UNIVERSITÀ DEGLI STUDI DI MILANO

DiSAA
DIPARTIMENTO
di SCIENZE
AGRARIE e
AMBIENTALI

32° Forum di Medicina Vegetale

Risposte al Green Deal dall'innovazione genetica delle sementi

Vittoria Brambilla

10 dicembre 2020

GREEN DEAL
Commissione Europea

ENTRO IL 2050:

UE climaticamente neutrale

FARM TO FORK: entro il 2030

- RIDURRE GLI SPERCHI LUNGO LA FILIERA PRODUTTIVA
- MIGLIORARE LE ABITUDINI ALIMENTARI DEI CITTADINI

Farm to Fork

AGRICOLTURA - entro il 2030:

- riduzione dell'uso di:
  - agrofarmaci (50%)
  - fertilizzanti (20%)
  - antimicrobici in allevamenti e acquacoltura (50%)

-10% della terra coltivata a boschi

- agricoltura biologica dall'attuale 7,5% al 25 %

VALUTAZIONE DELL'IMPATTO

Economico & Ambientale? No…

VALUTAZIONE DELL'IMPATTO economico

USDA
United States Department of Agriculture

Economic Research Service

Economic Brief Number 30

November 2020

Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies

Jayson Beckman, Maros Ivanic, Jeremy L. Jelliffe, Felix G. Baquedano, and Sara G. Scott

-diminuzioni della produzione dal 7 al 12%

-aumento dei prezzi del cibo a livello mondiale dal 9% fino al 89%

-aumento delle persone con ridotto di accesso al cibo fino a 185 mln.

VALUTAZIONE DELL' IMPATTO ambientale

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COMMENT · 26 OCTOBER 2020 · CORRECTION 12 NOVEMBER 2020

Europe's Green Deal offshores environmental damage to other nations

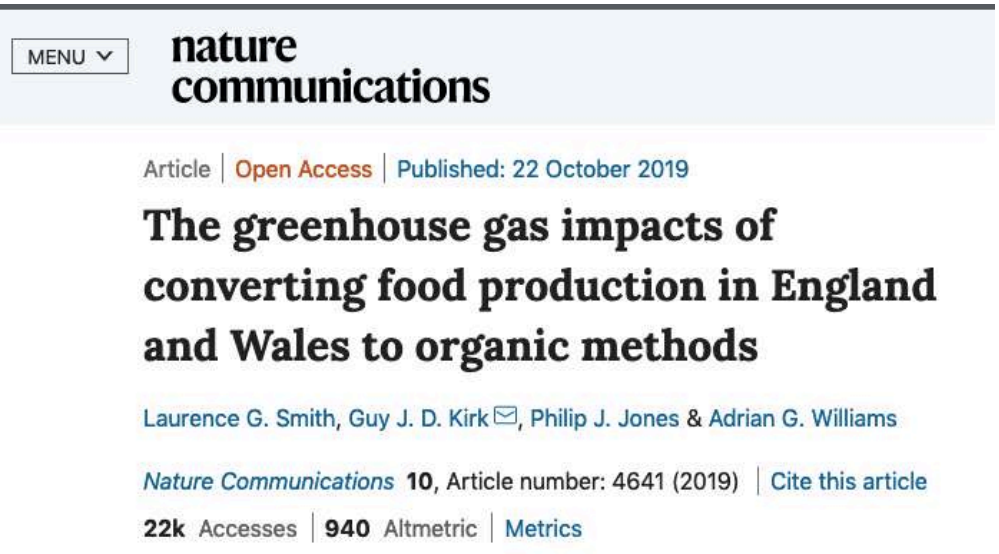
Importing millions of tonnes of crops and meat each year undercuts farming standards in the European Union and destroys tropical forests.

Richard Fuchs, Calum Brown & Mark Rounsevell

"between 1990 and 2014, **European forests expanded by 9%,** … (13 million hectares; Mha). Elsewhere**, around 11 Mha was deforested to grow crops that were consumed within the EU**."

