

Ecdysterone Content in Selected Vegetables and Crops - Applications in Sport

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INTRODUCTION

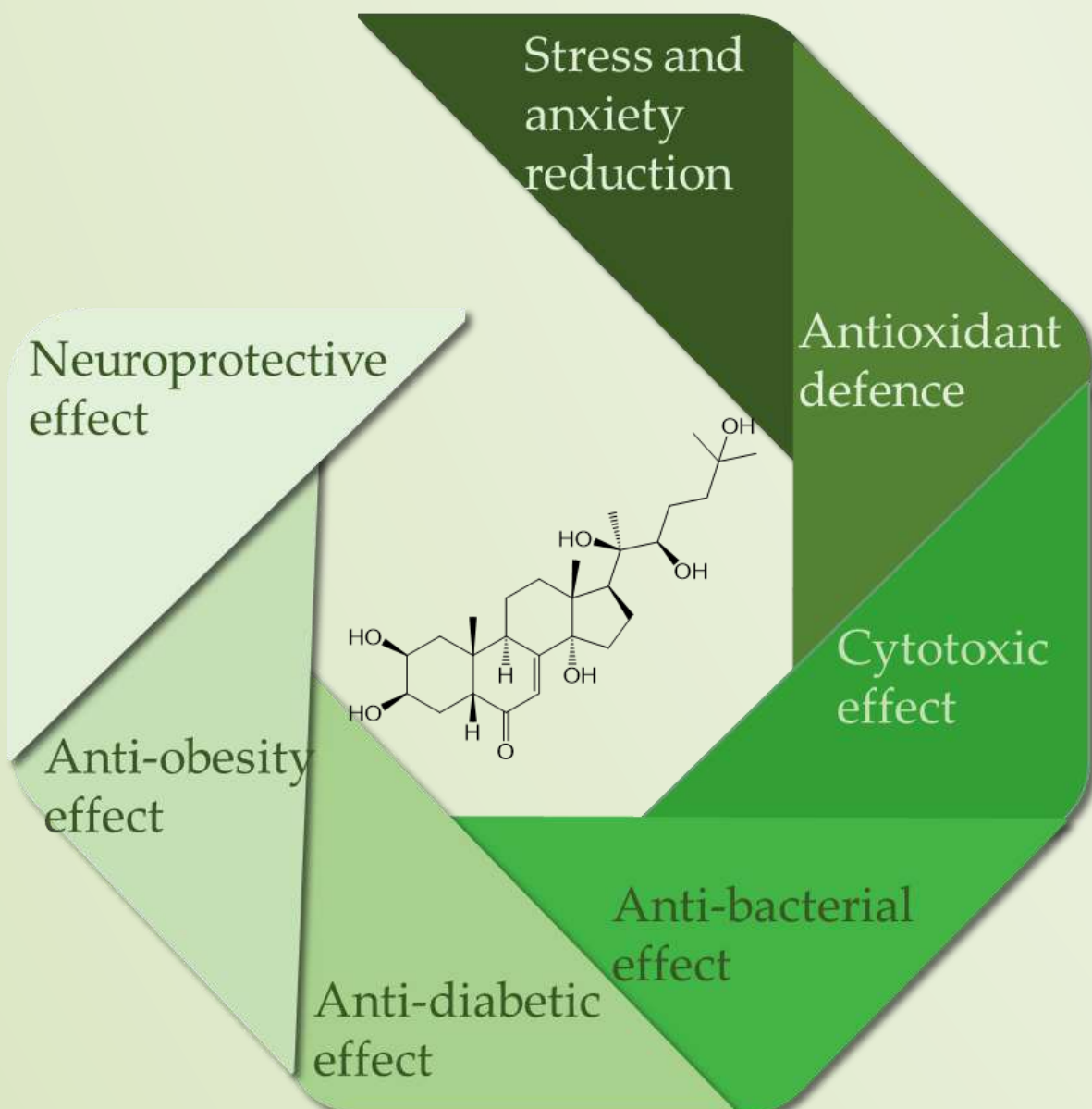


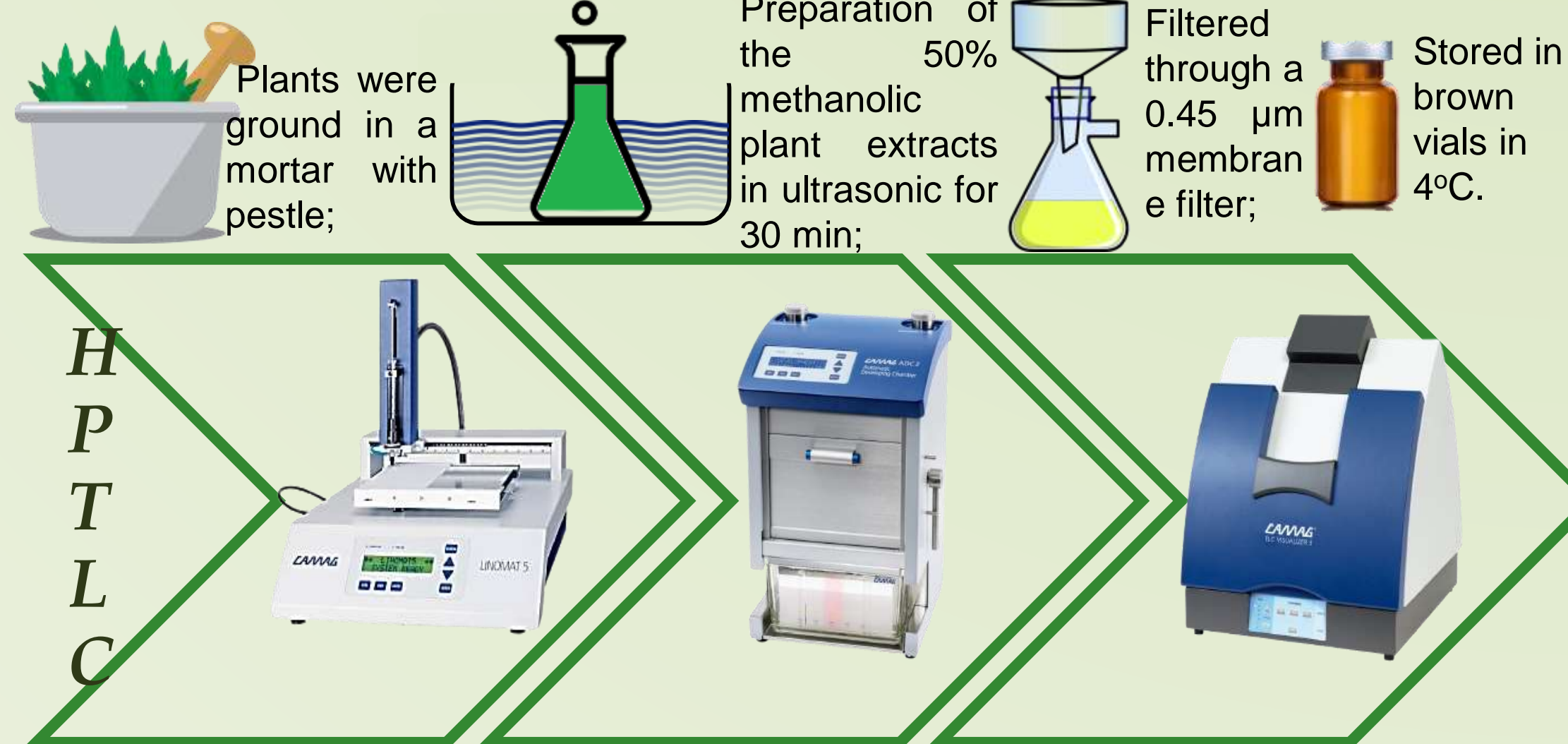
Figure 1. 20-hydroxyecdysterone biological effects.

- Among more than 520 known ecdysteroids, one of the most common is 20-hydroxyecdysterone (20-HE);
- Ecdysterone is a structurally characteristic ecdysteroid;
- Important for the biological activity of ecdysterone are the double bond at C-7, the keto group at C-6, and the hydroxyl groups at positions C-2, C-3, C-14, and C-22, the hydroxyl group at C-20 correlates with anabolic activity;
- In 2020 the World Anti-Doping Agency included 20-HE to their monitoring;
- It is widely thought to be nontoxic to mammals.

AIM

The aim of the current study was to quantify of 20-hydroxyecdysone, in various vegetable and crop extracts.

METHOD



- It was used the previously developed and validated HPTLC method for quantification of PDs – 20E, TU and PA [1];
- CAMAG HPTLC system (CAMAG, Muttenz, Switzerland);
- Plates - HPTLC glass plates pre-coated with normal-phase silica gel (Merck, Darmstadt, Germany);
- The application type - band, front - 70 mm;
- The mobile phase - methanol: acetonitrile 10:90 (v/v), volume of 10 mL;
- Time for development - 10 min, drying – 5 min;
- Detection was performed at 254 nm.

