I biostimolanti contro gli stress delle colture orticole

MACFRUT 2018

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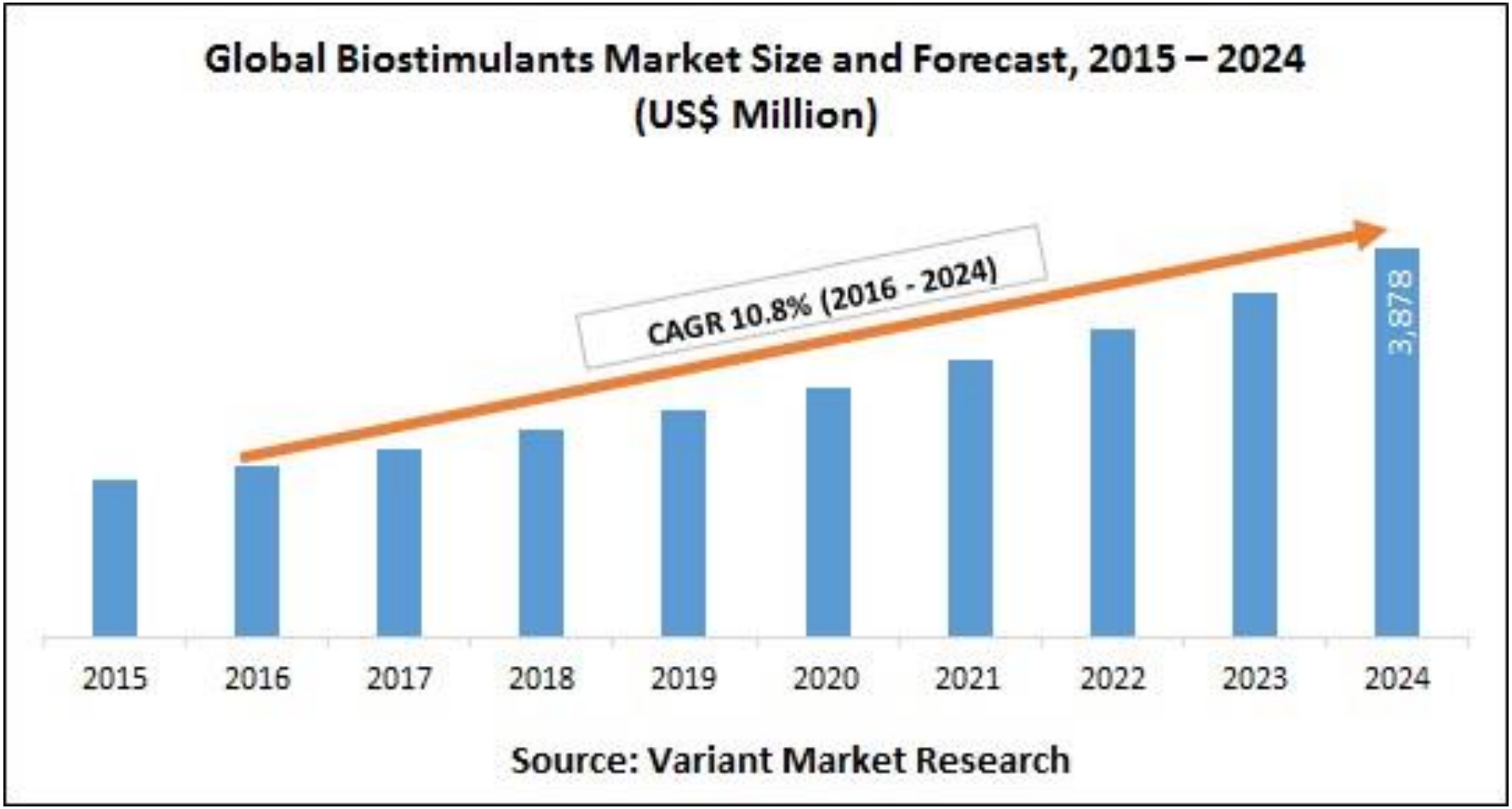
Sommario

- Prospettiva di crescita
- Normativa e definizione
  - Nazionale
  - Europea
- Classificazione
- Meccanismi ed esempi di incremento di tolleranza agli stress abiotici
- Modalità applicative
- Ricerca & Sviluppo

Prospettiva di crescita del settore fino al 2024



A livello nazionale…

Decreto Legislativo 29 aprile 2010 n. 75.

Riordino e revisione della disciplina in materia di fertilizzanti, a norma dell'articolo 13 della legge 7 luglio 2009, n. 88.

Pubblicato nel Supplemento Ordinario alla Gazzetta Ufficiale 26 maggio 2010 n. 121.

- Art. 2, cc) **'Prodotto ad azione specifica'**:

Prodotti che apportano ad un altro fertilizzante o al suolo o alla pianta, sostanze che favoriscono o regolano l'**assorbimento degli elementi nutritivi** o **correggono determinate anomalie di tipo fisiologic**o

- **Allegato 6, 4.1-** L'attività biostimolante **non deve derivare dall'addizione di sostanze ad azione fitormonale** al prodotto[...] NO **miscele** dei prodotti di questa sezione con altri **fertilizzanti**

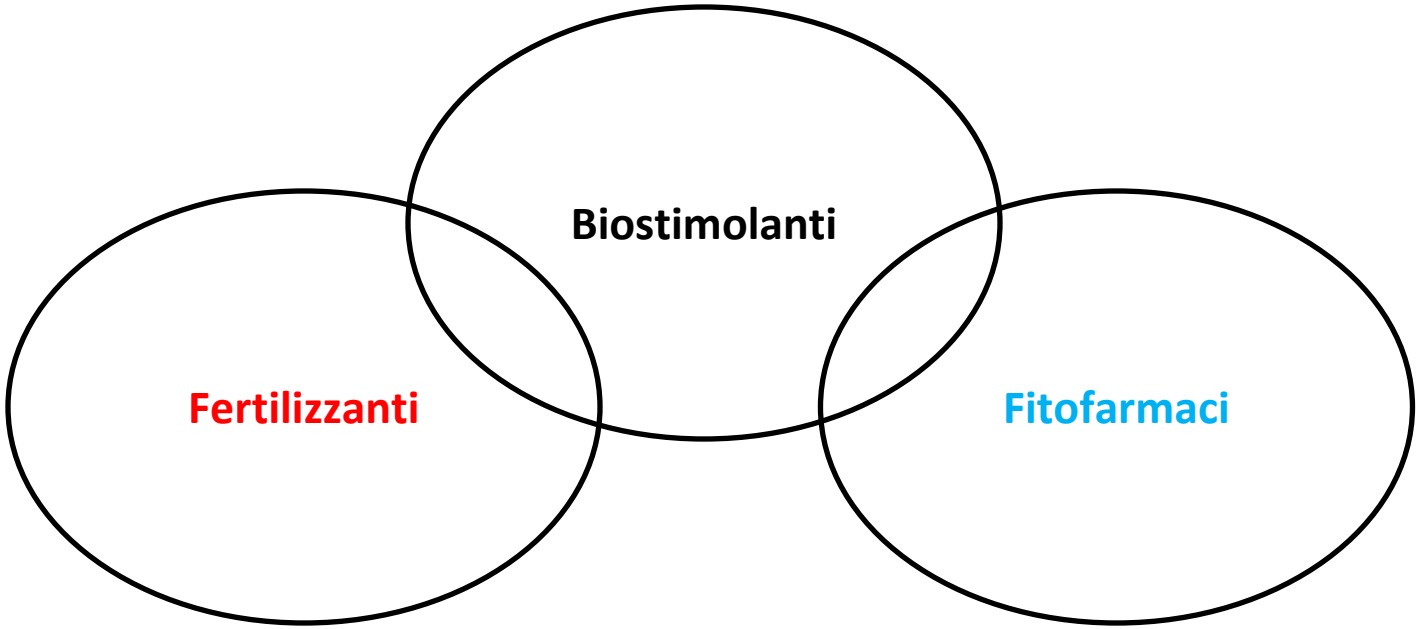
…A livello europeo

European Commission
ENTERPRISE AND INDUSTRY

EBIC
European Biostimulants Industry Council

- **Proposta** di REGOLAMENTO EUROPEO **17/03/2016 n° 157** per prodotti **fertilizzanti** CE.
  - ***«Un biostimolante contiene sostanze o microrganismi che, una volta applicati alle piante, sono in grado di incrementare l'efficienza di assorbimento e di uso di nutrienti all'interno della pianta, la tolleranza a stress abiotici e i caratteri qualitativi del prodotto, a prescindere dal contenuto di nutrienti»***
- Congresso mondiale biostimolanti e regolazione mercato

Perché utilizzare i biostimolanti?



