Curriculum of Scientific and Educational Activities

Professor Giuseppe Cannazza

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1. **Main Research Areas of Prof. Cannazza**

The primary research focus of Prof. Cannazza has been the development of innovative analytical techniques for the characterization and qualitative and quantitative determination of pharmaceutical compounds. Throughout his academic career, his scientific activities have centered on the following research areas:

Development of Liquid Chromatography Techniques Coupled with High-Resolution Mass Spectrometry for the Characterization of the Chemical Composition of Medicinal Extracts from *Cannabis Sativa* L.
Since 2016, Prof. Cannazza's research has concentrated on developing liquid chromatography techniques coupled with high-resolution mass spectrometry for the qualitative and quantitative determination of bioactive compounds in *Cannabis Sativa* L. His research has particularly focused on developing analytical methods for: a) the determination of phytocannabinoids in cannabis-based extracts prepared as magistral galenicals in pharmacies, b) the qualitative and quantitative determination of phytocannabinoids in hemp seed oil, c) the qualitative determination of polyphenols and lipids in cannabis extracts. Additionally, metabolomic methods have been developed for a qualitative and quantitative characterization of the phytocannabinoid profile in the medicinal cannabis variety FM2, produced by the Military Pharmaceutical Chemical Plant in Florence. These methods have led to the identification of new classes of phytocannabinoids, with some exhibiting strong affinities for the cannabinoid receptors CB1 and CB2. Notably, among the various new isolated phytocannabinoids, tetrahydrocannabiphorol (THCP) has shown a greater cannabinoid-mimetic activity compared to tetrahydrocannabinol (THC), which is considered the primary psychoactive compound in cannabis.

Development of Qualitative and Quantitative Analytical Methods for the Determination of Pharmaceutical Compounds in Cells, Fluids, and Biological Tissues
Prof. Cannazza has developed analytical methods in liquid chromatography coupled with mass spectrometry for the qualitative and quantitative determination of synthetic and natural pharmaceutical compounds in cell cultures, fluids, and biological tissues. His research has particularly focused on determining compounds that act on the central nervous system in plasma and brain tissue to assess their metabolism and ability to cross the blood-brain barrier. Additionally, he has developed analytical methods for the determination of small peptides in cell cultures to evaluate their ability to reach intracellular molecular targets.

Development of Analytical Methods for the Qualitative and Quantitative Determination of Exogenous and Endogenous Compounds in Brain Microdialysates of Rats and Mice
The cerebral microdialysis technique allows the determination of concentrations present in the intersynaptic space of both endogenous and exogenous compounds and their metabolites. Given that the concentrations in microdialysates are typically extremely low (in the nanomolar range), highly sensitive analytical techniques are required for accurate qualitative and quantitative determination. Prof. Cannazza has developed chromatographic techniques coupled with electrochemical detectors or mass spectrometry to evaluate the cerebral concentrations of both endogenous substances, such as neurotransmitters and neuromodulators, and pharmaceutical substances capable of crossing the blood-brain barrier. In particular, a "heart-cut" bidimensional achiral-chiral liquid chromatography method coupled with mass spectrometry was developed for the stereospecific qualitative and quantitative determination of endogenous and exogenous compounds in brain microdialysates. This technique was then applied to a chiral pharmaceutical

compound active on the central nervous system to simultaneously determine its concentration, its metabolites, its stereospecific metabolism, and its ability to interfere with specific neurotransmission pathways in particular brain areas.

Development of Analytical Methods for the Enantiomeric Resolution of Chiral Compounds
One of Prof. Cannazza's main research areas has been the development of chromatographic methods for the analytical and preparative enantioseparation of chiral pharmaceutical compounds active on the central nervous system. Specifically, chromatographic methods were developed for the chiral resolution of pharmaceutical compounds, enabling both their quantitative determination in biological fluids and the isolation of individual enantiomers to evaluate their enantiospecificity in pharmacological action. Additionally, enantioseparation methods were developed in liquid chromatography coupled with circular dichroism detection, allowing the determination of the absolute configuration of the eluted enantiomers to identify the eutomer.

Development of Analytical Methods for the Evaluation of the Configurational and Chemical Stability of Pharmaceutical Compounds
National and international regulatory bodies responsible for drug approval, such as the Food and Drug Administration (FDA), require the evaluation of their configurational and chemical stability. A research area for Prof. Cannazza has involved developing innovative multidimensional chromatographic techniques that couple chiral columns with achiral columns to simultaneously determine the chemical and configurational stability of new pharmaceutical compounds. These multidimensional chromatography methods have the advantage of using small amounts of racemic sample and do not require individual stereoisomers.

Design, Synthesis, and Biological Activity of Positive Allosteric Modulators of the AMPA Receptor
Prof. Cannazza's research has focused on the design, synthesis, and biological evaluation of benzothiadiazine-structured compounds as positive allosteric modulators of the AMPA receptor. Starting from the lead compound (±)-7-chloro-3-methyl-3,4-dihydro-2H-1,2,4-benzothiadiazine 1,1-dioxide (IDRA21), molecular modeling studies have allowed the design and synthesis of new 5-arylbenzothiadiazine derivatives with positive modulatory activity on the AMPA receptor, which are several times more potent than IDRA21 itself. These compounds are currently being studied to evaluate their nootropic activity in laboratory animals.

