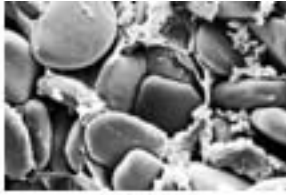
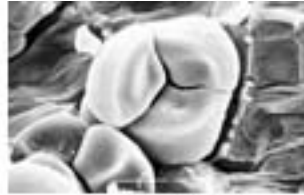




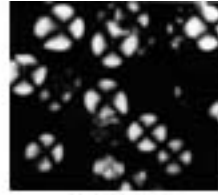
Achira



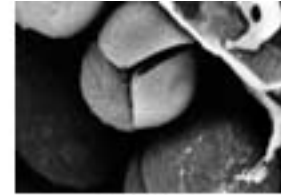
Achira



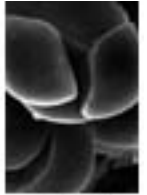
Sweet Potato



Manioc



Manioc



Jicama

Ethnobotanical Leaflets Starch Research Page

Co-Edited by Don Ugent and Linda S. Cummings

Why study starch? The long and short of it is that size, shape, and optical and chemical properties of starch are useful in the determination of taxonomic species. Starch characteristics can be used in place of, or in combination with other features of the plant to facilitate the identification of macro archaeological plant remains, or even small pieces of modern plant materials which for one reason or the other are lacking the traditional "key" taxonomic characters. As in the case of pollen and phytolith analyses, the study of fossil starch grains can help the ethnobotanist to better understand the diet of ancient human cultures.

The taxonomic usefulness of starch was long ago noted by Edward Tyson Reichert (1913), whose monumental work on "The Differentiation and Specificity of Starches in Relation to Genera, Species, Etc." has today become a classic in its field. He writes:

"It must have been recognized by Leeuwenhoek, and by many of the investigators of the earliest part of the last century, that starches from different sources are not morphologically identical, but if so it does not seem to have attracted any particular attention until the investigations of Fritzsche (Ann. d. Physik. u. Chemie, 1834, xxxii, 129). . . Fritzsche described the starches obtained from a variety of plants. . . He noted not only that the starches from different sources were different, but also that often the form was so characteristic as to determine the plant, or, at least, indicate the genus and family from which the specimen was obtained. This statement was confirmed some years later by Schleiden (Principles of Botany, 1849, 14), who examined a number of starches, mostly not described by Fritzsche. From the differences observed he was enabled to tabulate the various forms, and he published a classification that has continued to be quoted in various standard works, even at the present time."

Starch List Server: Please direct questions on starch to starch@acl.archaeology.usyd.

Identification Keys by Early Workers

- [Kraemer](#)
- [Meyer](#)
- [Muter](#)
- [Nägeli](#)
- [Schleiden](#)
- [Winton](#)

Illustrations of Starch Grains

- [Canna Plate from Reichert \(1913\)](#)
- [SEM of Ancient *Solanum maglia* Starch](#)
- [SEM of Ancient Maize](#)
- [Drawings of Ancient Starch from Towle, 1961](#)

Light and Chemical Reactions of Starch

The starches of various plant species can be distinguished from one another by using a combination of light and chemical tests. These tests are described in detail in an article entitled "The Differential Analysis of Starches" by James B. McNair (Botanical Series, Vol. IX, Field Museum of Natural History, Chicago, pp. 1-44, June 19, 1930).

Polarization:

An interference figure (or "Maltese cross") is seen when starch grains are examined under the polarization microscope. Intensity, distinctness, shape, regularity and position of the interference figure varies from species to species. With respect to intensity, potato starch has a value of 90 ("very high"), daffodil (*Narcissus poeticus*) a value of 50 (or "moderate"), and *Richardia albo-maculata* a value of 30 (or "low"). Intermediate gradations are readily expressed by both words and numbers (see [Polarization Chart](#)).

Coloration:

Iodine. Use 0.25 per cent Lugol's solution (the latter made by dissolving 5.0 grams of iodine plus 10.0 grams of potassium iodide in 100 ml of distilled or deionized water). Several drops are placed on a specimen and examined microscopically under low power. Potato starch, used as a color standard, is

taken as having a value of 60 (or "moderately deep"). *Crinum moorei* has a value of 30 (or "light"). Intermediate values are given in the [Iodine Reaction Chart](#).

Swelling Agents:

Chloral hydrate-iodine solution. Prepared by saturating a saturated solution of chloral hydrate with iodine. Several drops are placed on the specimen and examined under the polarizing microscope. The time for the disappearance of the Maltese cross (or gelatinization) is noted (see [Chloral Hydrate-Iodine Chart](#)).

Other Reagents: Purdy's solution (an aqueous solution of KOH), Pyrogallic acid, chromic acid, and ferric chloride. Use of these reagents is similar to that described for the above Chloral hydrate-iodine solution (see [Purdy's Solution Chart](#); [Pyrogallic Acid Chart](#); [Chromic Acid Chart](#) and [Ferric Chloride Chart](#)).

Temperature of Gelatinization:

A small quantity of starch is placed in a test tube holding 10 cc of water and slowly warmed in a water bath. The specimen is periodically removed from the water bath and observed under the polarization microscope for the occurrence of any optical changes. The time for gelatinization is noted (see [Temperature of Gelatinization Chart](#)).

Did You Know That. . .

Starch paste was used by the ancient Egyptians to cement strips of papyrus stems together for use as writing paper as early as 4000 B.C.

A procedure for starch production was given in a Roman treatise by Cato in the year 184 B.C.

Pliny the Elder (23-74 A.D.) states that the Romans used wheat starch to make papyrus documents, as well as to stiffen and whiten cloth and powder the hair.

Dioscorides (1st century A.D.), in his *Greek Herbal*, recommended the use of wheat starch for the treatment of ulcers, sores and eye inflammations.

Chinese paper documents of about 312 A.D. were coated with a starch sizing to provide resistance to ink penetration. Starches from rice, wheat and barley were commonly used at that time.

Abu Mansur, an Arabian teacher and pharmacologist, described a method in which wounds could be treated with the use of an artificial "honey" made by mixing starch with saliva in the year 975 A.D.

Starch was used in northern Europe to stiffen linen, possibly as early as the 14th century. Colored and uncolored starches were used as cosmetics, and uncolored starch primarily as hair powder. Blue starch was used by the Puritans until its use was banned by Queen Elizabeth in 1596.

Yellow starch was fashionable during the middle ages until a notorious women prisoner wearing a bright yellow-starched ruffle was publicly executed. Red starch cosmetics remained in fashion for many years (from Whistler, *et al.*, 1984, *Starch Chemistry and Technology*).

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KRAEMER'S (1907) CLASSIFICATION

A. Simple spherical grains.

(a) **Not more than 5 mu in diameter:** *Cimicifuga*, *Cypripedium*, *Frangula*, *Hydrastis*, *Leptandra*, *Piper*, *Prunus virginiana*, *Quassia*, *Quercus alba*, *Rhamnus purshiana*, *Spigelia*, *Viburnum opulus*, and *Viburnum prunifoliulli*.

(b) **Not more than 10 mu in diameter:** *Calamus*, *Eunonymus*, *Gelsemium*, *Granatum*, *Quillaja*, *Sanguinaria*, *Serpentaria*, *Tonka*, *Ulnus*, *Xanthoxylum*.

(c) **Not more than 15 mu in diameter:** *Apocynum*, *Cinchona*, *Colchici semen (in caruncle only)*, *Convallaria*, *Sumbul*, *Valeriana*.

(d) **Not more than 201 mu in diameter:** *Glycyrrhyza*, *Phytolacca*.

(e) **Not more than 300 mu in diameter:** *Rumex*, *Stillingia*.

B. Compound spherical or polygonal grains.

(a) **2 to 3 compound:** *Belladonna radix (5 to 15 mu)*, *Sassafras (7 to 20 mu)*, *Veratrum viride (7 to 20 mu)*.

(b) **2 to 4 compound:** *Aconitum (4 to 12 mu)*, *Cinnamonum. (7 to 15 mu)*, *Colchici cormus (7 to 20 mu)*, *Ipecacuanha (4 to 14 mu, those of Carthagena ipecac being uniformly larger)*, *Krameria (20 to 30 mu)*, *Rheum (5 to 201 mu)*, *Sarsaparilla (7 to 201 mu)*.

(c) **2 to 6 compound:** *Podophyllurn (5 to 121 mu)*.

(d) **More than 6 compound:** *Capsicum (3 to 7 mu)*, *Cardamonum (1 to 41 mu)*, *Cubeba (1 to 41 mu)*, *Gossypii cortex (5 to 20 mu)*, *Mezereum (10 to 151 mu)*, *Myristica (5 to 7 mu)*, *Pimenta (7 to 10 mu)*, *Rubus (3 to 7 mu)*.

C. Ellipsoidal or ovoid grains. *Althea (10 to 201 mu)*, *Geranium (10 to 15 mu)*, *Glycyrrhiza (5 to 10 mu)*, *Pareira (7 to 15 mu)*, *Physostigma (25 to 40 mu)*, *Rumex (10 to 20 mu)*, *Stillingia (15 to 30 mu)*, *Strophanthus (2 to 4 mu)*, *Zingiber (15 to 301 mu)*.

D. Grains of characteristic shape. *Calumba* (25 to 35 mu), *Iris florentina* (15 to 30 mu), and potato and other starches, such as arrowroot, wheat, corn, yam, canna, bean, pea, cassava.

E. Altered grains. *Guarana* (10 mu), *Jalapa* (15 to 35 mu; also 2 to 3 compound grains), *Tragacantha* (2 to 101 mu), turmeric in masses (70 to 140 mu).

F. Amylodextrin grains. Mace contains starch-grains which give a reddish color with iodine. Kraemer notes that leaves, herbs, and flowers do not as, a rule, contain starch.

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MEYER'S (1895) CLASSIFICATION OF STARCH-GRAINS

DEFINITIONS:

- (a) **Simple or monarch starch-grains.** Grains which have but one hilum.
- (b) **Complex starch-grains.** Grains that are formed from several starch-grains which are so crowded in one chromatophore that they become enveloped within common starchy layers, and thus bound into a single individual. Complex starch-grains may be diarch to polyarch.
- (c) **Solitary starch-grains.** Grains which grow singly in one chromatophore.
- (d) **Adelphous starch-grains.** Those which grow along with other grains in one chromatophore. They may be di- to poly-adelphous; up to 6-adelphous would be designated as oligo-adelphous.
- (e) **Monotone starch-grains.** Grains which during their entire life have undergone periods of solution, leaving coherent traces of each of the lamellae formed during the period of storage. Perfect monotone starch-grains in which there still exists a trace of every lamella which has been formed and in which, even if eccentric, the lamellae are closed are exceedingly rare. This term is also to be used in all cases in which no distinct characters of a polytone type are present.
- (f) **Polytone starch-grains.** Grains that have during their development undergone two or more periods of solution in which numerous lamellae completely disappear or decrease in width, interspersed with other periods during which they developed as the relative monotone type. Polytone grains if they have an eccentric structure show a series of lamellae which are open laterally.

Meyer's 1895 Classification

A. Monarch Starch-Grains.

(a) Solitary Starch-grains.

I. Centric starch-grains. Hilum. in the mathematical center; lamellae always equal at two diametrically opposite points (Nägeli, Type 1).

(1) Monarch solitary, spherical. (Nägeli, Type 1.) Hilum spherical in the center of the spherical grain; lamellae of uniform thickness, forming complete circles.

(2) Monarch solitary, centric, lens-shaped. Hilum and grains rounded and compressed (also rounded-reniform. or rounded-oval, compressed).

(3) Monarch solitary, centric, oval grains. Hilum and grains oval and lanceolate-oval; circular in cross-section; lamella) equal at two diametrically opposite points, being coarsest at two poles.

(4) Monarch solitary, centric, rod-shaped, and cone-shaped grains are bone-shaped and somewhat flattened.

II. Eccentric starch-grains.

(5) Monarch solitary, eccentric, rod-shaped. Lamellae on one side the heaviest, and at the diametrically opposite side the finest. Grains are circular in transverse section; both ends of almost equal width and thickness.

(6) Monarch solitary, eccentric, conical. Lamellae are the densest at one side and the most delicate at the diametrically opposite side. Grains are conical; circular in transverse sections. Hilum located at the narrower, less dense end.

(7) Monarch solitary, eccentric, inverted-conical. Grains similar to those in Type 6, but with the hilum. at the more dense end. Grains of Type 7 are usually found in company with those of Types 5 and 6.

(8) Monarch solitary, eccentric, flattened.

(b) Adelphous starch-grains.

I. Oligoadelphous Starch-grains. If several starch-grains grow simultaneously in a chromatophore, they behave just as spherocrystals do when growing in an inexhaustible mother liquor. Only in the very earliest stage are the two starch-grains spherical, and, as is apparent, the spherical shape is the more pronounced the larger the chloroplast when the first grains start to form. If the chloroplast is still small when the starch-gains begin to grow, so that the grains develop along with the chloroplast and exceed it in growth, they are very soon prevented from increasing in size on the inner side, and both become flattened. The lamellae are heaviest within and below, and in purely monotone grains they are always closed, since the crystallization substance between the grains is furnished in the greatest quantity. Flattening of the grains results, as is readily seen if one considers that when two spherical grains grow side by side in a chromatophore, the chromatophore

layer being thinnest where the two spheres come in closest contact with their surfaces. The entire process of growth of the diadelphous starch-grains is similar to that of monarch, solitary grains of *Pellionia*.

II. Polyadelphous starch-grains. The polyadelphous starch-grains of a chromatophore, which are not easily distinguished from the diadelphous, forms, are approximately similar in form and size, though the proportion of the diameter of the smallest to that of the largest is usually as 1 to 4. The greatest diameter of a chromatophore filled with starch-grains which was measured by Nägeli is 106 μ . Such a chromatophore may, according to Nägeli, contain between 10 and 30,000 growing starch-grains. The form of the polyadelphous grains is mostly polyangular or rounded with centric structure. Some exceptions are found in the flattened forms of *Arenaria* and *A. graminifolia* and *Drymaria cordata* described by Nägeli. The polyadelphous grains are found relatively seldom in rhizomes and roots, although there are some exceptions, but occur most abundantly in the reserved food of seeds.

B. Complex (Di- to Poly-arch) Starch-Grains. It can not be readily demonstrated that complex grains, like certain grains, for example, of *Pellionia*, are descended from adelphous grains. It has, however, been proven that all plant parts in which complex grains are present also at times develop adelphous starch-grains which correspond entirely with the central lamellae of the complex grains. Furthermore, gradations between the adelphous and the similar complex forms can be found. Additional proof of the connection between adelphous and complex starch-grains is the fact that plant parts which produce few and irregular adelphous grains likewise have relatively few and irregular complex grains in their cells.

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MUTER'S (1905) CLASSIFICATION

Muter's classification, which is based upon histological and polariscopic peculiarities, is characterized by the designation of each group by some important type of starch:

Potato group. Oval or ovoid granules, showing hilum and concentric rings clearly; cross and colors with selenite usually distinct.

Legume group. Round or oval granules, hilum marked, rings faint, but rendered visible in cases by chromic-acid solution; cross and colors feeble.

Wheat group. Round and oval granules, hilum and rings generally invisible; feebly marked cross and colors.