- Contibuiscono ad una **orticoltura sostenibile**
- **Prebiotici e Probiotici**

Categorie di biostimolanti

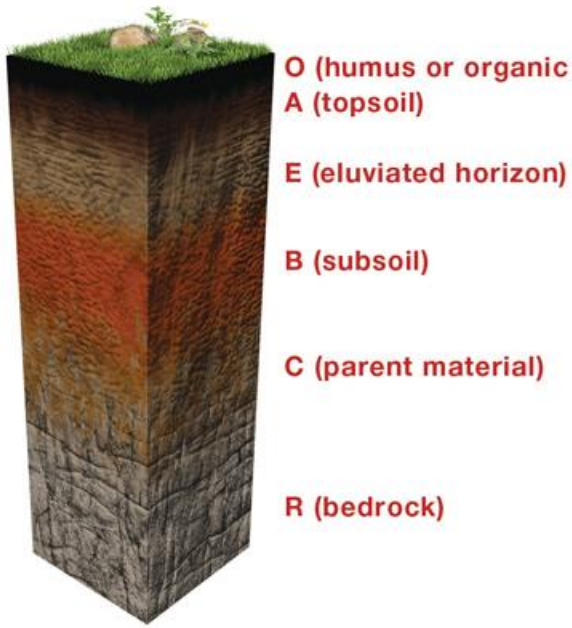
- Sostanze Umiche

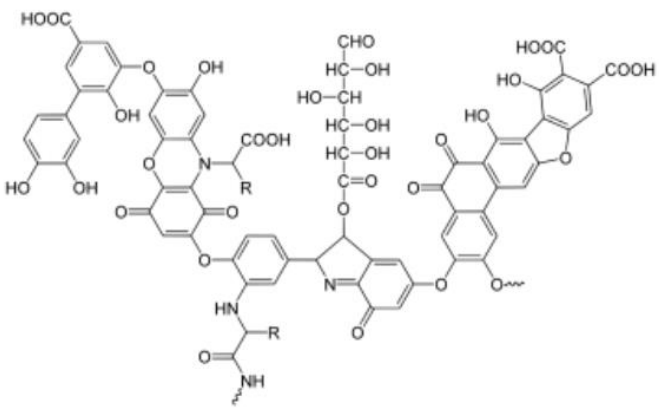
- Idrolizzati proteici

- Estratti di alghe/ composti di derivazione vegetale

- Microrganismi (micorrize arbuscolari)

Sostanze umiche: definizione e classificazione





Humic substances (pigmented polymers)

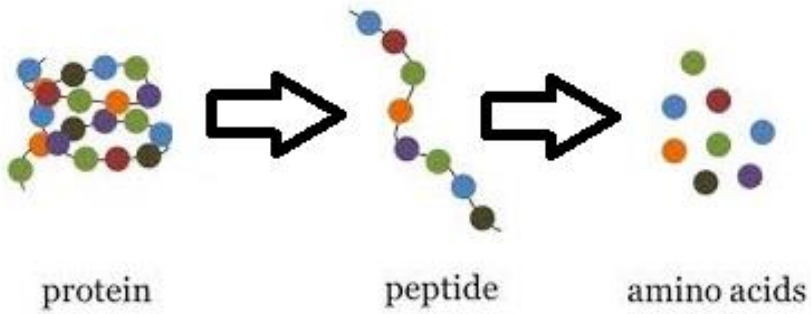
Fulvic acids		Humic acids		Humins
Light yellow	Yellow brown	Dark brawn	Grey black	Black

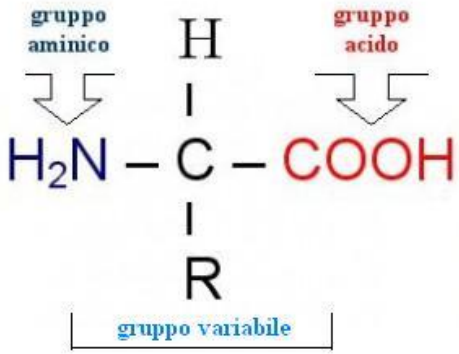
	increase of intensity of colour →	
	increase in degree of polymerization →	
2 000	increase of molecular weight →	300 000
45%	increase of carbon content →	62%
48%	decrease in oxygen content →	30%
1400	decrease in exchange acidity →	500
	decrease in degree of solubility →	

Sostanze umiche: metodi di produzione

- Depositi di materia organica naturalmente umificata
- Depositi minerali
- Compost o Vermicompost

Idrolizzati proteici: definizione e classificazione





Metodi di produzione e caratteristiche idrolizzati proteici

Materiali di partenza

Origine vegetale

Idrolisi enzimatica

pH neutro, temperature < 60 C

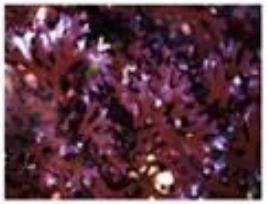
Peptidi , AA, poliammine

Origine animale

Parametro	Idrolizzato proteico da collagene per idrolisi chimica	Idrolizzato proteico da leguminose per idrolisi enzimatica
Contenuto d'azoto	++	+
Rapporto C:N	+	++
Amminoacidi liberi	++	+
Peptidi	+	++
Cloro e sodio	++	+
Amminoacidi caratteristici	Glicina, prolina	Acido aspartico, Acido glutammico e triptofano

Estratti da alghe ed - definizione generale e classificazione

Ulva sp.



Chondrus sp.

Ascophyllum nodosum

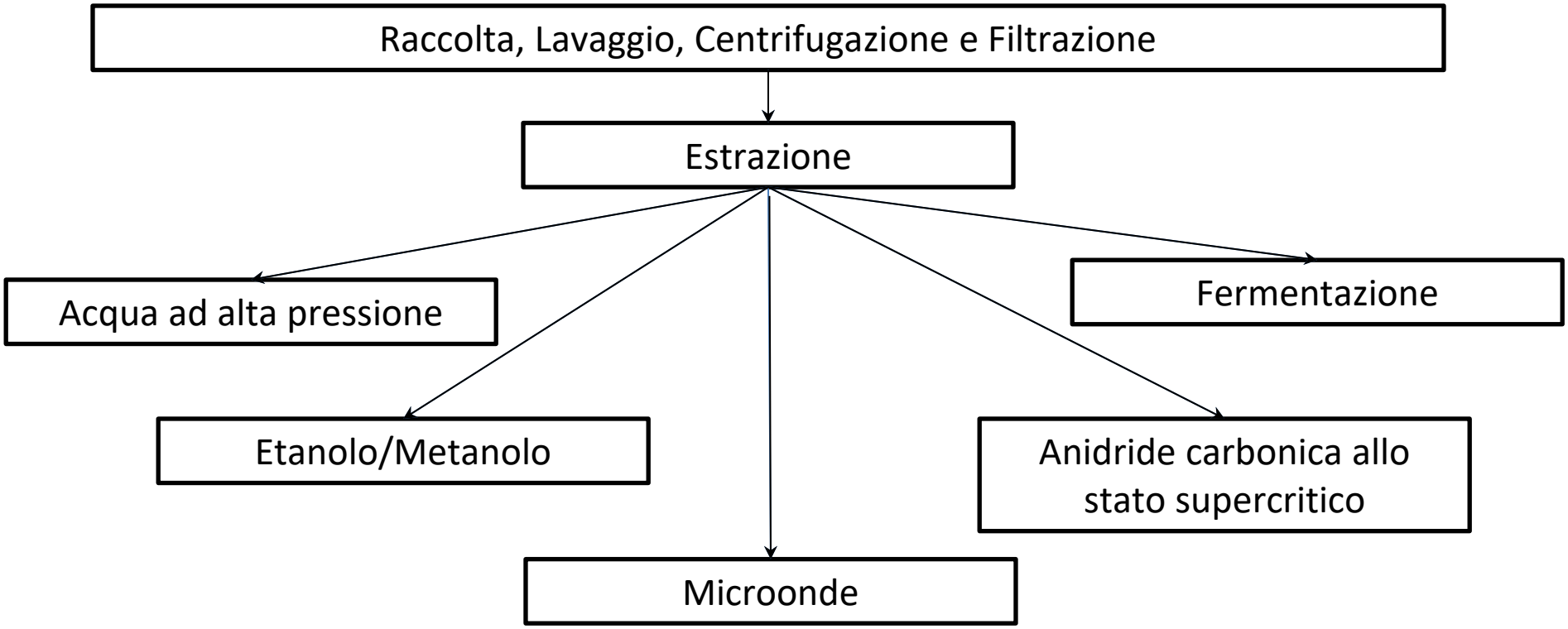
Palmarla sp.

Laminaria digitata

Ecklonia maxima

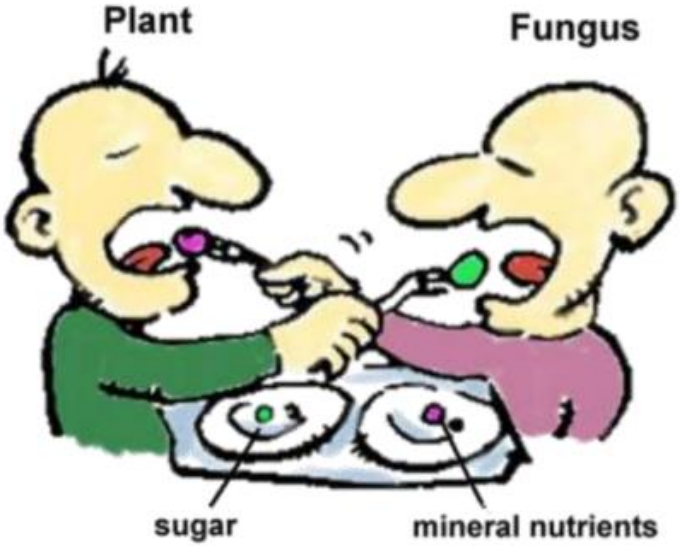
Fucus sp.

