



Tel (714) 572-0444

Fax: (714) 572-0999

January 15,, 2007

Robert L. Pooler  
National Organic Program, AMS / USDA  
STOP 0268 – Room 4008S  
1400 Independence Avenue SW  
Washington, DC 20250-0268

ORIGINAL

Re: Petitions for the Addition of  
Non-Organic Agricultural Substances to the National List  
Pursuant to Section 205.606 of the NOP

Dear Mr. Pooler:

Thank you for your letter, dated December 20, 2006, wherein you returned our original "combined" petition for fifteen natural colorants (dated October 16, 2006) and instructed us to file fifteen "separate" petitions, one for each colorant.

Pursuant to your instructions, please find enclosed with this letter fifteen (15) separate petitions, one for each natural colorant. We enclose an original and one copy of each petition for you to review. We ask the National Organic Standards Board (NOSB) to add onto the National List the following natural colorants:

**Anthocyanins:** (1) chokeberry juice, (2) black currant juice, (3) red cabbage extract, (4) purple carrot extract, (5) elderberry juice, (6) grape juice, (7) grape skin extract, (8) red radish extract; and

**Carotenoids:** (9) annatto seed extract, (10) beta-carotene from carrots, (11) lycopene, (12) paprika, (13) saffron; and

**Betalains:** (14) beet juice; and

**Other:** (15) turmeric.

You may recall that our original petition was organized by the four categories shown above. It may be prudent -- in the interest of time -- for the NOSB to consider the enclosed petitions in these same categories / groups.

5. The source of the substance and a detailed description of its manufacturing or processing procedures: Red cabbages grows as a bulbs of tightly packed leaves indigenous to Asia. The cabbages are collected, washed, and cut into small pieces. The pieces are soaked in water. After 42 – 78 hours, the liquid is mechanically filtered and concentrated, producing a dark, blue-red liquid concentrate composed of the same anthocyanin molecules produced inside the cabbage.

6. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance: No such government reviews of red cabbage extract are known; but anthocyanins (particularly from grapes) have been used since antiquity to color human foods and are Generally Regarded As Safe (GRAS).

7. Information regarding EPA, FDA, and State Regulations: FDA permits the use of red cabbage extract as a color additive exempt from certification. 21 CFR 73.260 Vegetable Juice. Red cabbage extract is also permitted as a natural color additive in foods in the European Union (E163) and throughout Asia.

8. The Chemical Abstract Service (CAS) number: There is no specific CAS Number for red cabbage extract; however, anthocyanins in general have been assigned CAS No. 11029-12-2.

9. The substance's physical properties and chemical mode of action: The anthocyanins extracted from red cabbages are distinct and unique molecules. They are different from carotenoids and betalains (other molecules used as natural colorants). Anthocyanins are sensitive to the pH of their surrounding environment, appearing red in an acidic pH (pH < 4.5.) and blue in an alkaline pH (pH > 6.5). In addition, anthocyanins display strong antioxidant properties which may be beneficial to human health. Beyond these unique properties, anthocyanins do not interact with substances used in organic food production and have no impact on the environment.

Red cabbages have been consumed for centuries and their growth and ultimate consumption has the same impact on the environment as organically grown, biodegradable fruits and vegetables.

10. Safety information about the substance: Please see the attached Material Safety Data Sheet (MSDS). Red cabbages, and the anthocyanins extracted from red cabbages, are GRAS.

11. Research information about the substance: See the attached Bibliography. A leading American researcher on anthocyanins is Professor Ron Wrolstad, Dept. of Food Science, University of Oregon, Corvallis, OR 97331. Dr. Worlstad recently retired, but he can still be reached at the University.

12(G) Justification Statements:

Enhanced Visual Appeal Using Natural Colorants. Food safety dictates that processed foods must be fully cooked to assure low bacterial counts for extended shelf-life and broad geographical distribution. Many food and beverage processors also employ a low pH environment and/or low water activity and/or or low temperature distribution of the finished product (refrigeration or freezing) to further assure minimal bacterial counts. These processing parameters are challenging to colorants residing inside the "core food" (for example, chlorophyll inside florets of broccoli, beta-carotene inside cut carrots, or anthocyanins inside strawberry preserves).

The addition of natural colorants compensates for the "original" colorants destroyed by high temperature / low pH processing. In so doing, the finished organic food or beverage product presents to the consumer the same visual appeal it would have if it were fresh. The addition of natural colorants can also enhance an existing color, making the organic food or beverage even more appealing; or it may extend the shelf-life of an organic food or beverage, making it available to more consumers both over time and geographical distance.

Without the addition of natural colorants, organic food and beverage products might lack the visual appeal and attraction of their direct non-organic competition. Thus, natural colorants help organic processors compete.

In so doing, natural colorants advance the organic philosophy by (literally) displaying to consumers visually appealing organic food and beverage products brightly colored without artificial colors such as FD&C Yellow 5.

Low Usage Levels of Natural Colorants. Because natural colorants are concentrated and very strong, they are used in organic food and beverage products at very low levels, typically less than 1%. The inherent strength of natural colorants sets in motion or "triggers" two distinct events: (1) natural colorants always fall under the 95 / 5 rule where five percent of the ingredients in an organic product may be non-certified; and (2) the volume of natural colorants purchased is very small.

By way of example, a hypothetical organic dairy develops organic certified yogurt. First, new product developers add red cabbage extract at 0.5% of the total formula. They do not actively seek out organic certified red cabbage extract because they know the ingredient easily falls under the 95 / 5 rule. Second, the dairy's new product is successful and within the first year it produces 500 tons of organic certified yogurts. Despite such success, the dairy would purchase only 833 lb of red cabbage extract per month. This low volume of natural colorant sales, combined with inclusion of natural colorants in the "five percent non-certified" portion of the formula, provides little economic incentive to certify natural colorants as organic.

In the future, we anticipate the total amount of organic food and beverage products to increase. We may reach a point in time where a strong economic incentive places natural colorant crops under organic systems of production. It should be noted that no ingredient may remain on the National List for more than five (5) years without review by the National Organic Standards Board (NOSB).

The NOSB must therefore review the status of natural colorants five years hence (roughly 2012) and, at that time, may discover that an adequate supply of natural colorants is available for use in organic foods and beverages.

*International Production of Natural Colorants.* Most natural colorants are derived from International fruit and vegetable crops grown in developing countries; there is little International acreage certified organic. Most international organic acreage is utilized for corn, sugar and grains. Further, organic certification of International acreage remains problematic, plagued by cultural, financial, and language difficulties. Moreover, most fruit and vegetable crops are typically consumed where they are grown. As a result, there is a limited supply of the requisite fruit and vegetable crops needed for the creation of natural colorants.

Thus, natural colorants are not available in the appropriate quantity from International sources to meet the needs of organic processors.

*Domestic Production of Natural Colorants / The Current State of the US Organic Industry.* Certified organic cropland and pasture accounted for about 0.5% of total US farmland in 2005. Only a small percentage of top US field crops – corn (0.2%), soybeans (0.2%), and wheat (0.5%) – were grown under certified organic farming systems. Organic carrots (6% of the US carrot acreage), organic lettuce (4% of US lettuce acreage), and organic apples (3% of US apple acreage) were more commonly grown organic.

Markets for organically grown fruits and vegetables have been developing for decades in the US, and fresh produce is still the top-selling organic category in retail sales. Organic livestock was beginning to catch up with produce in 2005, with 1% of US dairy cows and 0.6% of the layer hens managed under certified organic systems. After decades of strong growth, the US organic marketplace is a bountiful "Farmers' Market" for consumers, but it does not supply the appropriate quantity of natural colorants for organic food processors.

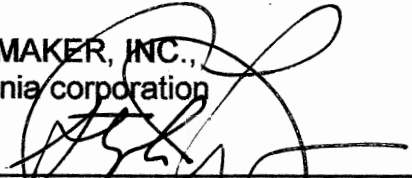
Because there is no current supply of organic certified natural colorants from International sources, and because there is no current supply of organic certified natural colorants from US sources, and because natural colorants at levels below 5% greatly improve the visual appearance of organic foods and beverages, this Petition seeks the addition of natural colorants to the National List.

13. This Petition respectfully seeks the addition of red cabbage extract, a.k.a. "red cabbage," to the National List as a non-organic agricultural product under Section 205.606 of the NOP.

Respectfully Submitted,

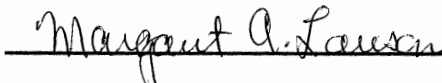
COLORMAKER, INC.,  
a California corporation

By:

  
\_\_\_\_\_  
Stephen J. Lawo  
(Name & Title)

DD WILLIAMSON, INC.  
a Kentucky corporation

By:

  
\_\_\_\_\_  
Margaret A. Lawson  
(Name & Title)

VP Science & Innovation

<p><b>ColorMaker, Inc.</b>  3309 East Miraloma Ave., Suite 105  Anaheim, California 92806  (714) 572-0444  (714) 572-0999 fax</p> <p><i>inquire@colormaker.com</i></p>	<p><b>Hazard rating at a glance</b>  0-least, 1-slight, 2-moderate, 3-high, 4-extreme</p> <p><b>HEALTH</b>                    <u>  0  </u></p> <p><b>FLAMMABILITY</b>           <u>  0  </u></p> <p><b>REACTIVITY</b>                <u>  0  </u></p>
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## MATERIAL SAFETY DATA SHEET

### 1. *Product Identification:*

- 1.1 Product Name: Standard Red Cabbage Extract
- 1.2 Product Number: 2745
- 1.3 Ingredient Statement: Vegetable juice extract
- 1.4 Description of Product: A red liquid designed to color and function in food and beverage products. Specific formulation is withheld as a trade secret pursuant to 21 CFR 20.61. The characterizing principles and/or other components of this color blend are approved and are in compliance with 21 CFR 73. None of the ingredients appear on the list of hazardous items established under California's Proposition 65.

### 2. *Hazardous Ingredients and Exposure Limits:*

- 2.1 It is our opinion that the above named product does not meet the definition of a "Hazardous Chemical" as defined in 21 CFR 1910.1200. This MSDS is provided as general information for health and safety reasons.

### 3. *Health Hazard Data*

- |     |                   |                              |
|-----|-------------------|------------------------------|
| 3.1 | Carcinogenic      | None known.                  |
| 3.2 | Acute Toxicity    | None known.                  |
| 3.3 | Oral LD50         | Not determined.              |
| 3.4 | Dermal LD50       | Not determined.              |
| 3.5 | Ingestion         | None known.                  |
| 3.6 | Skin Contact      | None known.                  |
| 3.7 | Irritation (skin) | None known.                  |
| 3.8 | Irritation (eye)  | May cause slight irritation. |

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#### 4. *First Aid Measures*

- 4.1 Eye Contact Remove contact lenses and flush eyes with copious amount of water for at least fifteen minutes. Contact physician if irritation persists.
- 4.2 Skin Contact No significant health hazard. Wash exposed skin with soap and water for at least fifteen minutes. If irritation persists, consult a doctor.
- 4.3 Ingestion Administer 1 - 2 glasses of water or milk to dilute. **DO NOT INDUCE VOMITING.** Seek medical attention if it seems advisable.

#### 5. *Fire Fighting Measures*

- 5.1 Flash Point (method used) Not determined.
- 5.2 Flammable Limits Not determined.
- 5.3 Unusual Fire & Explosion Hazard None known.
- 5.4 Extinguishing Media Carbon dioxide, dry chemical, foam, and water spray.

#### 6. *Spill, Leak, and Waste Disposal*

- 6.1 Absorb spills on vermiculite or other absorbent materials. Remove to approved disposal containers. Use rag and mop to clean small spots or dilute with large amounts of water. Colorant is biodegradable.

#### 7. *Handling and Storage*

- 7.1 Store in a cool dry area. The wearing of rubber gloves and safety glasses to prevent skin and eye contact is recommended. Store in tightly closed containers.

## 8. *Exposure Protection*

8.1	Respiratory	No special equipment under normal conditions of use.
8.2	Skin	Skin protection appropriate to use conditions.
8.3	Eye	Safety glasses must be worn at all times
8.4	Hand	Suitable gloves.
8.5	Other	None

## 9. *Physical / Chemical Characteristics*

9.1	Appearance	Red liquid
9.2	Boiling Point	Not established
9.3	Vapor Pressure	Not established
9.4	pH value	7.0
9.5	Solubility in Water	Complete
9.6	Specific Gravity	To be established

## 10. *Stability and Reactivity*

10.1	Stability	Stable.
10.2	Incompatibility	Avoid strong oxidizing agents.
10.3	Hazardous Decomposition	Not known.
10.4	Hazardous Polymerization	Not known.

## 11. *Toxicological Health Hazards*

11.1 None known. Colorant is naturally derived and biodegradable.

## 12. *Ecological Effects*

12.1 None known. Colorant is naturally derived and biodegradable

## 13. *Disposal Considerations*

13.1 Incineration. Observe local, State, and Federal regulations concerning health and the environment. Do not incinerate in sealed containers.

*The information contained herein is based upon data considered accurate and reliable. Nevertheless, an independent investigation and verification of this information should be made by the user. No warranty is made, expressed or implied, regarding the accuracy or correctness of these data. The use of this information and this product are beyond the control of ColorMaker, Inc. Therefore, it is the sole responsibility of the user to determine the conditions necessary for the safe use of this product.*



## Bibliography

Dalzell, Janet M., Ingredients Handbook - Food Colours; Letterhead, Publishers; Copyright 1997.

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**EVALUATION CRITERIA FOR SUBSTANCES ADDED TO THE NATIONAL LIST**

**Category 1. Adverse impacts on humans or the environment?**

Substance – RED CABBAGE EXTRACT

Question	Yes	No	N/A	Documentation (TAP; petition; regulatory agency; other)
1. Are there adverse effects on environment from manufacture, use, or disposal? [§205.600 b.2]		X		Petition; FDA regulations
2. Is there environmental contamination during manufacture, use, misuse, or disposal? [§6518 m.3]		X		Petition; FDA regulations
3. Is the substance harmful to the environment? [§6517c(1)(A)(i);6517(c)(2)(A)i]		X		Petition; FDA Regulations
4. Does the substance contain List 1, 2, or 3 inerts? [§6517 c (1)(B)(ii); 205.601(m)2]			X	
5. Is there potential for detrimental chemical interaction with other materials used? [§6518 m.1]		X		Petition; FDA Regulations
6. Are there adverse biological and chemical interactions in agroecosystem? [§6518 m.5]		X		Petition; FDA Regulations
7. Are there detrimental physiological effects on soil organisms, crops, or livestock? [§6518 m.5]		X		Petition; FDA Regulations
8. Is there a toxic or other adverse action of the material or its breakdown products? [§6518 m.2]			X	
9. Is there undesirable persistence or concentration of the material or breakdown products in environment?[§6518 m.2]		X		Petition; FDA Regulations
10. Is there any harmful effect on human health? [§6517 c (1)(A)(i) ; 6517 c(2)(A)i; §6518 m.4]		X		Petition; FDA Regulations
11. Is there an adverse effect on human health as defined by applicable Federal regulations? [205.600 b.3]		X		Petition; FDA Regulations

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12. Is the substance GRAS when used according to FDA's good manufacturing practices? [§205.600 b.5]	X			Petition; FDA Regulations
13. Does the substance contain residues of heavy metals or other contaminants in excess of FDA tolerances? [§205.600 b.5]		X		Petition; FDA Regulations

1 If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 2. Is the Substance Essential for Organic Production?**      Substance – RED CABBAGE EXTRACT

Question	Yes	No	N/A	Documentation (TAP; petition; regulatory agency; other)
1. Is there a natural source of the substance? [§205.600 b.1]			X	
2. Is there an organic substitute? [§205.600 b.1]		X		Petition
3. Is the substance essential for handling of organically produced agricultural products? [§205.600 b.6]			X	
4. Is there a wholly natural substitute product? [§6517 c (1)(A)(ii)]			X	
5. Is the substance used in handling not synthetic, but not organically produced? [§6517 c (1)(B)(iii)]	X			Petition; FDA Regulations
6. Is there any alternative substances? [§6518 m.6]		X		Petition; FDA Regulations
7. Is there another practice that would make the substance unnecessary? [§6518 m.6]			X	

1 If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 3. Is the substance compatible with organic production? Substance – RED CABBAGE EXTRACT**

Question	Yes	No	N/A	Documentation (TAP; petition; regulatory agency; other)
1. Is the substance compatible with organic handling? [§205.600 b.2]			X	
2. Is the substance consistent with organic farming and handling? [§6517 c (1)(A)(iii); 6517 c (2)(A)(ii)]	X			Petition; FDA Regulations
3. Is the substance compatible with a system of sustainable agriculture? [§6518 m.7]	X			Petition; FDA Regulations
4. Is the nutritional quality of the food maintained with the substance? [§205.600 b.3]			X	
5. Is the primary use as a preservative? [§205.600 b.4]		X		
6. Is the primary use to recreate or improve flavors, colors, textures, or nutritive values lost in processing (except when required by law, e.g., vitamin D in milk)? [205.600 b.4]			X	
7. Is the substance used in production, and does it contain an active synthetic ingredient in the following categories:				
a. copper and sulfur compounds;			X	
b. toxins derived from bacteria;			X	
c. pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals?			X	
d. livestock parasiticides and medicines?			X	
e. production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleaners?			X	

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**Carotenoids**: (9) annatto seed extract, (10) beta-carotene from carrots, (11) lycopene, (12) paprika, (13) saffron; and

**Betalains**: (14) beet juice; and

**Other**: (15) turmeric.

You may recall that our original petition was organized by the four categories shown above. It may be prudent -- in the interest of time -- for the NOSB to consider the enclosed petitions in these same categories / groups.

5. The source of the substance and a detailed description of its manufacturing or processing procedures: Purple carrots grow beneath the ground throughout Europe and Northern Asia. The carrots are collected, washed, and cut into small pieces. The pieces are soaked in water. After 42 – 78 hours, the liquid is mechanically filtered and concentrated, producing a dark, blue-red liquid concentrate composed of the same anthocyanin molecules produced inside the carrots.

6. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance: No such government reviews of purple carrot extract are known; but anthocyanins (particularly from grapes) have been used since antiquity to color human foods and are Generally Regarded As Safe (GRAS).

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8. The Chemical Abstract Service (CAS) number: There is no specific CAS Number for purple carrot extract; however, anthocyanins in general have been assigned CAS No. 11029-12-2.

9. The substance's physical properties and chemical mode of action: The anthocyanins extracted from purple carrots are distinct and unique molecules. They are different from carotenoids and betalains (other molecules used as natural colorants). Anthocyanins are sensitive to the pH of their surrounding environment, appearing red in an acidic pH (pH < 4.5) and blue in an alkaline pH (pH > 6.5). In addition, anthocyanins display strong antioxidant properties which may be beneficial to human health. Beyond these unique properties, anthocyanins do not interact with substances used in organic food production and have no impact on the environment.

Purple carrots have been consumed for centuries and their growth and ultimate consumption has the same impact on the environment as organically grown, biodegradable fruits and vegetables.

10. Safety information about the substance: Please see the attached Material Safety Data Sheet (MSDS). Purple carrots, and the anthocyanins extracted from purple carrots, are GRAS.

11. Research information about the substance: See the attached Bibliography. A leading American researcher on anthocyanins is Professor Ron Wrolstad, Dept. of Food Science, University of Oregon, Corvallis, OR 97331. Dr. Wrolstad recently retired, but he can still be reached at the University.

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By way of example, a hypothetical organic dairy develops organic certified yogurt. First, new product developers add purple carrot extract at 0.5% of the total formula. They do not actively seek out organic certified purple carrot extract because they know the ingredient easily falls under the 95 / 5 rule. Second, the dairy's new product is successful and within the first year it produces 500 tons of organic certified yogurts. Despite such success, the dairy would purchase only 833 lb of purple carrot extract per month. This low volume of natural colorant sales, combined with inclusion of natural colorants in the "five percent non-certified" portion of the formula, provides little economic incentive to certify natural colorants as organic.