Sago group. Truncated granules, hilum distinct, rings faint; cross and colors usually faint.

Rice group. Polygonal granules, hilum distinct, rings faint; cross and colors usually faint.

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Nägeli's (1874) Classification of Starches From Different Sources

A. Grains Simple.

I. Centric. Hilum in the mathematical center; lamellae always equal at two corresponding diametrically opposite points.

Type 1. Spherical. When the grain is free both hilum and grain are spherical (Plate 1, *Zea mays*).

Type 2. Lenticular. When the grain is free both hilum and grain are rounded; grains compressed; sometimes circular or ovoid; sometimes triangular or quadrangular (Plate 2, *Secale*).

Type 3. Oval. When the grain is free both hilum and grain are oval to lanceolate-oval; occasionally kidney-shaped or somewhat curved; when on end they appear circular or somewhat compressed (Plate 6, *Phaseolus* and *Doliches*).

Type 4. Spindle-shaped. Grain linear or lanceolate, tapering towards the pointed ends, or of equal width with blunt ends; when on end they appear almost circular (*Euphorbia*, none illustrated).

Type 5. Bone-shaped. Grain elongated and compressed from the narrow aspect, but linear spindle-shaped from the broad aspect, with enlarged laminated ends (*Euphorbia*, none illustrated).

II. Eccentric. Hilum usually more or less removed from the mathematical center of the grain; lamellae coarsest and finest at opposite ends of the grain, respectively.

Type 6. Inverted cone-shaped. Grain on end almost circular; slender at the hilum end (Plate 100, *Solanum tuberosum*).

Type 7. Cone-shaped. Grains on end almost circular; decidedly thicker and broader at the hilum end (Plate 35, *Scilla peruviana*).

Type 8. Wedge-shaped or compressed. Grains flattened, of equal thickness throughout,

or thicker but narrower at the hilum end than at the distal end (Plate 83, *Canna edulis*).

Type 9. Rod-shaped (Plate 63, *Iris florentina*, *I. pallida*).

III. Grains simple and structure obscure.

Type 10. Structure not fully developed, or not identified owing to diminutive size of the grains. Lamellae, hila, cavities, fissures, and clefts seldom observed (Plate 60, *Narcissus poeticus*).

B. Grains semi-compound.

Type 11. Grains semi-compound. The component part-grains are enveloped partly or wholly by a common substance (Plate 41, *Hyacinthus orientalis*).

C. Grains Compound. The component part-grains not enveloped by a common substance.

I. Composed of fused part-grains.

Type 12. Composed of fused part-grains. The part-grains are not separated by fissures, and even different grains may be fused with one another (Plate 80, *Zingiber officinale*).

II. Composed of separated part-grains. The part-grains separated by fissures.

Type 13. Grains in 1 or 2 rows. From 3 to 11 components arranged in 1 or 2 rows (Plate 10, *Polygonum fagopyrum*).

Type 14. Equally divided grains of few components. From 2 to 10 or more almost equal-size part-grains which when separated have 1 curved surface and 1 or more pressure facets (Plate 98, *Manihot* and Plate 100, *Batatas edulis*).

Type 15. Unequally divided grains of few components. From 2 to 10 or more unequal sized firmly united part-grains, which when separated have 1 curved surface and several flattened pressure facets (Plate 95, *Aconitum napellus*).

Type 16. Multiple grains. From 20 to many thousand firmly united part-grains which when separated are covered with pressure facets (Plate 2, *Oryza sativa*).

Type 17. Hollow spherical grains. The part-grains are arranged in a spherical layer, as if a globular shell had been divided radially (Algae, none illustrated).

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SCHLEIDEN'S (1849) CLASSIFICATION OF STARCH-GRAINS

I. Amorphous Starch.

II. Simple Grains. The majority of plants exhibit perfectly simple individual grains, among which doublets and triplets only occur as exceptions.

1. Roundish Bodies.

A. With the central cavity or hilum, apparently absent.

1. Quite small, almost spherical granules.

2. Large, irregular, knobby, often truncated multiangular grains.

B. With small roundish central cavities or hila.

(a) With a perceptible laminated formation.

3. Very large, rough grains, deformed as it were.

4. Ovoid granules.

5. Mussel-like granules.

6. Almost triangular.

(b) With an indistinct or deficient lamellated formation.

7. Rounded-off polyhedric grains.

8. Sharp-edged, polyhedric, very small grains.

(c) With an elongated central cavity.

9. Roundish or oval grains, in a dry condition, generally showing a star-like cleft in the inner layers.

(d) Perfectly hollow, apparently cup-like grains.

10. Very marked in the rhizome of *Iris florentina* and in kindred species.

2. Flatly compressed lenticular granules.

11. Sometimes with, sometimes without, a decided lamellated formation; sometimes with a central, or eccentric, or less rounded, or more elongated, or radiated torn-up cavity or hilum.

3. Perfectly flat discs.

12. With more distinct lamellae, in which it is, however, at times doubtful whether they pass entirely around or are only menisci laid over one another.

4. Elongated grains.

13. With an elongated central cavity in the milk-juice of the indigenous and a few of the tropical Euphorbiaceae.

5. Very irregular grains.

14. In the milky juice of many tropical Euphorbiaceae.

III. Compound Granules. Here we find a simple grain as an exception in the plant or part of the plant.

1. The separate grains in the compound grains without evident central cavity or hilum.
 15. Compounded according to the simplest types in 2, 3, or 4.
 16. Generally arranged regularly, seldom irregularly, and composed of from 2 to 6.
2. The separate grains in the compound grain having a distinct central cavity or hilum.
 - (a) All the parts of the grains of nearly the same size.
 17. United according to simple types from 2 to 4. The central cavity or hilum small and roundish.
 18. Combined according to simple types from 2 to 4. The central cavity or hilum large and very beautiful, opened in a star-like form.
 19. Combined according to simple types from 2 to 4. The separate grains quite hollow, apparently cup-shaped.
 20. Firmly combined, from 2 to 12 in number, in very irregular groups.
 21. A large number, often as many as 30, of small roundish grains, very loosely grouped.
 - (b) Many smaller grains grown together upon one larger one.
 22. In the pith of *Sagua rumphii*, etc., and generally in sago.

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URL: <http://www.siu.edu/~ebl/schleid.htm>

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Ethnobotanical Leaflets Starch Research Page

WINTON'S CLASSIFICATION OF STARCHES

Winton (1906) records that the forms of the grains are so numerous, even in the same variety, as to forbid accurate classification, but that the following are the more striking:

1. **Globular.** The starch of the peanut and some grains of maize.
2. **Lenticular.** The large grains of wheat, rye, and barley.
3. **Ellipsoidal.** The starch of legumes.
4. **Ovoid or pear-shaped.** The starch of potato, canna, Bermuda arrowroot, yam, and banana.
5. **Truncated.** Most of the grains of cassava, batata, and sago.
6. **Polygonal.** The starch of maize, rice, oats, and buckwheat.

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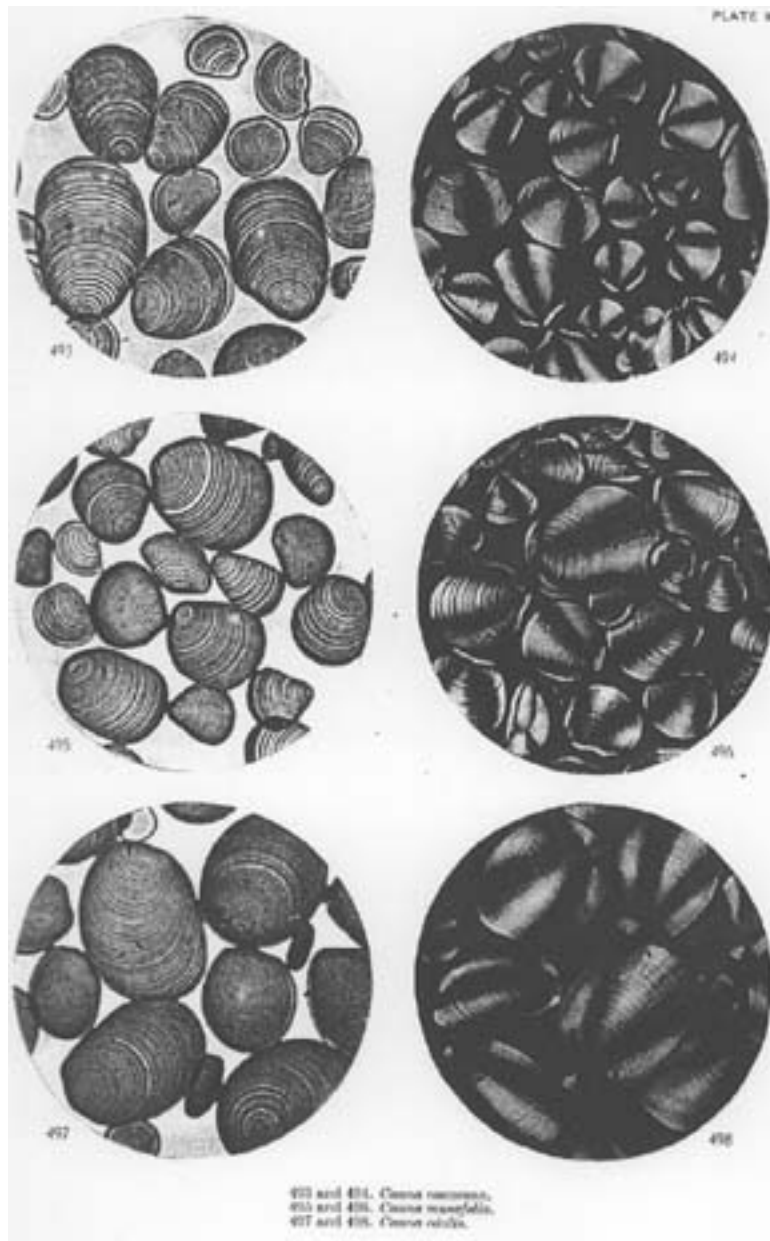
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URL: <http://www.siu.edu/~ebl/winton.htm>

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Canna Plate from Reichert (1913).
Polarized images are shown on the right.

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SEM micrograph of ancient *Solanum maglia* starch (ca. 11,000 b.c.). Specimen obtained from Monte Verde, Chile. [photo by D. Ugent]

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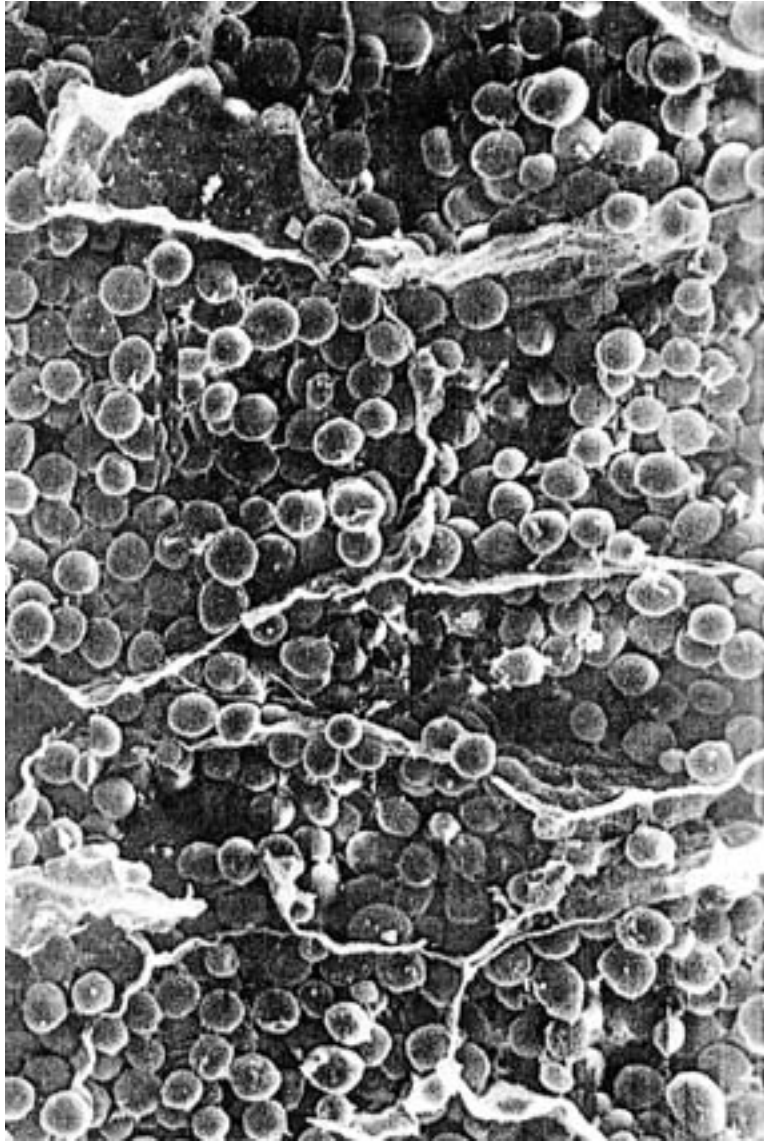
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URL: <http://www.siu.edu/~ebl/maglia.htm>

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Archaeological maize starch (ca. 500 b.c.).
Peruvian specimen collected by Don Ugent
at the Paracas Necropolis.

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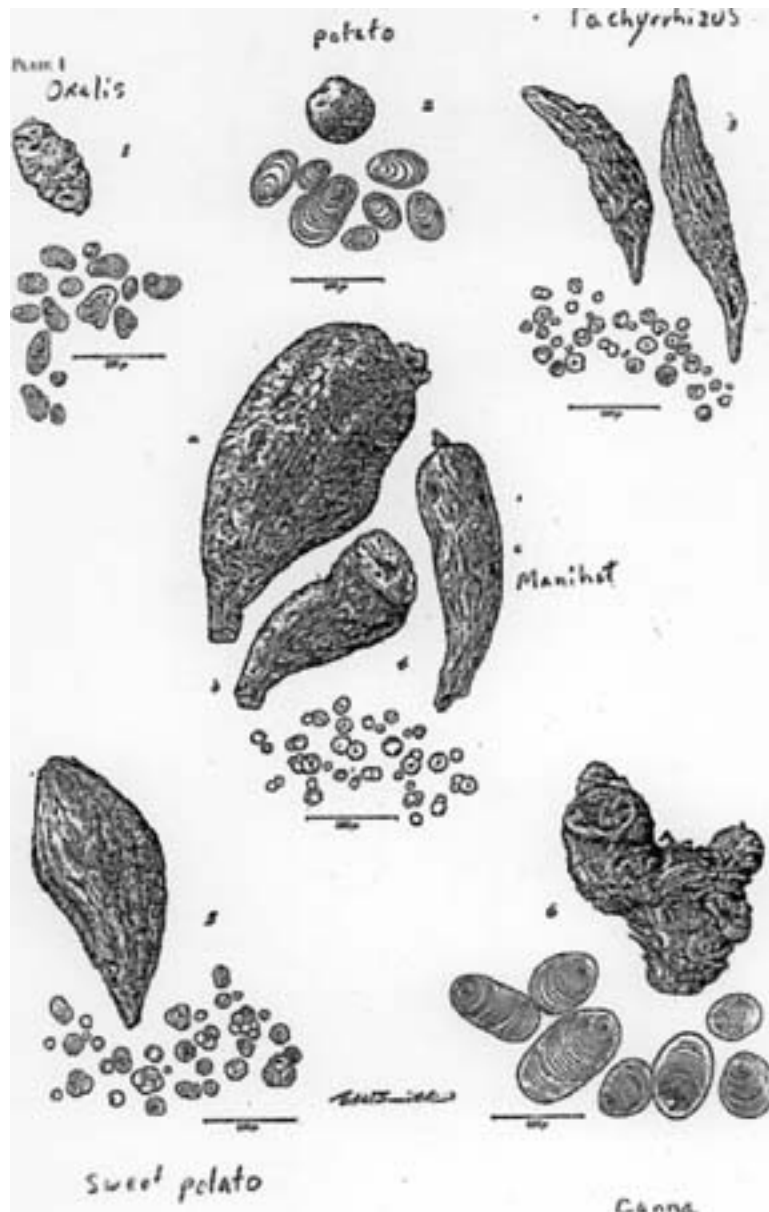


Plate from Towle (1961). First drawings of archaeological starch?

