



I semi del futuro

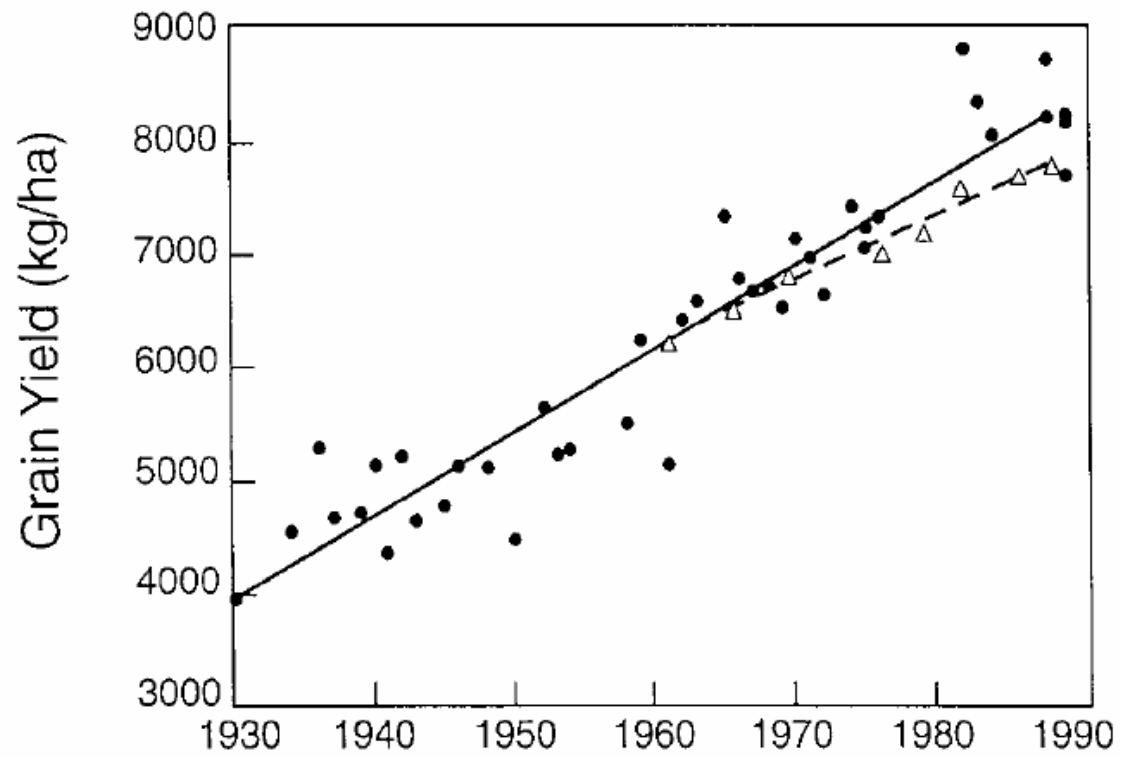
Astro-Siesta
21 gennaio 2010

Table 1. World production in terms of fresh weight harvested and biomass corrected for moisture content (assuming 12% for cereals, 70% for roots, tubers and fruits)

Ranked crop species	Annual production (Mt)	Biomass in dry matter (adjusted ranking) (Mt)
1 maize	721	634 (1)
2 wheat	627	552 (2)
3 rice	605	532 (3)
4 potato	327	82 (5)
5 cassava	202	51 (7)
6 barley	153	135 (4)
7 sweet potato	127	32 (8)
8 banana	71	18 (10)
9 sorghum	59	52 (6)
10 millet	29	26 (9)

Cereals are in **bold**. Figures from FAO (2004)

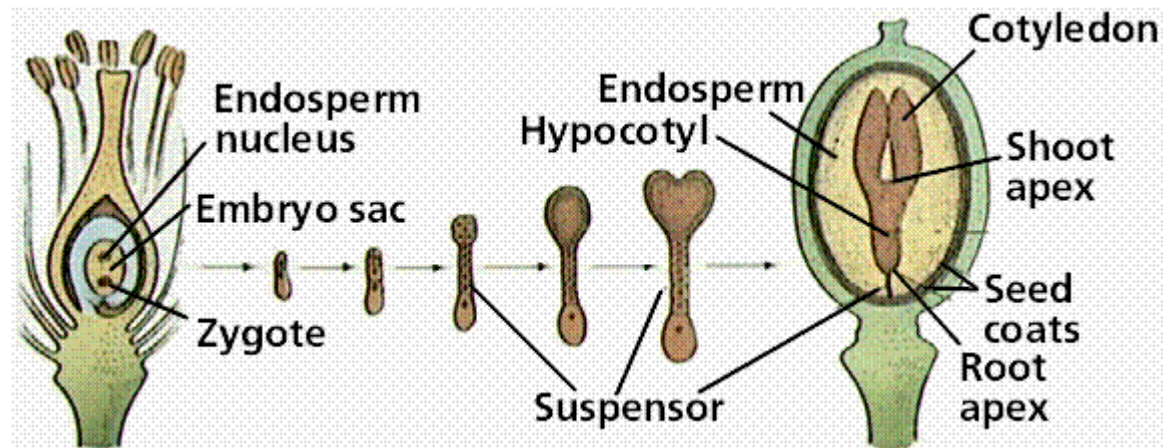
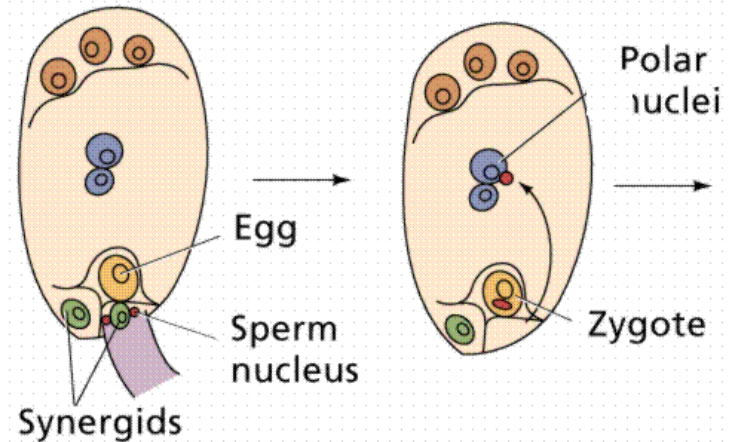
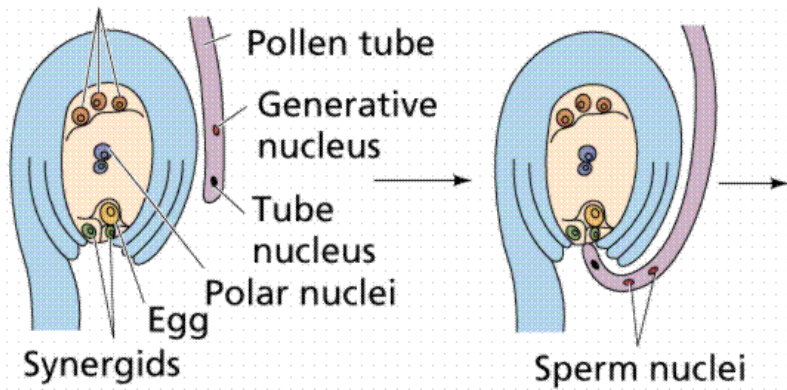
Yield potential