2. **Education and Academic Career Summary**

- Associate Professor in the Department of Life Sciences at the University of Modena and Reggio Emilia in the disciplinary sector SSD-CHIM08 Pharmaceutical Chemistry since 09/01/2021.
- Scientific Qualification for Full Professor in SSD-CHIM08 Pharmaceutical Chemistry obtained on 10/04/2022.
- Scientific Qualification for Associate Professor in SSD-CHIM01 Analytical Chemistry obtained on 05/13/2019.
- Scientific Qualification for Associate Professor in SSD-CHIM08 Pharmaceutical Chemistry obtained on 07/31/2017.
- Permanent Researcher in the Department of Life Sciences at the University of Modena and Reggio Emilia in SSD-CHIM08 Pharmaceutical Chemistry since 12/16/2005 and confirmed as a researcher since 12/16/2008.
- Research Fellow (01/01/2001-12/31/2004). Prof. Cannazza won the competitive selection for a research fellowship on "Design, synthesis, biological activity, and structure-activity relationships of chiral 3,4-dihydro-2H-1,2,4-benzothiadiazine derivatives as positive allosteric modulators of AMPA

receptors" Area C07X-Pharmaceutical Chemistry. The fellowship was for two years (01/01/2001-12/31/2002) and was renewed until 12/31/2004 following a positive evaluation by the Commission on the research activity carried out in the 2001-2002 biennium. Prof. Cannazza conducted his research at the Department of Pharmaceutical Sciences, University of Modena and Reggio Emilia, in the laboratory directed by Prof. Carlo Parenti, developing the fellowship's theme.

- Ph.D. in "Pharmaceutical Sciences" (02/28/2000). Prof. Cannazza won the Ph.D. program in "Pharmaceutical Sciences" – XII cycle (academic year 1996/97) at the University of Modena and Reggio Emilia. He successfully passed the exam for the Ph.D. title on 02/28/2000, presenting a final dissertation titled: "Development of analytical methods for the study of biologically active substances and their metabolites." During the three-year training period, he attended general training courses, specialized seminars organized by the Board of Professors, and seminars organized by the Division of Pharmaceutical Chemistry of the Italian Chemical Society. Prof. Giuseppe Cannazza carried out his research at the Department of Pharmaceutical Sciences, University of Modena and Reggio Emilia, in the laboratory directed by Prof. M. Di Bella and Prof. C. Parenti, developing the theme of the final dissertation.

- Consultant for Pharmacia & Upjohn S.p.A. (1996). Prof. Cannazza was appointed in 1996 by Pharmacia & Upjohn S.p.A. as a consultant within the National Research Program on Neurobiological Systems-Signal Transduction Technologies on the theme: "Study of the interaction of natural and/or synthetic compounds with receptors and/or post-receptor transducers."

- Degree in Chemistry and Pharmaceutical Technology (02/24/1995). Prof. Cannazza graduated in Chemistry and Pharmaceutical Technology on 02/24/1995 with a grade of 110/110 cum laude, presenting a final dissertation titled: "Separation of dipeptides using High-Performance Ligand Chiral Exchange Chromatography," prepared under the guidance of Prof. M. Di Bella and Prof. G. Gübitz.

- High School Diploma in Science (1987). Prof. Cannazza obtained his Scientific High School Diploma on 07/18/1987 with a grade of 60/60.

3. **Leadership or Participation in Research Groups with National or International Collaborations**

Corresponding Author
Prof. Cannazza is the corresponding author in 43 out of the 107 published articles.

Collaborations with International Research Groups

- Collaboration with Prof. Wolfgang Lindner's research group at the Department of Analytical Chemistry, University of Vienna (Austria).

- Collaboration with Prof. Irving W. Wainer's research group at the National Institute of Health, National Institute on Aging, Baltimore (MD, USA).

- Collaboration with Prof. Krzysztof Jóźwiak's research group at the Medical University of Lublin, Lublin (Poland).

- Collaboration with Prof. Martin Gerhard Schmid's research group at Karl-Franzens-Universität Graz, Graz (Austria).

Collaborations with National Research Groups

- Collaboration with Prof. Giuseppe Gigli's research group at the Institute of Nanotechnology CNR-Nanotec, Lecce.

- Collaboration with Prof. Luigino Troisi's research group at the Department of Biological and Environmental Sciences and Technologies, University of Salento, Lecce.
- Collaboration with Prof. Giuseppe Ciccarella's research group at the Department of Biological and Environmental Sciences and Technologies, University of Salento, Lecce.
- Collaboration with Prof. Aldo Laganà's research group at the Department of Chemistry, University La Sapienza, Rome.
- Collaboration with Prof. M.A. Raggi's research group at the University of Bologna.
- Collaboration with Prof. S. Maione's research group at the Division of Pharmacology, University of Campania "L. Vanvitelli."
- Collaboration with Prof. A. Di Stefano's research group at the Department of Pharmaceutical Sciences, University "G. D'Annunzio."