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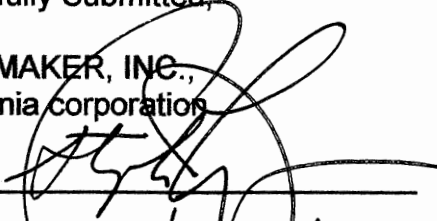


13. This Petition respectfully seeks the addition of purple carrot extract, a.k.a. "black carrot," to the National List as a non-organic agricultural product under Section 205.606 of the NOP.

Respectfully Submitted,

COLORMAKER, INC.,  
a California corporation

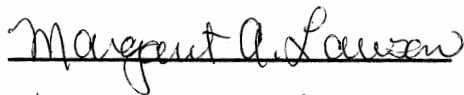
By:



Stephen J. Leuvo  
(Name & Title)

DD WILLIAMSON, INC.  
a Kentucky corporation

By:



Margaret A. Lawson  
(Name & Title)  
VP Science & Innovation

ColorMaker, Inc.  
3309 East Miraloma Ave., Suite 105  
Anaheim, California 92806  
(714) 572-0444  
(714) 572-0999 fax

*inquire@colormaker.com*

**Hazard rating at a glance**  
0-least, 1-slight, 2-moderate, 3-high, 4-extreme

HEALTH 0

FLAMMABILITY 0

REACTIVITY 0

## MATERIAL SAFETY DATA SHEET

### 1. *Product Identification:*

- 1.1 Product Name: Standard Purple Carrot Extract
- 1.2 Product Number: 2885
- 1.3 Ingredient Statement: Vegetable juice
- 1.4 Description of Product: A purple liquid designed to color and function in food and beverage products. Specific formulation is withheld as a trade secret pursuant to 21 CFR 20.61. The characterizing principles and/or other components of this color blend are approved and are in compliance with 21 CFR 73. None of the ingredients appear on the list of hazardous items established under California's Proposition 65.

### 2. *Hazardous Ingredients and Exposure Limits:*

- 2.1 It is our opinion that the above named product does not meet the definition of a "Hazardous Chemical" as defined in 21 CFR 1910.1200. This MSDS is provided as general information for health and safety reasons.

### 3. *Health Hazard Data*

- 3.1 Carcinogenic None known.
- 3.2 Acute Toxicity None known.
- 3.3 Oral LD50 Not determined.
- 3.4 Dermal LD50 Not determined.
- 3.5 Ingestion None known.
- 3.6 Skin Contact None known.
- 3.7 Irritation (skin) None known.
- 3.8 Irritation (eye) May cause slight irritation.

#### 4. *First Aid Measures*

- 4.1 Eye Contact Remove contact lenses and flush eyes with copious amount of water for at least fifteen minutes. Contact physician if irritation persists.
- 4.2 Skin Contact No significant health hazard. Wash exposed skin with soap and water for at least fifteen minutes. If irritation persists, consult a doctor.
- 4.3 Ingestion Administer 1 - 2 glasses of water or milk to dilute. DO NOT INDUCE VOMITING. Seek medical attention if it seems advisable.

#### 5. *Fire Fighting Measures*

- 5.1 Flash Point (method used) Not determined.
- 5.2 Flammable Limits Not determined.
- 5.3 Unusual Fire & Explosion Hazard None known.
- 5.4 Extinguishing Media Carbon dioxide, dry chemical, foam, and water spray.

#### 6. *Spill, Leak, and Waste Disposal*

- 6.1 Absorb spills on vermiculite or other absorbent materials. Remove to approved disposal containers. Use rag and mop to clean small spots or dilute with large amounts of water. Colorant is biodegradable.

#### 7. *Handling and Storage*

- 7.1 Store in a cool dry area. The wearing of rubber gloves and safety glasses to prevent skin and eye contact is recommended. Store in tightly closed containers.

## 8. *Exposure Protection*

8.1	Respiratory	No special equipment under normal conditions of use.
8.2	Skin	Skin protection appropriate to use conditions.
8.3	Eye	Safety glasses must be worn at all times
8.4	Hand	Suitable gloves.
8.5	Other	None

## 9. *Physical / Chemical Characteristics*

9.1	Appearance	Purple liquid
9.2	Boiling Point	Not established
9.3	Vapor Pressure	Not established
9.4	pH value	7.0
9.5	Solubility in Water	Complete
9.6	Specific Gravity	To be established

## 10. *Stability and Reactivity*

10.1	Stability	Stable.
10.2	Incompatibility	Avoid strong oxidizing agents.
10.3	Hazardous Decomposition	Not known.
10.4	Hazardous Polymerization	Not known.

## 11. *Toxicological Health Hazards*

11.1 None known. Colorant is naturally derived and biodegradable.

## 12. *Ecological Effects*

12.1 None known. Colorant is naturally derived and biodegradable

## 13. *Disposal Considerations*

13.1 Incineration. Observe local, State, and Federal regulations concerning health and the environment. Do not incinerate in sealed containers.

*The information contained herein is based upon data considered accurate and reliable. Nevertheless, an independent investigation and verification of this information should be made by the user. No warranty is made, expressed or implied, regarding the accuracy or correctness of these data. The use of this information and this product are beyond the control of ColorMaker, Inc. Therefore, it is the sole responsibility of the user to determine the conditions necessary for the safe use of this product.*

## Bibliography

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**EVALUATION CRITERIA FOR SUBSTANCES ADDED TO THE NATIONAL LIST**

**Category 1. Adverse impacts on humans or the environment?**

Substance – PURPLE CARROT EXTRACT

Question	Yes	No	N/A	Documentation (TAP; petition; regulatory agency; other)
1. Are there adverse effects on environment from manufacture, use, or disposal? [§205.600 b.2]		X		Petition; FDA regulations
2. Is there environmental contamination during manufacture, use, misuse, or disposal? [§6518 m.3]		X		Petition; FDA regulations
3. Is the substance harmful to the environment? [§6517c(1)(A)(i);6517(c)(2)(A)i]		X		Petition; FDA Regulations
4. Does the substance contain List 1, 2, or 3 inerts? [§6517 c (1)(B)(ii); 205.601(m)2]			X	
5. Is there potential for detrimental chemical interaction with other materials used? [§6518 m.1]		X		Petition; FDA Regulations
6. Are there adverse biological and chemical interactions in agroecosystem? [§6518 m.5]		X		Petition; FDA Regulations
7. Are there detrimental physiological effects on soil organisms, crops, or livestock? [§6518 m.5]		X		Petition; FDA Regulations
8. Is there a toxic or other adverse action of the material or its breakdown products? [§6518 m.2]			X	
9. Is there undesirable persistence or concentration of the material or breakdown products in environment?[§6518 m.2]		X		Petition; FDA Regulations
10. Is there any harmful effect on human health? [§6517 c (1)(A)(i) ; 6517 c(2)(A)i; §6518 m.4]		X		Petition; FDA Regulations
11. Is there an adverse effect on human health as defined by applicable Federal regulations? [205.600 b.3]		X		Petition; FDA Regulations

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12. Is the substance GRAS when used according to FDA's good manufacturing practices? [§205.600 b.5]	X			Petition; FDA Regulations
13. Does the substance contain residues of heavy metals or other contaminants in excess of FDA tolerances? [§205.600 b.5]		X		Petition; FDA Regulations

1 If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 2. Is the Substance Essential for Organic Production?**      Substance – PURPLE CARROT EXTRACT

Question	Yes	No	N/A	Documentation (TAP; petition; regulatory agency; other)
1. Is there a natural source of the substance? [§205.600 b.1]			X	
2. Is there an organic substitute? [§205.600 b.1]		X		Petition
3. Is the substance essential for handling of organically produced agricultural products? [§205.600 b.6]			X	
4. Is there a wholly natural substitute product? [§6517 c (1)(A)(ii)]			X	
5. Is the substance used in handling not synthetic, but not organically produced? [§6517 c (1)(B)(iii)]	X			Petition; FDA Regulations
6. Is there any alternative substances? [§6518 m.6]		X		Petition; FDA Regulations
7. Is there another practice that would make the substance unnecessary? [§6518 m.6]			X	

1 If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 3. Is the substance compatible with organic production?** Substance – PURPLE CARROT EXTRACT

Question	Yes	No	N/A	Documentation (TAP; petition; regulatory agency; other)
1. Is the substance compatible with organic handling? [§205.600 b.2]			X	
2. Is the substance consistent with organic farming and handling? [§6517 c (1)(A)(iii); 6517 c (2)(A)(ii)]	X			Petition; FDA Regulations
3. Is the substance compatible with a system of sustainable agriculture? [§6518 m.7]	X			Petition; FDA Regulations
4. Is the nutritional quality of the food maintained with the substance? [§205.600 b.3]			X	
5. Is the primary use as a preservative? [§205.600 b.4]		X		
6. Is the primary use to recreate or improve flavors, colors, textures, or nutritive values lost in processing (except when required by law, e.g., vitamin D in milk)? [205.600 b.4]			X	
7. Is the substance used in production, and does it contain an active synthetic ingredient in the following categories:				
a. copper and sulfur compounds;			X	
b. toxins derived from bacteria;			X	
c. pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals?			X	
d. livestock parasiticides and medicines?			X	
e. production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleaners?			X	

1 If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.



# GNT

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2007 JAN 16 A 8: 37

## **National List Petition For Red Cabbage Juice Color**

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Red Cabbage Juice Color

January 12, 2007

GNT USA, Inc. ▪ 660 White Plains Road ▪ Tarrytown, New York 10591  
Telephone 914.524.0600 ▪ Telefax 914.524.0681 ▪ [www.gntusa.com](http://www.gntusa.com)



GNT USA, Inc.  
660 White Plains Road  
Tarrytown, NY 10591

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2007 JAN 16 A 8:37

January 12, 2007

Robert L. Pooler  
USDA/AMS/T&M/ National Organic Program  
Agricultural Marketing Specialist  
Room 4008-S, Ag Stop 0268  
1400 Independence Avenue, SW  
Washington, DC 20250

Subject: National List Petition Submission for Red cabbage Juice Color.

Dear Mr. Pooler:

GNT USA Inc. is petitioning red cabbage juice color for inclusion on the National List under Section 205.606:

Agricultural (nonorganic) substances allowed in or on processed products labeled as “organic” or “made with organic (specified ingredients)”.

Red cabbage juice color is classified by the F.D.A as “exempt from certification” under 21CFR73.260, vegetable juice color.

The proposed criteria for this category are as follow:

- The colors have to be manufactured from red cabbage
- The process has to be exclusively physical without any synthetic aid or adjuvant.
- The production methods have to be certified organic under the USDA-NOP standards.

Attached, please find the completed forms as well as the Material Safety Data Sheet, the Statement on Residue and the Organic Production Methods Certificate for red cabbage juice color.

If further information is required, please contact our main office in Tarrytown, New York at 914.524.0600.

Sincerely,

Amelie Hayte

## Red cabbage Juice Color

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### ITEM A

The substance is being petitioned for inclusion on the National List under Section 205.606:

Non-organic agricultural substances allowed in or on processed products labeled as “organic” or “made with organic (specified ingredients).”

### ITEM B

1. Red cabbage Juice Color

2. Manufactured by:

GNT Nederland B.V.  
Industrieweg 26  
5731 HR Mierlo  
The Netherlands  
+31-492-663952

3. Intended and current use of the substance:

Food ingredient having coloring properties

4. The substance is being used as a food ingredient having coloring properties in diverse foods and beverages. The substance is added during the processing of the food product to impart color throughout the shelf life of the product.

## Red cabbage Juice Color

5. The source of the food ingredient is red cabbage.

The production process is on an entirely physical basis such as crushing, pressing, filtering and concentration by vacuum evaporation. Water, invert sugar and citric acid may be added during the manufacturing process.

6. Reviews by State, private certification programs or organizations:

GNT Nederland B.V., the production site of GNT Group, is under review and/or certification of the following organizations

- Dutch Food and Consumer Product Safety Authority (Voedsel en Waren Autoriteit - VWA)
- DNV Nederland - certification body for ISO 9001:2000, Dutch HACCP and GMP
- Skal Certification Organic Production - organic production and certification in the Netherlands are based on the EU-regulation (EEC) nr. 2092/91
- Skal Control Union World Group - organic production and certification in the Netherlands according to USDA Organic and NOP

7. FDA registration number: 18189116412

8. The Chemical Abstract Service (CAS) is not applicable.

The substance falls under the F.D.A regulation for “colors exempt from certification” 21CFR73.260, vegetable juice color.

## **Red cabbage Juice Color**

9. N/A. The substance is intended for food application. It is 100% natural and is not formulated or processed with any synthetic aid or adjuvant

10. See enclosed Material Safety Data Sheet (MSDS)

11. The substance is made from red cabbage, which has a well-known history of consumption and which is Generally Recognized As Safe (GRAS).

12. Petition Justification Statement

G. Inclusion of a non-organically produced agricultural substance onto the National List, 205.606.

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**Red cabbage Juice Color**

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EVALUATION CRITERIA FOR SUBSTANCES ADDED TO THE NATIONAL LIST

Category 1. Adverse impacts on humans or the environment?

Substance Red cabbage Juice Color

Question	Yes	No	N/A <sup>1</sup>	Documentation (TAP; petition; regulatory agency; other)
1. Are there adverse effects on environment from manufacture, use, or disposal? [§205.600 b.2]		✓		The substance is not synthetic. It is derived from red cabbage only, processed by physical means like crushing, pressing, filtering and concentration by vacuum evaporation (See attached process flow chart). During the processing, no chemical solvents are used. The production is GMP certified and organic wastes are used for animal feed according to specific EC legislation related to the animal feed sector.
2. Is there environmental contamination during manufacture, use, misuse, or disposal? [§6518 m.3]		✓		All raw materials and processing adjuvant are derived from all-natural sources. The production methods are certified organic under the USDA-NOP standards. (See attached certificate)
3. Is the substance harmful to the environment? [§6517c(1)(A)(i);6517(c)(2)(A)i]		✓		The substance is manufactured from natural sources only and is therefore not harmful to the environment.
4. Does the substance contain List 1, 2, or 3 inerts? [§6517 c (1)(B)(ii); 205.601(m)2]			✓	The substance contains only the natural constituents of the processed red cabbage. Citric acid and invert sugar may be used for standardization purposes and these ingredients are GRAS.
5. Is there potential for detrimental chemical interaction with other materials used? [§6518 m.1]		✓		There is no indication for detrimental chemical interaction of red cabbage extracts with other materials.
6. Are there adverse biological and chemical interactions in agro-ecosystem? [§6518 m.5]			✓	This substance is intended for food application
7. Are there detrimental physiological effects on soil organisms, crops, or livestock? [§6518 m.5]			✓	This substance is intended for food application
8. Is there a toxic or other adverse action of the material or its breakdown products? [§6518 m.2]		✓		The substance is from natural sources only (red cabbage, citric acid, invert sugar, water). Citric acid and invert sugar may be used for standardization purposes and these ingredients are GRAS
9. Is there undesirable persistence or concentration of the material or breakdown products in environment?[§6518 m.2]		✓		This substance is intended for food application. In case of accident-caused release the products are completely biodegradable.
10. Is there any harmful effect on human health? [§6517 c (1)(A)(i) ; 6517 c(2)(A)i; §6518 m.4]		✓		The substance is actually beneficial for human health. It is vegetable based and rich in antioxidants like e.g. anthocyanins.
11. Is there an adverse effect on human health as defined by applicable Federal regulations? [205.600 b.3]		✓		The substance is manufactured from natural sources that have been consumed for years on a daily basis. Furthermore, the raw materials are known to have beneficial effects on human health.
12. Is the substance GRAS when used according to FDA's good manufacturing practices? [§205.600 b.5]		✓		Currently, there is no GRAS exemption for color additives. For the F.D.A., all colors are considered artificial and are categorized under "certified" or "exempt from certification".
13. Does the substance contain residues of heavy metals or other contaminants in excess of FDA tolerances? [§205.600 b.5]		✓		See attached statement on residues

<sup>1</sup>If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 2. Is the Substance Essential for Organic Production?** Substance Red cabbage Juice Color

Question	Yes	No	N/A <sup>1</sup>	Documentation (TAP; petition; regulatory agency; other)
1. Is the substance formulated or manufactured by a chemical process? [6502 (21)]		✓		The substance is formulated from natural sources only and is processed only with water and physical processing. The production methods are certified organic under the USDA-NOP standards.
2. Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral, sources? [6502 (21)]		✓		The process is not intended to chemically change the substance. The red cabbage is concentrated with the help of water and physical processing. Therefore, the properties of the substance are similar to the properties of the vegetable.
3. Is the substance created by naturally occurring biological processes? [6502 (21)]		✓		The substance itself does not occur naturally, but it only contains natural constituents of the processed red cabbage.
4. Is there a natural source of the substance? [§205.600 b.1]			✓	The substance is 100% natural. It is not formulated or processed with any synthetic aid or adjuvant
5. Is there an organic substitute? [§205.600 b.1]		✓		The amount of raw materials that is processed for red cabbage juice color is not commercially available as organic. A period of 10 years has been estimated as a minimum to be able to produce organically the amount of raw materials necessary.
6. Is the substance essential for handling of organically produced agricultural products? [§205.600 b.6]			✓	The substance is 100% natural. It is not formulated or processed with any synthetic aid or adjuvant.
7. Is there a wholly natural substitute product? [§6517 c (1)(A)(ii)]			✓	The substance is 100% natural. It is not formulated or processed with any synthetic aid or adjuvant.
8. Is the substance used in handling, not synthetic, but not organically produced? [§6517 c (1)(B)(iii)]	✓			The substance is 100% natural but cannot be produced organically yet, as the raw materials are not commercially available as organic. Only The production methods are certified organic under the USDA-NOP standards. (see attached certificate)
9. Is there any alternative substances? [§6518 m.6]		✓		All other colors “exempt from certification” are non-organic and are processed or formulated with the aid of synthetic substances. To avoid any synthetic ingredients in organic food, only organic, or as an interim solution non-organic, fruit and vegetable juice colors can be used to impact color and partly nutritive values to consumers’ food.
10. Is there another practice that would make the substance unnecessary? [§6518 m.6]		✓		The substance is needed, as no organic color is available yet. Only time is necessary to have enough farmers and lands to produce red cabbage organically in the quantity, quality and form requested by the food industry and the consumers.

<sup>1</sup>If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.



