Amaranth – crop culture of 21st century

Author: Dr.Prof. Magomedov I.M.
St.Petersburg, Russia

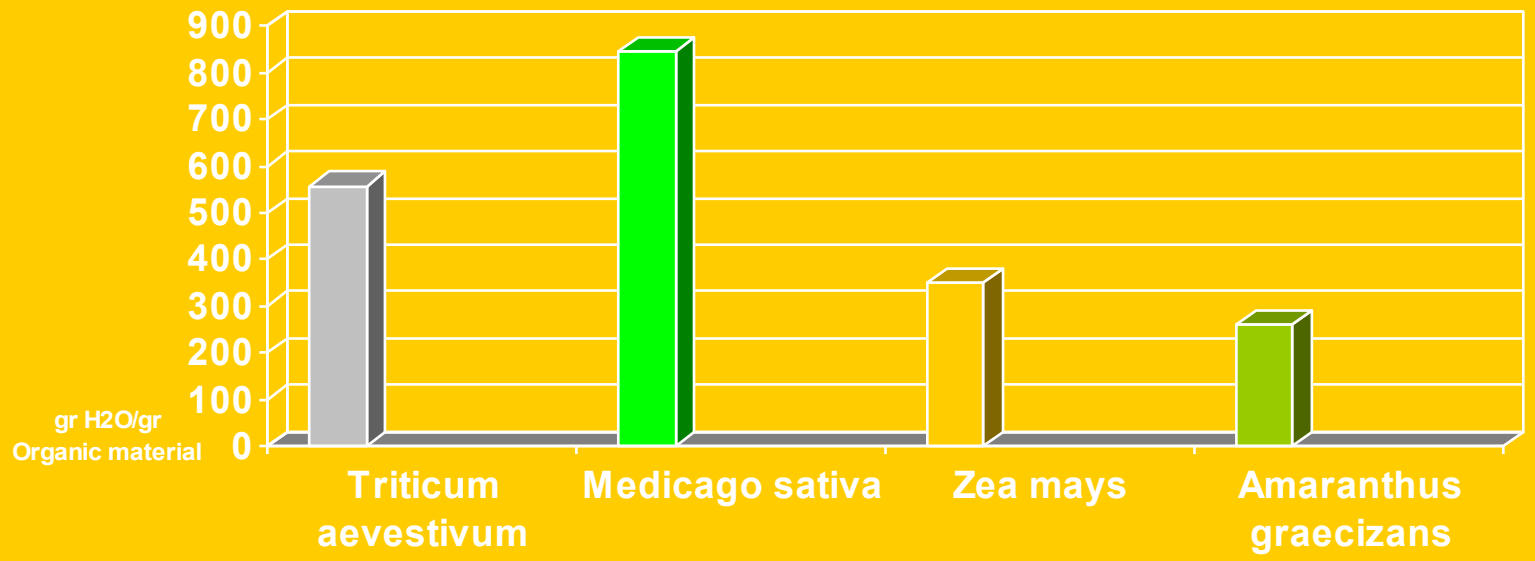
Amaranth – crop culture of 21st century

- It is known that 80.000 species of plants may be potentially used for human nutrition.
- Representative of 3.000 species of plants in some way is included into human ration. 150 species are commercially successful.
- 21 species – the source of protein and calories:
- 7- corn (crops), 7 – legumes, 2 oil containing legumes, 3 – containing starch.
- 30 species provides 95% of food demand.
- Generally the man widely uses 12 species of plants.
- Amaranth can become the 13th species of plant

Amaranth multifunctionality

- Amaranth – grain crop
- Amaranth – feed crop
- Amaranth – vegetable crop
- Amaranth – industrial crop
- Amaranth – ornamental crop
- Amaranth – break crop
- Amaranth – source of biological fuel

Diagram. The effectiveness of water usage by different plants (G. EDWARDS, WALKER,1983)



