

Manoj Sapkota

<https://manoj34sapkota.github.io/>



Breeding Insight, Cornell University
119 CALS Surge Facility
Ithaca, NY 14853-2703
Email: manoj.sapkota@cornell.edu

825 Gaines School Rd, Apt 220,
Athens, GA, 30605
Cell: +1 (706) 296 5126
Email: manoj34sapkota@gmail.com

EDUCATION

University of Georgia (UGA), Athens, GA

Ph.D., Plant Breeding, Genetics and Genomics, Institute of Plant Breeding, Genetics and Genomics (IPBGG), 2023

Cumulative GPA: 3.84/4.00

Thesis title: Elucidating the genetic basis of flavor volatiles in tomato

Tribhuvan University (TU), Nepal

B.S., Agriculture, Institute of Agriculture and Animal Sciences, Rampur, Nepal

Major in Plant Breeding, 2016

Passed with 82.19% under Distinction Division

Thesis title: Agromorphological characterization of foxtail millet (*Setaria italica* L. Beauv) at Rampur, Chitwan

RESEARCH EXPERIENCE

Genomics Postdoctoral Associate, Breeding Insight, Cornell University, Ithaca, NY

June 2023 –

Supervisor: Dr. Dongyan Zhao

- Identification and mapping novel loci underlying several traits in crops like blueberry, alfalfa, strawberry, cranberry, lettuce, pecan, and cucumber
- Developing bioinformatic pipelines for quality control of genotypes and QTL analysis
- Preparing scientific reports and manuscripts

Breeding Insight (BI) is a U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) initiative hosted at Cornell University in Ithaca, New York.

Graduate Research Assistant, Institute of Plant Breeding, Genetics, and Genomics, University of Georgia

August 2017 – May 2023

Supervisor: Dr. Esther van der Knaap

- Identification and fine mapping of novel loci underlying fruit weight in tomatoes
- Genome-wide association and QTL mapping for volatiles contributing to flavor
- Identification and fine mapping of *METHYLESTERASE* locus controlling methyl salicylate levels in tomato fruits
- Genetic characterization of *METHYLESTERASE* and *NON-SMOKY GLUCOSYL TRANSFERASE1* in red-fruited tomato

This research culminated in at least nine peer reviewed publications and was funded by NSF-IOS 1564366, Plant Genome Research Program (PGRP), “Exploitation of Genetic and Epigenetic Variation in the Regulation of Tomato Fruit Quality Traits” (Sept 2016-Apr 2022); and NSF-IOS 2151032, PGRP, “Decoding the genetics of volatile aroma of tomato fruits” (Jul 2022-Jun 2025).

Research Technician, International Maize, and Wheat Improvement Centre (CIMMYT), Nepal

November 2016-June 2017

Supervisor: Dr. AR Sadananda

- Design, setup and conduct varietal evaluation trials of tomato, maize, cauliflower, onion and lentils
- Data analysis and report preparation.
- Provide training and workshops to farmers and researchers.

This work was funded through Nepal Seed and Fertilizer (NSAF) Project at the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT).

Research Intern, Wheat Breeding Unit, Agriculture and Botany Division, Nepal Agriculture Research Council, Nepal

April 2016 – November 2016

Supervisor: Dr. Dhruva Bahadur Thapa

- Establishing and conducting various wheat varietal evaluation trials
- Observation and data analysis of various wheat and durum wheat varietal evaluation trials
- Writing varietal release proposal for several wheat and durum wheat varieties release request.
- Setting up and distributing trials sets for different research stations.

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This research resulted in one publication and was funded through Nepal Agricultural Research Council, CIMMYT, the Bill and Melinda Gates Foundation and the Foreign, Commonwealth, and Development Office of the UK Government. I also contributed significantly to proposal preparation and statistical analysis for variety release of two bread wheat varieties (Munal and Chyakhura) and Nepal's first two durum wheat varieties (Khajura Durum 1 and Khajura Durum 2).

RESEARCH GRANT

Contributions to Funded Research

Title: Decoding the genetics of volatile aroma of tomato fruits (July 2022-June 2025)

Principle Investigators: Esther van der Knaap, PhD, University of Georgia and Denise E. Tieman, PhD, University of Florida National Science Foundation, Plant Genome Research Program, IOS 2151032: \$1,499,986.00

Role: My work on genome wide association mapping for novel loci controlling volatiles contributing to tomato flavor was the basis for this grant. I provided preliminary data, developed aims, developed extension program, and wrote the grant with Dr. van der Knaap and Dr. Tieman.

