

## Lectins in food

*This is an alphabetical list of Foods containing Lectins, from edible Plant and Animal sources.*

Most lectins, in plant species, are NOT ABO blood type specific. Even fewer EDIBLE plants have lectins that are ABO type specific. This list does conflict with the information of the various incarnations of 'blood type diets', as far as specific foods agglutinating certain of the ABO blood types only. However, this information below has been derived directly from the published scientific literature and studies which are listed in the references which follow this list. It is not known where the authors of these diet books came up with their ABO blood-type agglutination data, it is definitely false when compared to published scientific studies.

The first section has a list of foods, in alphabetical order for easier searching, their scientific names, and which blood types are agglutinated by them. The researchers who did this testing have published their findings. Their work covers many medicinal plants too, which I did not list here.

Also included below the table is additional information on the allergenic potential of the foods where this information is available; even though allergy is not associated with lectin specificity, this information may be helpful to those using this list.

Agglutination activity, mitogenesis, etc. are all from results of laboratory study of the lectin with blood and cells in vitro, unless noted.

Most interesting to those who follow the blood type diet *may not be whether a food causes agglutination or not*, but that almost every food reacts identically with each blood type. So, what is the basis for the Blood Type Diet??? Answer: There IS NO basis. It is a pure scam.

## Lectins in Common Foods and Their Blood Type Specificity

agglutination = + | no agglutination = -

Common Name	Scientific Name	Part used for testing	A	B	AB	O
Allspice	<i>Pimenta dioica</i>	Leaf	++	++	++	++
Almond	<i>Prunus amygdalus</i>	Nut kernel	-	-	-	-
Aloe vera	<i>Aloe vera</i>	Leaf	-	-	-	-
Anise	<i>Pimpinella anisum</i>	Fruit	-	-	-	-
Annatto, achiote	<i>Bixa orellana</i>	Seed	+	+	+	+
Apple varieties	<i>Malus pumila</i>	Seed	-	-	-	-
Avocado	<i>Persea americana</i>	Seed	+	+	+	+
Banana	<i>Musa paradisiaca</i>	Raw fruit pulp	-	-	-	-
Barley	<i>Hordeum vulgare</i>	Fruit	+	+	+	+
Basil	<i>Ocimum basilicum</i>	Leaf	lysis	lysis	lysis	lysis
Bitter melon	<i>Mormordica charantia</i>	Fruit pulp	-	-	-	-
Black pepper	<i>Piper nigrum</i>	Fruit	-	-	-	-
Black-eyed pea	<i>Vigna unguiculata</i>	Seed	-	-	-	-
Broad or fava bean	<i>Vicia faba</i>	Seed	+++	+++	+++	+++

## Lectins in Common Foods and Their Blood Type Specificity

agglutination = + | no agglutination = -

Common Name	Scientific Name	Part used for testing	A	B	AB	O
Cabbage & Kale	Brassica oleracea	Head	-	-	-	-
Cabbage, Savoy	Brassica oleracea	Seed	lysis	lysis	lysis	lysis
Cardamom	Elettaria cardamomum	Seed	-	-	-	-
Celery	Apium graveolens	Fruit	-	-	-	-
Chayote	Sechium edule	Fruit and seed	-	-	-	-
Chickpea or Garbanzo	Cicer arietinum	Seed	+	+	+	+
Chinese melon, hairy melon	Benincasa hispida	Fruit	-	-	-	-
Cinnamon	Cinnamomum zeylanicum	Stem bark	++	++	++	++
Citron	Citrus medica	Rind, fruit, pulp	-	-	-	-
Coconut	Cocos nucifera	Fruit	-	-	-	-
Common bean, fresh string or snap and all dried varieties, kidney, Frijol, field bean, etc.	Phaseolus vulgaris	Seed	+++++	+++++	+++++	+++++
Coriander &	Coriandrum	Leaf and	-	-	-	-

## Lectins in Common Foods and Their Blood Type Specificity

agglutination = + | no agglutination = -

Common Name	Scientific Name	Part used for testing	A	B	AB	O
Cilantro	sativum	fruit				
Corn, maize	Zea mays	Kernels	-	-	-	-
Corn, popping, 'Everta' ssp.	Zea mays everta	Kernels	-	+	+-	-
Cucumber	Cucumis sativa	Fruit, rind and seed	-	-	-	-
Cumin	Cuminum cyminum	Fruit	-	-	-	-
Dates	Phoenix dactylifera	Fruit, dried	-	-	-	-
Dill	Anethum graveolens	Leaf and fruit	-	-	-	-
Elderberry	Sambucus nigra	Seeds	++	+	++	+
Endive	Chicorium endivia	Root	-	-	-	-
Fennel	Foeniculum vulgare	Fruit	-	-	-	-
Fennugreek	Trigonella foenum-graecum	Seed	-	-	-	-
Garlic	Allium sativum	Clove	-	-	-	-
Ginger, gingerroot	Zingiber officinale	Rhizome	-	-	-	-
Guava	Psidium	Unripe	+	+	+	+

