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The quality and glucosinolate composition of cruciferous sprouts under elicitor treatments using MeJA and LED lights

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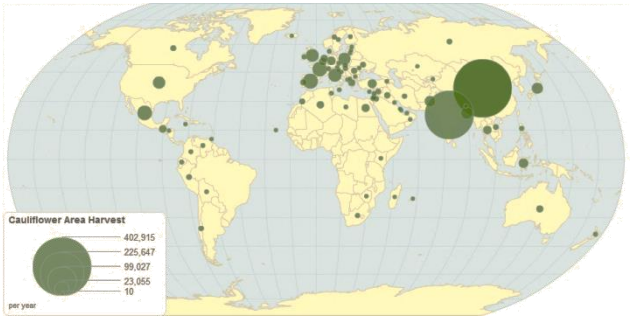
Cruciferous vegetables (*Brassicaceae* family)

- 350 genera and about 3,700 species
- Consumed by people all over the world, especially in China, Japan, India and European countries.



Brassica oleracea (broccoli, cabbage, cauliflower, Brussels sprouts)

Raphanus sativus (radish)

Sinapis alba (mustard)





Baenas, N., *et al. 2015. FRI, 69, 305–312.*
Baenas, N., *et al. 2014. Molecules, 19(9), 13541-13563.*
Baenas, N, *et al. 2014. JAFC, 62, 1881−1889.*
Baenas, N, *et al. 2012. JAFC, 60, 11409−11420.*

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Cruciferous vegetables (*Brassicaceae* family)

 These vegetables are a rich source of:

Nutrients

- Folates
- Minerals (Ca, Fe, K, Cu…)
- Vitamins (A, E, C and K)

Bioactive compounds

- Carotenoids
- Phenolic compounds
- **Glucosinolates**

Beneficial effects against

- Cancer
- Cardiovascular diseases
- Neurological disorders
- Diabetes

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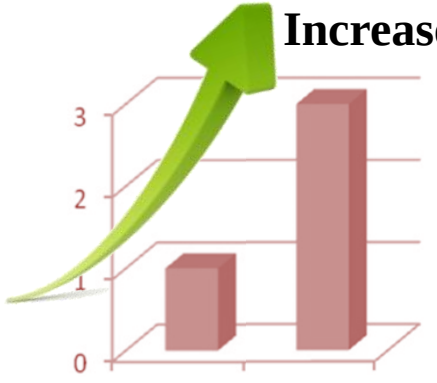
Enriching sprouts in bioactive compounds by elicitation

Elicitors: Abiotic or Biotic

Activate defense responses

Expression of defense-related genes

Bioactive compounds synthesis



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Enriching sprouts in bioactive compounds by elicitation

The use of LEDs (light-emitting diodes) for the development of microgreens, microvegetables and **sprouts** (germinating seeds of 5 to 10d of age depending on variety) has been incorporated to food production systems in the last few years. Great potential for food security (sustainability, soilless, indoor, etc.).

Aims:

- Development of cruciferous sprouts in hydroponics elicited with LED lighting and Methyl-Jasmonate (MeJA) to bio-stimulate the production of glucosinolates.

- Evaluate the differential effect of two types of LEDs (commercial *versus* experimental) to gain knowledge on the response by means of performance (germination rate, biomass yield) and phytochemical composition of fresh edible sprouts of cruciferous varieties (broccoli, radish, cabbage and mustard).

- Evaluate the combined effect of LEDs treatments and MeJA (250 µM) spray as biotic elicitor on the glucosinolate composition of the cruciferous varieties under study.

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Materials and Methods

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Cruciferous (Brassicaceae) seeds for sprouting:

Broccoli	Brassica olreacea var. italica L. cv. Calabrese
White mustard	Sinapis alba L.
Red radish	Raphanus sativus var. sativus L. cv. Sango
Red cabbage	B. oleracea var. capitata f. rubra L.