Planning, Direction, and Coordination of Research Groups
During his activity as a research fellow and later as a researcher, Prof. Cannazza was entrusted by Prof. Carlo Parenti and Prof. Daniela Braghiroli with the planning, direction, and coordination of the research group focusing on the following topics:
a. Development of analytical methods for the qualitative and quantitative determination of active ingredients in pharmaceutical formulations.
b. Development of analytical methods for the qualitative and quantitative determination of compounds with potential pharmacological activity.
c. Development of analytical methods for the enantiomeric resolution of chiral compounds.
d. Studies on enantiomerization and deracemization of chiral compounds.
e. Synthesis of compounds with potential modulatory activity on glutamatergic transmission.

4. **Responsibility for Studies and Scientific Research Entrusted by Qualified Public or Private Institutions**

- Scientific responsibility for an agreement with the company Linnea SA (Switzerland) for funding a research scholarship (06/16/2017).
- Scientific responsibility for funding an annual research fellowship by Linnea SA for "Research on extraction methods and analytical profiles of Cannabis sativa" (06/01/2018).
- Consultancy for Pharmacia & Upjohn S.p.A. within the PNR on neurobiological systems-signal transduction technologies-Theme 1 Line 3.4 "Study of the interaction of natural and/or synthetic compounds with receptors and/or post-receptor transducers" (09/29/1996 to 09/29/1997).
- Responsibility for scientific research entrusted by ERGONEX corporation (Hauptgasse 38, CH 9050, Switzerland) concerning the determination of brain neurotransmitter concentrations after the administration of new L-DOPA prodrug compounds in rats (02/07/2006 to 05/12/2006).
- Scientific responsibility for a scientific collaboration with Linnea SA (Switzerland) for metabolomic analysis using LC-HRMS of herbal extracts (01/25/2017).
- Scientific responsibility for a scientific collaboration agreement signed on 04/03/2017 between the Italian Customs Agency - Interregional Directorate for Emilia Romagna and Marche - Laboratory and Chemical Services Division and the Department of Life Sciences, University of Modena and Reggio Emilia, for the implementation of the following research program:
  a) Study and development of official analytical methods for determining delta-9-tetrahydrocannabinol in hemp varieties, particularly by gas chromatography GC-FID and liquid

chromatography HPLC-DAD, referring respectively to Reg. (EU) 639/2014 Annex III as amended by Reg. (EU) 2017/1155 and the Monograph on Cannabis Sativa from the German Pharmacopoeia published on 05/05/2017.
b) Comparison between the two analytical methods (GC and HPLC) based on analyses to be conducted on various samples of *Cannabis sativa* L. (commonly known as fiber or industrial hemp) marketed on the Italian market by EasyJoint and provided free of charge. The operational conditions for sample preparation (drying, cleaning, grinding, extraction, etc.) will also be evaluated, and all extracts will be analyzed using both techniques (04/03/2017).

- Winner of an international call from the "World Health Organization" (WHO) for: "Author contributions to WHO Expert Committee on Drug Dependence (ECDD) Pre-Reviews of Cannabis-Related Substances, topic Chemistry" on 11/19/2017 (https://www.ungm.org/Public/Notice/63472). The World Health Organization entrusted Prof. G. Cannazza with preparing four research reports concerning the chemical (synthetic and analytical) aspect of delta-9-tetrahydrocannabinol (THC), THC Isomers, Cannabis, and Cannabis extracts and tinctures, to be presented at the WHO Expert Committee on Drug Dependence (ECDD) meeting held in Geneva from June 4-8, 2018 (from 01/19/2018 to 06/08/2018).

- Development of an analytical method for the determination of phytocannabinoids in cannabis-based galenic preparations for drafting the monograph on cannabis oil extracts to be included in the Italian Official Pharmacopoeia in collaboration with the Italian Society of Pharmacist Preparers (SIFAP). The analytical method was presented to the Italian National Institute of Health (ISS) and is under evaluation.

- Scientific responsibility for a scientific collaboration with Canapar S.r.l. for the "Development of four formulations, two of which contain 2% and 5% cannabidiol in oil extracted from industrial hemp, and another two containing 5% and 10% (w/w) cannabidiol in vegetable oil" (04/24/2020).

5. **Scientific Responsibility for International and National Research Projects Funded through Competitive Calls Subject to Peer Review**

- Scientific responsibility for the research project titled "Preparative enantioseparation of chiral 1,2,4-benzothiadiazine derivatives by HPLC," admitted to funding based on a competitive call for the year 2001 within the “Young Researchers Project” of the MIUR (Fiscal Year 1999) with the following motivation: "Original and highly relevant project; documented autonomy of the applicant" (01/01/2001 to 12/31/2001).

- Participant in the PRIN 2009 research program. Scientific Coordinator: Carlo De Micheli, Scientific Responsibility: Maria Paola Costi, University of Modena and Reggio Emilia, Protocol 200925BPZ5_004, Area 03, Duration 24 months (17/10/2011-17/10/2013), Title "Design and development of new leads directed at the folate pathway, active against Trypanosomatidae parasitic infections" (17/10/2011 to 17/10/2013).