## Lectins in Common Foods and Their Blood Type Specificity

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Common Name	Scientific Name	Part used for testing	A	B	AB	O
	guajava	fruit				
Jackfruit	Artocarpus heterophyllus	Leaf and seed	++	++	++	++
Jerusalem artichoke	Helianthus tuberosus	Tuber	++	+	++	+
Kohlrabi	Brassica oleracea var. gongylodes	Stem	-	-	-	-
Leek	Allium porrum	Leaf	-	-	-	-
Lemon	Citrus limon	Rind & fruitpulp	-	-	-	-
Lemon basil	Ocimum americanum	Seed	-	-	-	-
Lemon grass	Cymbopogon citratus	Leaf	-	-	-	-
Lentil	Lens culinaris	Seed	++++	++++	++++	++++
Lettuce	Lactuca sativa	Leaf	-	-	-	-
Licorice root	Glycyrrhiza glabra	Root and leaf	-	-	-	-
Lima bean	Phaseolus lunata	Seed	++++	-	++++	-
Lime	Citrus aurantifolia	Fruitpulp	++	++	++	++
Mace	Myristica fragrans	Aril (seed coat)	+	+	+	+
Mango	Mangifera	Rind	+++	+++	+++	+++

## Lectins in Common Foods and Their Blood Type Specificity

agglutination = + | no agglutination = -

Common Name	Scientific Name	Part used for testing	A	B	AB	O
	<i>indica</i>					
Marjoram	<i>Majorana hortensis</i>	Leaf	-	-	-	-
Millet, Pearl millet	<i>Pennisetum americanum</i>	Fruit	-	-	-	-
Mung bean, azukia	<i>Vigna mungo</i>	Seed	-	-	-	-
Mung bean, golden gram	<i>Vigna radiata</i>	Seed	-	-	-	-
Nutmeg	<i>Myristica fragrans</i>	Seed and nut	-	-	-	-
Onion	<i>Allium cepa</i>	Bulb	-	-	-	-
Orange, sweet; Navel	<i>Citrus sinensis</i>	Fruit and seed	-	-	-	-
Oregano	<i>Origanum vulgare</i>	Leaf	-	-	-	-
Papaya	<i>Carica papaya</i>	Fruitpulp	+	+	+	+
Passion fruit	<i>Passiflora edula</i>	Fruit	lysis	lysis	lysis	lysis
Pawpaw, custard apple	<i>Annona squamosa</i>	Fruit pulp	-	-	-	-
Pea	<i>Pisum sativum</i>	Seed	+++	+++	+++	+++
Peach	<i>Prunus persica</i>	Rind and fruitpulp	+	+	+	+
Peanut	<i>Arachis hypogaea</i>	Seed and shell	-	-	-	-
Peppermint	<i>Mentha</i>	Leaf and	-	-	-	-

## Lectins in Common Foods and Their Blood Type Specificity

agglutination = + | no agglutination = -

Common Name	Scientific Name	Part used for testing	A	B	AB	O
	piperita	stem				
Peppers -Cayenne, chili, Hungarian, Tabasco	Capsicum frutescens	Seed	-	-	-	-
Pigeonpea	Cajanus cajan	Seed	-	-	-	-
Pineapple	Ananas comosus	Rind and fruitpulp	-	-	-	-
Plum, purple plum	Prunus domestica	Fruit	-	-	-	-
Pomegranate	Punica granatum	Fruitpulp and seed	-	-	-	-
Pommelo, pomelo	Citrus maxima	Stem bark	-	-	-	-
Potato	Solanum tuberosum	Tuber	++	++	++	++
Psyllium	Plantago ovata	Seedcoat and seed	-	-	-	-
Pumpkin	Cucurbita maxima	Fruit and seed	-	-	-	-
Radish	Raphanus sativus	Root and leaf	-	-	-	-
Rice	Oryza sativa	Fruit	+	+	+	+
Rosemary	Rosamarinus officinalis	Leaf	lysis	lysis	lysis	lysis
Rye	Secale cereale	Seed	++	++	++	++
Sesame seed	Sesamum orientale	Seed	-	-	-	-