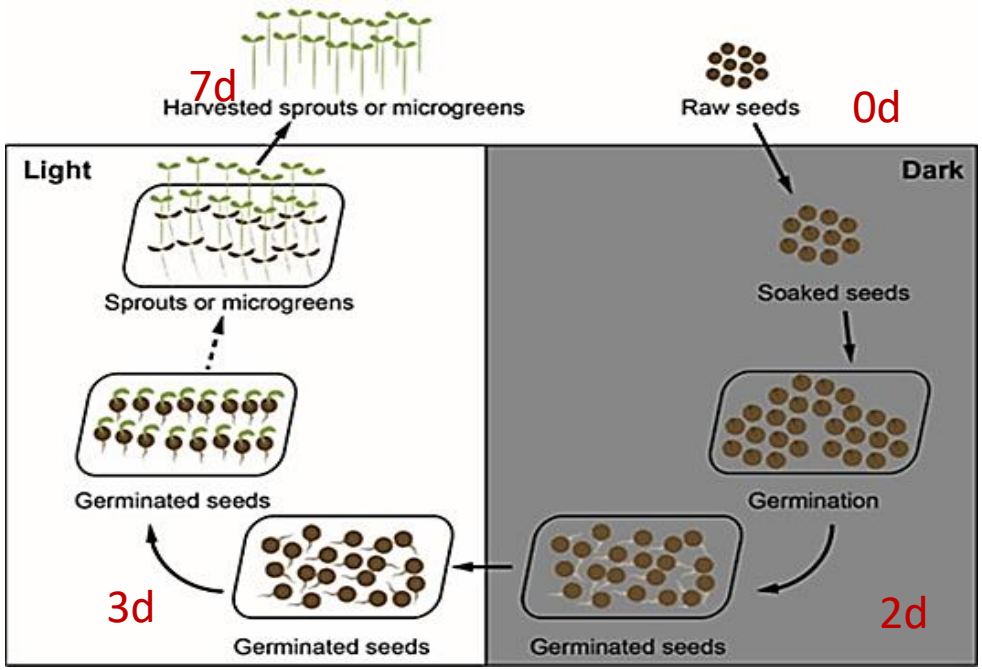

Diagram extracted from Zhang et al.(2020)

Experimental
LEDs (Sysled)

Commercial
LEDs (Phillips)

(HPLC-PDA
HPLC-PDA-ESI-MSn)

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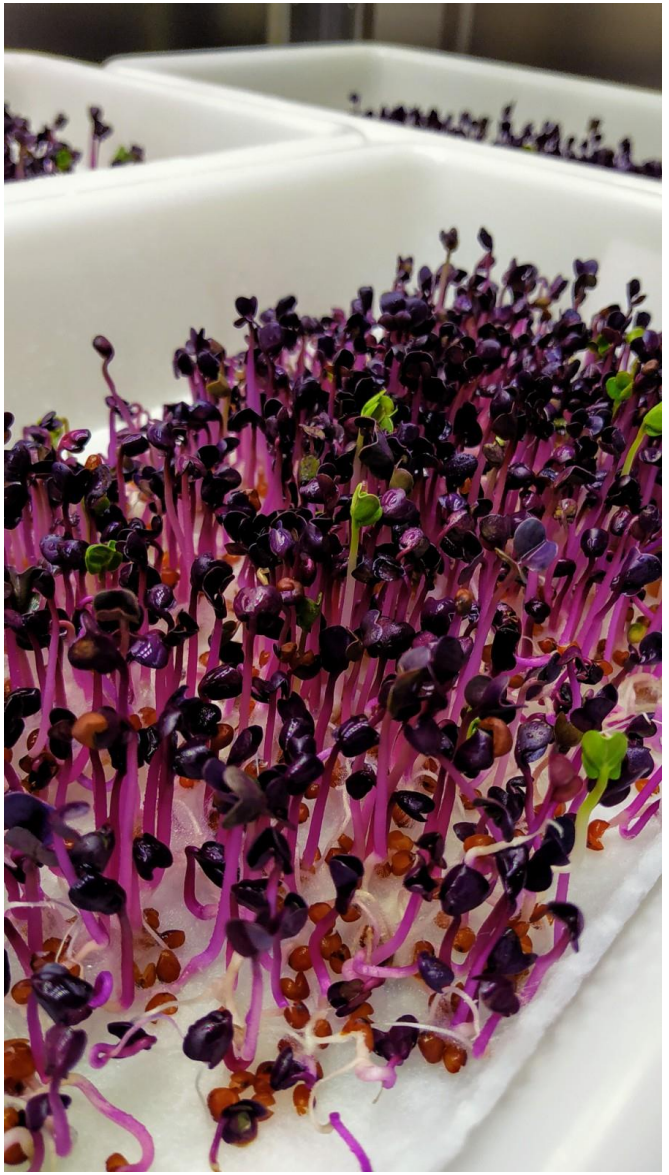
Results and Discussion



