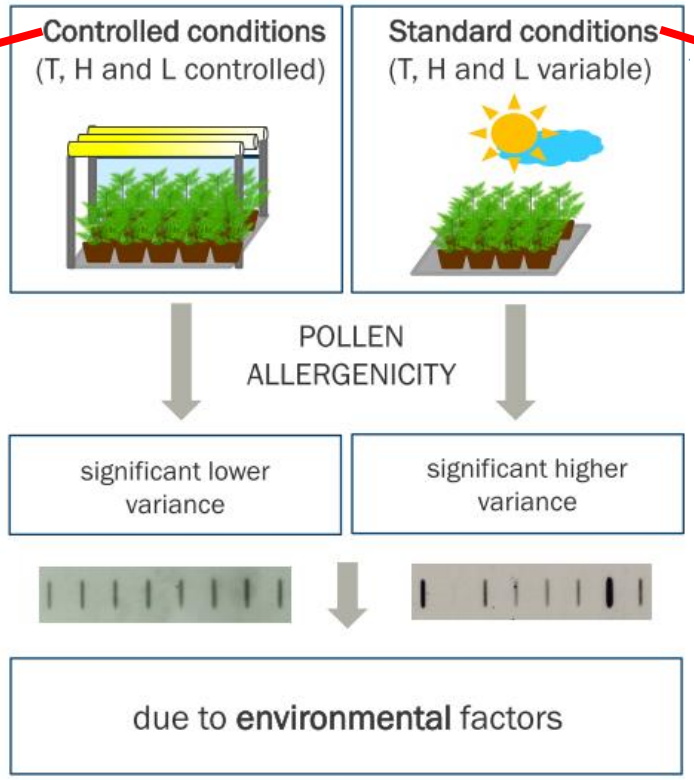
ICA2018
11th International Congress on Aerobiology
3-7 September 2018, Parma, Italy

Is pollen allergenicity a temperature-responsive trait in common ragweed (*A. artemisiifolia* L.)?

Rodolfo Gentili, Chiara Montagnani, Riccardo Asero, Gianni Mistrello, Maria Francesca Guarino, Sarah Caronni, Sandra Citterio

Previous experiments….



Pollen allergenicity → **Epigenetic controlled trait governed by environmental conditions (T, H and L)**

OPEN

Is ragweed pollen allergenicity governed by environmental conditions during plant growth and flowering?

Received: 11 April 2016
Accepted: 01 July 2016
Published: 26 July 2016

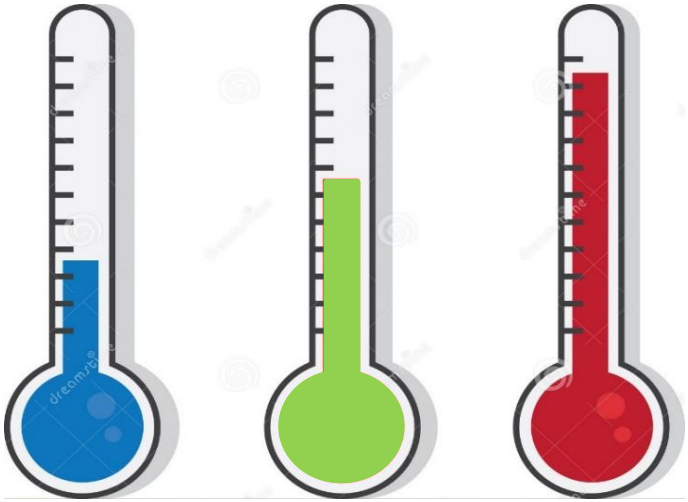
Alessandra Ghiani[1,*], Silvia Ciappetta[1,*], Rodolfo Gentili[1], Riccardo Asero[2] & Sandra Citterio[1]

SCIENTIFIC REPORTS | 6:30438 | DOI: 10.1038/srep30438

Determination of temperature effect: germination and growth conditions

3 growth rooms:

- **constant photoperiod (15-9 h light-dark)**
- **constant intensity of light (Osram Dulux L 36W/840 Lumilux, 2900 lm, total 300-350 LUX).**
- **3 thermal regimes:**



LT **IT** **HT**

18-14 °C **24-20 °C** **30-26 °C**

51 plants per temperature

a total of 153 plants

Determination of temperature effect: pollen collection

- During flowering:
  - Male inflorescences were covered with a modified ARASYSTEM to collect pollen grains

- Sampled pollen was stored in 2 ml eppendorf in boxes containing silica gel at room temperature