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The Degrees of Polarization of Various Starches

Based on a scale running from 0 (or very low intensity) to 4 (very high).

Aconitum Napellus 1
Actaea alba 1
Actaea spicata var. rubra 1
Aesculus Hippocastanum 3
Alstroemeria aurantiaca (aurea) 4
Alstroemeria brasiliensis 3
Alstroemeria brasiliensis 4
Amaryllis belladonna major 3
Andropogon Sorgham var. (Shallu) 3
Andropogon Sorghum var. (W. K. Corn) 3
Andropogon Sorghum var. (Y. B. Sorgh.) 4
Anemone apennina 1
Anemone blanda 1
Anemone fulgens 2
Anemone japonica 2
Antholyza crocosmoides 3
Antholyza paniculata 3
Arachis hypogaea 3
Arisaema triphyllum 3
Arrhenatherum elatius var. 2
Arum cornutum 3
Arum italicum 3
Arum palaestinum 2
Avena sativa var. (Clydesdale) 2
Babiana var. (Athraction) 2
Babiana var. (violacea) 2
Batatas edulis 3
Brodiaea californica 3
Brodiaea coccinea 3
Brodiaea congesta 3
Brodiaea grandiflora 3
Brodiaea ixioides var. splendens 3
Brodiaea lactea 3

Brodiaea laxa 3
Brodiaea peduncularis 3
Brodiaea Purdyi 3
Brodiaea stellaris 3
Calathea Lietzei 2
Calathea vittata 3
Calathea Wiotiana 2
Calathea Wiotiana 3
Calochortus albus 3
Calochortus Benthami 4
Calochortus Leichtlinii 4
Calochortus lilacinus 4
Calochortus luteus var. oculatus 4
Calochortus Maweanus var. major 4
Calochortus nitidus 3
Calochortus splendens 3
Canna edulis 4
Canna Roscoeana 4
Canna var. (Jean Tissot) 3
Canna var. (Konigin Charlotte)3
Canna var. (L. D. Eisele) 4
Canna var. (L. F. Baily) 3
Canna var. (Mrs. Kate Grey) 4
Canna var. (President Carnot) 3
Canna Warscewiczii 4
Castanea americana 3
Castanea pumila 3
Castanea sativa var. 3
Castanea sativa var. numbo 3
Chionodoxa Lucillae 3
Chionodoxa sardensis 3
Chionodoxa Tmolusi 3
Cimicifuga racemosa 1
Cochlearia Armoracia 2
Cochlearia Armoracia 3
Colchicum Parkinsoni 3
Convallaria majalis 2
Crinum americanum 4
Crinum fimbriatulum 4
Crocus Susianus (Cloth of Gold) 3
Crocus var. (Baron von Brunow) 3
Crocus versicolor (Cloth of Silver) 3
Curcuma longa 2

Curcuma petiolata 3
Cycas circinalis 3
Cycas revoluta 3
Cyclamen coum 3
Cyclamen repandum 3
Cypella Herberti 2
Dieffenbachia illustris (pith) 4
Dieffenbachia seguine var. maculata (cortex) 3
Dieffenbachia seguine var. irrorata (cortex) 2
Dieffenbachia seguine var. irrorata (pith) 3
Dieffenbachia seguine var. maculata (pith) 4
Dieffenbachia seguine var. nobilis (cortex) 2
Dieffenbachia seguine var. nobilis (pith) 3
Dieffenbachis illustris (cortex) 3
Dioon edule 3
Dolichos Lablab 2
Dracunculus vulgaris 3
Eranthus hyemalis 3
Erythronium americanum 3
Erythronium californicum 3
Erythronium citrinum 3
Erythronium Dens-canis 2
Erythronium Dens-canis var. grand. 3
Erythronium grandiflorum 2
Freesia refracta var. alba 3
Freesia refracta var. Leichtlinni 3
Fritillaria armena 3
Fritillaria aurea 3
Fritillaria imperialis var. Aurora 3
Fritillaria liliacea 3
Fritillaria pudica 3
Fritillaria pyrenalca 3
Fritillaria recurva 4
Galanthus Elwesii 3
Galanthus nivalis 3
Galtonia candicans 4
Gelasine azurea 3
Gesneria tubiflora 3
Gladiolus byzantinus 3
Gladiolus cardinalis (Blushing Bride) 3
Gladiolus floribundus 3
Gladiolus primulinus 3
Gloxinia var. 3

Haemanthus Katherinae 3
Hedychium coronarium 1
Hedychium Gardnerianum 0
Hippeastrum aulicum var. robustum 3
Hippeastrum equestre 3
Hippeastrum vittatum 3
Homeria collina 3
Hordeum sativum var. (Champion) 2
Hyacinthus orientalis var. alba superba 3
Hyacinthus orientalis var. albulus (Italian) 3
Hymenocallis undulata 3
Iris alata 4
Iris Bismarkiana 3
Iris caucasica 4
Iris florentina 2
Iris Histrio 4
Iris iberica 3
Iris pallida var. speciosa 3
Iris pumila var. cyanea 3
Iris reticulata 4
Iris tingitana 4
Iris xiphium var. Grand Tresorier 4
Iris xiphium var. lusitanica 4
Iris xiphium. var. Wilhelmine 4
Ixia speciosa 2
Ixia var. (Emma) 3
Ixia viridiflora 2
Jatropha Curcas 4
Lachenalia pendula 2
Lachenalia tricolor var. luteola 2
Lathyrus latifolius var. albus 3
Lathyrus magellanicus var. albus 3
Lathyrus odoratus var. Shahzada 3
Lathyrus sylvestris 2
Lens esculenta 4
Leucojum aestivum 3
Leucojum vernalis 3
Lilium auratum 3
Lilium candidum 3
Lilium longiflorum var. eximium 3
Lilium longiflorum var. giganteum 3
Lilium martagon 3
Lilium Parryi 3

Lilium philadelphicum 3
Lilium rubellum 3
Lilium speciosum var. album 3
Lilium superbum 3
Lilium tenuifolium 3
Lilium tigrinum var. splendens 3
Lilium Henryi 4
Manihot utilisima 3
Maranta arundinacea 3
Maranta arundinacea var. No. 1 3
Maranta arundinacea var. No. 2 3
Maranta leuconeura 3
Maranta Massangeana 3
Maranta musaica 3
Marica gracilis 0
Moraea tristis 3
Mucuna pruriens 4
Musa Cavendishii (green fruit) 2
Musa Cavendishii 1
Muscari botryoides 3
Muscari commutatum 3
Muscari comosum 3
Muscari compactum 3
Muscari micranthum 3
Muscari paradoxum 3
Narcissus biflorus 3
Narcissus Bulbocodium 3
Narcissus Bulbocodium var. monophyllus 3
Narcissus Bulbocodium. var. conspicuus 3
Narcissus Horsfieldii 3
Narcissus incomparabilis 3
Narcissus Jonquilla 3
Narcissus Jonquilla var. Campernelli rug 3
Narcissus Jonquilla var. rugulosus 4
Narcissus maximus 3
Narcissus odorus 3
Narcissus poeticus 3
Narcissus tazetta var. orientalis 3
Nelumbo lutes 3
Nelumbo nucifera 3
Nymphaea alba 3
Nymphaea Gladstoniana 3
Nymphaea marliacea. var. albida 3

Nymphaea odorata 3
Nymphaea odorata var. *rosea* 3
Nymphaea marliacea var. *carnea* 3
Ornithogalum narbonense (*pyramidale*) 3
Ornithogalum nutans 3
Ornithogalum thyrsoides var. *aureum* 4
Ornithogalum umbellatum 3
Oryza sativa var. 2
Panicum Crus-galli var. 2
Phaseolus lunatus var. (H.'s B. Lima) 3
Phaseolus vulgaris var. (Red K. Bean) 3
Pisum sativum var. (Elec. E. Early) 3
Pisum sativum var. (Eugenie green) 1
Pisum sativum var. (Eugenie yellow) 2
Pisum sativum var. (L. W. Marrowfat) 3
Pisum sativum var. (Mam. G. Seeded) 2
Pisum sativum var. (Thos. Laxton) 1
Polygonum Fagopyrum var. (American) 3
Polygonum Fagopyrum var. (Japanese) 3
Puschkinia scilloides 3
Puschkinia scilloides var. *libanotica* 3
Quercus alba 3
Quercus Muhlenbergii 3
Quercus Prinus 3
Quercus rubra 2
Quercus texana 3
Ranunculus bulbosus 1
Ranunculus Ficaria 3
Richardia africana 0
Richardia albo-maculata 2
Richardia Elliotiana 2
Romulea rosea var. *speciosa* 3
Scilla bifolia 3
Scilla peruviana 3
Scilla sibirica 3
Secale cereale var. (Mammoth Winter) 2
Secale cereale var. (Spring) 3
Solanum tuberosum 4
Sparaxis grandiflora var. *alba* 3
Sparaxis var. (Albertine) 3
Sprekelia formosissima 3
Sternbergia lutes 3
Stromanthe sanguinea 3

Tacca pinnatifida 3
Tigridia Pavonia var. conchiflora 1
Tigridia Pavonia var. grandiflora alba 1
Trianosperma ficifolia 3
Trillium grandiflorum 2
Trillium ovatum 2
Trillium sessile var. californicum 2
Triteleia uniflora 3
Triticum sativum var. dicoccum 1
Triticum sativum var. vulgare 1
Tritonia crocata 2
Tritonia crocata var. lilacina 3
Tritonia crocata var. rosea 3
Tritonia crocosmaeflora 3
Tritonia Pottsii 3
Tritonia securigera 3
Tulipa australis 3
Tulipa Billietiana 3
Tulipa Clusiana 3
Tulipa Clusiana var. persica 3
Tulipa Didieri 3
Tulipa Didieri var. Fransoniana 3
Tulipa Didieri var. Mauriana 3
Tulipa Greigi 3
Tulipa Hageri 3
Tulipa oculus-solis 3
Tulipa praecox 3
Tulipa sylvetris 3
Vallota purpurea 3
Vicia Faba 3
Vicia fulgens 4
Vicia Gerardi 4
Vicia sativa 3
Vicia villosa 3
Vicia villosa 4
Vucia Faba 4
Watsonia humilis 3
Watsonia iridifolia var. O'Brieni 3
Watsonia Meriana 3
Wistaria chinensis 3
Zamia integrifolia 4
Zea Mays var. everta (Golden Queen) 3
Zea Mays var. everta (White Rice) 3

Zea Mays var. indentata (H. King) 3
Zea Mays var. indentata. (E'y L'g) 3
Zea Mays var. indurata (C.'s Early) 3
Zea Mays var. indurata (N. Dakota) 3
Zea Mays var. saccharata (B. Mex.) 2
Zea Mays var. saccharata (G. B'm) 3
Zea Mays var. saccharata (S.'s E'n) 3
Zephyranthes candida 3
Zephyranthes rosea 3
Zingiber officinale var. Cochin 1
Zingiber officinale var. Jamaica No. 2 1
Zingiber officinale var. Jamaica No. I 1

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The Iodine Reaction of Various Starches

Based on a scale running from 0 (no coloration or very light) to 4 (very dark).

Aconitum Napellus 4
Actaea alba 4
Actaea spicata var. rubra 4
Adonis amurensis 3
Aesculus Hippocastanum 3
Alstroemeria aurantiaca (aurea) 4
Alstroemeria brasiliensis 4
Alstroemeria ligtu 4
Amaryllis belladonna major 3
Andropogon Sorghum var. (Shallu) 3
Andropogon Sorghum var. (W. K. Corn) 3
Andropogon Sorghum var. (Y. I. Sorgh.) 3
Anemone apennina 4
Anemone blanda 4
Anemone fulgens 4
Anemone japonica 4
Antholyza crocosmoides 1
Antholyza paniculata 1
Arachis hypogaea 3
Arisaema triphyllum 3
Arrhenatherum elatius var. 1
Arum cornutum 4
Arum italicum 3
Arum palaestinum 3
Avena sativa var. (Clydesdale) 1
Babiana var. (Athraction) 1
Babiana var. (violacea) 1
Batatas edulis 4
Brodiaea californica 3
Brodiaea candida 3
Brodiaea capitata 4
Brodiaea coccinea 4
Brodiaea congesta 3

Brodiaea grandiflora 4
Brodiaea ixioides var. *splendens* 3
Brodiaea lactea 4
Brodiaea laxa 4
Brodiaea peduncularis 3
Brodiaea Purdyi 4
Brodiaea stellaris 3
Calathea Lietzei 3
Calathea Vandenheckei 2
Calathea vittata 2
Calathea Wiotiana 3
Calochortus albus 4
Calochortus Benthami 4
Calochortus Howellii 4
Calochortus Leichtlinii 4
Calochortus lilacinus 4
Calochortus luteus var. *oculatus* 4
Calochortus Maweanus var. *major* 4
Calochortus nitidus 4
Calochortus splendens 4
Canna edulis 4
Canna musaefolia 3
Canna Roscoeana 4
Canna var. (J. D. Eisele) 3
Canna var. (Jean Tissot) 3
Canna var. (Konigin Charlotte) 3
Canna var. (L. E. Baily) 3
Canna var. (Mrs. Kate Grey) 4
Canna var. (President Carnot) 3
Canna Warscewiczii 3
Castanea americana 3
Castanea pumila 3
Castanea sativa var. 3
Castanea sativa var. *numbo* 3
Chionodoxa Lucillae 3
Chionodoxa sardensis 3
Chionodoxa Tmolusi 3
Cimicifuga racemosa 3
Cochlearia Armoracia 4
Colchicum Parkinsoni 2
Convallaria majalis 3
Crinum americanum 4
Crinum fimbriatulum 3