**Category 3. Is the substance compatible with organic production practices?**

Substance Red cabbage Juice Color

Question	Yes	No	N/A <sup>1</sup>	Documentation (TAP; petition; regulatory agency; other)
1. Is the substance compatible with organic handling? [§205.600 b.2]	✓			The substance is currently used in organic products. E.g. organic yogurt, ice cream, juices, dried fruits, etc.
2. Is the substance consistent with organic farming and handling? [§6517 c (1)(A)(iii); 6517 c (2)(A)(ii)]			✓	The substance is from natural sources only and does not contain any synthetic ingredients or processing aid like solvents or emulsifiers. The production methods are certified organic under the USDA-NOP standards.
3. Is the substance compatible with a system of sustainable agriculture? [§6518 m.7]	✓			Since the substance is derived only from natural sources it is compatible with sustainable agriculture and production.
4. Is the nutritional quality of the food maintained with the substance? [§205.600 b.3]	✓			The substance does contain almost all natural and valuable constituents of the processed red cabbage.
5. Is the primary use as a preservative? [§205.600 b.4]		✓		This is not a preservative
6. Is the primary use to recreate or improve flavors, colors, textures, or nutritive values lost in processing (except when required by law, e.g., vitamin D in milk)? [205.600 b.4]			✓	This substance is not formulated or processed with any synthetic aid or adjuvant. This is a food having coloring properties.
7. Is the substance used in production, and does it contain an active synthetic ingredient in the following categories:				
a. copper and sulfur compounds;		✓		
b. toxins derived from bacteria;		✓		
c. pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals?		✓		
d. livestock parasiticides and medicines?		✓		
e. production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleaners?		✓		

<sup>1</sup>If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

# NOSB RECOMMENDED DECISION

Form NOPLIST2. Full Board Transmittal to NOP

For NOSB Meeting: _____	Substance: _____																								
<p><b>A. Evaluation Criteria (Documentation attached; committee recommendation attached)</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;"></td> <td style="text-align: right;">Criteria Satisfied?</td> </tr> <tr> <td>1. Impact on humans and environment</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> <tr> <td>2. Availability criteria</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> <tr> <td>3. Compatibility &amp; consistency</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> </table>			Criteria Satisfied?	1. Impact on humans and environment	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)	2. Availability criteria	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)	3. Compatibility & consistency	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)																
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<p><b>B. Substance fails criteria?</b></p> <p>Criteria category: _____</p> <p>Comments: _____</p>	<p><b>C. Proposed Annotation:</b> _____</p> <p>_____</p> <p><b>Basis for annotation:</b></p> <p>To meet criteria above: _____ Criteria: _____</p> <p>Other regulatory criteria: _____ Citation: _____</p>																								
<p><b>D. Final Board Action &amp; Vote:</b> Motion by: _____ Second: _____</p> <p><u>Vote:</u></p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">Agricultural</td> <td style="width: 20px;"></td> <td style="padding: 2px;">Nonagricultural</td> <td style="width: 20px;"></td> <td style="padding: 2px;">Crops</td> <td style="width: 20px;"></td> </tr> <tr> <td style="padding: 2px;">Synthetic</td> <td></td> <td style="padding: 2px;">Not synthetic</td> <td></td> <td style="padding: 2px;">Livestock</td> <td></td> </tr> <tr> <td style="padding: 2px;">Allowed<sup>1</sup></td> <td></td> <td style="padding: 2px;">Prohibited<sup>2</sup></td> <td></td> <td style="padding: 2px;">Handling</td> <td></td> </tr> <tr> <td style="padding: 2px;">No restriction</td> <td></td> <td style="padding: 2px;">Deferred<sup>4</sup></td> <td></td> <td style="padding: 2px;">Rejected<sup>3</sup></td> <td></td> </tr> </table> <p>Yes: _____</p> <p>No: _____</p> <p>Abstain: _____</p> <p style="margin-left: 40px;">1—substance voted to be added as “allowed” on National List</p> <p>Annotation: _____</p> <p style="margin-left: 40px;">2—substance to be added to “prohibited” paragraph of National List</p> <p>Describe why a prohibited substance: _____</p> <p style="margin-left: 40px;">3—substance was rejected by vote for amending National List</p> <p>Describe why material was rejected: _____</p> <p style="margin-left: 40px;">4—substance was recommended to be deferred</p> <p>Describe why deferred; if any follow-up is needed. If follow-up needed, who conducts follow-up. _____</p>		Agricultural		Nonagricultural		Crops		Synthetic		Not synthetic		Livestock		Allowed <sup>1</sup>		Prohibited <sup>2</sup>		Handling		No restriction		Deferred <sup>4</sup>		Rejected <sup>3</sup>	
Agricultural		Nonagricultural		Crops																					
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No restriction		Deferred <sup>4</sup>		Rejected <sup>3</sup>																					
<p><b>E. Approved by NOSB Chair to transmit to NOP:</b></p> <p>_____</p> <p>Dave Carter, NOSB Chair <span style="float: right;">Date _____</span></p>																									
<p><b>F. NOP Action:</b> Include in FR to amend National List: <input type="checkbox"/></p> <p>Return to NOSB <input type="checkbox"/> Reason: _____</p> <p>_____</p> <p>Richard H. Mathews, Program Manager <span style="float: right;">Date _____</span></p>																									

# NOSB COMMITTEE RECOMMENDATION

Form NOPLIST1. Committee Transmittal to NOSB

For NOSB Meeting: _____	Substance: _____																								
Committee: Crops <input type="checkbox"/> Livestock <input type="checkbox"/> Handling <input type="checkbox"/>																									
<p><b>A. Evaluation Criteria (Documentation attached; committee recommendation attached)</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;"></td> <td style="text-align: right; font-weight: bold;">Criteria Satisfied?</td> </tr> <tr> <td>4. Impact on humans and environment</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> <tr> <td>5. Availability criteria</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> <tr> <td>6. Compatibility &amp; consistency</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> </table>			Criteria Satisfied?	4. Impact on humans and environment	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)	5. Availability criteria	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)	6. Compatibility & consistency	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)																
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USDA NATIONAL  
ORGANIC PROGRAM

2007 JAN 16 A 8: 37

## STATEMENT ON RESIDUES

GNT USA Inc. hereby confirms that:

The raw materials used for EXBERRY® products originate from direct cultivation and suppliers are obliged to comply with the legal European requirements governing the cultivation of fruits and vegetables. Other raw materials of supplying companies have to comply to the current European legislations for the specific material before it is purchased.

### Pesticides:

Any pesticide residues left on or in the raw materials designed for the manufacture of EXBERRY® products do not exceed the maximum residue limit specified in the Council Directive 90/642/EEC of November 27, 1990 on the fixing of maximum levels for pesticide residues in and on certain products of plant origin, including fruit and vegetables and its amendments.

Any pesticide residues in EXBERRY® products do not exceed the maximum residue limits specified in the Directive 90/642/EEC (and amendments).

So far, neither organochlorine pesticides nor organophosphorus pesticides have been traced in our products. The same applies to other pesticide residues, with the current limits of determination being as follows:

- ... organochlorine pesticides: 0,001 - 0,005 mg/kg
- ... organophosphorus pesticides: 0,005 - 0,010 mg/kg
- ... other pesticide residues: 0,005 - 0,010 mg/kg

### Heavy metals:

Regarding the maximum levels for heavy metals there are no defined maximum levels for EXBERRY® products (fruit and vegetables concentrates) within the European legislation.

Our EXBERRY® products do normally not exceed the following max levels:

Arsenic	< 3 mg/kg
Cadmium	< 1 mg/kg
Mercury	< 1 mg/kg
Lead	< 10 mg/kg
Heavy metals (as lead)	< 40 mg/kg

### Mycotoxins:

EXBERRY® products are in compliance with the current European food legislation (*Directive 1525/97/EC, 194/97/EC, etc.*).

To ensure compliance with the above mentioned regulations, all raw materials and semi-finished products designed for the production of EXBERRY® products are regularly screened for pesticide residues, heavy metals and other contaminates.

The frequency of the analyses depends on the processing of the raw materials. The raw materials for EXBERRY® products are normally processed per campaign or season, depending on the amount of processed raw material a certain number of samples are taken and analysed.

Residues statement: EU-31/08/05

**EXBERRY® is a registered Trade Mark of GNT mbH, Germany**

**EXBERRY® Natural Colours are produced by GNT Nederland B.V., Netherlands**

The information contained herein or any other information given by us is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we do not guarantee any results, and we are not liable for any damage incurred by following these suggestions. Nothing contained herein is to be construed as a recommendation for use in violation of any patents or of applicable laws or regulations.

# GNT

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Full Page

## PROCESS FLOW DIAGRAM

### EXBERRY® Fruit and Vegetable Juice Color

**CONFIDENTIAL**

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Process Flow Diagram No. : USA-not applicable 19/6/06

**EXBERRY® is a registered Trade Mark of GNT International B.V., Netherlands**  
**EXBERRY® is produced by GNT Nederland B.V., Netherlands**

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# CERTIFICATE

CERTIFICATE N°: C803789NOP-01.2005  
REGISTRATION N°: SKAL-INT 803789

Field of attention:

**Organic production methods  
USDA-NOP**

Issued to:

**GNT Nederland BV  
Mierlo, NETHERLANDS  
Project in: NETHERLANDS**

Standard:

**The National Organic Programme of the United States Department of Agriculture and Skal  
International Standards**

**Date of certification: 9 November 2005**

Skal International declares to have inspected the unit(s), and/or product(s) of the above mentioned client, and have found them in accordance with the standards mentioned above. This certificate covers the unit(s), and/or product(s) as mentioned in the authenticated annex of this certificate.

This certificate is in force until further notice, provided that the above-mentioned client continues meeting the conditions as laid down in the client contract with Skal International. Based on the annual inspections that Skal International performs, this certificate is updated and kept into force.

Date of certification:  
9 November 2005

Place and date of issue:  
Zwolle, 9 November 2005



Skal International is officially  
accredited by the United States  
Department of Agriculture

Delegated by:

On behalf of the Managing  
Director

Mr. J. Huisman  
Certifier

Skal International  
P.O. Box 161  
8000 AD Zwolle  
The Netherlands  
<http://www.skalint.com>  
tel.: +31(0)38-426.01.00

# MATERIAL SAFETY DATA SHEET

## EXBERRY®

### Generic MSDS for EXBERRY® Products

Product No. : not applicable

May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements. If any item is not applicable, or no information is available, the space must be marked to indicate that.

---

#### SECTION I. Product Identification

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Manufacturer's name: **GNT International B.V.**

Telephone number: +31 - (0)492 668141  
Address: P.O. Box 94, 5731 AB Mierlo, The Netherlands

Product name: **EXBERRY® Generic MSDS for EXBERRY®  
Product No. : not applicable**

Botanical family: not applicable  
Formula: Preparation manufactured from:  
fruits invert sugar  
vegetables citric acid

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#### SECTION II. Hazardous ingredients/Identity Information

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Specific chemical identity; CAS #; ACGIH TLV (Units); OSHA PEL (Units); STEL (Units)

Not applicable. Foodstuff.

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#### SECTION III. Physical/Chemical Characteristics

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Boiling point: 215-230 °F  
Vapor pressure: < 50 mbar (70 °F)  
Vapor density (AIR=1): not available  
Solubility in water: soluble

Material Safety Data Sheet No.: USA-not applicable 13/6/06

13. 06. 06

page 1

**EXBERRY® is a registered Trade Mark of GNT mbH, Germany  
EXBERRY® Natural Colors are produced by GNT Nederland B.V., Netherlands**

The information contained herein or any other information given by us is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we do not guarantee any results, and we are not liable for any damage incurred by following these suggestions. Nothing contained herein is to be construed as a recommendation for use in violation of any patents or of applicable laws or regulations.

Appearance and odor:	viscous and aromatic
Specific gravity (H <sub>2</sub> O=1):	1,28 - 1,38
Percent volatile, by volume (%):	not available
Evaporation rate (butyl acetate=1):	not available (very small)
Freezing point:	less than 0 °F

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#### SECTION IV. Fire and Explosion Hazard Data

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Flash point (method used):	not available
Flammable limits:	not available
LEL:	not available
UEL:	not available
Extinguishing media:	water etc.
Special fire fighting procedures:	not necessary
Unusual fire and explosion hazards:	none known

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#### SECTION V. Reactivity Data

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##### Stability

Unstable:	no
Stable:	yes
Conditions to avoid:	not applicable

Incompatibility (materials to avoid): strong acids and bases, sulfides and sulfites

##### Hazardous polymerization

May occur:	no
Will not occur	certain
Conditions to avoid:	not applicable

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#### SECTION VI. Health Hazard Data

---

##### Route(s) of entry

Inhalation:	no
Skin:	no
Ingestion:	yes

##### Health hazards (acute and chronic)

Carcinogenicity:	no
NTP:	no
LARC monographs:	no
OSHA regulated:	no

Signs and symptoms of exposure: foodstuff, no health hazards



Medical conditions generally aggravated by exposure:

In case of contact with eyes, remove contact lenses and rinse immediately with plenty of water. Contact physician if irritation persists.

Emergency and first aid procedures:

not necessary

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#### SECTION VII. Precautions for Safe Handling and Use

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Steps to be taken in case material is released or spilled: clean with water

Waste disposal method: same as foodstuffs. Observe local, State and Federal Regulations. Do not incinerate sealed containers.

Precautions to be taken in handling and storing: special precautions are not necessary.

Other precautions: not necessary

---

#### SECTION VIII. Control Measures

---

Respiratory protection (specify type)

Ventilation

Local exhaust:	not necessary
Special:	not necessary
Mechanical:	not necessary
Other:	not necessary

Protection gloves: not necessary (strong coloring foodstuff)

Eye protection: not necessary

Other protective clothing or equipment: not necessary

Work/hygienic practices: same as foodstuffs



**Food Ingredient Solutions, LLC.**

10 Malcolm Avenue, Unit 1  
Teterboro, New Jersey 07608  
T: (201) 440-4377 F: (201) 440-4211  
[www.foodcolor.com](http://www.foodcolor.com)

Friday, January 12, 2007

Program Manager  
USDA/AMS/TM/NOP  
Room 4008-So., Ag Stop 0268  
1400 Independence Avenue., SW  
Washington, D.C. 20250

Re: Petition for National List

RECEIVED  
USDA NATIONAL  
ORGANIC PROGRAM  
2007 JAN 16 A 9:24

Dear Sir/Madam:

Please find enclosed petitions for two ingredients to be added to the National List §205.606 Nonorganically produced agricultural products allowed as ingredients in or on processed products labeled as organic or made with organic ingredients.

The petitions cover the following two exempt from certification colors:

Vegetable Juice Color/Red Cabbage Juice Color 21 CFR 73.260

Vegetable Juice Color/Black Carrot Juice Color 21 CFR 73.260

I have enclosed the required documents along with completed forms from various color suppliers demonstrating the current lack of commercial availability of organic raw materials.

Please contact me if I can of further assistance.

Kindest regards,

  
Helen Greaves

Food Ingredient Solutions, LLC

Tel: 562-956-1577

Fax: 707-840-0519

Email: [hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)

CBI DELETED



**Food Ingredient Solutions, LLC.**

10 Malcolm Avenue, Unit 1  
Teterboro, NY 07608  
T: (201) 440-4377 F: (201) 440-4211

January 11, 2007

Petition for the Use of Red Cabbage Juice Color  
To be Added to Section 205.606 of the Natural List

Item A

We are petitioning to add the nonorganic substance red cabbage juice color to the category of "Nonorganically produced agricultural products allowed as ingredients in or on processed products labeled as "organic".

Item B

1. The common name of the substance is red cabbage juice color or vegetable juice color.
2. The manufacturer of the product is:
3. The product will be used in acidic food products, including beverages, fruit preparations, confectioners and dairy products such as yogurt.
4. Not intended for crop, livestock or handling activities
5. The production flow diagram for this item is as follows:

} CBI DELETED

} CBI DELETED

6. Not available.
7. Approved for use per 21 CFR 73.260
8. Not applicable.

9. Appearance: A red viscous liquid. Description: A vegetable extract. Toxicity and environmental impact: Limited information available. Product is a food grade, water soluble color additive derived from red cabbage.
- a. No known interactions with other substances, including substances used in organic production when used correctly.
  - b. No known toxicity or environmental persistence when used correctly.
  - c. Environmental impacts from its use and manufacture and correct use should be negligible.
  - d. No known effects on human health.
  - e. No known effects on soil organisms, crops or livestock when used correctly.
10. Report from National Institute of Environmental Health not available. MSDS attached. Product has in use in food products and permitted for food use per 21 CFR 73.260.
11. All categories of vegetable juice colors are approved for use in accordance with 21 CFR and are GRAS. This product should be allowed in non-organic products in order to maintain a standard of identity for products. For example, many fruits have a tendency to brown over time. Usage of red cabbage color will provide products such as yogurt and beverages with a more consistent and stable red color thus preventing the consumer from perceiving the product as spoiled. Organic raw materials for this product are not yet fully commercially available. In theory this cabbage could be grown in any part of the world where red cabbage is grown. However, red cabbage colorings are made from hybrids that contain large amounts of coloring principles (anthocyanins).
12. Additional information to satisfy evaluation criteria (G) Inclusion of a non-organically produced agricultural substance onto the National List:
- a. The vegetable juice color made by concentrating the juice of red cabbage. All components are GMO-free. The process used does not change the chemical structure of the red cabbage. The pigment component, anthocyanins, is concentrated and standardized in the juice by removing insoluble and soluble solids. The color is created in the cabbage naturally. The cabbage is not genetically modified. Red cabbage juice color helps to identify red to purple acidic foods to consumers and, as such, is essential. In addition ORAC testing on certain red cabbage colors has shown them to be high in antioxidants and beneficial to human health.
13. Confidential business information statement: Certain information pertaining to business relationships and production processes are considered confidential and should be deleted from public copies.

EVALUATION CRITERIA FOR SUBSTANCES ADDED TO THE NATIONAL LIST

Category 1. Adverse impacts on humans or the environment? Red Cabbage Extract Color

Question	Yes	No	N/A <sup>1</sup>	Documentation (TAP; petition; regulatory agency; other)
1. Are there adverse effects on environment from manufacture, use, or disposal? [§205.600 b.2]		✓		
2. Is there environmental contamination during manufacture, use, misuse, or disposal? [§6518 m.3]		✓		If used in accordance with GMP
3. Is the substance harmful to the environment? [§6517c(1)(A)(i);6517(c)(2)(A)i]		✓		If used in accordance with GMP
4. Does the substance contain List 1, 2, or 3 inerts? [§6517 c (1)(B)(ii); 205.601(m)2]				This is a natural product derived solely from vegetable sources. Any listed substance present will be naturally occurring.
5. Is there potential for detrimental chemical interaction with other materials used? [§6518 m.1]		✓		This is a natural product derived solely from vegetable sources and should have no adverse effects if used in accordance with GMP
6. Are there adverse biological and chemical interactions in agro-ecosystem? [§6518 m.5]		✓		
7. Are there detrimental physiological effects on soil organisms, crops, or livestock? [§6518 m.5]		✓		
8. Is there a toxic or other adverse action of the material or its breakdown products? [§6518 m.2]		✓		
9. Is there undesirable persistence or concentration of the material or breakdown products in environment?[§6518 m.2]		✓		
10. Is there any harmful effect on human health? [§6517 c (1)(A)(i) ; 6517 c(2)(A)i; §6518 m.4]		✓		
11. Is there an adverse effect on human health as defined by applicable Federal regulations? [205.600 b.3]		✓		
12. Is the substance GRAS when used according to FDA's good manufacturing practices? [§205.600 b.5]		✓		
13. Does the substance contain residues of heavy metals or other contaminants in excess of FDA tolerances? [§205.600 b.5]		✓		

<sup>1</sup>If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 2. Is the Substance Essential for Organic Production?** Substance: Red Cabbage Extract Color

Question	Yes	No	N/A <sup>1</sup>	Documentation (TAP; petition; regulatory agency; other)
1. Is the substance formulated or manufactured by a chemical process? [6502 (21)]		x		
2. Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral, sources? [6502 (21)]		x		
3. Is the substance created by naturally occurring biological processes? [6502 (21)]		✓		
4. Is there a natural source of the substance? [§205.600 b.1]			✓	This is a natural product derived solely from vegetable sources
5. Is there an organic substitute? [§205.600 b.1]		✓		None that we are aware of
6. Is the substance essential for handling of organically produced agricultural products? [§205.600 b.6]		✓		
7. Is there a wholly natural substitute product? [§6517 c (1)(A)(ii)]		✓		This is a natural product derived solely from vegetable sources
8. Is the substance used in handling, not synthetic, but not organically produced? [§6517 c (1)(B)(iii)]	✓			
9. Is there any alternative substances? [§6518 m.6]		x		Not that we are aware of
10. Is there another practice that would make the substance unnecessary? [§6518 m.6]		x		Not that we are aware of

<sup>1</sup>If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

**Category 3. Is the substance compatible with organic production practices?**

Substance: Red Cabbage Extract Color

Question	Yes	No	N/A <sup>1</sup>	Documentation (TAP; petition; regulatory agency; other)
1. Is the substance compatible with organic handling? [§205.600 b.2]			x	
2. Is the substance consistent with organic farming and handling? [§6517 c (1)(A)(iii); 6517 c (2)(A)(ii)]			x	
3. Is the substance compatible with a system of sustainable agriculture? [§6518 m.7]			x	
4. Is the nutritional quality of the food maintained with the substance? [§205.600 b.3]	✓			Quantity of this product used in the food product will have no significant effect on the food itself
5. Is the primary use as a preservative? [§205.600 b.4]		✓		
6. Is the primary use to recreate or improve flavors, colors, textures, or nutritive values lost in processing (except when required by law, e.g., vitamin D in milk)? [205.600 b.4]	✓			
7. Is the substance used in production, and does it contain an active synthetic ingredient in the following categories:				
a. copper and sulfur compounds;		✓		
b. toxins derived from bacteria;		✓		
c. pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals?		✓		
d. livestock parasitocides and medicines?		✓		
e. production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleaners?		x		These are not used during the manufacture of the product.

<sup>1</sup>If the substance under review is for crops or livestock production, all of the questions from 205.600 (b) are N/A—not applicable.