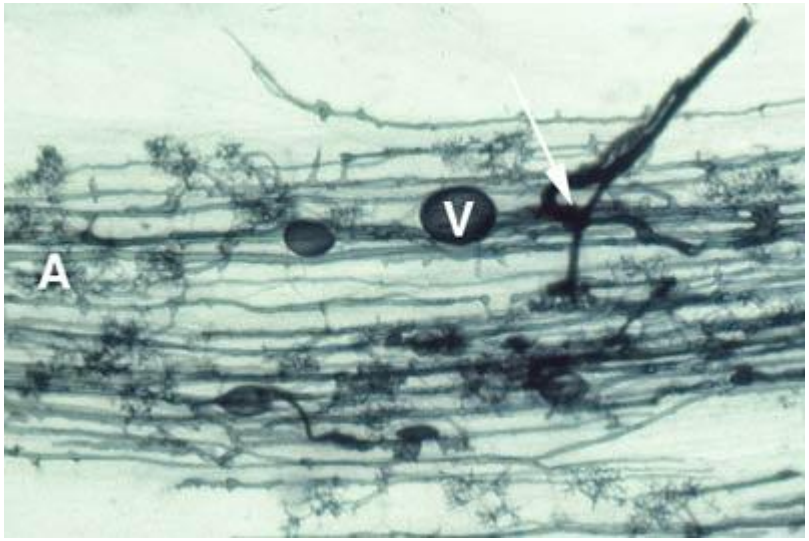
Estratti da alghe: metodi di produzione



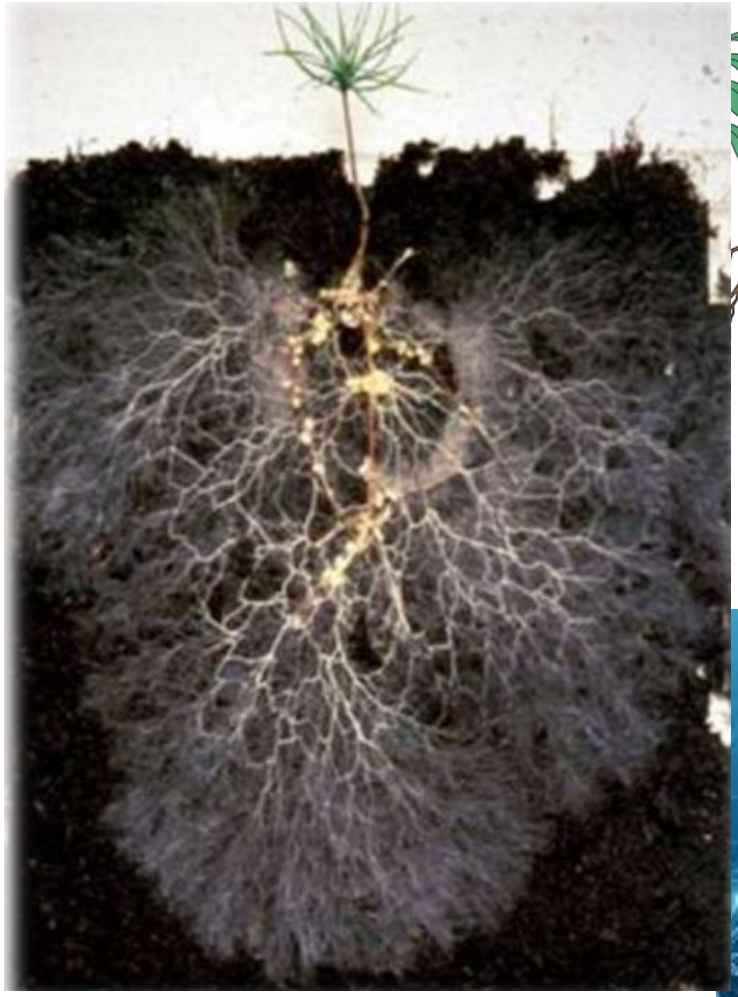
Polisaccaridi (laminarine, alginati…), analoghi dei fitormoni, vitamine

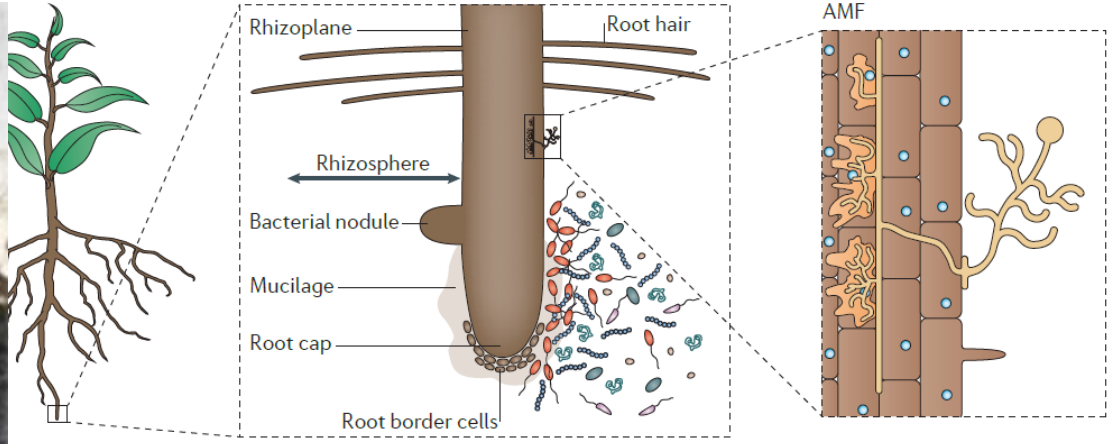
Microrganismi (micorrize arbuscolari)