Crocus Susianus (Cloth of Gold) 3
Crocus var. (Baron von Brunow) 3
Crocus versicolor (Cloth of Silver) 3
Curcuma longa 1
Curcuma petiolata 2
Cycas circinalis 3
Cycas revoluta 3
Cyclamen cou 4
Cyclamen repandum 3
Cypella Herberti 3
Dieffenbachia illustris (cortex) 3
Dieffenbachia illustris (pith) 4
Dieffenbachia seg. var. irror. (cort.) 3
Dieffenbachia seg. var. irror. (pith) 3
Dieffenbachia seg. var. mac. (cort.) 4
Dieffenbachia seg. var. mac. (pith) 4
Dieffenbachia seg. var. nob. (cort.) 3
Dieffenbachia seg. var. nob. (pith) 3
Dioon edule 3
Dolichos Lablab 2
Dracunculus vulgaris 4
Eranthis hyemalis 3
Erythronium americanum 3
Erythronium californicum 3
Erythronium citrinum 3
Erythronium Dens-canis 3
Erythronium Dens-canis var. grand. 3
Erythronium grandiflorum 3
Freesia refracta var. alba 3
Freesia refracta var. Leichtlinii 4
Fritillaria armena 2
Fritillaria aurea 3
Fritillaria liliacea 3
Fritillaria meleagris 3
Fritillaria pudica 3
Fritillaria pyrenaica 3
Fritillaria recurva 3
Galanthus Elwesii 4
Galanthus nivalis 3
Galtonia candicans 3
Gelasine azurea 3
Gesneria tubiflora 4
Gladiolus byzantinus 3

Gladiolus cardinalis (Blushing Bride) 3
Gladiolus floribundus 3
Gladiolus primulinus 3
Gloxinia var. 3
Haemanthus Katherinae 3
Hedychium coronarium 2
Hedychium Gardnerianum 2
Hippeastrum aulicum var. robustum 4
Hippeastrum equestre 4
Hippeastrum vittatum 4
Homeria collina 3
Hordeum sativum var. (Champion) 1
Hyacinthus orient. var. (Italian) 3
Hyacinthus orient. var. alba superb. 3
Hyacinthus orient. var. albulus (white) 3
Hymenocallis calathina 4
Hymenocallis undulata 3
Iris alata 3
Iris Bismarckidana 3
Iris caucasica 3
Iris florentina 3
Iris Histrio 3
Iris iberica 3
Iris pallida speciosa 3
Iris pumila var. cyanea 3
Iris reticulata 3
Iris tingitana 3
Iris xiphium var. Grand Tresorier 3
Iris xiphium var. lusitanica 3
Iris xiphium var. Wilhelmine 3
Ixia speciosa 3
Ixia var. (Emma) 3
Ixia viridiflora 3
Jatropha Cureas 3
Lachenalia pendula 3
Lachenalia tricolor var. luteola 3
Lathyrus latifolius var. albus 3
Lathyrus magellanicus var. albus 2
Lathyrus odoratus var. Shahzada 2
Lathyrus sylvestris 3
Lens esculenta 3
Leucojum aestivum 4
Leucojum vernal 3

Lilium auratum 3
Lilium candidum 3
Lilium Henryi 3
Lilium longiflorum var. eximium 3
Lilium longiflorum var. giganteum 3
Lilium martagon 3
Lilium pardalinum 3
Lilium Parryi 3
Lilium philadelphicum 3
Lilium puberulum 3
Lilium rubellum 3
Lilium speciosum var. album 4
Lilium superbum 4
Lilium tenuifolium 3
Lilium tigrinum var. splendens 4
Manihot utilissima 1
Maranta arundinacea 3
Maranta arundinacea var. No. 1 3
Maranta arundinacea var. No. 2 3
Maranta leuconeura 3
Maranta Massangeana 3
Maranta musaica 3
Moraea tristis 3
Mucuna pruriens 3
Musa Cavendishii (green fruit) 4
Musa Cavendishii 3
Musa ensete 4
Musa sapientum 4
Muscari botryoides 3
Muscari commutatum 3
Muscari comosum 3
Muscari compactum 3
Muscari conicum 3
Muscari micranthum 3
Muscari paradoxum 3
Muscari racemosum 3
Narcissus biflorus 4
Narcissus Bulbo var. conspicuus 4
Narcissus bulbo var. monophyllus 3
Narcissus Bulbocodium 4
Narcissus Horsfieldii 3
Narcissus incomparabilis 3
Narcissus Jonquilla 3

Narcissus Jonquilla var. Campernelli rug. 4
Narcissus Jonquilla var. rugulosus 4
Narcissus maximus 4
Narcissus odorus 4
Narcissus poeticus 4
Narcissus tazetta var. orientalis 3
Nelumbo lutea 3
Nelumbo nucifera 3
Nymphaea alba 2
Nymphaea Gladstoniana 1
Nymphaea marliacea var. albida 2
Nymphaea marliacea var. carnea 2
Nymphaea odorata 2
Nymphaea odorata var. rosea 2
Ornithogalum narbonense pyrimadale 3
Ornithogalum nutans 3
Ornithogalum thyrsoides var. aureum 3
Ornithogalum umbellatum 3
Oryza sativa var. 1
Panicum Crus-galli var. 1
Phaseolus limatus var. (H.'s B. Lima) 3
Phaseolus vulgaris var. (Red K. Bean) 3
Pisum sativum var. (Elec. E. Early) 2
Pisum sativum var. (Eugenie green) 2
Pisum sativum var. (Eugenie yellow) 2
Pisum sativum var. (L. W. Marrow-fat) 3
Pisum sativum var. (Mam. G. Seeded) 3
Pisum sativum var. (Thos. Laxton) 1
Polygonum Fagopyrum var. (American) 1
Polygonum Fagopyrum var. (Japanese) 1
Pritillaria imperialis var. Auro 3
Puschkinia scil. var. libanotica 4
Puschkinia scilloides 3
Quercus alba 2
Quercus Muhlenbergii 2
Quercus Prinus 2
Quercus rubra 2
Quercus texana 2
Ranunculus bulbosus 3
Ranunculus Ficaria 4
Richardia africana 3
Richardia albo-maculata 4
Richardia Elliotiana 3

Romulea rosea var. speciosa 1
Scilla bifolia 3
Scilla peruviana 3
Scilla sibirica 3
Secale cereale var. (Mammot Winter) 3
Secale cereale var. (Spring) 3
Solanum tuberosum 4
Sparaxis grandiflora alba 3
Sparaxis var. (Albertine) 3
Sprekelia formosissima 3
Sternbergia lutea 3
Stromanthe sanguinea 1
Tacca pinnatifida 3
Tigridia Pavonia var. conchiflora 3
Tigridia Pavonia var. grand. alba 3
Trianosperma ficifolia 4
Trillium grandiflorum 3
Trillium ovatum 4
Trillium sessile var. californicum 3
Triteleia uniflora 3
Triticum sativum var. dicoccum 3
Triticum sativum var. vulgare 2
Tritonia crocata 2
Tritonia crocata var. lilacina 3
Tritonia crocata var. rosea 3
Tritonia crocosmaeflora 2
Tritonia Pottsii 1
Tritonia securigera 2
Tulipa australis 3
Tulipa Billietiana 3
Tulipa Clusiana 3
Tulipa Clusiana var. persica 4
Tulipa Didieri 3
Tulipa Didieri var. Fransoniana 3
Tulipa Greigi 4
Tulipa Hageri 3
Tulipa oculus-solis 3
Tulipa sylvestris 4
Tulips praecox 3
Tullpa Didieri var. mauriana 3
Vallota purpurea 2
Vicia Faba 3
Vicia fulgens 3

Vicia Gerardi 3
Vicia sativa 3
Vicia villosa 3
Watsonia humilis 1
Watsonia iridifolia var. O'Brieni 2
Watsonia Meriana 1
Wistaria chinensis 3
Zamia integrifolia 1
Zea Mays var. everta (Golden Queen) 3
Zea Mays var. everta (White Rice) 3
Zea Mays var. indentata (E'y L'g) 3
Zea Mays var. indentata (H. King) 3
Zea Mays var. indurata (C.'s Early) 3
Zea Mays var. indurata (N. Dakota) 3
Zea Mays var. saccharata (B. Mex.) 3
Zea Mays var. saccharata (G. B'm) 3
Zea Mays var. saccharata (S.'s E'n) 3
Zephyranthes candida 3
Zephyranthes rosea 3
Zingiber offic. var. Cochin 3
Zingiber offic. var. Jamaica No. 1 3
Zingiber offic. var. Jamaica No. 2 3
Zingiber officinale 3

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The Chloral Hydrate-Iodine Reaction of Various Starches

Relative times for gelatinization based on a scale running from 0 to 11, where 11=60 or more minutes.

<i>Aconitum Napellus</i>	0
<i>Actaea alba</i>	0
<i>Actaea spicata</i> var. <i>rubra</i>	0
<i>Adonis amurensis</i>	0
<i>Aesculus Hippocastanum</i>	1
<i>Alstroemeria aurantiaca</i> (aurea)	3
<i>Alstroemeria brasiliensis</i>	1
<i>Alstroemeria ligtu</i>	1
<i>Amaryllis belladonna</i> major	1
<i>Andropogon Sorghum</i> var. (Shallu)	3
<i>Andropogon Sorghum</i> var. (W. K. Corn)	2
<i>Andropogon Sorghum</i> var. (Y. B. Sorgh.)	2
<i>Anemone apennina</i>	0
<i>Anemone blanda</i>	0
<i>Anemone fulgens</i>	0
<i>Anemone japonica</i>	0
<i>Antholyza crocosmoides</i>	11
<i>Antholyza paniculata</i>	11
<i>Arachis hypogaea</i>	0
<i>Arisaema triphyllum</i>	5
<i>Arrhenatherum elatius</i> var.	1
<i>Arum cornutum</i>	0
<i>Arum italicum</i>	5
<i>Arum palaestinum</i>	1
<i>Avena sativa</i> var. (Clydesdale)	1
<i>Babiana</i> var. (Athraction)	11
<i>Babiana</i> var. (violacea)	11
<i>Batatas edulis</i>	11
<i>Brodiaea californica</i>	11
<i>Brodiaea candida</i>	6
<i>Brodiaea capitata</i>	11
<i>Brodiaea coccinea</i>	11
<i>Brodiaea congesta</i>	11

Brodiaea grandiflora 11
Brodiaea ixioides var. *splendens* 11
Brodiaea lactea 8
Brodiaea laxa 6
Brodiaea peduncularis 11
Brodiaea Purdyi 11
Brodiaea stellaris 11
Calathea Lietzei 11
Calathea Vandenbeckei 11
Calathea vittata 11
Calathea Wiotiana 11
Calochortus albus 1
Calochortus Benthami 0
Calochortus Howellii 1
Calochortus Leichtlinii 1
Calochortus lilacina 0
Calochortus luteus var. *oculatus* 1
Calochortus Maweanus var. *major* 1
Calochortus nitidus 0
Calochortus splendens 1
Canna edulis 0
Canna musaefolia 1
Canna Roscoeana 0
Canna var. (J. D. Eisele) 0
Canna var. (Jean Tissot) 0
Canna var. (Konigin Charlotte) 0
Canna var. (L. E. Baily) 0
Canna var. (Mrs. Kate Grey) 0
Canna var. (President Carnot) 0
Canna Warscewiczii 0
Castanea americana 0
Castanea pumila 0
Castanea sativa var. 0
Castanea sativa var. *numbo* 0
Chionodoxa Lucillae 2
Chionodoxa sardensis 2
Chionodoxa Tmolusi 1
Cimicifuga racemosa 0
Cochlearia Armoracia 0
Colchicum Parldnsoni 9
Convallaria majalis 0
Crinum americanum 2
Crinum fimbriatulum 5

Crocus Susianus (Cloth of Gold) 0
Crocus var. (Baron von Brunow) 0
Crocus versicolor (Cloth of Silver) 1
Curcuma longa 1
Curcuma petiolata 1
Cycas circinalis 11
Cycas revoluta 11
Cyclamen coum 0
Cyclamen repandum 0
Cypella Herberti 5
Dieffenbachia illustris (cortex) 11
Dieffenbachia illustris (pith) 11
Dieffenbachia seg. var. irror. (cort.) 4
Dieffenbachia seg. var. irror. (pith) 7
Dieffenbachia seg. var. mac. (pith) 11
Dieffenbachia seg. var. mac. (port.) 11
Dieffenbachia seg. var. nob. (cort.) 2
Dieffenbachia seg. var. nob. (pith) 5
Dioon edule 11
Dolichos Lablab 11
Dracunculus vulgaris 1
Eranthis hyemalis 0
Erythronium americanum 0
Erythronium californicum 1
Erythronium citrinum 0
Erythronium Dens-canis 0
Erythronium Dens-canis var. grand. 0
Erythronium grandiflorum 0
Freesia refracta var. alba 11
Freesia refracts var. Leichtlinii 11
Fritillaria armena 1
Fritillaria aurea 1
Fritillaria imperialis var. Aurora 2
Fritillaria liliacea 0
Fritillaria meleagris 0
Fritillaria pudica 0
Fritillaria pyrenaica 1
Fritillaria recurva 2
Galanthus Elwesii 5
Galanthus nivalis 2
Galtonia candicans 1
Gelasine azurea 11
Gesneria tubiflora 11

Gladiolus byzantinus 11
Gladiolus cardinalis (Blushing Bride) 11
Gladiolus floribundus 2
Gladiolus primulinus 11
Gloxinia var. 0
Haemanthus Katherinae 0
Hedychium coronarium 0
Hedychium Gardnepanum 0
Hippeastrum aulicum var. robustum 9
Hippeastrum equestre 11
Hippeastrum. vittatum 11
Homeria collina 11
Hordeum sativum var. (Champion) 11
Hyacinthus orient. var. albulus 2
Hyacinthus orientalis var. alba superb. 0
Hyacinthus orientalis var. albulus (white) 0
Hymenocallis calathina 0
Hymenocallis undulata 1
Iris alata 5
Iris Bismarckiana 0
Iris caucasica 2
Iris florentina 0
Iris Histrio 11
Iris iberica 2
Iris pallida speciosa 2
Iris pumila var. cyanea 2
Iris reticulata 7
Iris tingitans 4
Iris xiphium var. Grand Tresorier 2
Iris xiphium var. lusitanica 2
Iris xiphium var. Wilhelmine 2
Ixia speciosa 5
Ixia var. (Emma) 5
Ixia viridiflora 5
Jatropha Cureas 0
Lachenalia pendula 5
Lachenalia tricolor var. luteola 8
Lathyrus latifolius var. albus 5
Lathyrus magellanicus var. albus 11
Lathyrus odoratus var. Shahzada 11
Lathyrus sylvestris 5
Lens esculenta 11
Leucojum aestivum 5

Leucojum vernum 5
Lilium auratum 3
Lilium candidum 2
Lilium Henryi 2
Lilium longiflorum var. giganteum 2
Lilium longiflorum var. eximium 1
Lilium martagon 0
Lilium pardalinum 0
Lilium Parryi 0
Lilium philadelphicum 1
Lilium puberulum 2
Lilium rubellum 1
Lilium speciosum var. album 0
Lilium superbum 1
Lilium tenuifolium 1
Lilium tigrinum var. splendens 0
Manihot utilissima 11
Maranta arundinacea 11
Maranta arundinacea var. No. 2 11
Maranta arundinacea var. No. I 11
Maranta leuconeura 11
Maranta Massangeana 11
Maranta musaica 11
Marica gracilis 11
Moraea tristis 11
Mucuna pruriens 11
Musa Cavendishii (green fruit) 0
Musa Cavendishii 0
Musa ensete 1
Musa sapientum 0
Muscari botryoides 3
Muscari commutatum 5
Muscari comosum 5
Muscari compactum 5
Muscari conicum 11
Muscari micranthum 3
Muscari paradoxum 11
Muscari racemosum 9
Narcissus biflorus 11
Narcissus Bulbocodium 11
Narcissus Bulbocodium var. conspicuus 11
Narcissus Bulbocodium. var. monophyllus 11
Narcissus Horsfieldii 11