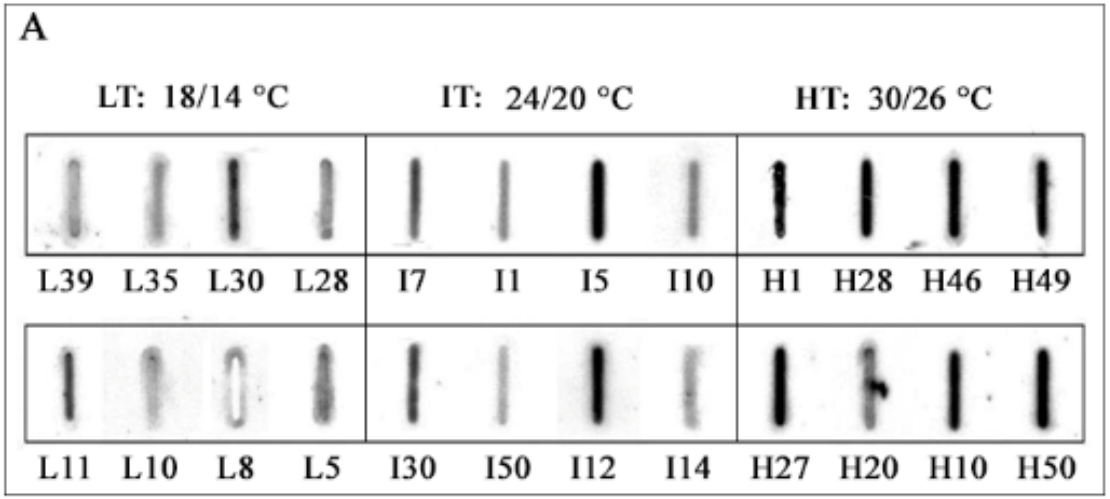
- Pollen from each single plant was used to obtain soluble protein extracts to determine pollen allergenic potency (by Slot blot, 1D/2D immunoblotting and LC-MS-MS)

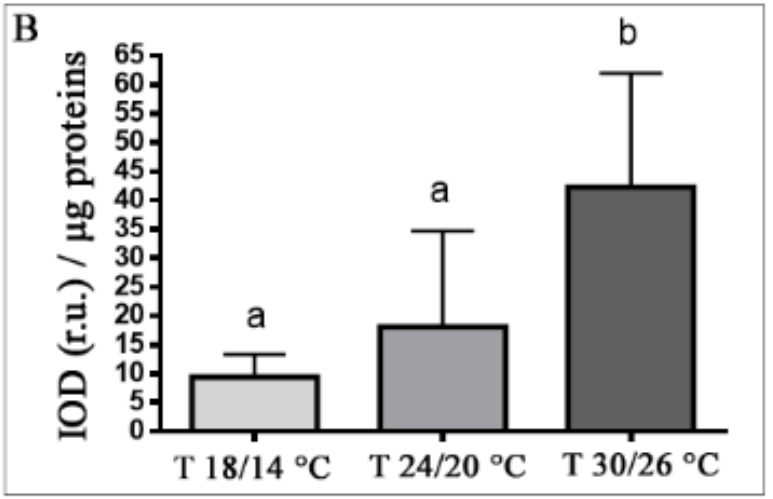
Determination of temperature effect:

pollen total allergenicity by Slot blot analysis

Representative Slot blot membrane

Each spot corresponds to a immunoreactive reaction with a pool of sera (patients sensitized to common ragweed).