Riscaldamento globale

"Each EU citizen currently 'imports' around 1 tonne of carbon dioxide per year in goods entering the EU".



Abstract

Agriculture is a major contributor to global greenhouse gas (GHG) emissions and must feature in efforts to reduce emissions. Organic farming might contribute to this through decreased use of farm inputs and increased soil carbon sequestration, but it might also exacerbate emissions through greater food production elsewhere to make up for lower organic yields. To date there has been no rigorous assessment of this potential at national scales. Here we assess the consequences for net GHG emissions of a 100% shift to organic food production in England and Wales using life-cycle assessment. We predict major shortfalls in production of most agricultural products against a conventional baseline. Direct GHG emissions are reduced with organic farming, but when increased overseas land use to compensate for shortfalls in domestic supply are factored in, net emissions are greater. Enhanced soil carbon sequestration could offset only a small part of the higher overseas emissions.

Possibili conseguenze del Green Deal

IMPATTO ECONOMICO

Diminuzione della produzione

Aumento dei prezzi

…

IMPATTO AMBIENTALE

Deforestazione delle foreste pluviali

Riscaldamento globale

SOLUZIONI:

IMPATTO ECONOMICO

IMPATTO AMBIENTALE

Intensificazione sostenibile

TECNOLOGIA

INVESTIMENTI IN RICERCA

tecnologia

- **Digitalizzazione** per ottimizzare gli input produttivi (es. agrofarmaci, fertilizzanti e acqua)

- **Modelli** previsionali per patologie e avversità;

- **Biotecnologie** applicate al miglioramento genetico delle sementi

Biotechnologie

Climate change brings new threats to **plant health**. The sustainability challenge calls for measures to protect plants better from emerging pests and diseases, and for innovation. The Commission will adopt rules to reinforce vigilance on plant imports and surveillance on Union territory. New innovative techniques, including biotechnology and the development of bio-based products, may play a role in increasing sustainability, provided they are safe for consumers and the environment while bringing benefits for society as a whole. They can also accelerate the process of reducing dependency on pesticides. In response to the request of Member States, the Commission is carrying out a study which will look at the potential of new genomic techniques to improve sustainability along the food supply chain. Sustainable food systems also rely on **seed security and diversity**. Farmers need to have access to a range of quality seeds for plant varieties adapted to the pressures of climate change. The Commission will take measures to facilitate the registration of seed varieties, including for organic farming, and to ensure easier market access for traditional and locally-adapted varieties.

The market for organic food is set to continue growing and **organic farming** needs to be further promoted. It has a positive impact on biodiversity, it creates jobs and attracts young farmers. Consumers recognise its value. The legal framework supports the shift to this type of farming, but more needs to be done, and similar shifts need to take place in the oceans and inland waters. In addition to CAP measures, such as eco-schemes, investments and advisory services, and the Common Fisheries Policy (CFP) measures, the Commission will put forward an Action Plan on organic farming. This will help Member States stimulate both supply and demand for organic products. It will ensure consumer trust and boost demand through promotion campaigns and green public procurement. This approach

- Ursula von der Leyen ha definito le biotecnologie applicate al miglioramamento genetico “strategiche ed abilitanti”.

- Frans Timmermans, vice presidente esecutivo della CE per il Green Deal dice che l’UE intende fornire agli agricoltori “agricoltura di precisione e miglioramento delle sementi”.

