Milk	Amaranth
Threonine	0.15	0.56
Valine	0.15	0.69
Methionine	0.08	0.23
Isoleucine	0.16	0.59
Leucine	0.43	0.89
Phenylalanine	0.13	0.55
Lysine	0.32	0.75
Histidine	0.03	0.39
Tryptophan	0.06	0.18

This product information corresponds to our knowledge on the subject at the date of publication and we assume no obligation to update it. It is offered without warranty, and is intended for use by persons who are experienced and knowledgeable in the field and capable of determining the suitability of ingredients for their specific applications. Because we cannot anticipate all variations in actual end-use conditions, we assume no liability and make no warranty in connection with your use of our products or product information. We do not guarantee the efficacy of active ingredients, delivery systems, functional ingredients, rheology modifiers, natural or botanical products, preservative and protection systems or proteins in any specific application or use. The information we provide is not intended to substitute for testing. You should perform your own tests to determine for yourself the suitability and efficacy of ingredients in your application and conditions of use. The information we provide should not be construed as a license to operate under or a recommendation to infringe any patent or other intellectual property right, and you should ensure that your use does not infringe any such rights. Our products are for industrial use only. WE MAKE NO WARRANTY (INCLUDING AS TO MERCHANTABILITY OR FITNESS FOR PURPOSE) OF ANY KIND, EXPRESS OR IMPLIED, OTHER THAN THAT OUR PRODUCTS CONFORM TO THE APPLICABLE PRODUCT SPECIFICATIONS.

General Manufacturing Process

Amaranth Pro ECT is made by taking the amaranth grain in water and enzymatically hydrolyzing the protein to produce a colloidal solution; further filtration removes the insoluble components resulting in a clear, aqueous solution, high in hydrolyzed amaranth protein.

Amaranth S is prepared by taking the resultant hydrolyzed proteins and reacting them with naturally derived acylated fatty acids from coconuts. The reactive fatty acid group is covalently bonded to the protein chain as a result of this reaction. Alkaline base may be used to neutralize the carboxylic acid group; which produces the soluble foaming polypeptide, **Amaranth S**. **Amaranth S** is now available in an Ecocert-approved version under the trade name, **Amaranth S ECT**.

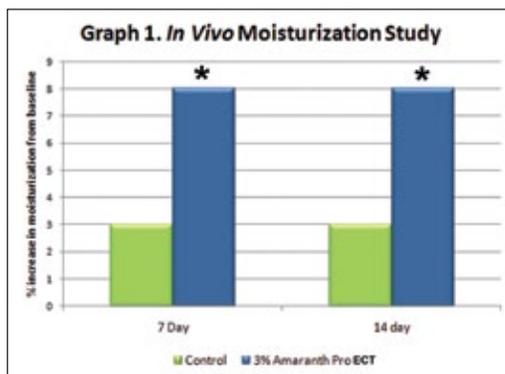
Efficacy

Amaranth Pro ECT

In Vivo Moisturization Study

An *in vivo* study was conducted on 30 female panelists to determine the moisturization efficacy of a 3% **Amaranth Pro** clear gel formulation compared to the control (gel formulation without **Amaranth Pro**). Test sites were defined on the panelists' volar forearms and 0.002ml of the test materials was applied to test sites twice daily. Corneometric readings were taken at baseline, 7 days and 14 days after product application.

As shown in Graph 1, 3% **Amaranth Pro ECT** in a gel formulation enhanced moisturization by 8% compared to the untreated site at both 7 and 14 days.



Amaranth S

Foam Height Study

A study was conducted to determine the foam quantity of the **Amaranth S** foaming peptide versus typical foaming agents used in personal care cleansing products.

Method

A total of 200 grams of the testing materials with similar active levels and water were added into a Waring lab blender and then mixed for 15 seconds at the lowest speed. The foam height of the solution was measured using a ruler. The solution was set aside for five minutes and then the foam height was recorded once more.