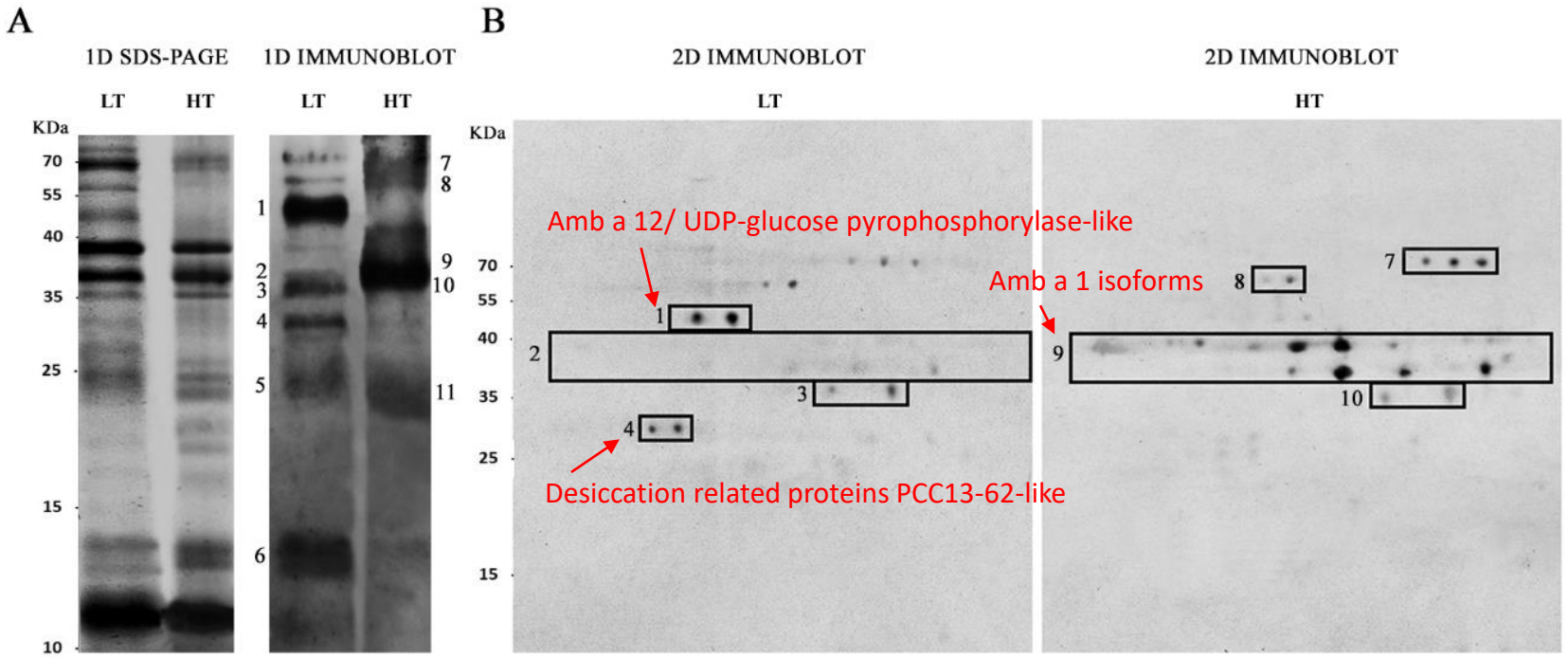


highest mean potential allergenicity

in pollen from plants grown at HT

Determination of temperature effect:

what can explain the different total pollen allergenicity? Allergen profile?