- Participant in the PRIN 2012 research program. Scientific Coordinator: Carlo De Micheli, Scientific Responsibility: Maria Paola Costi, University of Modena and Reggio Emilia, Protocol 201274BNKN_003, Area 03, Duration 36 months (03/08/2014-03/08/2017).

- Coordination and scientific responsibility for the research project titled "Development of a 'heart-cut' bidimensional achiral-chiral liquid chromatography method coupled with mass spectrometry (LC-LC-MS/MS) for the simultaneous evaluation of the pharmacokinetic and pharmacodynamic profiles of chiral pharmaceutical compounds active on the central nervous system," funded under the "University Research Fund for the Year 2015" (01/07/2016 to 12/30/2017).

- Scientific responsibility for the CNR-NANOTEC project, funded based on a competitive call from the Puglia region, published in the Official Regional Bulletin No. 138 of October 22, 2015, No. 496: Project Title "Comparative study of the effectiveness of biological products in controlling CoDiRO in the area of *Xylella fastidiosa* infestation" Acronym BioCOXY Theme (Article 4 of the call) Control measures against both the bacterium and potential insect vectors, in compliance with eco-sustainable practices Promoting entity COPAGRI Duration (in months) 18 (09/08/2016 to 02/08/2018).
- Prof. Cannazza is the "Project Leader" of Industrial Research and Experimental Development, Green Chemistry specialization area, titled "Use of biomass from industrial hemp for energy production and new biochemicals," co-financed by MIUR through the call published in the Director's Decree of July 13, 2017, No. 1735/Ric. "Notice for the presentation of Industrial Research and Experimental Development projects in the 12 specialization areas identified by the PNR 2015 - 2020." The total project cost is €6,735,045.96, with MIUR funding of €3,330,562.98 (09/30/2018 to 10/30/2022).

6. Editorial Board Leadership or Participation

Prof. Cannazza has served as a reviewer for the following journals:
Journal of Chromatography A, *Journal of Chromatography B*, *Current Therapeutic Research*, *European Journal of Medicinal Chemistry*, *Journal of Neuroscience Methods*, *Journal of Pharmaceutical and Biomedical Analysis*, *Cannabis and Cannabinoid Research*, *Journal of Cannabis Research*, *ABC*, *Analytical Chemistry*.

He is currently a member of the editorial boards of the following journals:
Frontiers in Chemistry, *Molecules*, and is an Associate Editor of the *Journal of Cannabis Research*.

7. Participation in Doctoral Committees and Teaching Assignments within Accredited Ph.D. Programs

Participation in Doctoral Committees
Prof. Cannazza has participated in the Doctoral Committee of the Ph.D. program in "SCIENCES AND TECHNOLOGIES OF HEALTH PRODUCTS" in the years 2006, 2007, 2008, 2009, 2010, 2011, and 2012.

Prof. Cannazza has participated in the Doctoral Committee of the Ph.D. program in "CLINICAL AND EXPERIMENTAL MEDICINE (CEM)" in the years 2013, 2020, 2021, 2022, and 2023.

Teaching Assignments within Ph.D. Programs
Prof. Cannazza has been responsible for teaching the following courses:

- "Detection of Neurotransmitters by Microdialysis" (1 CFU, 6 hours) for first-year students and "Detection of Neurotransmitters by Microdialysis" (1 CFU, 6 hours) for second-year students in the Ph.D. program "SCIENCES AND TECHNOLOGIES OF HEALTH PRODUCTS" (01/01/2007 to 12/31/2008).
- "Detection of Neurotransmitters by Microdialysis" (1 CFU, 6 hours) for first-year students, "Detection of Neurotransmitters by Microdialysis" (1 CFU, 6 hours) for second-year students, "Determination of Neurotransmitters by Cerebral Microdialysis. Part III" (0.5 CFU, 3 hours), and "Determination of Neurotransmitters in Cerebral Microdialysate Samples by HPLC. Part III" (0.5 CFU, 3 hours) for third-year students in the Ph.D. program "SCIENCES AND TECHNOLOGIES OF HEALTH PRODUCTS" (01/01/2008 to 12/31/2011).
- "Applications of Cerebral Microdialysis for Neurotransmitter Determination" (1 CFU, 6 hours) for students in the Ph.D. program "SCIENCES AND TECHNOLOGIES OF HEALTH PRODUCTS" (01/01/2012 to 12/31/2012).