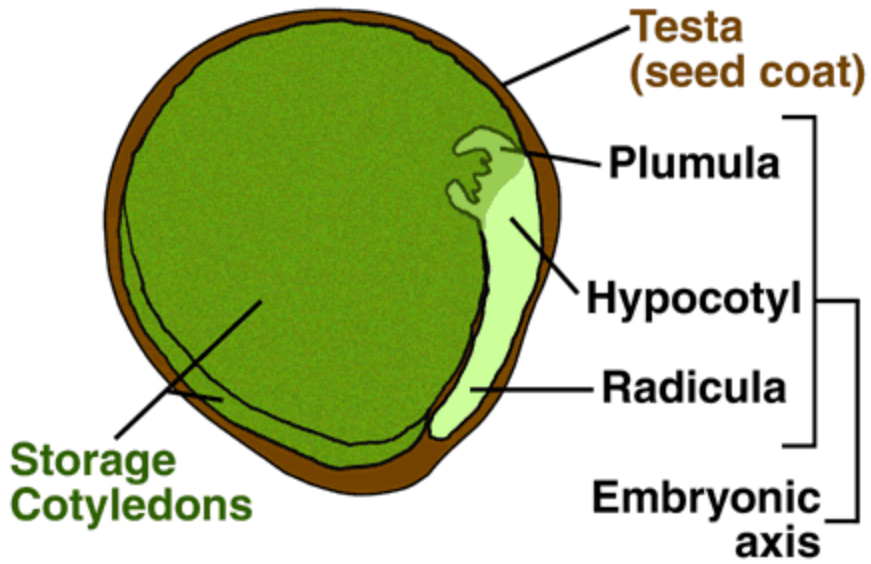
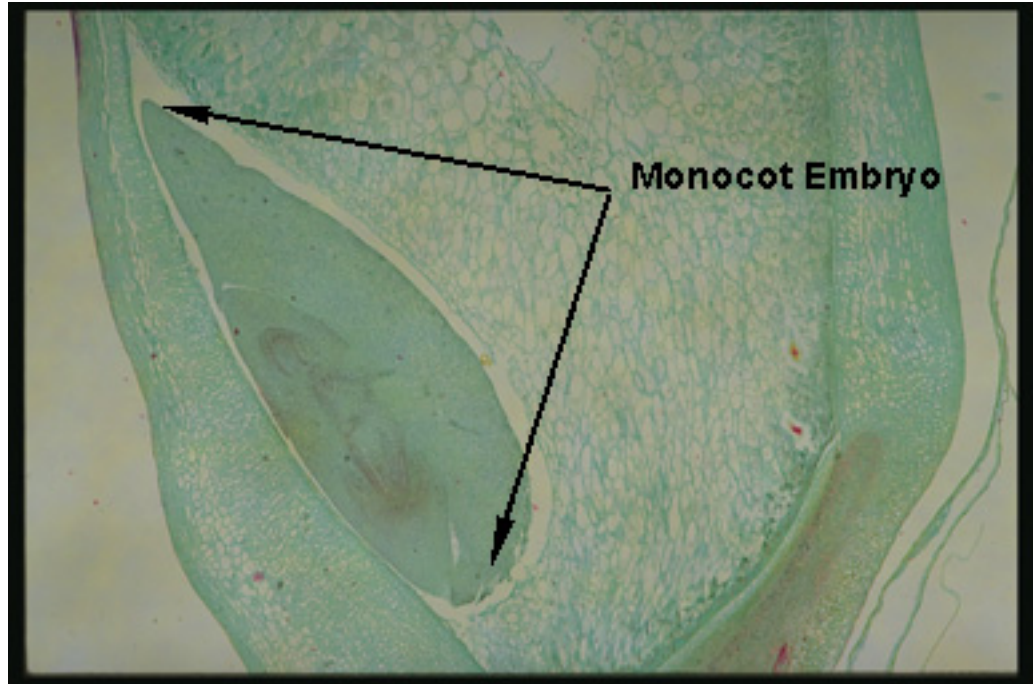


- ibridi di mais
- △ frumento

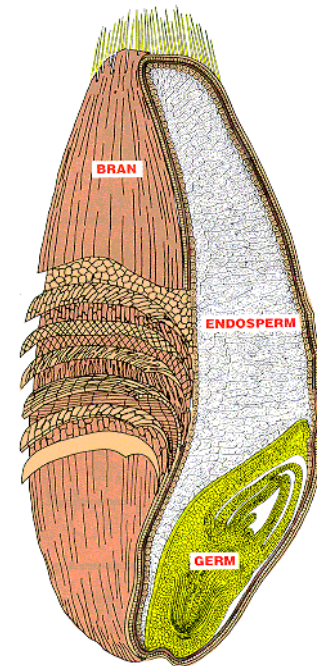
Seed development

Three antipodal cells





Pisum sativum



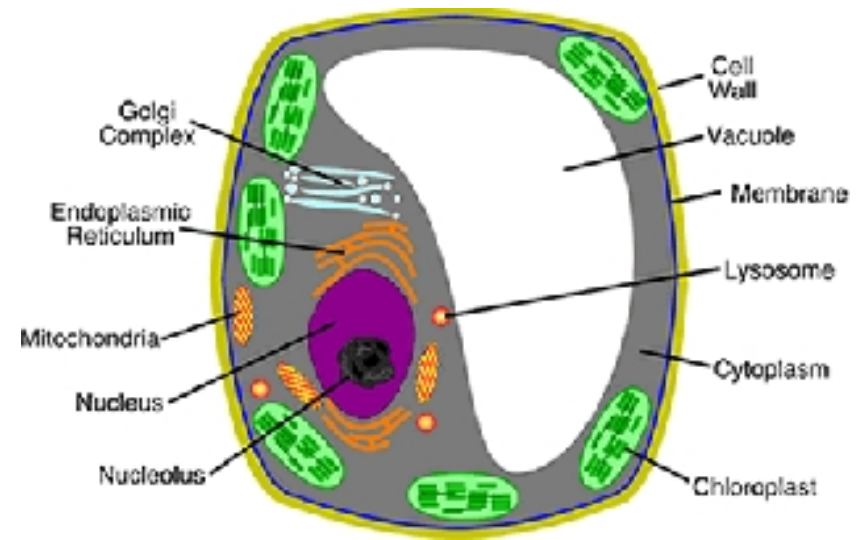
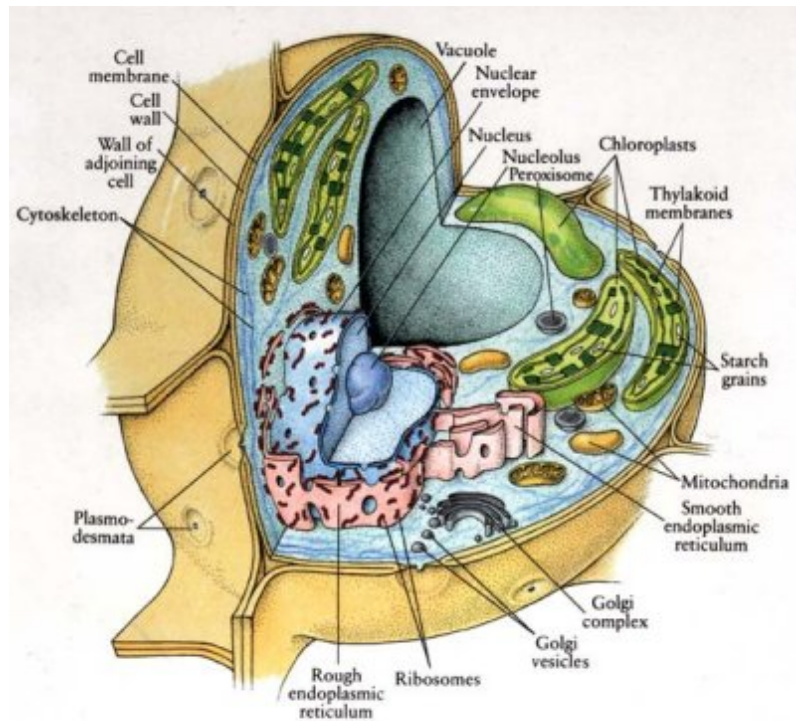
WORLD
Political Map



1260Km 0 1260 2520 3780 5040Km

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Struttura della cellula vegetale