Press release: The Nobel Prize in Chemistry 2020

English
English (pdf)
Swedish
Swedish (pdf)

KUNGL. VETENSKAPS-AKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES

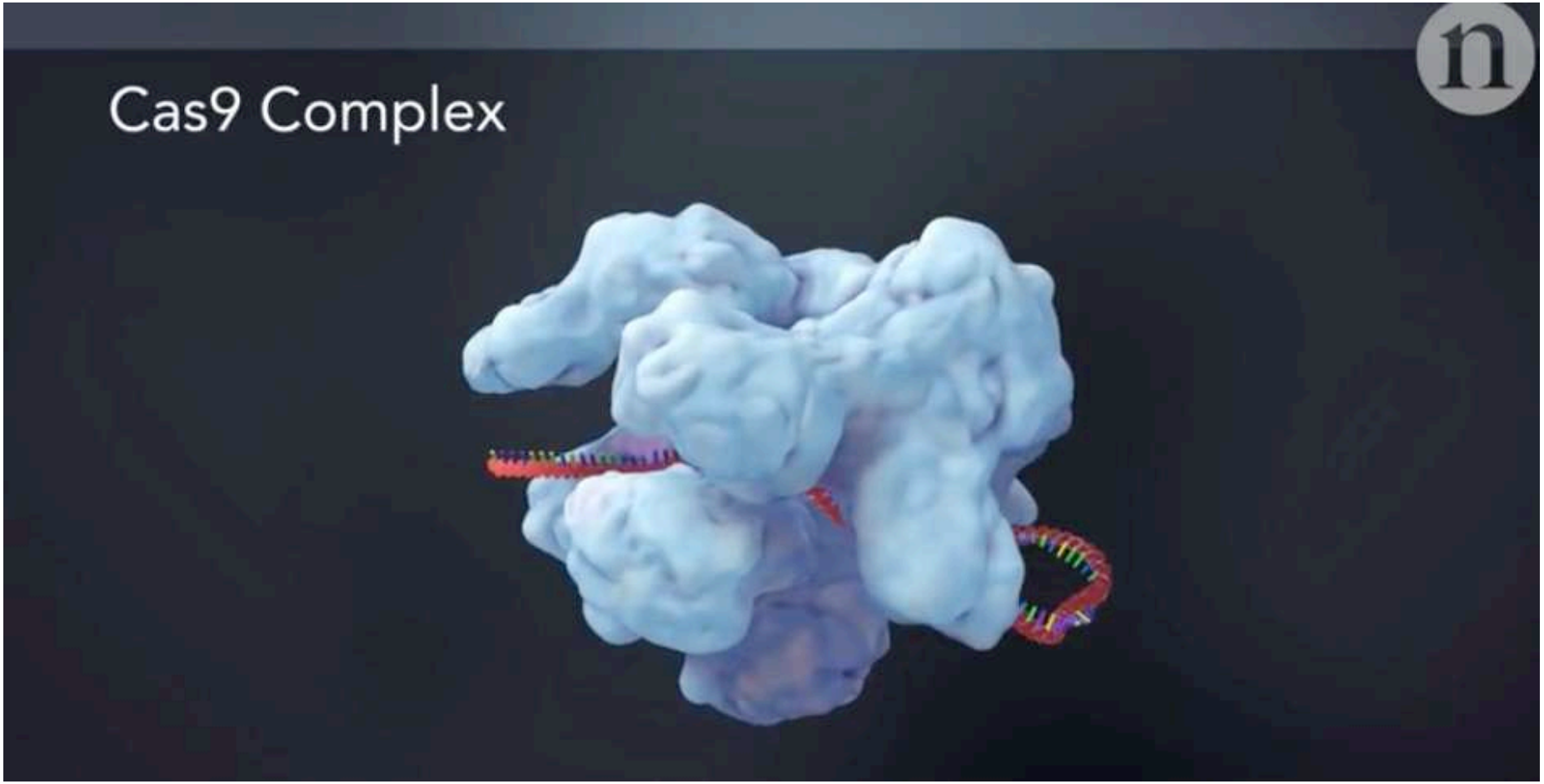
7 October 2020

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry 2020 to

Emmanuelle Charpentier
Max Planck Unit for the Science of Pathogens, Berlin, Germany