# NOSB RECOMMENDED DECISION

Form NOPLIST2. Full Board Transmittal to NOP

For NOSB Meeting: _____	Substance: _____																				
<p><b>A. Evaluation Criteria (Documentation attached; committee recommendation attached)</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;"></td> <td style="text-align: right; font-weight: bold;">Criteria Satisfied?</td> </tr> <tr> <td>1. Impact on humans and environment</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> <tr> <td>2. Availability criteria</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> <tr> <td>3. Compatibility &amp; consistency</td> <td style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)</td> </tr> </table>			Criteria Satisfied?	1. Impact on humans and environment	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)	2. Availability criteria	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)	3. Compatibility & consistency	Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)												
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# NOSB COMMITTEE RECOMMENDATION

Form NOPLIST1. Committee Transmittal to NOSB

For NOSB Meeting: _____	Substance: _____																								
Committee: Crops <input type="checkbox"/> Livestock <input type="checkbox"/> Handling <input type="checkbox"/>																									
<b>A. Evaluation Criteria (Documentation attached; committee recommendation attached)</b>																									
4. Impact on humans and environment 5. Availability criteria 6. Compatibility & consistency	Criteria Satisfied? Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below) Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below) Yes <input type="checkbox"/> No <input type="checkbox"/> (see B below)																								
<b>B. Substance fails criteria?</b> Criteria category: _____ Comments: _____	<b>C. Proposed Annotation:</b> _____ _____ Basis for annotation: To meet criteria above: ____ Criteria: _____ Other regulatory criteria: ____ Citation: _____																								
<b>D. Recommended Committee Action &amp; Vote:</b> Motion by: _____ Seconded: _____																									
Vote: Yes: _____ No: _____ Abstain: _____	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Agricultural</td> <td style="width: 20px;"></td> <td style="padding: 2px;">Nonagricultural</td> <td style="width: 20px;"></td> <td style="padding: 2px;">Crops</td> <td style="width: 20px;"></td> </tr> <tr> <td style="padding: 2px;">Synthetic</td> <td></td> <td style="padding: 2px;">Not synthetic</td> <td></td> <td style="padding: 2px;">Livestock</td> <td></td> </tr> <tr> <td style="padding: 2px;">Allowed<sup>1</sup></td> <td></td> <td style="padding: 2px;">Prohibited<sup>2</sup></td> <td></td> <td style="padding: 2px;">Handling</td> <td></td> </tr> <tr> <td style="padding: 2px;">No restriction</td> <td></td> <td style="padding: 2px;">Deferred<sup>4</sup></td> <td></td> <td style="padding: 2px;">Rejected<sup>3</sup></td> <td></td> </tr> </table>	Agricultural		Nonagricultural		Crops		Synthetic		Not synthetic		Livestock		Allowed <sup>1</sup>		Prohibited <sup>2</sup>		Handling		No restriction		Deferred <sup>4</sup>		Rejected <sup>3</sup>	
Agricultural		Nonagricultural		Crops																					
Synthetic		Not synthetic		Livestock																					
Allowed <sup>1</sup>		Prohibited <sup>2</sup>		Handling																					
No restriction		Deferred <sup>4</sup>		Rejected <sup>3</sup>																					
Annotation: _____ _____ 2—substance to be added to "prohibited" paragraph of National List Describe why a prohibited substance: _____ _____ 3—substance was rejected by vote for amending National List Describe why material was rejected: _____ _____ 4—substance was recommended to be deferred Describe why deferred; if follow-up is needed. If follow-up needed, who will follow up _____ _____																									
<b>E. Approved by Committee Chair to transmit to NOSB:</b> _____ Committee Chair <span style="float: right;">Date</span>																									



Food Ingredient Solutions, LLC.

10 Malcolm Avenue, Unit 1  
Teterboro, NJ 07608  
T: (201) 440-4377, F: (201) 440-4211

## MATERIAL SAFETY DATA SHEET

---

NAME: Food Ingredient Solutions, LLC.  
ADDRESS: 10 Malcolm Avenue, Unit 1, Teterboro, NJ 07608  
TELEPHONE: (201) 440-4377  
FACSIMILE: (201) 440-4211

DATE: January 11, 2007

---

### SECTION I - PRODUCT INFORMATION

---

PRODUCT NAME: Red Cabbage Extract Color  
TECHNICAL NAME: Red Cabbage Juice Concentrate  
CLASSIFICATION CODE: Not hazardous  
SYNONYMS: Not Applicable  
CAS NUMBER: Not Applicable

---

### SECTION II - HAZARDOUS INGREDIENT(S)

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None

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### SECTION III - PHYSICAL DATA

---

BOILING POINT (°C): Not established  
MELTING POINT (°C): Liquid at room temperature  
FLASH POINT : >100°C (closed cup)  
SOLUBILITY : Water  
VOLATILES: Not established  
APPEARANCE AND ODOR: A dark, purplish-red liquid with a characteristic odor.

---

### SECTION IV - FIRE AND EXPLOSION DATA

---

EXTINGUISHING MEDIA: Self-extinguishing when ignition source is removed.  
SPECIAL FIRE FIGHTING PROCEDURES: This material may burn, but it will not ignite readily. Move container from fire area if it is possible to do so without risk.  
UNUSUAL FIRE AND EXPLOSION HAZARD: None

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### SECTION V - REACTIVITY DATA

---

STABILITY: This material is stable.  
MATERIALS/CONDITIONS TO AVOID: Oxidizing agents  
HAZARDOUS POLYMERIZATION: Will not occur.

---



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## **SECTION VI - HEALTH HAZARD DATA**

---

INGESTION: No product-specific health hazards.  
INHALATION: No product-specific health hazards.  
SKIN CONTACT: No product-specific health hazards.  
EYE CONTACT: No product-specific health hazards.  
OTHER EFFECTS: None.

---

## **SECTION VII - EMERGENCY FIRST AID PROCEDURES**

---

SKIN: Wash skin with mild soap and water to remove color.  
INGESTION: Seek medical attention if large quantities of substance are ingested.  
INHALATION: Although this material is not classified as an irritant, the dry powder may cause irritation in sensitive individuals. Seek immediate medical attention.  
EYES: Flush eyes with water for 15 minutes. Seek medical attention.

---

## **SECTION VIII - PERSONAL PROTECTION**

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EYES: Wear protective goggles.  
VENTILATION: Maintain adequate ventilation.  
RESPIRATORY PROTECTION: Recommended  
OTHER PROTECTIVE EQUIPMENT: Gloves are recommended to simplify clean-up and minimize the exposure to sensitive individuals.  
WORK/HYGIENIC PRACTICES: Employ good personal hygiene practices; limit direct exposure as much as possible.

---

## **SECTION IX - SPILL OR LEAK PROCEDURES**

---

Wash with ample quantities of warm, soapy water. All spills should be thoroughly cleaned until color can no longer be detected.

DISPOSAL: Properly dispose of unused or spilled material in a sanitary landfill in accordance with local, state and Federal laws, regulations and ordinances.

---

## **SECTION X - STORAGE AND HANDLING**

---

Store in tightly sealed containers out of direct light at ambient temperatures

**Food Ingredient Solutions, LLC.**

10 Malcolm Avenue, Unit 1  
Teterboro, New Jersey 07608  
T: (201) 440-4377 F: (201) 440-4211  
[www.foodcolor.com](http://www.foodcolor.com)

Wednesday, January 10, 2007

Dear Supplier-

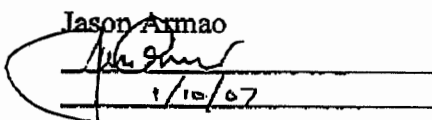
In accordance with our organic policy and the new Natural Organic Program requirements, we are required to show that we have made every effort to use organic ingredients when available.

Please check whether or not you have Red Cabbage ~~Black Carrot~~ Extract Color commercially available in a certified organic form

Available  Not Available

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Company Name: WILD FLAVORS, INC.  
Company Address: 1261 Pacific Ave. Erlanger, KY 41018  
Phone Number: 859-342-3917  
Fax Number: 859-342-3602

Print Name: Jason Armao  
Signature:   
Date: 1/10/07

Thank you,

Helen Greaves  
Food Ingredient Solutions, LLC  
(562) 965-1577  
(707) 840-0519 FAX  
[hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)



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Wednesday, January 10, 2007

Dear Supplier-

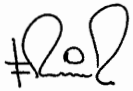
In accordance with our organic policy and the new Natural Organic Program requirements, we are required to show that we have made every effort to use organic ingredients when available.

Please check whether or not you have Red cabbage commercially available in a certified organic form

\_\_\_\_\_ Available                        X   Not Available

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Company Name:        Montana S.A  
Company Address:    Los Rosales 280, Santa Anita, Lima 43, Perú  
Phone Number:       51-1-419-3000 extension 1261  
Fax Number:           51-1-362-0736  
Print Name:           Fernando Martínez

Signature:             
Date:                    January 10, 2007

Thank you,

Helen Greaves  
Food Ingredient Solutions, LLC  
(562) 965-1577  
(707) 840-0519 FAX  
[hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)



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T: (201) 440-4377 F: (201) 440-4211  
[www.foodcolor.com](http://www.foodcolor.com)

Thursday, January 11, 2007

Dear Supplier-

In accordance with our organic policy and the new Natural Organic Program requirements, we are required to show that we have made every effort to use organic ingredients when available.

Please check whether or not you have Red Cabbage Extract Color commercially available in a certified organic form

           Available                        X   Not Available

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Company Name:   Ecom Manufacturing Corporation  

Company Address:   80 Telson Rd    
  Markham, Ontario, Canada  

Phone Number:   (905) 477-2441  

Fax Number:   (905) 477-2551  

Print Name:   Hoody  

Signature: \_\_\_\_\_

Date:   Jan. 11, 2007  

Thank you,

Helen Greaves  
Food Ingredient Solutions, LLC  
(562) 965-1577  
(707) 840-0519 FAX  
[hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)



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Thursday, January 11, 2007

Dear Supplier-

In accordance with our organic policy and the new Natural Organic Program requirements, we are required to show that we have made every effort to use organic ingredients when available.

Please check whether or not you have Red Cabbage Extract Color commercially available in a certified organic form

Available  No  Not Available

Comments:  We do not have it available

---

---

---

Company Name: Cybercolors Ltd

Company Address: Unit 8 Airport East Business Park Farmers Cross Ballygarvan  
Co Cork Ireland

Phone Number: 353 21 4375755

Fax Number: 353 21 4375756

Print Name: Noel Sexton

Signature: Noel Sexton

Date: Jan 11<sup>th</sup> 2007

Thank you,

Helen Greaves  
Food Ingredient Solutions, LLC  
(562) 965-1577  
(707) 840-0519 FAX  
[hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)



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T: (201) 440-4377 F: (201) 440-4211  
[www.foodcolor.com](http://www.foodcolor.com)

Thursday, January 11, 2007

Dear Supplier-

In accordance with our organic policy and the new Natural Organic Program requirements, we are required to show that we have made every effort to use organic ingredients when available.

Please check whether or not you have Red Cabbage Extract Color commercially available in a certified organic form

\_\_\_\_\_ Available                        X   Not Available

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Company Name:        Pronex S.A. \_\_\_\_\_

Company Address:    Jr. Los Titanes 236, La Campiña Chorrillos, Lima 9, Peru

Phone Number:        +51-1-2516630

Fax Number:            +51 1 2513696

Print Name:            Ricardo Sarmiento

Signature:             \_\_\_\_\_

Date:                    January 11<sup>th</sup>, 2007

Thank you,

Helen Greaves  
Food Ingredient Solutions, LLC  
(562) 965-1577  
(707) 840-0519 FAX  
[hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)



**Helen Greaves**

**From:** Gonzalo Balarezo [gbalarezo@imbarex.com]  
**Sent:** Wednesday, January 10, 2007 1:53 PM  
**To:** 'Helen Greaves'  
**Subject:** RE: looking for organic raw materials

Dear Helen

I must inform that we currently do not carry such products.

Thank you for your interest and have a nice day!

Saludos / Best regards / Meilleures salutations,

Gonzalo Balarezo  
Imbarex S.A.  
TEL: +51-1-251-0000  
FAX: +51-1-251-3482  
[www.imbarex.com](http://www.imbarex.com)

*Av. Produccion Nacional 229-19A  
Chornillos, Lima 09  
Peru*

---

**De:** Helen Greaves [mailto:hgreaves@foodcolor.com]  
**Enviado el:** Miércoles, 10 de Enero de 2007 02:51 p.m.  
**Para:** 'Helen Greaves'  
**CC:** info@foodcolor.com; inquire@colormaker.com; 'Francois Cormier'; 'Robin Côté'; 'noelsexton'; jarmao@wildflavors.com; 'Millie'; 'Jenny Feng'; 'Karen Murray'; 'Gissela Gonzales'; 'Fernando Martinez'; gbalarezo@imbarex.com; Richh@rfiingredients.com  
**Asunto:** looking for organic raw materials

Hi-

Can you please complete the attached forms and fax back to me at 707-840-0519 (or send via email) asap. We are trying to source USDA recognized organic raw materials for red cabbage and black carrot.

Please complete the attached forms and advise if you have such products available.

I really appreciate your time.

Thank you,  
Helen

Helen Greaves  
**Food Ingredient Solutions, LLC**  
1428 East 33rd Street  
Signal Hill, CA 90755  
mobile: 562-965-1577  
tel: 562-424-4340  
fax: 562-424-4142

1/10/2007

**Helen Greaves**

**From:** Millie [mfattibene@floridafood.com]  
**Sent:** Wednesday, January 10, 2007 1:55 PM  
**To:** Helen Greaves  
**Subject:** RE: looking for organic raw materials

*Millie Fattibene  
Florida Food Products  
2331 West Highway 44  
Eustis, FL 32726*

We do not offer either of these products.

Millie

-----Original Message-----

**From:** "Helen Greaves" <hgreaves@foodcolor.com>  
**Sent:** 1/10/2007 2:52 PM  
**To:** "Helen Greaves" <hgreaves@foodcolor.com>  
**Cc:** "info@foodcolor.com" <info@foodcolor.com>; "inquire@colormaker.com" <inquire@colormaker.com>; "Francois Cormier" <fcormier@colarome.com>; "Robin Coté" <rcote@colarome.com>; "noelsexton" <noelsexton@cybercolors.ie>; "jarmao@wildflavors.com" <jarmao@wildflavors.com>; "Millie" <mfattibene@floridafood.com>; "Jenny Feng" <jennyf@hichebio.com>; "Karen Murray" <karen.murray@overseal.com>; "Gissela Gonzales" <ggonzales@globenatural.com>; "Fernando Martinez" <fmartinez@montana.com.pe>; "gbalarezo@imbarex.com" <gbalarezo@imbarex.com>; "Richh@rfiingredients.com" <Richh@rfiingredients.com>  
**Subject:** looking for organic raw materials

Hi-

Can you please complete the attached forms and fax back to me at 707-840-0519 (or send via email) asap. We are trying to source USDA recognized organic raw materials for red cabbage and black carrot.

Please complete the attached forms and advise if you have such products available.

I really appreciate your time.

Thank you,

Helen

Helen Greaves  
**Food Ingredient Solutions, LLC**  
1428 East 33rd Street  
Signal Hill, CA 90755  
mobile: 562-965-1577  
tel: 562-424-4340  
fax: 562-424-4142

1/10/2007

**Food Ingredient Solutions, LLC.**

10 Malcolm Avenue, Unit 1  
Teterboro, New Jersey 07608  
T: (201) 440-4377 F: (201) 440-4211  
[www.foodcolor.com](http://www.foodcolor.com)

Thursday, January 11, 2007

Dear Supplier-

In accordance with our organic policy and the new Natural Organic Program requirements, we are required to show that we have made every effort to use organic ingredients when available.

Please check whether or not you have Red Cabbage Color commercially available in a certified organic form

                     Available                       Not Available

Comments: Red cabbage colorings are made from hybrids that contain large amounts of coloring principles, *i.e.*, anthocyanins. These varieties are usually not used in food processing precisely because of the quantity of anthocyanins and therefore are not available as organic. For example, these varieties could not be used in prepared salads because of the coloring principles of red cabbage bleeding onto other components of the salad therefore creating an unappealing visual impact.


Most liquid red cabbage colorings on the market contain citric acid and propylene glycol as diluent. We provide a liquid formulation (product code XCR-666L) that contains red cabbage juice color, citric acid and glycerin. Citric acid is made by fermentation and glycerin is derived from palm oil, *i.e.*, two ingredients approved for use in organic foods. Therefore, we believe that this formulation is compatible with organic foods. We also provide the red cabbage coloring in a powdered form (product code XCR-1125P). Here the coloring with citric acid is spray-dried onto maltodextrin.

Company Name: Colarome Inc.  
Company Address: 5132 Bombardier Street  
St-Hubert (QC)  
Canada J3Z 1H1  
Phone Number: (450) 766-8707  
Fax Number: (450) 766-8711

Print Name: François Cormier, Vice-President RD&QC

Signature:

Date:

  
January 11, 2007

Thank you,

Helen Greaves  
Food Ingredient Solutions, LLC  
(562) 965-1577  
(707) 840-0519 FAX  
[hgreaves@foodcolor.com](mailto:hgreaves@foodcolor.com)

**CBI Deleted Version**  
**Petition to the National Organic Standards Board and the National Organic Program for the  
Addition of Red Cabbage Extract to the National List Section §205.606**

**Item A**

This is a petition to amend the National List Section §205.606 to include Red Cabbage Extract as a non-organically produced agricultural product allowed as an ingredient in or on processed products labeled as “organic”.

**Item B**

**1. Substance Common Name.**

Red Cabbage Extract is the common name for the coloring components extracted from the scientific varieties of *Brassicaceae brassica oleracea*.

Other names: Red cabbage juice extract  
Red Cabbage Extract powder  
Red Cabbage Extract liquid  
Red cabbage juice

**2. Manufacturers' Names, Addresses, and Telephone Numbers.**

This petition is submitted by the International Association of Color Manufacturers' on behalf of our members.

International Association of Color Manufacturers'  
1620 I Street NW, Suite 925  
Washington, DC 20006  
Phone: (202) 293-5800  
Fax: (202) 463-8998

Contact: Sean Taylor, IACM Scientific Director  
E-mail: [staylor@therobertsgroup.net](mailto:staylor@therobertsgroup.net)

Relevant member companies include (but are not limited to):

D.D. Williamson & Co., Inc.  
1901 Payne Street  
Louisville, KY 40206  
USA

Wild Flavors, Inc.  
1261 Pacific Avenue  
Erlanger, KY 41018  
USA

Chr. Hansen, Inc.  
9015 West Maple Street  
Milwaukee, WI 53214  
USA

**3. Intended or current use of the substance.**

Red Cabbage Extract is a highly colored vegetable juice that has applications in food as a coloring substance. It is used to color a variety of organic and non-organic foods, including juices and other non-alcoholic beverages, fruit preparations, yogurts and confectionaries (candies). Red Cabbage Extract adds a red or pink color to foods, depending upon the exact concentration used. Red Cabbage Extract is generally used at a very low level in foods, with typical concentrations of 0.05-0.1% in the final food product. As is described in 21 CFR 73.260, Red Cabbage Extract is approved by the Food and Drug Administration (FDA) for use at all concentrations that are considered Good Manufacturing Practices and that do not exceed those levels necessary to provide the intended coloring effect.

Red Cabbage Extract is currently used as a color additive in a variety of organic and non-organic food products. In organic foods, Red Cabbage Extract has been in use as an allowed non-synthetic ingredient under "Colors, non-synthetic sources only," which is listed on the National List §205.605(a). However, the National Organic Standards Board has recommended that "Colors, non-synthetic sources only" be allowed to sunset off of the National List in October 2007. Therefore, Red Cabbage Extract must be added as an individual coloring substance onto the National List. Due to the minimal processing involved in its production, Red Cabbage Extract meets the current definition of an agricultural substance. This petition is to place Red Cabbage Extract as an allowed non-organic agricultural ingredient under §205.606 until such an organic form of Red Cabbage Extract is commercially available to organic foods producers in the necessary form, quality and quantity that is needed to fulfill the demands of the organic industry.