C3 - plants

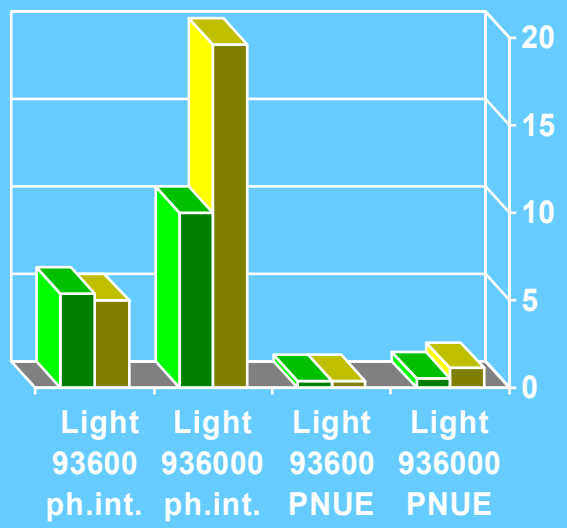
C4 - plants

Amaranth in Russia during drought 2010

Table. Grain chemical composition of different plants (in 100 grams)

Plant	Calories	Humidity level %	Protein gr	Fat gr	Carbohydrates gr	Fibre gr	Ash mg	Ca mg	P mg
Amaranth grain	391	9.35	15-18	6-8	63.1	2.89	2.0	490	455
Buckwheat	335	11.0	11.7	2.4	72.9	9.9	2.0	114	282
Zea mays	355	12.0	9.2	3.9	73.9	1.6	1.2	20	256
Rye	334	11	12.1	1.7	73.4	2.0	1.8	38	376
Soya flour	356	8	43.8	6.7	36.6	2.5	5.3	263	634
Wheat	333		13.3			2.3	1.7	41	372

Diagram. Speed of photosynthesis and PNUE leaves of C3 (celosia) and C4 (amaranth) plants depending on different light



