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環境資源科学研究センター 技術支援

「LC-QTOF-MS を用いたメタボローム解析」支援について (ver2.0)

理化学研究所

環境資源科学研究センター

質量分析・顕微鏡解析ユニット

主旨

理化学研究所環境資源科学研究センターは、研究技術支援の1つとして、「LC-QTOF-MS を用いたメタボローム解析」を共同研究として実施させていただきます。以下の注意点をよくお読みいただいたうえで担当者までお問い合わせください。

対象代謝物

二次代謝産物

- フェニルプロパノイド (桂皮酸類、リグナンなど)
- フラボノイド (フラボノール、アントシアニン、プロアントシアニジン、C-フラボンなど)
- サポニン
- フェノールアミド
- アルカロイド

使用機器

液体クロマトグラフィー-フォトダイオードアレイ-飛行時間型-質量分析 (LC-PDA-QTOF-MS) 装置

LC 部 Acquity UPLC (Waters)

PDA 部 Acquity PDA e λ (Waters)

MS 部 Xevo G2 QTof (Waters)

必要なもの

消耗品

- 2 ml チューブ (SARSTEDT Safe-seal micro tube 2mL, PP for extraction)
- ジルコニアビーズ (アズワン 5-4060-13 ジルコニアボール (ϕ 5mm) YTZ-5)

支援技術

① 非ターゲット分析

多変量解析 (PCA など) によるサンプルの比較解析

化学的情報（精密質量、組成式、構造名）の付与

② ターゲット分析

フラボノイドをターゲットとしたサンプルの比較解析

化学的情報（精密質量、組成式、構造名）の付与

研究支援の流れ

- ① 研究支援の事前連絡（貴研究室 → 当ユニット担当者）
- ② 事前打ち合わせ（目的、対象、サンプル数、納期の確認など）
- ③ 利用申請書提出（貴研究室 → 当ユニット、事務局）
- ④ 共同研究開始
- ⑤ 植物サンプルの授受における確認書の作成（**必須**）
- ⑥ 植物サンプルの授受における確認書、予備実験サンプル、本番サンプル、サンプルシートの提供（貴研究室 → 当ユニット担当者）
- ⑦ 測定結果（当ユニット担当者 → 貴研究室）
- ⑧ 結果の解釈（貴研究室 → 当ユニット）
- ⑨ データの解釈のフィードバック
- ⑩ 論文化の相談

サンプルの準備、送付

実験をはじめめるまえに、下記 URL の「サンプルについて」にアクセスしてご確認ください。

<https://masspec-phytohormone.riken.jp/sample/>

納期

納期は、出来るだけ対応させていただきますが、機器の予約状況によって異なりますので、ご理解いただいたうえでご利用下さい。

お断りする分析依頼

- 極性溶媒と逆相カラムを用いた分析となりますので、その範疇ではない代謝物の分析
- 物理的に抽出が出来ないサンプルの分析
- サンプル数が多い分析（100 以上）
- 大規模スクリーニング、明確な研究目的が無いサンプル分析

費用負担

指定のチューブとビーズはご購入くださいますようお願いいたします。

送付にかかる費用はご負担ください。

共著のお願い

解析結果を用いた発表をする場合（学会発表，論文）は、発表内容を事前に連絡していただき、下記関係者を共著者としていただきますようお願い致します。

森 哲哉 1, 平井 優美 1

1 理研 CSRS

実績

原著

1. Amit Rai, Hideki Hirakawa, Ryo Nakabayashi, Shinji Kikuchi, Koki Hayashi, Megha Rai, Hiroshi Tsugawa, Taiki Nakaya, Tetsuya Mori, Hideki Nagasaki, Runa Fukushi, Yoko Kusuya, Hiroki Takahashi, Hiroshi Uchiyama, Atsushi Toyoda, Shoko Hikosaka, Eiji Goto, Kazuki Saito, Mami Yamazaki
Chromosome-level genome assembly of *Ophiorrhiza pumila* reveals the evolution of camptothecin biosynthesis.
Nat Commun., 12, 405 (2021)
2. Keiko Yonekura-Sakakibara, Masaomi Yamamura, Fumio Matsuda, Eiichiro Ono, Ryo Nakabayashi, Satoko Sugawara, Tetsuya Mori, Yuki Tobimatsu, Toshiaki Umezawa, Kazuki Saito
Seed-coat protective neolignans are produced by the dirigent protein AtDP1 and the laccase AtLAC5 in *Arabidopsis*.
The Plant Cell, 33, 129–152 (2021)
3. Amit Rai, Megha Rai, Hidetaka Kamochi, Tetsuya Mori, Ryo Nakabayashi, Michimi Nakamura, Hideyuki Suzuki, Kazuki Saito, Mami Yamazaki
Multiomics-based characterization of specialized metabolites biosynthesis in *Cornus Officinalis*.
DNA Res., 27 (2020)
4. Ryo Nakabayashi, Tetsuya Mori, Noriko Takeda, Kiminori Toyooka, Hiroshi Sudo, Hiroshi Tsugawa, Kazuki Saito
Metabolomics With ¹⁵N Labeling for Characterizing Missing Monoterpene Indole Alkaloids in Plants
Anal Chem., 92, 5670-5675 (2020)
5. J. Musembi Mutuku, Songkui Cui, Chiaki Hori, Yuri Takeda, Yuki Tobimatsu, Ryo Nakabayashi, Tetsuya Mori, Kazuki Saito, Taku Demura, Toshiaki Umezawa, Satoko Yoshida, Ken Shirasu
The Structural Integrity of Lignin Is Crucial for Resistance against *Striga*

