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DESAGA Technology

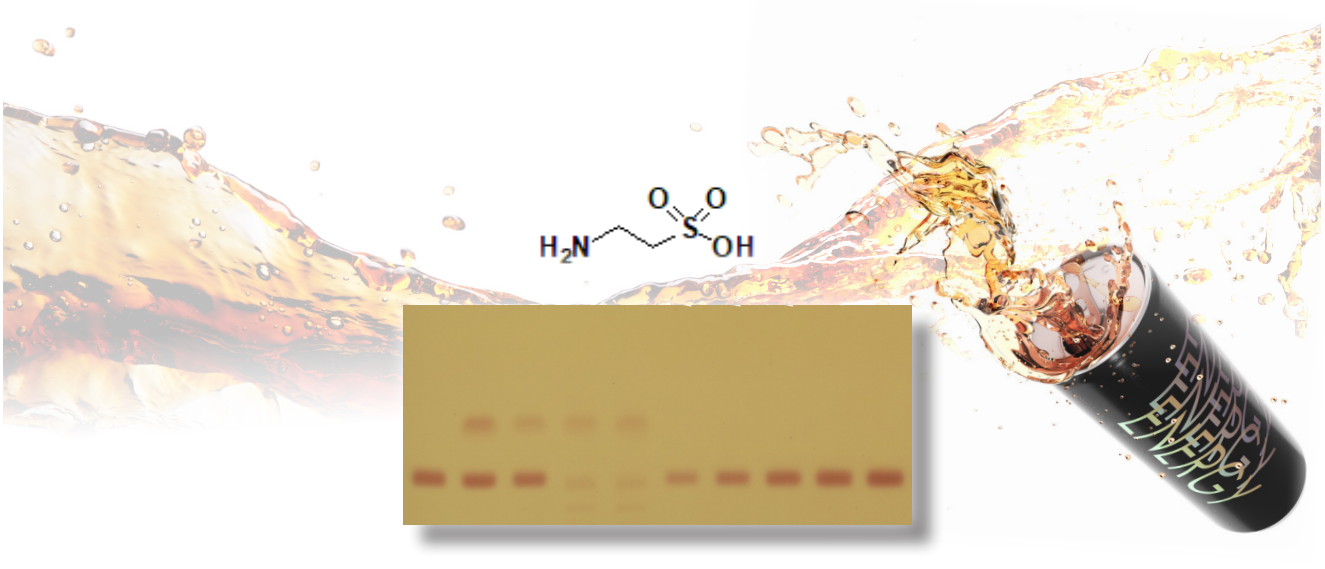
Ready-to-use

Application Notes from the lab for the lab

Detection and Determination of Taurine in Energy Drinks by ChromaJet DS20, ProViDoc System DD70 and HPTLC-Densitometer CD60

Introduction

Energy drinks with high taurine contents (up to 4000 mg/L are usually granted through certificates of exemption) are provided increasingly on the market. The extensive usage of energy drinks with taurine enhances the cases with unwanted side effects. To check the valid maximum limits of taurine, a fast and efficient analytical method is necessary to apply [1,2].
High-Performance Thin-Layer Chromatography (HPTLC) is a rapid and cost-effective analytical technique for analysing different samples under the same conditions.
Here evaluation of taurine in energy drinks from different suppliers was performed by ProViDoc System DD70 after post-chromatographic derivatization with Ninhydrin by ChromaJet DS20. Additionally, quantification was carried out by HPTLC-Densitometer CD60.



Keywords

HPTLC, Food, Drinks, Taurine, Ninhydrin, HPTLC-Applicator AS30, Autosampler BS35, Standard Separating Chamber, ProViDoc System DD70, ChromaJet DS20, Thermoplate S *plus,* HPTLC-Densitometer CD60

Sample and Standard Preparation

Five different energy drinks from different suppliers were examined. For each sample, the following steps were performed. The energy drink samples were degassed for 20 min by shaking. For preparation of the standard solution, 0.01 g of taurine standard was dissolved in 10 mL water.

Derivatization Reagent Preparation

Ninhydrin: 3 g of Ninhydrin was dissolved in 30 mL of n-butanol and 0.3 mL of acetic acid 97 %.

Required Devices and Applied Parameters

Samples were applied onto pre-coated HPTLC plates by the HPTLC-Applicator AS30 and Autosampler BS35. The plates were developed in a solvent system inside the Standard Separating Chamber. For visualization of taurine, the plate was sprayed by Ninhydrin reagent with fully automatic spraying device ChromaJet DS20; followed by heating at 100 °C for 2 min on the heating plate Thermoplate S *plus*. Afterwards, documentation of the developed plate was performed under white light by imaging ProViDoc system DD70. Finally, the determination of taurine in energy drink samples was carried out by HPTLC-Densitometer CD60. Figure A shows the applied parameters and the used devices in this project.

Sample Application
HPTLC-Applicator AS30
Autosampler BS35

- Band length: 5 mm
- Track distance: 12 mm
- Application volume: 0.5 µL (sample), 0.5 - 5 µL (standard)
- Start position: 15 mm

Development
Standard Separating Chamber

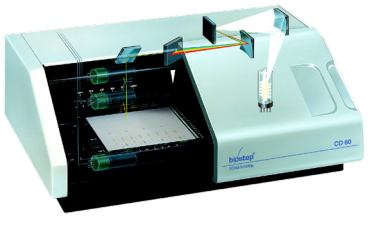
- HPTLC plates Nano-DURASIL-20 UV254 (Macherey-Nagel), 20 x 10 cm
- Developing solvent: 2-Propanol / Water
- Saturation time: 20 min, 4 mL solvent
- Migration time: 1 h

Derivatization
ChromaJet DS20

- Ninhydrin reagent
- Spray cycles: 3
- Air throughput: 70 %
- Reagent throughput: 100 s/mL

Documentation
ProViDoc System DD70

- Under visible light



Quantification
HPTLC-Densitometer CD60

- Slit dimention: 6 x 0.1 mm
- Wavelength: 570 nm

Fig. A. Work flow for the identification and determination of taurine in energy drinks.