Jennifer A. Doudna
University of California, Berkeley, USA

Forbici molecolari



https://youtu.be/4YKFw2KZA5o?t=30

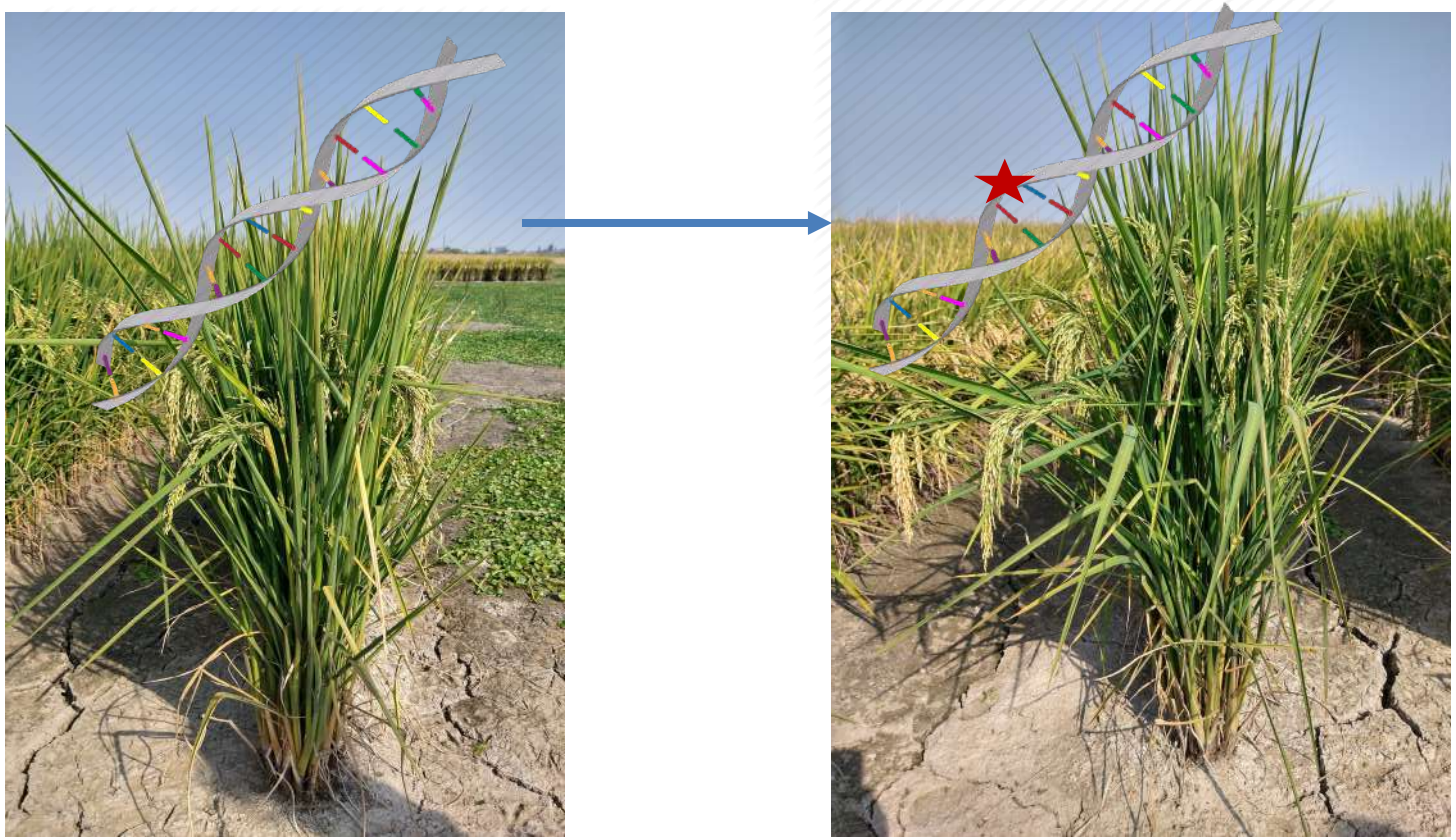
Forbici molecolari che permettono di inserire piccole mutazioni nel DNA