Seed composition

		Wheat	Pea	Faba bean	Common vetch*	Bitter vetch*	Chickpea Desi*	Blue lupin	White lupin	Yellow lupin**	Soyabean seed
Components (% dry matter)	Proteins	12	24	29	28	26	22	34	38	42	39
	Starch	69	51	43	43	nd	41	0	0	0	0
	Fats	1.7	1.1	1.7	1.6	1.1	6.1	5.9	9.5	6.1	20
	Ash	1.8	3.5	4	4	3.3	3.2	3.8	3.9	3.8	5.9
	Crude fibres	2.5	6	9.3	4.5	4.1	10	16	13	18	5.9
Amino acids (% protein)	Lysine	2.9	7.3	6.5	5.7	6.4	6.8	5	4.9	5.3	6.2
	Methionine + cysteine	4	2.3	2	1.8	2.4	2	2.6	2.4	2.9	3.1
	Threonine	3.1	3.8	3.6	3.3	3.8	3.4	3.9	3.7	3.5	4
	Tryptophane	1.2	0.9	0.8	nd	nd	0.8	0.7	0.7	0.8	1.3

Cereals have low Lys, legumes have low Met

Table 4.5

Essential amino acids in selected foods*

Food	Isoleucine	Leucine	Lysine	Methionine	Phenylalanine	Threonine	Tryptophan	Valine	Protein Score
Hen's egg	393	551	436	210	358	320	93	428	100
Beef	301	507	556	169	275	287	70	313	80
Cow's milk	295	596	487	157	336	278	88	362	79
Chicken	334	460	497	157	250	248	64	318	72
Fish	299	480	569	179	245	286	70	382	70
Corn	230	783	167	120	305	225	44	303	49
Wheat	204	417	179	94	282	183	68	276	62
Rice	238	514	237	145	322	244	78	344	69
Beans	262	476	450	66	326	248	63	287	44
Soybeans	284	486	399	79	309	241	80	300	67
Potatoes	236	377	299	81	251	235	103	292	34

Source: Food and Agriculture Organization (1970), Nutritional Study No. 24 (Rome: FAO).

*Amounts are expressed as milligrams of amino acid per gram of protein nitrogen. Egg is considered to have a perfect protein, and others are rated in comparison with it to give a protein score.

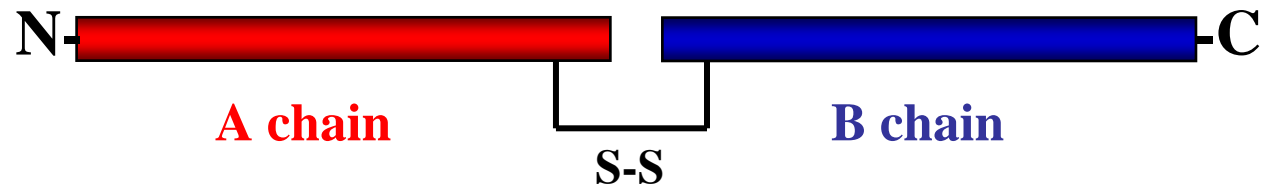
Classes of seed storage proteins

<i>class</i>	<i>plants</i>	<i>food plants</i>
7S and 11S globulins	Probably all seed plants and pteridophytes (ferns)	Major proteins in legumes
2S albumins	Probably all seed plants and pteridophytes (ferns)	Major proteins in oilseed
prolamins	Cereals	Cereals

Molte proteine di riserva sono allergeniche

Protein classification	Allergen source/allergen
Inhibitors of proteases and α -amylases	Soybean: Kunitz trypsin inhibitor family; cereals: trypsin/ α -amylase inhibitors; barley: Hor v 1/BMAI-1, CMb, BDP; wheat: CM16; rye: Sec c 1,* RDAI-1, RDAI-3; rice: RAP
Peroxidases	Wheat, barley
Profilins	Peanut: Ara h 5; soybean: Gly m 3; celery: Api g 4; pear: Pyr c 4; hazelnut, apple, carrot, lychee, tomato, pumpkin seeds
Seed storage proteins 2S albumins	Yellow mustard: Sin a 1; oriental mustard: Bra j 1; oilseed rape: BnIII; Brazil nut: Ber e 1; English walnut: Jug r 1
Vicilins	Peanut: Ara h 1; English walnut: Jug r 2
Conglutins	Peanut: Ara h 2, Ara h 6, Ara h 7
Glycinins	Peanut: Ara h 3, Ara h 4; soybean
Beta-conglycinins	Soybean
Thiol-proteases	Papaya: papain; fig: ficin; pineapple: bromelain; kiwi: actinidin/Act c 1; soybean: Gly m 1*
Lectins	Peanut: agglutinin

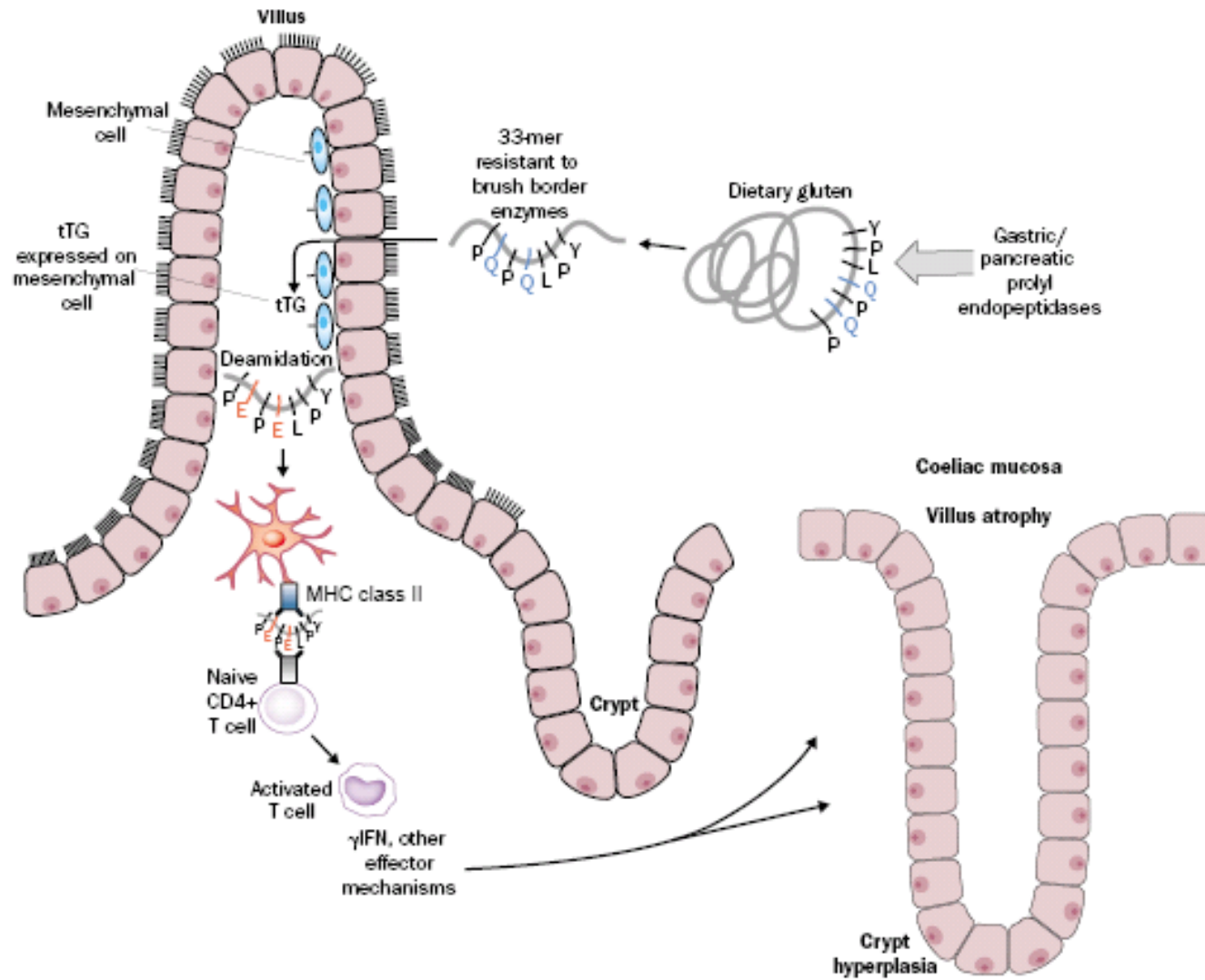
Alcune proteine dei semi sono fra le sostanze più tossiche conosciute



