

Poisoned chalice: Toxicity in plants

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Selected Significant Climate Anomalies and Events

June 2018

GLOBAL AVERAGE TEMPERATURE

June 2018 average global land and ocean temperature was the fifth highest for June since records began in 1880.

NORTH AMERICA

June 2018 ranked as the sixth warmest June since continental records began in 1910. The contiguous U.S. had its third highest June temperature since national records began in 1895.

HURRICANE BUD (June 9–15, 2018)

Maximum winds - 215 km/h
The second major hurricane in the Eastern North Pacific Hurricane basin in 2018. Bud brought heavy rain and floods to northern Mexico and parts of the southwestern contiguous U.S.

SOUTH AMERICA

Warmer-than-average temperatures were present in the northern half of South America, while southern South America had near- to cooler-than-average conditions during June 2018. Averaged as a whole, South America had its smallest June temperature departure from average since 2008.

ANTARCTIC SEA ICE EXTENT

June 2018 sea ice extent was 3.8 percent below the 1981–2010 average—the eighth smallest June sea ice extent on record.

ARCTIC SEA ICE EXTENT

June 2018 sea ice extent was 9.0 percent below the 1981–2010 average—the fourth smallest June sea ice extent since satellite records began in 1979.

EUROPE

Europe had its highest June temperature since 2003. Several European countries had a June temperature that ranked among the six warmest Junes on record.

AFRICA

Africa had its fourth highest June temperature since 1910.

ASIA

Record warm temperatures were observed across much of central Russia. Overall, Asia had its seventh highest June temperature on record.

OMAN

Oman recorded its highest minimum temperature on June 26 when temperatures only dropped to 42.6°C (108.7°F) in Quriyat.

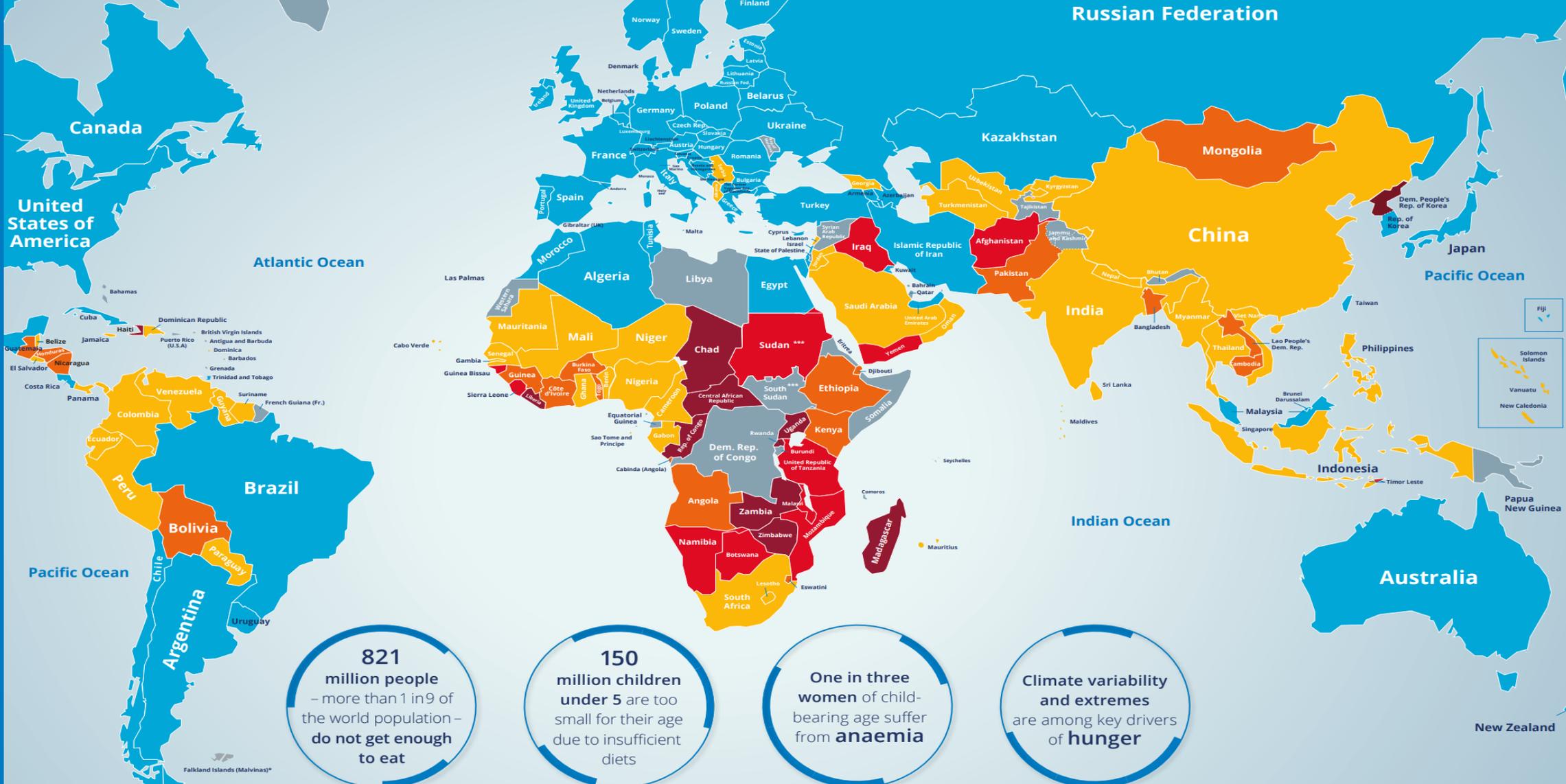
AUSTRALIA

Drier-than-average conditions were present across much of Australia. Regionally, Northern Territory had the most notable precipitation deficit at 90% below average.

Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <http://www.ncdc.noaa.gov/sotc>



Hunger Map 2018



821 million people
– more than 1 in 9 of the world population –
do not get enough to eat

150 million children under 5
are too small for their age due to insufficient diets

One in three women of child-bearing age suffer from **anaemia**

Climate variability and extremes are among key drivers of **hunger**

PREVALENCE OF UNDERNOURISHMENT IN THE TOTAL POPULATION (PERCENT) IN 2015-17

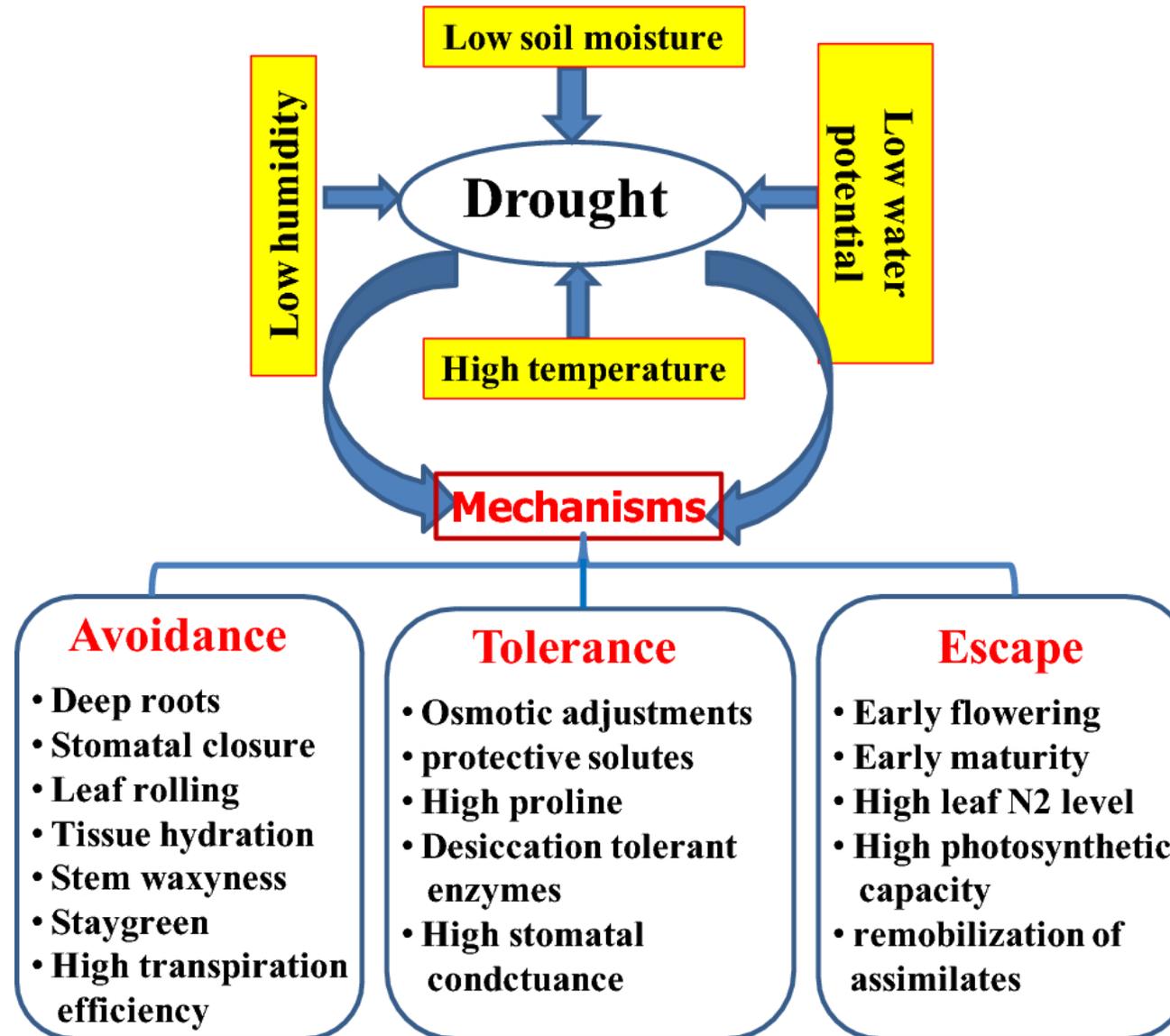


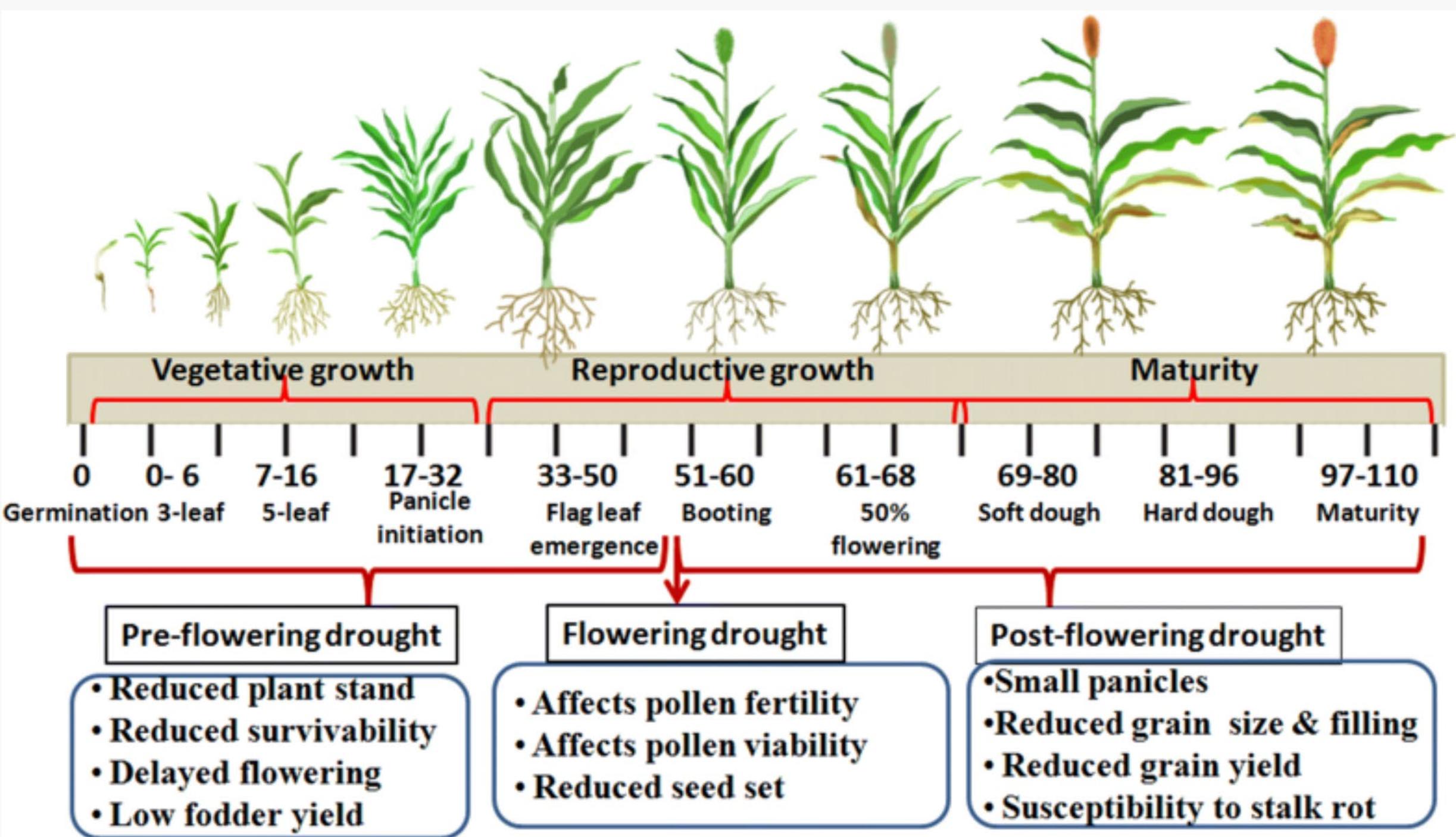
Undernourishment is defined as the condition in which an individual's habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active, healthy life. The indicator is reported as the prevalence of undernourishment (PoU), which is an estimate of the percentage of individuals in the total population that are in a condition of undernourishment. To reduce the influence of possible estimation errors in some of the underlying parameters, national estimates are reported as a three-year moving average.
Source: FAO, IFAD, UNICEF, WFP and WHO. 2018. The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO.
Further information is available at www.wfp.org/content/2018-state-food-security-and-nutrition-world-soil-report

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The designations employed and the presentation of material in this map do not imply the expression of any opinion whatsoever on the part of WFP concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.
* A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).
** Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.



Drought Defence mechanisms in Plants





ROBINSWOOD HILL DROUGHT 1975-1976

The 1975-76 drought was the most severe on record. 40% became bare ground. Joe Angseesing and Anne Saunders recorded its effects on the cyanogenesis polymorphism in legumes White Clover and Birdsfoot Trefoil which had previously shown to be susceptible to changes in soil water stress. These effects were still apparent four years later.