## Lectins in Common Foods and Their Blood Type Specificity

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Common Name	Scientific Name	Part used for testing	A	B	AB	O
Shallot	<i>Allium ascalonicum</i>	Bulb	-	-	-	-
Sorghum	<i>Sorghum vulgare</i>	Fruit	+	+	+	+
Soya bean	<i>Glycine max</i>	Seed	++	++	++	++
Spaghetti squash, Kampo	<i>Lagenaria siceraria</i>	Fruit pulp, rind and seed	-	-	-	-
Spearmint	<i>Mentha spicata</i>	Leaf and stem	-	-	-	-
Spinach	<i>Sinacea oleracea</i>	Seed	-	-	-	-
Star Anise	<i>Illicium verum</i>	Fruit and seed	-	-	-	-
Sugar beet	<i>Beta vulgaris</i>	Leaf	-	-	-	-
Sugar cane	<i>Saccharum officinarum</i>	Stem, stem pulp	-	-	-	-
Summer squash	<i>Cucurbita pepo</i>	Fruit	-	-	-	-
Sweet potato	<i>Ipomoea batatas</i>	Tuber	-	-	-	-
Tamarind	<i>Tamarindus indica</i>	Fruit and leaf	-	-	-	-
Tangerine, Mandarin, Tangelo, Clementine	<i>Citrus reticulata</i>	Fruit and seed	-	-	-	-
Tapioca, manioc,	<i>Manihot</i>	Tuber	-	-	-	-



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Common Name	Scientific Name	Part used for testing	A	B	AB	O
cassava	esculenta					
Taro	Colocasia esculenta	Tuber	+	++	+	+
Tea; green, oolong, black	Camellia sinensis	Young & Mature leaves	+	+	+	+
Thyme	Thymus serpyllum	Leaf	lysis	lysis	lysis	lysis
Tomatoes; beefsteak, plum, cherry, Italian	Lycopersicon esculentum	Rind & fruitpulp	-	-	-	-
Tomatoes; beefsteak, plum, cherry, Italian	Lycopersicon esculentum	Extract	+++++	+++++	+++++	+++++
Turmeric	Cucurma domestica	Rhizome	-	-	-	-
Walnut, black walnut	Juglans regia	Kernel and shell	-	-	-	-
Watermelon	Citrullus vulgaris	Fruit	++	++	++	++
Wheat germ	Triticum aestivum	Seed	++	++	++	++
Wine grapes	Vitis vinifera	White fruitpulp Blue fruitpulp & blue seed	-	-	-	-

## Lectins in Common Foods and Their Blood Type Specificity

agglutination = + | no agglutination = -

Common Name	Scientific Name	Part used for testing	A	B	AB	O
Wine grapes	Vitis vinifera	White rind & seed and Blue rind	+	+	+	+

### Banana (*Musa paradisiac*)

- Lectin Group: Unknown
- Lectin Designation: BanLec-I
- Lectin Location: the banana lectin is in the fruit itself.
- Agglutination: It does not agglutinate untreated human or sheep erythrocytes (red blood cells), but does agglutinate rabbit red blood cells.
- Mitogenic: Yes. Banana lectin stimulates T-cell proliferation (T-cells are one type of immune system white cell).
- Allergenic: Yes. IgG4 antibodies to banana were found to occur more frequently than expected

### Barley (*Hordeum vulgare*)

- Lectin Group: Chitin-binding lectins (Chitin is the horny outer covering, especially of insects and crustaceans, composed of carbohydrates of two or more molecules of simple sugars)
- Lectin Designation: HVA, 'Hordeum vulgare agglutinin'
- Lectin Location: The barley lectin was first isolated from barley embryos. It has also been isolated from roots and leaves of adult plants.
- Agglutination: It is specific for GlcNAc, and most probably has a higher affinity for GlcNAc-oligomers than for GlcNAc, like the closely related wheat germ agglutinin (WGA). The barley

- lectin agglutinates all human and rabbit erythrocytes (red blood cells).
- Mitogenic:
  - Allergenic:

Black pepper - Peppercorns, includes black and white (*Piper nigrum*)

- Lectin Group: None found
- Lectin Designation: None found
- No information found on any lectin in *Piper nigrum*

Blackberry (*Rubus fruticosus*)

- Lectin Group: Unknown
- Lectin Designation: Unknown
- The lectin is specific for glucosamine oligomers.

Broad bean, Fava bean (*Vicia faba*)

- Lectin Group: Legume lectins
- Lectin Designation: VFA, favin
- Lectin Location: The lectin is in the seeds.
- Agglutination: The lectin agglutinates human, mouse, rat, rabbit and guinea pig erythrocytes, but not sheep erythrocytes. It is specific for mannose/glucose and oligosaccharides (oligosaccharides are sugars composed of a few simple sugars, or saccharides) containing these sugars in the alpha-configuration.
- Mitogenic: Yes. The lectin is mitogenic to lymphocytes (induces division of white cells).
- Allergenic:
- Other: VFA in the diet of rats had no effect on the animals.