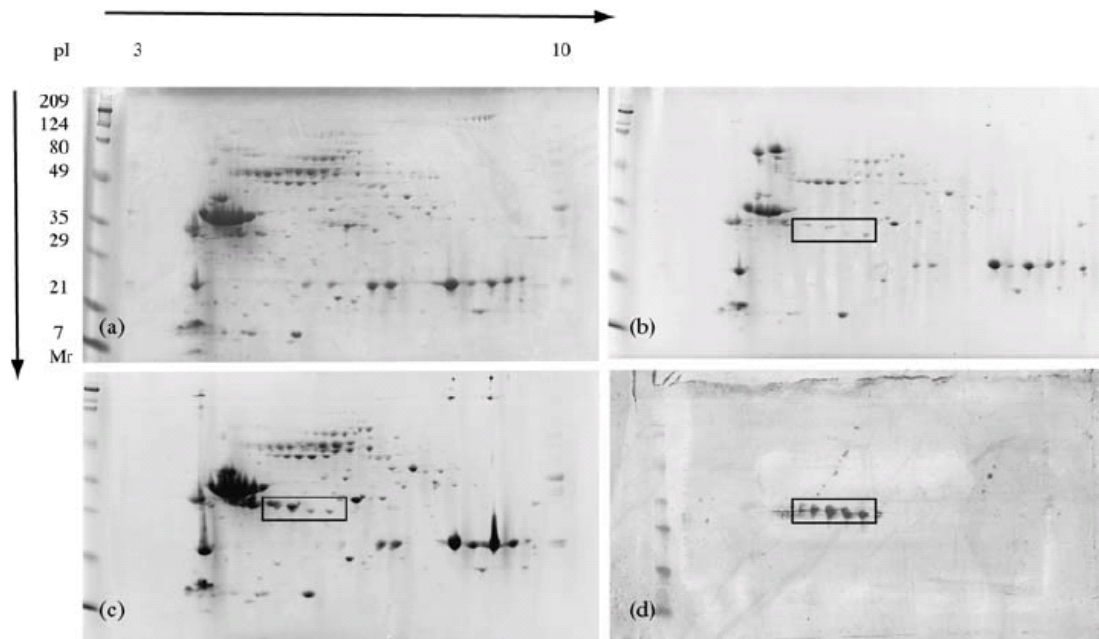
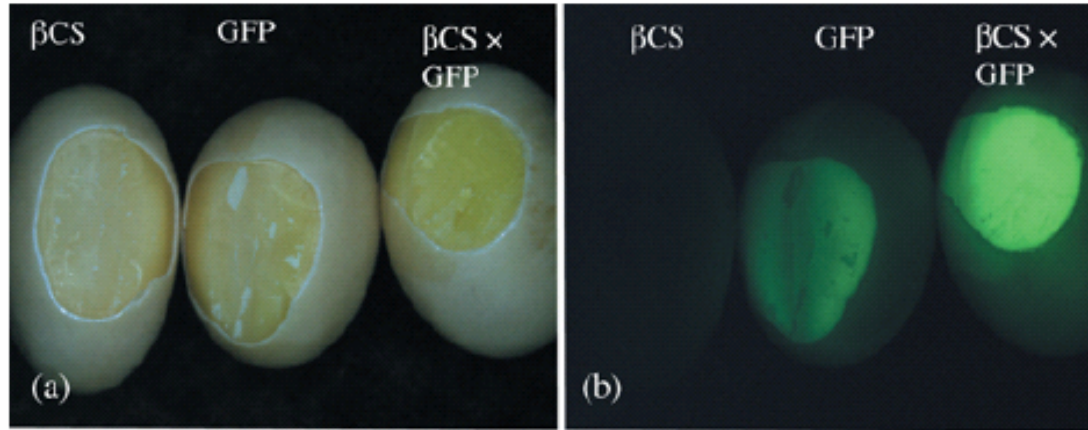
$LD_{50} = 3 \mu\text{g}/\text{kg}$