ricercatori

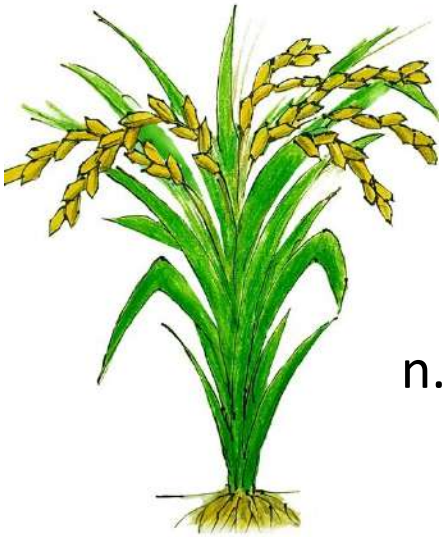
piante

GENOME EDITING

Mutazioni mirate possono portare al miglioramento genetico delle piante in cui vengono inserite.



singole mutazioni NOTE portano a un grosso miglioramento nelle piante



n. of branches
(*IPA1)*

x

n. of grains/branch
(*Gn1a*, *DEP1*)

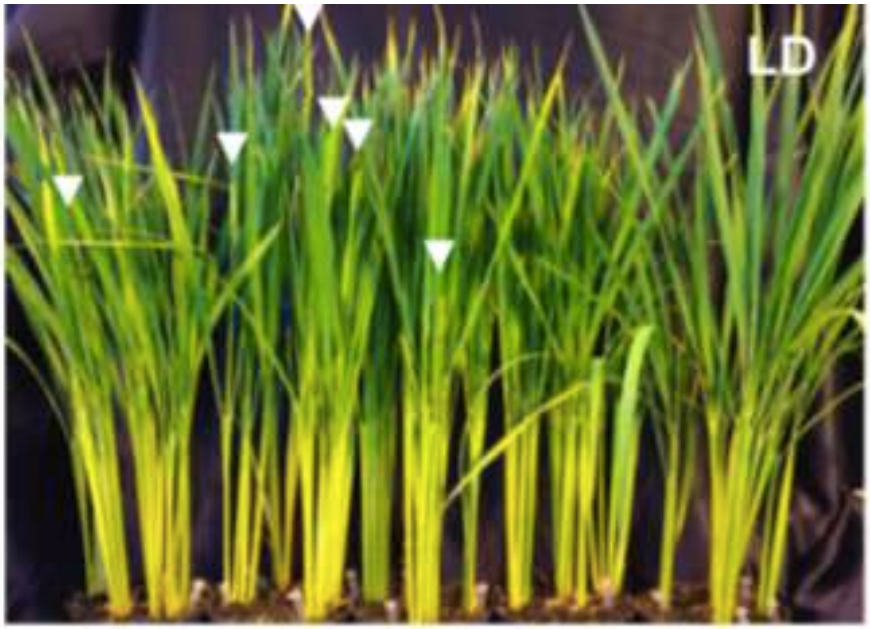
x

grain weight
(*GS3*, *GW2*, *GS5*)

Li et al., *Frontiers* 2016, Huang et al., *Frontiers* 2018

DALLA RICERCA DI BASE ALLE APPLICAZIONI

Mutanti nei geni HBF1 e HBF2 fioriscono prima - hanno ciclo accelerato



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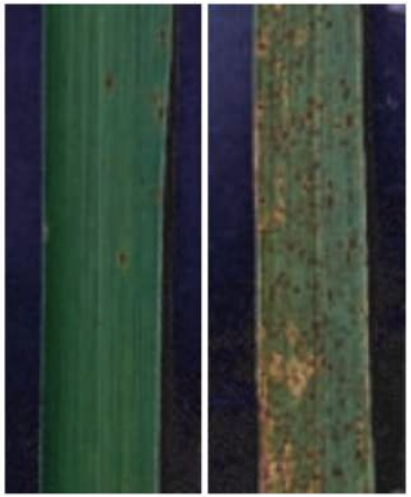
Dal Genome Editing soluzioni per la patologia vegetale

