

Cassava and Starch Technology Research Unit

Cassava (*Manihot esculent* Crantz) or tapioca is a perennial plant widely grown in many tropical countries, including Thailand as one of the most important commercial crops. At present, there are 1 million hectares devoted to cassava planting in Thailand producing annually 20 million tons of roots.



Cassava roots: a good source of starch for industrial uses

Since cassava roots contain a high starch content, but low quantity of impurities such as protein and lipid, they are recognized as an excellent source of pure starch suitable for a wide range of applications. The most important characteristics of cassava starch are odorless, paste clarity, and stickiness. These remarkable characteristics of cassava starch are enable to be conveniently and readily blended with other flavoring and coloring agents. Cassava is not only used as a food security, but it is also served as a source of chemical reagent, feed stock of all fermentation processes, and adhesive substance.

The various applications of cassava starch are appealing to the industrial sector for starch manufacturing process and have been supported by Thai government as an important agro-industrial product. As a result, the Cassava Starch Technology Research Unit was established in 1995 by the cooperation between the government sectors including the National Center for Genetic Engineering and Biotechnology (BIOTEC), the National Science and Technology Development Agency (NSTDA), Kasetsart University and the private sector including the Thai Tapioca Development Institute (TTDI). The Unit is located at Kasetsart Agricultural and Agro-Industrial Product Improvement Institute (KAPI), Kasetsart University.

Vision >>

The Unit aims to be the Center of Excellence of

- Cassava and starch properties
- Cassava starch process
- Cassava starch modification
- Cassava and starch application

Mission >>

The Unit's goal is to support the industrial sectors in order to strengthen their competitiveness in the world market. Our missions include:

- To conduct research and development on cassava starch property, processing, modification and industrial application
- To coordinate technology between producers and users
- To collect and distribute information, transfer technology, support technical service and undertake joint research with related agencies and the private sectors

Activities >>

In-house research, technology training and information services form the core of the Unit's activities. Major activities include:

Core Competence Development

The Unit strives to assist in strengthening the industrial base of the cassava processing industry and to improve human resource capability by providing information on, or undertaking research related to:

- Implementation of suitable methodology for the biochemical and physicochemical determination of cassava and derivative products
- Understanding the physicochemical properties of cassava and starch
- Improving cassava starch extraction efficiency and product quality
- Creation or adaptation of technology suitable for transformation of cassava starch to value added products
- Production of value added products from processing waste
- Improving industrial utilization of cassava

Research and Development >>

Research projects completed by the Unit demonstrate a strong capability to combine basic researches with industrially orientated application. Completed and on-going projects include:

- Root and starch quality of various cassava varieties developed in Thailand
- Varietal and environmental factors on cassava root and starch properties
- Improvement of cassava starch production efficiency by new technology adoption
- Establishment of quality control plan in cassava starch process
- Attainable technology for sugar syrup production from cassava chips and waste for fermentation process
- Physical modification of cassava starch by mechanical and hydrothermal treatment
- Chemical modification of cassava starch and potential application in food and paper industry
- Production of biodegradable packaging material from cassava starch

Technical Services >>

The Unit provides various technical services to support and promote industrial capability including:

- Starch Conference: The international conference on starch technology - 'Starch Update' is organized every two years in order to refresh starch technologists with new information and technology.
- Seminar and workshop: A series of seminars and workshops is continually arranged aiming at transferring technology and increasing basic understanding of cassava starch structure, properties, processing and application.
- Technical training: Personal from government agencies, universities (national and international) or the private sectors are regularly instructed on starch properties and their instrumental analysis.
- Contract researches: The Unit provides research assistance to industrial users via a joint-research or a contract research by experienced researchers.
- Information service: The information concerning any aspect of cassava can be exchanged internationally through www.cassava.org and quarterly newsletter 'StarchNews'.
- Analytical services: The analysis of cassava starch quality including chemical (the content of sugar, starch, sulfur dioxide, cyanide etc.), biochemical (amylose and amylopectin content and fine structure etc.), physical (granule morphology, crystallinity etc.), physico-chemical (paste and gel properties, gelatinization analysis etc.) and microbial properties (microbial loads, pathogenic contamination etc.) can be conducted by very high skilled researchers.

Publications >>

- Sanguanpong, V., Chotineeranat, S., Piyachomkwan, K., Oates, C.G., Chinachoti, P. and Sriroth, K. 2003. Hydration and physico-chemical properties of small-particle cassava starch. *J. Sci. Food Agriculture*. 83(2): 123-132.
- Piyachomkwan, K., Chotineeranat, S., Kijkhunasatian, C., Tonwitawat, R., Prammanee, S., Oates, C.G. and Sriroth, K. 2002. Edible canna (*Canna edulis*) as a complementary starch source to cassava for the starch industry. *Industrial Crops and Products*. 16: 11-21.
- Santisopasri, V., Kurotjanawong, K., Chotineeranat, S., Piyachomkwan, K., Sriroth, K., and Oates, C. G. 2001. Impact of water stress on yield and quality of cassava starch. *Industrial Crops and Products*.

13(2): 115-129.

- Sriroth, K., Piyachomkwan, K., Santisopasri, V. and Oates, C. G. 2001. Environmental conditions during root development: drought constraint on cassava starch quality. *Euphytica*. 120: 95-101.
- Sriroth, K., Piyachomkwan, K., Wanlapatit, S. and Oates, C. G. 2000. Cassava starch technology: the Thai experience. *Starch/Starke*. 52: 439-449.
- Sriroth, K., Chollakup, R., Chotineeranat, S., Piyachomkwan, K., and Oates, C. G. 2000. Processing of cassava waste for improved biomass utilization. *Bioresource Technol.* 71(1): 63-69.
- Sriroth, K., Wanlapatit, S., Chollakup, R., Chotineeranat, S., Piyachomkwan, K., and Oates, C. G. 1999. An improved dewatering performance in cassava starch process by a pressure filter. *Starch/Starke*. 51 (1999), 383-388.
- Sriroth, K., Santisopasri, V., Petchalanuwat, C., Kurotjanawong, K., Piyachomkwan, K. and Oates, C. G. 1999. Cassava starch granule structure-function properties: influence of time and conditions at harvest on four cultivars of cassava starch. *Carbohydrate Polymer*. 38(2): 161-170.
- Sriroth, K., Wanlapatit, S., Piyachomkwan, K., and Oates, C. G. 1998. Improved cassava starch granule stability in the presence of sulphur dioxide. *Starch/Starke*. 50(11-12): 466-473.

Personnel >>

The director of the Unit, Dr. Klanarong Sriroth, heads a team of researchers and assistant researchers. more information : aapkrs@ku.ac.th