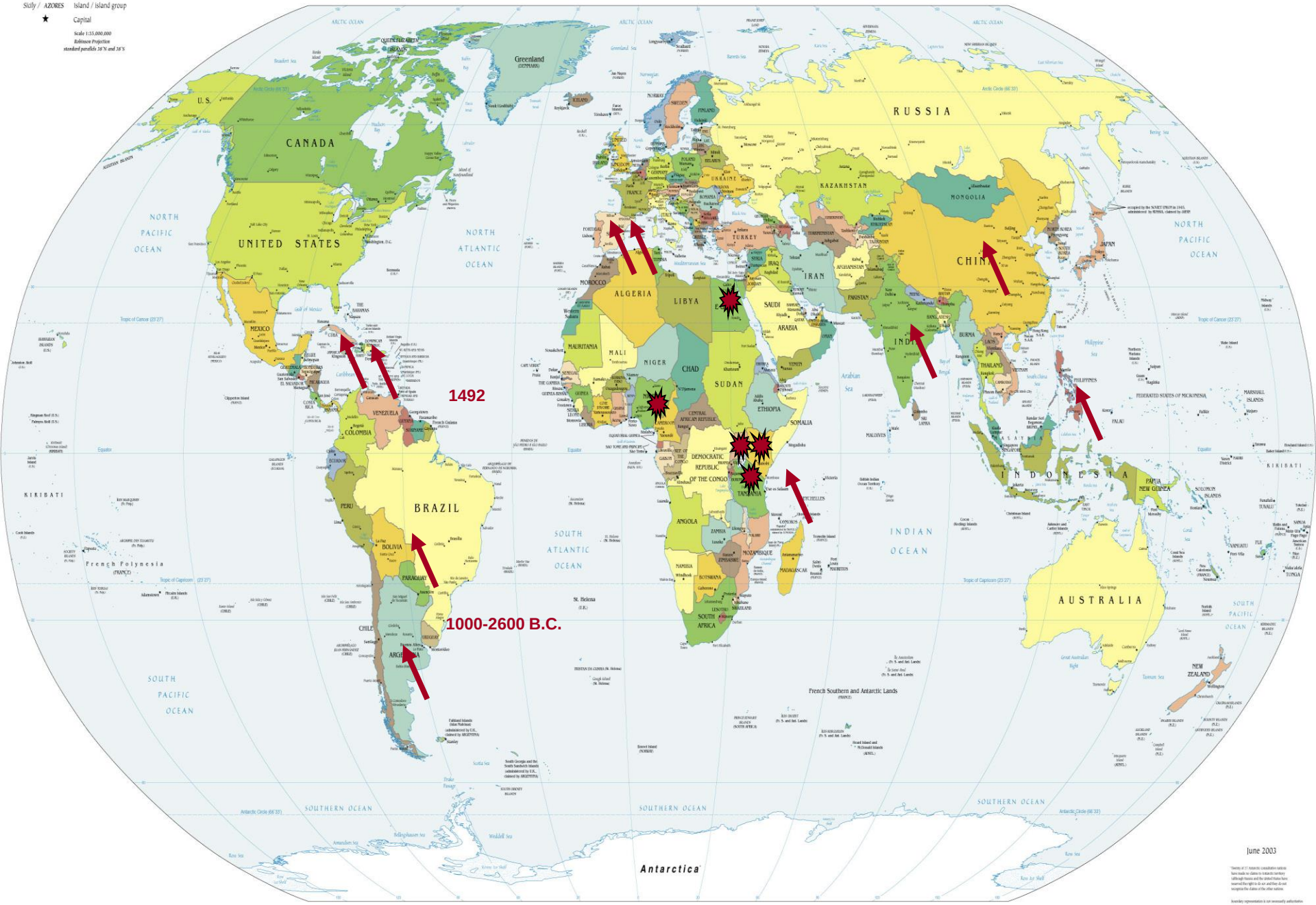
SWEETPOTATO

Mervat M. M. Ahmed EL-Far

Agricultural Genetic Engineering Research Institute (AGERI)
Agricultural Research Centre

Political Map of the World, June 2003



Sweetpotato is considered the seventh most important food crop in the world and is ranked fourth in developing countries. It is cultivated in more than 100 countries as a valuable source of human food, animal feed and industrial raw material.

Sweetpotato is high in carbohydrates, vitamines and proteins,the roots of some varities provide nutritional significant quantities of vitamin A, ascorbic acid, riboflavin, iron, calcium, protiens and some functional components such as anthocyanins, polyphenols and dietary fibers.

According to CSPI nutritionists, the single most important dietary change for most people would be to replace fatty foods with foods rich in complex carbohydrates, such as sweet potatoes.

CSPI gave foods points for their content of dietary fiber, naturally occurring sugars and complex carbohydrates, protein, vitamins A and C, iron and calcium. Points are deducted for fat content (especially saturated fat), sodium, cholesterol, added refined sugars and caffeine. The higher the score, the more nutritious the food.

SWEET POTATO, BAKED	184
POTATO, BAKED	83
SPINACH	76
KALE	55
MIXED VEGETABLES	52
BROCCOLI	52
WINTER SQUASH, BAKED	44
BRUSSELS SPROUTS	37
CABBAGE, RAW	34
GREEN PEAS	33
CARROT	30
OKRA	30
CORN ON THE COB	27
TOMATO	27
GREEN PEPPER	26
CAULIFLOWER	25
ARTICHOKE	24
ROMAINE LETTUCE	24

THE CSPI NUTRITION SCOREBOARD

SWEET POTATO RANKS NUMBER ONE IN NUTRITION

NUMBER 1

CSPI is a non-profit, independent organization seeking to improve the public's health by offering reliable nutrition information and by working to reform the nation's food and health policies. Ratings listed are for average-size servings. Adjust the score proportionally for larger or smaller portions.

In a recent study, the Center for Science in the Public Interest (CSPI) ranked the sweet potato number one of all vegetables. With a score of 184, the sweet potato outscored the next-highest vegetable by nearly 100 points. CSPI nutritionists recommend choosing foods that are near the top of the chart and eating less of the foods that have negative values or are near the bottoms. A varied diet, composed mainly of grain products and fresh vegetables and fruits, is best.