Ph.D. Student Supervision

Prof. Cannazza has been the tutor of the following Ph.D. students:

- Umberto Battisti, who presented a thesis titled "Development of Positive Allosteric Modulators of the AMPA Receptor," XXIV CYCLE - Ph.D. program in "SCIENCES AND TECHNOLOGIES OF HEALTH PRODUCTS" (02/12/2009 to 01/31/2012).
- Addolorata Stefania Cazzato, who presented a thesis titled "Synthesis of New Compounds with Central Nervous System Activity and Development of Analytical Methods for Assessing Their Biological Activity," XXVII CYCLE - Ph.D. program in "SCIENCES AND TECHNOLOGIES OF HEALTH PRODUCTS" (02/16/2012 to 01/31/2015).
- Natalia Stasiak, who presented a thesis titled "Development of a Method for Qualitative and Quantitative Measurement of Xenobiotics in Mouse Brain Microdialysates by Liquid Chromatography Coupled to Mass Spectrometry (LC-MS) to Test the Pharmacokinetic and Pharmacodynamic Profile of Novel Pharmaceutical Compounds Targeting the Central Nervous System," XXIX CYCLE - CLINICAL AND EXPERIMENTAL MEDICINE (CEM) (02/05/2014 to 03/27/2017).
- Fabiana Russo, whose research project will focus on identifying new phytocannabinoids in medicinal cannabis, 36th CYCLE - CLINICAL AND EXPERIMENTAL MEDICINE (CEM) (2020 to 2023).

8. Formal Research Assignments (Fellowships) at Renowned Foreign or Supranational Universities and Research Institutes

- Research activity for the preparation of the experimental thesis in Chemistry and Pharmaceutical Technology with an Erasmus scholarship titled "Separation of Dipeptides by 'High-Performance Ligand Exchange Chromatography'" at the Department of Pharmaceutical Chemistry, University of Graz (Austria), in the laboratory directed by Prof. Gerald Gübitz (6 months). (10/01/1993 to 03/31/1994).
- Research activity as a "Special Volunteer" at the National Institute of Health/National Institute on Aging (Baltimore, USA) from 11/25/2001 to 02/25/2002 and from 05/25/2002 to 06/25/2002. During the four months, Prof. Cannazza collaborated on research activities with Prof. Irving W. Wainer's group (11/25/2001 to 06/25/2002).

9. Awards and Recognitions for Scientific Activity, Including Membership in Prestigious Academic Institutions

- Affiliation with the CNR NANOTEC - Institute of Nanotechnology from July 31, 2015, to the present.
- Winner, along with the research group (Prof. C. Citti, Prof. F. Forni, Prof. M.A. Vandelli), of the Open Innovation Award in the Food Sector of the Maccaferri Group Call. Awarded on 04/06/2018 (attached PDF of the call). The proposed project "Sugar with All the Nutraceutical Properties of Hemp" was the winning entry in the competition.
- The research on phytocannabinoids conducted by Prof. Cannazza's group has been featured in major national newspapers such as *La Repubblica*, *Il Fatto Quotidiano*, *Il Giornale*, *La Stampa*, *Il Resto del Carlino*, etc. http://unihemp.dhitech.it/wp-content/uploads/2020/04/Press-Review-UNIMORE_ScopertaNuovoCannabinoide.pdf
- Several international media outlets (CNN, FOX, New York Post, etc.) reported the discovery of new phytocannabinoids published in *Scientific Reports* on December 30, 2019. https://nature.altmetric.com/details/73417747/news

- Associate at the "Centre For Neuroscience and Neurotechnology" of the University of Modena and Reggio Emilia since 01/01/2017.
- Member of the Scientific Technical Committee of the "Italian Hemp Federation" (Federcanapa) since 01/03/2017.
- Winner of the international call for "External Expert" by the World Health Organization (WHO) for writing reports on cannabis and its derivatives discussed at the 40th WHO Expert Committee on Drug Dependence, June 4-8, 2018, Geneva, Switzerland (02/08/2018 to 06/08/2018).
- Prof. Cannazza was an "Adviser" on the chemical aspect of Cannabis, Cannabis Extracts, THC, THC Isomers, and Cannabidiol for the WHO Expert Committee on Drug Dependence (ECDD) (06/04/2018 to 06/08/2018).
- Member of the Scientific Committee of the "Academy of Molecular Mechanisms" of the Department of Chemical Sciences and Materials Technology - CNR since 03/08/2019.
- Member of the D37 Working Group on Cannabis at the American Society for Testing and Materials International (ASTM International) since 02/01/19.
- Appointed representative of universities at the Hemp Industry Technical Table by decree of the Ministry of Agriculture, Food, and Forestry (MIPAAF) on 12/17/2020.
- Invited by the Presidency Office of the Justice Commission for an informal hearing within the framework of the referral examination of the bills C. 2160 Molinari and C. 2307 Magi, concerning the production, trafficking, and possession of illicit drugs or psychotropic substances in minor cases on 10/07/2020. The documentation of the intervention was published on the website of the Italian Chamber of Deputies.