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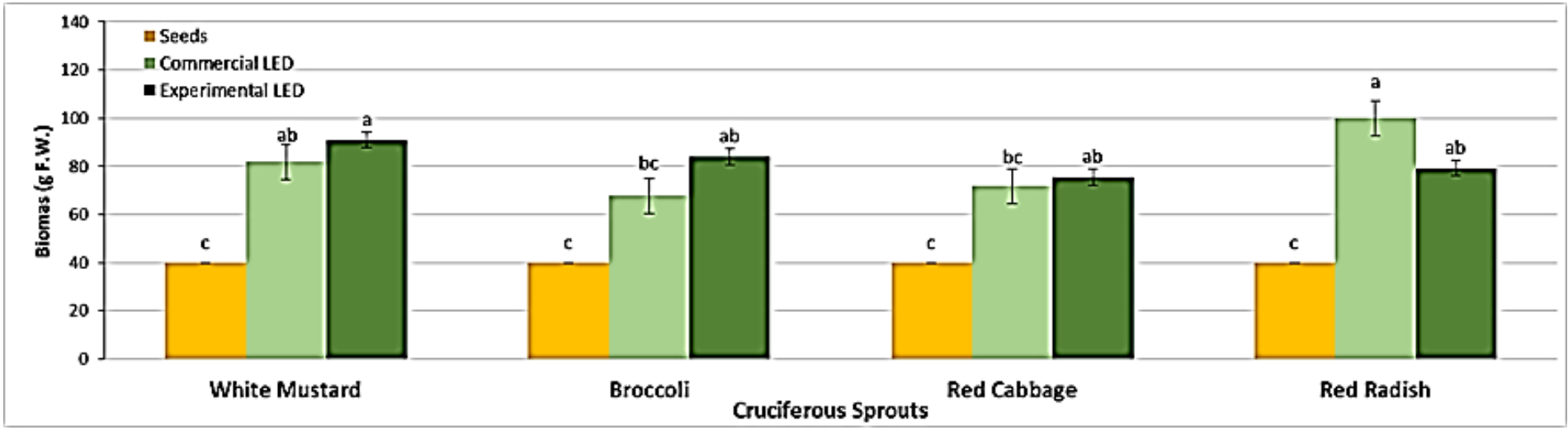
Commercial LEDs (Phillips)

Experimental LEDs (Sysled)



Biomass (Fresh Weight)