Cherymoya, custard apple (*Anona cherimoya*)

- Lectin Group: Unknown
- Lectin Designation: Unknown
- No specific information found on this lectin, other than brief mention of it being isolated.

Chestnut (*Castanea spp.*) belonging to the Fagaceae family (beech)

- Lectin Group:
- Lectin Designation:
- Lectin Location:
- Agglutination:
- Mitogenic:
- Allergenic: Yes. Linked with latex and avocado allergy, patients may be cross-reactive to this group.

Chick pea, Garbanzo, Ceci Bean (*Cicer arietinum*)

- Lectin Group: Legume lectins
- Lectin Designation: CAA, CPA
- Lectin Location: The lectin is in the seeds of chickpeas.
- Agglutination: It agglutinates all human erythrocytes (red blood cells), it is not blood type specific.
- Mitogenic: No. The lectin is non-mitogenic to human lymphocytes (does not cause division of white cells).
- Allergenic:

Chicken (*Gallus gallus*)

- Lectin Group: S-Lectins, galectins
- Lectin Designation: Unknown
- Lectin Location:
- Agglutination: Binds beta-galactoside
- Mitogenic:
- Allergenic:

Corn, Maize (*Zea mays*)

- Lectin Group: Unknown
- Lectin Designations: ZMA-I, ZMA-II, Corn Coleoptile lectin
- Lectin Location: The ZMA lectins are in the kernels of corn.
- Agglutination: ZMA-I interacts with GalNAc, and ZMA-II with mannose. These corn lectins agglutinate rabbit erythrocytes, not human RBCs. There is also a lectin first isolated from corn coleoptiles (coleoptiles are the first leaves of

monocot plants) with a high agglutinating activity for human Type O and B red blood cells.

- Mitogenic:
- Allergenic: Yes, high incidence known to occur.
- Other: Corn is one of the major food crops that has been genetically modified, large quantities grown in the U.S. of the GMO varieties.

Corn 'Everta' ssp. (*Zea mays everta*)

- Lectin Group: Unknown
- Lectin Designation: Unknown
- Lectin Location: An anti-B lectin was isolated from *Zea mays* 'everta' ssp. seeds. 'Everta' is a variety used as popping corn. *Zea mays* L. var. *everta* common names: Popcorn, strawberry popcorn, popping maize, Ayacucho popcorn, Popcorn 'Confite Morocho,' 'Confite Puntiago,' South American popcorn.
- Agglutination: Serological studies showed anti-B specificity. The lectin will agglutinate A1B erythrocytes significantly more weakly than erythrocytes of B and A2B blood groups.
- Mitogenic:
- Allergenic: Yes.

Cranberry (*Vaccinium macrocarpon* Ait)

- Lectin Group: Unknown
- Lectin Designation: Unknown
- Lectin Location:
- Agglutination: There is a lectin in cranberries which acts against insects only, little info is found on it.
- Mitogenic:
- Other: Cranberries inhibit the lectin binding of bacteria of human uropathogens (urinary tract bacteria).

Eel (*Conger myriaster*)

- Lectin Group: S-lectins (galectin)
- Lectin Designation: Congerin-I
- No other information found on this lectin yet

Eel, freshwater (*Anguilla anguilla*)

- Lectin Group: Agglutinin
- Lectin Designation: AAA, AanA
- No other information found on this lectin

Eggplant (*Solanum melongena*)

- Lectin Group: None found
- Lectin Designation: None found
- No information found yet as to any lectin associated with eggplant

Elderberry (*Sambucus nigra*)

- Lectin Group: Unknown
- Lectin Designation: SNA-III
- Lectin Location: SNA-III is found in elderberry seeds.
- Agglutination: It agglutinates animal and human erythrocytes. It has a slight preference for type A over B and O erythrocytes.
- Mitogenic:
- Allergenic:
- Other: Elderberry fruits contain several different lectins.

