



Understanding the functional properties of starch from the “Malanga” grown in Cuba. Comparison of starch from corms and cormels

PhD candidates: Jehannara Calle, Yaiza Benavent and Raquel Garzón
Prof.: PhD. Cristina M. Rosell

Laboratory 109 Cereals



| Common names of Malanga worldwide

Xanthosoma sagittifolium

Mafafa, Otoe, Malanga, Cocoñame, Ocumo, Bore, Yautía, Chonque, Macabo, Rascadera, Quequisque and Tania

Colocasia esculenta

Mexico: Taro

Brazil: Cará

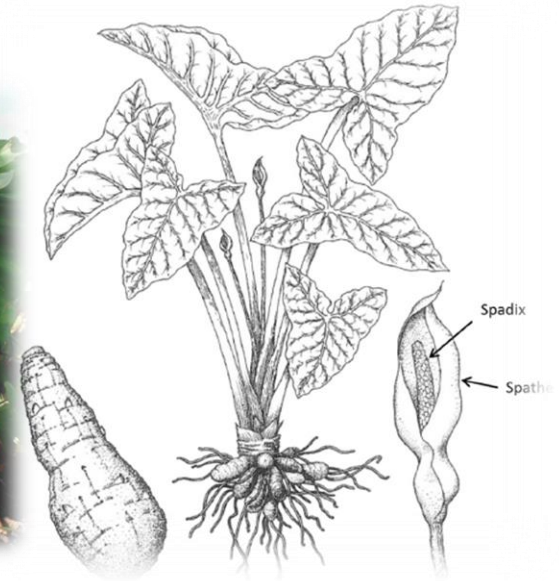
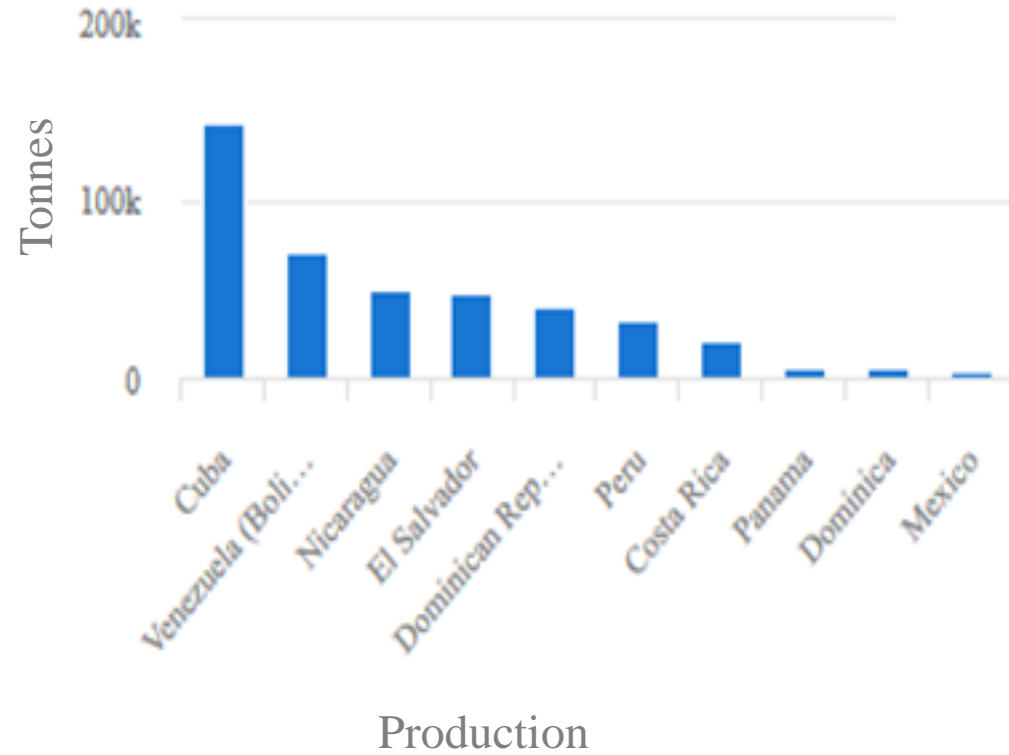
Dominican Republic: Yautía coco