Crops and Hydrogen Cyanide

H-C≡N

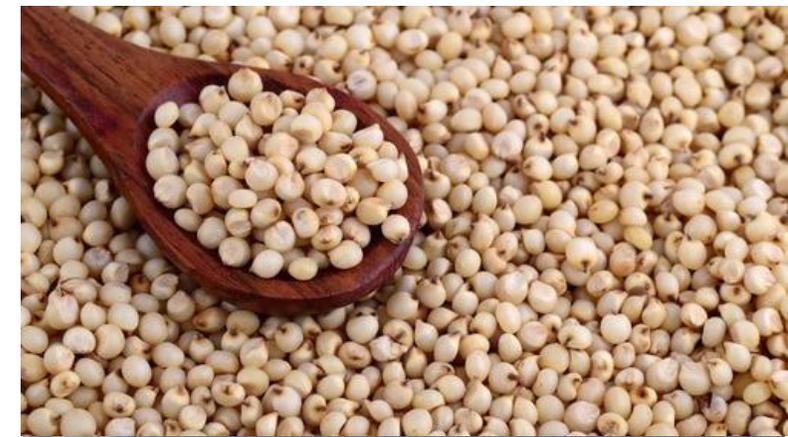
Several thousand **plant** species, including many economically important food **plants**, synthesize **cyanogenic** glycosides and cyanolipids. On tissue disruption, these natural products are hydrolyzed liberating the respiratory poison hydrogen cyanide. This phenomenon of cyanogenesis accounts for numerous cases of acute and chronic cyanide poisoning of animals including humans.

Sorghum is a C₄ crop whose yield levels are highly affected by terminal drought stress under rainfed conditions.

Sudangrass, sorghum, cassava and lima beans are important food plants that produce hydrogen cyanide, and which are known to **poison** livestock and humans.

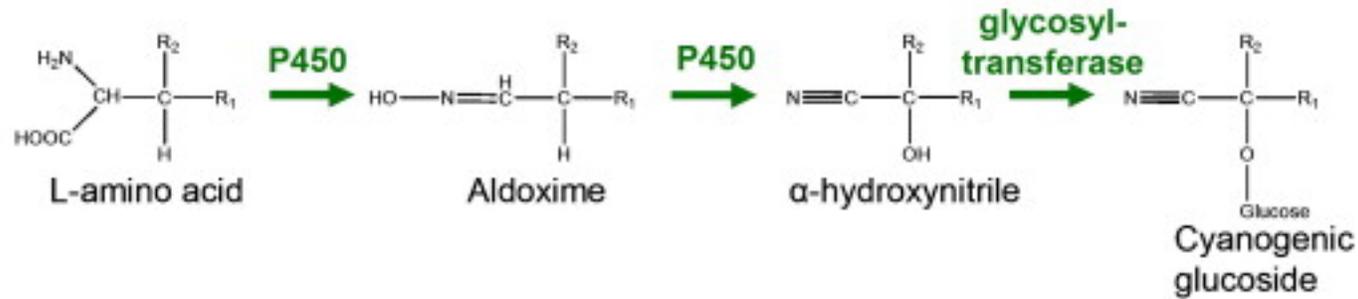
In cyanogenetic plants this decomposition process frees the cyanide from its chemical bond, and it becomes toxic **hydrocyanic acid**, frequently called **prussic acid**.