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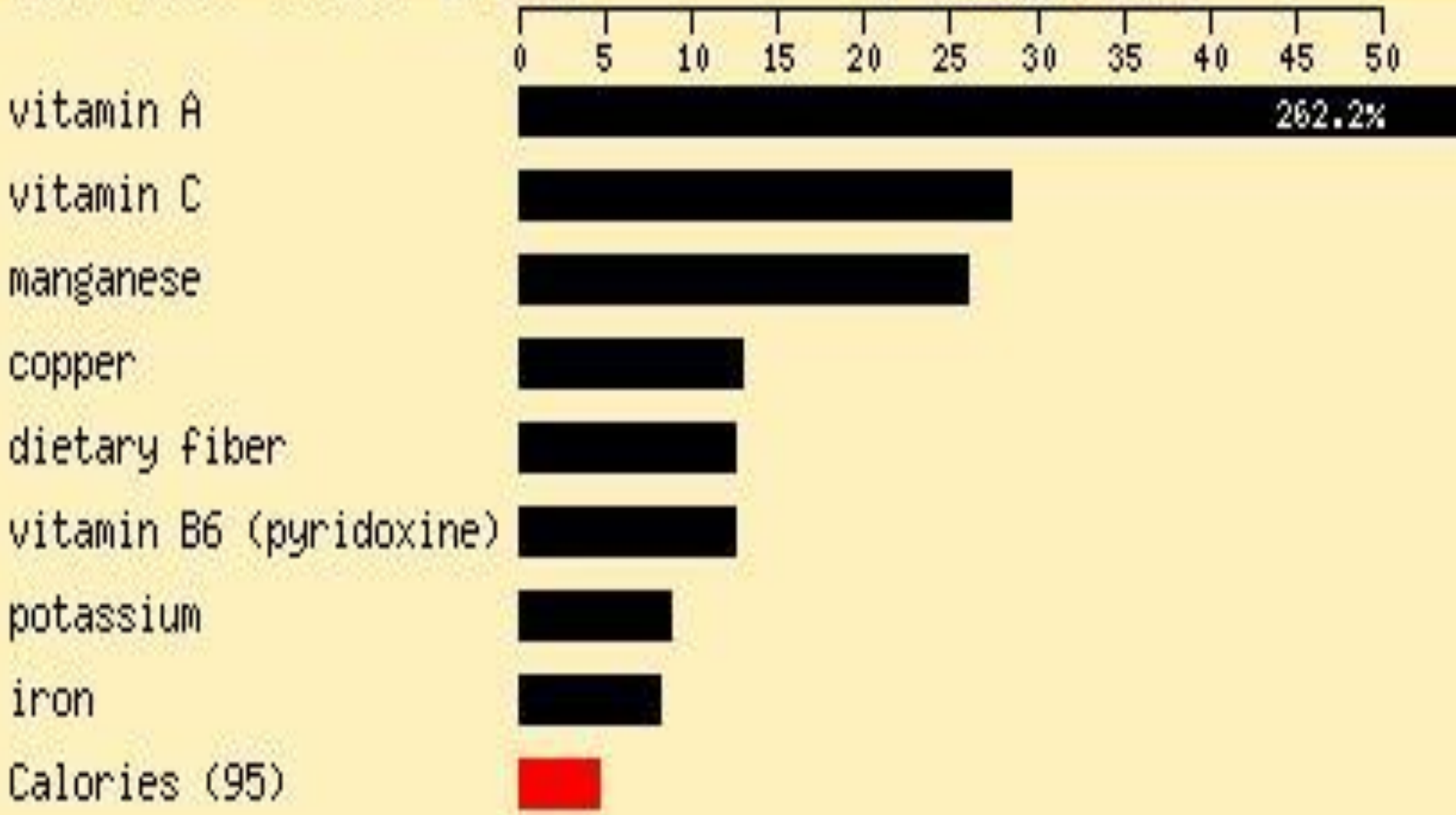
Nutrients in Sweet Potato, Baked, With Skin

1.00 each (77.00 grams) **% Daily Value**



Orange-fleshed varieties are excellent source of vitamin A, (in the form of beta-carotene) and a very good source of vitamin C, Beta-carotene is helpful in preventing heart disease, strokes.

Sweetpotato increase milk production in nursing mothers and are an excellent food for those that do heavy muscular activities, as they enhance strength. it is used to treat ulcers and inflamed colon conditions. It has long been used to improve against anemia, constipation, diarrhea, dysentery, poor circulation, hemorrhoids high blood pressure, mastitis, and premature ejaculation.

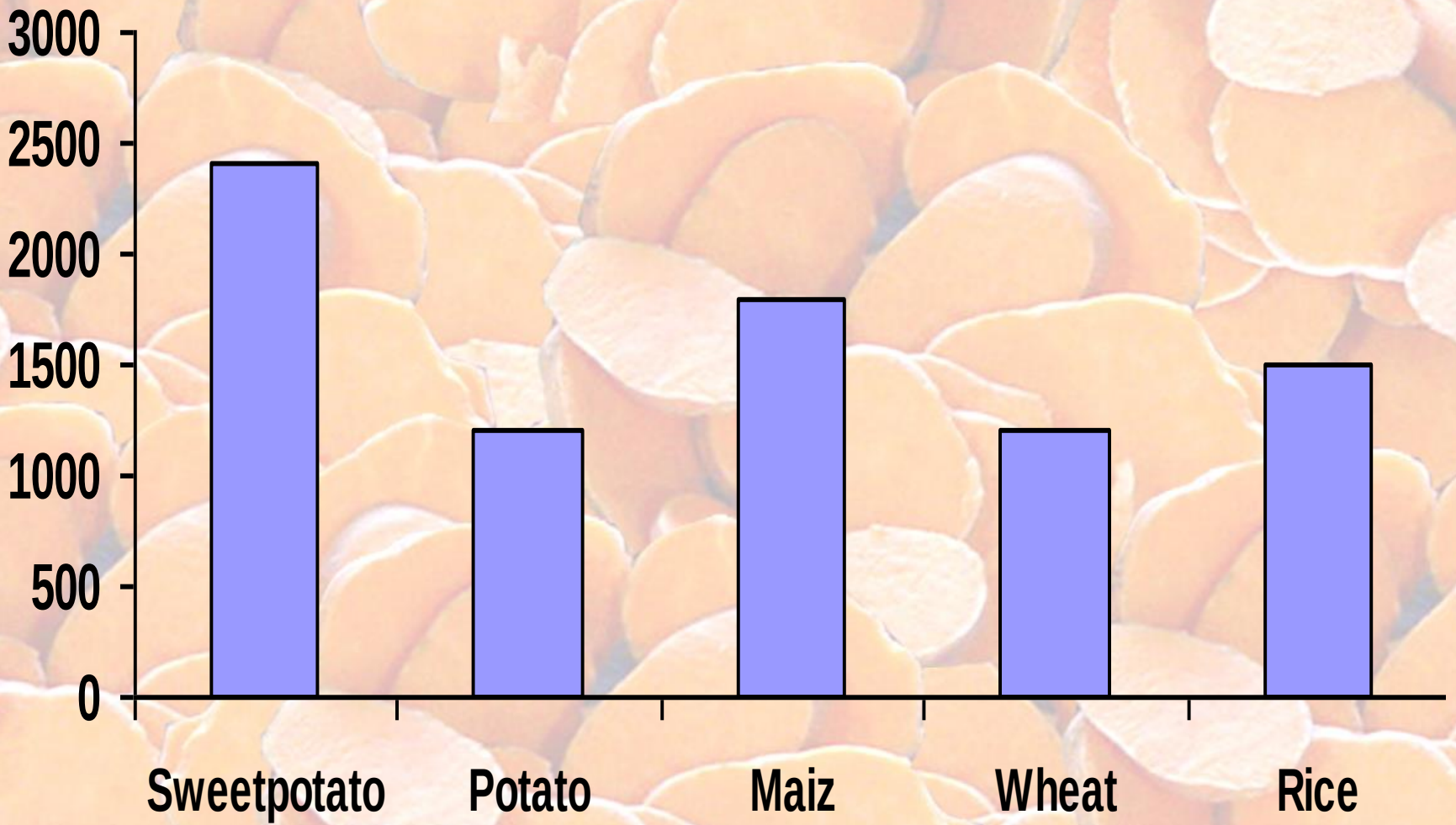
Sweetpotato also contain protease inhibitors, which inhibit the formation of cancer cells according to many studies. sweetpotato helped stabilize blood sugar levels, healing properties as an antioxidant food.