10. Results Achieved in Technology Transfer in Terms of Participation in the Creation of New Enterprises (Spin-offs), Development, Use, and Commercialization of Patents

- Inventor of the Italian (IT2001BO00271 20010508) and global patent (WO02089734 (A2) — 2002-11-14) titled "Method for treatment and prevention of disturbances of the central nervous system associated with an alteration of glutamatergic neurotransmission by administration of 2-aminobenzenesulfonamide derivatives."
- Inventor of the Italian (IT1402905 (B1) — 2013-09-27) and European patent (EP2457906 (A1) — 2012-05-30) titled "Derivatives of 1,2,4-benzothiadiazine dioxide, their preparation and use as allosteric modulators of the AMPA receptor."
- Inventor of the international patent application titled "Extraction method and composition obtained therefrom" (WO2020121218A2) concerning the development of a high-yield extraction method for cannabinoids from industrial hemp biomass in an aqueous medium using a cyclodextrin. The patent also reports studies on the stability of the phytocannabinoid/cyclodextrin complex over time. Filed on 12/11/2018. The patent rights were transferred to Naturalia Ingredients.
- Inventor of the Provisional Application for a patent titled "Cannabis extracts and uses thereof" for the discovery, identification, and complete physicochemical characterization of four new cannabinoids in cannabis extracts (cannabidibutol, tetrahydrocannabutol, cannabidiforol, and tetrahydrocannabiforol). Application No. 63050240 (EFS ID: 39966462) filed on 07/10/2020. The exploitation of the patent rights was transferred to Canapar S.r.l.

11. Specific Professional Experience Characterized by Research Activities Relevant to the Academic Sector

- Co-author, along with Prof. C. Citti, of four research reports on the chemistry of delta-9-tetrahydrocannabinol (THC), THC Isomers, Cannabis, and Cannabis Extracts and Tinctures for the World Health Organization Expert Committee on Drug Dependence (WHO-ECDD) held in Geneva, June 4-8, 2018. These reports were published on the WHO website at https://www.who.int/medicines/access/controlled-substances/ecdd_40_meeting/en/.

- Co-author, along with Prof. C. Citti, of several research reports on the chemistry of substances of abuse for the World Health Organization Expert Committee on Drug Dependence (WHO-ECDD) held in Geneva in 2021, 2022, and 2023. These were published on the WHO website.
  ECDD 44th (2021): 1. 4F-MDMB-BICA; 2. Eutylone; 3. Kratom, mitragynine, 7-hydroxymitragynine; 4. Metonitazene; 5. Phenibut.
  ECDD 45th (2022): 1. ADB-BUTINACA, 2. Adinazolam, 3. Bromazolam, 4. Protonitazene, 5. Etazene, 6. Etonitazepyne, 7. Zopiclone (link: https://iris.who.int/bitstream/handle/10665/366392/9789240068735-eng.pdf?sequence=1)
  ECDD 46th (2023): 1. Bromazolam; 2. Flubromazepam; 3. Butonitazene; 4. 3-CMC; 5. Dipentylone; 6. 2-fluorodeschloroketamine; 7. Nitrous oxide; 8. Carisoprodol.

- "Adviser" for the WHO Expert Committee on Drug Dependence (ECDD) Congress held in Geneva from June 4-8, 2018, and October 16-20, 2023.

As a member of the scientific committee of Federcanapa, Prof. Cannazza has been a speaker at various events, meetings with politicians and ministry officials, and contributed to drafting and proposing amendments to regulations on hemp cultivation and commercialization. For Federcanapa, Prof. Cannazza organized and coordinated a scientific workshop held in Milan on October 27, 2018, on "Medical Cannabis and Cannabinoids."

- Prof. Cannazza collaborates with the European Industrial Hemp Association (EIHA) in drafting scientific reports (e.g., Joint EIHA – FAAAT contribution to the 39th ECDD evaluation of Cannabidiol) https://faaat.net/wp-content/uploads/EIHA-FAAAT_WHO_CBD_submission_2017.pdf

- Prof. Cannazza is a member of the therapeutic cannabis study group of the Italian League Against Epilepsy (LICE), actively collaborating in the training of clinical epileptologists. He was invited to present on the pharmaceutical chemistry aspect of cannabidiol at LICE's national congresses in both 2019 and 2020. A video is available for download at https://epilessia-info.forumfree.it/?t=76843925

- Prof. Cannazza is a member of the scientific committee of Canapar S.r.l. for the production of cannabidiol and hemp extracts.

- Dithech S.c.a.r.l. (leader of the UNIHEMP project), together with partners CNR NANOTEC Lecce, Council for Agricultural Research (CREA), UNIMORE, Avantech Group S.r.l., Manifatture Sigaro Toscano S.p.A., Ekuberg Pharma S.r.l., relies on Prof. Cannazza's professional expertise as "Project Leader" aimed at Industrial Research and Experimental Development in the "Green Chemistry" area. The total project cost is €6,735,045.96, with MIUR funding of €3,330,562.98, from 09/30/2018 to present. http://unihemp.dhitech.it/

- Prof. Cannazza is a "Research Fellow" at the NANOTECHNOLOGY INSTITUTE (CNR-NANOTEC, Lecce) for the creation of an analysis center for hemp and its extracts, characterizing cannabinoids, terpenes, heavy metals, pesticides, aflatoxins, and moisture content in different hemp varieties.