**4. List of crop, livestock, or handling activities for which the substance will be used. If used for handling (including processing), the substance's mode of action must be described.**

Red Cabbage Extract is used in handling only for food application as described above. The water-soluble extract is commonly added during formulation of the food product and it mixes homogeneously with the aqueous phase. Red Cabbage Extract acts to supplement the inherent natural color found in the aqueous phase of the food product formulation. This natural color is often partially or completely lost during heating steps involved in the processing. As is described above, Red Cabbage Extract is used at very low levels in food products, and it therefore is not known to impart any other technical effect in the food product.

**5. The source of the substance and a detailed description of its manufacturing or processing procedures from the basic component(s) to the final product. Petitioners with concerns for confidential business information can follow the guidelines in the Instructions for Submitting Confidential Business Information (CBI) listed in #13.**

Red Cabbage Extract is the coloring material produced from the common red cabbage, *Brassicaceae brassica oleracea*. It is commonly available for use in coloring applications as either a powder or as a liquid. Red cabbage grows naturally in all temperate regions and is eaten raw or cooked in many parts of the world.

CBI Deleted—commercial availability information

CBI

**6. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance.**

To the best of our knowledge, no previous reviews have been conducted to approve the use of Red Cabbage Extract used as a food coloring material as a nonorganically-produced agricultural ingredient in or on foods labeled as 'organic' or 'made with organic'. Currently, all food coloring substances that are non-synthetic are on the National List, Section 205.605(a), under "Colors, Non-Synthetic Sources Only" (the NOSB was provided with a technical advisory panel review of "Colors, Non-Synthetic Sources Only" that was completed in October 2005. It is included as Attachment #1 to this petition). However, the National Organic Standards Board has recommended that 'Colors, Non-Synthetic Sources Only' not be renewed to the National List, and it is therefore scheduled to sunset from the National List effective October 22, 2007. Given this regulatory history, no state or private certification programs are known to have conducted reviews of Red Cabbage Extract.

Information about Red Cabbage Extract or other forms of red cabbage products sold as organic will be found in this petition. Please see Item B Nos. 11 & 12, Petition Justification Statement.

While to the best of our knowledge no other reviews have been Red Cabbage Extract, reviews of anthocyanins, the predominant coloring components in Red Cabbage Extract, have been done. They include the Summary of Evaluations Performed by the Joint FAO/WHO Expert Committee on Food Additives (JECFA). The evaluation of anthocyanins may be found at: <http://www.inchem.org/documents/jecfa/jecmono/v17je05.htm> and is included here as Attachment #2.

The Canadian Organic Standards, that were published September 2, 2006, include colors for use in food products under the following listing: §5.4.2.1 Colouring, natural, from non-synthetic sources only and shall not be produced using synthetic solvents and carrier systems or any artificial preservative.

## **7. Information regarding EPA, FDA, and State regulatory authority registrations, including registration numbers.**

Red Cabbage Extract conforms in every aspect to the requirements mandated by the Federal Food, Drug, and Cosmetic Act. Red Cabbage Extract used as a coloring material is fully consistent with 21 CFR 73.260:

Sec. 73.260 Vegetable juice.

(a) Identity. (1) The color additive vegetable juice is prepared either by expressing the juice from mature varieties of fresh, edible vegetables, or by the water infusion of the dried vegetable. The color additive may be concentrated or dried. The definition of vegetable juice in this paragraph is for the purpose of identity as a color additive only, and shall not be construed as a standard of identity under section 401 of the act. However, where a standard of identity for a particular vegetable juice has been promulgated under section 401 of the act, it shall conform to such standard.

(2) Color additive mixtures made with vegetable juice may contain as diluents only those substances listed in this subpart as safe and suitable in color additive mixtures for coloring foods.

(b) Uses and restrictions. Vegetable juice may be safely used for the coloring of foods generally, in amounts consistent with good manufacturing practice, except that it may not be used to color foods for which standards of identity have been

## Red Cabbage Extract Petition

promulgated under section 401 of the act, unless the use of added color is authorized by such standards.

(c) Labeling. The color additive and any mixtures intended solely or in part for coloring purposes prepared therefrom shall bear, in addition to the other information required by the act, labeling in accordance with the provisions of Sec. 70.25 of this chapter.

(d) Exemption from certification. Certification of this color additive is not necessary for the protection of the public health, and therefore batches thereof are exempt from the certification requirements of section 721(c) of the act.

No listing for Red Cabbage Extract was found in the Environmental Protection Agency's (EPA) Substance Registry System (SRS).

Like all coloring materials, Red Cabbage Extract cannot obtain Generally Regarded as Safe (GRAS) status. As is detailed in the Frequently Asked Questions (FAQ) section of the FDA's GRAS guidance website (<http://www.cfsan.fda.gov/~dms/grasguid.html#Q6>):

Is a substance that is used to impart color eligible for classification as GRAS?

The short answer is "No." Under section 201(s) of the Act, the GRAS provision applies to the definition of a food additive. There is no corresponding provision in the definition (in section 201(t) of the Act) of a color additive.

However, under section 201(t)(1) and 21 CFR 70.3(f), the term color additive means a material that is a dye, pigment, or other substance made by a process of synthesis or similar artifice, or extracted, isolated, or otherwise derived from a vegetable, animal, mineral, or other source, and that is capable (alone or through reaction with another substance) of imparting color when added or applied to a food; except that such term does not include any material which FDA, by regulation, determines is used (or intended to be used) solely for a purpose or purposes other than coloring. Under 21 CFR 70.3(g), a material that otherwise meets the definition of color additive can be exempt from that definition on the basis that it is used or intended to be used solely for a purpose or purposes other than coloring, as long as the material is used in a way that any color imparted is clearly unimportant insofar as the appearance, value, marketability, or consumer acceptability is concerned. Given the construct of section 201(t)(1) of the Act and 21 CFR 70.3(f) and (g), the use of a substance that is capable of imparting color may constitute use as both a color additive and as a food additive or GRAS substance. For example, beta-carotene is both approved for use as a color additive (21 CFR 73.95) and affirmed as GRAS for use as a nutrient (21 CFR 184.1245); in some food products, beta-carotene may be used for both purposes.

**8. The Chemical Abstract Service (CAS) number or other product numbers of the substance and labels of products that contains the petitioned substance. If the substance does not have an assigned product number, this fact should be reported.**

## Red Cabbage Extract Petition

### Chemical Abstracts Service (CAS) No.:

528-58-5 (for cyanidin, the major anthocyanin coloring component in Red Cabbage Extract)  
528-53-0 (for delphinidin, an anthocyanin coloring component in Red Cabbage Extract)  
643-84-5 (for malvidin, an anthocyanin coloring component in Red Cabbage Extract)  
134-01-0 (for peonidin, an anthocyanin coloring component in Red Cabbage Extract)  
1429-30-7 (for petunidin, an anthocyanin coloring component in Red Cabbage Extract)  
134-04-3 E163 (for pelargonidin, an anthocyanin coloring component in Red Cabbage Extract)

### European Community (EC) No.:

E163 (for anthocyanins)

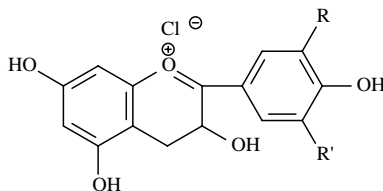
### Color Index No.: None found

Please see Attachment #3 for label(s) of products that contain the petitioned substance.

### **9. The substance's physical properties and chemical mode of action including (a) chemical interactions with other substances, especially substances used in organic production; (b) toxicity and environmental persistence; (c) environmental impacts from its use or manufacture; (d) effects on human health; and, (e) effects on soil organisms, crops, or livestock.**

Red Cabbage Extract is a red/pink powder or liquid, depending upon the processing method. Red Cabbage Extract is soluble in water and mainly insoluble in ethanol and water. Although a variety of colored compounds are known to be present, the major coloring principles of Red Cabbage Extract are anthocyanins.

Anthocyanins are polyphenolic natural pigments that are widely distributed in the plant kingdom where they occur as glycosides (i.e., associated with a sugar moiety) in combinations that produce orange, red, blue, or purple coloration in a variety of fruits and vegetables. Commercial production of anthocyanins for use as coloring materials began roughly 30 years ago. They are obtained from edible fruits and vegetables, and traditional sources are black currant fruits, elderberry and black currant. The chemical structure of the most commonly occurring anthocyanins that are found in fruits and berries are shown below.



Cyanidin: R=OH, R'=H  
Delphinidin: R, R'=OH  
Malvidin: R,R'=OCH<sub>3</sub>  
Pelargonidin: R,R'=H  
Peonidin: R=OCH<sub>3</sub>, R'=H  
Petunidin

Water-soluble anthocyanin pigments such as 3-mono- and 3,5-di-glucosides of malvidin, delphinidin and cyanidin, as well as their acyl ester derivatives, are responsible for the orange, red, blue, and purple colors of anthocyanin-containing fruits. The color intensity increases as pH falls, with stability being greatest below pH 4.5. Fruit extracts that contain anthocyanins are stable to light and temperature, but they are sensitive to oxygen, SO<sub>2</sub> concentration, and the presence of metal ions such as iron, tin, and aluminum which cause them to produce a bluer color (Marmion, 1991).

### **(a) Chemical interactions with other substances, especially substances used in organic production.**



## Red Cabbage Extract Petition

There are no reports of chemical interactions with other substances used in organic production of the food products in which Red Cabbage Extract is used as a coloring material.

### **(b) Toxicity and environmental persistence.**

No relevant toxicity or environmental studies for Red Cabbage Extract were found. As anthocyanins are the predominant coloring pigments found in Red Cabbage Extract, data found for them is summarized below.

#### Genotoxicity

Anthocyanins are not genotoxic by a weight of evidence analysis (Brown & Dietrich, 1979; Ferguson *et al.*, 1985; MacGregor & Jurd, 1978; Viola & Nosotti, 1978; Haveland-Smith, 1981).

#### Acute Toxicity

The extremely low acute oral toxicity of mixed anthocyanins (cyanidin, delphinidin, petunidin, and malvidin) is demonstrated by mouse and rat LD<sub>50</sub> values greater than 25 and 20 g/kg bw, respectively (Pourrat *et al.*, 1967). Welch's grape color extract administered to rats at 0, 5, 10, 15 and 20% of the diet produced no toxic signs or effects over the 30 day testing period (Stevens and Gallo, 1977).

#### Long-term Toxicity

No overt signs of toxicity were seen in rats given oral doses of 3000 mg/day mixed anthocyanins for 90 days (Pourrat *et al.*, 1967). No adverse effects occurred when dogs were fed a diet containing 15% grape color powder for 13 weeks (Becci *et al.*, 1983a) or grape color extract for 90 consecutive days (Cox and Babish, 1978).

#### Reproductive/Developmental Toxicity

No adverse effects on reproduction occurred when grape color extract was fed to rats at dietary levels of 7.5 % and 15 % through two generations (Becci *et al.*, 1983b; Cox and Babish, 1978). There were no teratogenic effects in multi-generation studies with rats, mice, or rabbits (Pourrat *et al.*, 1967).

#### Metabolism

Anthocyanins are not readily absorbed from the intestine and the small quantity absorbed appears to be excreted by the kidney in its unchanged form (Horwitt, 1933).

#### Environmental persistence

There is no evidence of environmental persistence from the production of Red Cabbage Extract or anthocyanins used as a coloring material in foods.

### **(c) Environmental impacts from its use or manufacture;**

There are no environmental impacts from the production of Red Cabbage Extract or its use in foods.

### **(d) Effects on human health**

As described above, Red Cabbage Extract has not been shown to be genotoxic in animal models, suggesting that it also has no genotoxic effects in humans. Additionally, the very high LD<sub>50</sub> value in acute toxicity studies suggests that it can be considered non-toxic to humans.

As noted above, preparations of Red Cabbage Extract have very high concentrations of anthocyanin compounds. These naturally occurring antioxidants have been shown to be effective free radical scavengers in the body. The intake of natural antioxidants promotes general good health, and some evidence suggests that they reduce the risks of cancer, the neurodegenerative effects of aging, and the risks of developing cardiac diseases.

### **(e) Effects on soil organisms, crops, or livestock.**

There is no evidence of any effect from Red Cabbage Extract on soil organisms, crops, or livestock from the production of Red Cabbage Extract.

**10. Safety information about the substance including a Material Safety Data Sheet (MSDS) and a substance report from the National Institute of Environmental Health Studies**

The Material Safety Data Sheet for Red Cabbage Extract is included as Attachment #4. No substance report for Red Cabbage Extract from the National Institute of Environmental Health Studies was found.

**11. Research information about the substance which includes comprehensive substance research reviews and research bibliographies, including reviews and bibliographies which present contrasting positions to those presented by the petitioner in supporting the substance's inclusion on or removal from the National List. For petitions to include non-organic agricultural substances onto the National List, this information item should be responded to with research concerning the availability of organic alternatives.**

Safety Reviews:

JECFA (1982). Toxicological evaluation of certain food additives. WHO Food Additives Series No. 17. Twenty-sixth meeting of the Joint WHO/FAO Expert Committee on Food Additives.

References:

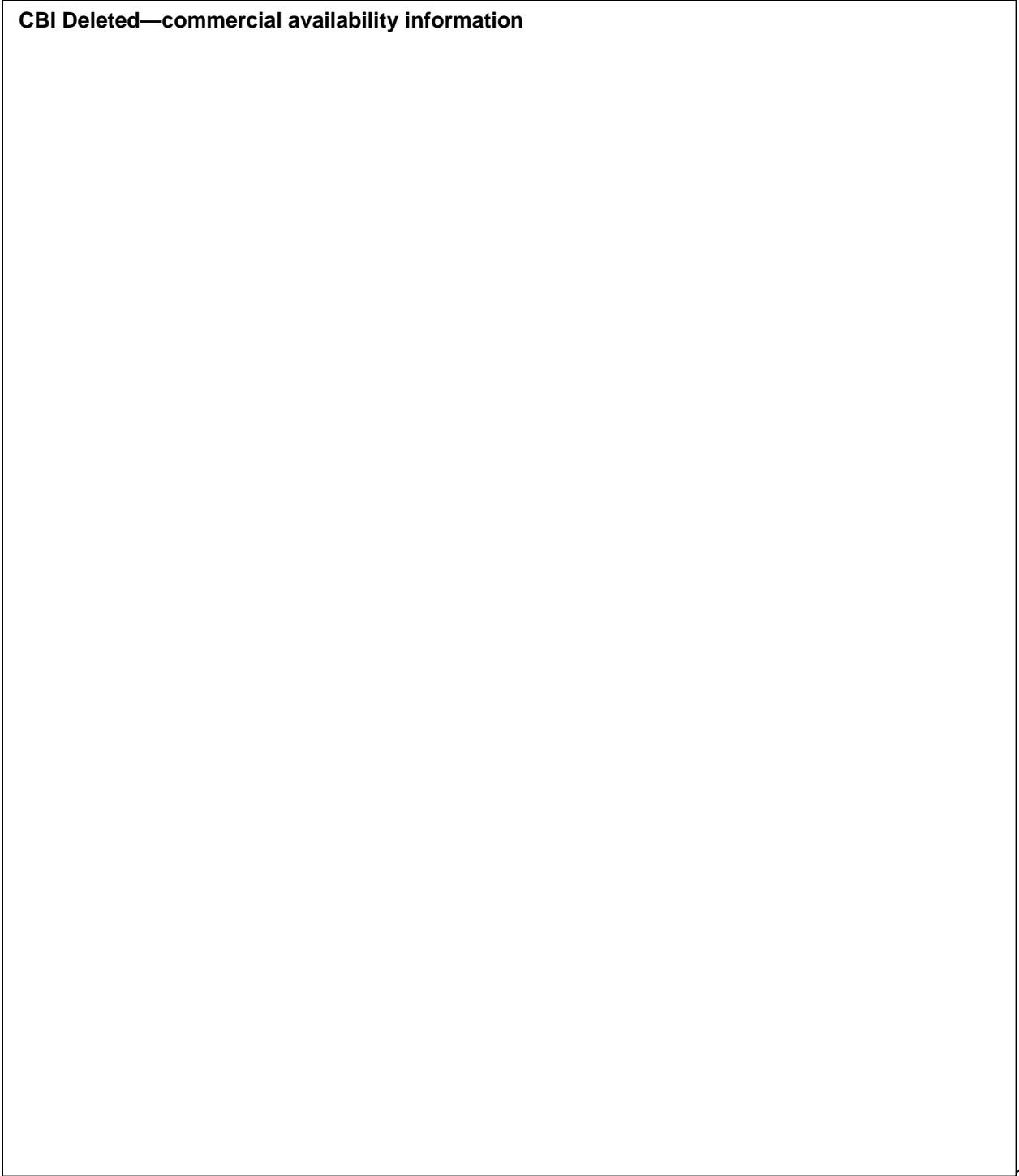
- Becci P.J., Hess F.G., Gallo M.A., Johnson W.D. and Babish J.G. (1983a) Subchronic feeding study of grape colour extract in beagle dogs. *Food Chemical Toxicology* **21**, 75-77.
- Becci P.J., Hess F.G., Babish J.G., Gallo M.A. and Voss K.A. (1983b) Reproduction study of grape colour extract in rats. *Food Chemical Toxicology* **21**, 79-83.
- Brown J.P. & Dietrich P.S. (1979) Mutagenicity of plant flavonols in the *salmonella*/mammalian microsome test. *Mutation Research* **66**, 223-240.
- Cox G.E. and Babish J.G. (1978) Evaluation of the safety of dietary administration of special grape color powder (Type BW-AT) on reproduction, lactation, and maturation when fed to Sprague-Dawley rats. Food and Drug Research Laboratories. Lab. No. 5417.
- Ferguson L.R., van Zijl P., Holloway W.D. and Jones W.T. (1985) Condensed tannins induce micronuclei in cultured V79 Chinese hamster cells. *Mutation Research* **158**, 89-95.
- Haveland-Smith R.B. (1981) Evaluation of the genotoxicity of some natural food colours using bacterial assays. *Mutation Research* **91**, 285-290.
- Horwitt M.K. (1933) Observations on behavior of the anthocyan pigment from concord grapes in the animal body. *Proceeding of the Society for Experimental Biology and Medicine* **30**, 949-951.
- MacGregor J.T. & Jurd L. (1978) Mutagenicity of plant flavonoids: Structural requirements for mutagenic activity in *Salmonella typhimurium*. *Mutation Research* **54**, 297-309.
- Marmion, D.M.; Handbook of U.S. Colorants for Foods, Drugs, Cosmetics and Medical Devices. 3rd Ed.; John Wiley & Sons, Inc.: New York, New York, 1991.
- Pourrat H., Bastide P., Dorier P., Pourrat M.A. and Tronche P. (1967) Préparation et activité thérapeutique de quelques glycosides d'anthocyanes. *Chimie Thérapeutique* **2**, 33-38.
- Stevens K.R. and Gallo M.A. (1977) Thirty-day dose range finding study of Welch's grape extract in rats. Food and Drug Research Laboratories. Lab No. 5388.
- Viola M. & Nosotti A. (1978) Applicazione del test di Ames su Alcuni coloranti. *Bollettino Chimico Farmaceutico* **117**, 402-415.

See Attachment #5 for information on the history, culinary use, and medical use of red cabbage.

Commercial Availability Research:

As justification for this petition to place Red Cabbage Extract for use as a food coloring substance on National List section §205.606, we have done considerable research into the commercial availability of organic forms of Red Cabbage Extract.