Sweetpotato contains phytochelatins which can bind to heavy metals and can therefore help in detoxifying the body of copper, mercury, lead, and cadmium. In fold medicine, if a child accidentally swallowed a coin, sweet potatoes would be given to stick to the object and carry it out of its system more easily.

In a Japanese study of twenty-eight fruits and vegetables tested for binding with cholesterol and lowering it, sweetpotato ranked number one.

Sweetpotato produces more biomass and nutrients per land area than any other crop, adaptable to abroad range of agro-ecological conditions, can grow on low-nitrogen soils and draught tolerant. Sweetpotato has an abundance of uses, ranging from fresh roots to many processed form.

Dry matter value Kg/Ha



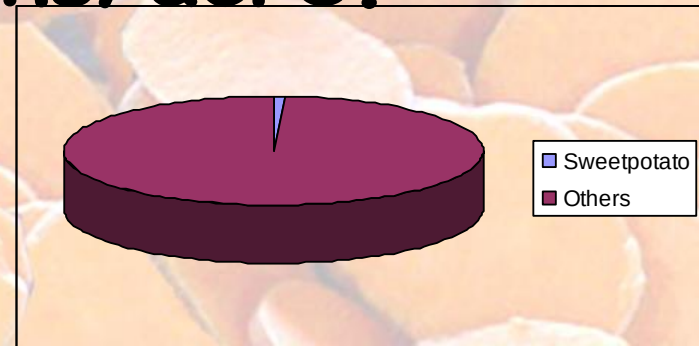

Uncle Ben's
RICE BOWL
Hearty Spoonfuls
2.99
SCALLOPED SWEET POTATOES
SWEET POTATO CASSEROLE


national
cut
sweet potatoes
in light syrup


TO OPEN
EARTH'S BEST
BABY FOOD
SWEET POTATO & CHICKEN DINNER

In Egypt

Sweetpotato is grown in Upper Egypt, Nubaria, Kafr Elsheikh and Menoufia, the area of sweet potato under production has reached 28.000 acres with an average yield 12 tons/acre.