Micorrize arbuscolari



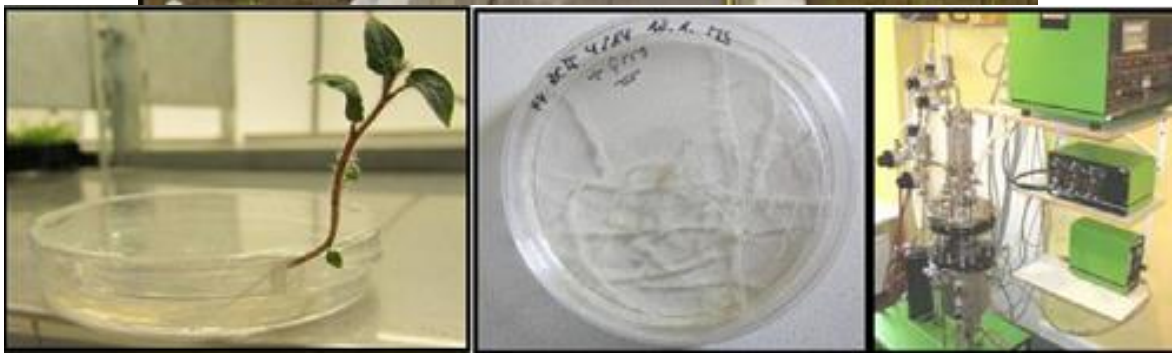


Produzione micorrize

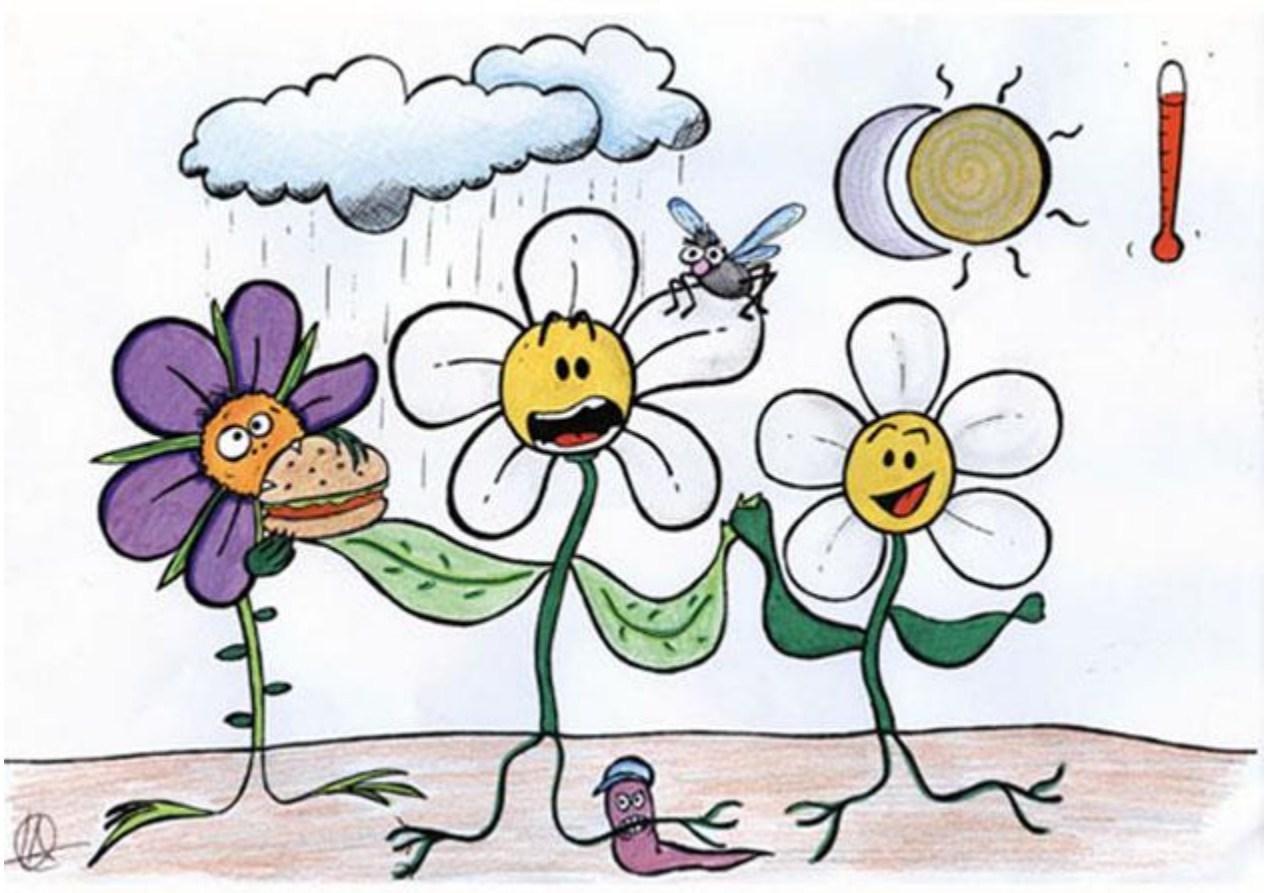
- Campo

- Serra

- Vitro



Stress



Condizioni esterne che influiscono negativamente sulla crescita, sviluppo o produttività della pianta.

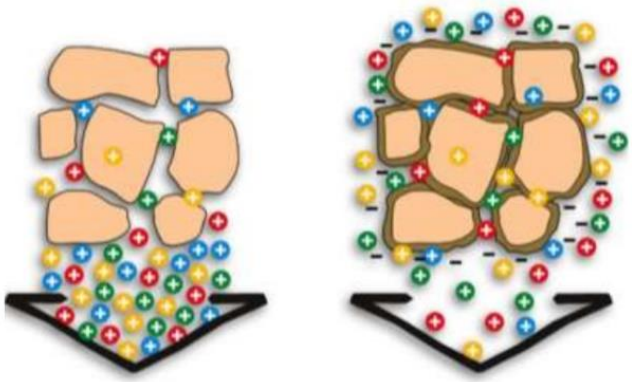
•Biotico - imposto da altri organismi

•**Abiotico – insorge da un eccesso o deficit nell'ambiente fisico o chimico**

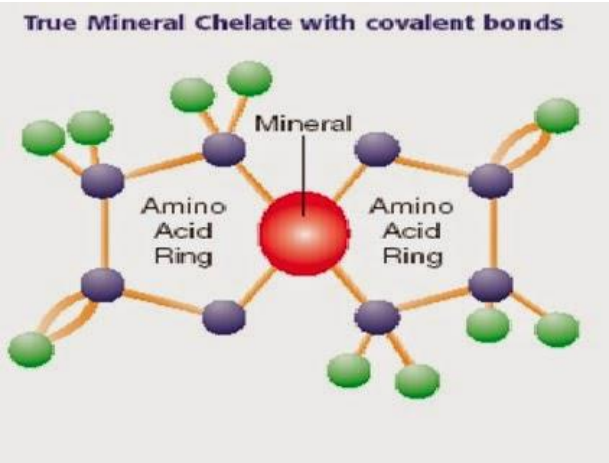
Principali meccanismi innescati dai BS per l'incremento della tolleranza a stress

- Disponibilità di nutrienti nel suolo
- Assorbimento ed assimilazione dei nutrienti
- Influenza sulle comunità microbiche
- Modulano l'attività ormonale ed il metabolismo
- Stimolano la produzione di composti bioattivi ed antiossidanti

Disponibilità di elementi nel suolo



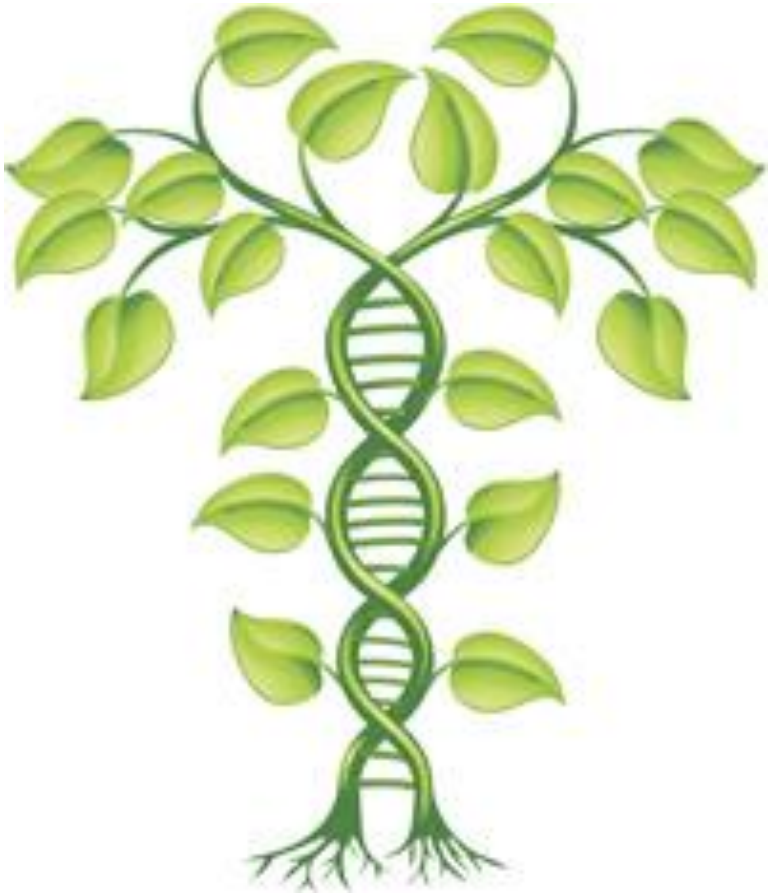
-Aumento CSC
-Effetto di solubilizzazione elementi nutritivi
-Effetto tampone pH
-Riducono l'azione di Na^+ e Cl^- e dei metalli pesanti

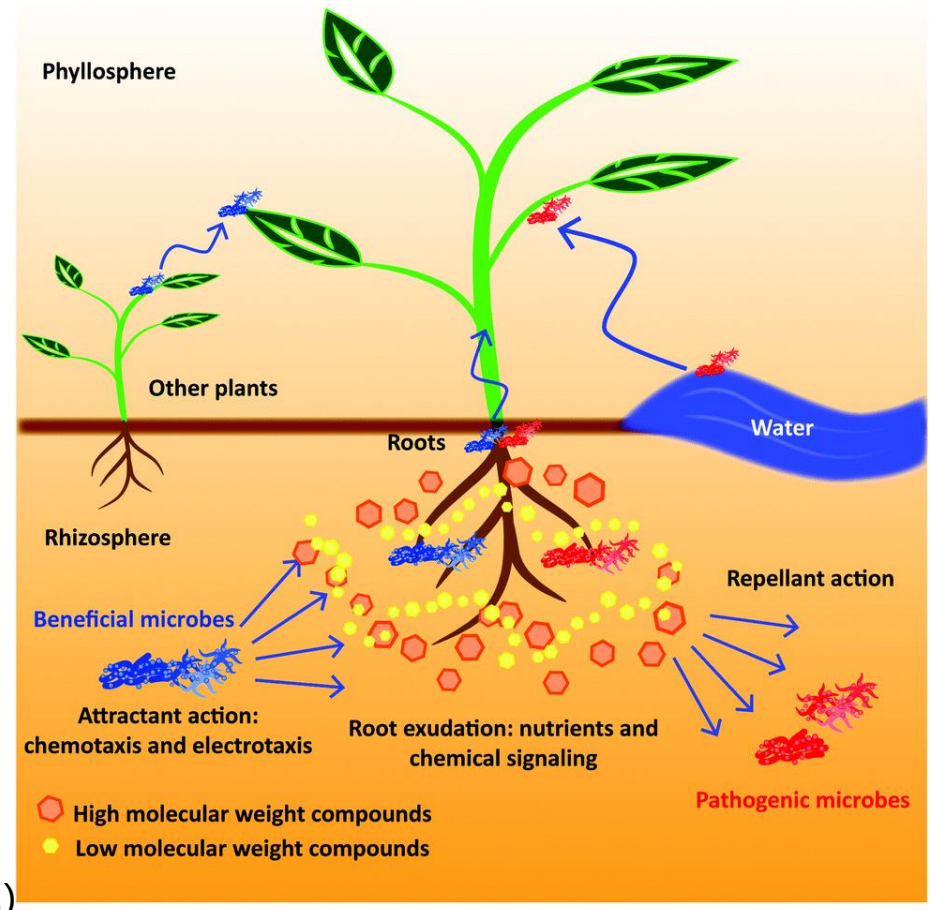


-Aumento disponibilità micronutrienti (Cu, Fe, Mn, Zn)

