Francesco Pennacchio

- Nationality: Italian.
- Work address: Department of Agricultural Sciences, University of Napoli "Federico II", via Università, 100 - 80055 Portici (NA).

EDUCATION AND RESEARCH POSITIONS

- PhD in Entomology, 1989.
- Research Expert at EU JRC Ispra, September-December 1988.
- Post-doctoral associate, Texas A&M University, Department of Entomology, College Station, TX, USA, 1989-1990.

ACADEMIC POSITIONS

- Professor of Entomology, November 2000-present (Associate Professor, 1992-2000; Assistant Professor, 1988-1992).
- Visiting Professor, University of Newcastle upon Tyne (UK), 2006-present.
- Chair of the International PhD course in "Insect Science and Biotechnology", 2002-2016.
- Chair of the European Network of PhD Schools in "Insect Science", 2010-present.
- Head of the Department of Agricultural Entomology and Zoology "F. Silvestri", 2009-2012.
- Rector Delegate for Scientific Research at the University of Basilicata, 2003-2005.
- Rector Delegate in the National Committee for Scientific Research, CRUI, 2003-2005.

MAJOR SCIENTIFIC CONSULTANCIES

- Member of the National Board of Directors, Italian Council for Research in Agriculture (CRA), 2007-2011.
- Member of an EASAC (European Academies Science Advisory Council) working group on sustainable agriculture and neonicotinoids, as a representative of the Accademia Nazionale dei Lincei, 2013-2014.
- Member of the Italian Scientific Board for Pesticide Registration, Ministry of Health, 2005-present.
- Representative for the Italian Ministry of Research in the Managing Committee of the COST action "Using three-way interactions between plants, microbes and arthropods to enhance crop protection and production", 2015-2019.
- Member of the International Committee of Virus Taxonomy, study group Polydnaviridae.
- Member of International Committees in charge of scientific assessment of foreign research institutes (INRA, FERA, Czech Academy of Sciences - Institute of Biology).
- Reviewer of grant applications for major national, foreign and international agencies.
- Reviewer for major scientific journals (including Science, Nature, PNAS, PLoS Pathogens, Current Biology)

SCIENTIFIC CREDENTIALS

Publications
- Scientific publications are focused on the following topics: insect parasitology and pathology, immunity, honeybee health, bioinsecticides, insect multitrophic interactions.
- Bibliometric parameters in ISI Web of Science:
130 publications
h-index 35
number of total citations 3837
average citations per item 28.63.

Editor of Scientific Journals
- Editor "Journal of Insect Physiology", Elsevier, 2010-present.

Prizes and Honors
- Recipient of PNAS Cozzarelli Prize 2013 (National Academy of Sciences U.S.A.), awarded to the best paper published in PNAS (Applied Biological Sciences).
- President of the "Società Entomologica Italiana", 2012-present.
- Member of the "Accademia Nazionale Italiana di Entomologia", 2001-present.
- Vice-President FISNA (Federazione Italiana di Scienze della Natura e dell'Ambiente), 2015-2018.
- Member of the Praesidum of European Congress of Entomology 2014-present.
- Member of the Council for International Congresses of Entomology, 2016-2032.
- Chair of the XI European Congress of Entomology - July 2-6, 2018.

MAJOR RESEARCH GRANTS

Eu Funded Projects
- H2020-SFS- 2016/2017- GA 773554: "Stacking of ecosystem services: mechanisms and interactions for optimal crop protection, pollination enhanced and productivity (EcoStack)". Coordinator ; 2018-2023, value € 11000 K.
- KBBE-KBBE-7 – GA 613960 (SmartBees) "Sustainable management of resilient bee populations"
- Partner; 2014-2018, value € 300K.
- QLK3-CT-2001- 01586 BIP (FP6); "Biopesticides from Insect Parasitoids"
- Partner and deputy coordinator; 2002-2004, value € 1400K.
- FAIR 6-CT98–4322 "Artificial diets for the production of natural enemies (predators and parasitoids) of greenhouse pest insects". Partner; 2000-2002, value € 300K