Results

Post-Chromatographic Derivatization and Documentation

Taurine was detected by ProViDoc system DD70 under white light at a *hRF* value of 26, see developed plate in figure B.

- Note: By using spraying device ChromaJet DS20, derivatization reagents are sprayed onto HPTLC plates homogeneously with highest precision.

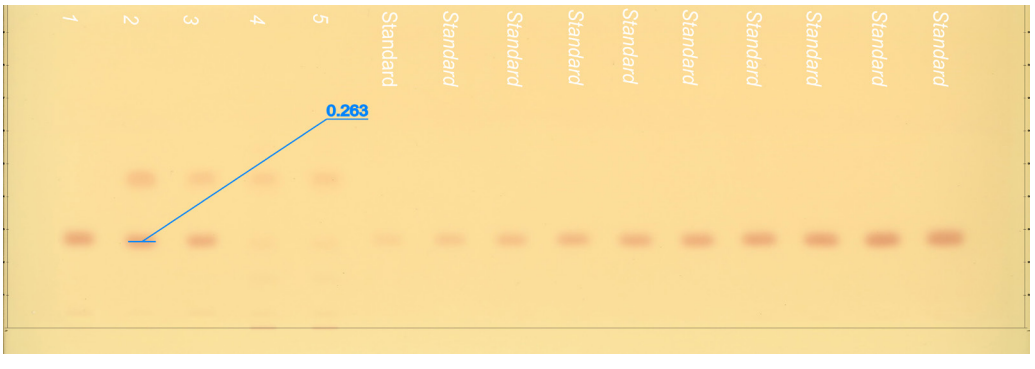


Fig. B. HPTLC plate under visible light, tracks 1 - 5: samples (0.5 µL each); tracks 6 -15: standards (0.5 - 5 µL).

Turine Calibration Curve

Quantification was carried out by biostep HPTLC-Densitometer CD60 and ProQuant software in absorption mode at 570 nm using a deuterium/tungsten lamp. The amount of taurine in the samples was calculated by doing a 4-point-calibration (Figure C). The taurine values from those drinks in which taurine was declared to be 4 mg/mL, were determined to be 6.2 mg/mL for sample 1; 5.6 mg/mL for sample 2 and 4.8 mg/mL for sample 3 ($r = 0.99937$). Slit dimension: 6 x 0.1 mm; evaluation via linear regression via peak area (Figure C).

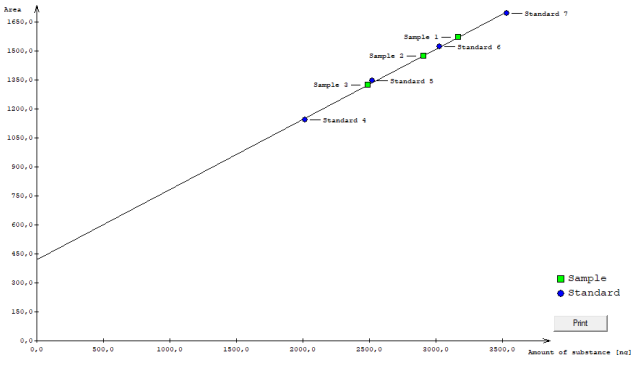


Fig. C. Calibration function of taurine standards and samples measured at 570 nm after derivatization, linear working range between 2000 and 3500 ng (linear regression via peak area).

Conclusion

These results show that HPTLC plates containing taurine can be homogenously visualized by spraying device ChromaJet DS20 and evaluated by imaging system ProViDoc DD70 and HPTLC-Densitometer CD60.
HPTLC is a quick and cost-effective technique suitable for qualitative and quantitative analytical tasks. The HPTLC method offers several advantages over liquid chromatographic methods, such as simultaneous analysis of multiple samples and standards on the same plate. This leads to higher sample throughput (lower analysis time), less costs per sample as well as less sample requirement. Less solvent consumption leads to reduced purchase and disposal costs.

Applied Devices and Material

Order No.	Description
BS130.500	HPTLC-Applicator AS30, 230 V, 10 µl dosing/ 25 µl filling syringe, incl. software
BS130.510	Autosampler BS35 for AS30, 230 V, incl. 80 sample vials
BS120.160	Standard Separating Chamber 200 × 200 mm with knob lid
BS130.700	ChromaJet DS 20, reagent spraying device, 230 V, software
BS121.845	Thermoplate S *plus*, 230 V
BS140.061	ProViDoc System DD70, incl. CabUVIS 230 V, documentation top with UV filter, digital reflex camera, software
BS131.800	HPTLC-Densitometer CD60, Transmission/Remission, 230 V, incl. interface, control/ evaluation software ProQuant

All solvents used for this experiment were bought from Carl Roth GmbH, Karlsruhe, Germany.

Literature

[1] G. B. Draganov, I. P. Pencheva, K. A. Todorova, *IJNFS.,* 2014, 3(2), 123.
[2] S. Triebel, C. Sproll, H. Reusch, R. Godelman, D. W. Lachenmeier, *J. Amino Acids*, 2007, 33, 451.

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