Du Jardin, 2015

Effetti sulla cenosi microbica





-**Micorrize** ed azione di colonizzazione nicchie ecologiche suolo & produzione di sostanze benefiche (**analoghi degli ormoni, glomalina**, etc.)
-**PH & SWE** per la promozione di microrganismi utili alle piante

Philippot et al., 2013

Incremento dell'assorbimento e dell'assimilazione dei nutrienti

Idrolizzati proteici

Effetto diretto **peptide RHPP**

Colla et al., 2014

Micorrize

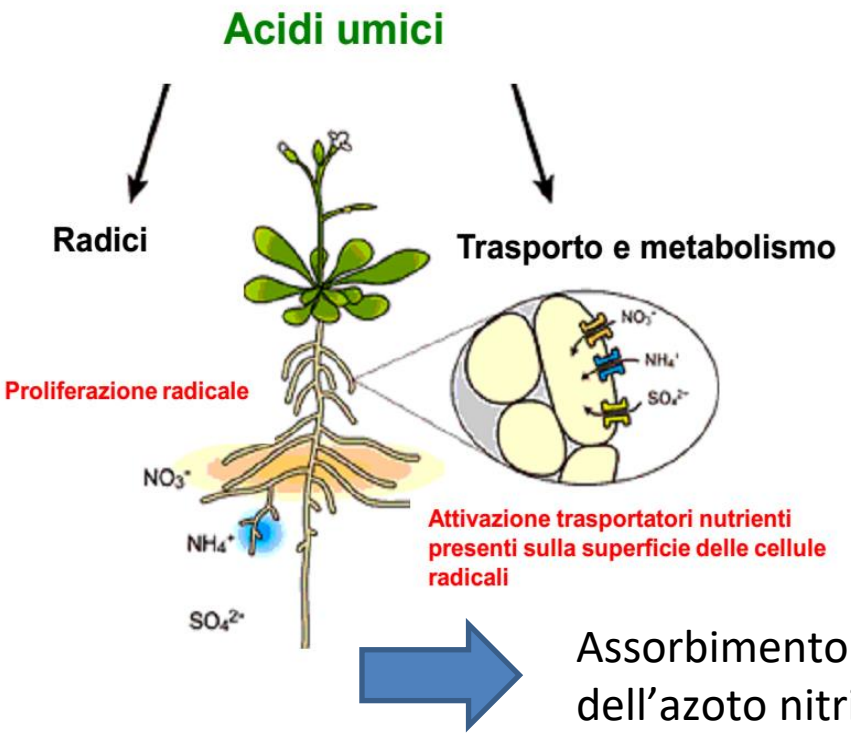
Estensione dell'apparato radicale

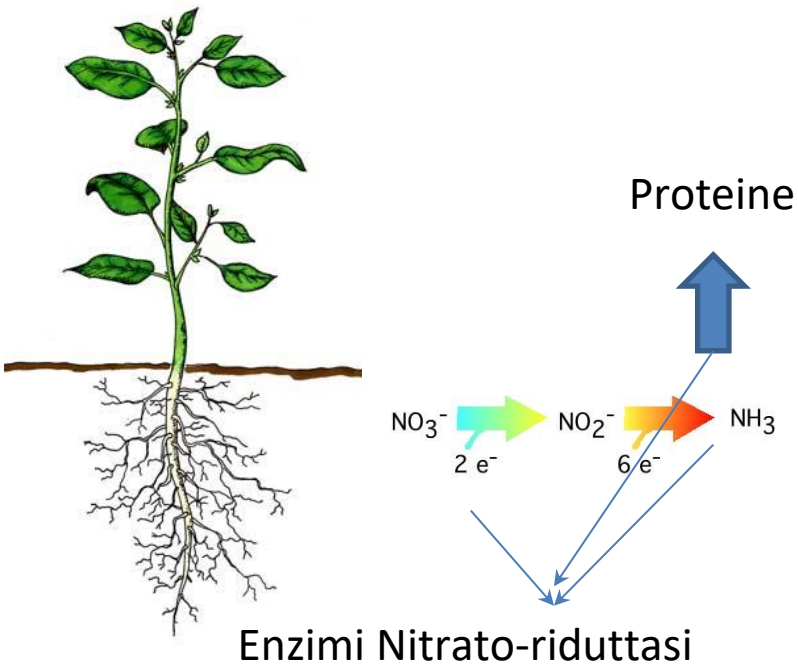
Liu et al., 2016

Incremento dell'assorbimento e dell'assimilazione dei nutrienti

- Attivazione dei trasportatori radicali
  (Nardi et al., 2016)

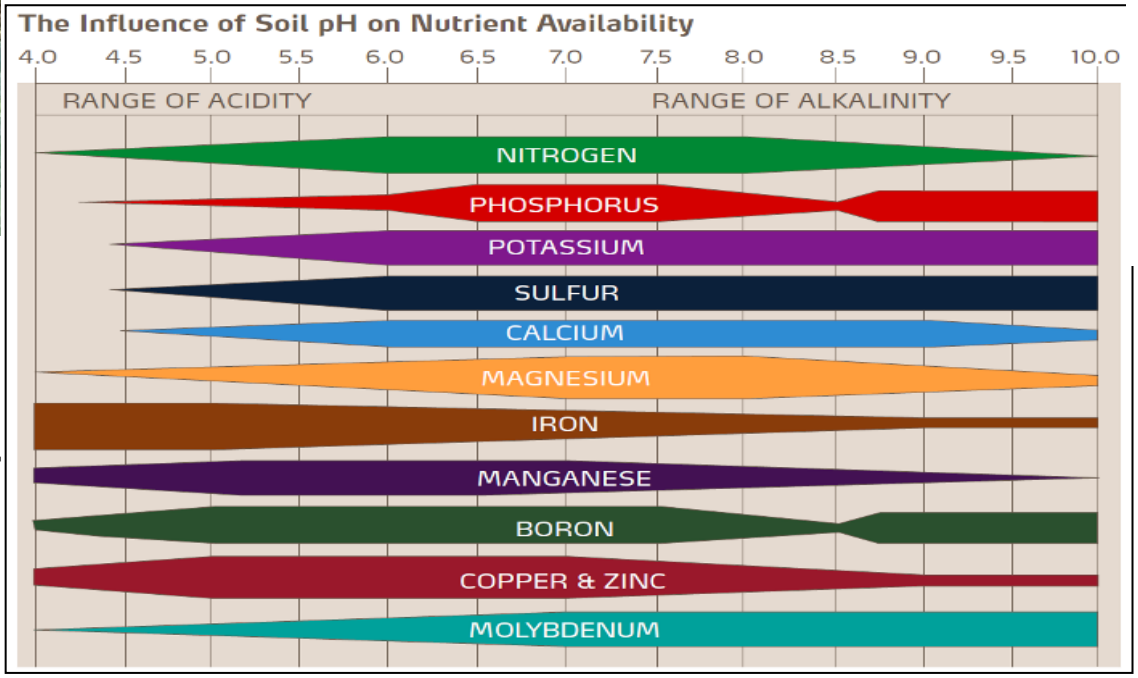
- Idrolizzati proteici ed estratti d'alga per attivazione del complesso enzimatico NR--> + amminoacidi & proteine
  (Ertani et al., 2014; Zhang et al., 2010)



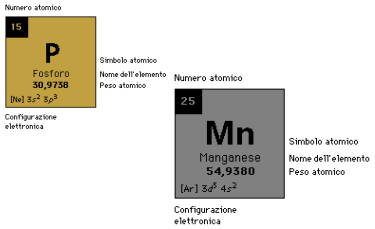


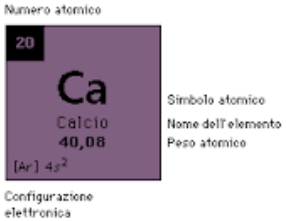
Assorbimento ed assimilazione dei nutrienti