Glucosinolates

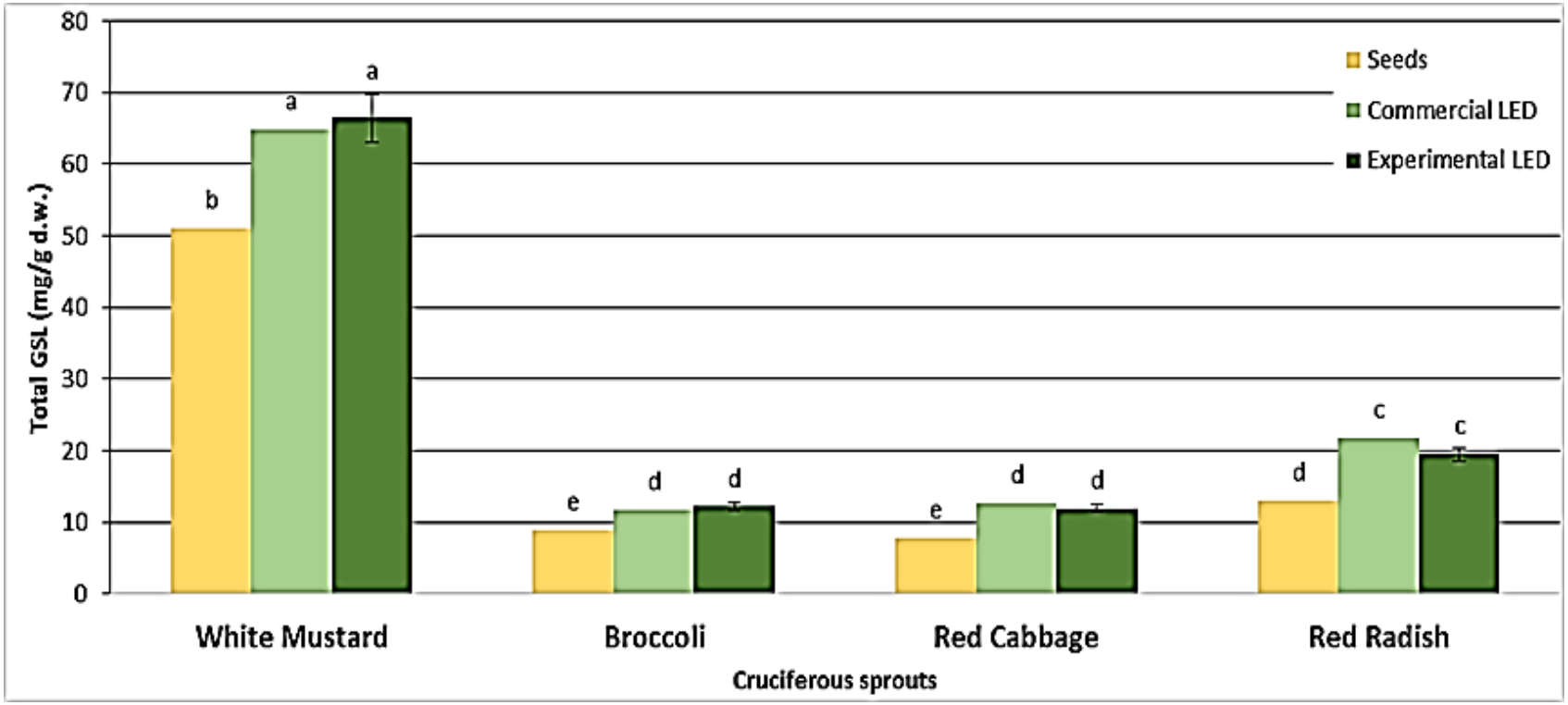


Table 1. Total Glucosinolates (mg/100g fresh weight) of sprouts of White Mustard, Broccoli, Red Cabbage and Red Radish, under the two different LED lighting comparing Commercial *versus* Experimental LEDs and elicited with MeJA (250μM). The numbers show the average values per treatment (n=3).

Sprout variety	Experimental LEDs		Commercial LEDs	
	Control	MeJA	Control	MeJA
White Mustard	179.2	220.5	177.4	231.3
Broccoli	45.8	63.1	42.8	59.4
Red Cabbage	112.6	275.2	124.1	272.9
Red Radish	55.4	62.9	55.1	62.8

Conclusive Remarks

- The use of LED lights for the growing of edible cruciferous sprouts is beneficial in terms of biomass production and phytochemical content (glucosinolates), without negative effects.

- The use of LED lights is of great interest in the production of foods because of the reduced energy consumption and in this case, the commercial *versus* experimental lights were very similar in the effects on sprouts. It would be advisable to recommend the experimental LEDs for future research and production purposes.

- The use of MeJA (250 µM) was positive, confirming previous results, and increased the content of total GSL in the cruciferous sprouts. The intensity of the response was dependent on the genotype. The influence of the combination of LED lights and MeJA was limited. More research on these aspects and the implementation of additional techniques is necessary.