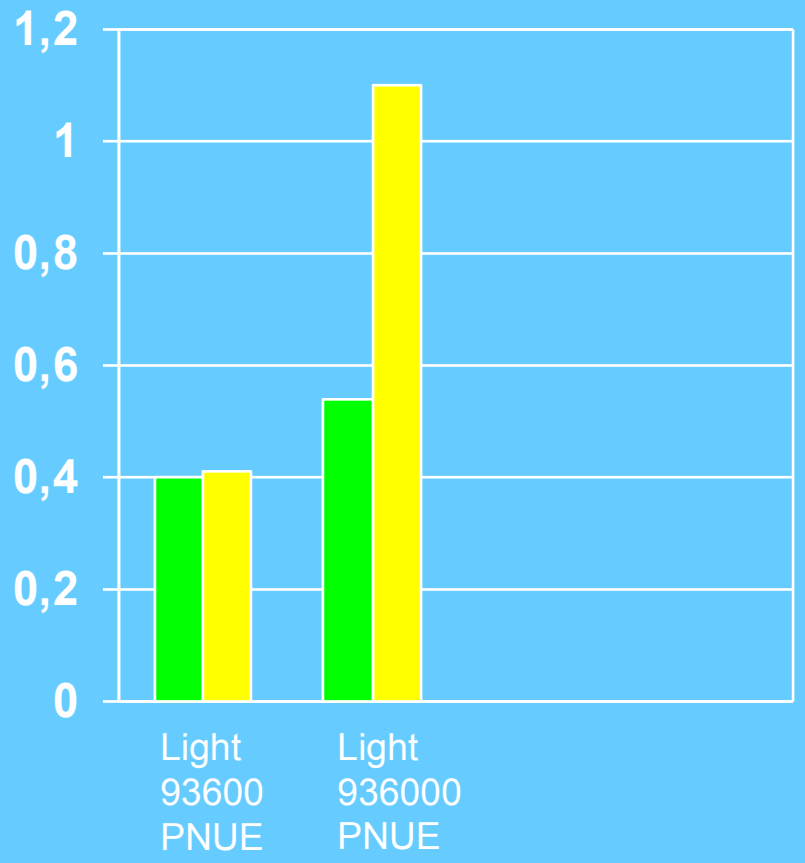


Diagram.Composition of Amaranth Oil

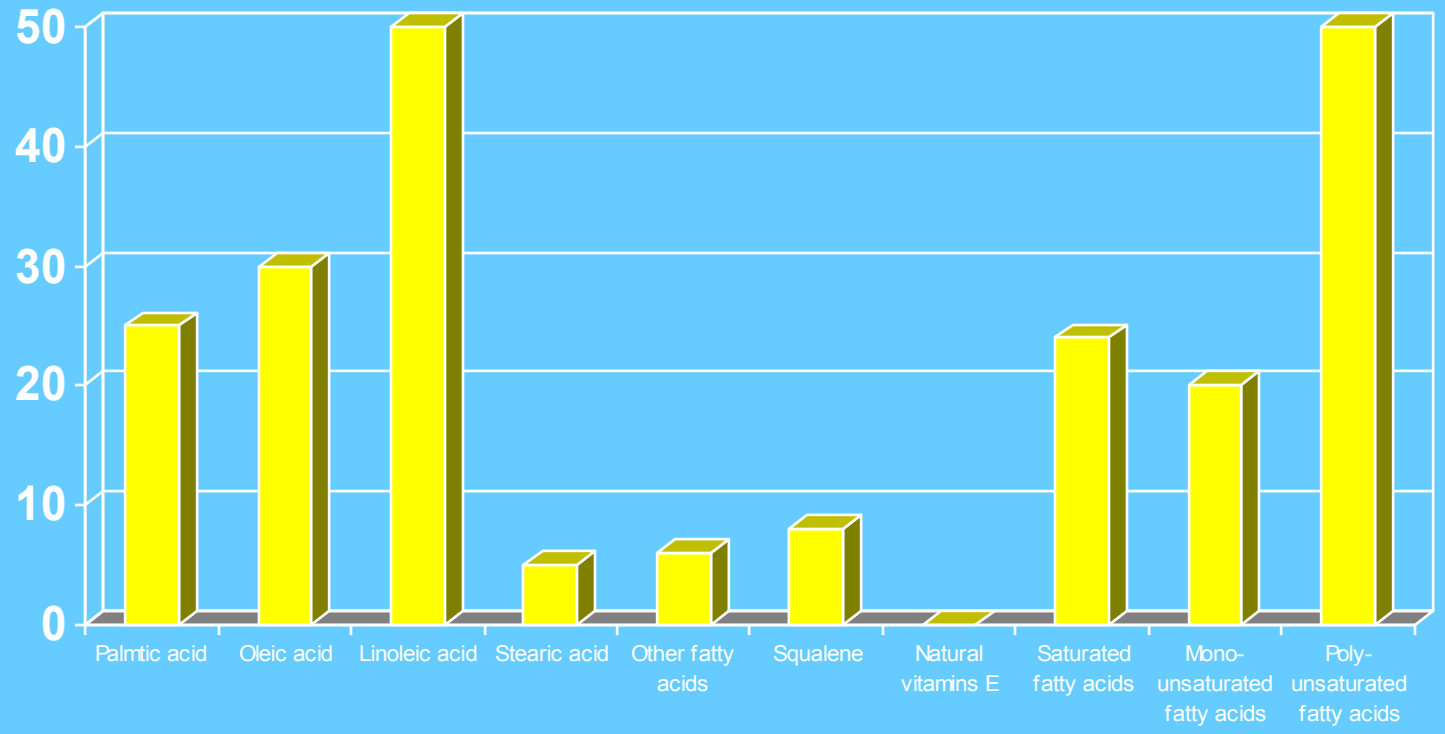


Diagram. Amount of squalene in different cultures %