Table 1. Foam Height Study Results

Product	Initial Foam Height (cm)	Foam Height After 5 Minutes (cm)
1.5% Active Amaranth S*	16.5	14.0
1.5% Active Decyl Glucoside*	16.5	14.0
1.5% Total Active of Amaranth S*/ Decyl Glucoside* (1:1)	17.1	16.5
1.5% Sodium Lauryl Sulfate*	17.1	15.2
1.5% Sodium Lauryl Ether Sulfate*	15.2	12.7
1.5% Cocamidopropyl Betaine*	15.9	12.7

* % Active Concentration Evaluated

Results of this study are shown in Table 1. At the same active level, the test results indicate that **Amaranth S** provides an excellent foam height and is superior to two synthetic surfactants: Sodium Lauryl Ether Sulfate (SLES) and Cocamidopropyl Betaine (CAPB). **Amaranth S** and Decyl Glucoside (DG) provide comparable foam height to each other. The foam height of the blend of **Amaranth S/DG** is as good as the strong synthetic surfactant, Sodium Lauryl Sulfate (SLS) and is better than **Amaranth S** and DG alone.

For the foam heights after 5 minutes duration, all testing surfactant solutions provide similar foam stability results which were described above but all the foam heights were lower than the initial readings. The blend of Amaranth S/DG offers the best foam height after 5 minute duration among all the testing surfactants, including SLS.

Compatibility with Salt

Typical surfactant systems can be compromised by the presence of salts and salt response can be considered indicative of foaming properties in “hard water” application. A salt response study was conducted to determine the compatibility of **Amaranth S** in water and compared to other surfactant solution. A series of testing surfactant solution was prepared. Using the foam testing method outlined above, foam heights of each solution were measured. Sodium chloride was then added in 0.5% increments up to 1.0%.

Table 2a. Foam Height Study Results - Compatibility with 0.5% Salt

Product	Initial Foam Height (cm)	Foam Height After 5 Minutes (cm)
1.5% Active Amaranth S*	16.5	14.0
1.5% Active DG*	13.3	11.4
1.5% Total Active of Amaranth S*/DG* (1:1)	15.2	13.3
1.5% SLS*	15.2	12.7
1.5% SLES*	13.3	10.2
1.5% CAPB*	15.2	12.7

* % Active Concentration Evaluated



Table 2b. Foam Height Study Results – Compatibility with 1.0% Salt

Product	Initial Foam Height (cm)	Foam Height After 5 Minutes (cm)
1.5% Active Amaranth S*	15.9	13.3
1.5% Active DG*	14.6	12.1
1.5% Total Active of Amaranth S*/DG* (1:1)	15.2	12.7
1.5% SLS*	15.2	12.7
1.5% SLES*	12.7	9.5
1.5% CAPB*	15.2	12.7

* % Active Concentration Evaluated

At the same active level, the results of this study are shown in Tables 2a and 2b and demonstrate all surfactant systems are impacted by the presence of salts with both initial foam heights and the foam heights after 5 minutes mostly drop when the salt content is increased. **Amaranth S** provides not only the best initial foam height but also good foam height after 5 minutes when compared to DG, SLS, SLES, and, CAPB. The blend of **Amaranth S/DG** improves the foam height of DG alone. Both initial foam height and 5 minutes readings of the blend of **Amaranth S/DG** are comparable to SLS.

Compatibility with Sebum – Triglyceride Used as a Sebum Model

The unavoidable amount of fragrance oil in the formula and a thin layer of sebum on the skin surface often suppress foam. In order to determine the effect of **Amaranth S** in the presence of high oil concentrations, triglyceride was used since a typical artificial sebum consists mostly of triglycerides.⁸ An oil response study was conducted to determine the compatibility of the **Amaranth S** with 1% triglyceride in water and compared to other surfactant solution. Using the same foam testing method outlined above, foam heights of each solution were measured.

Table 3. Foam Height Study Results – Compatibility with 1% Triglyceride

Product	Initial cm	After 5 Minutes cm
1.5% Active Amaranth S*	14.6	11.4
1.5% Active DG*	12.7	10.2
1.5% Total Active of Amaranth S*/DG* (1:1)	14.0	10.8
1.5% SLS*	17.1	14.6
1.5% SLES*	14.0	10.8
1.5% CAPB*	12.1	9.5

* % Active Concentration Evaluated



At the same active level, the results of this triglyceride response study are shown in Table 3 and demonstrate that initial foam heights and the foam heights after 5 minutes of all surfactant systems are negatively impacted by the presence of oil, except the initial foam height of SLS. In general, all foam heights after 5 minutes were lower than the initial readings.