Riso resistente al brusone - Magnaporthe oryzae

21 AUGUST 2009 VOL 325 SCIENCE

Loss of Function of a Proline-Containing Protein Confers Durable Disease Resistance in Rice

Shuichi Fukuoka,[1*] Norikuni Saka,[2] Hironori Koga,[3] Kazuko Ono,[1] Takehiko Shimizu,[4] Kaworu Ebana,[1] Nagao Hayashi,[5] Akira Takahashi,[5] Hirohiko Hirochika,[6] Kazutoshi Okuno,[7] Masahiro Yano[1]



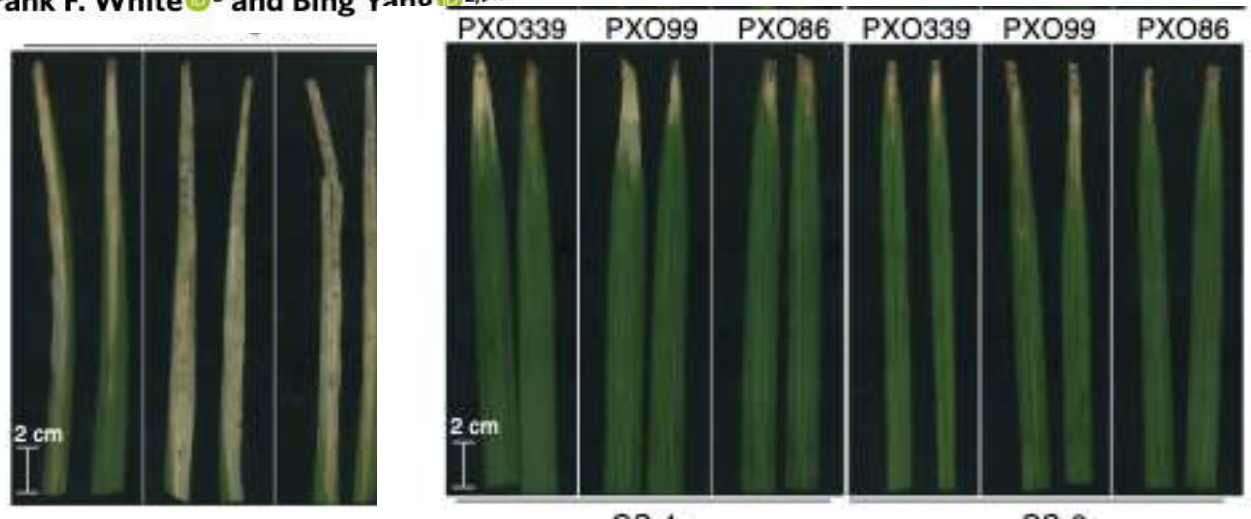
Riso resistente alla ruggine batterica - Xantomonas oryzae

ARTICLES
https://doi.org/10.1038/s41587-019-0267-z

nature biotechnology
OPEN

Broad-spectrum resistance to bacterial blight in rice using genome editing

Ricardo Oliva[1,12*], Chonghui Ji[2,12], Genelou Atienza-Grande[1,10,12], José C. Huguet-Tapia[3,12], Alvaro Perez-Quintero[4,11,12], Ting Li[5], Joon-Seob Eom[6], Chenhao Li[2], Hanna Nguyen[1], Bo Liu[2], Florence Auguy[4], Coline Sciallano[4], Van T. Luu[6], Gerbert S. Dossa[7], Sébastien Cunnac[4], Sarah M. Schmidt[6], Inez H. Slamet-Loedin[1], Casiana Vera Cruz[1], Boris Szurek[4], Wolf B. Frommer[6,8*], Frank F. White[3] and Bing Yang[2,9*]