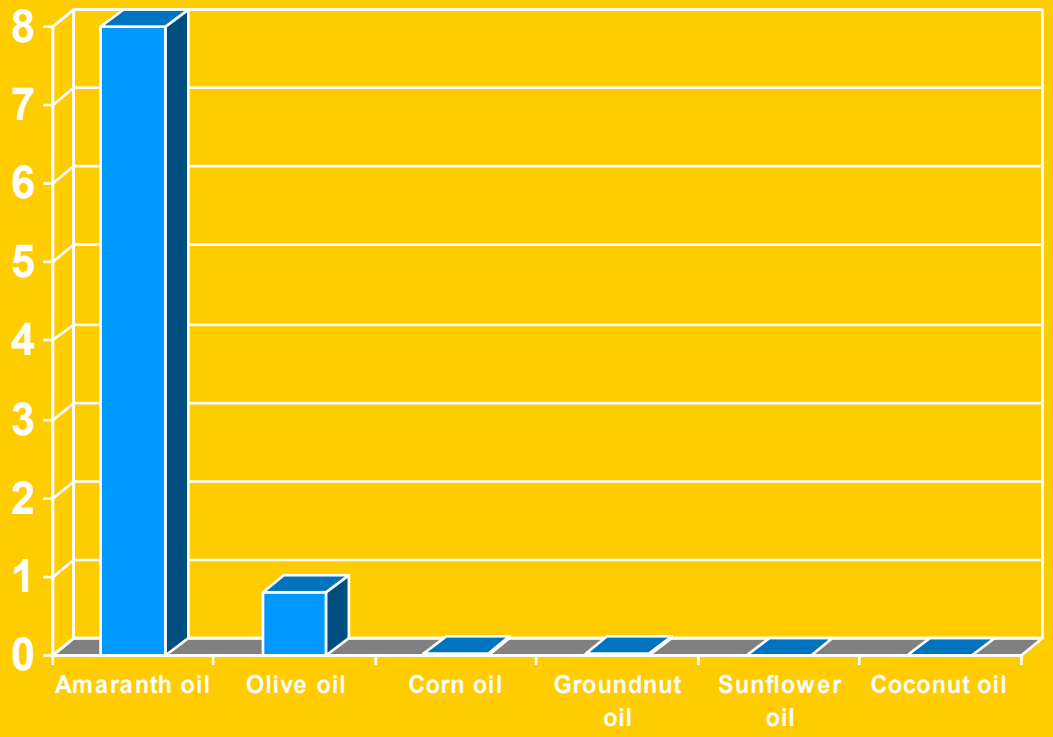


Diagram. Amino acid composition in food products

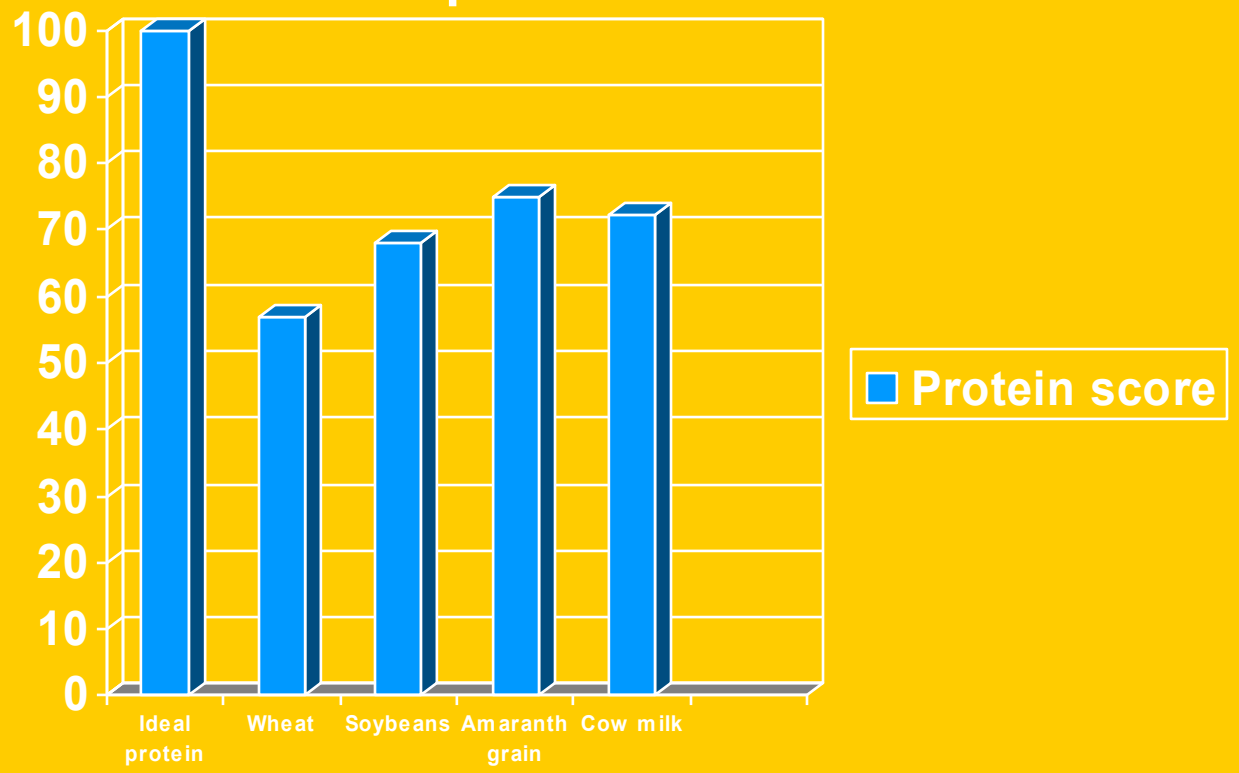


Table.
Foliar composition of amaranth and other plants (in 100 grams)