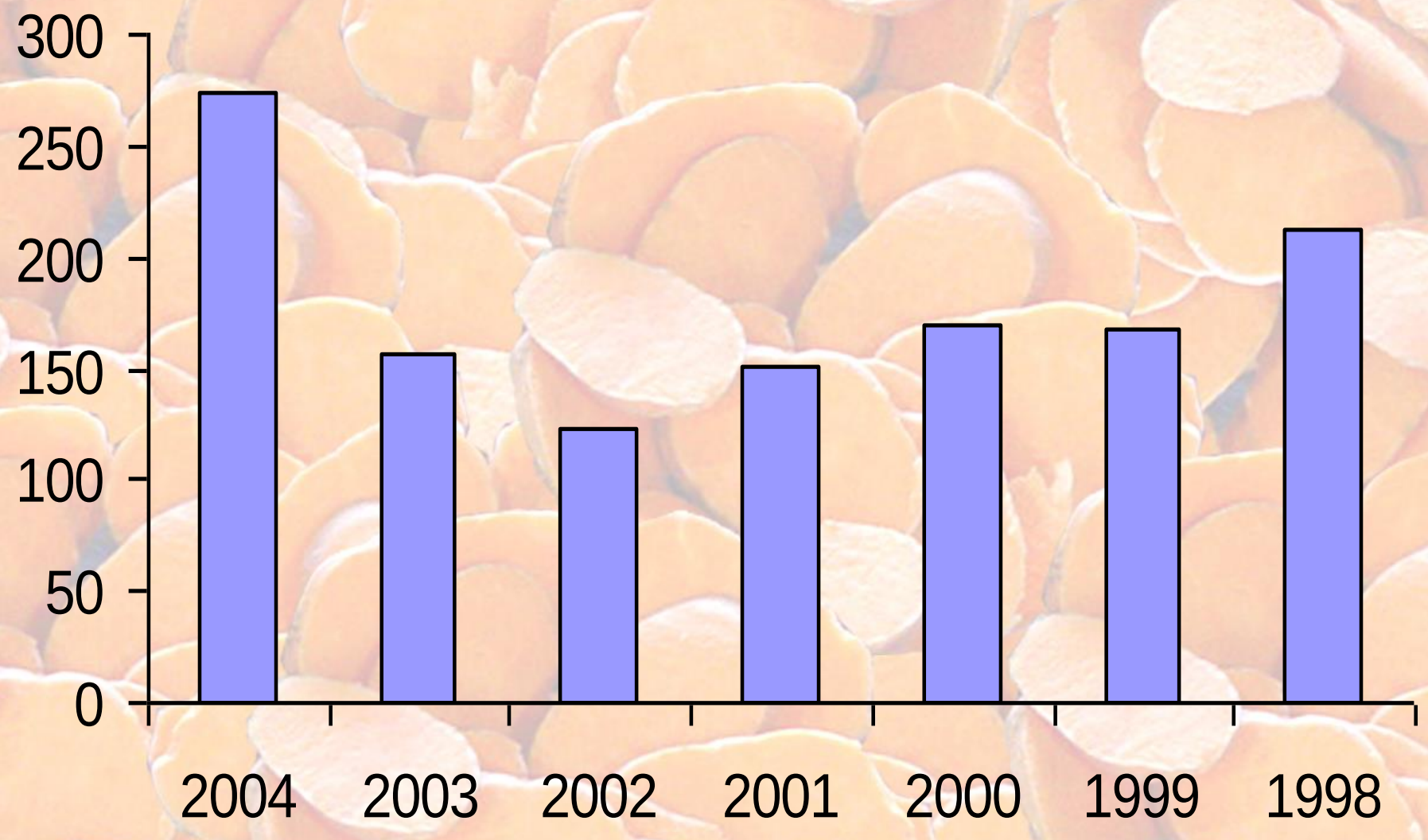


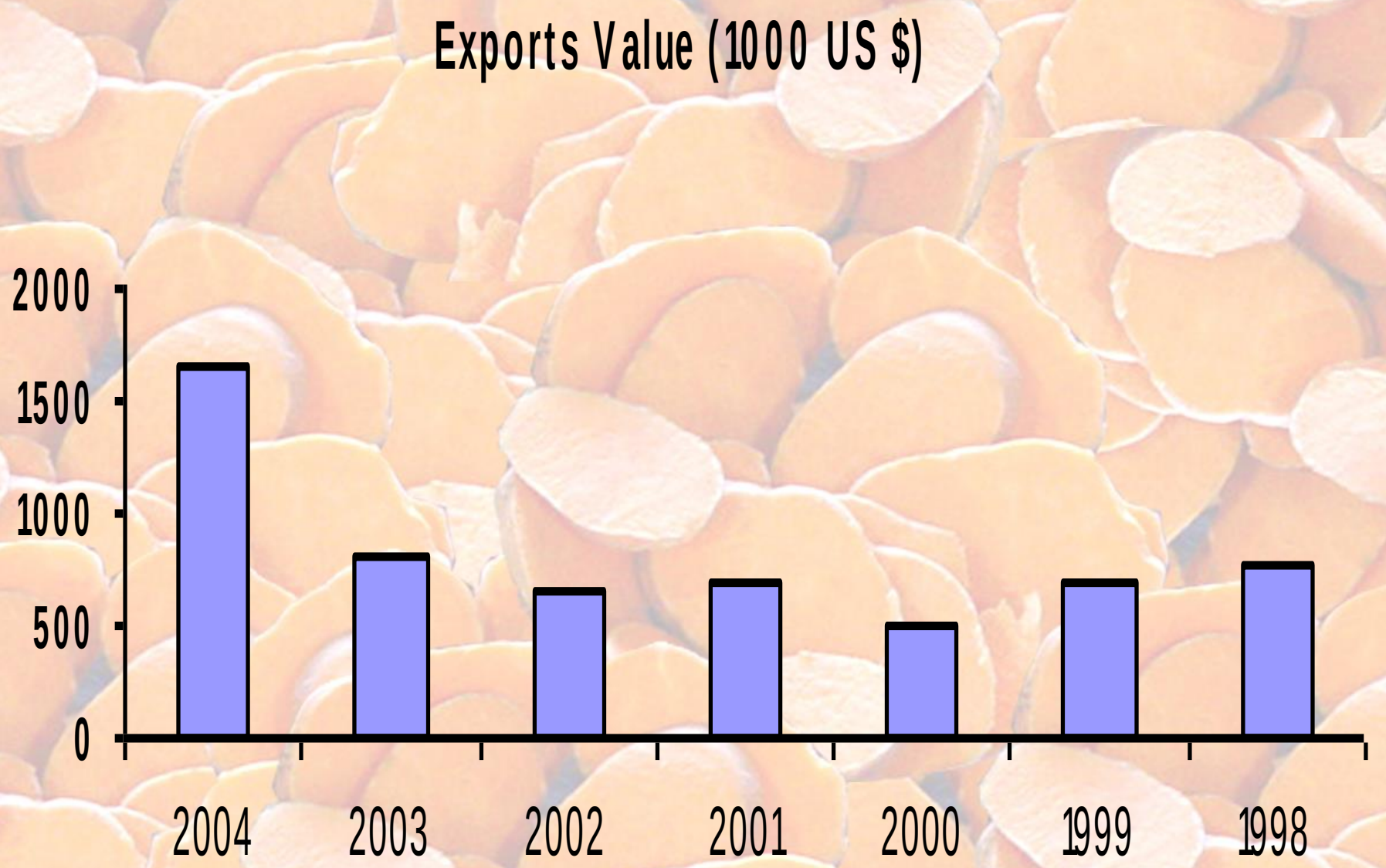
Nutritional studies in Egypt gave the evidence that population in Egypt suffer from the deficiency of zinc, iron and vitamin A, making them more vulnerable to illness, fatigue, visual and memory impairment and increasing the possibility of mental retardation among their children.

During the last three years, demand for sweetpotato export has been increased.

While Egypt export only 6.000 tons to Europe,

Exports Unit Value (US $/tonne/No)