Hydrogen cyanide is also being used in **pesticides**

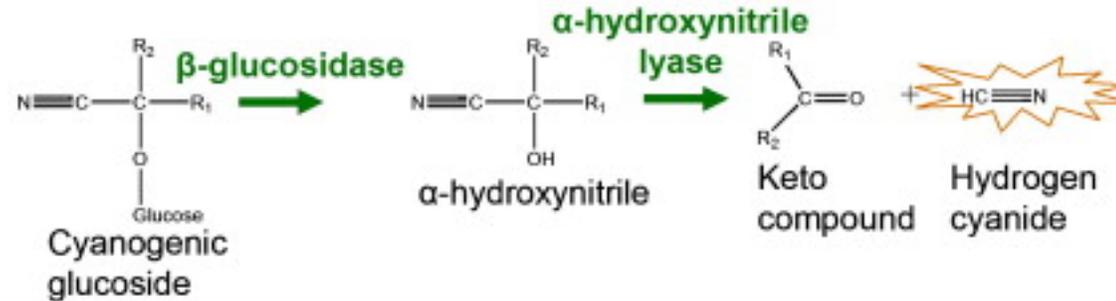


Cyanogenesis in plants and arthropods

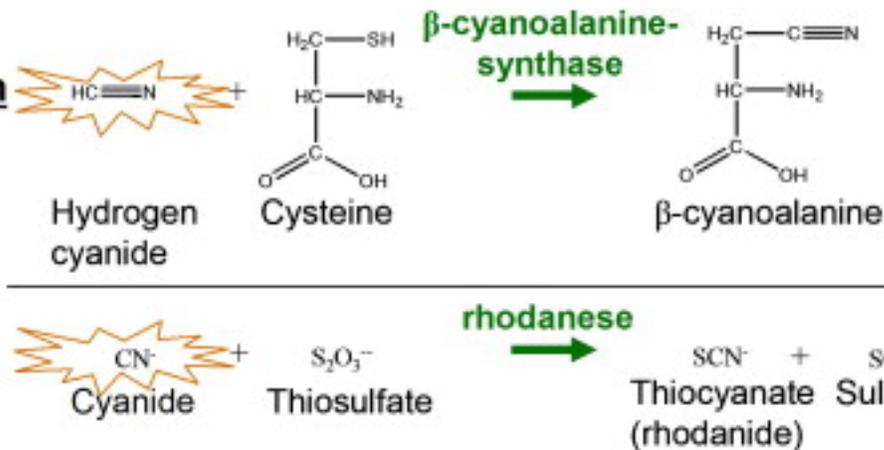
Anabolism



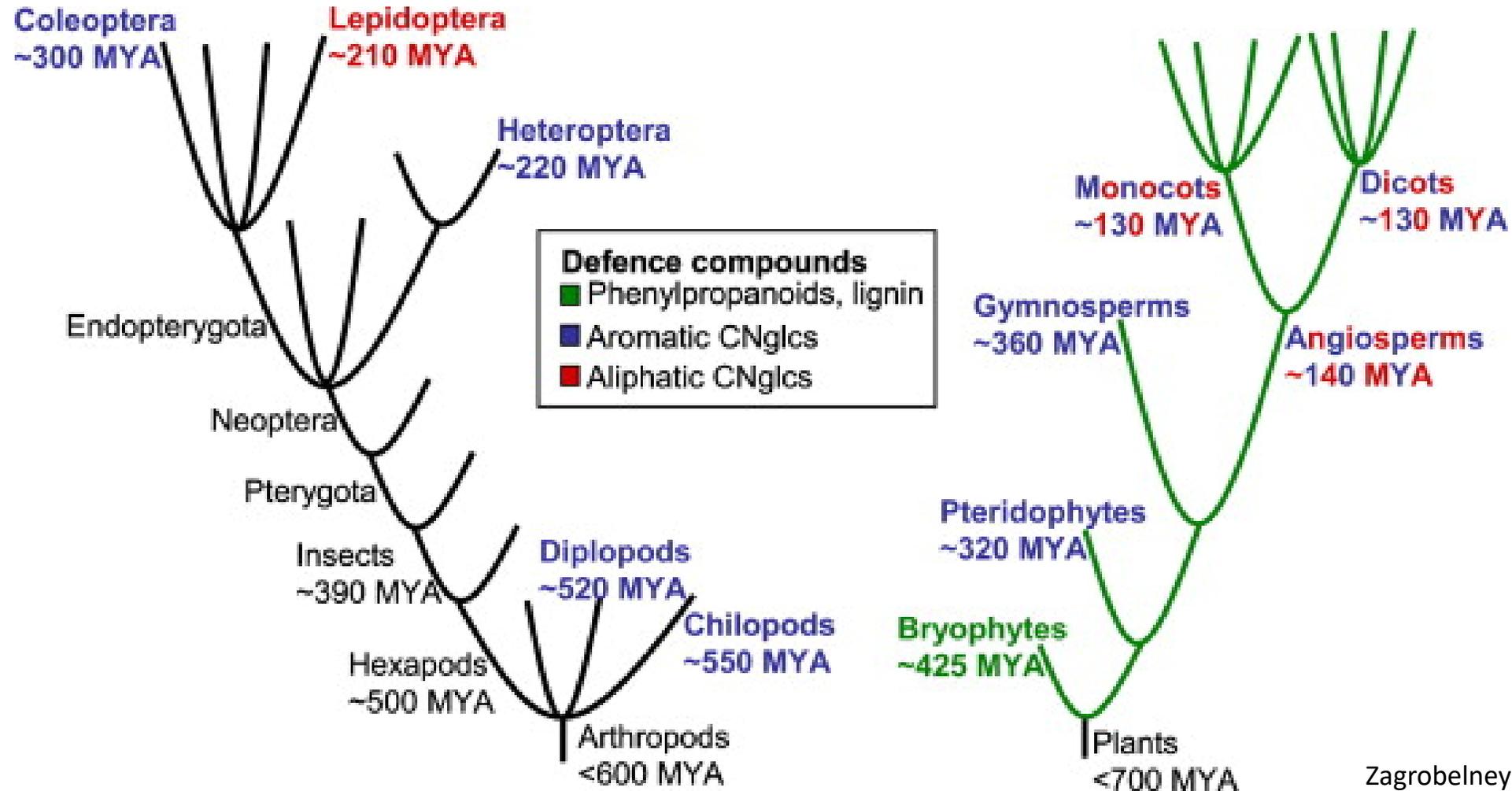
Catabolism



Detoxification



Evolution of defence compounds





inch

1

MYCOTOXINS

Even 1microgram can affect you adversely