Narcissus incomparabilis 11
Narcissus Jonquilla 8
Narcissus Jonquilla var. *Campernellei rug.* 11
Narcissus Jonquilla var. *rugulosus* 11
Narcissus maximus 11
Narcissus odorus 11
Narcissus poeticus 11
Narcissus tazetta var. *orientalis* 11
Nelumbo lutea 0
Nelumbo nucifera 0
Nymphaea alba 11
Nymphaea Gladstoniana 11
Nymphaea marliacea var. *albida* 11
Nymphaea marliacea var. *carnea* 11
Nymphaea odorata 11
Ornithogalum narbonense (*pyramidale*) 1
Ornithogalum nutans 1
Ornithogalum thyrsoides var. *aureum* 0
Ornithogalum umbellatum 1
Oryza sativa 3
Panicum Crus-galli var. 2
Phaseolus lunatus var. (*H.'s B. Lima*) 11
Phaseolus vulgaris var. (*Red K. Bean*) 11
Pisum sativum var. (*Eugenie green*) 0
Pisum sativum var. (*L. W. Marrowfat*) 11
Pisum sativum var. (*Mam. G. Seeded*) 11
Pisum sativum. var. (*Elec. E. Early*) 11
Pisum sativum. var. (*Eugenie yellow*) 0
Pisum sativum. var. (*Thos. Laxton*) 0
Polygonum Fagopyrum var. (*Japanese*) 0
Polygonum. Fagopyrum var. (*American*) 0
Puschldnia scilloides 1
Puschldnia scilloides var. *libanoti* 2
Quercus alba 0
Quercus Muhlenbergii 1
Quercus Prinus 0
Quercus rubra 0
Quercus texana 0
Ranunculus bulbosus 0
Ranunculus Ficaria 0
Richardia africana 0
Richardia albo-maculata 1
Richardia Elliotiana 3

Romulea rosea var. speciosa 11
Scilla bifolia 2
Scilla peruviana 2
Scilla sibirica 2
Secale cereale var. (Mammoth Winter) 3
Secale cereale var. (spring)1
Solanum tuberosum 8
Sparaxis grandiflora alba 0
Sparaxis var. (Albertine) 0
Sprekelia formosissima 1
Sternbergia lutea 11
Stromanthe sanguinea 2
Tacca pinnatifida 11
Tigridia Pavonia var. conchiflora 1
Tigridia Pavonia var. grand. alba 2
Trianosperma ficifolia 0
Trillium grandiflorum 0
Trillium ovatum 0
Trillium sessile var. californicum 0
Triteleia uniflora 11
Triticum sativum var. vulgare 11
Triticum sativum. var. dicoccum 11
Tritonia crocata 4
Tritonia crocata var. lilacina 5
Tritonia crocata var. rosea 4
Tritonia crocosmaeflora 11
Tritonia Pottsii 11
Tritonia securigera 5
Tulipa australis 1
Tulipa Billietiana 2
Tulipa Clusiana 1
Tulipa Clusiana var. pergica. 1
Tulipa Didieri 3
Tulipa Didieri var. Fransoniana 2
Tulipa Didieri var. mauriana 3
Tulipa Hageri Tulipa Greigi 1
Tulipa oculus-solis 1
Tulipa praecox 3
Tulipa sylvestris 2
Vallota purpurea 11
Vicia Faba 11
Vicia fulgens 11
Vicia Gerardi 11

Vicia sativa 11
Vicia villosa 11
Watsonia humilis 3
Watsonia iridifolia var. O'Brieni 2
Watsonia Meriana 3
Wistaria chinensis 0
Zamia integrifolia 11
Zea Mays var. everta (Golden Queen) 0
Zea Mays var. everta (White Rice) 0
Zea Mays var. indentata (E'y L'g) 1
Zea Mays var. indentata (H. King) 1
Zea Mays var. indurata (C.'s Early) 1
Zea Mays var. indurata (N. Dakota) 1
Zea Mays var. saccharata (B. Mex.) 1
Zea Mays var. saccharata (G. B'm) 1
Zea Mays var. saccharata (S.'s E'n) 1
Zephyranthes candida 11
Zephyranthes rosea 11
Zingiber officinale 0
Zingiber officinale var. Cochin 11
Zingiber officinale var. Jamaica No. 1 11
Zingiber officinale var. Jamaica No. 2 1

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Ethnobotanical Leaflets Starch Research Page

The Purdy's Solution (KOH) Reactions of Various Starches

Based on a graduated scale running from 0 to 11, where 11=60 or more minutes for gelatinization.

Aconitum Napellus 0
Actaea alba 0
Actaea spicata var. rubra 0
Adonis amurensis 0
Aesculus Hippocastanum 3
Alstroemeria aurantiaca (aurea) 0
Alstroemeria brasiliensis 0
Alstroemeria ligtu 0
Amaryllis belladonna major 2
Andropogon Sorghum var. (Shallu) 11
Andropogon Sorghum var. (W. K. Corn) 11
Andropogon Sorghum var. (Y. B. Sorgh.) 11
Anemone apennina 0
Anemone blanda 0
Anemone fulgens 0
Anemone japonica 0
Antholyza crocosmoides 11
Antholyza paniculata 11
Arachis hypogaea 3
Arisaema triphyllum 11
Arrhenatherum elatius var. 11
Arum cornutum 11
Arum italicum 11
Arum palaestinum 11
Avena sativa var. (Clydesdale) 11
Babiana var. (Athraction) 1
Babiana var. (violacea) 3
Batatas edulis 11
Brodiaea californica 11
Brodiaea candida 11
Brodiaea capitata 11
Brodiaea coccinea 11
Brodiaea congesta 11

Brodiaea grandiflora 11
Brodiaea ixioides var. *splendens* 11
Brodiaea lactea 11
Brodiaea laxa 11
Brodiaea peduncularis 11
Brodiaea Purdyi 11
Brodiaea stellaris 11
Calathea Lietzei 3
Calathea Vandenheckei 7
Calathea vittata 1
Calathea Wiotiana 1
Calochortus albus 0
Calochortus Benthami 0
Calochortus Howellii 0
Calochortus Leichtlinii 0
Calochortus lilacinus 0
Calochortus luteus var. *oculatus* 0
Calochortus Maweanus var. *major* 0
Calochortus nitidus 0
Calochortus splendens 0
Canna edulis 3
Canna musaefolia 3
Canna Roscoeana 2
Canna var. (J. D. Eisele) 2
Canna var. (Jean Tissot) 3
Canna var. (Konigin Charlotte) 2
Canna var. (Mrs. Kate Grey) 2
Canna var. (President Carnot) 1
Canna Warscewiczii *Canna* var. (L. E. Baily) 4
Castanea americans 0
Castanea pumila 0
Castanea sativa var. 0
Castanea sativa var. *numbo* 0
Chionodoxa Lucillae 0
Chionodoxa sardensis 0
Chionodoxa Tmolusi 1
Cimicifuga racemosa 0
Cochlearia Armoracia 0
Colchicum Parkinsoni 11
Convallaria majalis 0
Crinum americanum 11
Crinum fimbriatulum 11
Crocus Susianus (Cloth of Gold) 5

Crocus var. (Baron von Brunow) 11
Crocus versicolor (Cloth of Silver) 11
Curcuma longa 0
Curcuma petiolata 0
Cycas circinalis 7
Cycas revoluta 11
Cyclamen coum 2
Cyclamen repandum 1
Cypella Herberti 11
Dieffenbachia illustris (cortex) 11
Dieffenbachia illustris (pith) 11
Dieffenbachia seg. var. irror. (cort.) 11
Dieffenbachia seg. var. irror. (pith) 11
Dieffenbachia seg. var. mac. (cort.) 11
Dieffenbachia seg. var. mac. (pith) 11
Dieffenbachia seg. var. nob. (cort.) 11
Dieffenbachia seg. var. nob. (pith) 11
Dioon edule 0
Dolichos Lablab 11
Dracunculus vulgaris 11
Eranthis hyemalis 0
Erythronium americanum 0
Erythronium californicum 0
Erythronium citrinum 0
Erythronium Dens-canis 0
Erythronium Dens-canis var. grand. 0
Erythronium grandiflorum 0
Freesia refracta var. alba 11
Freesia refracta var. Leichtlinii 11
Fritillaria pyrenaica 0
Fritillaria armena 0
Fritillaria aurea 0
Fritillaria imperialis var. Aurora 1
Fritillaria liliacea 0
Fritillaria meleagris 0
Fritillaria pudica 0
Fritillaria recurva 0
Galanthus Elwesii 11
Galanthus nivalis 11
Galtonia candicans 0
Gelasine azurea 11
Gesneria tubiflora 2
Gladiolus byzantinus 11

Gladiolus cardinalis (Blushing Bride) 11
Gladiolus floribundus 11
Gladiolus primulinus 11
Gloxinia var. 0
Haemanthus Katherinae 11
Hedychium coronarium 8
Hedychium Gardnerianum 8
Hippeastrum aulicum var. robustum 11
Hippeastrum equestre 11
Hippeastrum vittatum 11
Homeria collina 11
Hordeum sativum var. (Champion) 11
Hyacinthus orientalis var. albulus (Italian) 11
Hyacinthus orientalis var. albus (White) 11
Hyacinthus orientalis var. albus superb. 5
Hymenocallis calathina 11
Hymenocallis undulata 11
Iris alata 2
Iris Bismarckiana 11
Iris caucasica 1
Iris florentina 11
Iris Histrio 0
Iris iberica 11
Iris pallida speciosa 11
Iris pumila var. cyanea 11
Iris reticulata 2
Iris tingitana 11
Iris xiphium var. Grand Tresorier 11
Iris xiphium var. lusitanica 11
Iris xiphium var. Wilhelmine 11
Ixia speciosa 1
Ixia var. (Emma) 3
Ixia viridiflora 2
Jatropha Cureas 1
Lachenalia pendula 11
Lachenalia tricolor var. luteola 11
Lathyrus latifolius var. albus 5
Lathyrus magellanicus var. albus 11
Lathyrus odoratus var. Shahzada 11
Lathyrus sylvestris 5
Lens esculenta 11
Leucojum aestivum 11
Leucojum vernalis 11

Lilium auratum 0
Lilium candidum 0
Lilium Henryi 0
Lilium longiflorum var. eximium 0
Lilium longiflorum var. giganteum 0
Lilium martagon 0
Lilium pardalinum 0
Lilium Parryi 0
Lilium philadelphicum 0
Lilium puberulum 0
Lilium rubellum 0
Lilium speciosum var. album 0
Lilium superbum 0
Lilium tenuifolium 0
Lilium tigrinum var. splendens 0
Manihot utilissima 4
Maranta arundinacea 0
Maranta arundinacea var. No. 1 0
Maranta arundinacea var. No. 2 0
Maranta leuconeura 0
Maranta Massangeana 1
Maranta musaica 1
Marica Herberti 11
Moraea tristis 11
Mucuna pruriens 11
Musa Cavendishii (green fruit) 1
Musa Cavendishii 2
Musa ensete 1
Musa sapientum 1
Muscari botryoides 11
Muscari commutatum 11
Muscari comosum 11
Muscari compactum 11
Muscari conicum 11
Muscari micranthum 11
Muscari paradoxum 11
Muscari racemosum 11
Narcissus biflorus 11
Narcissus Bulbocodium 11
Narcissus Bulbocodium var. conspicuus 11
Narcissus Bulbocodium var. monophyllus 11
Narcissus Horsfieldii 11
Narcissus incomparabilis 11

Narcissus Jonquilla 11
Narcissus Jonquilla var. Campernelli rug. 11
Narcissus Jonquilla var. rugulosus 11
Narcissus maximus 11
Narcissus odorus 11
Narcissus poeticus 11
Narcissus tazetta var. orientalis 11
Nelumbo lutea 0
Nelumbo nucifera 3
Nymphaea alba 2
Nymphaea Gladstoniana 11
Nymphaea marliacea var. albida 11
Nymphaea marliacea var. carnea 4
Nymphaea odorata 4
Nymphaea odorata var. rosea 2
Ornithogalum narbonense (pyramidale) 0
Ornithogalum nutans 0
Ornithogalum thyrsoides var. aureum 1
Ornithogalum umbellatum 0
Oryza sativa var. 11
Panicum Crus-galli var. 11
Phaseolus lunatus var. (H.'s B. Lirna) 11
Phaseolus vulgaris var. (Red K. Bean) 11
Pisum sativum var. (Elec. E. Early) 11
Pisum sativum var. (Eugenie yellow) 5
Pisum sativum var. (L. W. Marrow-fat) 11
Pisum sativum var. (Mam. G. Seeded) 11
Pisum sativum var. (Thos. Laxton) 5
Pisum sativum. var. (Eugenie green) 5
Polygonum Fagopyrum var. (American) 11
Polygonum Fagopyruni var. (Japanese) 11
Puschkinia scilloides 2
Puschkinia scilloides var. libanotica 3
Quercus alba 0
Quercus Muhlenbergii 11
Quercus Prinus 5
Quercus rubra 11
Quercus texana 11
Ranunculus bulbosus 1
Ranunculus Ficaria 5
Richardia africana 11
Richardia albo-maculata 11
Richardia Elliotiana 11

Romulea rosea var. speciosa 11
Scilla bifolia 0
Scilla peruviana 0
Scilla sibirica 2
Secale cereale var. (Mammoth Winter) 11
Secale cereale var. (Spring) 11
Solanum tuberosum 2
Sparaxis grandiflora alba 0
Sparaxis var. (Albertine) 0
Sprekelia formosissima 11
Sternbergia lutea 11
Stromanthe sanguinea 3
Tacca pinnatifida 11
Tigridia Pavonia var. conchiflora 3
Tigridia Pavonia var. grand. alba 4
Trianosperma ficifolia 0
Trillium grandiflorum 1
Trillium ovatum 2
Trillium sessile var. californicum 4
Triteleia uniflora 11
Triticum sativum var. dicoccum 2
Triticum. sativum var. vulgare 4
Tritonia crocata 11
Tritonia crocata var. lilacina 11
Tritonia crocosmaeflora 11
Tritonia Pottsii 11
Tritonia securigera 11
Tulip& Didieri var. mauriana 0
Tulipa australis 0
Tulipa Billictiana 0
Tulipa Clusiana 0
Tulipa Clusiana var. persica 0
Tulipa Didieri 0
Tulipa Didieri var. Fransoniana 0
Tulipa Greigi 0
Tulipa Hageri 0
Tulipa oculus-solis 0
Tulipa praecox 0
Tulipa sylvestris 0
Vallota purpurea 11
Vicia Faba 2
Vicia fulgens 11
Vicia Gerardi 4

Vicia sativa 11
Vicia villosa 3
Watsonia humilis 11
Watsonia iridifolia var. O'Brieni 11
Watsonia Meriana 11
W'istaria chinensis 11
Zamia integrifolia 11
Zea Mays var. everta (Golden Queen) 11
Zea Mays var. everta (White Rice) 11
Zea Mays var. indentata (E'y L'g) 11
Zea Mays var. indurata (C.'s Early) 11
Zea Mays var. indurata (N. Dakota) 11
Zea Mays var. saccharata (B. Mex.) 11
Zea Mays var. saccharata (G. B'm) 11
Zea Mays var. saccharata (S *' s E'n) 11
Zephyranthes candida 11
Zephyranthes rosea 11
Zingiber officinale 0
Zingiber officinale var. Cochin 1
Zingiber officinale var. Jamaica No. 1 1
Zingiber officinale var. Jamaica No. 2 1

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The Pyrogallic Acid Reaction of Various Starches

Based on a graduated scale running from 0 to 11, where 11=60 or more minutes for gelatinization.