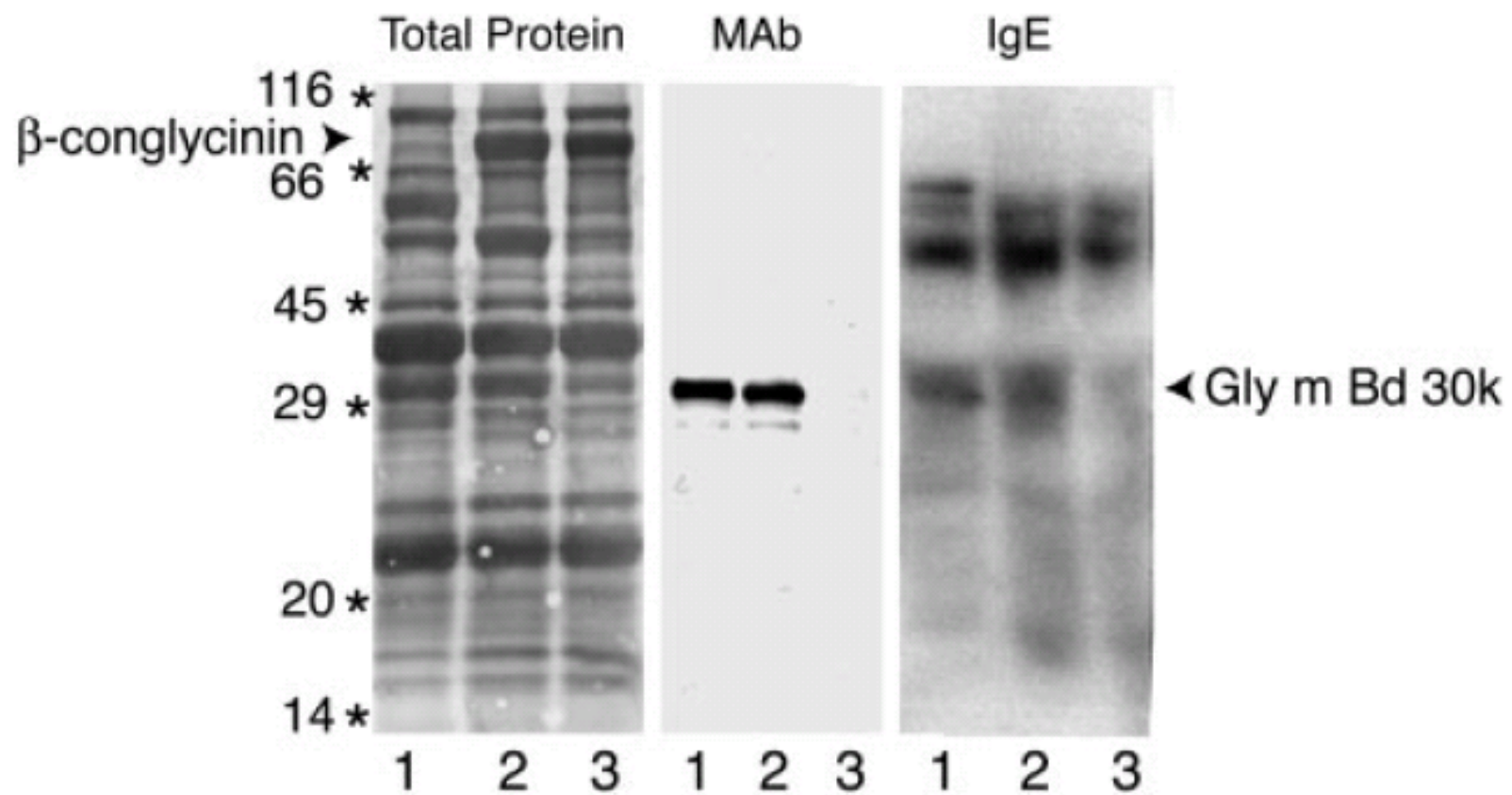
Celiachia

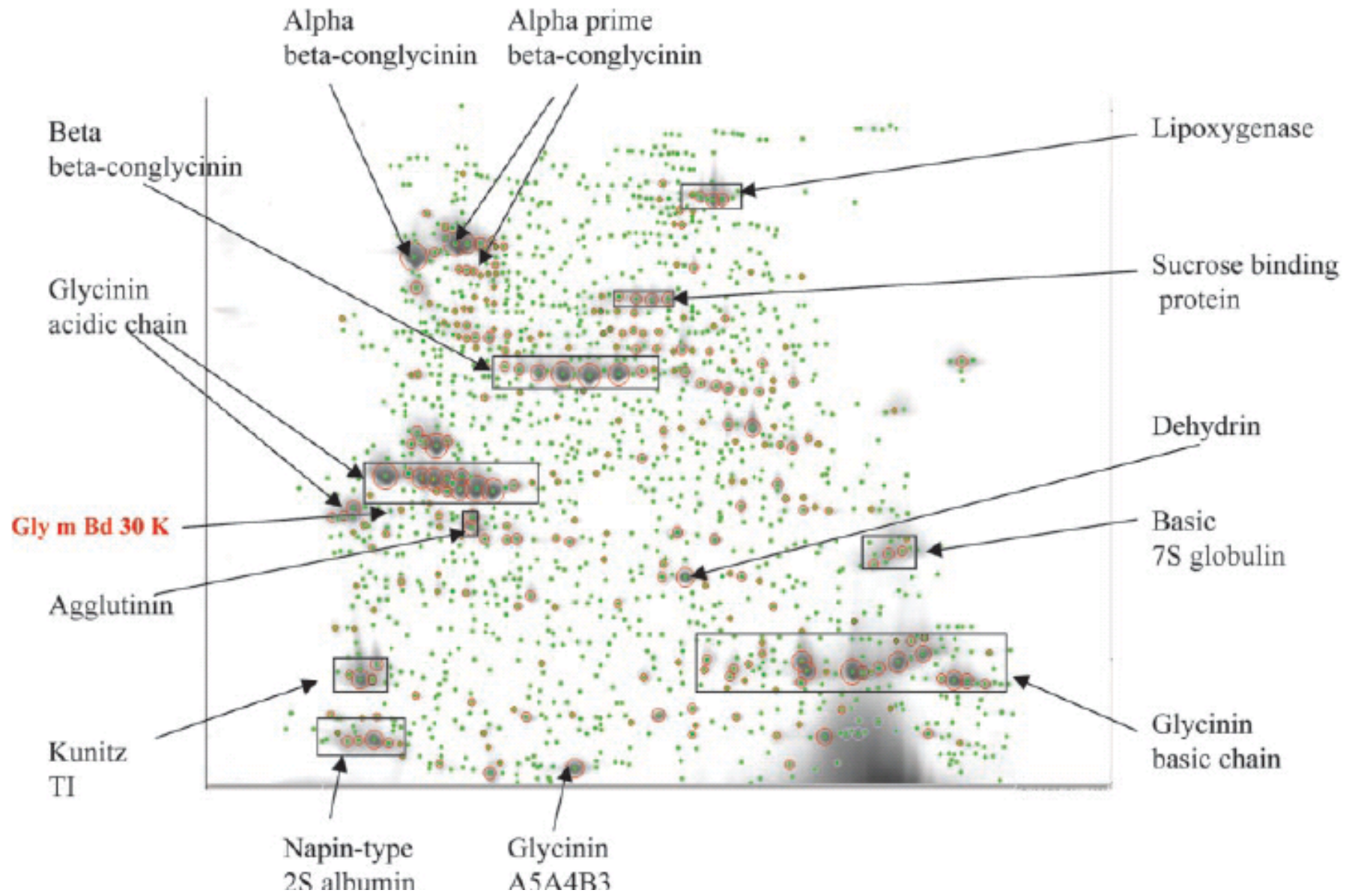


Le proteine endogene possono essere sostituite con proteine esogene

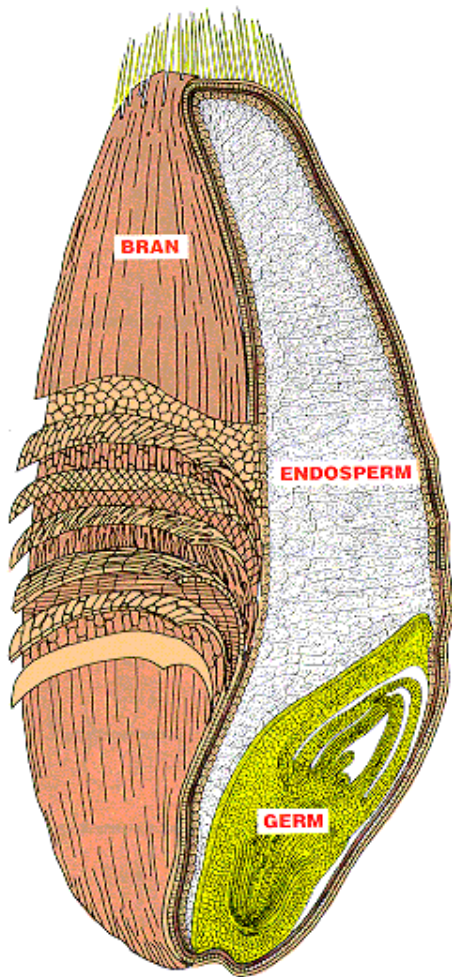


Il principale allergene della soia può essere selettivamente eliminato





Composizione della cariosside di frumento



- Carboidrati (70 - 80 %)
- Lipidi (1.5 - 2.5 %)
- Proteine (8 - 18 %)

Il frumento è unico fra i cereali



Il glutine è essenziale per la formazione di un impasto visco-elastico



Ritenzione dei gas prodotti durante la fermentazione

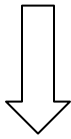


Trattenimento dell'amido durante la cottura

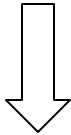
Proteine del glutine

Prolamine

Gliadine



Monomeriche



α , γ and ω

Glutenine



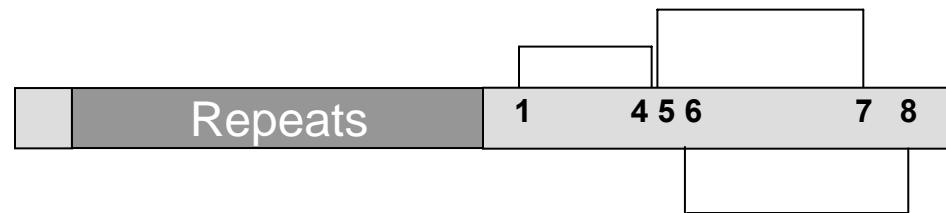
Polimeriche



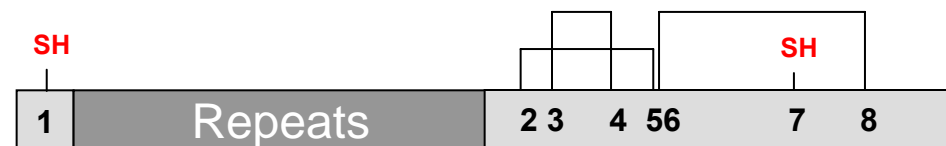
- **Subunità ad alto peso molecolare (HMW-GS)**
- **Subunità a basso peso molecolare (LMW-GS)**

Le subunità gluteniniche sono caratterizzate dalla presenza di residui di cisteina che possono formare ponti disolfuro intercatena