12. Institutional Activities

- Prof. Cannazza regularly participates in Departmental Councils and Degree Course Councils. He has been a regular member of degree exam committees.
- Prof. Cannazza has supervised three Ph.D. students, one research fellow, and one research grant recipient. He is currently supervising a Ph.D. student conducting research at the Department of Life Sciences at UNIMORE and two research fellows conducting research at CNR Nanotec in Lecce.
- Prof. Cannazza has been a member of the "Internship Committee" of the CTF degree course since 2017.
- Prof. Cannazza is the representative of the University of Modena and Reggio Emilia at the Hemp Supply Chain Technical Table of the Ministry of Agriculture, Food, and Forestry since 10/22/2020.
- Prof. Cannazza has served on several committees for the award of scholarships or research grants.
- Prof. Cannazza has been a member of two committees for awarding the Ph.D. title at the University of Bari Aldo Moro and one committee at the University of Salento.
- Prof. Cannazza has supervised over 30 experimental and compilative theses in Pharmacy, CTF, or Biotechnology.
- Prof. Cannazza is responsible for the Erasmus student exchange between UNIMORE and Karl Franzens Universität Graz, Austria.

13. Overall Scientific Production

Articles in Peer-Reviewed International Scientific Journals

Prof. Cannazza has published 112 peer-reviewed scientific articles. His h-index is 27, with a total of 3,022 citations (Scopus data as of 07/22/2024).

Prof. Cannazza is the author of the chapter “Chemistry and Technology of Cannabinoids and Terpenes in Hemp” (G. Cannazza, C. Citti) in the book *"La canapa: Miglioramento genetico, sostenibilità, utilizzi, normativa di riferimento"* edited by P. Ranalli, (2020) Edagricole, ISBN 978-88-506-5602-8.

Organization or Participation as a Speaker at Scientific Conferences in Italy or Abroad

1. G. Cannazza, P. Zanoli, M. Baraldi, "Changes in Kynurenine Pathway After Prenatal Exposure to Methyl Mercury in Rats," 8th National Congress of the Italian Society of Neurosciences, Rome, September 26-29, 1999.
2. G. Cannazza, C. Parenti, D. Braghiroli, G. Puia, G. Losi, J. M. Bonardi, M. Baraldi, W. Lindner, I. W. Wainer, "Hydrolysis of Benzothiadiazines," 10th Meeting on Recent Developments in Pharmaceutical Analysis, RDPA 2003, Cogne, Italy, June 28 – July 1, 2003.
3. G. Cannazza, M.M. Carrozzo, "Mass Spectrometry for Evaluating the Configurational Stability of Pharmaceutical Compounds," Mass Spectrometry User Meeting, November 29-30, 2010, Rome.
4. G. Cannazza, "5-Arylbenzothiadiazine Type Compounds as Positive Allosteric Modulators of AMPA/Kainate Receptors," Vth Conservatory on Medicinal Chemistry, Lublin, Poland, September 13-15, 2012.
5. Oral Presentation: “Cannabis sativa L. Phytocomplex: Analytical Criticism and Molecular Fingerprinting to Elucidate the Complexity of Cannabis Extracts” at the symposium organized by Linnea and Crystal Hemp at CPHI Worldwide Frankfurt, October 24-26, 2017.

6. Oral Presentation: “Cannabidiol (CBD) in Hemp Seed Oil: 'Impurity' as a Marker of 'Purity'” at the “International Conference of the European Industrial Hemp Association (EIHA),” Cologne, June 12-13, 2018.
7. G. Cannazza, “Pharmaceutical Chemistry Aspects of Cannabidiol” at the 42nd National Congress, LICE, Rome, June 5-7, 2019.
8. G. Cannazza, “Chemistry and Pharmacology of Cannabinoids” at the 1st Mediterranean Dermatological Interactive Meeting, Malta, November 14-16, 2019.
9. G. Cannazza, “Isolated Cannabidiol or in Association with Other Cannabinoids: Pharmaceutical Chemistry Aspects,” at the 43rd Virtual National Congress, LICE, September 30 - October 2, 2020.

Organization of National and International Scientific Conferences:

1. Organizer of the "Metabolomics Seminar" at UNIMORE, Modena, September 19, 2016.
2. Member of the "NATIONAL ORGANIZING COMMITTEE" for the Meeting "Eurasia Conference on Chemical Sciences - Rome, September 5-8, 2018" http://www.eurasia2018.org/rome/organization/noc.
3. Member of the organizing committee for the meeting “Recent Development and Pharmaceutical Analysis 2021” held in Modena, September 5-8, 2021. https://www.rdpa2021.unimore.it/

Teaching Activity

Prof. Cannazza has been involved in teaching activities since the 2003/04 academic year, teaching courses such as “Laboratory of Drug Extraction and Synthesis” (CTF degree program) and “Pharmaceutical Chemistry” (Biotechnology degree programs), “Medicinal Analysis 1” (Pharmacy and CTF degree programs), “Medicinal Analysis 2” (CTF degree program), Pharmaceutical Chemistry 1 (Pharmacy degree program). He has also taught courses on “Radiopharmaceuticals” and “Pharmaceutical Chemistry Aspects of Antitumor Drugs” for the School of Specialization in Hospital Pharmacy and the “Basic Course on the Use of Libraries and Bibliographic Research” for the CTF degree program.
Prof. Cannazza has consistently received positive evaluations from students in all the courses he has taught.