**CBI Deleted—commercial availability information**



CBI

**12. Petition Justification Statement which provides justification for any of the following actions requested in the petition:**

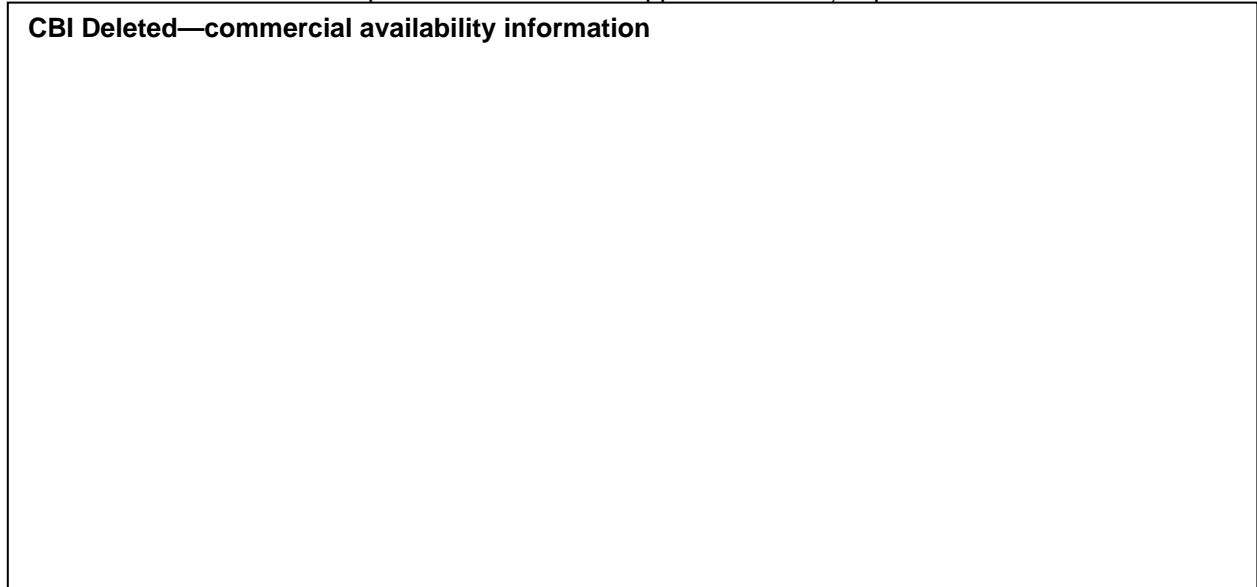
Natural colors have historically been an essential component of many food products. Practically all consumers judge the palatability of foods not only on flavor, texture, and aroma, but also on appearance. A large number of these consumers would find foods that did not meet their expectations for vibrant yet

reliable colors to be unappealing and perhaps would suspect that they are not sufficiently nutritious or even, in some cases, safe to eat. Consumer acceptance of these foods is therefore based in large part upon the ability of processed food manufacturers to utilize food colors to maintain expected and desirable appearances for their products.

Organic consumers expect no less from their foods. Organic foods are chosen by consumers because they know that they are healthy and reliable, but also because they look good to consumers. For many foods, a large part of this positive appearance is due to the use of natural colors. Packaged organic black cherry yogurt looks like delicious yogurt with fresh black cherries swirled in because of the addition of grape juice. Organic portabello mushroom veggie hot dogs resemble a “traditional” hot dog due to the addition of paprika. Organic strawberry cheesecake looks like, well, strawberry cheesecake through the addition of beet juice. In all cases, the consumer is guaranteed that in addition to the great flavor and health benefits of eating organic foods, they also have the expected appearance and a highly desirable palatability.

The use of natural colors in organic and traditional foods is critical due to the processes involved in food production. In many processes there is at least one and occasionally several heating steps involved in the conversion of raw ingredients to final food products. In other cases the blending of ingredients changes the pH or increases the rate of oxidation. These have a deleterious effect on the colors in the raw materials, turning a bright red strawberry into something else entirely—something that consumers of traditional and organic foods might find unpalatable. Supplementing or replacing the naturally-contained color in the raw materials of food products with small amounts of natural colors ensures that the finished food products maintain the appeal of natural, unprocessed foods.

**CBI Deleted—commercial availability information**



The members of IACM have a long history of working with the US Food and Drug Administration (FDA) and with international regulatory bodies such as the Joint Expert Committee on Food Additives (JECFA) to ensure that our coloring materials are safe and conform to the expectations of governments, customer companies, and consumers. We feel strongly that our relationship with the National Organic Program (NOP) and the National Organic Standards Board (NOSB), while it has just begun, will also be positive and productive for all involved while being in the best interests of the consumer and of the organic industry in general. To that end, the members of IACM that produce natural colors currently and in the future will produce food colors that can meet the requirements of the National Organic Program.

**Conclusions:**

The members of the International Association of Color Manufacturers (IACM) that produce natural colors are committed to developing commercially available certified organic colors when a consistent supply chain that meets our needs can be established. Currently, this supply chain doesn't exist. There are issues related to inconsistent quality, insufficient quantity, and ready access to organic raw ingredients. We expect that over time these issues will be resolved, and we continue to work to resolve them. In the interim, however, we feel that it is essential to provide our organic customers that rely on Red Cabbage

Extract as a coloring material a commercially available form. Therefore, we respectfully submit this petition for Red Cabbage Extract to be added to the National List section §205.606 as a natural color that is compliant with the National Organic Program and that can be used by organic handlers.

The scheduled sunset date for “Colors, non-synthetic sources only” will create a vacuum for organic handlers who incorporate natural colors into their food products. This petition, among others filed by us and others for natural colors, will work to fill this vacuum, and will provide organic handlers and the growing organic industry with a necessary continuity that is essential to eliminate the possibility of disruptions in production, the need for product reformulation, and the requirements for new product labeling. While work towards a certified organic process for Red Cabbage Extract used as a coloring material continues, this petition and others will work to minimize the potential impact of the October 2007 sunset for “Colors, non-synthetic sources only” to the organic industry.

While IACM supported the renewal of “Colors, non-synthetic sources only” to the National List section 205.605(a), we do recognize that there were procedural difficulties with its initial placement on the National List that warranted its removal for legal reasons. The members of IACM have substantial interest in the potential growth of the organic industry, and we see the value in developing certified organic processes for our coloring materials. Should this petition be approved, Red Cabbage Extract used as a coloring material will be supplied to our organic customers by our member companies only until such a time as processes for certified organic Red Cabbage Extract that can be used as a coloring material are commercially available. Until that time, our customer organic handlers will be able to incorporate a spectrum of vibrant natural colors into their products, and the consumers will continue to purchase organic food products that meet their desires for a healthy, colorful diet.

### 13. Commercial Confidential Information Statement:

CBI Deleted—commercial availability information

CBI

### List of Attachments:

- Attachment #1: Technical Advisory Panel Review of “Colors, Non-Synthetic Sources Only”
- Attachment #2: JECFA Evaluation of Anthocyanins
- Attachment #3: Label(s) of Products containing Red Cabbage Extract
- Attachment #4: Material Safety Data Sheet for Red Cabbage Extract used as a coloring material
- Attachment #5: Information on the history, culinary use, and medical use of Red Cabbage
- Attachment #6: Commercial Availability Information (CBI—Not included in CBI-deleted versions)

1 **OVERVIEW OF FOOD COLOR ADDITIVES**  
2 **Prepared for the USDA National Organic Program and**  
3 **the National Organic Standards Board**  
4 **October 14, 2005**  
5

6 This paper provides a general overview of color additives and how they are regulated in  
7 the United States. Use of colors in organic food production and potential adverse effects  
8 from the consumption of some specific colorants also are discussed.  
9

10 **I. EXECUTIVE SUMMARY**  
11

12 Colors are defined as any dye, pigment, or other substance that can impart color to a  
13 food, drug, or cosmetic or to the human body. Colors are regulated in the United States  
14 by the U.S. Food and Drug Administration (FDA) and are categorized either as  
15 “certifiable” (those derived primarily from petroleum and known as coal-tar dyes) or  
16 “exempt from certification” (those obtained largely from mineral, plant, or animal  
17 sources). Currently, there are no GRAS (“generally recognized as safe”) exemptions for  
18 color additives. Consequently, all color additives are subject to premarket approval  
19 requirements. To obtain approval from FDA for a new color additive, the manufacturer  
20 must submit a petition demonstrating the safety and suitability of the new color additive  
21 or new use. FDA is then responsible for evaluating the petition and determining whether  
22 the color additive is safe for human consumption. Additionally, the decision regarding  
23 batch certification is made during FDA’s review of the petition. If required, a sample  
24 from each manufactured batch must be submitted to FDA for analysis and certification.  
25 With this regulatory process, color additives generally have a good safety record;  
26 however, some adverse reactions have been noted. Specifically, allergic effects to  
27 Yellow No. 5 and carmine and cochineal extract have been observed. Additionally,  
28 possible carcinogenic effects have led FDA to ban uses of FD&C Red No. 3 and FD&C  
29 Red No. 2.  
30

31 **II. CHARACTERIZATION**  
32

33 Color additives are defined as any dye, pigment, or other substance that can impart color  
34 to a food, drug, or cosmetic or to the human body. Color additives include those that are  
35 white, black, and gray (Barrows et al., 2003). They also may include any chemical that  
36 reacts with another substance and causes formation of a color. In the United States, FDA  
37 is responsible for regulating color additives. For regulation purposes, FDA categorizes  
38 colors as “certifiable” (those derived primarily from petroleum and known as coal-tar  
39 dyes) and “exempt from certification” (those obtained largely from mineral, plant, or  
40 animal sources).  
41

42 Certifiable colors can be further categorized into straight colors, mixtures, and dyes and  
43 lakes. Straight colors are those color additives that have not been mixed or chemically  
44 reacted with any other substance. Mixtures are the resulting color additives that are  
45 formed by mixing one color additive with one or more color additives or non-colored  
46 diluents, without a chemical reaction. Dyes are defined as those that “...dissolve in water

1 and are manufactured as powders, granules, liquids or other special purpose forms. They  
2 can be used in beverages, dry mixes, baked goods, confections, dairy products, pet foods  
3 and a variety of other products” (FDA, 1993). Lakes are the water insoluble form of the  
4 dye. Lakes tend to be more stable than dyes and ideal for coloring products containing  
5 fats and oils or items lacking sufficient moisture to dissolve dyes. Some examples where  
6 lakes are used include coated tablets, cake and donut mixes, hard candies, and chewing  
7 gums. Additionally, certifiable colors that are added to food are chemically classified as  
8 azo, xanthene, triphenylmethane, and indigoid dyes.

### 10 III. REGULATION

#### 12 A. History

14 Color additives were initially regulated in the United States under the U.S. Department of  
15 Agriculture’s (USDA) Bureau of Chemistry. In 1906, the Food and Drugs Act was  
16 passed by Congress, which prohibited the use of poisonous or deleterious colors in  
17 confectionery and the coloring or staining of food to conceal damage or inferiority. In  
18 1927, responsibility of the Food and Drugs Act was transferred to FDA. Increasing  
19 government oversight, the Federal Food, Drug, and Cosmetic Act (FFDCA) was passed  
20 in 1938 and established the three following categories for colors:

- 22 • **FD&C:** colors used in foods, drugs and cosmetics;
- 24 • **D&C:** colors used in drugs and cosmetics when in contact with mucous  
25 membranes or ingested; and
- 27 • **Ext. D&C:** colors used in products applied externally.

29 The FFDCA mandated a listing of those coal-tar colors that were determined to be  
30 “harmless and suitable” for use in foods, drugs, and cosmetics. FDA interpreted  
31 “harmless” to mean harmless at any level (Francis, 2000). Additionally, the FFDCA  
32 required the listing of new colors, mandated the previously voluntary certification  
33 program for batches of listed color with associated fees, and contained adulteration and  
34 misbranding provision for the use of coal-tar colors in food, drugs, and cosmetics  
35 (Barrows et al., 2003).

37 The Color Additive Amendments to the FFDCA were established in 1960 because FDA’s  
38 interpretation of “harmless” was not workable. Under the Color Additive Amendments,  
39 “color additives” were defined and a requirement was established that only color  
40 additives (except coal-tar hair dyes) listed as “suitable and safe” for a given use could be  
41 used in foods, drugs, cosmetics, and medical devices. A current listing of FDA approved  
42 colorants, including those that do and do not require certification, is provided in Table 1  
43 (Barrows et al., 2003). As illustrated in Table 1, all of these colorants are straight colors.

1  
2

**Table 1. FDA Approved Food Color Additives**

<b>21 CFR Section</b>	<b>Straight Color</b>	<b>Use and Restrictions</b>
<b>Color Additives Subject To Certification</b>		
74.101	FD&C Blue No. 1	Foods generally
74.102	FD&C Blue No. 2	Foods generally
74.203	FD&C Green No. 3	Foods generally
74.250	Orange B	Casings or surfaces of frankfurters and sausages, NTE 150 ppm
74.302	Citrus Red No. 2	Skins of oranges not intended or used for processing, NTE 2.0 ppm (by weight)
74.303	FD&C Red No. 3	Foods generally
74.340	FD&C Red No. 40	Foods generally
74.705	FD&C Yellow No. 5	Foods generally
74.706	FD&C Yellow No. 6	Foods generally
<b>Color Additives Exempt From Certification</b>		
73.30	Annatto extract	Foods generally
73.35	Astaxanthin	Salmonid fish feed
73.40	Dehydrated beets (beet powder)	Foods generally
73.50	Ultramarine blue	Salt for animal feed
73.75	Canthaxanthin	Foods generally, NTE 30 mg/lb of solid or semisolid food or per pint of liquid food; broiler chicken feed; salmonid fish feed
73.85	Caramel	Foods generally
73.90	$\beta$ -Apo-8'-carotenal	Foods generally, NTE 15 mg/lb solid, 15 mg/pt liquid
73.95	$\beta$ -Carotene	Foods generally
73.100	Conchineal extract; carmine	Foods generally
73.125	Sodium copper chlorophyllin	Citrus-based dry beverage mixes, NET 0.2% dry mix
73.140	Toasted partially defatted cook cottonseed flour	Foods generally
73.160	Ferrous gluconate	Ripe olives
73.165	Ferrous lactate	Ripe olives
73.169	Grape color extract	Nonbeverage food
73.170	Grape skin extract (enocianina)	Still and carbonated drinks and ades; beverage bases; alcoholic beverages
73.185	Haematococcus algae meal	Salmonid fish feed
73.200	Synthetic iron oxide	Sausage casings, NTE 0.1%



21 CFR Section	Straight Color	Use and Restrictions
		(by weight); dog and cat food, NTE 0.25% (by weight)
73.250	Fruit juice	Foods generally
73.260	Vegetable juice	Foods generally
73.275	Dried algae meal	Chicken feed
73.295	Tagetes (Aztec marigold mean and extract)	Chicken feed
73.300	Carrot oil	Foods generally
73.315	Corn endosperm oil	Chicken feed
73.340	Paprika	Foods generally
73.345	Paprika oleoresin	Foods generally
73.355	Phaffia yeast	Salmonid fish feed
73.450	Riboflavin	Foods generally
73.500	Saffron	Foods generally
73.575	Titanium dioxide	Foods generally, NTE 1% (by weight)
73.600	Turmeric	Foods generally
73.615	Turmeric oleoresin	Foods generally

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The Color Additive Amendments also established the “Delaney Clause” that prohibited the listing of a color additive shown to be carcinogenic.

**B. Petition Process**

Under the current regulatory system, FDA is responsible for ensuring the safety of new food additives, including colors. However, food additive petitions are not required for food additives that are identified as “generally recognized as safe” (GRAS) substances. Currently, there are no GRAS (“generally recognized as safe”) exemptions for color additives. Consequently, all color additives are subject to premarket approval requirements. These requirements are listed in Title 21 of the Code of Federal Regulations (CFR), Part 71. In filing a color additive petition, the manufacturer is responsible for providing FDA with information including, but not limited to the following:

- Identification of the food additive;
- Physical, chemical, and biological properties;
- Chemical specifications;
- Manufacturing process description;
- Stability data;
- Intended uses and restrictions;
- Labeling<sup>1</sup>;

<sup>1</sup> Any labeling that will be required by applicable provisions of the FFDCFA on the finished food by reason of the use of the food additive.

- 1 • Tolerances and limitations<sup>2</sup>;
- 2 • Analytical methods for enforcing chemical specifications;
- 3 • Safety studies; and
- 4 • Estimate of probable exposure.

### 6 **C. Safety Assessment**

7  
8 A color additive petition must demonstrate the safety and suitability of the new color  
9 additive or new use. FDA is responsible for evaluating petitions and determining  
10 whether the additive is safe for human consumption. Generally, this determination is  
11 made by examining the following parameters:

- 12
- 13 • History of use or natural occurrence;
- 14 • Consumption ratio, if applicable;
- 15 • Exposure levels;
- 16 • Inherent toxicity of the substance;
- 17 • Toxicological data on the substance or on structurally-related compounds; and
- 18 • Metabolism of the substance (either known or forecasted on the basis of data for
- 19 structurally-related compounds).

20  
21 FDA's safety assessment includes a review toxicity data such as the results of controlled  
22 animal studies. Ideally, a complete range of data, including short- and long-term toxicity  
23 studies, as well as studies that examine possible reproductive, carcinogenic, mutagenic,  
24 and sensitization characteristics of the color additive would be available for review.  
25 Sometimes a complete set of toxicology data is not available. One method of gaining  
26 additional insight on a color lacking a complete set of data is to evaluate the toxicity of  
27 structurally related substances. By evaluating structurally related substances, scientists  
28 can try to determine how the compound is absorbed, distributed, and metabolized within  
29 the body, and how it may act on target organs in the body. Based on these data and  
30 various safety factors, FDA determines a safe exposure level for the color additive.

31  
32 FDA then compares the safe exposure level to the amount likely to be consumed in food  
33 taking into consideration the composition and properties of the substance and the  
34 proposed conditions of use. Because the absolute safety of any substance can never be  
35 proven, FDA must determine if the additive is safe under the proposed conditions of use,  
36 based on the best scientific knowledge available. For more information, see  
37 <http://vm.cfsan.fda.gov/~dms/opa-cg8e.html>.

38  

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<sup>2</sup> According to 21 CFR Part 571, "If the food additive is one for which a tolerance limitation is required to assure its safety, the level of use proposed should be no higher than the amount reasonably required to accomplish the intended physical or other technical effect, even though the safety data may support a higher tolerance."

1 **D. Batch Certification**

2  
3 As described in Section II, FDA requires certification of every manufactured batch of  
4 some color additives. Color additives requiring and exempt from batch certification are  
5 listed in Table 1.

6  
7 Batch certification is required when the composition of the color needs to be controlled in  
8 order to protect public health. Procedures for color additive batch certification are  
9 available in 21 CFR Part 80. Under these procedures, a sample from each manufactured  
10 batch of certifiable color additive, as well as a "Request for Certification," must be  
11 submitted to FDA's Color Certification Branch. The "Request for Certification" should  
12 provide information regarding the batch weight, storage conditions, and the use for which  
13 it is being certified. FDA is then responsible for evaluating the batch's physical  
14 appearance and performing chemical analyses including, but not limited to the following:

- 15  
16 • Purity (total color content);  
17 • Moisture;  
18 • Residual salts;  
19 • Unreacted intermediates;  
20 • Colored impurities other than the main color;  
21 • Any other specified impurities; and  
22 • Heavy metals (lead, arsenic, and mercury).

23  
24 If the sample meets FDA's requirements, FDA will issue a certificate for the batch that  
25 identifies the color additive, batch weight, uses for which the color additive is certified,  
26 the name and address of the owner, as well as other information. The batch also is  
27 assigned a unique lot number.

28  
29 Colors that are exempt from certification are usually derived from plant or mineral  
30 sources and must comply with the identity and purity specification and use limitation  
31 described in their listing regulations. According to 21 CFR 71.1(c)G, "If exemption from  
32 batch certification is requested, the reasons why it is believed such certification is not  
33 necessary (including supporting data to establish the safety of the intended use)."  
34 Consequently, a petition for exemption from certification must show why such  
35 certification is not necessary for the protection of public health (21 CFR 71.18). Color  
36 additives that are exempt from batch certification for one use may be subject to batch  
37 certification for other uses. Because natural colorants are exempt from a lengthy  
38 certification process, there has been a strong trend over the past 50 years toward the use  
39 of these color additives as compared to synthetic coal-tar dyes (Francis, 2000).

40  
41 **IV. ADVERSE EFFECTS**

42  
43 Although food colors generally have a good safety record, some adverse reactions have  
44 been noted. For example, Yellow No. 5 (listed as tartrazine on medicine labels; a color  
45 found widely in beverages, desserts, processed vegetables, drugs, makeup, and many  
46 other products) causes itching or hives in a small population sub-group (FDA, 2001).