- hermonthica Parasitism in Rice.
Plant Physiol., 179, 1796-1809 (2019)
6. Hiroshi Tsugawa*, Ryo Nakabayashi*, Tetsuya Mori, Yutaka Yamada, Mikiko Takahashi, Amit Rai, Ryosuke Sugiyama, Hiroyuki Yamamoto, Taiki Nakaya, Mami Yamazaki, Rik Kooke, Johanna A. Bac-Molenaar, Nihal Oztolan-Erol, Joost J. B. Keurentjes, Masanori Arita, Kazuki Saito *equal contribution
A cheminformatics approach to characterize metabolomes in stable-isotope-labeled organisms.
Nat. Methods., 16, 295-298 (2019)
 7. Eva Knoch, Satoko Sugawara, Tetsuya Mori, Christian Poulsen, Atsushi Fukushima, Jesper Harholt, Yoshinori Fujimoto, Naoyuki Umemoto, and Kazuki Saito
The third DWF1 paralog in Solanaceae, sterol D24-isomerase, branching withanolide biosynthesis from the general phytosterol pathway.
Proc. Natl. Acad. Sci. USA, 115, E8096-E8103 (2018)
 8. Hiroyoshi Kubo, Shunsuke Nozawa, Takuma Hiwatashi, Youichi Kondou, Ryo Nakabayashi, Tetsuya Mori, Kazuki Saito, Kojiro Takanashi, Takayuki Kohchi, Kimitsune Ishizaki
Biosynthesis of riccionidins and marchantins is regulated by R2R3-MYB transcription factors in Marchantia polymorpha.
J. Plant Res., 131, 849-864 (2018)
 9. Kazuyoshi Kitazaki, Atsushi Fukushima, Ryo Nakabayashi, Yozo Okazaki, Makoto Kobayashi, Tetsuya Mori, Tomoko Nishizawa, Sebastian Reyes-Chin-Wo, Richard W. Michelmore, Kazuki Saito, Kazuhiro Shoji, Miyako Kusano
Metabolic Reprogramming in Leaf Lettuce Grown Under Different Light Quality and Intensity Conditions Using Narrow-Band LEDs.
Scientific Rep., 8, 7914 (2018)
 10. Yoshio Tamura, Tetsuya Mori, Ryo Nakabayashi, Makoto Kobayashi, Kazuki Saito, Seiichi Okazaki, Ning Wang, Miyako Kusano
Metabolomic evaluation of the quality of leaf lettuce grown in practical plant factory to capture metabolite signature.
Front Plant Sci., 9, 665 (2018)
 11. Eva Knoch, Satoko Sugawara, Tetsuya Mori, Ryo Nakabayashi, Kazuki Saito, Keiko Yonekura-Sakakibara
UGT79B31 is responsible for the final modification step of pollen-specific flavonoid biosynthesis in Petunia hybrid.