He has taught the following courses in the following academic years:

- **Academic Years 2021/22, 2022/23, 2023/24**
  Prof. Cannazza was assigned the course "Pharmaceutical Chemistry 1" (11 CFU, 88 hours) for the Pharmacy degree program, UNIMORE.
  He was also responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  Additionally, he taught 1 CFU (8 hours) of the "Radiopharmaceuticals" course and 1 CFU (8 hours) of "Pharmaceutical Chemistry Aspects of Antitumor Drugs" for the School of Specialization in Hospital Pharmacy, UNIMORE.
- **Academic Year 2020/21**
  Prof. Cannazza was assigned the course "Pharmaceutical Chemistry 1" (11 CFU, 88 hours) for the Pharmacy degree program, UNIMORE.
- **Academic Year 2019/20**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  He taught 1 CFU (8 hours) of the "Radiopharmaceuticals" course and 1 CFU (8 hours) of

"Pharmaceutical Chemistry Aspects of Antitumor Drugs" for the School of Specialization in Hospital Pharmacy, UNIMORE.

- **Academic Year 2018/19**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  He taught 1 CFU (8 hours) of the "Radiopharmaceuticals" course for the School of Specialization in Hospital Pharmacy, UNIMORE.

- **Academic Year 2017/18**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  He taught 1 CFU (8 hours) of the "Radiopharmaceuticals" course for the School of Specialization in Hospital Pharmacy, UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Bachelor's Degree in Biotechnology).

- **Academic Year 2016/17**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  He taught 1 CFU (8 hours) of the "Radiopharmaceuticals" course for the School of Specialization in Hospital Pharmacy, UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Bachelor's Degree in Biotechnology).

- **Academic Year 2015/16**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Bachelor's Degree in Biotechnology) and for the "Pharmaceutical Chemistry" course (6 CFU, 48 hours of lectures) (Master's Degree in Medical Biotechnology and Nanotechnology).

- **Academic Year 2014/15**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 1" course for the CTF degree program (4 CFU, 48 hours) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Bachelor's Degree in Biotechnology) and for the "Pharmaceutical Chemistry" course (6 CFU, 48 hours of lectures) (Master's Degree in Medical Biotechnology and Nanotechnology).

- **Academic Year 2013/14**
  Prof. Cannazza was responsible for two laboratory sections of the "Medicinal Analysis 1" course for the Pharmacy degree program (5 CFU, 120 hours) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Bachelor's Degree in Biotechnology) and for the "Pharmaceutical Chemistry" course (6 CFU, 48 hours of lectures) (Master's Degree in Medical Biotechnology and Nanotechnology).

- **Academic Year 2012/13**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 45 hours of lectures and 125 hours of laboratory) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Bachelor's Degree in Biotechnology).

- **Academic Year 2011/2012**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 40 hours of lectures and 65 hours of laboratory) at UNIMORE.

- **Academic Year 2010/2011**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 40 hours of lectures and 65 hours of laboratory) at UNIMORE.

- **Academic Year 2009/2010**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 40 hours of lectures and 65 hours of laboratory) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Specialized Degree in Industrial Pharmaceutical Biotechnology).

- **Academic Year 2008/2009**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 45 hours of lectures and 130 hours of laboratory) at UNIMORE.
  He taught the "Basic Course on the Use of Libraries and Bibliographic Research" (1.5 Hours) for the CTF degree program at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Specialized Degree in Industrial Pharmaceutical Biotechnology).

- **Academic Year 2007/08**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 40 hours of lectures and 65 hours of laboratory) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Specialized Degree in Industrial Pharmaceutical Biotechnology).

- **Academic Year 2006/2007**
  Prof. Cannazza was assigned the "Medicinal Analysis 1" course for the Pharmacy degree program (10 CFU, 40 hours of lectures and 130 hours of laboratory) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Specialized Degree in Industrial Pharmaceutical Biotechnology).

- **Academic Year 2005/06**
  Prof. Cannazza was responsible for one laboratory section of the "Medicinal Analysis 2" course for the Pharmacy degree program (40 hours) at UNIMORE.
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Salento for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Specialized Degree in Industrial Pharmaceutical Biotechnology).

- **Academic Year 2004/05**
  Contract Professor at the Faculty of Pharmacy at the "G. D'Annunzio" University of Chieti for the "Laboratory of Extractive and Synthetic Drug Preparation" course (10 CFU) (CTF degree program).
  Contract Professor at the Faculty of Mathematical, Physical and Natural Sciences at the University of Lecce for the "Pharmaceutical Chemistry" course, (6 CFU, 40 hours of lectures and 12 hours of laboratory) (Specialized Degree in Industrial Pharmaceutical Biotechnology).

- **Academic Year 2003/04**
  Contract Professor at the Faculty of Pharmacy at the "G. D'Annunzio" University of Chieti for the "Laboratory of Extractive and Synthetic Drug Preparation" course (10 CFU) (CTF degree program).

- **Academic Years 2000/01, 2001/02, 2002/03**
  Prof. Cannazza taught the annual course of “Advanced Laboratory Methodologies for Drug Research” (6 hours per year).

Modena 07/22/2024
SIGNATURE

Giuseppe Cannazza