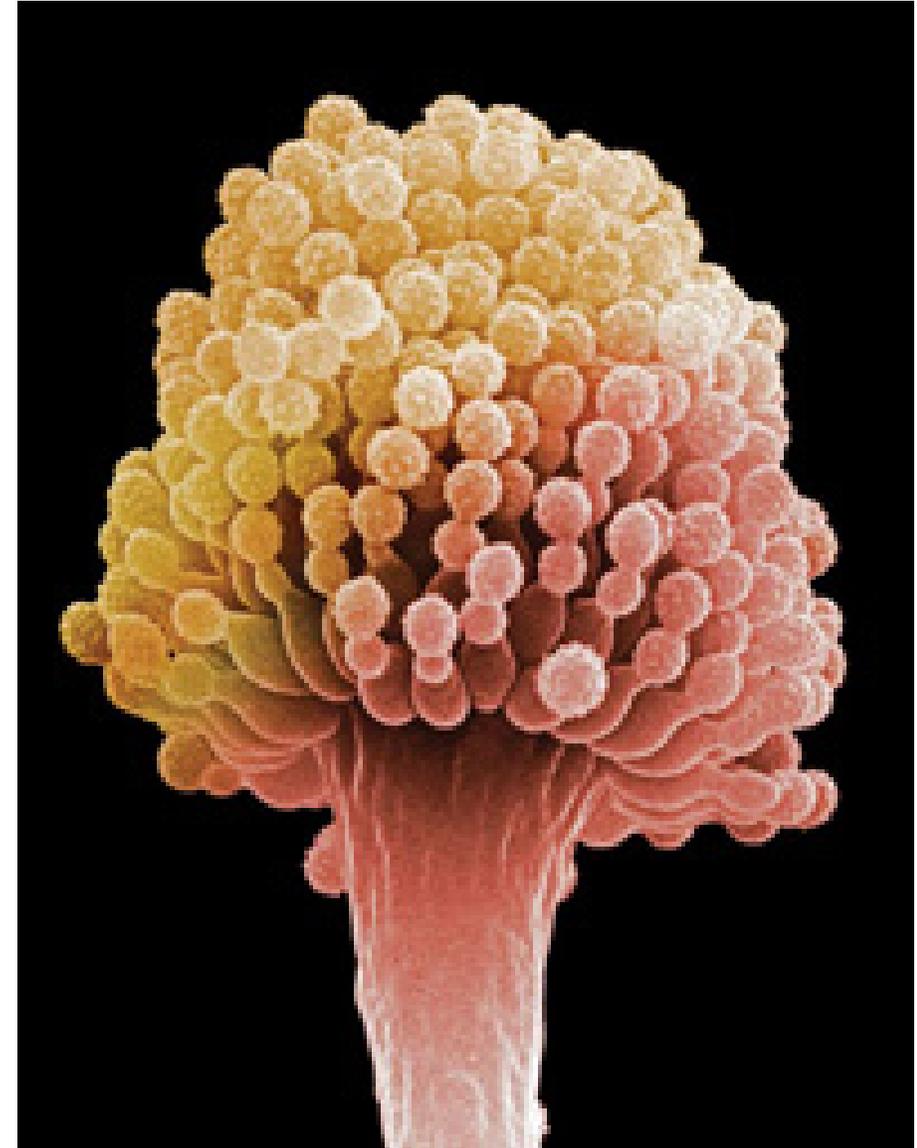
Eating food grown in contaminated soils increases our exposure to mycotoxins

Processing can also encourage mycotoxins to emerge, for example in coffee and chocolate the beans can become cracked enabling mycotoxins to develop

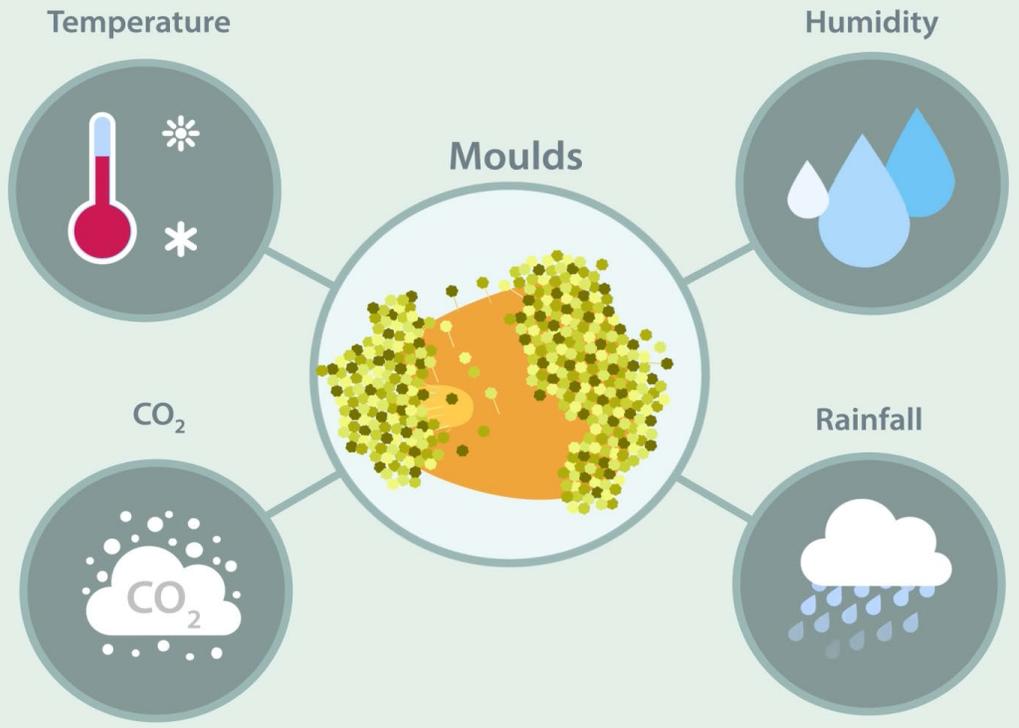
Fumonisin . Mainly found in corn and in much processed food