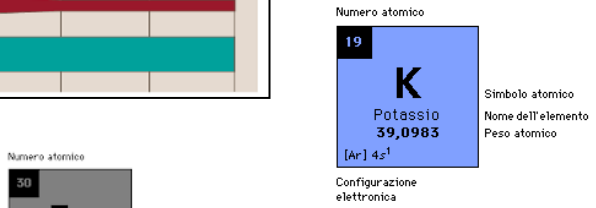
- Micorrize e pH basso



- Micorrize e pH alto

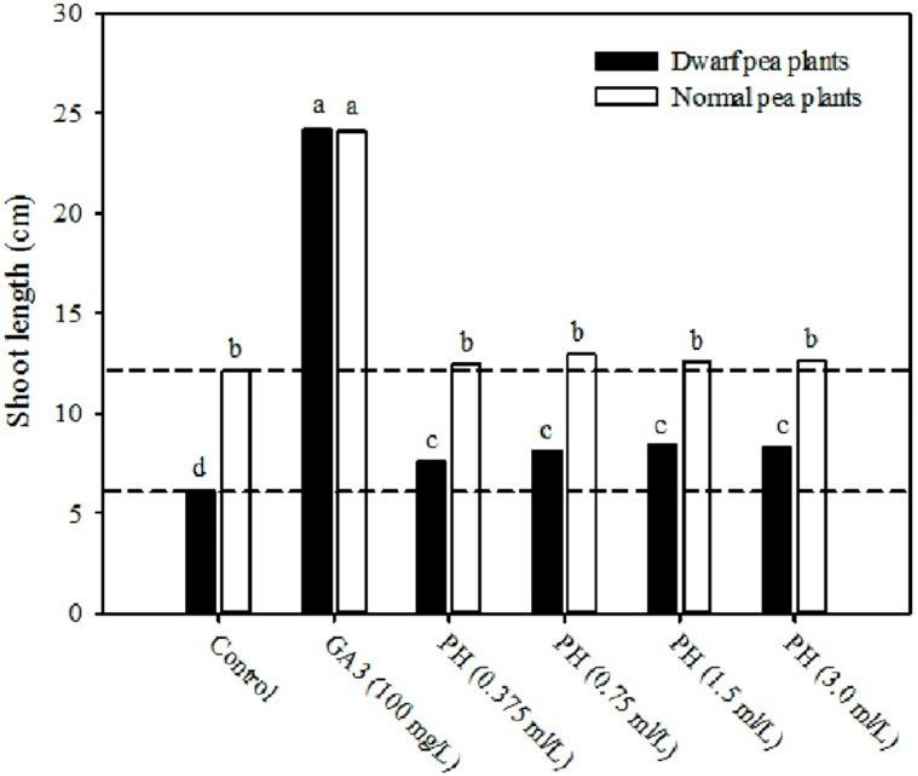


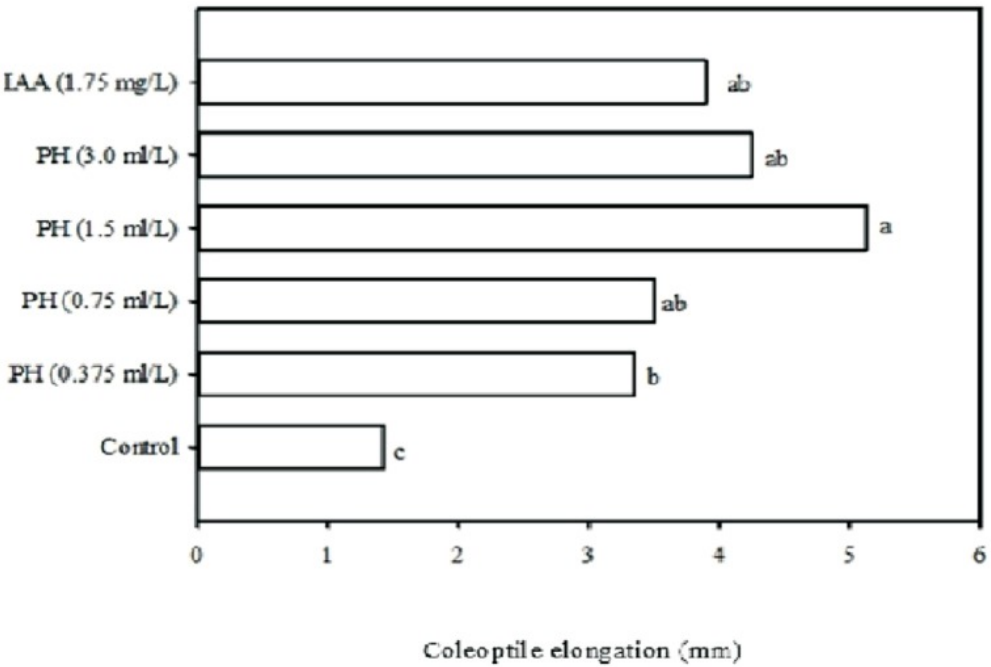




Rouphael et al. 2015; Rouphael et al., 2017; Cardarelli 2010

Effetti sul metabolismo ormonico





Gibberelline: germinazione semi, distensione cellulare, tubetto pollinico

Auxine: distensione cellulare, fioritura, radicazione

Colla et al., 2014

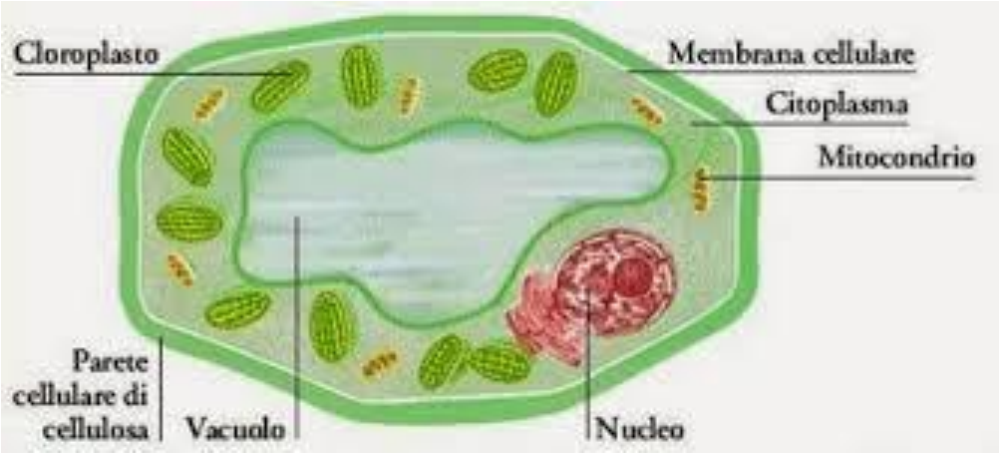
Effetti sul metabolismo ormonico

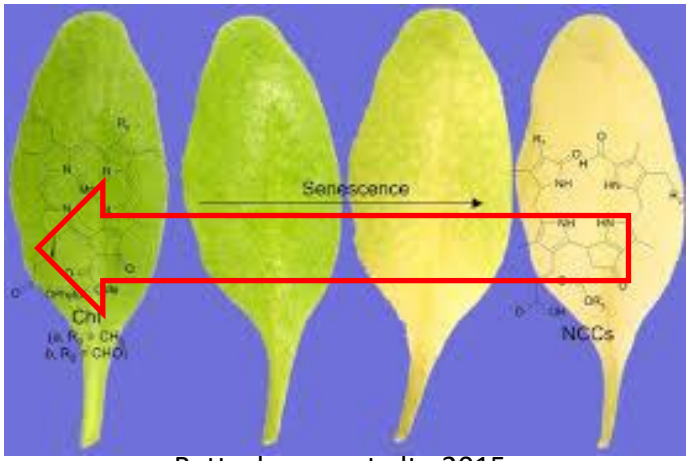
Figure 4 - Microscope view (40x) of non-coated broccoli seeds (a) and broccoli seeds coated in spouted bed (b).