Puerto Rico, Guatemala, Honduras, **Spain and Cuba: Malanga**

Canary Islands and Costa Rica: Yam



| World production of Malanga



State of the art. Search engines: Web of science, Google scholar and Scopus

The screenshot shows the Web of Science interface with 349 results for the search term 'xanthosoma'. The results are sorted by 'Fecha de publicación -- de más recent...'. The first three results are visible:

- Ceratocystis uchidae, a new species on Araceae in Hawaii and Fiji**
Por: Li, Qian; Harrington, Thomas C.; McNew, Douglas; et ál.
MYCOSCIENCE Volumen: 58 Número: 6 Páginas: 398-412 Fecha de publicación: NOV 2017
- Characterization of the flour and starch of aroid cultivars grown in Mexico**
Por: Hoyos-Leyva, Javier D.; Bello-Perez, Luis A.; Yee-Madeira, Hernani; et ál.
STARCH-STARKE Volumen: 69 Número: 9-10 Número de artículo: UNSP 1600370 Fecha de publicación: SEP 2017
- Habitat morphology constrains the depth distribution and growth rate of a coral-associated reef fish**
Por: Smallhorn-West, Patrick F.; Bridge, Tom C. L.; Munday, Philip L.; et ál.
MARINE ECOLOGY PROGRESS SERIES Volumen: 576 Páginas: 43-53 Fecha de publicación: AUG 3 2017

Rhizome as an alternative for non-conventional flours or starch to be used in different baked goods

349 articles: flour and products
59 articles: starch

The screenshot shows the Google Académico interface with approximately 13,400 results for the search term 'xanthosoma'. The results are sorted by 'Ordenar por relevancia'. The first three results are visible:

- Composition, physicochemical properties and retrogradation characteristics of native, oxidised, acetylated and acid-thinned new cocoyam (*Xanthosoma sagittifolium*) ...**
QS Lawal - Food chemistry, 2004 - Elsevier
New cocoyam starch was modified through oxidation (oNCS), acetylation (aNCS) and acid-thinning (atNCS). Ash content, fat content, crude fibre, protein and amylose contents were reduced following modifications. The starch granules were round and polygonal in shape.
☆ 99 Citado por 212 Artículos relacionados Las 5 versiones
- [CITAS] Propagación in vitro de la malanga (*Xanthosoma sagittifolium* (L.) Schott)**
M Dottin - 2000 - Tesis presentada para optar por el ...
☆ 99 Citado por 18 Artículos relacionados
- Raphides with barbs and grooves in *Xanthosoma sagittifolium* (Araceae)**
WS Sakai, M Hanson, RC Jones - Science, 1972 - science.sciencemag.org
Raphides in petioles of *Xanthosoma sagittifolium* are needlelike crystals about 50 micrometers long. The rectangular cross sections have maximum dimensions of approximately 850 by 250 nanometers. The raphides have two distinct end structures. One
☆ 99 Citado por 73 Artículos relacionados Las 8 versiones

13.400 results: flour and products (0.05s)
3.000 results: starch (0.21s)

Different researches about flour and starch

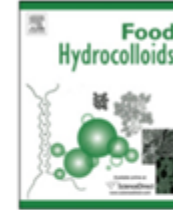
Food Hydrocolloids 30 (2013) 173–181



Contents lists available at [SciVerse ScienceDirect](#)

Food Hydrocolloids

journal homepage: www.elsevier.com/locate/foodhyd



Starch corms

Physicochemical properties of five cocoyam (*Colocasia esculenta* and *Xanthosoma sagittifolium*) starches

Kolawole O. Falade*, Chidinma A. Okafor

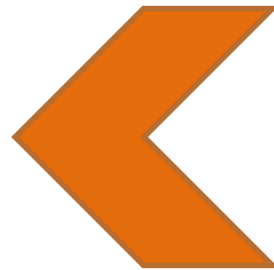
Department of Food Technology, University of Ibadan, Ibadan, Nigeria