- Planta, 247, 779–790 (2018)
12. Ryo Nakabayashi, Tetsuya Mori, Tomoko Nishizawa, Kazuki Saito
Temporal lag between gene expression and metabolite accumulation in flavonol biosynthesis of Arabidopsis roots.
Phytochemistry Letters, 22, 44-48 (2018)
 13. Atsushi Fukushima, Michimi Nakamura, Hideyuki Suzuki, Mami Yamazaki, Eva Knoch, Tetsuya Mori, Naoyuki Umemoto, Masaki Morita, Go Hirai, Mikiko Sodeoka, Kazuki Saito
Comparative Characterization of the Leaf Tissue of Physalis alkekengi and Physalis peruviana Using RNA-seq and Metabolite Profiling.
Front Plant Sci., 20 (2017)
 14. Felipe Rojas Rodas, Shaokang Di, Yoshinori Murai, Tsukasa Iwashina, Satoko Sugawara, Tetsuya Mori, Ryo Nakabayashi, Keiko Yonekura-Sakakibara, Kazuki Saito, Ryoji Takahash
Cloning and characterization of soybean gene Fg1 encoding flavonol 3-O-glucoside/galactoside (1→6) glucosyltransferase.
Plant Mol. Biol., 92, 445-456 (2016)
 15. Zhigang Yang*, Ryo Nakabayashi*, Tetsuya Mori, Satoshi, Susumu, Kitanaka, Kazuki Saito * equal contribution
Metabolome Analysis of Oryza sativa (Rice) Using Liquid Chromatography-Mass Spectrometry for Characterizing Organ Specificity of Flavonoids with Anti-inflammatory and Anti-oxidant Activity.
Chem. Pharm. Bull., 64, 952-956 (2016)
 16. Toshiyuki Nakagawa, Masanori Itoh, Kazunori Ohta, Yuichi Hayashi, Miki Hayakawa, Yasushi Yamada, Hiroshi Akanabe, Tokio Chikaishi, Kiyomi Nakagawa, Yoshinori Itoh, Takato Muro, Daisuke Yanagida, Ryo Nakabayashi, Tetsuya Mori, Kazuki Saito, Kaori, Ohzawa, Chihiro Suzuki, Shimo Li, Masashi Ueda, Miao-xing Wang, Emika Nishida, Saiful Islam, Tana, Masuko Kobori, Takashi Inuzuka
Improvement of memory recall by quercetin in rodent contextual fear conditioning and human early-stage Alzheimer's disease patients.
Neuroreport, 27, 671-676 (2016)
 17. Chonprakun Thagun, Shunsuke Imanishi, Toru Kudo, Ryo Nakabayashi, Kiyoshi Ohyama, Tetsuya Mori, Koichi Kawamoto, Yukino Nakamura, Minami Katayama, Satoko Nonaka, Chiaki Matsukura, Kentaro Yano, Hiroshi Ezura, Kazuki Saito, Takashi Hashimoto and Tsubasa Shoji
Jasmonate-Responsive ERF Transcription Factors Regulate Steroidal

- Glycoalkaloid Biosynthesis in Tomato.
Plant Cell Physiol., 57, 961-975 (2016)
18. Arati N. Poudel, Tong Zhang, Misha Kwasniewski, Ryo Nakabayashi, Kazuki Saito, Abraham J. Koo
Mutations in jasmonoyl-L-isoleucine-12-hydroxylases suppress multiple JA-dependent wound responses in *Arabidopsis thaliana*.
Biochim. Biophys. Acta., 1861, 1396-1408 (2016)
 19. Nuoendagula, Naofumi Kamimura, Tetsuya Mori, Ryo Nakabayashi, Yukiko Tsuji, Shojiro Hishiyama, Kazuki Saito, Eiji Masai, Shinya Kajita
Expression and functional analyses of a putative phenylcoumaran benzylic ether reductase in *Arabidopsis thaliana*.
Plant Cell Rep., 35, 513-526 (2016)
 20. Yuko Ogo, Tetsuya Mori, Ryo Nakabayashi, Kazuki Saito and Fumio Takaiwa
Transgenic rice seed expressing flavonoid biosynthetic genes accumulate glycosylated and/or acylated flavonoids in protein bodies.
J. Exp. Bot., 67, 95-106 (2016)
 21. Akira Oikawa, Takao Ohtsuka, Ryo Nakabayashi, Yusuke Jikumaru, Kanji Isuzugawa, Hideki Maruyama, Kazuki Saito, Katsuhiko Shiratake
Metabolic Profiling of Developing Pear Fruits Reveals Dynamic Variation in Primary and Secondary Metabolites, Including Plant Hormones.
PloS One, 10, e0131408 (2015)
 22. Shaokang Di, Fan Yan, Felipe Rojas Rodas, Tito O Rodriguez, Yoshinori Murai, Tsukasa Iwashina, Satoko Sugawara, Tetsuya Mori, Ryo Nakabayashi, Keiko Yonekura-Sakakibara, Kazuki Saito, Ryoji Takahashi
Linkage mapping, molecular cloning and functional analysis of soybean gene *Fg3* encoding flavonol 3-O-glucoside/galactoside (1 → 2) glucosyltransferase.
BMC Plant Biol., 15, 126 (2015)
 23. Mami Suzuki, Ryo Nakabayashi, Yoshiyuki Ogata, Nozomu Sakurai, Toshiaki Tokimatsu, Susumu Goto, Makoto Suzuki, Michal Jasinski, Enrico Martinoia, Shungo Otagaki, Shogo Matsumoto, Kazuki Saito, Katsuhiko Shiratake
Multi omics in grape berry skin revealed specific induction of stilbene synthetic pathway by UV-C irradiation.
Plant Physiol., 168, 47-59 (2015)
 24. Ryo Nakabayashi, Tetsuya Mori, Kazuki Saito
Alternation of flavonoid accumulation under drought stress in *Arabidopsis*