National Funded Projects
- PRIN 2017 (2017954WNT) – "Understanding how stress affects honey bee immunity to manage colony losses" National coordinator; 2019-2022, value € 706K
- PRIN 2008 (2008FBJPR8) – "Development of new bioinsecticides" National coordinator; 2010-2011, value € 301K
- PRIN 2006 (2006079417) – "New strategies for insect control with genes from natural antagonists" National coordinator; 2007-2008, value € 180K
- PRIN 2002 (2002077357) - "New natural insecticides from insect parasitoids" National coordinator; 2003-2004, value € 240K
- FIRB negoziale (RBNE01YXA8) – GeFI "Insect functional genomics for the development of innovative plant protection strategies" National coordinator; 2002-2006, value € 1050K
- MIUR - International PhD course in "Insect Biotechnology" Coordinator; 2002-2005, value

€ 220K

- MIUR - International PhD course in "Insect Science and Biotechnology" Coordinator; 2005-2008, value € 200K
- MIPAAF - APENET Partner; 2009-2012, value € 280K
- MIPAAF - "Genetic resources of beneficial organisms for sustainable agriculture"
- Coordinator sub-project on insects; 2002-2005, value € 500K.

Regional Projects

- URCOFI: Coordination of monitoring and research on plant protection in Campania Region. Coordinator; 2012-2019, value € 2000 K
- Network of biotechnology in Campania Region. BIP: BioIndustrial Processes. (Project Code PO FESR 2007-2013 Ob. Oper. 2.1), Partner, 2013-2015, value € 92K.

SELECTED PUBLICATIONS IN THE LAST 10 YEARS

1. CORRADO G., ARCIELLO S., FANTI P., FIANDRA L., GARONNA A., DIGILIO M.C., LORITO M., GIORDANA B., PENNACCHIO F., RAO R. -2008- The Chitinase A from the baculovirus AcMNPV enhances resistance to both fungi and herbivorous pests in tobacco. Transgenic Research, 17(4):557-71.

2. TETTAMANTI G., GRIMALDI A., PENNACCHIO F., DE EGUILEOR M. – 2008 - *Toxoneuron nigriceps* parasitization delays midgut replacement in fifth-instar *Heliothis virescens larvae*. CELL AND TISSUE RESEARCH 332:371-379.

3. CASARTELLI M., CERMENATI G., RODIGHIERO S., PENNACCHIO F., GIORDANA B. -2008- A megalin-like receptor is involved in protein endocytosis in the midgut of an insect (*Bombyx mori*, Lepidoptera). American Journal of Physiology, Regul. Integr. Comp. Physiol., 295(4): 290-300.

4. PRUIJSSERS A. J., FALABELLA P., EUM J.-H., PENNACCHIO F., BROWN M. R., STRAND M. R. -2009- Infection by a symbiotic polydnavirus induces wasting and inhibits metamorphosis of the moth *Pseudoplusia includens*. Journal of Experimental Biology, 212**(18):** 2998-3006**.**

5. FALABELLA P**.,** RIVIELLO L., DE STRADIS M.L., STIGLIANO C., VARRICCHIO P., GRIMALDI A., DE EGUILEOR M.,GRAZIANI F., GIGLIOTTI S., PENNACCHIO F. -2009- Aphidius ervi teratocytes release an extracellular enolase. Insect Biochemistry and Molecular Biology, 39 (11): 801-813.

6. DUCHI S., CAVALIERE V., FAGNOCCHI L., GRIMALDI M.R., FALABELLA P., GRAZIANI F., GIGLIOTTI S., PENNACCHIO F., GARGIULO G. -2010- The impact on microtubule network of a bracovirus IkB-like protein. Cellular and Molecular Life Sciences, 67(10): 1699-1712.

7. FIANDRA L., TERRACCIANO I., FANTI P., GARONNA A., FERRACANE L., FOGLIANO V., CASARTELLI B., GIORDANA B., RAO. R., PENNACCHIO F. -2010- A viral chitinase enhances oral activity of TMOF. Insect Biochemistry and Molecular Biology, 40(7): 533.540.

8. DIGILIO M. C., CORRADO G., SASSO R., COPPOLA V., IODICE L., PASQUARIELLO M., BOSSI S., MAFFEI M.E., COPPOLA M., PENNACCHIO F., RAO R., GUERRIERI E. -2010- Molecular and chemical mechanisms involved in aphid resistance in cultivated tomato. New Phytologist, 187(4): 1089-1101.