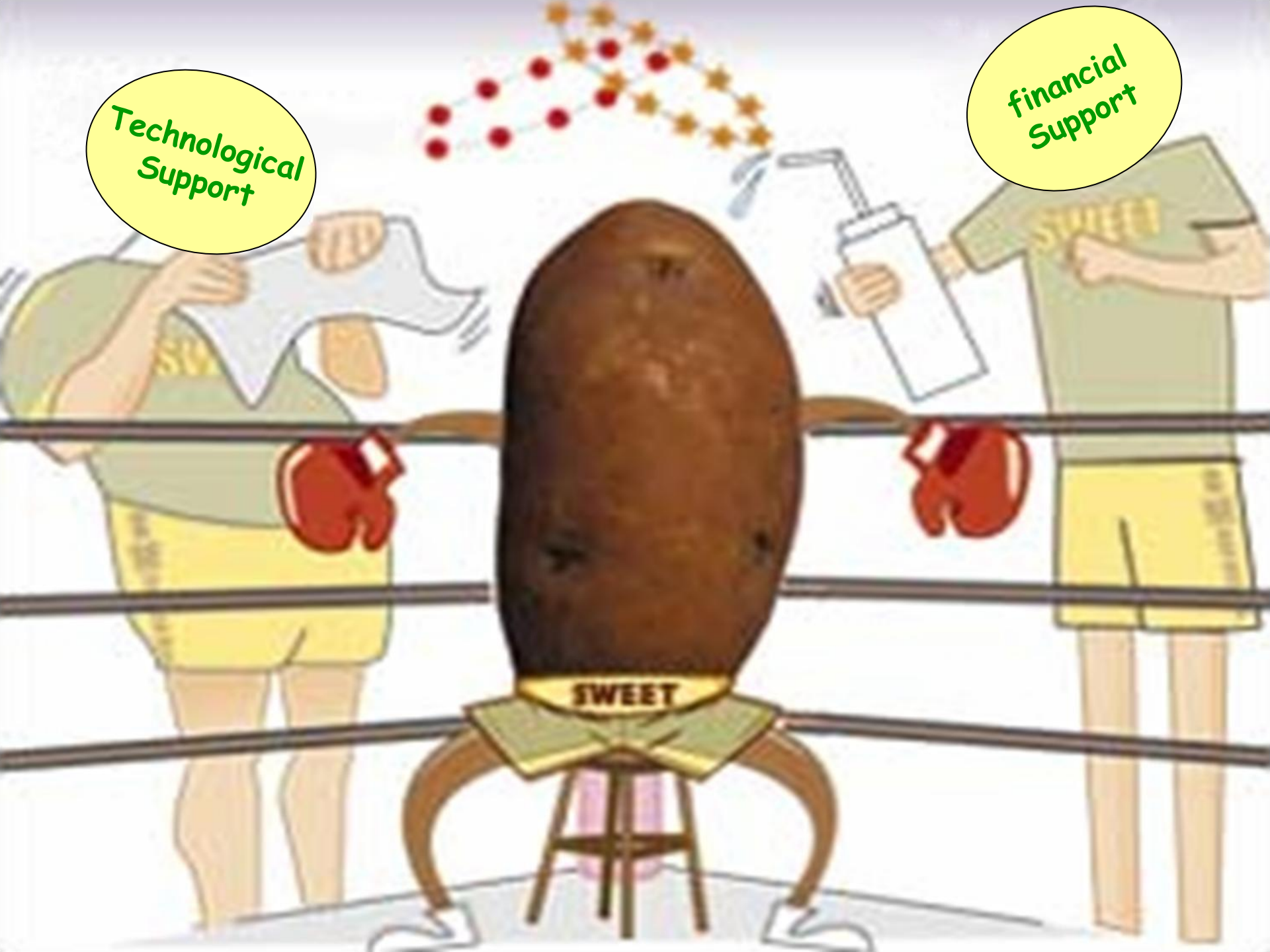

Exports Value (1000 US $)
2000
1500
1000
500
0
2004
2003
2002
2001
2000
1999
1998


EFFAT

Pests and diseases prevent the crop from reaching its maximum agricultural potential. Virus diseases have been attributed as the main cause of low yield. Productivity, low quality and the major cause of cultivar decline; losses often reach 65 to 90 %. For this reason farmers did not appreciate planting sweetpotato.

For that we have adoapted the idea of improving the sweetpotato crop. The improvement will allow better food prices because the production costs will be lower and crop failure will be decreased.

We found that sweetpotato needs


Technological Support
financial Support
SWEET

SWEETPOTATO ACTIVITIES AT AGERI

1. Improvement the deteriorated local varity (Abees) through the production of virus-free stock plants.
2. Development of an efficient system of propagation that can prevent a spread of virus disease.
3. Development of efficient quantitative system for viral detection in sweetpotato fields.
4. Sequence determination for the coat protein gene.
5. Optimization of in vitro regeneration ability to solve the difficulty of genotype dependent regeneration phenomenon.

6. Evaluation of an orange-fleshed sweetpotato germplasm provided by CIP for yield, nutritional contents and resistance/tolerance to major biotic and abiotic stresses.
7. Quality assessment on the level of B-carotene, proteins, fibers, minerals and carbohydrates.
8. Sensory evaluation of sweetpotato products.
9. Stimulate and promote microinterprise development using products from orange-flesh sweetpotato.
10. Raising awareness through the extension to the farmers and peaple for the sp value.

1. Improvement the deteriorated local varity (Abees) through the production of virus-free stock plants.

- Using tissue culture techniques (heat therapy and meristem tip culture) we could obtain a virus free stock plants from ABEES the egyptian local varities.

- Production of pathogen-free material is the first step of controlling the viral diseases.

2.Development of efficient system of propagation that can prevent a spread of virus disease

Culturing of single-bud explant using tissue culture technique could produce 2 to 8 million plants following 9 subcultures. This was calculated on the basis of 20% losses of the obtained shoots in each subculture.

1
6
36
216
1296
7776
46656
279936
1679616
10077696

AGERI

- Introduce virus-free stock plants.
- Select adequate method for in vitro multiplication.
- Produce in vitro massive germplasm

Agro-food

- Multiplication of sweetpotato plants.
- Evaluation of sweetpotato germplasm at different locations.
- Production of sweetpotato tuberous root.

PPRI

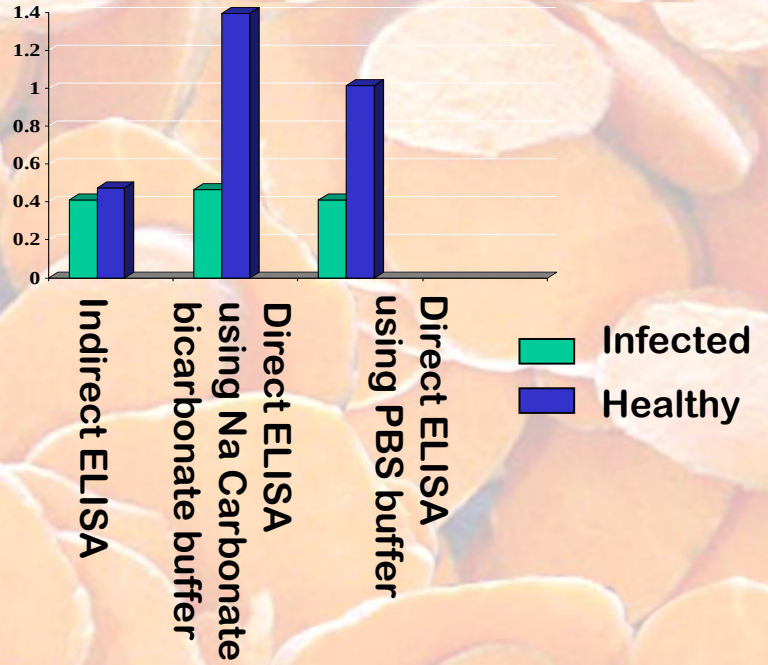
- Monitoring harvest&post harvest operation up to transport to marke.
- Evaluation sweetpotato quality, storabili shelf life extension upon the
- Effect of introduced post harvest trea

- The productivity of sweetpotato virus-free plants using tissue culture technique was improved.
- The production reached 15 to 20 tons/acre comparing to 10-12 tons/acre produced by commercial Abees roots. Results showed that the productivity may also affected by the location and type of soil.

The production of clean sweetpotato plants through tissue culture method and bio- farming system at Agro-food Co. enhanced the final product and increased the exportation of the product to EU-Market.