Aconitum Napellus 0
Actaea alba 0
Actaea spicata var. rubra 0
Adonis amurensis 0
Aesculus Hippocastanum 0
Alstroemeria aurantiaca (aures) 0
Alstroemeria brasiliensis 0
Alstroemeria ligtu 0
Amaryllis belladonna major 0
Andropogon Sorghum var. (Shallu) 0
Andropogon Sorghum var. (W. K. Corn) 0
Andropogon Sorghum var. (Y. B. Sorgh.) 0
Anemone apennina 0
Anemone blanda 0
Anemone fulgens 0
Anemone Japonica 0
Antholyza crocosmoides 0
Antholyza paniculata 0
Arachis hypogaea 0
Arimona triphyllum 4
Arrhenatherum elatius var. 0
Arum cornutum 5
Arum italicum 1
Arum palaestinum 2
Avena sativa var. (Clydesdale) 0
Babiana var. (Athraction) 1
Babiana var. (violacea) 3
Batatas edulis 8
Brodiaea californica 8
Brodiaea candida 0
Brodiaea capitata 11
Brodiaea coccinea 11
Brodiaea congesta 11

Brodiaea grandiflora 11
Brodiaea ixioides var. *splendens* 0
Brodiaea lactea 0
Brodiaea laxa 0
Brodiaea peduncularis 1
Brodiaea Purdyi 11
Brodiaea stellaris 7
Calathea Lietzei 11
Calathea vittata 3
Calathea Wiotiana 11
Calathes Vandenheckei 11
Calochortus albus 0
Calochortus Benthami 0
Calochortus Howellii 0
Calochortus Leichtlinii 1
Calochortus lilacinus 0
Calochortus luteus var. *oculatus* 1
Calochortus Maweanus var. *major* 1
Calochortus nitidus 0
Calochortus splendens 0
Canna edulis 3
Canna musaefolia 11
Canna Roscoeana 11
Canna var. (J. D. Eisele) 2
Canna var. (Jean Tissot) 2
Canna var. (Konigin Charlotte) 7
Canna var. (L. E. Baily) 5
Canna var. (Mrs. Kate Grey) 3
Canna var. (President Carnot) 2
Canna Warscewiczii 11
Castanea americana 0
Castanea pumila 0
Castanea sativa var. 0
Castanea sativa var. *numbo* 0
Chionodoxa Lucillae 0
Chionodoxa sardensis 0
Chionodoxa Tmolusi 0
Cimicifuga racemosa 0
Cochlearia Armoracia 0
Colchicum Parkinsoni 0
Convallaria majalis 0
Crinum americanum 0
Crinum fimbriatulum 0

Crocus Susianus (Cloth of Gold) 0
Crocus var. (Baron von Brunow) 0
Crocus versicolor (Cloth of Silver) 0
Curcuma longa 5
Curcuma petiolata 11
Cycas circinalis 4
Cycas revoluta 5
Cyclamen coum 0
Cyclamen repandum 0
Cypella Herberti 0
Dieffenbachia illustris (pith) 1
Dieffenbachia seg. var. irror. (cort.) 1
Dieffenbachia seg. var. irror. (pith) 1
Dieffenbachia seg. var. mac. (cort.) 1
Dieffenbachia seg. var. mac. (pith) 1
Dieffenbachia seg. var. nob. (pith) 0
Dieffenbachia seg. var. nob. (cort.) 0
Dieffenbachis illustris (cortex) 2
Dioon edule 0
Dolichos Lablab 3
Dracunculus vulgaris 2
Eranthis hyemalis 0
Erythronium americanum 0
Erythronium californicum 0
Erythronium citrinum 0
Erythronium Dens-canis 0
Erythronium Dens-canis var. grand. 0
Erythronium grandiflorum 0
Freesia refracta var. alba 11
Freesia refracta var. Leichtlinii 11
Fritillaria armena 0
Fritillaria aurea 0
Fritillaria imperialis var. Aurora 0
Fritillaria liliacea 0
Fritillaria meleagris 0
Fritillaria pudica 0
Fritillaria pyrenaica 0
Fritillaria recurva 0
Galanthus Elwesii 8
Galanthus nivalis 2
Galtonia candicans 0
Gelasine azurea 11
Gesneria tubiflora 5

Gladiolus byzantinus 5
Gladiolus cardinalis (Blushing Bride) 4
Gladiolus floribundus 2
Gladiolus primulinus 6
Gloxinia var. 0
Haemanthus Katherinae 0
Hedychium coronarium 11
Hedychium Gardnerianum 11
Hippeastrum equestre 6
Hippeastrum vittatum 5
Hippeastrum. aulicum var. robustum 3
Homeria collina 11
Hordeum sativum var. (Champion) 0
Hyacinthus orientalis var. albulus (Italian) 0
Hyacinthus orientalis var. albulus (White) 0
Hyacinthus orientalis var. albus superb. 0
Hymenocallis calathina 0
Hymenocallis undulata 0
Iris alata 0
Iris Bismarckiana 0
Iris caucasica 0
Iris florentina 0
Iris Histrio 0
Iris iberica 0
Iris pallida speciosa 0
Iris pumila var. cyanea 0
Iris reticulata 0
Iris tingitana 0
Iris xiphium var. Grand Tresorier 0
Iris xiphium var. lusitanica 0
Iris xiphium var. Wilhelmine 0
Ixia speciosa 1
Ixia var. (Emma) 3
Ixia viridiflora 3
Jatropha Curcas 0
Lachenalia pendula 0
Lachenalia tricolor var. luteola 0
Lathyrus latifolius var. albus 0
Lathyrus magellanicus var. albus 0
Lathyrus odoratus var. Shahzada 0
Lathyrus sylvestris 0
Lens esculenta 0
Leucojum aestNum 0

Leucojum vernum 0
Lilium auratum 0
Lilium candidum 0
Lilium Henryi 0
Lilium longiflorum var. eximium 0
Lilium martagon 0
Lilium pardalinum 0
Lilium Parryi 0
Lilium philadelphicum 0
Lilium puberulum 0
Lilium rubellum 0
Lilium speciosum var. album 0
Lilium superbum 0
Lilium tenuifolium 0
Lilium tigrinum var. splendens 0
Lilium. longiflorum var. giganteum 0
Manihot utilisima 0
Maranta arundinacea 0
Maranta arundinacea var. No. 1 0
Maranta arundinacea var. No. 2 0
Maranta leuconeura 0
Maranta Massangeana 0
Maranta musaica 0
Marica gracilis 0
Moraea tristis 11
Mucuna pruriens 2
Musa Cavendishii (green fruit) 8
Musa Cavendishii 8
Musa ensete 2
Musa sapientum 8
Muscari botryoides 0
Muscari commutatum 4
Muscari comosum 1
Muscari compactum 0
Muscari conicum 6
Muscari micranthum 1
Muscari paradoxum 3
Muscari racemosum 5
Narcissus billorus 4
Narcissus Bulbocodium 8
Narcissus Bulbocodium var. conspicuus 3
Narcissus Bulbocodium var. monophyllus 2
Narcissus Horsfieldii 11

Narcissus incomparabilis 5
Narcissus Jonquilla 11
Narcissus Jonquilla var. *Campernellei rug.* 11
Narcissus Jonquilla var. *rugulosus* 2
Narcissus maximus 6
Narcissus odorus 11
Narcissus poeticus 11
Narcissus tazetta var. *orientalis* 11
Nelumbo lutea 0
Nelumbo nucifera 0
Nymphaea alba 0
Nymphaea Gladstoniana 1
Nymphaea marliacea var. *albida* 1
Nymphaea marliacea var. *carnea* 0
Nymphaea odorata 0
Nymphaea odorata var. *rosea* 0
Ornithogalum narbonense (pyramidale) 0
Ornithogalum nutans 1
Ornithogalum thyrsoides var. *aureum* 0
Ornithogalum umbellatum 0
Oryza sativa var. 1
Panicum Crus-galli var. 1
Phaseolus lunatus var. (H.'s B. Lim) 0
Phaseolus vulgaris var. (Red K. BeRD) 0
Pisum sativum var. (Eugenie green) 11
Pisum sativum var. (Eugenie yellow) 11
Pisum sativum var. (L. W. Marrowfat) 0
Pisum sativum var. (Mam. G. Seeded) 0
Pisum sativum var. (Thos. Laxton) 11
Pisum sativum. var. (Elec. E. Early) 0
Polygonum Fagopyrum var. (Japanese) 0
Polygonum Fagopyrum var. (American) 0
Puschkinia scilloides 0
Puschkinia scilloides var. *libanotica* 0
Quercus alba *Quercus Prinus* 0
Quercus rubra 0
Quercus texana 0
Ranunculus bulbosus 0
Ranunculus Ficaria 0
Richardia africana 11
Richardia albo-maculata 11
Richardia Elliotiana 11
Romulea rosea. var. *speciosa* 11

Scilla bifolia 0
Scilla peruviana 0
Scilla sibirica 0
Secale cereale var. (Mammoth Winter) 0
Secale cereale var. (Spring) 0
Solanum tuberosum 4
Sparaxis grandiflora alba 0
Sparaxis var. (Albertine) 0
Sprekelia formosissima 0
Sternbergia lutea 4
Stromanthe sanguinea 1
Tacca pinnatifida 0
Tigridia Pavonia var. conchiflora 0
Tigridia Pavonia var. grand. alba 0
Trianosperma ficifolia 0
Trillium grandiflorum 0
Trillium ovatum 0
Trillium sessile var. californicum 0
Triteleia uniflora 0
Triticum sativum var. dicoccum 0
Triticum sativum var. vulgare 0
Tritonia crocata 11
Tritonia crocata var. lilacina 11
Tritonia crocata var. rosea 11
Tritonia crocosmaeflora 2
Tritonia Pottsii 2
Tritonia securigera 11
Tulipa australis 0
Tulipa Billietiana 0
Tulipa Clusiana 0
Tulipa Clusiana var. persica 0
Tulipa Didieri 0
Tulipa Didieri var. Fransoniana 0
Tulipa Didieri var. mauriana 0
Tulipa Greigi 0
Tulipa Hageri 0
Tulipa oculus-solis 0
Tulipa praecox 0
Tulipa sylvestris 0
Vallota purpurea 4
Vicia Faba 1
Vicia fulgens 0
Vicia Gerardi 0

Vicia sativa 0
Vicia villosa 0
Watsonia humilis 2
Watsonia iridifolia var. O'Brieni 1
Watsonia Meriana 2
Wistaria chinensis 1
Zamia integrifolia 1
Zea Mays var. everta (Golden Queen) 0
Zea Mays var. everta (White Rice) 0
Zea Mays var. indentata (E'y L'g) 0
Zea Mays var. indurata (C.'s Early) 0
Zea Mays var. indurata (N. Dakota) 0
Zea Mays var. saccharata (B. Mex.) 0
Zea Mays var. saccharata (G. B'm) 0
Zea Mays var. saccharata (S.'s E'n) 0
Zea Mays var. indentata (H. King) 0
Zephyranthes candida 6
Zephyranthes rosea 5
Zingiber officinale 11
Zingiber officinale var. Cochin 4
Zingiber officinale var. Jamaica No. 1 11
Zingiber officinale var. Jamaica No. 2 11

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Ethnobotanical Leaflets Starch Research Page

The Chromic Acid Reaction of Various Starches

Based on a scale running from 0 to 13 or more minutes for gelatinization.

Aconitum Napellus 0
Actaea alba 0
Actaea spicata var. rubra 0
Adonis amurensis 0
Aesculus Hippocastanum 0
Alstroemeria brasiliensis 0
Alstroemeria ligtu 0
Amaryllis belladonna major 2
Andropogon Sorghum var. (Shallu) 2
Andropogon Sorghum var. (W. K. Corn) 2
Andropogon Sorghum var. (Y. B. Sorgh.) 3
Anemone apennina 0
Anemone blanda 0
Anemone fulgens 0
Anemone japonica 0
Antholyza crocosmoides 2
Antholyza paniculata 1
Arachis hypogaea 1
Arisaema triphyllum 4
Arrhenatherum elatius var. 0
Arum cornutum 5
Arum italicum 4
Arum palaestinum 9
Astroemeria aurantiaca (aurea) 1
Avena sativa var. (Clydesdale) 0
Babiana var. (Athraction) 1
Babiana var. (violacea) 1
Batalas edulis 6
Brodiaea candida 3
Brodiaea capitata 9
Brodiaea coccinea 5
Brodiaea congesta 4
Brodiaea grandiflora 9

Brodiaea ixioides var. *splendens* 5
Brodiaea lactea 3
Brodiaea laxa 1
Brodiaea peduncularis 9
Brodiaea Purdyi 9
Brodiaea stellaris 9
Calathea Lietzei 5
Calathea Vandenheckei 4
Calathea vittata 4
Calathea Wiotiana 5
Calochortus albus 0
Calochortus Benthami 1
Calochortus Howellii 0
Calochortus Leichtlinii 0
Calochortus lilacinus 0
Calochortus luteus var. *oculatus* 0
Calochortus Maweanus var. *major* 0
Calochortus nitidus 0
Calochortus splendens 0
Canna edulis 2
Canna musaefolia 3
Canna Roscoeana 2
Canna var. (J. D. Eisele) 1
Canna var. (Jean Tissot) 2
Canna var. (Konigin Charlotte) 1
Canna var. (L. E. Baily) 1
Canna var. (Mrs. Kate Grey) 1
Canna var. (President Carnot) 1
Canna Warscewiczii 1
Castanea americana 0
Castanea pumila 0
Castanea sativa var. 0
Castanea sativa var. *numbo* 0
Chionodoxa Lucillae 1
Chionodoxa sardensis 1
Chionodoxa Tmolusi 1
Cimicifuga racemosa 0
Cochlearia Armoracia 0
Colchicum Parkinsoni 1
Convallaria majalis 0
Crinum americanum 9
Crinum fimbriatulum 13
Crocus Susianus (Cloth of Gold) 0