Pomodoro resistente all'oidio

SCIENTIFIC REPORTS

OPEN

Rapid generation of a transgene-free powdery mildew resistant tomato by genome deletion

Received: 16 February 2017
Accepted: 22 February 2017
Published online: 28 March 2017

Vladimir Nekrasov[1,4], Congmao Wang[2], Joe Win[1], Christa Lanz[3], Detlef Weigel[3] & Sophien Kamoun[1]

Genome editing has emerged as a technology with a potential to revolutionize plant breeding. In this study, we report on generating, in less than ten months, Tomelo, a non-transgenic tomato variety resistant to the powdery mildew fungal pathogen using the CRISPR/Cas9 technology. We used whole-genome sequencing to show that Tomelo does not carry any foreign DNA sequences but only carries a deletion that is indistinguishable from naturally occurring mutations. We also present evidence for CRISPR/Cas9 being a highly precise tool, as we did not detect off-target mutations in Tomelo. Using our pipeline, mutations can be readily introduced into elite or locally adapted tomato varieties in less than a year with relatively minimal effort and investment.

Nuove biotecnoogie: TECNOLOGIE DI EVOLUZIONE ASSISTITA - TEA

COLDIRETTI

ARTICOLO | Ambiente e sviluppo sostenibile

Storico patto contadini-scienziati, nasce la genetica "green"

HOMEPAGE | AMBIENTE E SVILUPPO SOSTENIBILE | **STORICO PATTO CONTADINI-SCIENZIATI, NASCE LA GENETICA "GREEN"**

20 Giugno 2020

Storico patto contadini-scienziati, nasce la genetica "green"

Nasce il primo storico accordo tra agricoltori e scienziati per la una nuova genetica "green" capace di sostenere l'agricoltura nazionale, difendere il patrimonio di biodiversità agraria presente in Italia dai cambiamenti climatici e far tornare la ricerca italiana protagonista in questa fase 3 dopo l'emergenza coronavirus.

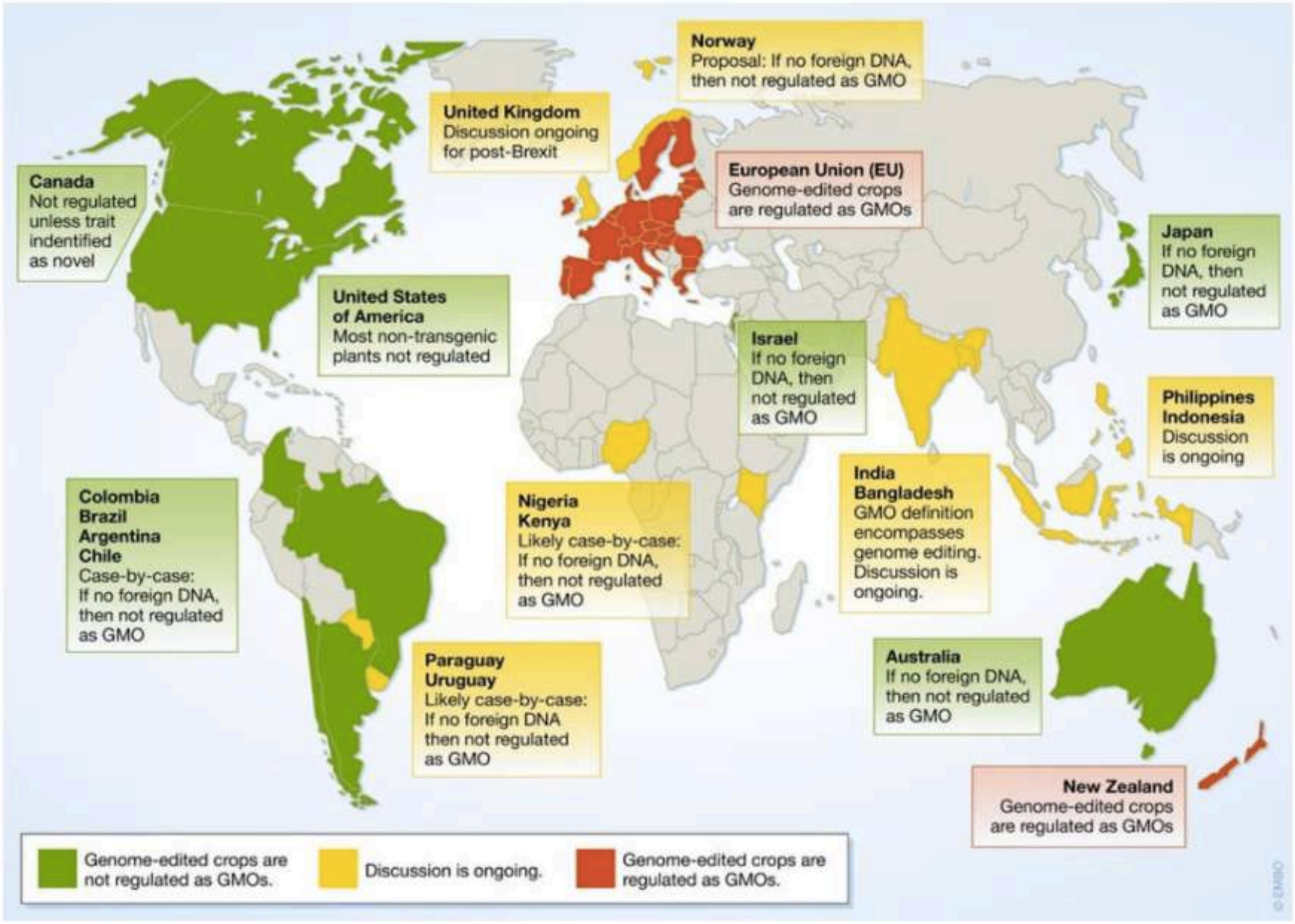
L'intesa è stata firmata a Palazzo Rospigliosi a Roma dal presidente della Coldiretti Ettore Prandini e dal presidente