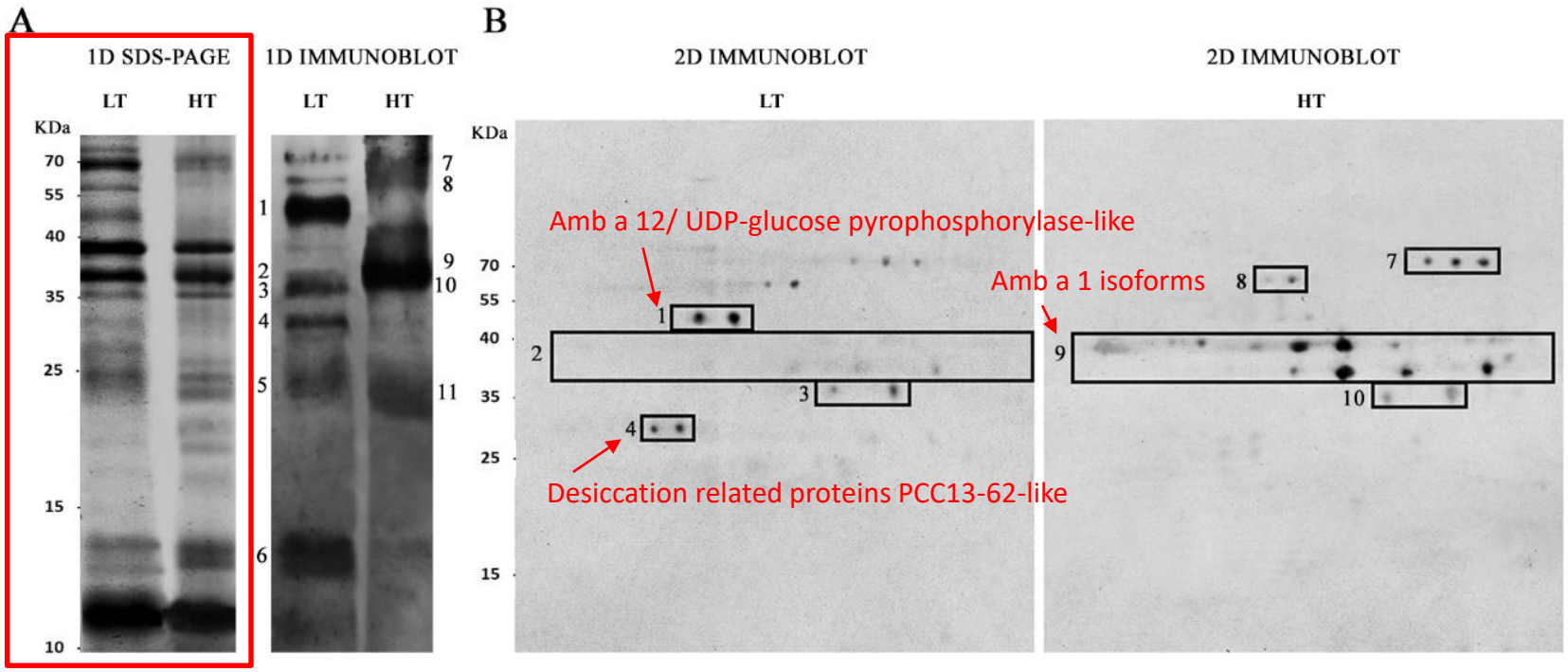
(1) Amb a 12 and UDP-glucose pyrophosphorylase-like, (2) Amb a 1.03, (3) Amb a 11, (4) Desiccation related protein PCC13-62-like, (5) triosephosphate isomerase like protein and Amb a 1.05, (6) Amb a 1 beta chain and Amb a 3, (7) berberine bridge enzyme-like 21, (8) glyoxal oxidase enzyme N-terminus like, (9) Amb a 1 isoforms, (10) Amb a 11, (11) triosephosphate isomerase like protein and Amb a 1.05.

LT and HT show different allergenic profiles:

- **at HT the allergenicity is mainly related Amb a 1 isoforms .**
- **at LT the allergenicity is mainly related to Amb a 12/ UDP-glucose pyrophosphorylase-like and to a desiccation related protein PCC13-62-like**

Determination of temperature effect:

what can explain the different allergen profile?



- **Allergen expression**

  Amb a 12/ UDP-glucose pyrophosphorylase-like and Desiccation related protein PCC13-62 like are only expressed in LT samples

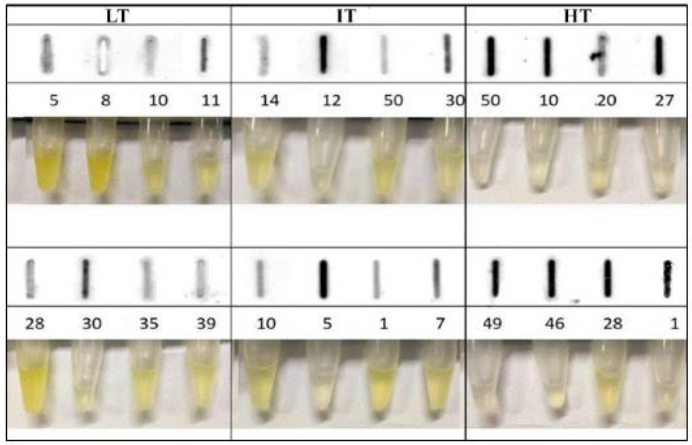
- **Allergen- IgE binding**

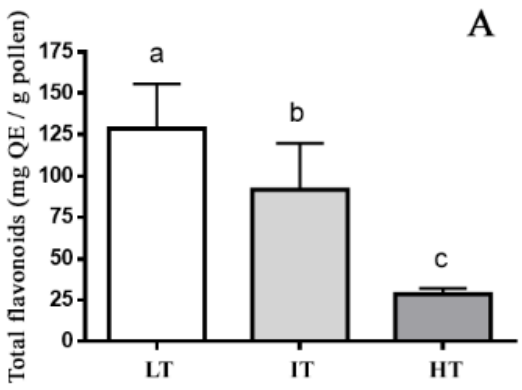
  HT affects Amb a 1- IgE binding

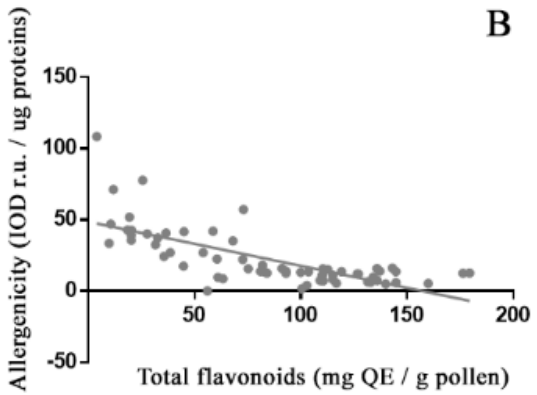
Determination of temperature effect:

what can explain the different Amb a 1 – IgE binding? Pollen flavonoids?

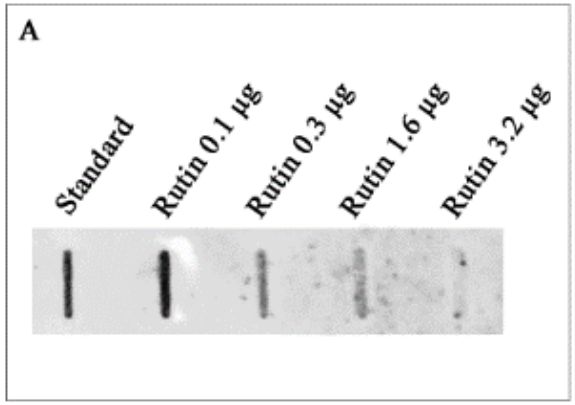
- **negative relationship between pollen allergenicity and flavonoid content**

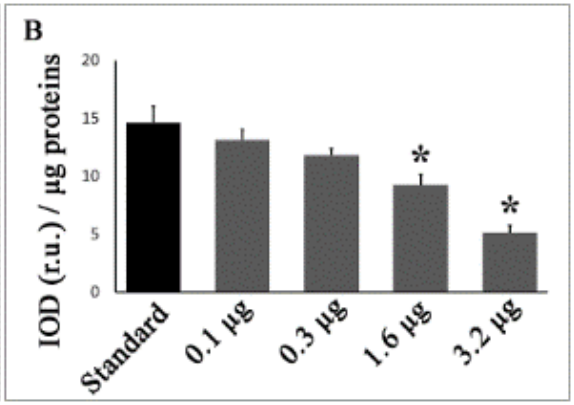






- **Quercetin-type flavonols addition to pollen extracts affects allergenicity**

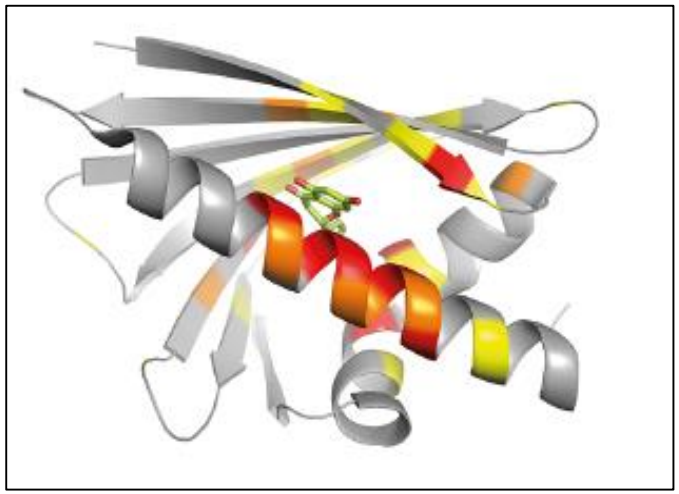




Flavonoids affect the allergen – IgE binding

Determination of temperature effect:
what can explain the different Amb a 1 – IgE binding? Pollen flavonoids?

Flavonoids are physiological ligands of PR10 proteins such as Bet v 1 and Fra a allergens



Seutter von Loetzen et al. 2014

Natural binding between Bet v 1 (major allergen of birch, PR10, pathogenesis-related protein) and quercetin-3-0-soforosid.

However…

the relevance of these interactions for allergenicity is still to be determined

Determination of temperature effect: conclusions

Summarizing….

Temperature modulates pollen allergenicity

- **through the expression of different allergenic proteins**
- **by changing flavonoid content in pollen**

⟶ influence on Amb a 1 – IgE binding

Is pollen allergenicity a temperature-responsive trait in common ragweed (*A. artemisiifolia* L.)?

Yes, it is

⟹ Increasing temperature increases pollen allergenicity

THANK YOU