α -gliadina



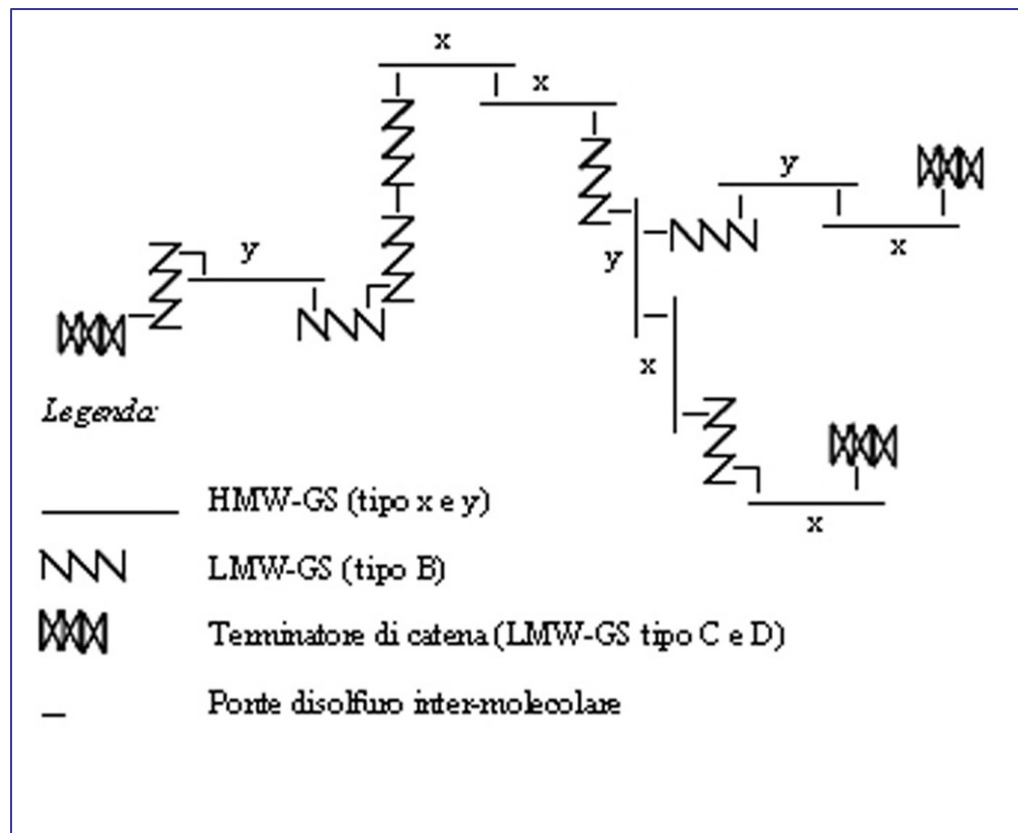
Subunità a basso P.M.



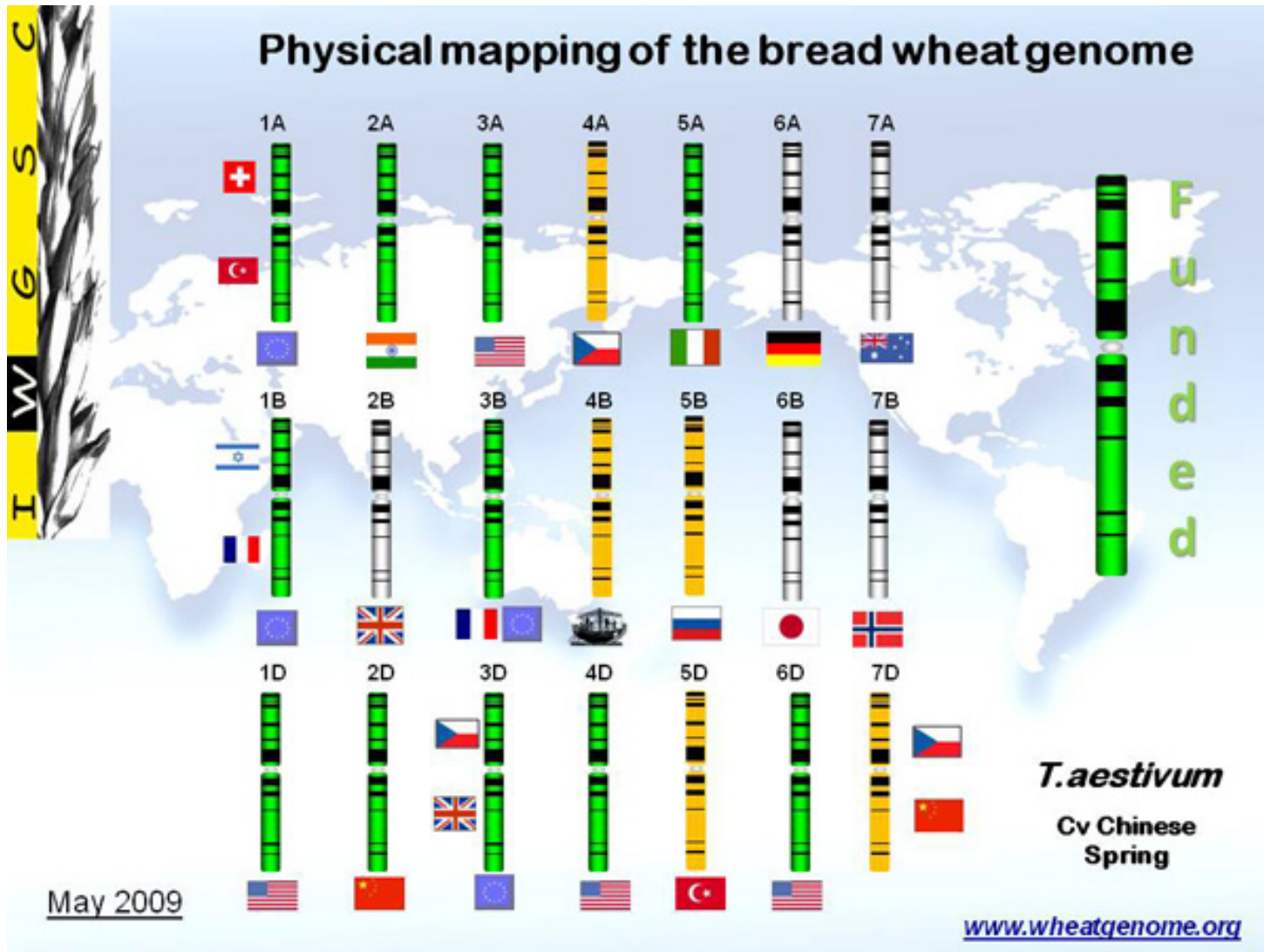
Subunità ad alto P.M.