Elderberry Bark (*Sambucus nigra*)

- Lectin Group: Unknown
- Lectin Designation: SNA
- Lectin Location: The lectin is found in elderberry bark.
- Agglutination: SNA is not blood group specific. It is widely used to study surface antigens of viruses, bacteria and mycoplasmas.
- Mitogenic:
- Allergenic:

Flounder (*Platichthys flesus*)

- Lectin Group: None found
- Lectin Designation: None found
- No information found as to any lectin associated with flounder

### Garden Pea (*Pisum sativum*)

- Lectin Group: Legume lectins
- Lectin Designations: PSA, PsA
- Lectin Locations: One lectin is in the seed, and one in the root of the plant.
- Agglutination: PSA possesses no specific affinity to blood group antigens. The lectin has affinity towards mannose and glucose. Fucose residues have been shown to be determinant in the tight binding of glycopeptides to pea lectin. The specificity is similar to lens culinaris (lentils).
- Mitogenic: Pea lectin is a mitogen (induces cellular division). It is non-toxic to several insects.
- Allergenic:

### Garlic (*Allium sativum*)

- Lectin Group: Monocot mannose-binding lectins
- Lectin Designations: ASA-I, ASA-II, ASA-L, ASA-RI
- Lectin Locations: Four lectins have been found in garlic. The first two listed are from the bulbs, the third is from the leaves, and the last one from the roots of the plant.
- Agglutination: All the garlic lectins agglutinate rabbit but not human erythrocytes (red blood cells). The two in the bulb (ASA-I and ASA-II) are highly specific for mannose. ASA-I and ASA-II show some anti-insect properties.
- Mitogenic:
- Allergenic: Human antiserum contains natural antibodies to the mannose-specific lectins from garlic bulbs.

### Halibut, Atlantic (*Hippoglossus hippoglossus*)

### Halibut, California (*Paralichthys californicus*)

### Halibut, Greenland (*Reinhardtius hippoglossoides*)

- Lectin Group: None found
- Lectin Designation(s): None found
- No information located on lectins in any halibut varieties

Jackfruit - tropical relative of breadfruit (*Artocarpus heterophyllus*)

- Lectin Group: Mannose binding lectins
- Lectin Designation: JFL, Jacalin
- Lectin Location:
- Agglutination: This is a mannose binding lectin. It has been used in research for the isolation of human secretory IgA of IgA1 and IgA2 subclass.
- Mitogenic:
- Allergenic:

Jerusalem Artichoke (*Helianthus tuberosus*)

- Lectin Group: Jacalin-related lectins
- Lectin Designations: HTA, HTA-I, HTA-II
- Location: HTA is found in the tubers of Jerusalem artichokes. Two lectins (HTA-I and HTA-II) have been found in the callus of the tuber.
- Agglutination: The HTA lectin has the highest agglutination with blood group A erythrocytes in humans. HTA-I and HTA-II agglutinate rabbit erythrocytes only.
- Mitogenic:
- Allergenic:

Kidney bean - This group includes the related Black beans (or turtle beans), pinto beans, etc. (*Phaseolus vulgaris*)

- Lectin Group: Legume lectins
- Lectin Designations: PHA-E, PHA-L, Pinto lectin
- Lectin Locations: The lectins are in the seeds, and PHA is present in all parts of the bean plant, but amounts present change during the life of the plant.
- Agglutination: PHA is highly reactive with most differentiated mammalian cells which express membrane glycoconjugates containing complex oligosaccharide chains. It agglutinates erythrocytes of most animal species. PHA-L agglutinates lymphocytes (white blood cells). PHA-E is NOT blood group specific



- Mitogenic: PHA is a very strong mitogen and can react with mast cells causing an IgE-independent histamine release and degranulation in vitro. PHA-E is mitogenic to lymphocytes (causing cell division to occur).
- Allergenic:
- Other: There are many different varieties of beans included in this grouping. The lectins may vary slightly between different types of these beans. PHA reacts with the insulin receptors of fat cell membranes and mimics most of the biological effects of insulin. At high levels of dietary intake, PHA appears to be nutritionally toxic for most animals, including insects, rats, birds, and humans.

#### Kiwi (*Actinidia chinensis*)

- Lectin Group: Unknown
- Lectin Designation: Unknown
- There is a lectin in kiwi fruit, but it affects only insects

#### Leek (*Allium porrum*)

- Lectin Group: Monocot mannose-binding lectins
- Lectin Designation: APA
- Lectin Location: The lectin is isolated from the leaves of the leek. High lectin concentrations are found in the nectar of leek flowers.
- Agglutination: It agglutinates rabbit, but not human red blood cells. It is a minor bulb protein and is highly specific for mannose.
- Mitogenic:
- Allergenic:

#### Lentil (*Lens culinaris*)

- Lectin Group: Legume lectins
- Lectin Designations: LcH, LCA
- Lectin Location: The lectins are in the seeds.
- Agglutination: It agglutinates human and rabbit erythrocytes. There is NO specific affinity to blood group antigens. The