il sondaggio

Con il ritorno al lavoro dopo le vacanze, come gestisci la tua pausa pranzo?

- Porto del cibo da casa
- Mi faccio consegnare il cibo al lavoro
- Acquisto cibo d'asporto

Le nuove biotecnolgie NEL MONDO



Situazione legislativa in Europa: GENOME EDITING = OGM sentenza 25 luglio 2018

Direttiva 2001/18 EC

Articolo 2

Definizioni

Ai fini della presente direttiva si intende per:

1) «organismo», qualsiasi entità biologica capace di riprodursi o di trasferire materiale genetico;

2) «organismo geneticamente modificato (OGM)», un organismo, diverso da un essere umano, il cui materiale genetico è stato modificato in modo diverso da quanto avviene in natura con l'accoppiamento e/o la ricombinazione genetica naturale.

Press and Information

Court of Justice of the European Union
PRESS RELEASE No 111/18
Luxembourg, 25 July 2018

Judgment in Case C-528/16
Confédération paysanne and Others v Premier ministre and Ministre de l'Agriculture, de l'Agroalimentaire et de la Forêt

Organisms obtained by mutagenesis are GMOs and are, in principle, subject to the obligations laid down by the GMO Directive

La Commissione Europea produrrà uno studio entro il 30 aprile 2021

Council of the
European Union

Brussels, 24 October 2019
(OR. en)

12781/19

AGRI 479
AGRILEG 167
ENV 825

LEGISLATIVE ACTS AND OTHER INSTRUMENTS

Subject:	COUNCIL DECISION requesting the Commission to submit a study in light of the Court of Justice's judgment in Case C-528/16 regarding the status of novel genomic techniques under Union law, and a proposal, if appropriate in view of the outcomes of the study

Article 1

The Council requests the Commission to submit, by 30 April 2021, a study in light of the Court of Justice's judgment in Case C-528/16 regarding the status of novel genomic techniques under Union law.