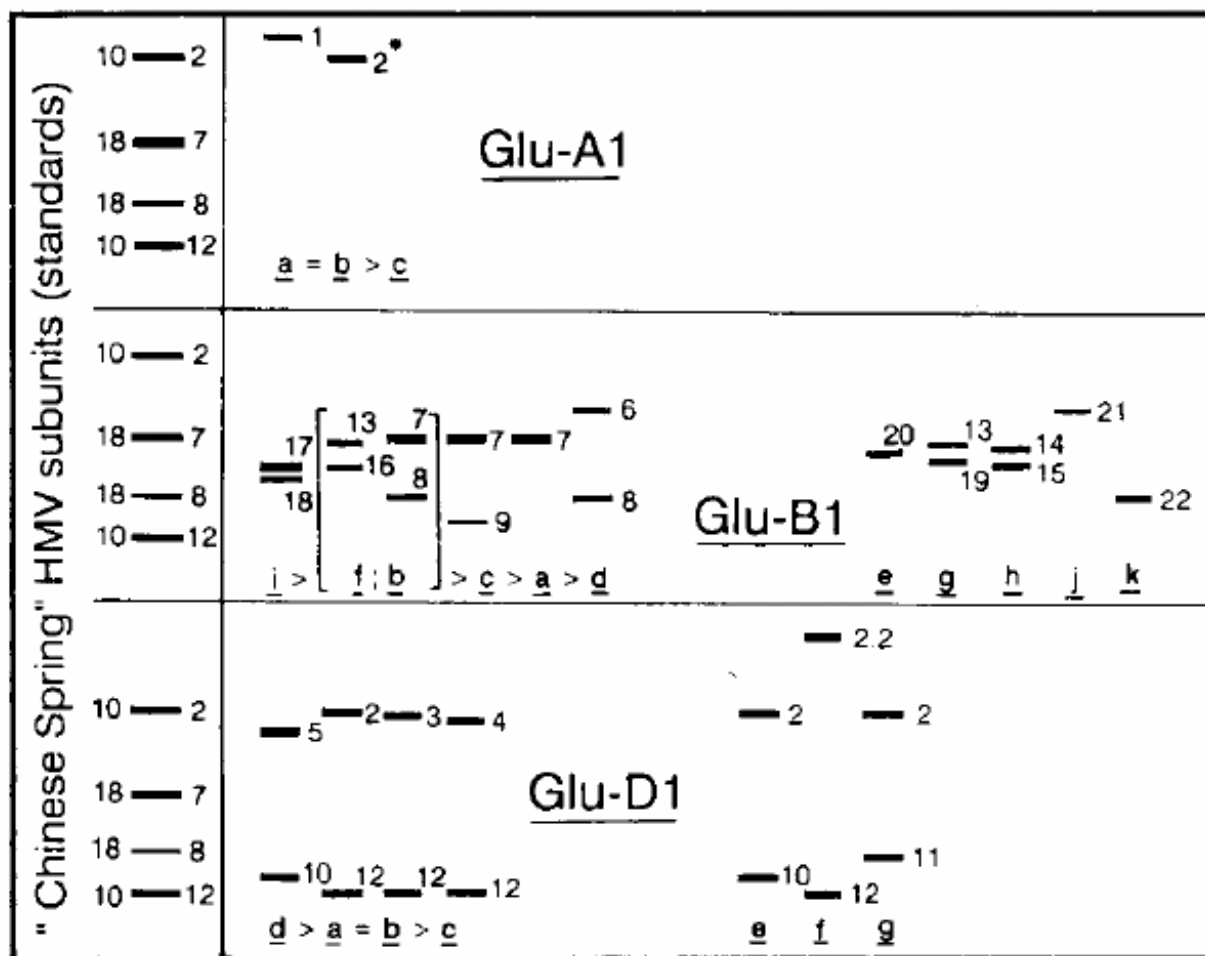


Ipotetica struttura di un polimero gluteninico



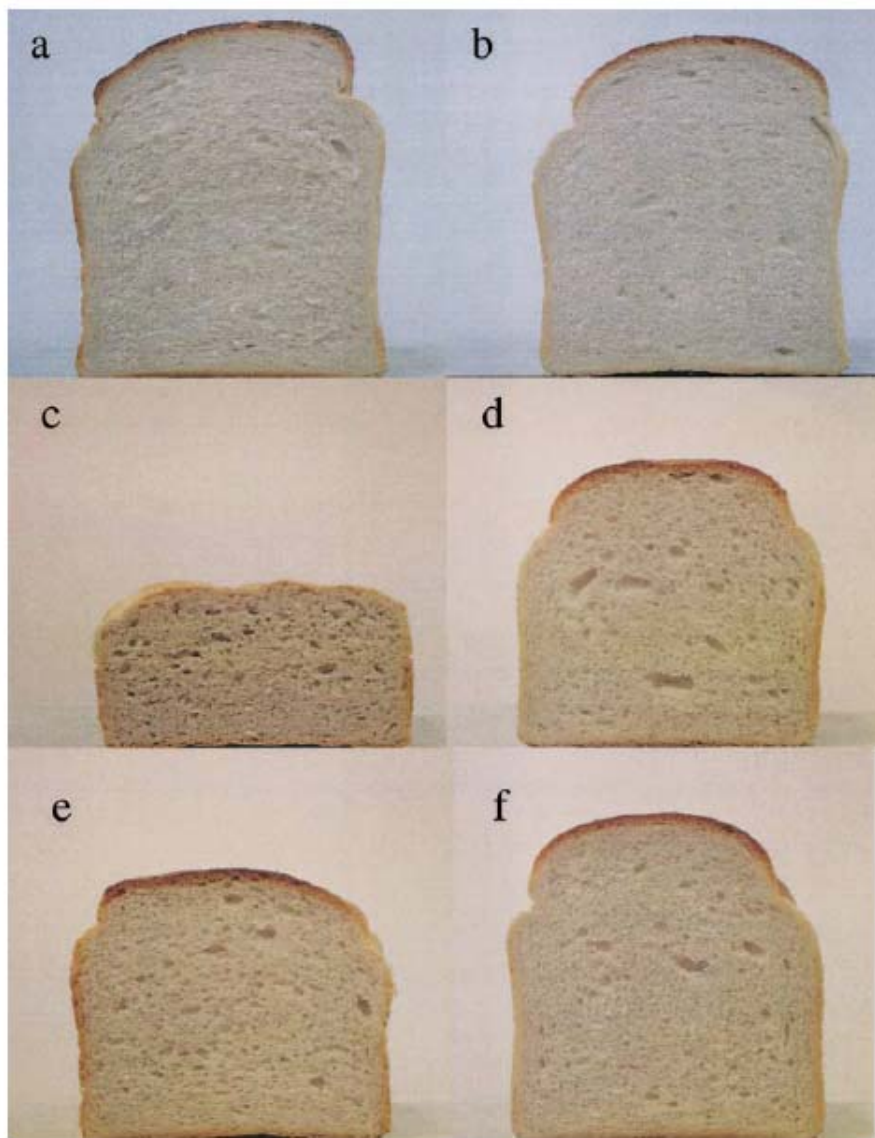
The wheat genome sequencing project





Quality

← not tested →

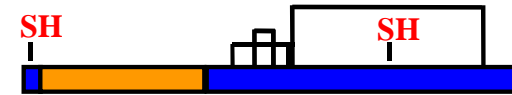


Wild-type

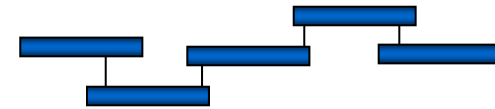
Transgenic

Il nostro obiettivo

Struttura molecolare delle subunità gluteniniche
Modificazioni co- e post-traduzionali
Ambiente cellulare