3.Development of efficient quantitative system for viral detection in sweetpotato fields.

Sensitive analytic techniques including double antibody sandwich enzyme linked immunosorbent assay (DAS-ELISA), direct ELISA, dot ELISA and reverse transcription polymerase chain reaction (RT-PCR) were compared and evaluated for their capability to reliably distinguished between healthy and sweet potato feathery mottle virus (SPFMV) infected sweet potato plants. results revealed that direct-ELISA technique was sufficient for viral detection in quantitative bases



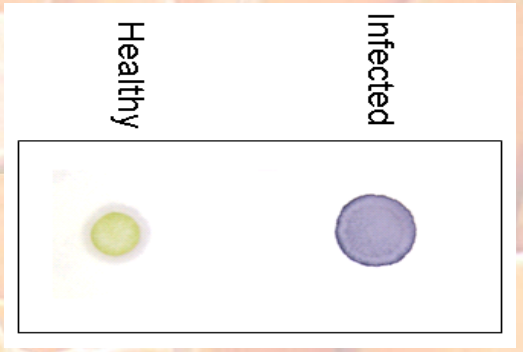
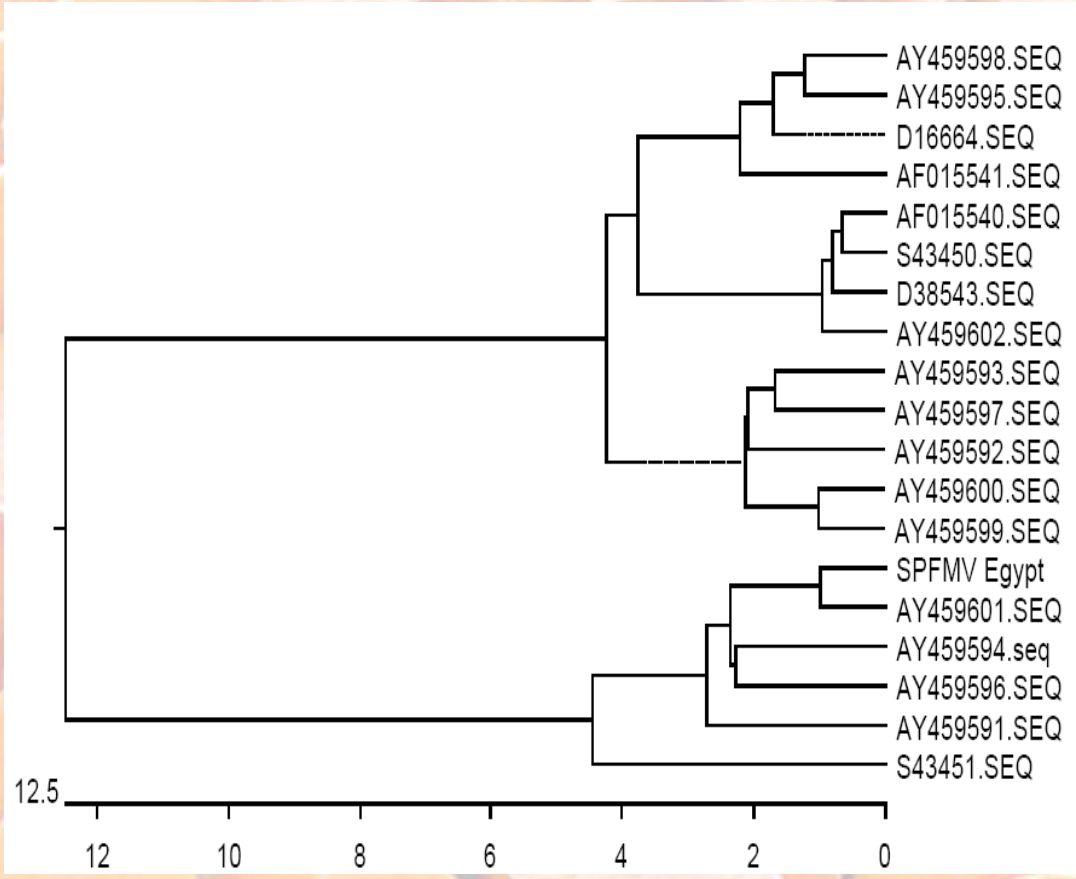


Figure 1. Dot-ELISA of healthy and SPFMV-infected sweet potato plants.

4.Sequence determination for the coat protein gene.

The availability of sequence information for the coat protein gene is a necessity for downstream applications like molecular and serological diagnostic tools and improving sweet potato crop by introducing resistant *via* established gene transformation strategies.



The Phylogenic analysis indicated that the Egyptian isolate occurs within the *C* strains of identified SPFMV.

Primers used in this study were conserved in all viral strains in the NCBI database.

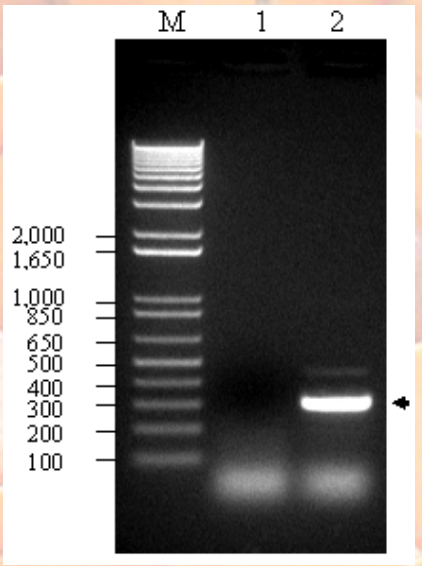


Figure 2. Detection of SPFMV by RT-PCR. Healthy (1) and SPFMV-infected (2) sweet potato plants. (M) Molecular weight marker. PCR product is indicated by an arrow.

SPFMV-F
5`-CTTCAGTGACGTTGCTGAAGC-3`

P-SPFMV-R
5`AAGAGGTTATGTATATTTCTAGTA-3´

Accession Number	SPFMV Isolate and Strian
AF015540	Korean strain 1
AF015541	Korean strain 2
AF016366	Zimbabwe
AF439637	United States
AF439638	United States
AY459591	Kenya: Kakamega strain C
AY459592	Kenya: Kakamega strain EA
AY459593	Kenya: Kisii strain EA
AY459594	Kenya: Kisumu strain C
AY459595	Uganda: Arua strain O
AY459596	Uganda: Namulonge strain C
AY459597	Madagascar strain EA
AY459598	Tanzania strain RC
AY459599	Portugal strain EA
AY459600	Spain, Canary Islands strain EA
AY459601	South Africa strain C
AY459602	China strain RC
D16664	ordinary strain, SPFMV-O
D38543	Strain Severe
S43450	Strain RC
S43451	Strain C
S69825	China isolate CH

5.Optimization of in vitro regeneration ability to solve the difficulty of genotype dependent regeneration phenomenon.