Crocus var. (Baron von Brunow) 1
Crocus versicolor (Cloth of Silver) 2
Curcuma longa 9
Curcuma petiolata 8
Cycas circinalis 3
Cycas revoluta 4
Cyclamen coum 0
Cyclamen repandum 0
Cypella Herberti 2
Dieffenbachia illustris (cortex) 3
Dieffenbachia illustris (pith) 3
Dieffenbachia seg. irror. (pith) 3
Dieffenbachia seg. var. irror. (cort.) 1
Dieffenbachia seg. var. mac. (cort.) 4
Dieffenbachia seg. var. mac. (pith) 5
Dieffenbachia seg. var. nob. (cort.) 3
Dieffenbachia seg. var. nob. (pith) 3
Dioon edule 1
Dolichos Lablab 6
Dracunculus vulgaris 6
Eranthis hyemalis 0
Erythronium americanum 0
Erythronium californicum 0
Erythronium citrinum 0
Erythronium Dens-canis 0
Erythronium Dens-canis var. grand. 0
Erythronium grandiflorum 0
Freesia refracta var. alba 3
Freesia refracta var. Leichtlinii 2
Fritillaria armena 0
Fritillaria aurea 0
Fritillaria imperialis var. Aurora 0
Fritillaria liliacea 0
Fritillaria meleagris 0
Fritillaria pudica 0
Fritillaria pyrenaica 0
Fritillaria recurva 0
Galanthus Elwesii 7
Galanthus nivalis 1
Galtonia candicans 0
Gelasine azurea 11
Gesneria tubiflora 4
Gladiolus byzantinus 6

Gladiolus cardinalis (Blushing Bride) 3
Gladiolus floribundus 3
Gladiolus primulinus 4
Gloxinia var. 0
Haemanthus Katherinae 6
Hedychium coronarium 10
Hedychium Gardnerianum 4
Hippeastrum aulicum var. robustum 5
Hippeastrum equestre 5
Hippeastrum vittatum 5
Homeria collina 13
Hordeum sativum var. (Champion) 2
Hyacinthus orientalis var. albulus (Italian) 2
Hyacinthus orientalis var. albulus (White) 2
Hyacinthus orientalis var. albus superb. 1
Hymenocallis calathina 2
Hymenocallis undulata 4
Iris alata 2
Iris Bismarckiana 0
Iris caucasica 1
Iris florentina 0
Iris Histrio 3
Iris iberica 1
Iris pallida speciosa 1
Iris pumila var. cyanea 2
Iris reticulata 1
Iris tingitana 2
Iris xiphium var. Grand Tresorier 0
Iris xiphium. var. Wilhelmine 1
Iris xiphium var. lusitanica 1
Ixia speciosa 1
Ixia var. (Emma) 1
Ixia viridiflora 1
Jatropha Curcas 0
Lachenalia pendula 4
Lathyrus latifolius var. albus 3
Lathyrus magellanicus var. albus 4
Lathyrus odoratus var. Shahzada 9
Lathyrus sylvestris 1
Lens esculenta 12
Leucojum aestivum 4
Leucojum vernal 3
Lilium candidum 0

Lilium Henryi 0
Lilium longiflorum var. eximium 0
Lilium longiflorum var. giganteum 0
Lilium martagon 0
Lilium pardalinum 0
Lilium Parryi 0
Lilium philadelphicum 0
Lilium puberulum 0
Lilium rubellum 0
Lilium speciosum var. album 0
Lilium superbum 0
Lilium tenuifolium 0
Lilium tigrinum var. splendens 0
Lilium. auratum 1
Manihot utilisima 1
Maranta arundinacea 3
Maranta arundinacea var. No. 1 1
Maranta arundinacea var. No. 2 1
Maranta leuconeura 1
Maranta Massangeana 2
Maranta musaica 7
Marica gracilis 5
Moraea tristis 3
Mucuna pruriens 6
Musa Cavendishii (green fruit) 2
Musa Cavendishii 4
Musa ensete 0
Musa sapientum 1
Muscari botryoides 3
Muscari commutatum 1
Muscari comosum 2
Muscari compactum 2
Muscari conicum 3
Muscari micranthum 1
Muscari paradoxum 3
Muscari racemosum 2
Nacissus incomparabilis 5
Narcissus biflorus 4
Narcissus Bulbocodium 7
Narcissus Bulbocodium var. conspicuus 5
Narcissus Bulbocodium. var. monophyllus 4
Narcissus Horsfieldii 13
Narcissus Jonquilla 9

Narcissus Jonquilla var. Campernelli rug. 6
Narcissus Jonquilla var. rugulosus 3
Narcissus maximus 4
Narcissus odorus 4
Narcissus poeticus 8
Narcissus tazetta var. orientalis 7
Nelumbo lutea 0
Nelumbo nucifera 1
Nymphaea alba 1
Nymphaea Gladstoniana 2
Nymphaea marliacea var. albida 3
Nymphaea marliacea var. carnea 0
Nymphaea odorata 2
Nymphaea odorata var. rosea 1
Ornithogalum narbonense (pyramidale) 0
Ornithogalum nutans 0
Ornithogalum thyrsoides var. aureum 1
Ornithogalum umbellatum 0
Oryza sativa var. 3
Panicum Crus-galli var. 1
Phaseolus lunatus var. (H.'s B. Lima) 7
Phaseolus vulgaris var. (Red IL Bean) 7
Pisum sativum var. (Eugenie green) 2
Pisum sativum var. (Eugenie yellow) 5
Pisum sativum var. (L. W. Marrow fat) 4
Pisum sativum var. (Thos. Laxton) 4
Pisum sativum. -var. (Elec. E. Early) 5
Pisum sativum var. (Mam. G. Seeded) 3
Polygonum Fagopyrum var. (American) 0
Polygonum Fagopyrum var. (Japanese) 0
Puschkinia scilloides 0
Puschkinia scilloides var. libanotica 0
Quercus alba 0
Quercus Muhlenbergii 0
Quercus Prinus 1
Quercus rubra 0
Quercus texana 0
Ranunculus bulbosus 0
Ranunculus Ficaria 0
Richardia africana 3
Richardia albo-maculata 9
Richardia Elliotiana 4
Romulea rosea var. speciosa 3

Scilla bifolia 1
Scilla peruviana 1
Scilla sibirica 0
Secale cereale var. (Mammoth Winter) 2
Secale cereale var. (Spring) 1
Solanum tuberosum 5
Sparaxis grandiflora alba 1
Sparaxis var. (Albertine) 0
Sprekelia formosissima 9
Sternbergia lutea 6
Stromanthe sanguinea 4
Taca pinnatifida 3
Tigridia Pavonia var. conchiflora 0
Tigridia Pavonia var. grand. alba 0
Trianosperma ficifolia 1
Trillium grandiflorum 0
Trillium ovatum 0
Trillium sessile var. californicarn 0
Triteleia uniflora 3
Triticum sativum var. dicoccum 1
Triticum sativum var. vulgare 2
Tritonia crocata 13
Tritonia crocata var. lilacina 13
Tritonia crocata var. rosea 13
Tritonia crocosmaeflora 3
Tritonia Pottsii 3
Tritonia securigera 13
Tulipa australis 0
Tulipa Billietiana 0
Tulipa Clusiana 0
Tulipa Clusiana var. persica 0
Tulipa Didieri var. mauriana 0
Tulipa Didieri var. Fransoniana 0
Tulipa Greigi 0
Tulipa Hageri 0
Tulipa oculus-solis 0
Tulipa praecox 0
Tulipa sylvestris 0
Vallota purpurea 4
Vicia Faba 2
Vicia fulgens 2
Vicia Gerardi 1
Vicia sativa 4

Vicia villosa 2
Watsonia humilus 4
Watsonia iridifolia var. O'Brieni 2
Watsonia Meriana 4
Wistaria chinensis 0
Zamia integrifolia 5
Zea Mays var. everta (Golden Queen) 1
Zea Mays var. everta (White Rice) 1
Zea Mays var. indentata (H. King) 0
Zea Mays var. indurata (C.'s Early) 3
Zea Mays var. indurata (N. Dakota) 3
Zea Mays var. saccharata (B. Mex.) 0
Zea Mays var. saccharata (G. B'm) 1
Zea Mays var. saccharata (S.'s E'n) 2
Zephyranthes candida 5
Zephyranthes rosea 5
Zingiber officinale 1
Zingiber officinale var. Cochin 10
Zingiber officinale var. Jamaica No. 1 13
Zingiber officinale var. Jamaica No. 2 12

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The Ferric Chloride Reaction of Various Starches

Based on a scale running from 0 to 11, where 11=60 or more minutes for gelatinization.

Aconitum Napellus	0
Actaea alba	0
Actaea spicata var. rubra	1
Adonis amurensis	0
Aesculus Hippocastanum	0
Alstroemeria aurantiaca (aurea)	3
Alstroemeria brasiliensis	2
Alstroemeria ligtu	2
Amaryllis belladonna major	3
Andropogon Sorghum var. (Shallu)	2
Andropogon Sorghum var. (W. K. Corn)	3
Andropogon Sorghum var. (Y. B. Sorgh.)	2
Anemone apennina	0
Anemone blanda	0
Anemone fulgens	0
Anemone japonica	0
Antholyza crocosmoides	7
Antholyza paniculata	4
Arachis hypogaea	2
Arisaema triphyllum	5
Arrhenatherum elatius var.	1
Arum cornutum	2
Arum italicum	1
Arum palaestinum	5
Avena sativa var. (Clydesdale)	1
Babiana var. (Athraction)	3
Babiana var. (violacea)	2
Batatas edulis	0
Brodiaea calif ornica	11
Brodiaea candida	5
Brodiaea capitata	11
Brodiaea coccinea	4
Brodiaea congesta	11

Brodiaea grandiflora 11
Brodiaea ixioides var. *splendens* 9
Brodiaea lactea 7
Brodiaea laxa 8
Brodiaea peduncularis 11
Brodiaea Purdyi 11
Brodiaea stellaris 11
Calathea Lietzei 2
Calathea Vandenheckei 11
Calathea vittata 11
Calathea Wiotiana 11
Calochortus albus 1
Calochortus Benthami 0
Calochortus Howellii 0
Calochortus Leichtlinii 1
Calochortus lilacinus 0
Calochortus luteus var. *oculatus* 1
Calochortus Maweanus var. *major* 1
Calochortus nitidus 0
Calochortus splendens 1
Canna edulis 8
Canna musaefolia 4
Canna Roscoeana 1
Canna var. (J. D. Eisele) 3
Canna var. (Jean Tissot) 4
Canna var. (Konigin Charlotte) 3
Canna var. (L. E. Baily) 4
Canna var. (Mrs. Kate Grey) 3
Canna var. (President Carnot) 2
Canna Warscewiczii 2
Castanea americana 0
Castanea pumila 0
Castanea sativa var. 0
Castanea sativa var. *numbo* 0
Chionodoxa Lucillae 5
Chionodoxa sardensis 1
Chionodoxa Tmolusi 1
Cimicifuga racemosa 0
Cochlearia Armoracia 0
Colchicum Parkinsoni 5
Convallaria majalis 0
Crinum americanum 5
Crinum fimbriatulum 11

Crocus Susianus (Cloth of Gold) 1
Crocus var. (Baron von Brunow) 2
Crocus versicolor (Cloth of Silver) 2
Curcuma longa 1
Curcuma petiolata 1
Cycas circinalis 4
Cycas revoluta 4
Cyclamen coum 0
Cyclamen repandum 0
Cypella Herberti 5
Dieffenbachia illustris (cortex) 3
Dieffenbachia illustris (pith) 5
Dieffenbachia seg. var. irror. (pith) 2
Dieffenbachia seg. var. mac. (cort.) 4
Dieffenbachia seg. var. mac. (cort.) 5
Dieffenbachia seg. var. mac. (pith) 4
Dieffenbachia seg. var. nob. (cort.) 1
Dieffenbachia seg. var. nob. (pith) 3
Dioon edule 1
Dolichos Lablab 11
Dracunculus vulgaris 8
Eranthus hyernalis 1
Erythronium americanum 0
Erythronium californicum 0
Erythronium citrinum 0
Erythronium Dens-canis 0
Erythronium Dens-canis var. grand. 0
Erythronium grandiflorum 0
Freesia refracta var. Leichtlinii 5
Freesia refracts var. alba 5
Fritillaria armena 1
Fritillaria aurea 1
Fritillaria imperialis var. Aurora 2
Fritillaria liliacea 2
Fritillaria meleagris 2
Fritillaria pudica 3
Fritillaria pyrenaica 1
Fritillaria recurva 2
Galanthus nivalis 11
Galtonia candicans 0
Gelasine azurea 11
Gesneria tubiflora 1
Gladiolus byzantinus 8

Gladiolus cardinalis (Blushing Bride) 8
Gladiolus floribundus 4
Gladiolus primulinus 4
Gloxinia var. 1
Haemanthus Katherinae 9
Hedychium Gardnerianum 0
Hedychium coronarium 1
Hippeastrum aulicum var. robustum 7
Hippeastrum equestre 9
Hippeastrum vittatum 10
Homeria collina 11
Hordeum sativum var. (Champion) 11
Hyacinthus orient. var. albulus (Italian) 2
Hyacinthus orientalis var. albulus (White) 1
Hyacinthus orientalis var. albus superb. 1
Hymenocallis calathina 5
Hymenocallis undulata 11
Iris alata 5
Iris Bismarckiana 0
Iris caucasica 7
Iris florentina 1
Iris Histrio 9
Iris iberica 2
Iris pallida speciosa 2
Iris pumila var. cyanea 2
Iris reticulata 6
Iris tingitana 3
Iris xiphium var. Grand Tresorier 2
Iris xiphium var. lusitanica 2
Iris xiphium var. Wilhelmine 1
Ixia iridiflora 2
Ixia speciosa 1
Ixia var. (Emma) 3
Jatropha Curcas 3
Lachenalia pendula 3
Lachenalia tricolor var. luteola 3
Lathyrus latifolius var. albus 11
Lathyrus magellanicus var. albus 11
Lathyrus odoratus var. Shahzada 11
Lathyrus sylvestris 11
Lens esculenta 11
Leucojum aestivum 11
Leucojum vernum 11

Lilium auratum 1
Lilium candidum 4
Lilium Henryi 5
Lilium longiflorum var. eximium 1
Lilium longiflorum var. giganteum 3
Lilium Martagon 2
Lilium pardalinum 3
Lilium Parryi 2
Lilium philadelphicum 2
Lilium puberulum 3
Lilium rubellum 3
Lilium speciosum var. album 3
Lilium superbum 1
Lilium tenuifolium 3
Lilium tigrinum var. splendens 1
Manihot utilissima 3
Maranta arundinacea 0
Maranta arundinacea var. No. 1 1
Maranta arundinacea var. No. 2 2
Maranta leuconeura 1
Maranta Massangeana 2
Maranta musaica 11
Marica gracilis 8
Moraea tristis 8
Mucuna pruriens 11
Musa Cavendishii (green fruit) 0
Musa Cavendishii 1
Musa ensete 1
Musa sapientum 1
Muscari botryoides 7
Muscari commutatum 6
Muscari comosum 6
Muscari compactum 6
Muscari conicum 11
Muscari micranthum 2
Muscari paradoxum 8
Muscari racemosum 4
Narcissus biflorus 11
Narcissus Bulbocodium 8
Narcissus Bulbocodium var. monophyllus 8
Narcissus Bulbocodium var. conspicuus 11
Narcissus Horsfieldii 11
Narcissus incomparabilis 8