- lectin binds to multiple sugar residues more than single alpha-mannose residue.
- Mitogenic: LcH is a mitogen (causes cells to divide).
  - Allergenic:

Lima Bean (*Phaseolus limensis*) aka (*P. lunatus*)

- Lectin Group: Legume lectins
- Lectin Designations: PLA, LBA, LBL
- Lectin Location: Two lectins are in the seeds of lima beans.
- Agglutination: They specifically bind glycoconjugates containing terminal non-reducing alpha-GalNAc residues. They also exhibit blood group specificity towards human Type A erythrocytes.
- Mitogenic: Lima bean lectin (LBL) is mitogenic for T- but not B-lymphocytes (types of white blood cells).
- Allergenic:

Litchi (*Litchi chinensis*)

- Lectin Group: Unknown
- Lectin Designation: LCL, Litchi chinensis lectin
- No information found on this lectin yet

Lobster (*Homarus americanus*)

- Lectin Group: Unknown
- Lectin Designation: HAA, Homarus americanus agglutinin
- No information found on this lectin yet

Mango - leaves and bark (*Mangifera indica*)

- Lectin Group: Unknown
- Lectin Designation: MIA, Mangifera indica agglutinin
- Lectin Location: The leaves of the mango tree contain the lectin, which has also been isolated from the bark.

Mung Bean (*Vigna radiata*) aka (*Phaseolus aureus*)

- Lectin Group: Unknown
- Lectin Designation: MBA, Mung bean agglutinin

- Lectin Location: The lectin is in the seeds.
- Agglutination: It agglutinates trypsinized (treated) rabbit erythrocytes but not human erythrocytes.
- Mitogenic:
- Allergenic:

Mushroom, common button (*Agaricus bisporus*)

- Lectin Group: Unknown
- Lectin Designations: ABA, AbiA, ABL
- No information located on these lectins yet

Okra (*Abelmoschus esculentus*)

- Lectin Group: Unknown
- Lectin Designation: Unknown
- There is a lectin in okra, it is thought to be non-toxic and present at low levels

Onion (*Allium cepa*)

- Lectin Group: Monocot mannose-binding lectins
- Lectin Designation: ACA, Allium cepa agglutinin
- Lectin Location: The lectin is found in the bulb.
- Agglutination: ACA is a minor bulb protein. It agglutinates rabbit but not human red blood cells. It is specific for mannose.
- Mitogenic:
- Allergenic:

Peanut (*Arachis hypogaea*)

- Lectin Group: Legume lectins
- Lectin Designations: PNA, GNL, MNL, PRA-I, PRA-II
- Lectin Locations: Lectins have been isolated from the seeds (PNA), the nodules and the roots of peanuts.
- Agglutination: PNA will NOT agglutinate human erythrocytes unless the cells are treated with neuraminidase. This applies to other cells, such as lymphocytes, as well. Agglutination of PNA, from the nuts, can be inhibited by galactose and lactose. PNA is specific for terminal beta-D-galactose residues.

- Mitogenic: PNA is a mitogen for human blood peripheral lymphocytes, colon cells, and stimulates proliferation in colon cells removed from patients with inflammatory bowel disease and colon polyps in vitro.
- Allergenic: Yes, high incidence known to occur

#### Pineapple (*Ananas comosus*)

- Lectin Group: None found
- Lectin Designation: None found
- No lectin found associated with pineapple, but a small protein, called bromelain inhibitor VI, which is a cysteine protease inhibitor.

#### Pinto bean (see Kidney Bean, *Phaseolus vulgaris*)

- Lectin Group: Legume lectins
- Lectin Designations: PHA-E, PHA-L, Pinto lectin
- Lectin Locations: The lectins are in the seeds, and PHA is present in all parts of the bean plant, but amounts present change during the life of the plant.
- Agglutination: PHA is highly reactive with most differentiated mammalian cells which express membrane glycoconjugates containing complex oligosaccharide chains. It agglutinates erythrocytes of most animal species. PHA-L agglutinates lymphocytes (white blood cells). PHA-E is NOT blood group specific
- Mitogenic: PHA is a very strong mitogen and can react with mast cells causing an IgE-independent histamine release and degranulation in vitro. PHA-E is mitogenic to lymphocytes (causing cell division to occur).
- Allergenic:
- Other: There are many different varieties of beans included in this grouping. The lectins may vary slightly between different types of these beans.