J Food Sci Technol (June 2015) 52(6):3440–3448
DOI 10.1007/s13197-014-1368-9

ORIGINAL ARTICLE



Flour corms

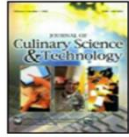


Physical, functional, and pasting properties of flours from corms of two Cocoyam (*Colocasia esculenta* and *Xanthosoma sagittifolium*) cultivars

Kolawole O. Falade • Chidinma A. Okafor



Different researches about baked goods



Journal of Culinary Science & Technology



ISSN: 1542-8052 (Print) 1542-8044 (Online) Journal homepage: <http://www.tandfonline.com/loi/wcsc20>

Evaluation of Cocoyam-Wheat Composite Flour in Pastry Products Based on Proximate Composition, Physicochemical, Functional, and Sensory Properties

P. T. Akonor, C. Tortoe & E. S. Buckman

To cite this article: P. T. Akonor, C. Tortoe & E. S. Buckman (2017): Evaluation of Cocoyam-Wheat Composite Flour in Pastry Products Based on Proximate Composition, Physicochemical, Functional, and Sensory Properties, Journal of Culinary Science & Technology, DOI: 10.1080/15428052.2017.1333937

To link to this article: <http://dx.doi.org/10.1080/15428052.2017.1333937>



Flour Composite (wheat and malanga)
baked goods

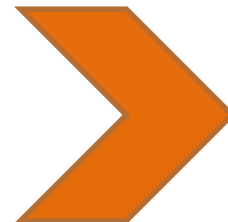
Vol.3, No.1, 22-29 (2014)

<http://dx.doi.org/10.4236/jacen.2014.31004>

Journal of Agricultural Chemistry and Environment

Cocoyam (corms and cormels)—An underexploited food and feed resource

Patricia G. Owusu-Darko^{1*}, Alistair Paterson², Emmanuel L. Omenyo³



Review (Darko *et al.*, 2014)
❖ reduce postharvest losses
❖ food security problems

Physicochemical properties of food grade acetylated cocoyam (*Xanthosoma sagittifolium*) starches

A. O. Tijani^{1*}, Celestina Ibitayo Omohimi², L. O. Sanni², E. K. Oke²

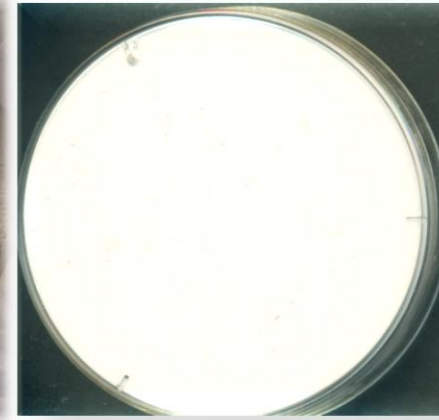
¹National Biotechnology Development Agency, Owode Yewa, Ogun state, P.M.B 5118, Wuse, Abuja, Nigeria

²Department of Food Science and Technology, P.M.B 2240, Federal University of Agriculture, Abeokuta, Nigeria



It is not specified (corms and cormels)
(Tijani *et al.*, 2016)

In Cuba

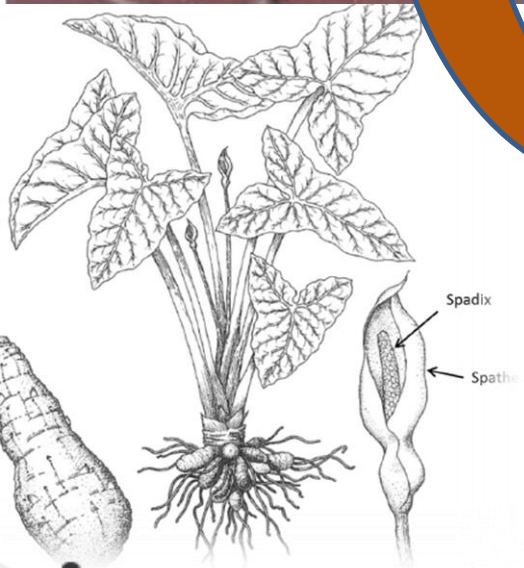


- Rich in starch
- Small granules
- Highly digestible

Corms transformation

Cormels (human consumption)
Corms (guarantee further farming)