Struttura dei polimeri gluteninici



Proprietà tecnologiche delle farine



Sistema sperimentale

Nicotiana tabacum SR1

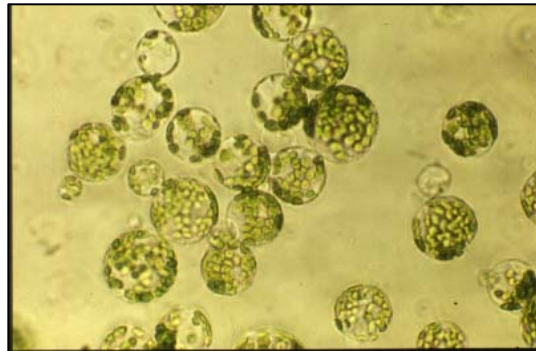


Espressione transiente in protoplasti di tabacco

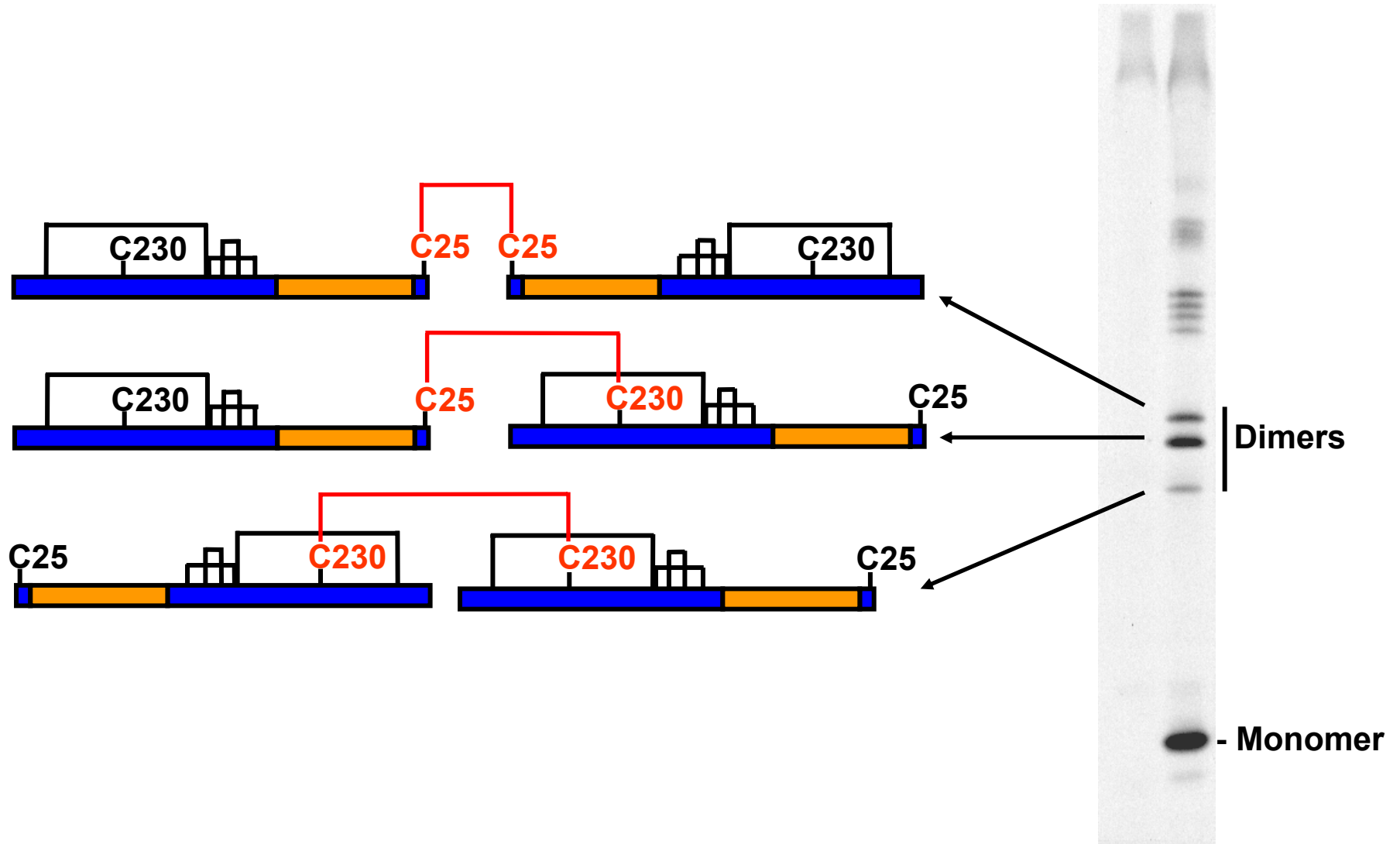
Facilmente trasfettabili

Co-espressione di differenti subunità

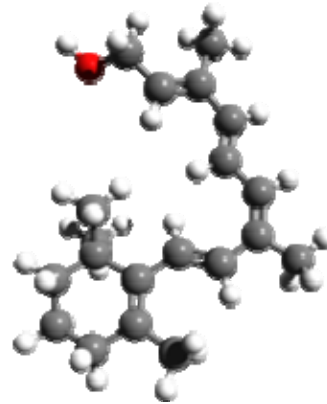
Modulazione del livello di espressione



La polimerizzazione è mediata dalla formazione di tutti i possibili ponti disolfuro intercatena



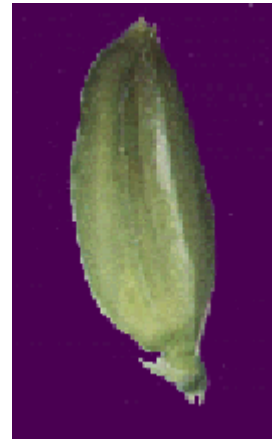
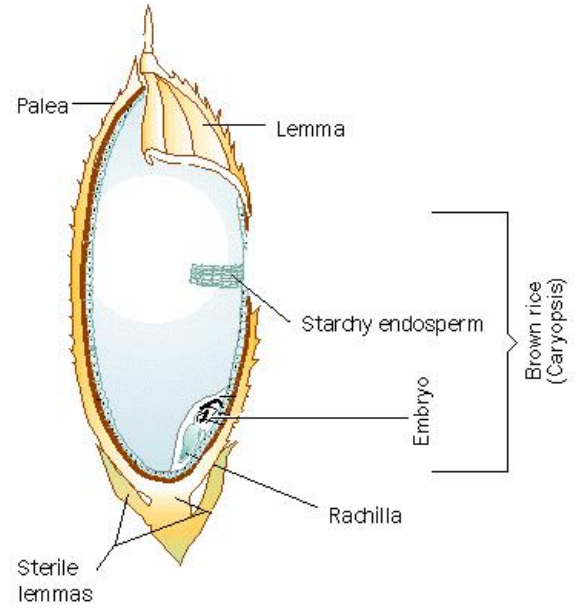
Vitamina A



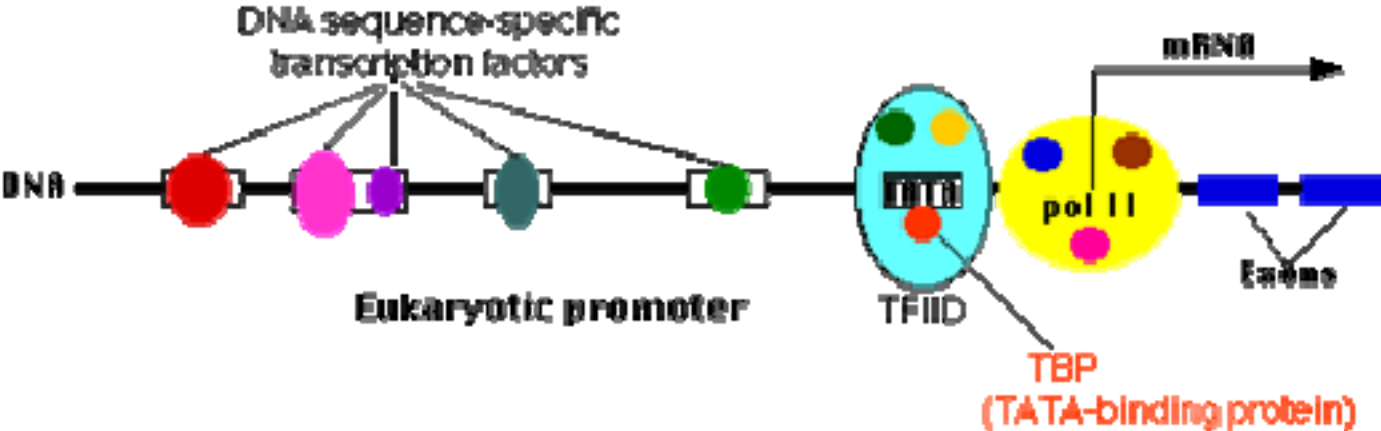
According to the World Health Organization, dietary vitamin A deficiency (VAD) causes some 250,000 to 500,000 children to go blind each year. Blindness and corneal afflictions are but indicators of more severe underlying health problems: more than half the children who lose their sight die within a year of becoming blind.

Diversi ortaggi sono una buona fonte di beta-carotene





L'espressione dei geni è regolata in maniera tessuto-specifica





The **HORROR**
of Genetically
Engineered Food

IT Came from the Grocery Store

You Can't Avoid
It Because It's
NOT LABELED!

GREENPEACE

From the **LABS** of Monsanto to **YOUR TABLE!**
A **NEW LIFE FORM** Released into the World!