Proteine idrolizzate soja come ingrediente concia del seme

Amirkhani et al., 2016

Estratti di alghe miglior fotosintesi→ <u>Produzione!</u>

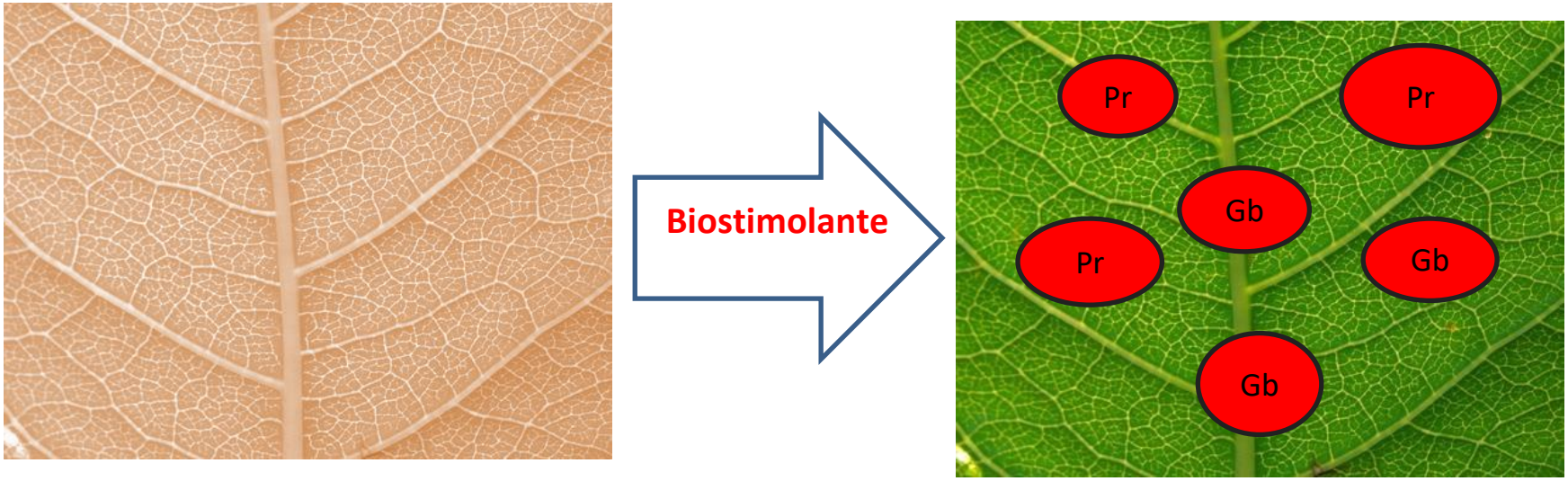




Battacharyya et alt., 2015
Lucini et alt., 2014

Effetti sul metabolismo- composti bioattivi

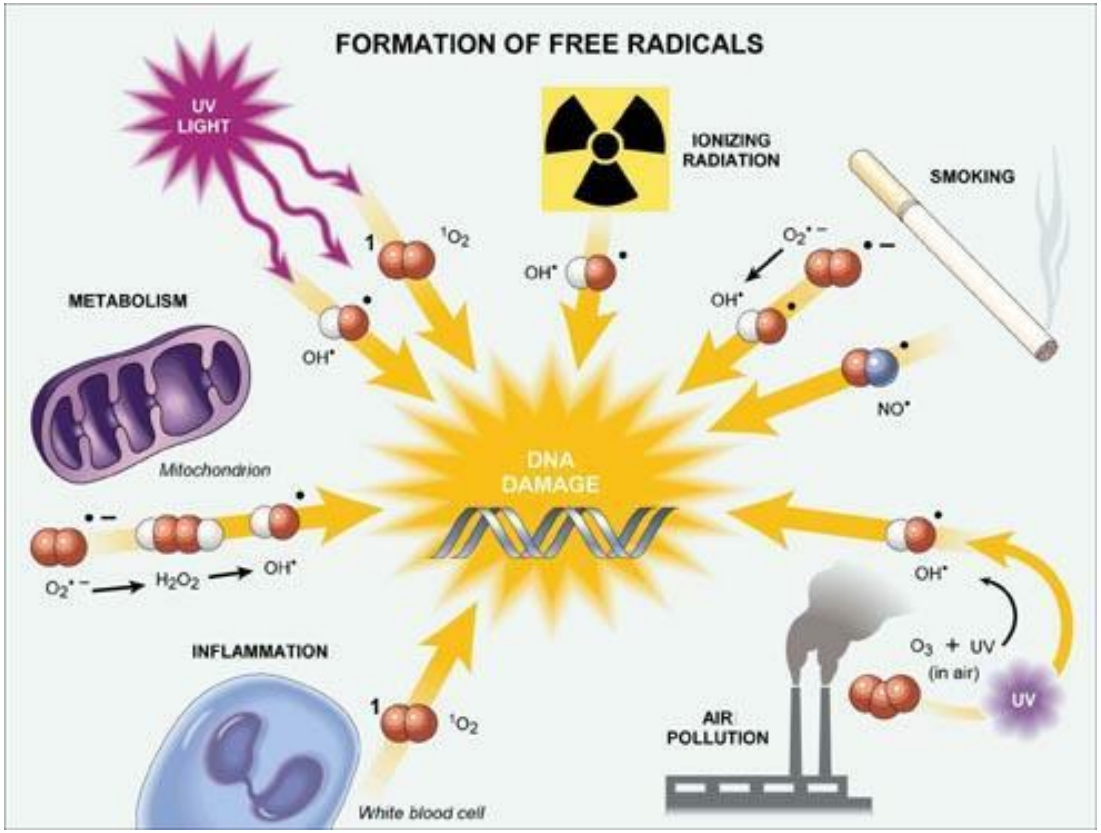
Estratti d'alghe e proteine idrolizzate composti bioattivi su stress da **basse temperature**



Ertani et al., 2013

Incremento del valore nutrizionale

Stress ossidativo



Incremento valore nutrizionale

Contenuto nutraceutici ed antiossidanti

Micorrize

+ Antociani, carotenoidi e composti fenolici

Braslam et al., 2011

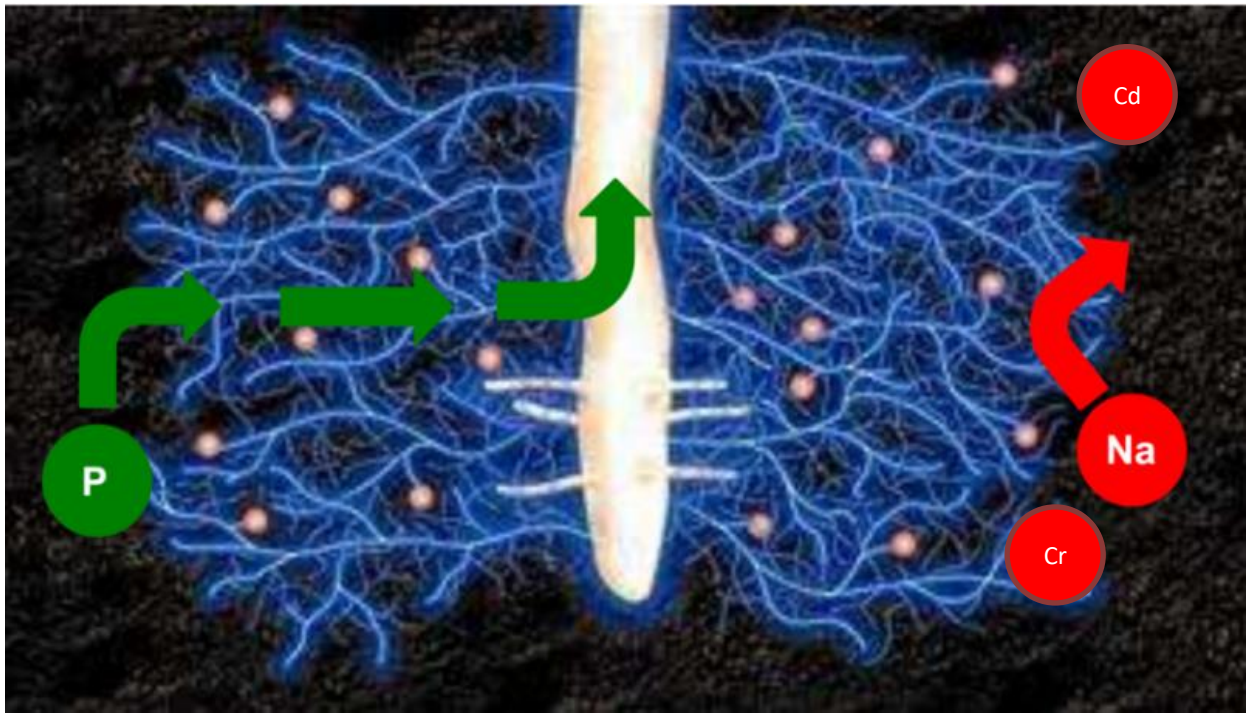
+ P, Zn, Licopene e zuccheri

Giovannetti et al., 2010

Incremento valore nutrizionale

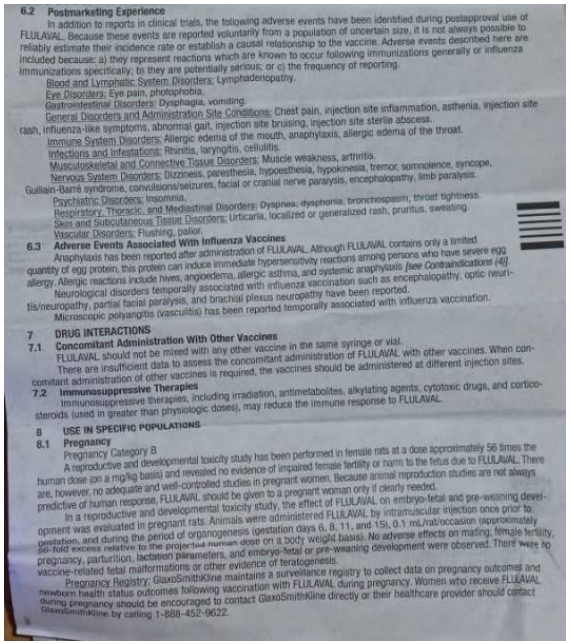
Effetti sul contenuto in elementi non desiderati

Micorrize **biofiltro** per metalli pesanti (Cd, Cr)



Rouphael at al., 2015

Aspetti applicativi



6.2 Postmarketing Experience

In addition to reports in clinical trials, the following adverse events have been identified during postapproval use of FLULAVAL. Because these events are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their incidence rate or establish a causal relationship to the vaccine. Adverse events described here are included because: a) they represent reactions which are known to occur following immunizations generally or influenza immunizations specifically; b) they are potentially serious; or c) the frequency of reporting.

Blood and Lymphatic System Disorders: Lymphadenopathy.

Eye Disorders: Eye pain, photophobia.

Gastrointestinal Disorders: Dysphagia, vomiting.

General Disorders and Administration Site Conditions: Chest pain, injection site inflammation, asthenia, injection site rash, influenza-like symptoms, abnormal gait, injection site bruising, injection site sterile abscess.