RESULTS & DISCUSSION

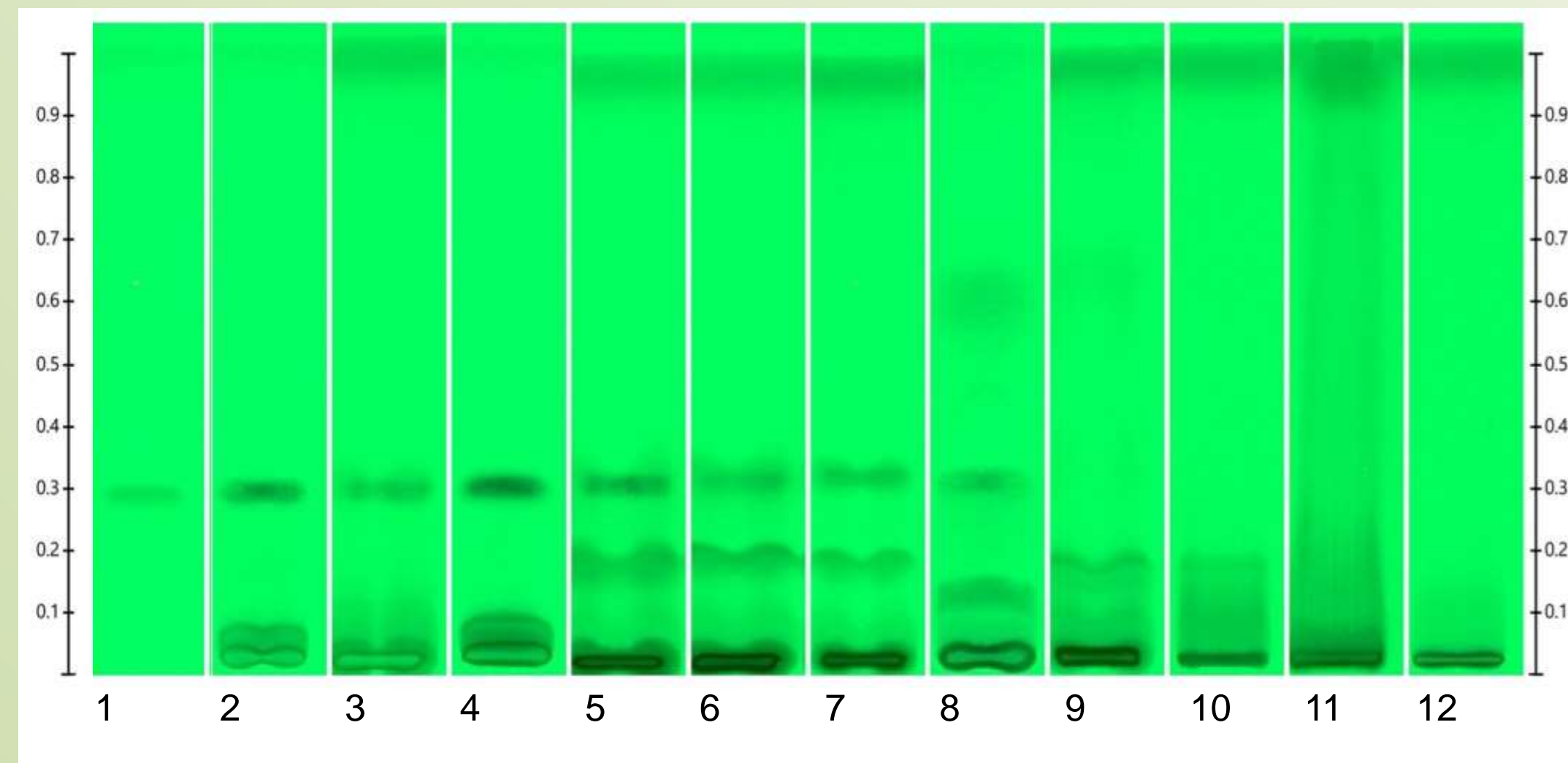


Figure 2. The HPTLC chromatogram of: 1. 20-HE 0.75 µg·band⁻¹; 2. White quinoa seeds extract (20 µL); 3. Red quinoa seeds extract (20 µL); 4. Kaniwa seeds extract (20 µL); 5. Spinach leaves extract 1 (20 µL); 6. Spinach leaves extract 2 (20 µL); 7. Spinach leaves extract 3 (20 µL); 8. Asparagus stems extract (20 µL); 9. Arugula leaves extract (50 µL); 10. Parsley leaves extract (50 µL); 11. Rumex leaves extract (50 µL); 12. Stinging nettle leaves extract (50 µL).

20-hydroxyecdysterone:

- promotes protein synthesis;
- improvements in strength, endurance;
- has not been linked to significant side effects.

20-hydroxyecdysterone is found in plants like spinach, quinoa, and asparagus, all of which are considered beneficial in athletes' diets. Its presence in supplements has made it more accessible for targeted performance benefits.

CONCLUSION

Ecdysterone is isolated not only from medicinal plant species including *Cyanotis arachnoidea*, *Rhaponticum carthamoides*, *Vitex glabrata*, *Serratula coronata*, but also from some vegetables and crops, such as quinoa, kaniwa, spinach and asparagus. The results contribute to the growing therapeutic potential of phytoecdysteroidss, which could be further explored in the development of nutraceuticals, and pharmaceuticals.

Table 1. 20-hydroxyecdysterone content in edible plants.

Prepared extracts	20-hydroxyecdysterone
White quinoa	310 µg/g dry mass
Red quinoa	259 µg/g dry mass
Kaniwa	670 µg/g dry mass
Spinach	252-455 µg/g dry mass
Asparagus	189 µg/g dry mass
Parsley	ND
Arugula	ND
Rumex	ND
Stinging nettle	ND

The results present the mean values for the three independent samples of each product and extract. The standard error of the mean does not exceed 2% and has been omitted to simplify the results.

REFERENCES

Todorova, V.; Savova, M.S.; Ivanova, S.; Ivanov, K.; Georgiev, M.I. Anti-Adipogenic Activity of *Rhaponticum Carthamoides* and Its Secondary Metabolites. *Nutrients* **2023**, *15*, 3061, doi:10.3390/nu15133061.