Plant	Humidity level %	Protein gr	Ca mg	P mg	Fe mg	K mg	Vitamin A	Thiamine mg	Riboflavin mg	Niacin mg	Vitamin C mg
Amaranth	86.9	3.5	267	67	3.9	411	6.100	08.0	0.16	1.4	80
Beet	90.9	2.2	119	40	3.3	570	6.100	0.10	0.22	0.4	30
Cabbage	87.5	4.2	179	73	22	378	8.900				
Spinach	90.7	3.2	93	51	3.1	470	8.100	0.10	0.20	0.6	51

Table

Main nutrient materials content in 100 gr of esculent food product tomato, cucumber and amaranth leaves and total annual nutritious product in kg/ha based on yearly production 80 tones/ha (FAO, 1968. Table of nutrition components for use in Africa)

Figures	**Tomato**	**Cucumber**	**Amaranth**
	Content kg/ha	Content kg/ha	Content kg/ha
Dry wet	6.5gr 5200	4.9g 3920	16.0gr 12800
Carotin	0.5mg 0.4	Min. Min.	5.7mg 4.6
Fe	0.6mg 0.5	0.5mg 0.4	8.9mg 7.1
Ca	10mg 8	13mg 10	410 330
Vitamin C	26mg 21	16mg 13	64mg 51
Protein	1.0mg 800	0.8gr 640	4.6g 3680

Table 7
Number of consumers who get nutrient materials from plant food from 1 ha for 1 year

Figures	1 man need		Comes from vegetables	Number of consumers/ha/year		
	Per day	Per year	Per year	Tomato	cucumber	amaranth
Carotin	1.5mg	0.5g	0.5gr	800	100	9200
Fe	9mg	3.3g	1.7gr	290	240	4180
Ca	500mg	183g	61.0gr	130	160	5410
Vitamin C	30mg	11.0g	11.0gr	1910	1180	4640
Protein	37gr	13.5kg	2.7kg	300	240	1360

Table. Vitamin C and Carotin content in different plants

Crops	Vitamin C (mg/100 gr of fresh wet)	Carotin mg/100gr fresh wet
Cabbage	60-150	0.2-0.8
Carrot	5-7	5-30
Cucumber	8-15	0.1-02
Parsley	58-290	2.6-19.8
Radish	11.4-44	Min.
Salad (leaves)	10-40	1.2-3.7
Tomato	15-45	0.8-1.2
Spinach	37-178	0.3-0.9
AMARANTH	68	5.7

AMARANTH and the use of it

PLANT

Leaves
Soups
Salads
Spices
Medicine
Proteins
Pectines
Amaranthyne
Tea

Stem
Feed

Roots
Pigments

Seeds
Flour
Bread
Grain
Confectionery products
Infant food
Oil
Starch
Proteins
Vitamins
Pop-amaranth
Beverage

Land reclamation
Phytomeliorant
Green manure
Radionuclides
Adsorbent
Source of biofuel

Amaranth plantation in Voronezskaya region

Amaranth effectiveness

1.10 amaranth plants provide sowing 1 ha
2. Biomass harvest from 1 ha – 300 tones
3. Protein harvest from 1 ha – 8 tones
4. Lysine harvest from 1 ha – 0,6 tones
5. In good growing conditions, each amaranth plant will produce 30,000 to 100,000 seeds
6. The net-profit of growing amaranth is more than three to five times the net profit of growing corn, oats, or wheat
7. Efficient use of nitrogen
8. Efficient use of water
9 .Efficient Photosynthesis

CONCLUSIONS

- To create “Amaranth” project consisting of the following sections:
- amaranth grain
- amaranth food
- vegetable amaranth
- amaranth and land reclamation
- amaranth grain and biomass processing
- international cooperation within FAO framework and other organizations