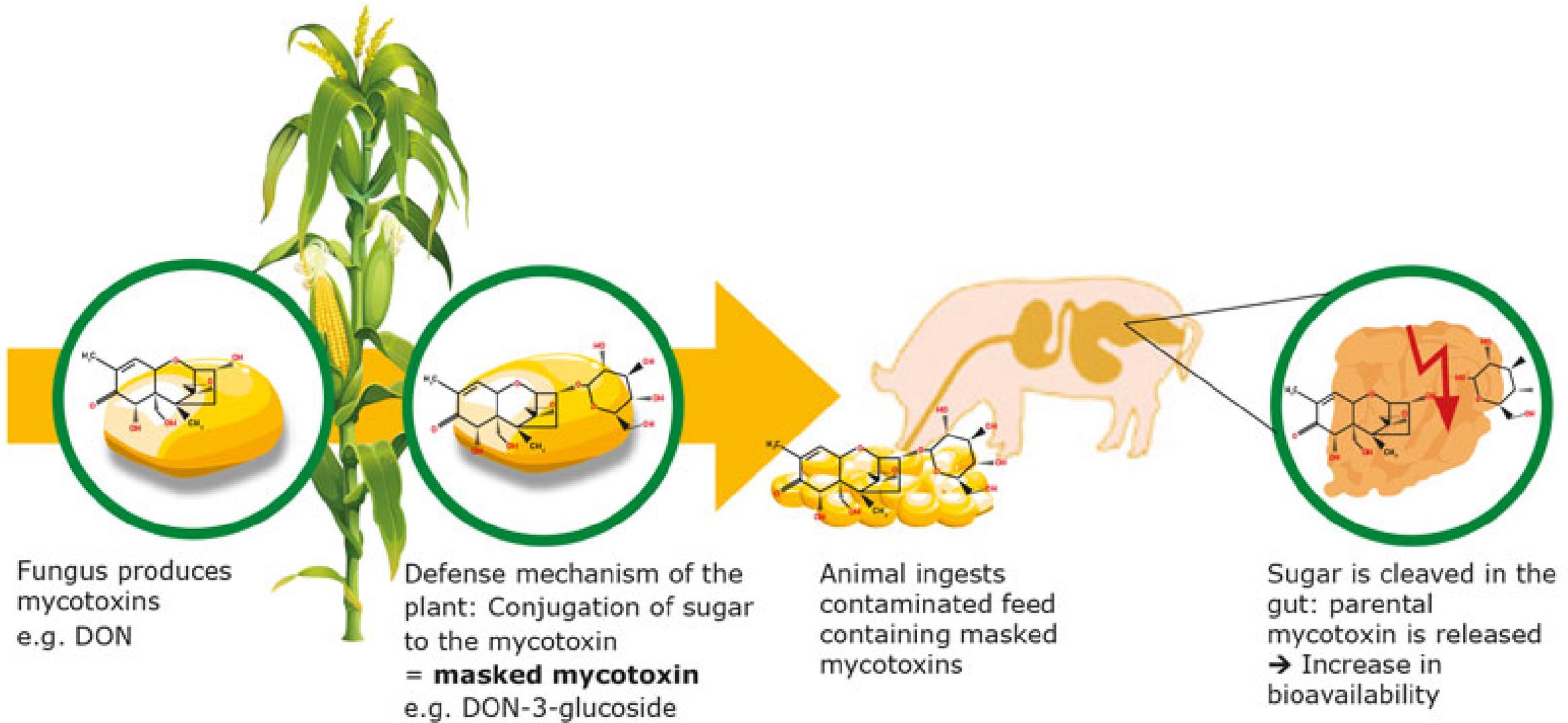
Trichothecenes Manly found in beers and wines

Zearalenones Act by imitating hormones especially estrogens – used by cattle breeders to produce more milk and linked to obesity and cancers



Moulds





AFLATOXINS

*“**Aflatoxins** have carcinogenic, teratogenic, hepatotoxic, mutagenic and immunosuppressive effects, with the liver being the target organ. Aflatoxins are associated with both **acute toxicity** as well as chronic **carcinogenicity** in humans and animals. Aflatoxins are regularly found in nuts, **dried fruits, spices, oil seeds, cereals, corn, rice and milk.***

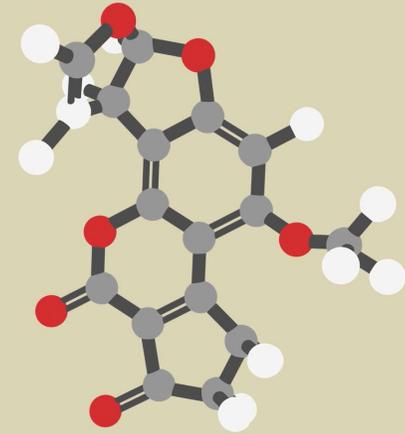
Contamination can occur before harvest, during the time between harvesting and drying, and in storage.