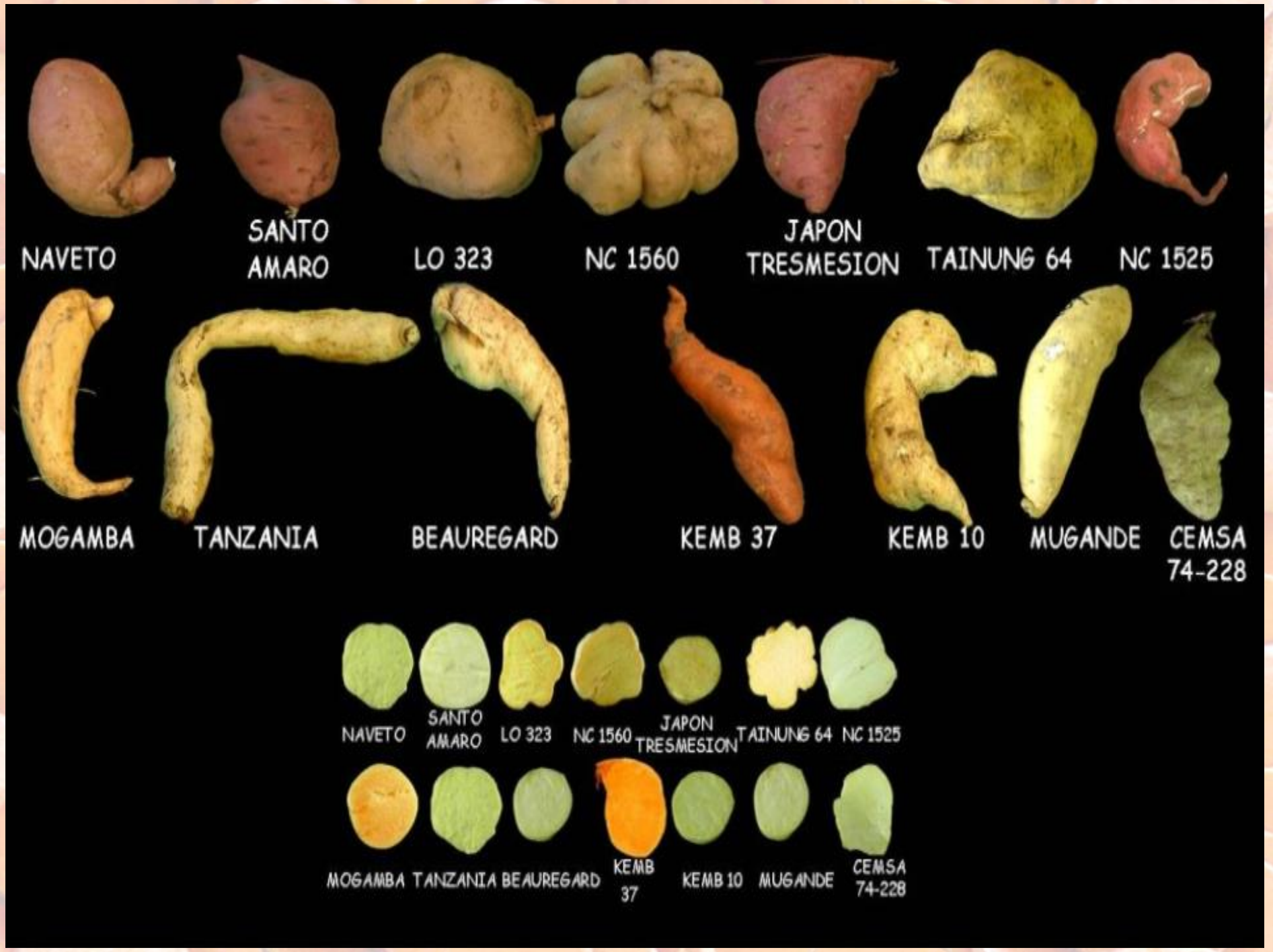
The bottle neck to produce transgenic sp has been the lack of a reliable and efficient regeneration system.The protocols developed for sp regeneration are strongly genotype dependent and thus limit the application of genetic engineering techniques for so improvement.

- 4 different somatic explants were used (bud, petiole, lamina and shoot tip).
- A wide range of a combination of hormones were used.
- The work is under progress.

6.Evaluation of an orange-fleshed sweetpotato germplasm provided by CIP for yield, nutritional contents and resistance/tolerance to major biotic and abiotic stresses.

Fourteen varieties/clones of sweetpotato were delivered to AGERI from International Potato Center (CIP)/Nirobi in 2002 as cuttings. They were *in vitro* propagated for their massive micro-propagation. Different media compositions and incubation conditions were examined to determine the optimal conditions for each cultivar. *In vitro* plants were acclimatized under insect-proof greenhouse and used as mother plants for the cuttings to be evaluated at different locations. Yield was evaluated on basis of weight and number of roots.

CIP NO.	Variety
400004	CEMSA 74-228
400011	SANTO AMARO
420009	JAPON TRESMESINO
440034	MOGAMBA
440092	NC 1525
440093	NC 1560
440131	NAVETO
440163	MUGANDE
440116	TANZANIA
440169	KEMB 10
440170	KEMB 37
440185	LO 323
440189	TAINUNG 64
440132	BEAUREGARD


NAVETO
SANTO AMARO
LO 323
NC 1560
JAPON TRESMESION
TAINUNG 64
NC 1525
MOGAMBA
TANZANIA
BEAUREGARD
KEMB 37
KEMB 10
MUGANDE
CEMSA 74-228
NAVETO
SANTO AMARO
LO 323
NC 1560
JAPON TRESMESION
TAINUNG 64
NC 1525
MOGAMBA
TANZANIA
BEAUREGARD
KEMB 37
KEMB 10
MUGANDE
CEMSA 74-228

7.Quality assessment on the level of B carotene, proteins, fibers, minerals and carbohydrates.

- In concerning to field evaluation results,8 cultivars were selected to be evaluated for their chemical composition in collaboration with the Food Technology Research Institute (FTRI), ARC.

- It could be clearly concluded that Santa Amaro and Kemb37 were the best varities having the highest content of chemical constituents compared with those of others creamy flashed sweetpotato varities, while Tainung64 and LO323 have been recognized as good sources of B-carotene.

8.Sensory evaluation of sweetpotato products.

- Testing for preferably to different ways of cooking (boiling, backing and crisping) was surveyed. 50 different consumers from different classes have tested the samples.