#### Potato (*Solanum tuberosum*)

- Lectin Group: Chitin-binding lectins

- Lectin Designation: STA, Solanum tuberosum agglutinin
- Lectin Location: The lectin was first found in the tubers.
- Agglutination: The potato lectin agglutinates all human and animal erythrocytes, including bovine, sheep, goat, horse, pig, cat guinea pig, rat, mouse and rabbit. It is NOT blood group specific. It is specific towards oligomers of N-acetylglucosamine. GlcNAc does not inhibit the agglutination of STA.
- Mitogenic:
- Allergenic:
- Other: The lectin is non-toxic to insects. It is considered a tuber protein, but occurs also in the roots, leaves and stems. The lectin content varies a great deal according to the variety.

#### Pumpkin, Marrow, Winter Squash (*Cucurbita maxima*)

- Lectin Group: Cucurbitaceae phloem lectins
- Lectin Designation: CMA, Cucurbita maxima agglutinin
- Lectin Location: The lectin was isolated from the phloem exudate of Cucurbita maxima. Phloem 'exudate' is sap.
- Agglutination: It is specific for oligomers of N-acetylglucosamine (oligomers are compounds containing a few structural units of polymers, which are made of 2 or more small molecules that combine to form larger molecules of basically repeating structures).
- Mitogenic:
- Allergenic:

#### Pumpkin, Summer Squash, Gourd (*Cucurbita pepo*)

- Lectin Group: Cucurbitaceae phloem lectins
- Lectin Designation: CPA
- Lectin Location: The lectin was found in the fruit of cucurbita pepo. It is a major protein in the phloem exudate. It is possible it has an anti-parasitic function.
- Agglutination: The lectin agglutinates rabbit erythrocytes. It is strongly inhibited by chitin oligosaccharides but only weakly by N-acetylglucosamine.

- Mitogenic:
- Allergenic:

#### Rice (*Oryza sativa*)

- Lectin Group: Chitin-binding lectins
- Lectin Designation: OSA, RL
- Lectin Location: Rice lectin was first isolated from rice bran. It is also found in rice embryos.
- Agglutination: Rice lectin agglutinates all human and rabbit erythrocytes. It is specific for GlcNAc and its oligomers.
- Mitogenic: It is mitogenic (causes the cells to divide) towards mouse spleen lymphocytes and human peripheral (in the bloodstream) lymphocytes.
- Allergenic: Not usually in the U.S., allergy to rice is much more prevalent in Asia.
- Other: Rice lectin has activity against the cowpea weevil.

#### Rye (*Secale cereale*)

- Lectin Group: Chitin-binding lectins
- Lectin Designation: SCA
- Lectin Location: The lectin is in the rye embryos.
- Agglutination: It agglutinates all human and rabbit erythrocytes. It is specific for GlcNAc. It is very closely related to wheat germ agglutinin (WGA).
- Mitogenic:
- Allergenic:

#### Saffron crocus (*Crocus sativus*)

- Lectin Group: Unknown
- Lectin Designation: LECp.CroSat.bu.HMA1
- Lectin Location: Four lectins have been found in crocus bulbs, but not in the edible part, the pollen (saffron).

#### Scarlet Runner Bean (*Phaseolus coccineus*)

- Lectin Group: Legume lectins
- Lectin Designations: PCA,

- Lectin Locations: There are two lectins in scarlet runner beans. This lectin is found in the seeds.
- Agglutination: It agglutinates all types of human erythrocytes. It has low agglutinating activity.
- Mitogenic: Yes. One of the lectins stimulates mitosis of lymphocytes (stimulates division of the white cells).
- Allergenic:

#### Shallot (*Allium ascalonicum*)

- Lectin Group: Monocot mannose-binding lectins
- Lectin Designation: AAA
- Lectin Location: The lectin is found in the bulbs. It is a minor bulb protein.
- Agglutination: It agglutinates rabbit but not human red blood cells. It is highly specific for mannose.
- Mitogenic:
- Allergenic:

#### Snail, Roman or edible (*Helix Pomatia*)

- Lectin Group: Unknown
- Lectin Designation: HPA
- Lectin Location:
- Agglutination: Possess anti-A blood group specificity. HPA also has affinity for terminal alpha-N-acetyl-D-galactosaminyl residues.
- Mitogenic:
- Allergenic:

#### Sole (*Solea solea*)

- Lectin Group: None found
- Lectin Designation: None found
- No information found on any lectin associated with sole

#### Soyabean (*Glycine max*)

- Lectin group: Legume lectins
- Lectin Designation: SBA
- Lectin Location: The lectin is in the seeds.