9. DI PRISCO G., PENNACCHIO F., BONCRISTIANI H.F. Jr., EVANS J., CHEN J. -2011- Varroa destructor is an effective vector of Israeli Acute Paralysis Virus in the honey bee, Apis mellifera. Journal of General Virology, 92:151-155.

10. DI PRISCO G., ZHANG X., PENNACCHIO F., CAPRIO E., LI J., EVANS J.D., DEGRANDI-HOFFMAN G., HAMILTON M., CHEN Y.P. -2011- Dynamics of persistent and acute deformed wing virus infections in honey bees, Apis mellifera. Viruses, 3(12): 2425-41

11. CERMENATI G., TERRACCIANO I., CASTELLI I., GIORDANA B., RAO R., PENNACCHIO F., CASARTELLI M. -2011- The CPP Tat enhances eGFP cell internalization and transepithelial transport by the larval midgut of Bombyx mori (Lepidoptera, Bombycidae). Journal of Insect Physiology, 57(12): 1689-1697.

12. PENNACCHIO F., MANCINI D. -2012- Aphid Parasitoid Venom and its Role in Host Regulation. In: Beckage Nancy, Parasitoid Viruses: Symbionts and Pathogens. Elselvier, PAESI BASSI. pp. 247 - 254

13. PENNACCHIO F., GIORDANA B., RAO R. -2012-. Applications of Parasitoid Virus and Venom Research in Agriculture. In:Beckage Nancy, Parasitoid Viruses: Symbionts and Pathogens. Elsevier, PAESI BASSI. pp. 269 – 283

14. CACCIA S, GRIMALDI A, CASARTELLI M, FALABELLA P, de EGUILEOR M, PENNACCHIO F, GIORDANA B. -2012- Functional analysis of a fatty acid binding protein produced by Aphidius ervi teratocytes. J. Insect Physiol. 58(5): 621-627.

15. FALABELLA P., RIVIELLO L., PASCALE M., DI LELIO I., TETTAMANTI G., GRIMALDI A., IANNONE C., MONTI M., PUCCI P., TAMBURRO A.M., de EGUILEOR M., GIGLIOTTI S., PENNACCHIO F.. -2012- Functional amyloids in insect immune response. Insect Biochem Mol Biol., 42(3): 203-211.

16. NAZZI F., BROWN S.P., ANNOSCIA D., DEL PICCOLO F., Di PRISCO G., VARRICCHIO P., DELLA VEDOVA G., CATTONARO F., CAPRIO E., PENNACCHIO F. -2012- Synergistic parasite-pathogen interactions mediated by host immunity can drive the collapse of honeybee colonies. PLoS Pathog. 8(6):e1002735.

17. COPPOLA V., COPPOLA M., ROCCO M., DIGILIO M. C., D'AMBROSIO C., RENZONE G., MARTINELLI R., SCALONI A., PENNACCHIO F., RAO R., CORRADO G.-2013- Transcriptomic and proteomic analysis of a compatible tomato-aphid interaction reveals a predominant salicylic acid-dependent plant response. BMC GENOMICS 14: 515.

18. DI PRISCO G., CAVALIERE V., ANNOSCIA D., VARRICCHIO P., CAPRIO E., NAZZI F., GARGIULO G., PENNACCHIO F. -2013- Neonicotinoid clothianidin adversely affects insect immunity and promotes replication of a viral pathogen in honey

bees**.** Proceedings of the National Academy of Sciences of the United States of America 110: 18466 - 18471.

19. NAZZI F., PENNACCHIO F. -2013- Agenti di stress e collasso delle colonie d'api. Atti Accademia Nazionale Italiana di Entomologia, 61: 77- 81.

20. WHITE J. A., GIORGINI M., STRAND M. R., PENNACCHIO F. -2013-Arthropod endosymbiosis and evolution, in Arthropod Biology and Evolution, eds Minelli A., Boxshall G., Fusco G., editors. (Berlin; Heidelberg: Springer-Verlag;), pp 441–477.

21. DI LELIO I., VARRICCHIO P., DI PRISCO G., MARINELLI A., LASCO V., CACCIA S., CASARTELLI M., GIORDANA B., RAO R., GIGLIOTTI S., PENNACCHIO F. -2014- Functional analysis of an immune gene of Spodoptera littoralis by RNAi. Journal of Insect Physiology 64: 90 - 97.