- A completed questionnaire about color, taste, flavor and aroma was collected and statistically analyzed.

10.Raising awareness through the extension to the farmers and peaple for the sp value.

Future plane of work

- Production of inhanced-quality food product through introduction of orange fleshed-sweetpotatoasmain gridiants.
- Germplasm conservation of Egyptian varities.
- induction of in vitro Tuberous roots.
- Finger printing of Egyptian varities.
- Using sweetpotato as a hyperaccumulator
- Using sweetpotato in phytoextraction.

Colaboratives

- Food Technology Research Institute (FTRI),ARC
- Regional Centre for Food and Feed (RCFF),ARC
- Plant Pathology Research Institute (PPRI),ARC
- Gene bank,ARC
- Potato International Centre (CIP)
- Agro Food Co.Ltd
- AERI, Institutional Linkage Project.Midwest University Consortium for International Activities (MUCIA),Inc. And University of Illinois.

Publications

Ahmed Ashoub; Mervat M. M. El Far; Dirk Prüfer; Taymour Nasr El-Din (2007).Comparison of Methods to Detect Sweet Potato Feathery Mottle Virus (SPFMV) In Sweet Potatoes. Egyptian journal of Genetics and Cytology, impress.

Ahmed Ashoub and Mervat M. M. El Far. Sequence and comparison analysis of coat protein gene and 3` non coding region of sweet potato feathery mottle virus (SPFMV) isolated from Egypt. Egyptian journal of Genetics and Cytology, impress.

Mervat M. M. EL Far. Optimization of Growth Conditions during Sweetpotato Micro-propagatio. 7th African Potato Association Conference 22-26 October 2007, Alexandria. Egypt.

Mervat M. M. El Far; Ahmed Ashoub; Ramzy El Bedewy and Taymour Nasr El-Din. From Laboratory to Market. Government-private sector contribution to improve sustainable development of sweetpotato production. 7th African Potato Association Conference 22-26 October 2007, Alexandria. Egypt.

Mervat, M. M. El Far; Ahmed Ashoub; Ramzy El Bedewy and Taymour Nasr El-Din. Evaluation of newly introduced sweetpota to germplasm under Egyptian conditions 7th African Potato Association Conference 22-26 October 2007, Alexandria, Egypt.

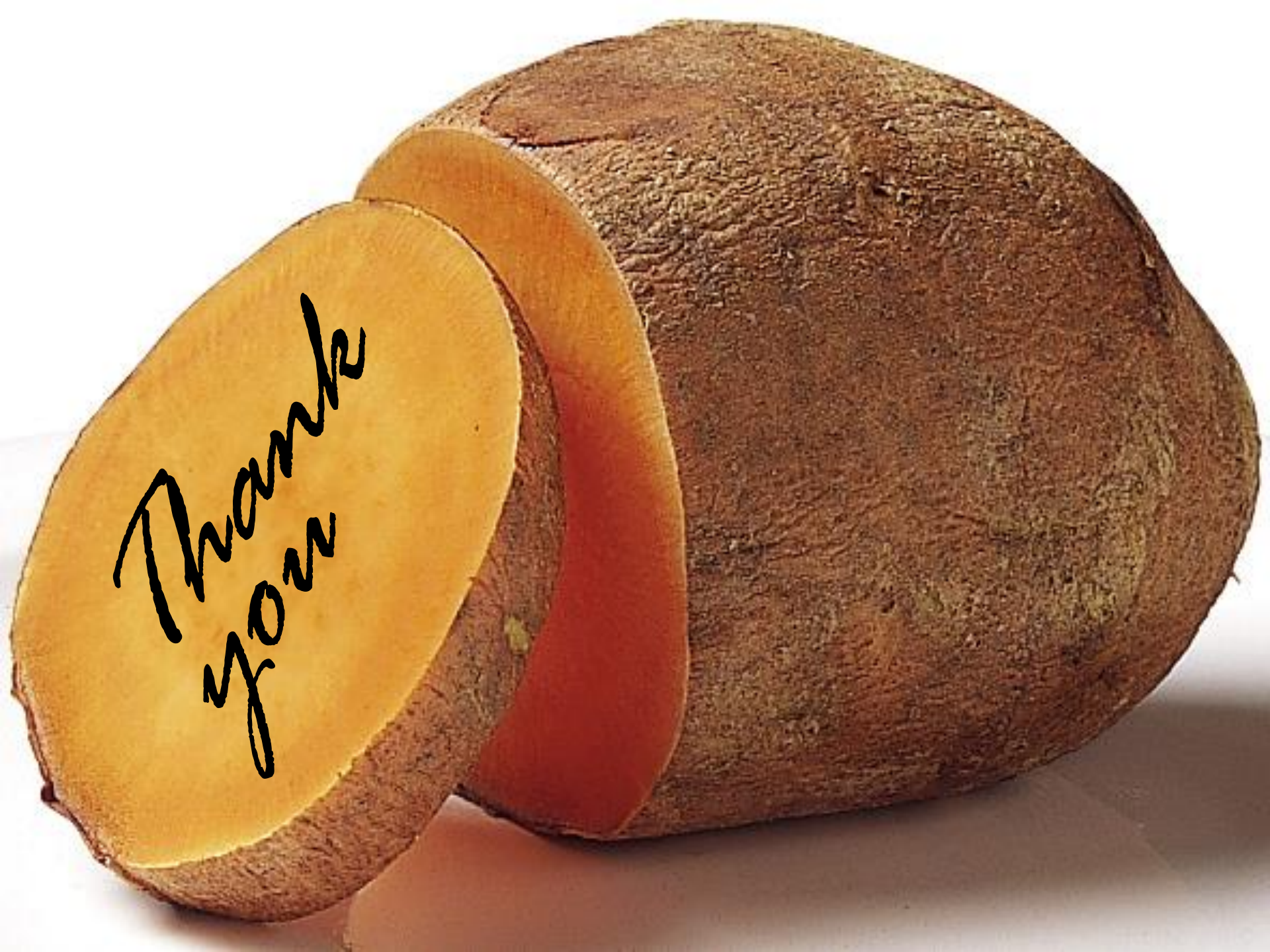
El-Bastawesy A.M; Lobna A,H and Mervat, M. M. El Far;.(2007). Chemical and Technological Evaluation of Some Sweetpotato Varities.Annals of Agricultural Science. Accepted for publication.

Projects

´´Biotechnology based production of high quality sweetpotato for export`

It is a project aimed to improve the agronomic qualities of deteriorated local varity by producing virus-free stock plants.

Midwest University Consortium for International Activities (MUCIA),Inc. And University of Illinois.


Thank you