FELLOWSHIPS

- The Roger and Cindy Boerma Plant Breeding Excellence Scholarship Award 2022.
- The John Ingle Innovation in Plant Breeding Award 2021.
- Awarded research grant for B.S. thesis research by Local Initiatives for Biodiversity, Research and Development (LiBIRD), Nepal, 2016.
- Full scholarship to study B.Sc. Agriculture in Rampur Campus, Institute of Agriculture and Animal Sciences by Tribhuvan University in competition basis, 2012-2016

HONORS & AWARDS

- 2nd place in the PhD poster competition at the 2022 PBGG Retreat, Jekyll Island, GA, May 2022.
- 3rd place in the PhD poster competition at the 2020 PBGG Retreat, virtual, July 2020.
- 1st place in the PhD poster at the 2020 PBGG Retreat. Dawsonville, GA, May 2019.
- Travel award to attend and present a talk at 3rd Annual University of Florida Plant Science Symposium, University of Florida, Gainesville, Florida, January 2019

SUPERVISED UNDERGRADUATE PROJECTS

Jeremiah Jackson, jljackson@presby.edu, under CCGv2 REEU 2022, Candidate gene identification for tomato monoterpenoid volatiles in fruits through an automated gene screening pipeline with GWAS.

Alexander Kim Sweet, xsweet@uga.edu, Fall 2021, Developing pipeline and Graphical User Interface program to analyze and classify scanned tomato fruit images based on ripeness.

Arman Spinola-Khazami, arman.spinolakh25@uga.edu, Spring 2021 and Summer 2021, Developing pipelines for local phylogenetic tree construction to study novel loci affecting fruit weight and flavor volatiles.

Seyedparsa Torabi, seyedparsa.torabi@uga.edu, Spring 2021, Identification and study of candidate genes underlying novel loci affecting methyl salicylate biosynthesis in tomato fruits.

PUBLICATIONS ([Google Scholar](#))

Li Q., Luo S., Zhang L., Feng Q., Song L., **Sapkota, M.**, Xuan S., Wang Y., Zhao J., van der Knaap, E., Chen X. and Shen S. 2023. Molecular and genetic regulation of fleshy fruit shape and lessons from Arabidopsis and rice. *Horticulture Research*, doi: doi.org/10.1093/hr/uhad108

Sapkota, M., Pereira, L., Wang, Y., Zhang, L., Topcu, Y., Tieman, D. and van der Knaap, E., 2023. Structural variation underlies functional diversity at methyl salicylate loci in tomato. *PLOS Genetics*, doi: [10.1371/journal.pgen.1010751](https://doi.org/10.1371/journal.pgen.1010751)

Zhang, B., Li, Q., Keyhaninejad, N., Taitano, N., **Sapkota, M.**, Snouffer, A. and van der Knaap, E., 2023. Combinatorial TRM-OPF module is required to fine-tune tomato fruit shape. *New Phytologist*. <https://doi.org/10.1111/nph.18855>

Frick, E.M., **Sapkota, M.**, Pereira, L., Wang, Y., Hermanns, A., Giovannoni, J.J., van der Knaap, E., Tieman, D.M. and Klee, H.J., 2023. A family of methyl esterases converts methyl salicylate to salicylic acid in ripening tomato fruit. *Plant Physiology*. doi: [10.1093/plphys/kiac509](https://doi.org/10.1093/plphys/kiac509)

Barnett, J., Buonauro, G., Kuipers, A., **Sapkota, M.**, van der Knaap, E., & Razifard, H. 2022. Genomic characterization of a wild-like tomato accession found in Arizona; a northward migration story. *Systematic Botany*. volume 47 issue 4 (October-December 2022). doi: [10.1600/036364422X16674053033895](https://doi.org/10.1600/036364422X16674053033895)

Thapa, D.B., Subedi, M., Yadav, R.P., Joshi, B.P., Adhikari, B.N., Shrestha, K.P., Magar, P.B., Pant, K.R., Gurung, S.B., Ghimire, S., Gautam, N.R., Acharya, N.R., **Sapkota, M.**, Mishra, V.K., Joshi, A.K., Singh, R.P., and Govindan, V. 2022. Variation in Grain Zinc and Iron Concentrations, Grain Yield and Associated Traits of Biofortified Wheat Genotypes in Nepal. *Frontiers in Plant Science*, 13:881965. doi: [10.3389/fpls.2022.881965](https://doi.org/10.3389/fpls.2022.881965)