Darko *et al.*, 2014



The consumption way

Postharvest utilization is still limited

Nowadays



Rhizome



Fried



Mashed

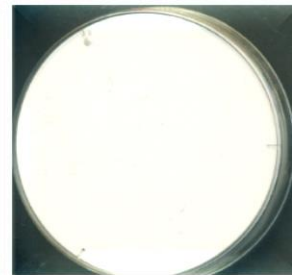


Boiled

What can we do?



Malanga Flour



Malanga starch

New products



Baked goods



Gluten free products



Infant formula

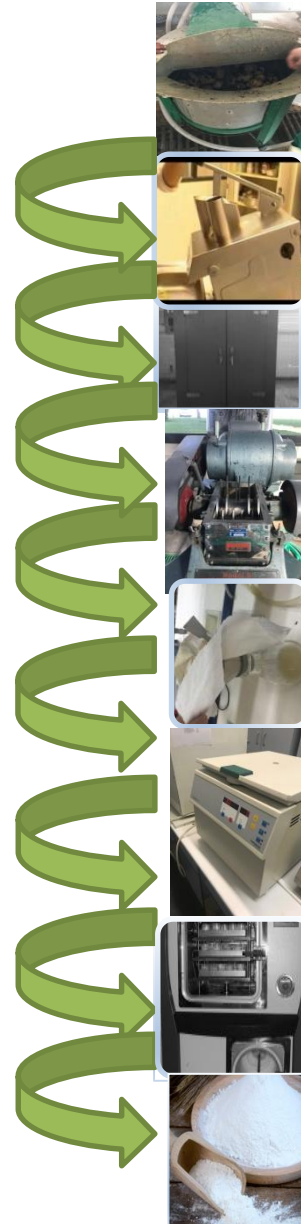
| Aim

To evaluate the potential of corms as a source of starch and the comparison of the functional properties of the starches from the corms and cormels of the same species.

Starch isolated



Corms and cormels
MX-2007



Cleaning and peeling

Cutting (1cm)

Drying (50°C, 24 h)

Sieving (Max. 30 % $\geq 300 \mu\text{m}$)

Flour washing and filtering (1:10)

Centrifuging (12 500 rpm, 5 min, 4 °C)

Lyophilizing (5h)

Starch

Physical and chemical properties of starch



Colour determination
(Minolta CR210, scale *CieLab*)

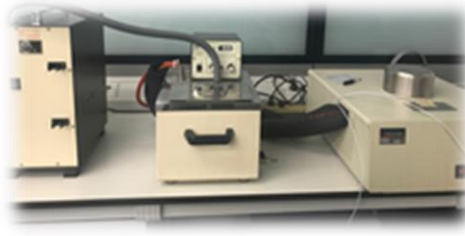


Content of amylose/amylopectin



Scanning electron microscopy
(JSM 5200)

|Gel thermal and pasting properties



Gelatinization properties (DSC)



Viscosity profile
RVA-4500; AACCI Method 61-02.01

| Statistics analysis

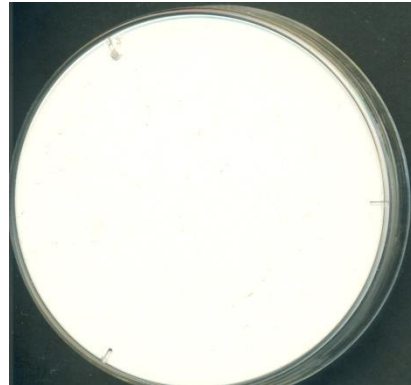
Software Statgraphics Centurion XVI.I
ANOVA Multifactorial

| Color characteristics

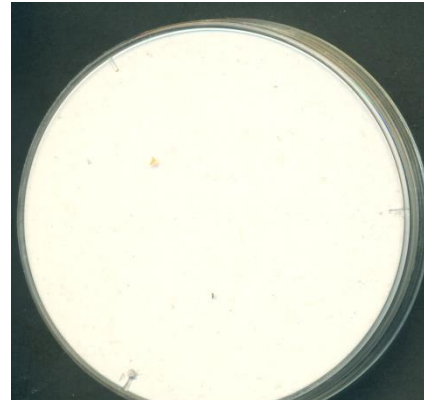
$$+ L^* \\ - a^* y b^*$$

(Himeda *et al.*, 2012; Aboubakar, 2008)