Narcissus Jonquilla 7
Narcissus Jonquilla 7
Narcissus Jonquilla var. Campernelli rug. 8
Narcissus maximus 11
Narcissus odorus 9
Narcissus poeticus 11
Narcissus tazetta var. orientalis 11
Nelumbo lutea 1
Nelumbo nucifera 2
Nymphaea alba 2
Nymphaea Gladstoniana 8
Nymphaea marliacea var. albida 9
Nymphaea marliacea var. carnea 4
Nymphaea odorata 3
Nymphaea odorata var. rosea 6
Ornithogalum narbonense (pyramidale) 1
Ornithogalum nutans 2
Ornithogalum umbellatum 2
Ornithogalum thyrsoides var. aureum 2
Oryza sativa var. 1
Panicum Crus-galli var. 4
Phaseolus lunatus var. (H.'s B. Lima) 11
Phaseolus vulgaris var. (Red K. Bean) 11
Pisum sativum var. (Elec. E. Early) 11
Pisum sativum var. (Eugenie green) 5
Pisum sativum var. (Eugenie yellow) 5
Pisum sativum var. (L. W. Marrowfat) 11
Pisum sativum var. (Thos. Laxton) 5
Pisum sativum var. (Mam. G. Seeded) 11
Polygonum Fagopyrum var. (American) 6
Polygonum Fagopyrum var. (Japanese) 3
Puschkinia scilloides 3
Puschkinia scilloides var. libanotica 3
Quercus alba 5
Quercus Muhlenbergii 8
Quercus Prinus 5
Quercus rubra 2
Quercus texana 2
Ranunculus bulbosus 0
Ranunculus Ficaria 0
Richardia africana 7
Richardia albo-maculata 11
Richardia Elliotiana 6

Romulea rosea var. speciosa 11
Scilla bifolia 3
Scilla peruviana 3
Scilla sibirica 2
Secale cereale var. (Mammoth Winter) 11
Secale cereale var. (Spring) 11
Solanum tuberosum 4
Sparaxis grandiflora alba 0
Sparaxis var. (Albertine) 0
Sprekelia formosissima 4
Sternbergia lutea 11
Stromanthe sanguinea 6
Tacca pinnatifida 6
Tigridia Pavonia var. conchiflora 2
Tigridia Pavonia var. grand. alba 2
Trianosperma ficifolia 0
Trillium grandiflorum 0
Trillium ovatum 0
Trillium sessile var. californicum 1
Triteleia uniflora 10
Triticum sativum var. dicoccuin 11
Triticum sativum var. vulgare 11
Tritonia crocata 7
Tritonia crocata var. lilacina 11
Tritonia crocata var. rosea 8
Tritonia crocosmaeflora 8
Tritonia Pottsii 7
Tritonia securigera 6
Tulipa australis 0
Tulipa Billietiana 1
Tulipa Clusiana 0
Tulipa Clusiana var. persica 2
Tulipa Didieri 1
Tulipa Didieri var. Fransoniana 2
Tulipa Didieri var. mauriana 1
Tulipa Greigi 1
Tulipa Hageri 0
Tulipa oculi-&-solis 1
Tulipa praecox 1
Tulipa sylvestris 1
Vallota purpurea 10
Vicia Faba 11
Vicia fulgens 11

Vicia Gerardi 8
Vicia sativa 11
Vicia villosa 7
Watsonia humilis 7
Watsonia iridifolia var. O'Brieni 8
Watsonia Meriana 8
Wistaria chinensis 3
Zamia integrifolia 11
Zea Mays var. aaccharata (S.'s E'n) 1
Zea Mays var. everta (Golden Queen) 1
Zea Mays var. everta (White Rice) 1
Zea Mays var. indentata (E'y L'g) 2
Zea Mays var. indentata (H. King) 1
Zea Mays var. indurata (C.'s Early) 2
Zea Mays var. indurata (N. Dakota) 2
Zea Mays var. saccharata (G. B'm) 1
Zephyranthes candida 7
Zephyranthes rosea 9
Zingiber officinale 0
Zingiber officinale var. Cochin 10

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Ethnobotanical Leaflets Starch Research Page

The Temperature of Gelatinization of Various Starches In Degrees Centigrade

Aesculus Hippocastanum	69.00
Alstroemeria aurantiaca, (aurea)	54.75
Alstroemeria brasiliensis	57.75
Alstroemeria ligtu	58.50
Amaryllis belladonna major	74.00
Andropogon Sorghum	66.90
Andropogon Sorghum var. (White Kaffir)	68.00
Andropogon Sorghum var. (Yellow Branching)	70.00
Antholyza crocommoides	74.00
Antholyza paniculata	72.00
Arachis hypogaea	66.50
Arisaema triphyllum	70.00
Arrhenatherum elatina var	60.25
Arum cornutum	70.00
Arum italicum	72.00
Arum palaestinum	70.50
Avena, sativa var. (Clydesdale)	63.00
Babiana var. (Athraction)	82.00
Babiana var. violacea	80.00
Brodiaea californica	67.30
Brodiaea candida	62.00
Brodiaea capitata	65.57
Brodiaea coccinea, 70.00	
Brodiaea congesta	69.25
Brodiaea grandiflora	65.90
Brodiaea lactea	64.50
Brodiaea laxa	61.00
Brodiaea peduncularis	68.50
Brodiaea Purdyi	67.00
Brodiaea stellaris	68.10
Brodinea ixioides var. splendens	61.75
Calochortus albus	53.00
Calochortus Benthami	61.50
Calochortus Howelli	50.50

Calochortus Leichtlinii 63.00
Calochortus lilacinus 59.00
Calochortus luteus var. oculatus 58.10
Calochortus Maweanus var. major 59.50
Calochortus nitidus 54.75
Calochortus splendens 55.10
Canna edulis 67.50
Canna musaefolia 70.50
Canna Roscoeana 69.50
Canna var. (J. D. Eisele) 62.50
Canna var. (Jean Tissot) 70.00
Canna var. (Konigin Charlotte) 65.25
Canna var. (L. E. Baily) 69.00
Canna var. (Mrs. Kate Grey) 62.50
Canna var. (Scilla peruviana) 65.50
Canna Warscewiczii 69.00
Castanea americana 59.25
Castanea pumila 59.75
Castanea sativa var 61.00
Castanea sativa var. numbo 60.00
Chionodoxa Lucillae 60.00
Chionodoxa sardensis 61.10
Chionodoxa Tmolusi 62.35
Colchicum Parkinsoni 61.25
Convallaria majalis 61.00
Crinum americanum 77.00
Crinum fimbriatum 76.00
Crocus Susianus (Cloth of Gold) 70.00
Crocus var. (Baron von Brunow) 74.00
Crocus versicolor (Cloth of Silver) 75.00
Curcuma longa 82.50
Curcuma petiolata 82.50
Cypella Herberti 55.00
Dieffenbachia illustris (cortex) 70.00
Dieffenbachia illustris (pith) 69.50
Dieffenbachia seguine var. irrorata (cortex) 68.75
Dieffenbachia seguine var. maculata (cortex) 70.60
Dieffenbachia seguine var. maculata (pith) 70.60
Dieffenbachia seguine var. nobilis (pith) 69.00
Dieffenbachia seguine, var. nobilis (cortex) 69.00
Dieffenbachia. seguine var. irrorata (pith) 69.00
Dolichos Lablab 79.50
Dracunculus vulgaris 64.25

Erythronium americanum 63.45
Erythronium californicum 57.90
Erythronium citrinum 50.45
Erythronium Dens-canis 52.65
Erythronium Dens-caniz var. grandiflorum 54.00
Erythronium grandiflorum 53.00
Freesia refracta var. alba 76.75
Freesia refracta var. Leichtlinii 77.25
Fritillaria armena 66.60
Fritillaria imperialis var. Aurora 68.40
Fritillaria liliacea 55.10
Fritillaria meLeagris 59.50
Fritillaria pudica 49.60
Fritillaria recurva 58.7
Fritillaria, pyrensica 63.15
Fritillaris, aurea 62.76
Galanthus Elwesii 70.00
Galanthus nivalis 66.50
Galtonia candicans 58.60
Gelasine azurea 73.50
Gladiolus byzantinus 78.50
Gladiolus cardinalis (Blushing Bride) 76.50
Gladiolus floribundus 81.00
Gladiolus primulinus 80.50
Haemanthus Katherinae 80.00
Hedychium coronarium 72.30
Hedychium Gardnerianum 71.15
Hippeastrum aulicum var. robustum 71.75
Hippeastrum equestre 72.50
Hippeastrum vittatum 72.00
Homeria collina 72.50
Hordeum sativum var. (Champion) 61.00
Hyacinthus orientalis var. albulus (Ital) 69.50
Hyacinthus orientalis var. albulus (White) 69.00
Hyacinthus orientalis var. albus super 67.00
Hymenocallis calathina 68.50
Hymenocallis undulata 71.50
Iris alata 66.50
Iris Bismarckiana 72.00
Iris caucasica 64.50
Iris florentina 71.50
Iris Histrion 65.50
Iris iberica 78.10

Iris pallida speciosa 74.50
Iris pumila var. *cyanea* 73.25
Iris reticulata 66.25
Iris tingitans 65.50
Iris xiphium var. *Grand Tresorier* 65.50
Iris xiphium var. *lusitanica* 67.00
Iris xiphium var. *Wilhelmine* 66.50
Ixia speciosa 84.00
Ixia var. *(Emma)* 84.50
Ixia viridiflora 83.00
Lachenalia pendula 60.65
Lachenalia tricolor var. *luteola* 73.10
Lathyrus latifolius var. *albus* 63.00
Lathyrus magellanicus var. *albus* 69.00
Lathyrus odoratus var. *Shahzada* 68.50
Lathyrus sylvestris 58.00
Lens esculenta 72.25
Leucojum aestivum 72.50
Leucojum vernum 71.50
Lilium auratum 58.60
Lilium candidum 61.65
Lilium Henryj 56.00
Lilium longiflorum var. *eximium* 65.60
Lilium longiflorum var. *giganteum* 62.55
Lilium martagon 59.10
Lilium pardalinum 63.30
Lilium Parryi 52.60
Lilium philadelphicum 63.90
Lilium rubellum 63.95
Lilium speciosum var. *album* 64.35
Lilium superbum 61.60
Lilium tenuifolium 67.30
Lilium tigrinum var. *splendens* 62.15
Maranta arundinacea 77.00
Maranta arundinacea var. *No. 2* 72.00
Maranta leuconeura 74.00
Maranta Massangeana 69.00
Maranta smandinacea var. *No. I* 72.50
Marica gracilis 70.00
Moraea tristis 70.00
Mucuna pruriens 74.00
Musa Cavendishii 67.75
Musa Cavendishii (green fruit) 67.50

Musa ensete 63.00
Musa sapientum 68.00
Muscari botryoides 71.00
Muscari commutatum 72.00
Muscari comosum 68.00
Muscari compactum 70.00
Muscari conicum 73.00
Muscari micranthum 69.75
Muscari paradoxam 73.00
Muscari racemosum 74.75
Narcissus biflorus 75.00
Narcissus Bulbocodium 72.00
Narcissus Bulbocodium var. conspicuus 72.75
Narcissus Bulbocodium var. monophyllus 74.00
Narcissus Horsfieldii 74.00
Narcissus incomparabilis 76.25
Narcissus Jonquilla 76.00
Narcissus Jonquilla Campernelli rugulosus 76.50
Narcissus Jonquilla rugulosus 75.25
Narcissus maximus 75.25
Narcissus odorus 74.50
Narcissus poeticus 73.25
Narcissus tazetta var. orientalis 77.00
Ornithogalum narbonense (pyramidale) 55.50
Ornithogalum nutans 61.25
Ornithogalum thyrsoides var. aureum 66.00
Ornithogalum umbellatum 56.75
Oryza sativa var 74.75
Panicum Crus-galli var 75.25
Phaseolus lunatus var. (Henderson's Bush Lima) 79.75
Phaseolus vulgaris var. (Red Kidney Bean) 74.50
Pisum sativum var. (Electric Extra Early) 70.00
Pisum sativum var. (Eugenie, green) 74.50
Pisum sativum var. (Eugenie, yellow) 73.50
Pisum sativum var. (Large White Marrowfat) 68.50
Pisum sativum var. (Mammoth Gray Seeded) 70.50
Pisum sativum var. (Thomas Larton) 73.25
Polygonum Fagopyrum var. (American) 63.50
Polygonum Pagopyrum var. (Japanese) 64.75
Puschkinia scilloides 56.35
Puschkinia scilloides var. libanotica 56.70
Quercus alba 60.75
Quercus Muhlenbergii 63.75

Quercus Prinus 64.75
Quercus rubra 63.00
Quercus texana 64.25
Richardia africana 75.00
Richardia albo-maculata 77.50
Richardia Elliotiana 76.00
Romulea rosea var. speciosa 73.50
Scilla bifolia 64.75
Scilla sibirica 66.00
Secale cereale var. (Mammoth Winter) 61.00
Secale cereale var. (spring) 62.00
Sparaxis grandiflora alba 71.50
Sparaxis var. (Albertine) 72.50
Sprekelia formosissima 77.00
Sternbergia lutea 75.50
Tacca pinnatifida 68.00
Tigridia Pavonia var. conchiflora 60.00
Tigridia Pavonia, var. grandiflora alba 61.00
Trillium grandiflorum 58.00
Trillium ovatum 56.75
Trillium sessile var. californicum 55.00
Triteleia uniflora 69.45
Triticum sativum var. dicoccum 62.90
Triticum sativum var. vulgare 64.00
Tritonia crocata 82.50
Tritonia crocata var. lilacina 81.75
Tritonia crocata var. rosea 81.50
Tritonia crocosmaeflora 73.00
Tritonia Pottsii 72.50
Tritonia securigera 81.00
Tulipa australis 51.15
Tulipa Billietiana 55.25
Tulipa Clusiana var. persica 54.75
Tulipa Didieri 50.75
Tulipa Didieri var. Fransoniana 54.85
Tulipa Didieri var. mauriana 50.95
Tulipa Greigi 50.30
Tulipa Hageri 56.90
Tulipa Clusiana 57.10
Tulipa sylvestris 57.15
Tulipa oculus-solis 53.75
Tulipa praecox 55.80
Vallota purpurea 74.25

Vicia fulgens 72.00
Vicia Gerardi 71.00
Vicia sativa 72.50
Vicia villosa 66.00
Vida Faba 65.00
Watsonia humilis 75.50
Watsonia iridifolia var. O'Brieni 74.50
Watsonia Meriana 76.25
Wistaria chinensis 71.50
Zea Mays var. everta (Golden Queen) 63.25
Zea Mays var. everta (White Rice) 63.25
Zea Mays var. indentata (Early Learning) 66.50
Zea Mays var. indentata (Hickory King) 66.75
Zea Mays var. indurata (Compton's Early) 68.50
Zea Mays var. indurata (North Dakota) 68.00
Zea Mays var. saccharata (Black Mexican) 65.00
Zea Mays var. saccharata (Stowell's) 66.85
Zea Mays var. saccharata (Golden Bantam) 66.60
Zephyranthes candida 73.00
Zephyranthes rosea 76.00
Zingiber officinale 73.86
Zingiber officinale var. Cochin 90.00
Zingiber officinale var. Jamaica No. 1 82.25
Zingiber officinale var. Jamaica No. 2 85.90

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