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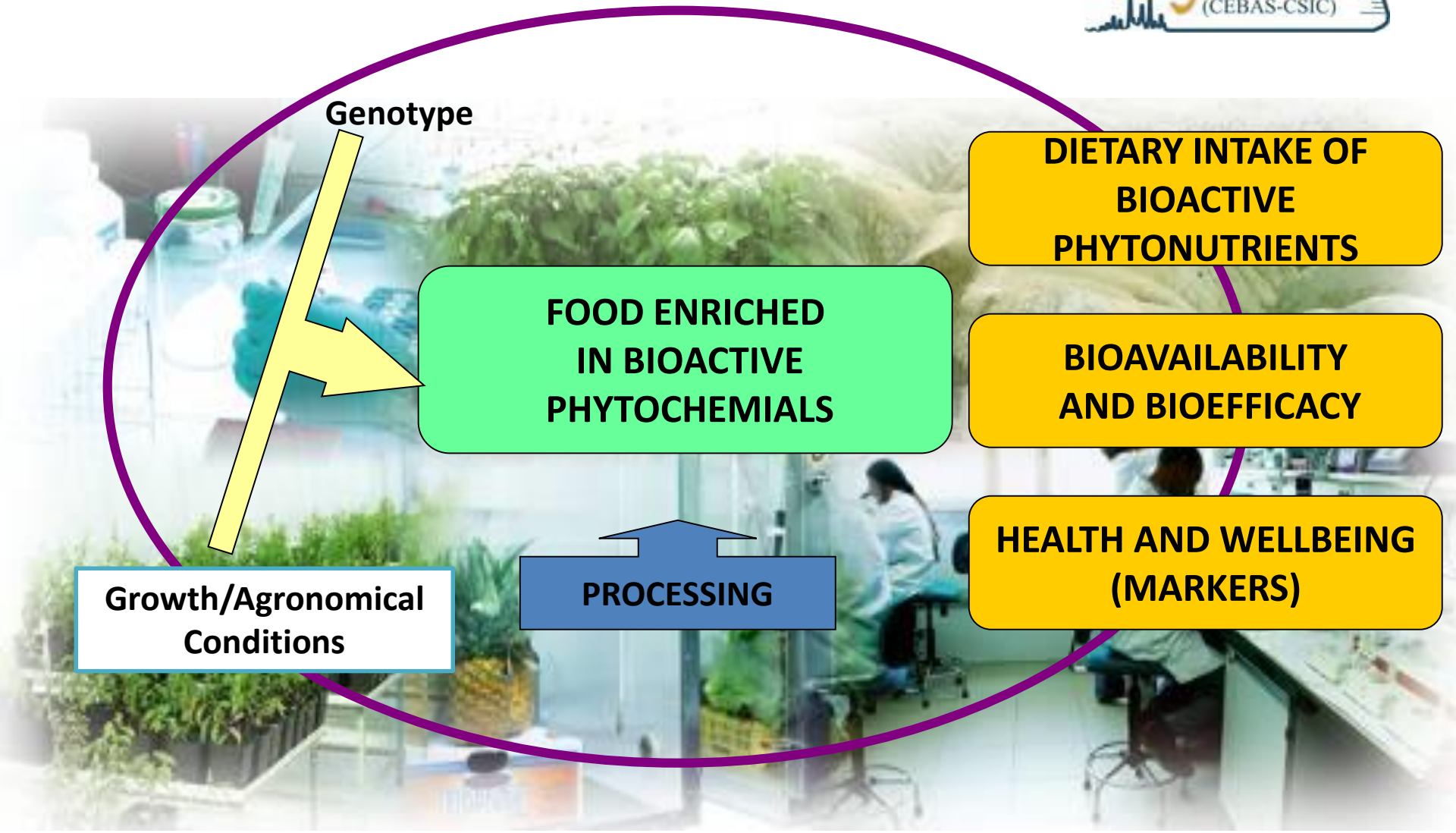
From Farm to Health Integrated Sudy



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Thank you for your attention

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Quality, Safety and Bioactivity of plant foods

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