1 Another color that causes allergic reactions is carmine and cochineal extract. Carmine  
2 and cochineal extract are scarlet red pigments that come from the female coccid insect  
3 *Dactylopius coccus* var. *Costa* (family Dactylopiidae, superfamily Coccoidea), which is  
4 parasitic on several species of cacti, particularly the cochineal figs produced by prickly  
5 pear (*Opuntia*) cactus *Nopalea cochenillifera*. There have been several case reports of  
6 anaphylaxis and urticaria resulting from ingestion of food or drink containing carmine  
7 (Beaudouin et al., 1995; Baldwin et al., 1997; DiCello et al., 199a,b; Chung et al., 2001).

8  
9 In 1960, FDA banned uses of FD&C Red No. 3 including cosmetics and externally  
10 applied drugs because large amounts of the color caused thyroid tumors in male rats  
11 (FDA, 2001). In 1976, FDA issued a ban on FD&C Red No. 2 because there appeared to  
12 be a statistically significant increase in malignant tumors when fed high doses of the  
13 color (FDA, 2001).

#### 14 15 **V. USE OF COLORS IN ORGANIC FOODS**

16  
17 Colors are currently on the National List of Allowed and Prohibited Substances for use in  
18 organic foods. Colors were not added to the National List as the result of a petition.  
19 Instead, they were included among substances initially placed on the National List when  
20 USDA promulgated regulations pursuant to the Organic Food Production Act of 1990.  
21 According to 21 CFR Part 205.605, nonagricultural (nonorganic) colors are allowed as  
22 ingredients in or on processed food products labeled as “organic” or “made with  
23 organic.” Only nonsynthetic colors (as a group) are allowed.

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44

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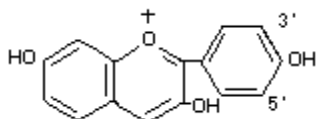
## ANTHOCYANINS

### Explanation

These compounds have not previously been reviewed by the Joint FAO/WHO Expert Committee on Food Additives.

### Introduction

Anthocyanins represent a large group of water-soluble plant pigments of the 2-phenylbenzopyrylium (flavylium) structure (Kuhnau, 1976). The class, "Anthocyanins", consists of some 200 or more compounds (Parkinson & Brown, 1981) chemically combined to a sugar moiety (glucose < rhamnose < galactose < xylose < arabinose) of which the most common are:



Anthocyanin structure

Compound	Carbon ring B substitution	
	3'	5'
pelargonidin	-H	-H
cyanidin	-OH	-H
delphinidin	-OH	-OH
peonidin	-OCH <sub>3</sub>	-H
petunidin	-OCH <sub>3</sub>	-OH
malvidin	-OCH <sub>3</sub>	-OCH <sub>3</sub>

The blue to red colour imparted by the anthocyanins depends largely upon the pH of the medium (Francis, 1977). The anthocyanins normally exist as glycosides; the aglycone component alone is extremely unstable.

The anthocyanin pigments present in grape-skin extract consist of diglucosides, monoglucosides, acylated monoglucosides, and acylated diglucosides of peonidin, malvidin, cyanidin, petunidin and delphinidin. The amount of each compound varies depending upon the variety of grape and climatic conditions.

### BIOLOGICAL DATA

#### BIOCHEMICAL ASPECTS

##### Absorption, distribution and excretion

Anthocyanins are poorly absorbed from the gastrointestinal tract. Anthocyanins (notably delphinidin) extracted from concord grapes were administered to rats by either gavage (100 mg) or by percutaneous injection (50 mg) and the urine tested for unchanged anthocyanins by an HCl-acid red test (Horwitt, 1933). Anthocyanin was detected in the urine of rats administered anthocyanin by the percutaneous route but not by gavage. In studies in dogs (Horwitt, 1933) administered anthocyanin (500 mg) by gastric fistula, no

urinary coloration was demonstrated. However, in the rabbit, 1-2% of an oral dose of anthocyanin (500 mg) was present in the urine as the unchanged pigment. It should be noted that the HCl-acid red test used in this study would only detect unchanged anthocyanins (Scheline, 1978). If the anthocyanins were transformed into colourless pseudobases or pale anhydrolases prior to absorption and excretion, they would not be detected (Kuhnau, 1976).

The absence of pigmented urine in normal individuals ingesting anthocyanin-containing foods in humans coupled with the apparent lack of metabolism of anthocyanins has been interpreted as showing that gastrointestinal absorption of these compounds does not occur (Clark & Mackay, 1950). Clinical studies have reported anthocyaninuria in patients with a beet allergy, following the ingestion of large amounts of beets (Zindler & Colovos, 1950). However, this has been identified as betaninuria, and is related to the excretion of betanin, rather than anthocyanins (Forrai et al, 1968).

Tissue disposition of anthocyanosides derived from Vaccinium myrtillus (approximately 25% anthocyanins) was examined in Charles River rats following intraperitoneal (i.p.) or intravenous (i.v.) injection. Following acute administration by either route, anthocyanins were found to distribute rapidly into the tissues.

Accumulation was primarily in the kidney, skin, liver, heart and lung (Lietti & Forni, 1976). There was also some indication of lymph node uptake of the anthocyanins. Elimination of the compound occurred primarily via the kidney (25-29%/24 hours) and bile (15-18%/24 hours). Because of the high urinary excretion rate in these studies, the anthocyanins are considered to be eliminated by both glomerular filtration and renal tubular excretion (Lietti & Forni, 1976).

#### Metabolism

Studies in rats have shown that some anthocyanins (notably pelargonidin, delphinidin, malvidin) were subject to degradation by intestinal bacteria (Griffiths & Smith, 1972a, b). p-hydroxyphenyl-lactic acid was detected in the urine of rats following the oral administration of pelargonidin (a 3',3'-diglycoside of pelargonidin). Decoloration of "anthocyanin" by rat caecal cell extracts has been reported (Haveland-Smith, 1981). Anthocyanin extracts incubated with human faecal suspensions for 2-3 days remained unchanged (as measured by a reduction in suspension colour).

The presence of 2 unidentified metabolites in the urine of rats after gavage with 100 mg of delphinidin has also been reported (Scheline, 1978). Rats gavaged with malvidin (a 3',5'-diglycoside of malvidin) had 3 unidentified metabolites present in the urine. These studies suggest that some of the metabolites of anthocyanins (aglycones) can be absorbed. Metabolism of anthocyanins may occur to a limited degree by ring fission and/or glycoside hydrolysis of the anthocyanins (Parkinson & Brown, 1981). Cyanidin, the most widespread anthocyanin, has not been shown to be attacked by intestinal bacteria (Scheline, 1968; Griffiths & Smith, 1972a).

#### Effects on enzymes and other biochemical parameters

Both pelargonidin and delphinidin have been shown to inhibit aldoreductase in the lens of rats (Varma & Kinoshita, 1976). In other studies, anthocyanin-3-monoglycosides (namely petunidin-, delphinidin- and malvidin-) extracted from grapes were found to increase the activity of alpha glucan phosphorylase and glutamic acid dicarboxylase but inhibit glycerol dehydrogenase, malate dehydrogenase and hexokinase (Carpenter et al., 1967).

Other studies have shown that anthocyanins are capable of chelating ions such as copper (Somaatmadja et al., 1964) and iodide (Moudgal et al., 1958). The iodide ion was observed in vitro to form a stable complex with the anthocyanins (Moudgal et al., 1958).

#### TOXICOLOGICAL STUDIES

##### Special studies on mutagenicity

Cyanidin chloride was not mutagenic when examined in the Ames assay using Salmonella typhimurium strain TA-98 with and without metabolic activation (arochlor 1254 induced rat liver S-9 fraction) (MacGregor & Jurd, 1978). Structure-activity testing of a large group of flavonols for mutagenic response in this assay system indicated that compounds of flavylum class were inactive.

Cyanidin and delphinidin were inactive in the Ames assay system using 5 different strains of Salmonella typhimurium (TA-1535, TA-100, TA-1537, TA-1538 and TA-98) with and without activation (Brown & Dietrich, 1979).

Anthocyanin was tested in both the Ames test using Salmonella typhimurium TA-1538 for mutagenicity and in another in vitro test employing E. coli Wf2 for induction of DNA damage. In both assay procedures with or without metabolic activation (using either rat caecal extracts or rat liver microsomes) anthocyanins were not found to induce any response (Haveland-Smith, 1981). Negative findings were also reported for the anthocyanins in a gene conversion assay using S. cerevisiae D4 (Haveland-Smith, 1981).

##### Special studies on pharmacology

In rabbits administered anthocyanin glycosides 6 g/kg (oral) or 500 mg/kg (i.p.) acutely, no adverse effect was noted on blood pressure. However, 100-200 mg/kg i.v. was shown to elicit a transient hypotension accompanied by a decrease in respiratory amplitude. At 25 mg/kg i.v., diuretic effects were also reported. Anthocyanin also caused a vasodilation in the isolated rabbit heart (Pourrat et al., 1967).

In mice, anthocyanins given in oral doses of 500 mg/kg produced a sedative effect on the animals (Pourrat et al., 1967).

Improvements in visual acuity and darkness adaptation have been reported in humans for a short period of time, after receiving oral doses of up to 700 mg of the anthocyanins (Pourrat et al., 1967).

##### Special studies on reproduction

A 2-generation reproduction study was performed in rats (Sprague-Dawley) ingesting a grape-skin extract preparation that was prepared by spray drying the liquid form of the extract after addition of a carrier material (malto-dextrose). The preparation contained approximately 3% anthocyanins. The test group received dietary levels of 7.5% or 15% of the grape-skin extract throughout the study. There were two concurrent control groups, one receiving the basal diet, the other receiving a diet containing 9% of the malto-dextrin used as a carrier to the grape-skin extract preparation. The F<sub>2a</sub> generation (10/litter culled at 4 days) were maintained for 21 days post-partum, then autopsied. No differences in reproduction performance or indices including pup viability were apparent between control and dosed groups. At the high-dose level, both the F<sub>1a</sub> and F<sub>2a</sub> rats exhibited lower body weights than the concurrent controls. Body weights of the F<sub>2</sub> pups in the 7.5% group were marginally depressed. However, it should be noted that the



decrease in body weights was accompanied by a concomitant decrease in food intake. At week 6 and at termination of the studies, haematological and blood serum chemistry and urinalyses were carried out in the F<sub>1a</sub> group. There were no compound-related effects. At week 18 of the study, rats in the F<sub>1a</sub> group were sacrificed and absolute and relative organ weights determined, and a complete histological study was carried out in the principal organs and tissues. Decrease in organ weights of the liver, adrenal and thyroid occurred in the 15% group. There were no compound-related histological effects (Cox & Babish, 1978a).

#### Special studies on teratogenicity

The anthocyanin glycosides (an extract from currants, blueberries and elderberries) were reported not to be teratogenic in rats, mice or rabbits when given at dose levels of 1.5, 3 or 9 g/kg over 3 successive generations (Pourrat et al., 1967).

#### Acute toxicity

Animal	Route	LD <sub>50</sub> (mg/kg bw)	Reference
Mice	i.p.	4 110	Pourrat et al., 1967
	i.v.	840	Pourrat et al., 1967
	Oral	25 000	Pourrat et al., 1967
Rats	i.p.	2 850	Pourrat et al., 1967
	i.v.	240	Pourrat et al., 1967
	Oral	20 000	Pourrat et al., 1967

Test animals were administered the anthocyanins (cyanidin, petunidin and delphinidin mixture extracted from currants, blueberries and elderberries) in doses from 0 to 25 000 mg/kg bw for mice and from 0 to 20 000 mg/kg for rats. Following i.v. or i.p. administration, toxic doses of anthocyanins produced sedation, convulsions and finally death.

#### Short-term studies

Weanling male and female Wistar rats (20/group) were fed a diet containing anthocyanin extract at levels equivalent to 3000 mg/day or 6000 mg/day for a period of 90 days. A group of concurrent controls were also used in the study. The doses of anthocyanin administered were estimated to be 5 and 10 times, respectively, the level that a human would ingest. No differences were observed between the test animals and controls in survival, growth or histopathology of the principal tissues at the termination of the study (Pourrat et al., 1967).

In another study, guinea-pigs received 3000 mg/kg of anthocyanin in the diet for 15 days. No adverse effects were reported (Pourrat et al., 1967).

Male and female beagle dogs (4/sex/dose) received either 0, 7.5% or 15% of grape-skin extract (approximately 2.39% anthocyanin by weight) in the diet for 90 days. No differences were noted between control and treated animals in body weights, growth, survival, clinical chemistries (haematology, biochemistry or urinalysis), organ weights or pathological lesions (gross or microscopic) (Cox & Babish, 1978a).

#### OBSERVATIONS IN MAN

Man is naturally exposed to anthocyanins through the ingestion

of fruits and vegetables. Levels of exposure under normal dietary conditions have not been established.

Information on the metabolism and toxicity of the anthocyanins is limited. Its interpretation is complicated because the anthocyanins represent a large group of chemically-related substances and the effect observed with one defined anthocyanin may not be applicable to another. The available information suggests that anthocyanins are poorly absorbed from the gastrointestinal tract. Metabolism is limited and may be due to the activity of the intestinal bacterial flora. The metabolites of anthocyanins have not been identified. However, the insensitivity of the assay techniques used for measuring unmetabolized anthocyanins may result in a significant underestimate of the degree of absorption and metabolism of the anthocyanins (Kuhnau, 1976).

#### Comments

Toxicological studies are limited, and have been carried out with mixtures extracted from a variety of fruits. The available data indicate that such extracts are of a very low order of toxicity. Diets containing 7.5% or 15% of a grape-skin extract preparation (approximately 3% anthocyanin) had no effect on the reproductive performance of rats in a 2-generation reproductive study. The lower body weights of offspring were related to a concomitant decrease in food intake. At the highest level tested, there was a decreased organ weight of the liver, adrenal and thyroid. There were no compound-related histological effects. No compound-related effects were observed in a short-term study in which dogs were fed diets containing 7.5% or 15% of the grape-skin extract preparation.

#### EVALUATION

Level causing no toxicological effect (Grape-skin extract preparation)

Rat (young): 7.5% of the diet equivalent to 7500 mg/kg bw.

Estimate of acceptable daily intake for man

0-2.5 mg/kg bw.\*

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\* Anthocyanins (present in the grape-skin preparation at level of approximately 3%).

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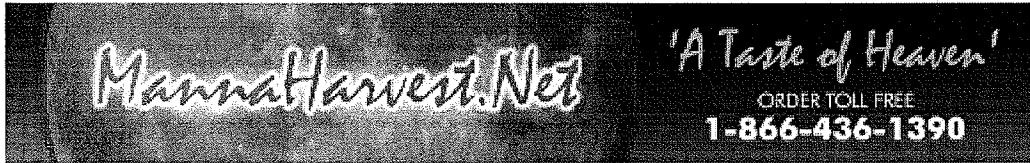
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See Also:

[Toxicological Abbreviations](#)  
[ANTHOCYANINS \(JECFA Evaluation\)](#)



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## Raspberry Filled Cereal Bars, 7.8 oz Nature's Choice - 12 Pack

\$4

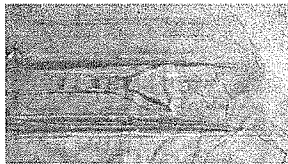
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Raspberry Filled Cereal Bars (Low Fat), 7.8 oz by Nature's Choice.. Kosher, Vegan, Low Sodium. Whether you're looking for a delicious breakfast on-the-go or a quick boost of energy any time of day, Nature's Choice is the right choice. Low in fat and wheat free, these great tasting bars are made from whole grains, like oats and barley, then filled with real fruit. Only the finest natural ingredients are used, which means they are free of artificial flavors, colors or preservatives of any kind. **Ingredients:** Raspberry Filling (Fruit Juice Concentrate [Pineapple, Peach and Pear], Raspberry Puree, Tapioca Starch, Apple Powder, Natural Raspberry Flavor, Glycerin, Locust Bean Gum, Red Cabbage [color enhancer]), Pineapple Juice Concentrate, Flour, Barley Flour, Date Paste, Oats, Rice Flour, Apple Powder, Expeller Pressed Canola Oil, Tapioca Flour, Barley Malt Extract, Salt, Baking Powder, Baking Soda. **Nutritional Info:**



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Serving Size	1 bar	% Daily Value*	Vitamin A - 0%	Vitamin C - 0%
Servings Per Container	37g / 6		Calcium - 0%	Iron - 2%
Calories	120		* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs	
Calories from Fat	15		Calories:	<2000
Total Fat	1.5 g	3%	Total Fat:	<65 g
Saturated Fat	0 g	0%	Saturated Fat:	<20 g
Cholesterol	0 mg	0%	Cholesterol:	
Sodium	65 mg	3%	Sodium:	<300 mg
Total Carbohydrate	25 g	8%	Total Carbs:	<2400 mg
Dietary Fiber	2 g	6%	Dietary Fiber:	<300 g
Fiber	13 g			<25 g
Sugars	g			
Protein	1 g		Calories per gram:	
			Fat - 9	Carbohydrates - 4
				Protein - 4

## Blackberry Grape - Energize



Ingredients: filtered water, crystalline fructose, apple juice concentrate, pear puree, natural flavor, citric acid, blackberry juice concentrate, pectin, ascorbic acid (vitamin C), guarana and siberian ginseng extracts, red cabbage extract (color), niacin (vitamin B3), cyanacabalamine (vitamin B12) ←

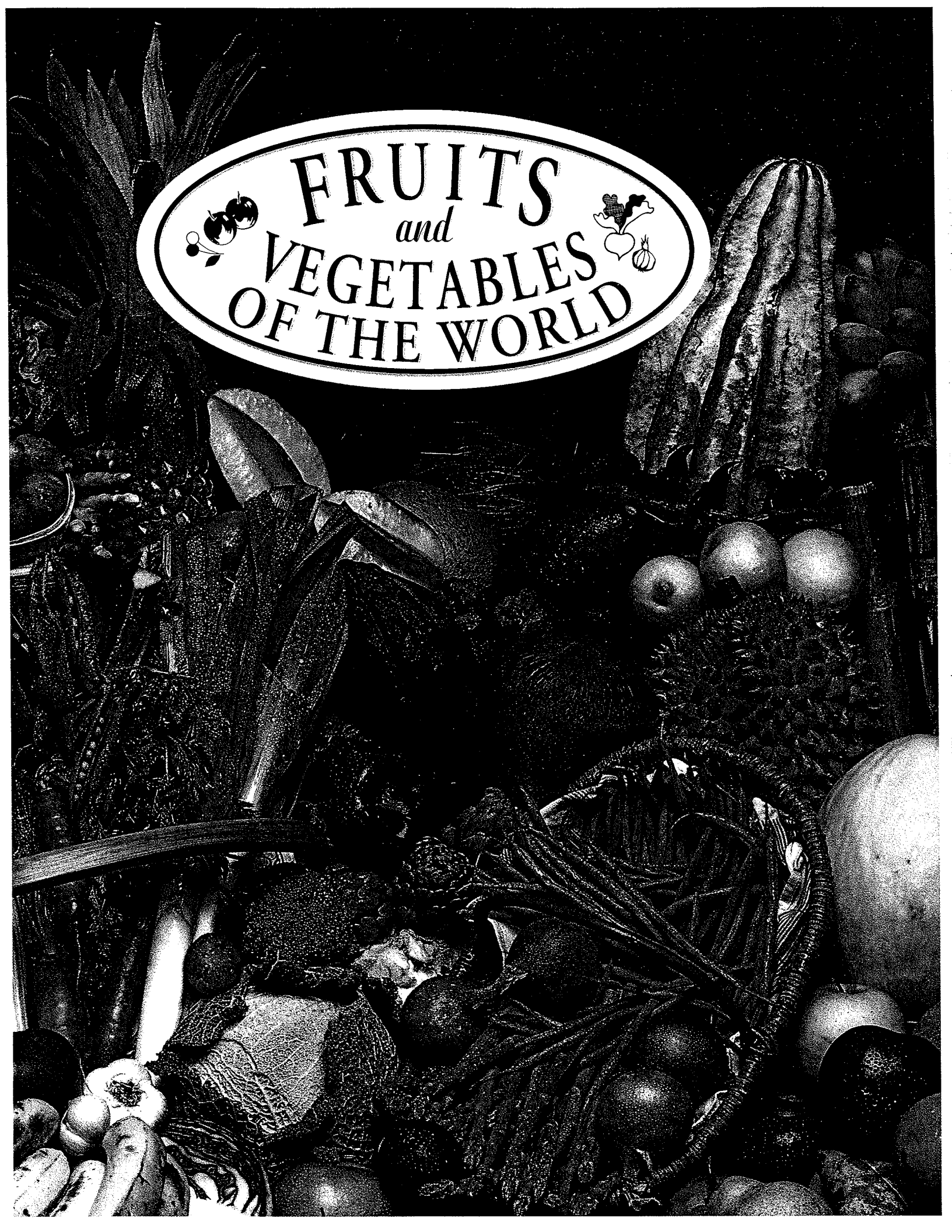
Nutrition Facts: contains 10% juice; calories 100; total fat 0g; sodium 15mg; total carbohydrates 26g; sugars 24g; protein 0g; vitamin C 100%; niacin (B3) 25%; vitamin B12 25%; siberian ginseng 100mg; guarana 100mg

**MATERIAL SAFETY DATA SHEET****RED CABBAGE EXTRACT**

<b>PRODUCT</b>	Liquid colorant extract of red cabbage for industrial purpose only
<b>NATURE OF DANGER</b>	<b>Flammable (Risk R 10)</b> (EC Directive 91/155) May be irritating to skin, to eyes and to respiratory system when used incorrectly. Dangerous if swallowed excessively
<b>FIRST AID</b>	<b>Contact with eyes</b> : thoroughly rinse with water for at least 15 minutes. If symptoms persist see medical advice. <b>Contact with skin</b> : plenty rinsing with water immediately. Take off contaminated clothing. <b>Ingestion</b> : Food product. Induce vomiting and seek for medical advice when swallowed in excess quantity.
<b>FIRE</b>	<b>Flash point</b> : 25.5 °C <b>Recommended</b> : powder, CO2
<b>DISPERSION</b>	Avoid contact with eyes and skin and inhalation. Recover the product by mopping with a non flammable material then wash with plenty water the contaminated area in order to limit the alcoholic vapor.
<b>PHYSICAL, CHEMICAL AND BACTERIOLOGICAL CHARACTERISTICS</b>	Alcoholic degree : from 25 % V/V to 30 % V/V See technical data sheet
<b>PROCEEDING FOR USE</b>	<b>Use</b> : Use in a well ventilated place. Do not re-use empty containers. <b>Storage</b> : Keep in a cool well ventilated place. Keep away from possible sources of ignition. Keep away from air and light.
<b>USE ADVICES</b>	IOFI guideline of good practice (International Organization of Flavor Industry)
<b>WASTE TREATMENT</b>	Banish release to the environment. Waste treatment must comply with the laws and rules in force
<b>TRANSPORTATION</b>	Classification : class 3 (c) Must comply with the rules in force especially for plane transport (IATA). Identification number (UN 1169)

*NB* : Up dated on 03/11/1999. This data-sheet has been produced for your information and is accurate to the best of our knowledge. However, due to complex and changing legislation, customers must check themselves that any ingredients they wish to incorporate in products are permitted in all markets they intend to supply.