Regarding both initial and after 5 minutes foam height readings, **Amaranth S** provides excellent foam heights and is superior to DG, SLES, and CAPB. When compared to the strong synthetic surfactant, SLS is better than **Amaranth S** and the blend of **Amaranth S/DG**. The blend of **Amaranth S/DG** improves the foam heights of DG alone. Such compatibility allows **Amaranth S** to produce a stable lather offering effective foam enhancing properties even in applications for oily skin and hair.

Conclusion

Consumers demand and seek natural ingredients in all applications which creates multiple challenges for cosmetic formulators. Formulators are looking for natural ways to enhance moisturizing and film forming properties, and also to offer more efficient foam boosters in cleansing applications, producing rich lather in the presence of salt and sebum. **Amaranth Pro ECT**, hydrolyzed amaranth protein, is suitable for use in any cosmetic formulation where moisturizing, film forming properties are desired. **Amaranth Pro ECT** offers enhanced substantivity to skin and hair, leaving behind an elegant, conditioned feel after rinsing.

Amaranth S, an organic-based foaming peptide, combines high performance and functionality. It produces stable foam with good aesthetics in hard water which contains a lot of salt and can be used in cleansing applications containing unavoidably high levels of salt. For mild and gentle cleansing application, many surfactants which can generate foam, such as Sodium Lauryl Sulfate, are too harsh for skin and hair causing irritation and dryness. **Amaranth S** is a mild foam booster and is compatible with sebum without losing its foaming properties. **Amaranth S** is non-ionic nature and is a versatile ingredient allowing it to be used in conjunction with cationic ingredients which makes **Amaranth S** particularly suitable for conditioning cleansing gel.⁹

Safety Profile - Amaranth Pro ECT

EpiOcular (Product tested at 100%)	Non-Irritating, Minimal
EpiDerm (Product tested at 100%)	Non-Irritating
RIPT (Product tested at 100%)	Did not demonstrate a potential for eliciting dermal irritation or sensitization

Safety Profile - Amaranth S

Dermal Irritation® Assay	Dermal Non-Irritant
Ocular Irritation® Assay	Minimal Ocular Irritant
Human Repeat Insult Testing – 20%	No identifiable signs or symptoms of irritation or sensitization



Amaranth S - Compatibility with Other Natural Surfactants

Cocamidopropyl Betaine	Almondamidopropyl Betaine
Decyl Glucoside	Avocadoamidopropyl Betaine
Coco-Glucoside	N-cocoyl-L-glutamate

Typical Properties	
Amaranth Pro ECT	
INCI Name	Hydrolyzed Amaranth Protein
SAP Code#	139200
Appearance	Clear amber liquid
Odor	Characteristic, Fruity note
Color (Gardner)	10 Maximum
Non-Volatile Matter (1g - 16hr - 105°C)	8% Minimum
pH (Direct @ 25°C)	4.0 – 6.0
Ash (800°C)	1.5% Maximum
Nitrogen	1.3% Minimum
Microbial Content	500 opg Maximum, No pathogens
Preservative System	1.25 - 1.35% <i>Salix nigra</i> (Willow) Bark Extract 0.4 - 0.6% Benzyl Alcohol
Recommended Use Level	5 - 20%

Typical Properties		
	Amaranth S	Amaranth S ECT
INCI Name	Sodium Cocoyl Hydrolyzed Amaranth Protein	Sodium Cocoyl Hydrolyzed Amaranth Protein
SAP Code#	138360	139210
Appearance	Clear to slightly hazy, pale yellow to amber liquid	Clear to slightly hazy, pale yellow to amber liquid
Odor	Slight, Characteristic	Slight, Characteristic
Color (Gardner)	5 Maximum	5 Maximum
Non-Volatile Matter (1g - 16hr - 105°C)	20.0 - 30.0%	20% Minimum
pH (Direct @ 25°C)	6.5 - 8.0	4.5 - 5.5
Ash (800°C)	2.0% Maximum	2.0% Maximum
Microbial Content	500 opg Maximum, No pathogens	100 opg Maximum, No pathogens
Preservative System	0.9 - 1.1% Phenoxyethanol	4.0 - 6.0% <i>Salix nigra</i> (Willow) Bark Extract 0.9 - 0.95% Benzyl Alcohol 0.50 - 0.65% Potassium Sorbate
Recommended Use Level	5 - 20%	5 - 20%



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