- **Agglutination:** Soybean lectin agglutinates red cells from humans and several animal species; it is not blood group specific. Soybean lectin shows the greatest affinity for N-acetylgalactosamine, its glycosides and oligosaccharides containing terminal N-acetylgalactosamine. It also reacts with galactose. It precipitates (causes to separate from solution or suspension) human A1 blood group substances, but reacts poorly with A2 and B substances and not at all with H substances.
- **Mitogenic:**
- **Allergenic:** Yes, high incidence of allergy known to occur to soybeans and soya products.
- **Other:** Soya is another major food crop that has been genetically modified and widely grown in the GMO format. Soybean agglutinin in the diet reduces the growth rate of young monogastric (single stomach) animals and induces dose- and polyamine-dependent and reversible hyperplastic growth (abnormal increase of in volume of a tissue or organ caused by the formation and growth of new normal cells) of the small intestine and pancreatic hypertrophy (increase in volume of a tissue or organ produced entirely by enlargement of existing cells). The lectin in the duodenal lumen stimulates pancreatic secretion via pancreatic cholecystokinin-A receptors and interferes with the absorption of Fe<sup>2+</sup> (iron). Parenteral administration ('parenteral' means by injection, either subcutaneous, intramuscularly, or intravenously) of the soybean lectin modulates the host's immune response and inhibits tumor growth.

Steelhead trout - eggs- (*Oncorhynchus mykiss*)

- **Lectin Group:** Unknown
- **Lectin Designations:** STL1, STL2
- No information found on these lectins yet

Sunflower seed (from *Helianthus annuus* L.)

- **Lectin Group:** No information found on this lectin



- Lectin Designation:
- Lectin Location:
- Agglutination:
- Mitogenic:
- Allergenic:

Tamarillo, Tree Tomato (*Cyphomandra betacea*)

- Lectin Group: Chitin-binding lectins
- Lectin Designation: CBL-1
- Lectin Location: This lectin is in the fruit of the tree tomato. In the fruit, the lectin is mostly located in the cell wall of fruit tissues and the seed coat. No lectin was detected in the leaves, stems, flowers or roots of the plant.
- Agglutination: The lectin agglutinates rabbit erythrocytes, not human. Oligomers of N-acetylglucosamine were the only carbohydrates that showed inhibition of CBL-1 induced agglutination. The lectin is heat stable.
- Mitogenic: It showed no mitogenic activity against human lymphocytes.
- Allergenic:

Taro (*Colocasia esculenta*)

- Lectin Group: Monocot mannose-binding lectins
- Lectin Designations: CEA, and a new taro lectin
- Lectin Location: The lectin in taro is found in the tubers, and is very abundant.
- Agglutination: CEA agglutinates rabbit but not human erythrocytes. A new taro lectin has been discovered and it specifically agglutinates immature sperm.
- Mitogenic:
- Allergenic:

Tomato (*Lycopersicon esculentum*)

- Lectin Group: Chitin-binding lectins
- Lectin Designations: LEA, TL, LEL

- **Lectin Location:** Tomato lectin was first isolated from ripe fruits. The lectin is located predominantly in the locular fluid and seeds. of ripe tomatoes.
- **Agglutination:** LEA agglutinates all human, and animal erythrocytes. It has specificity towards GlcNAc-oligomers. Researchers consider LEA apparently harmless even when eaten raw.
- **Mitogenic:** It is non-mitogenic for mouse and chicken lymphocytes. It is non-toxic to several insects.
- **Allergenic:**

#### Turbot (*Scophthalmus maximus*)

- **Lectin Group:** Unknown
- **Lectin Designation:** Unknown
- No information found on any lectin associated with turbot yet

#### Wheat Germ (*Triticum aestivum*) aka (*T. vulgare*)

- **Lectin Group:** Chitin-binding lectin
- **Lectin Designation:** WGA
- **Lectin Location:** The agglutinin was isolated originally from wheat germs. It has also been found in root tips and leaves of wheat seedlings.
- **Agglutination:** It agglutinates both human and animal erythrocytes. Has NO specific affinity to blood group antigens. It is specific for GlcNAc and GlcNAc-oligomers. WGA also binds sialic acid containing oligosaccharides.
- **Mitogenic:**
- **Allergenic:** Yes, high incidence of allergy is known to occur to wheat and wheat products.
- **Other:** It is toxic to several insects. WGA in the diet of rats reduced the digestibility and utilization of dietary proteins and the growth of the rats. The lectin binds to the epithelial cells and is a growth factor for the intestine. WGA inhibits herpes simplex virus absorption and rabies virus attachment to susceptible cells. WGA can inhibit the histamine release induced by basic secretagogues (an agent that stimulates secretion) from mast cells. WGA is virtually identical with the

lectins found in numerous other triticum species, such as, *T. bicornis*, *T. comosum*, *T. speltoides*, *T. umbellulatum*, etc.