FRUITS  
*and*  
VEGETABLES  
OF THE WORLD





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# Cabbages

Once upon a time, young English ladies would join hands on Hallowe'en and, with their eyes closed, proceed in pairs into the vegetable garden to pull up the first cabbage they could find. Depending on its size, whether it was twisted or straight, open or with a good head, their future husband would be handsome or ugly, well built or scrawny, sociable or taciturn. A lot of rich soil clinging to the root indicated that the suitor would be wealthy; if the cabbage's stem was smooth and soft, he would be good-natured, if it was uneven and rough, he would beat his spouse often.

The wide variety of cabbages in existence today all come from a common ancestor, *Brasica*

*oleracea*. From this species and after thousands of years of new hybrids, a large variety of cabbages has become available. They have been grown since Neolithic times. The Greeks were familiar with white cabbages. The cabbage was used to prevent drunkenness: a few leaves were generally eaten prior to banquets.

The Irish brought cabbages with them to the United States. Along with the potato, the cabbage has for a long time been a staple food of these poor immigrants. France is the leading European producer ahead of Italy, and the third world producer, behind both China and India.

For a long time, the selection of cabbages was made by examining the vegetable's leafage in order to obtain varieties with a greater number of tightly packed leaves. Through a slow process, the stems were also enlarged to create kohlrabi. Later, they were lengthened to produce Brussels sprouts. Cauliflower was invented by taking advantage of a vegetal anomaly in the flowers.

These varieties are all classified into six main categories: white cabbage, red cabbage, Savoy cabbage, kohlrabi, cauliflower, and Brussels sprouts.

White cabbages, also known as Dutch cabbages, have smooth, tightly packed

Savoy cabbage

Kohlrabi

Cauliflower

"Romano"  
cauliflower

leaves that form a compact, conical-shaped ball. Varieties with large heads are used to make sauerkraut. They are excellent both raw, often grated as an ingredient in coleslaw, and boiled. Raw white cabbage contains as much vitamin C as lemon juice.

Red cabbage



Red cabbages are a smaller variety, with red leaves and a round head. These cabbages are eaten in salads. When cooked, they are of a lesser quality than white cabbages. Germans make a



White cabbage

sauerkraut with red cabbage, whilst in other countries it is stewed with onions, apples, raisins, and spices.

Savoy cabbages have curly looking leaves that are too tough to be eaten raw. Steaming is the best way to keep all the vegetable's mineral salts and vitamins. It is often said that cabbage is difficult to digest. To aid in digestion, blanch the vegetable for five minutes, then change the water. Another frequent complaint is that cabbage gives off a strong odor as it cooks. This is easily absorbed by adding a slice of bread into the boiling water.

The swollen part of the kohlrabi (German for "cabbage-turnip") is a deformation at the stem's base. It always remains above ground, unlike the turnip, which also belongs to the cabbage family and is buried underground. Not to be confused with celeriac, kohlrabi should be eaten boiled when the stem reaches the size of a tennis ball. It is best to peel them because their outer layers are fairly fibrous. Although generally white or green, several varieties like the "Pourpre hâtif de Vienne" have entirely red heads.

A veritable botanical "monstrosity" with its compact white head of undeveloped flowers, the cauliflower has become a delicious vegetable. Another cabbage with a head of functional florets is also eaten: broccoli. Greatly valued by the Romans for its stimulating and diuretic virtues, the cauliflower long remained a culinary outcast. It reappeared in the 17th century as Louis XIV was particularly fond of the vegetable. His cooks prepared cauliflower in a broth seasoned with powdered mace and a butter sauce. His successor, Louis XV, shared the same passion, and as was the custom, a number of cauliflower-based dishes were dedicated to the king's favorite mistress, Madame du Barry. This denomination given by court cooks has remained until present times.

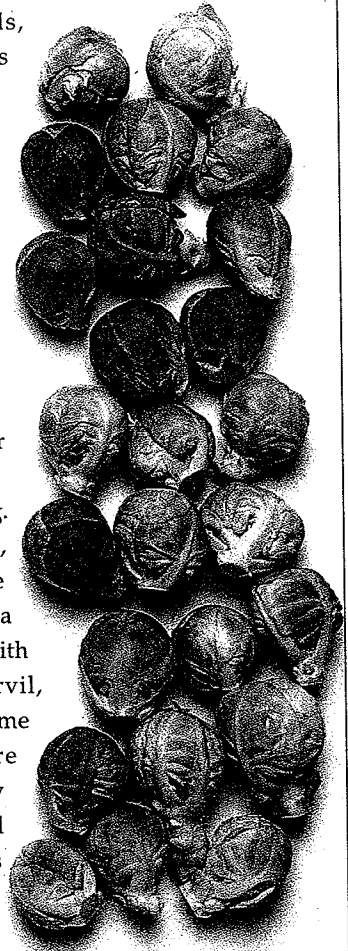
Cauliflower is eaten in a variety of ways: some people like to crunch on it raw with salt or a salad dressing. Its small, well-washed sprigs can also accompany dips. Cooked cauliflower can

be served with a dab of melted butter, in a cream sauce, baked with a béchamel sauce or sprinkled with grated cheese. It also makes a creamy soup or can be breaded and fried in oil. Hot or cold cauliflower can be served with a lemon sauce, mayonnaise, or a salad dressing. It is also pickled in vinegar and served with salads and cold meats.

The origin of Brussels sprouts remains unknown, though they are thought to have originated in Belgium. Who was the first to grow these tiny balls of leaves like miniature cabbages on a stem nearly 3 feet high? The Brussels sprout appellation dates to 1820. The Germans prefer the name Rosenkohl, which means "cabbage that carries roses." Separated from their stem

as small buds, Brussels sprouts can be eaten after being cooked for a few minutes in salted water. As with white cabbage, sprouts are easier to digest if the water is changed during cooking. Once drained, they can be served with a sauce made with yoghurt, chervil, garlic, and some salt; they are also very popular served with chestnuts or walnuts.

Brussels sprouts are usually green but the English have created a variety – the "Rubine" – that is purplish in color. The leaves from the top of the stalk may also be used as a vegetable.

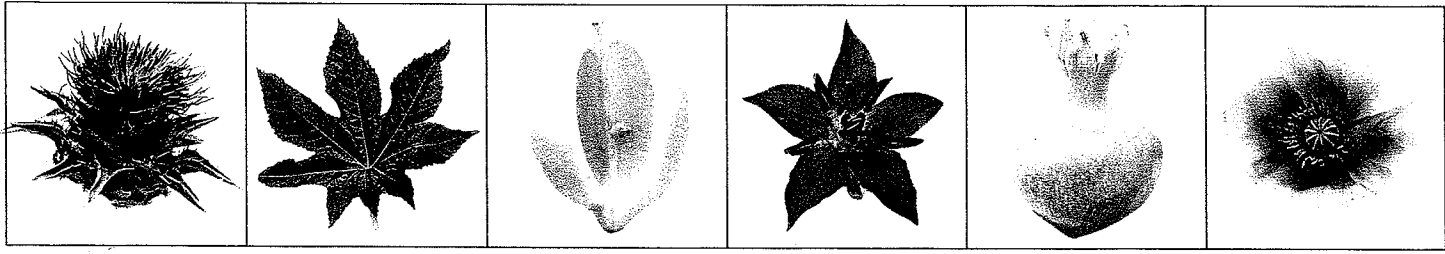


Brussels sprouts

ALLIUM SATIVUM \* BAPTISIA TINCTORIA \* CITRUS LIMON \* DIOSCOREA VILLOSA

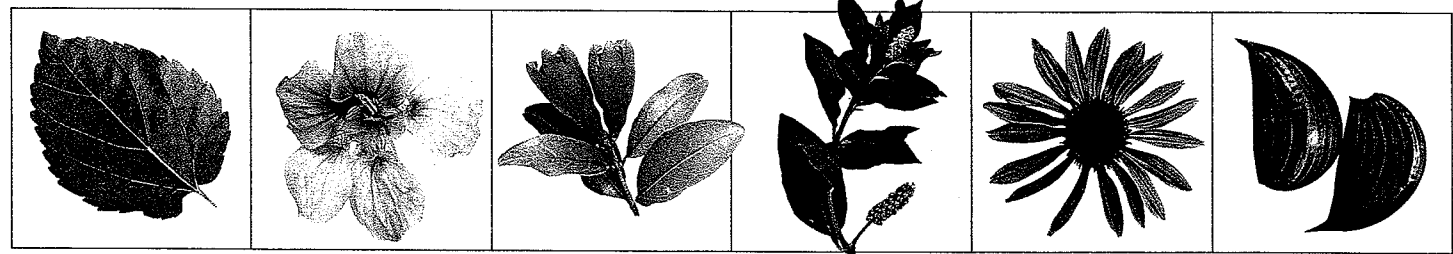
ROS MARINUS OFFICINALIS \* TAMARINDUS INDICA \* TILIA EUROPAEA \* VIOLA TRICOLOR \* ZIZIPHUS JUJUBA

# ANDREW CHEVALLIER



# THE ENCYCLOPEDIA OF MEDICINAL PLANTS

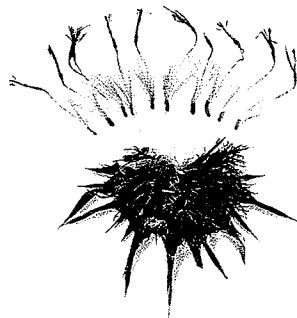
A PRACTICAL REFERENCE GUIDE  
TO MORE THAN 550 KEY MEDICINAL  
PLANTS & THEIR USES



PRUNELLA VULGARIS \* PRIMUM BOLIVICUM \* OLEA EUROPAEA \* MELISSA OFFICINALIS



A DK PUBLISHING BOOK



*"First the word, then the plant, lastly the knife."*

Aesculapius of Thassaly c. 1200 BC

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#### IMPORTANT NOTICE

Do not try self-diagnosis or attempt self-treatment for serious or long-term problems without first consulting a qualified medical herbalist or doctor. Do not take any herb without first checking the cautions in the relevant herb entry (see pp. 54–281) and the Essential Information on pp. 298–299. Do not exceed any dosages recommended. Always consult a professional if symptoms persist. If taking prescribed medicines, seek professional advice before using herbal remedies. Take care to identify plants correctly, and do not harvest restricted species.

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**Brassica oleracea**

(Cruciferae)

**CABBAGE**

**DESCRIPTION** Biennial or perennial herb growing to 8 ft (2.5 m). Has a thick stem, gray leaves, and 4-petaled yellow flowers. Within the first year, it produces a greatly enlarged terminal bud that develops into the familiar cabbage head in late summer.

**HABITAT & CULTIVATION** Wild cabbage is native to coasts of the English Channel and the Mediterranean. Cultivated varieties are produced worldwide as a vegetable.

**PARTS USED** Leaves.

**CONSTITUENTS** Cabbage is rich in vitamins A, B<sub>1</sub>, B<sub>2</sub>, and C.

**HISTORY & FOLKLORE**

The wholesome cabbage is one of the oldest vegetables. According to Greek myth, the plant sprang into

existence from the perspiration of Zeus. In a Greek ritual, cabbage was given to expectant mothers shortly before birth in order to establish good breast-milk production. The Romans used cabbage as an antidote, especially to alcohol, believing it countered intoxication and prevented or reduced a hangover. They also used cabbage leaves to cleanse infected wounds. One traditional method of making a cabbage poultice, which is still used today, is to cut out the midrib of a leaf and iron it, placing it while still hot on the area to be treated.

**MEDICINAL ACTIONS & USES** Cabbage's best-known medicinal use is as a poultice – the leaves of the wild or cultivated plant are blanched, crushed, or chopped, and applied to swellings, tumors, and painful joints. Wild cabbage leaves eaten raw or cooked aid digestion and the breakdown of toxins in the liver – so the Romans' eating it to ease a hangover was in fact quite sensible. Cabbage is also detoxifying and helpful in the long-term treatment of arthritis. The high vitamin C content of cabbage has made it useful in the prevention of scurvy.

**CAUTION** A cabbage poultice may cause blisters if left on for several hours.

**Bryonia dioica**

syn. *B. cretica* subsp. *dioica*  
(Cucurbitaceae)

**WHITE BRYONY**

**DESCRIPTION** Perennial climbing vine with fleshy taproot. Has straggling stem with tendrils, greenish flowers, and red berries.

**HABITAT & CULTIVATION** White bryony is native to southern England and parts of

Europe. The root is dug up in autumn.

**PART USED** Root.

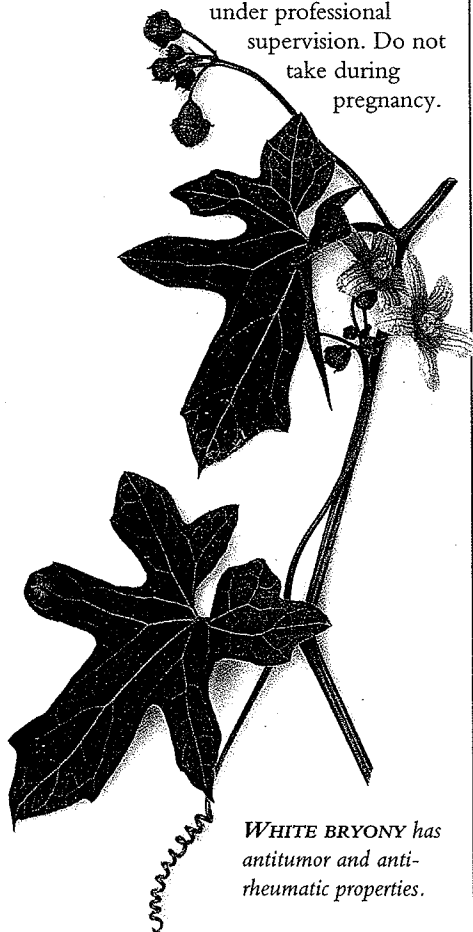
**CONSTITUENTS** White bryony contains cucurbitacins, glycosides, volatile oil, and tannins. The cucurbitacins kill cells and act on tumors.

**HISTORY & FOLKLORE** From prehistory to the Middle Ages, the thick roots of white bryony were cut into a human shape as a substitute (or a counterfeit) for mandrake root (*Mandragora officinarum*, p. 230), which was believed to afford magical protection. The Greek physician Dioscorides (1st century AD) reported that the leaves, fruit, and root of white bryony were applied to gangrenous wounds. In medieval England, the plant was used to treat leprosy.

**MEDICINAL ACTIONS & USES** A powerful cathartic and purgative, white bryony is used with great caution in herbal medicine today. Principally prescribed for painful rheumatic conditions, it may be taken internally or applied externally as a counterirritant, causing swelling and increased blood flow to the area. It is also given for other inflammatory conditions such as duodenal ulcers, asthma, bronchitis, and pleurisy, and may be used to reduce high blood pressure. The whole herb has an antiviral effect.

**RELATED SPECIES** *B. alba* is used in homeopathy. Black bryony (*Tamus communis*) is an unrelated plant with approximately similar uses.

**CAUTIONS** Bryony is a toxic plant. Use only under professional supervision. Do not take during pregnancy.



WHITE BRYONY has antitumor and anti-rheumatic properties.

**Butea monosperma**

(Fabaceae)

**PALAS, FLAME OF THE FOREST, BENGAL KINO**

**DESCRIPTION** Deciduous tree growing to 50 ft (15 m). Has 3-lobed leaves and large orange-red flowers in clusters.

**HABITAT & CULTIVATION** Palas is native to India and Malaysia. It grows in forests and open areas to altitudes of 4,000 ft (1,200 m).

**PARTS USED** Bark, flowers, leaves, gum, seeds.

**CONSTITUENTS** All parts of the tree except the seeds contain tannins.

**MEDICINAL ACTIONS & USES** The gum oozing from incisions in the bark is known as Bengal kino. Mildly astringent, it is used as a substitute for the kino derived from bastard teak (*Pterocarpus marsupium*). Bengal kino is taken as a decoction or a tincture for acid indigestion, diarrhea, and dysentery, and used as a gargle for sore throats and as a douche for vaginitis. The gum is mild in effect and is commonly given to children. A decoction of the astringent leaves and flowers is taken for diarrhea, heavy menstrual bleeding, and fever, and is applied to hemorrhoids and skin conditions. A decoction of leaves, bark, or flowers is also thought to be aphrodisiac, while the flowers are believed to have a contraceptive effect. The seeds are purgative, and are mainly used externally to treat herpes and ringworm.

**CAUTION** Do not take during pregnancy.

**Caesalpinia bonducella**

(Leguminosae)

**NIKKAR NUT**

**DESCRIPTION** Thorny bush growing to 28 ft (9 m) with spiny compound leaves, yellow flowers in dense clusters, and prickly pods containing yellow seeds (nuts).

**HABITAT & CULTIVATION** Nikkar nut grows throughout India in grasslands and open areas, and in tropical areas throughout the world. The seeds are gathered when ripe.

**PARTS USED** Seeds.

**CONSTITUENTS** The seeds contain a fixed oil (25%), a bitter principle (bonducin), and tannins.

**MEDICINAL ACTIONS & USES** Nikkar seeds are used to treat fevers and are taken as a tonic and aphrodisiac. In India, they are often mixed with black pepper (*Piper nigrum*, p. 248) for medicinal use. The seeds are also taken for arthritis. Roasted nikkar seeds are used to treat diabetes. The oil from the seeds is used in cosmetics to soften the skin.