22. VALZANIA L., ROMANI P., TIAN L., LI S., CAVALIERE V., PENNACCHIO F., GARGIULO G. -2014- A polydnavirus ANK protein acts as virulence factor by disrupting the function of prothoracic gland steroidogenic cells. PLoS One 9(4):e95104.

23. COLINET D., ANSELME C., DELEURY E., MANCINI D., POULAIN J., AZÉMA-DOSSAT C., BELGHAZI M., TARES S., PENNACCHIO F., POIRIÉ M. and GATTI J. L. -2014-. Identification of the main venom protein components of Aphidius ervi, a parasitoid wasp of the aphid model Acyrthosiphon pisum. BMC Genomics 15: 342.

24. PENNACCHIO F., MASI A. and POMPELLA A. -2014- . Glutathione levels modulation as a strategy in host-parasite interactions-insights for biology of cancer. Frontiers in Pharmacology 5:180.

25. PENNACCHIO F., CACCIA S., DIGILIO M. C. -2014- Host regulation and nutritional exploitation by parasitic wasps. Current Opinion in Insect Science. 6:74-79.

26. DI LELIO I., CACCIA S., COPPOLA M., BUONANNO M., DI PRISCO G., VARRICCHIO P., FRANZETTI E., CORRADO G., MONTI S. M., RAO R., CASARTELLI M., PENNACCHIO F. -2014- A virulence factor encoded by a polydnavirus confers tolerance to transgenic tobacco plants against lepidopteran larvae, by impairing nutrient absorption. PLoS One 1;9(12):e113988.

27. NAZZI F., PENNACCHIO F. -2014- Disentangling multiple interactions in the hive ecosystem. Trends in Parasitology 30(12):556-61.

28. COPPOLA M., CORRADO G., COPPOLA V., CASCONE P., MARTINELLI R., DIGILIO M. C., PENNACCHIO F., RAO R. -2015- Prosystemin Overexpression in Tomato Enhances esistance to Different Biotic Stresses by Activating Genes of Multiple Signaling Pathways. Plant Mol Biol Report. 2015;33(5):1270-1285.

29. CACCIA S., DI LELIO I., LA STORIA A., MARINELLI A., VARRICCHIO P., FRANZETTI E., BANYULS N., TETTAMANTI G., CASARTELLI M., GIORDANA B., FERRÉ J., GIGLIOTTI S., ERCOLINI D., PENNACCHIO F. -2016- Midgut microbiota and host immunocompetence underlie Bacillus thuringiensis killing mechanism. Proc Natl Acad Sci USA. 113(34):9486-91.

30. DI PRISCO G, ANNOSCIA D, MARGIOTTA M, FERRARA R, VARRICCHIO P, ZANNI V, CAPRIO E, NAZZI F, PENNACCHIO F. -2016- A mutualistic symbiosis between a parasitic mite and a pathogenic virus undermines honey bee immunity and health. Proc Natl Acad Sci USA. 113(12):3203-8.

31. SÁNCHEZ-BAYO F., GOULSON D., PENNACCHIO F., NAZZI F., GOKA K., DESNEUX N. -2016- Are bee diseases linked to pesticides? - A brief review. Environ Int. 89-90:7-11.

32. COPPOLA M., CASCONE P., MADONNA V., DI LELIO I., ESPOSITO F., AVITABILE C., ROMANELLI A., GUERRIERI E., VITIELLO A., PENNACCHIO F., RAO R., CORRADO G. -2017- Plant-to-plant communication triggered by systemin primes anti-herbivore resistance in tomato. Sci Rep. 14;7(1):15522.

33. DI PRISCO G., IANNACCONE M., IANNIELLO F., FERRARA R., CAPRIO E., PENNACCHIO F., CAPPARELLI R. -2017- The neonicotinoid insecticide Clothianidin adversely affects immune signaling in a human cell line. Sci Rep. 18;7(1):13446.

34. BECCHIMANZI A., AVOLIO M., DI LELIO I., MARINELLI A., VARRICCHIO P., GRIMALDI A., DE EGUILEOR M., PENNACCHIO F., CACCIA S. -2017- Host regulation by the ectophagous parasitoid wasp Bracon nigricans. J Insect Physiol.;101:73-81.