Immune System Disorders: Allergic edema of the mouth, anaphylaxis, allergic edema of the throat.

Infections and Infestations: Rhinitis, laryngitis, cellulitis.

Musculoskeletal and Connective Tissue Disorders: Muscle weakness, arthritis.

Nervous System Disorders: Dizziness, paresthesia, hypoesthesia, hypokinesia, tremor, somnolence, syncope, Guillain-Barré syndrome, convulsions/seizures, facial or cranial nerve paralysis, encephalopathy, limb paralysis.

Psychiatric Disorders: Insomnia.

Respiratory, Thoracic, and Mediastinal Disorders: Dyspnea, dysphonia, bronchospasm, throat tightness.

Skin and Subcutaneous Tissue Disorders: Urticaria, localized or generalized rash, pruritus, sweating.

Vascular Disorders: Flushing, pallor.

6.3 Adverse Events Associated With Influenza Vaccines

Anaphylaxis has been reported after administration of FLULAVAL. Although FLULAVAL contains only a limited quantity of egg protein, this protein can induce immediate hypersensitivity reactions among persons who have severe egg allergy. Allergic reactions include hives, angioedema, allergic asthma, and systemic anaphylaxis *(see Contraindications (4))*.

Neurological disorders temporally associated with influenza vaccination such as encephalopathy, optic neuritis/neuropathy, partial facial paralysis, and brachial plexus neuropathy have been reported.

Microscopic polyangiitis (vasculitis) has been reported temporally associated with influenza vaccination.

7 DRUG INTERACTIONS

7.1 Concomitant Administration With Other Vaccines

FLULAVAL should not be mixed with any other vaccine in the same syringe or vial.

There are insufficient data to assess the concomitant administration of FLULAVAL with other vaccines. When concomitant administration of other vaccines is required, the vaccines should be administered at different injection sites.

7.2 Immunosuppressive Therapies

Immunosuppressive therapies, including irradiation, antimetabolites, alkylating agents, cytotoxic drugs, and corticosteroids (used in greater than physiologic doses), may reduce the immune response to FLULAVAL.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Category B

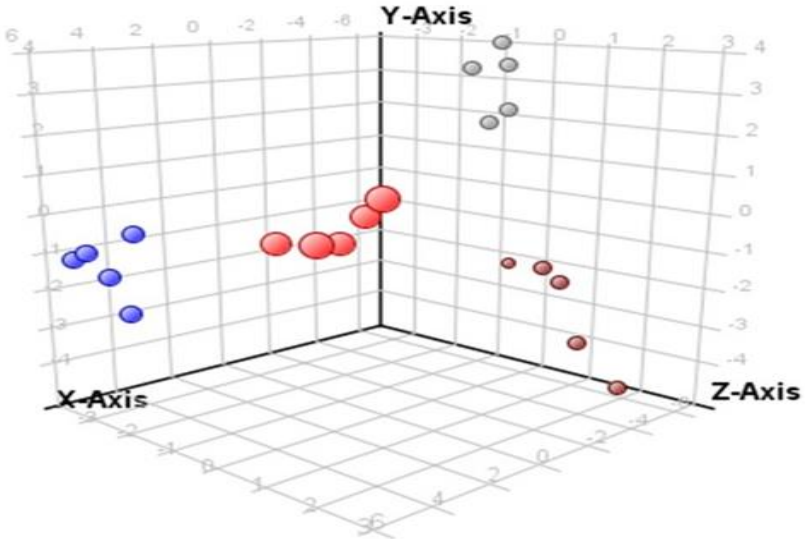
A reproductive and developmental toxicity study has been performed in female rats at a dose approximately 56 times the human dose (on a mg/kg basis) and revealed no evidence of impaired female fertility or harm to the fetus due to FLULAVAL. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, FLULAVAL should be given to a pregnant woman only if clearly needed.

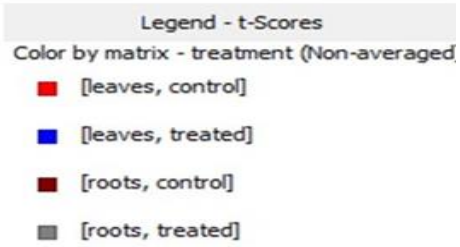
In a reproductive and developmental toxicity study, the effect of FLULAVAL on embryo-fetal and pre-weaning development was evaluated in pregnant rats. Animals were administered FLULAVAL by intramuscular injection once prior to gestation, and during the period of organogenesis (gestation days 6, 8, 11, and 15), 0.1 mL/rat/occasion (approximately 56-fold excess relative to the projected human dose on a body weight basis). No adverse effects on mating, female fertility, pregnancy, parturition, lactation parameters, and embryo-fetal or pre-weaning development were observed. There were no vaccine-related fetal malformations or other evidence of teratogenesis.

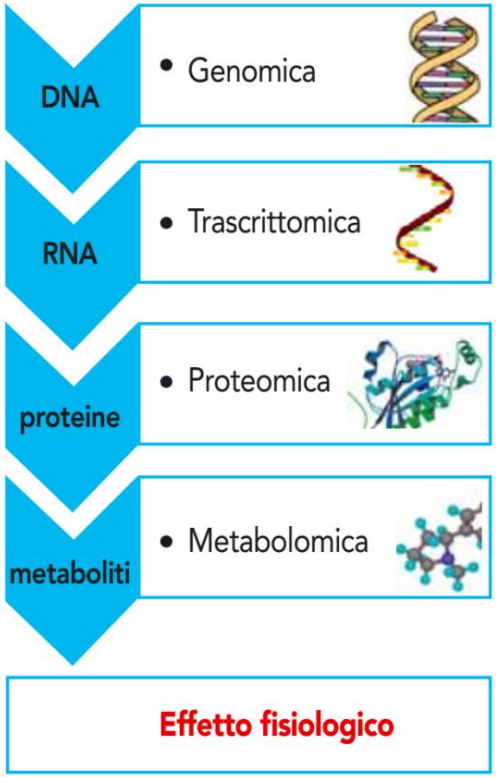
Pregnancy Registry: GlaxoSmithKline maintains a surveillance registry to collect data on pregnancy outcomes and newborn health status outcomes following vaccination with FLULAVAL during pregnancy. Women who receive FLULAVAL during pregnancy should be encouraged to contact GlaxoSmithKline directly or their healthcare provider should contact GlaxoSmithKline by calling 1-888-452-9622.

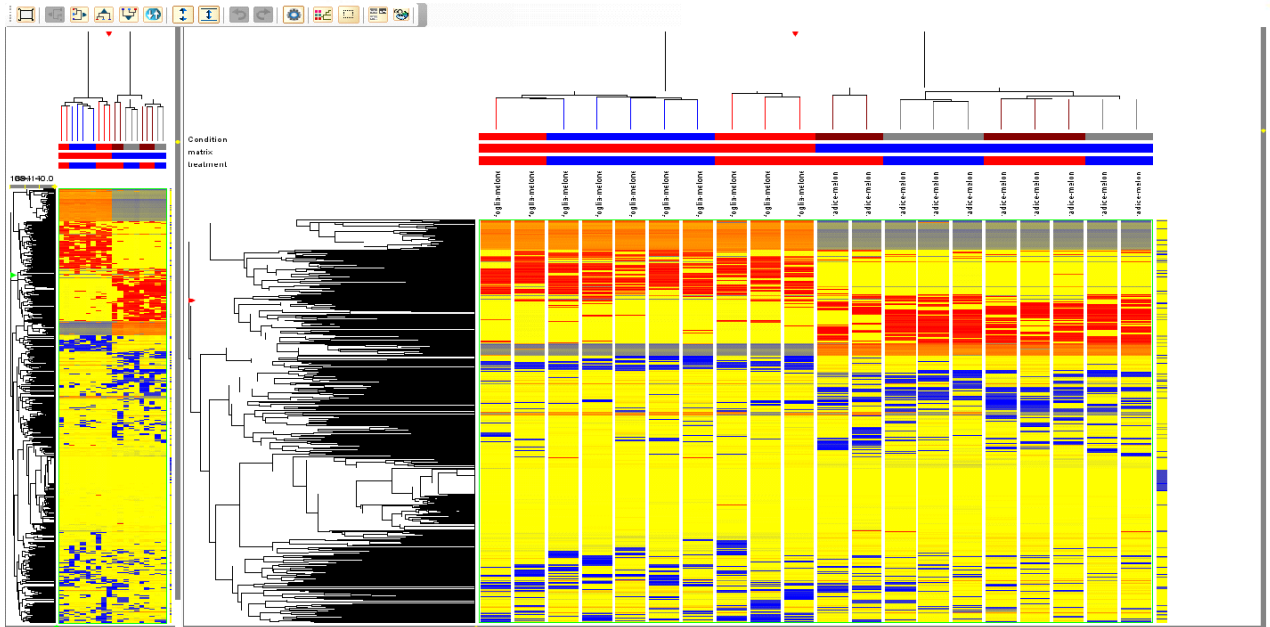
- Istruzioni fabbricante
- Ripetere il trattamento!?
- Gestione agronomica colture
- Compatibilita con agro-chimici

Ricerca e sviluppo BS









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