	L^*	a^*	b^*
X. corms	98.2±1.39	-0.11±0.03a	1.1±0.14a
X. cormels	97.7±0.10	-0.03±0.02b	1.9±0.16b
<i>P</i> -value	0.5418	0.0189	0.0042

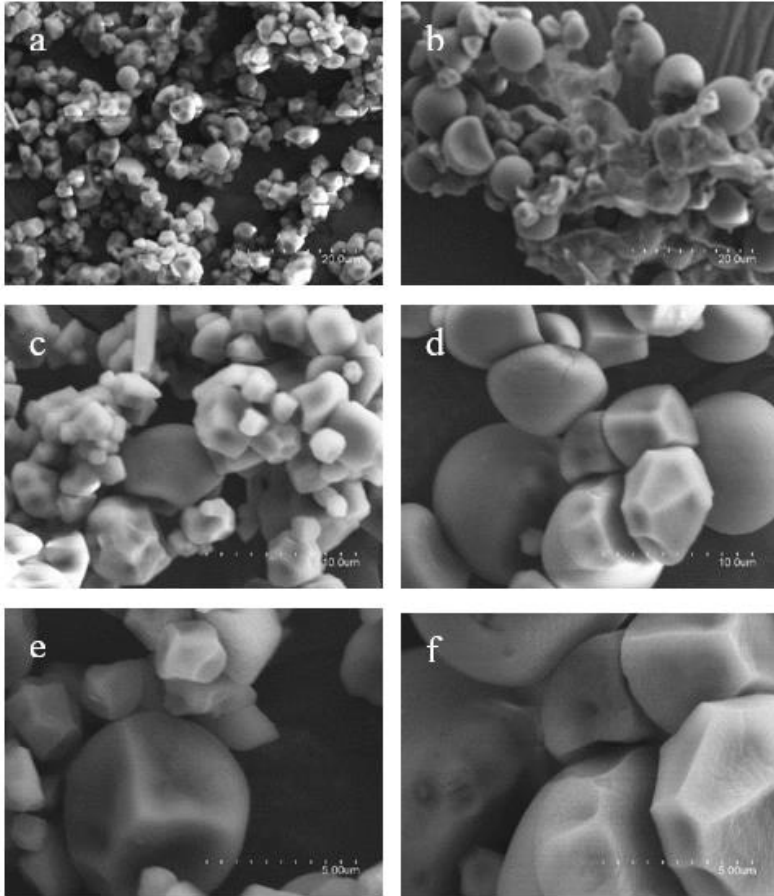


Xanthosoma corms



Xanthosoma cormels

Morphology of the malanga starch



- ❖ Polygonal, irregular shapes
- ❖ Granules diameters ranged from 1 to 5 μm
- ❖ Main differences: cormels' starch appeared as big aggregates where small granules were glued to each other

Amylase leached out and they acted as gluing material Dura and Rosell (2014)

Corms (a) and cormels (b) malanga granules at lower (2 000x) magnifications, c and d at medium (5 000x) and e and f at higher (10 000x) magnifications, respectively.