35. COPPOLA M., CASCONE P., CHIUSANO M. L., COLANTUONO C., LORITO M., PENNACCHIO F., RAO R., WOO S. L., GUERRIERI E, DIGILIO M. C. -2017- Trichoderma harzianum enhances tomato indirect defense against aphids. Insect Sci. 24(6):1025-1033.

36. BUONANNO M., COPPOLA M., DI LELIO I., MOLISSO D., LEONE M., PENNACCHIO F., LANGELLA E., RAO R., MONTI S. M. -2018- Prosystemin, a prohormone that modulates plant defense barriers, is an intrinsically disordered protein. Protein Science 27(3):620-632.

37. IGNESTI M., FERRARA R., ROMANI P., VALZANIA L., SERAFINI G., PENNACCHIO F., CAVALIERE V., GARGIULO G. -2018- A polydnavirus-encoded ANK protein has a negative impact on steroidogenesis and development. Insect Biochemistry and Molecular Biology 95:26-32.

38. NAZZI F., PENNACCHIO F. -2018- Honey Bee Antiviral Immune Barriers as Affected by Multiple Stress Factors: A Novel Paradigm to Interpret Colony Health Decline and Collapse. Viruses 10(4):159.

39. COPPOLA M., MANCO E., VITIELLO A., DI LELIO I., GIORGINI M., RAO R., PENNACCHIO F., DIGILIO M. C. -2018- Plant response to feeding aphids promotes aphid dispersal. Entomologia Experimentalis et Applicata 166(5):386-394.

40. DI LELIO I., ILLIANO A., ASTARITA F., GIANFRANCESCHI L., HORNER D., VARRICCHIO P., AMORESANO A., PUCCI P., PENNACCHIO F., CACCIA S. – 2019 - Evolution of an insect immune barrier through horizontal gene transfer mediated by a

parasitic wasp. PLOS Genetics, 2019 Mar 5;15(3): e1007998. doi: 10.1371/journal.pgen.1007998.

41. ANNOSCIA D., BROWN S. P., DI PRISCO G., DE PAOLI E., DEL FABBRO S., FRIZZERA D., ZANNI V., GALBRAITH D.A., CAPRIO E., GROZINGER C. M., PENNACCHIO F., NAZZI F. -2019- Haemolymph removal by *Varroa* mite destabilizes the dynamical intercation between immune effectors and virus in bees, as predicted by Volterra's model. Proc Biol Sci. 2019 Apr 24;286(1901):20190331. doi: 10.1098/rspb.2019.0331.

42. COPPOLA M., CASCONE P., DI LELIO I., WOO S.L., LORITO M., RAO R., PENNACCHIO F., GUERRIERI E., DIGILIO M. C. 2019- *Trichoderma atroviride* P1 colonization of tomato plants enhances both direct and indirect defense barriers against insects. Forntiers in Physiology 2019 Jul 5;10:813. doi: 10.3389/fphys.2019.00813.

43. COPPOLA M., DIRETTO G., DIGILIO M. C., WOO S. L., GIULIANO G., MOLISSO D., PENNACCHIO F., LORITO M., RAO R. – 2019- Transcriptome and matabolome reprogramming in tomato plants by *Trichoderma harzianum* strain T22 primes and enhances defense responses against aphids. Front Physiol. 2019 Jun 21;10:745. doi: 10.3389/fphys.2019.00745.

44. ALSHUKRI B., ASTARITA F., AL-ESAWY M., EL SAYED ABD EL HALIM H. M., PENNACCHIO F. , GATEHOUSE A. M. R., EDWARDS M. G. – 2019 – Targeting the potassium ion channel genes SKand SH as a novel approach for control of insect pests: efficacy and biosafety. (wileyonlinelibrary.com) DOI 10.1002/ps.5516.

45. CACCIA S., ASTARITA F., BARRA E. DI LELIO I., VARRICCHIO P., PENNACCHIO F. – 2019 - Enhancement of *Bacillus thuringiensis* toxicity by feeding *Spodoptera littoralis* larvae with bacteria expressing immune suppressive dsRNA. Journal of Pest Science, https://doi.org/10.1007/s10340-019-01140-6.