- thaliana.
Plant Signal. Behav., e29518 (2014)
25. Keiko Yonekura-Sakakibara*, Ryo Nakabayashi*, Satoko Sugawara, Takayuki Tohge, Takuya Ito, Misuzu Koyanagi, Mariko Kitajima, Hiromitsu Takayama and Kazuki Saito * equal contribution
A flavonoid 3-O-glucoside:2" -O-glucosyltransferase responsible for terminal modification of pollen-specific flavonols in Arabidopsis thaliana.
Plant J., 79, 769-782 (2014)
 26. Masayuki Tamura, Yukiko Tsuji, Tatsuya Kusunose, Atsushi Okazawa, Naofumi Kamimura, Tetsuya Mori, Ryo Nakabayashi, Shojiro Hishiyama, Yuki Fukuhara, Hirofumi Hara, Kanna Sato-Izawa, Toshiya Muranaka, Kazuki Saito, Yoshihiro Katayama, Masao Fukuda, Eiji Masai, Shinya Kajita
Successful expression of a novel bacterial gene for pinorensinol reductase and its effect on lignan biosynthesis in transgenic Arabidopsis thaliana.
Appl. Microbiol. Biotechnol., 98, 8165-8177 (2014)
 27. Zhigang Yang, Ryo Nakabayashi, Yozo Okazaki, Tetsuya Mori, Satoshi Takamatsu, Susumu Kitanaka, Jun Kikuchi, Kazuki Saito
Toward better annotation in plant metabolomics: Isolation and structure elucidation of 36 specialized metabolites from Oryza sativa (rice) by using MS/MS and NMR analyses.
Metabolomics, 10, 543-555 (2014)
 28. Ryo Nakabayashi, Keiko Yonekura-Sakakibara, Kaoru Urano, Makoto Suzuki, Yutaka Yamada, Tomoko Nishizawa, Fumio Matsuda, Mikiko Kojima, Hitoshi Sakakibara, Kazuo Shinozaki, Takayuki Tohge, Mami Yamazaki, Kazuki Saito
Enhancement of oxidative and drought tolerance in Arabidopsis by overaccumulation of antioxidant flavonoids.
Plant J., 77, 367-379 (2014)
 29. Jasmina Kurepa, Ryo Nakabayashi, Tatjana Paunesku, Makoto Suzuki, Kazuki Saito, Gayle E. Woloschak and Jan A. Smalle
Direct isolation of flavonoids from plants using ultra-small anatase TiO₂ nanoparticles.
Plant J., 77, :443-453 (2014)
 30. Felipe Rojas Rodas, Tito O. Rodriguez, Yoshinori Murai, Tsukasa Iwashina, Satoko Sugawara, Makoto Suzuki, Ryo Nakabayashi, Keiko Yonekura-Sakakibara, Kazuki Saito, Junichi Kitajima, Kyoko Toda, Ryoji Takahashi
Linkage mapping, molecular cloning and functional analysis of soybean gene Fg2

encoding flavonol 3-O-glucoside (1 → 6) rhamnosyltransferase.

Plant Mol. Biol., 84, 287-300 (2014)

31. Mami Suzuki, Michal Jasinski, Enrico Martinoia, Ryo Nakabayashi, Makoto Suzuki, Kazuki Saito, Katsuhiko Shiratake
Molecular cloning and characterization of ABCG/PDRtype ABC transporter in grape berry skin.
Adv. Hort. Sci., 28, (2014)
32. Junji Kimbara, Miho Yoshida, Hirotaka Ito, Mamiko Kitagawa, Wataru Takada, Kayoko Hayashi, Yusuke Shibutani, Miyako Kusano, Yozo Okazaki, Ryo Nakabayashi, Tetsuya Mori, Kazuki Saito, Tohru Ariizumi and Hiroshi Ezura
Inhibition of CUTIN DEFICIENT 2 Causes Defects in Cuticle Function and Structure and Metabolite Changes in Tomato Fruit.
Plant Cell Physiol., 54,1535-1548 (2013)

連絡先

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件名にご希望の支援技術名をご明記の上、ご相談ください。

例) 件名：サンプルについて【LC-QTOF-MSを用いたメタボローム解析】