Gelatinization parameters of starches determined by the DSC plots

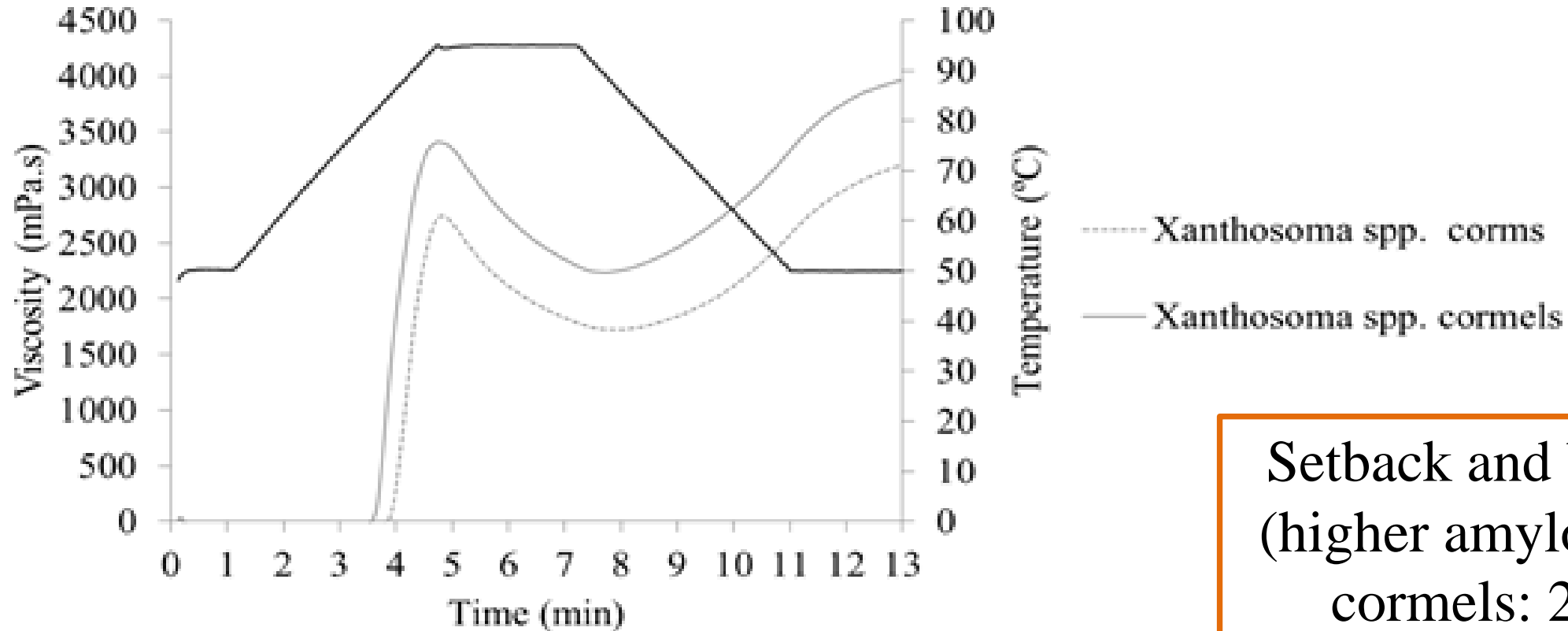
low enthalpy values

	To (°C)	Tp (°C)	Tc (°C)	ΔH (J/g)
X. cormels	74 ±0.25b	79±0.35b	87±0.48	18.82±1.37
X. corms	72±0.28a	76±0.35a	86±0.04	16.80±0.19
P-value	0.0109	0.0122	0.0748	0.1759

Thermal transition at lower temperatures

It needs more temperature to start the gelatinization process

Pasting forming



Setback and breakdown
(higher amylose contents
cormels: 27.65 %)

RVA profiles of the corm and cormels starch

|Conclusions

Physicochemical properties of corm and cormels starches from the same species, were significantly different which open the possibility to exploit both starches depending on their physicochemical properties.

| Other studies

- Different formulas of gluten free bread using Malanga flour from corm and cormels were developed.
- It was studied the use of Malanga flour from corm and cormels to develop basal formula for infants, elderly and people with special diet.

|Acknowledgements

- The financial support of the Spanish Ministry of Economy and Competitiveness (AGL2014-52928-C2-1-R) and the European Regional Development Fund (FEDER). Spain
- Institute of Agrochemistry and Food Technology. Spain
- National Institute of Tropical Food Research Farms in Cuba to provide raw materials. Cuba
- Food Research Institute for the Food Industry. Cuba



Thank you