Contamination of milk by aflatoxin is caused when cows are fed with contaminated feed, for example contaminated corn or peanut cake of poor quality.

*Aflatoxins are chemically and thermally stable during food processing, including cooking, boiling, baking, frying, **roasting and pasteurization.***

The best way to avoid contamination is prevention.” Spanjer 2018

Aflatoxin



Aflatoxin poisoning in popular foods: stunting, cancers & death



41% of children were found to have aflatoxin poisoning, leading to cancers, stunting and poor growth; 25% of pregnant women were consuming dangerous levels of aflatoxin.

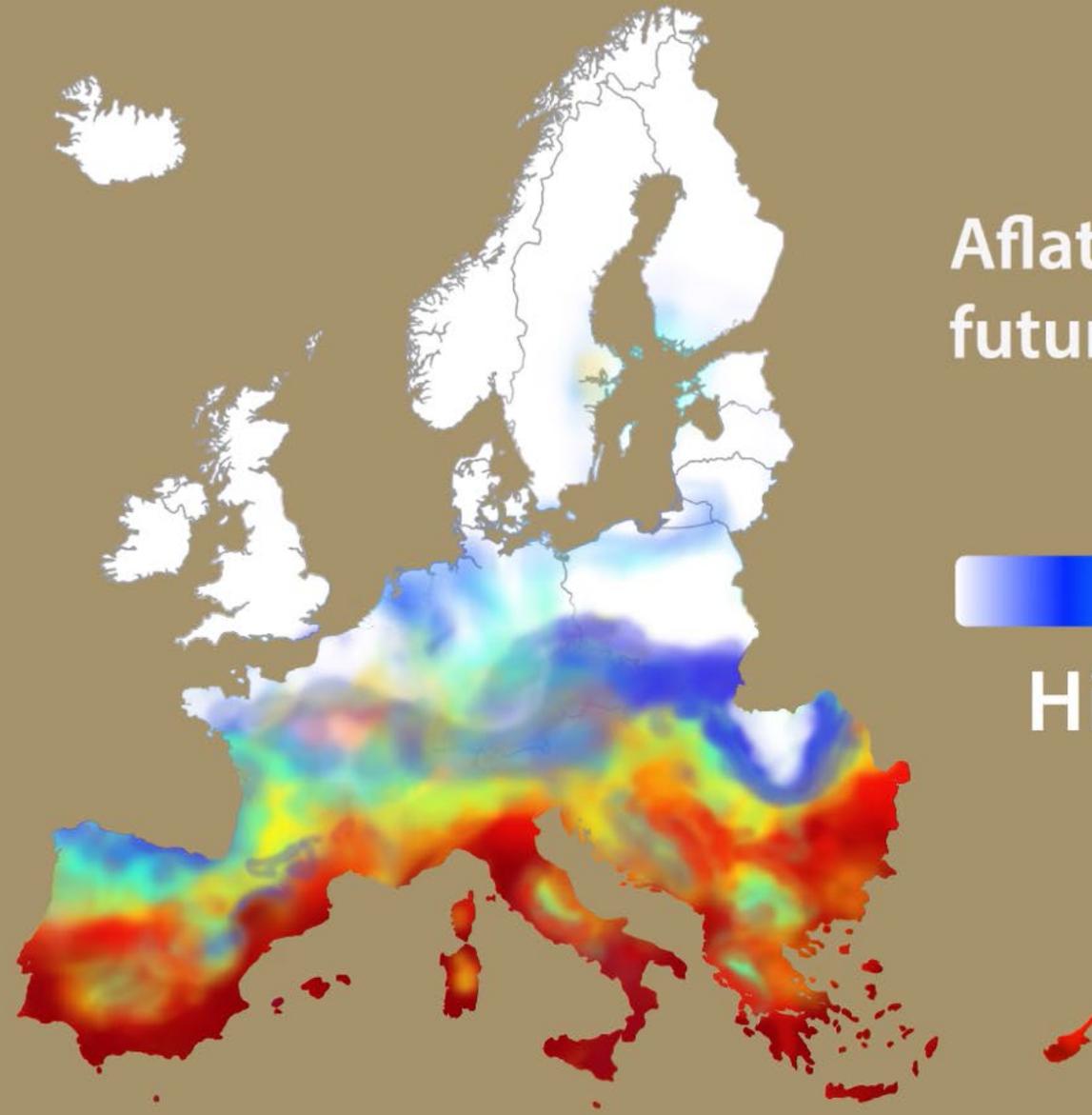
ILRI 2016

Aflatoxin in maize,
future scenario risk map

+2° C



Highest Risk



SOLUTIONS





SEED SOVEREIGNTY

Seed Sovereignty reclaims seeds and biodiversity as commons and public good. The farmer's rights to breed and exchange diverse Open Source Seeds which can be saved and which are not patented, genetically modified, owned or controlled by emerging seed giants'. - Lexicon of Food