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- Pereira, L., Zhang, L., **Sapkota, M.**, Ramos, A., Razifard, H., Caicedo, A.L. and van der Knaap, E., 2021. Unraveling the genetics of tomato fruit weight during crop domestication and diversification. *Theoretical and Applied Genetics*, 134(10), pp.3363-3378.
- Topcu, Y., **Sapkota, M.**, Illa-Berenguer, E., Nambeesan, S.U. and van der Knaap, E., 2021. Identification of blossom-end rot loci using joint QTL-seq and linkage-based QTL mapping in tomato. *Theoretical and Applied Genetics*, pp.1-15.
- Pereira, L., **Sapkota, M.**, Alonge, M., Zheng, Y., Zhang, Y., Razifard, H., Taitano, N.K., Schatz, M.C., Fernie, A.R., Wang, Y. and Fei, Z., Caicedo, A., Tieman, D. and van der Knaap, E., 2021. Natural genetic diversity in tomato flavor genes. *Frontiers in Plant Science*, 12, p.642828.
- Li Q., **Sapkota M.**, and van der Knaap E. 2020. Perspectives of CRISPR/Cas-mediated cis-engineering in horticulture: unlocking the neglected potential for crop improvement. *Horticulture research*, 7(1), 1-11.
- Poudel A., Thapa D.B., and **Sapkota M.** 2017. Cluster Analysis of Wheat (*Triticum aestivum* L.) Genotypes Based Upon Response to Terminal Heat Stress. *International Journal of Applied Sciences and Biotechnology*, 5(2), 188-193. DOI: 10.3126/ijasbt.v5i2.17614
- Bhattarai R.P., Ojha, B.R., Thapa D.B., Kharel R., Ojha, A., and **Sapkota M.** 2017. Evaluation of Elite Spring Wheat (*Triticum aestivum* L.) Genotypes for Yield and Yield Attributing Traits under Irrigated Condition. *International Journal of Applied Sciences and Biotechnology*, 5(2), 194-202. DOI: 10.3126/ijasbt.v5i2.17615
- Sapkota M.**, Timilsina D., Yadav M.K., and Ghimire S. 2016. Agromorphological Characterisation of Foxtail millet *Setaria italica* L. Beauv. at Rampur, Chitwan. Thesis. Himalayan Crops, Official site of the Local Crop Project. <http://www.himalayancrops.org/project/984/>
- Sapkota M.**, Pandey M.P., and Thapa D.B. 2016. Agromorphological Characterisation of Foxtail millet (*Setaria italica* L. Beauv) at Rampur, Chitwan, Nepal. *International Journal of Applied Science and Biotechnology*, 4(3), 298-307.
- Sapkota M.**, Pandey M.P., Thapa D.B., Yadav M.K., Ghimire S. and Timalisina D. 2016. Diversity Assessment of Foxtail millet (*Setaria italica* L. Beauv) Accessions Collected from Different Locations of Nepal. *International Journal of Applied Science and Biotechnology*, 4(4), 483-488. DOI: 10.3126/ijasbt.v4i4.16244.
- Vitrakoti D., Aryal S., Rasaily S., Ojha B.R., Kharel R., and **M. Sapkota**. 2016. Study on Genotypic Response And Correlation Analysis Of The Yield And Yield Attributing Traits Of Different Barley (*Hordeum vulgare*) Genotypes. *International Journal of Applied Science and Biotechnology*, 4(4), 529-536, DOI: 10.3126/ijasbt.v4i4.16269.

In preparation:

- Sapkota, M.**, Pereira, L., Zhang, L., Feng, Q., Hart, A., Topcu, Y., Tieman, D. and van der Knaap, E. Unraveling the Genetic Basis of Tomato Fruit Flavor Volatiles through an Integrated Genome-Wide Association and Biparental Mapping Approach.
- Zhao, D., **Sapkota, M.**, Lin, M., Beil, C., Sheehan, M., Greene, S. and Brian Irish. Genetic diversity, population structure and taxonomic confirmation in annual medic (*Medicago* spp.) collections from Crimea, Ukraine: An In-depth Exploration of Untapped Genetic Resources Beyond Established Genebank Collections.

ORAL PRESENTATIONS

- Sapkota M.** *Identification and characterization of novel loci underlying fruit weight and flavor volatiles in tomato*, Presentation talk at Institute of Plant Breeding, Genetics, and Genomics Departmental Retreat, Jekyll Island, May 2022
- Sapkota M.**, *Identifying novel QTLs underlying fruit weight in tomato*, Presentation talk at Plant Functional Genomics Seminar, Miller Plant Sciences, UGA, February 2020
- Sapkota M.**, *Elimination of Negative Flavor Volatiles for Breeding Tastier Tomatoes*, Presentation talk at 3rd Annual University of Florida Plant Science Symposium, University of Florida, Gainesville, Florida, January 2019
- Sapkota M.**, *How tomatoes got bland & tastier ones on the way*, Presentation talk at Institute of Plant Breeding, Genetics and Genomics seminar. PBGG, UGA, November 2018
- Sapkota M.**, *Breeding for tastier tomatoes: Eliminating negative flavor volatiles*, Presentation talk at Plant Functional Genomics Seminar, Miller Plant Sciences, UGA, October 2018

POSTERS PRESENTATIONS

- Sapkota M.**, Pereira L., Wang Y., Tieman D., and van der Knaap E., Genetic characterization of *METHYLESTERASE* and *NON-SMOKY GLUCOSYL TRANSFERASE1* in red-fruited tomato, Poster presentation at CROPS 2022, Huntsville, Alabama, May 2022.
- Sapkota M.**, Pereira L., Zhang L., Singh J., Topcu Y., Feng Q., Tieman D., and van der Knaap E., Genome-wide association mapping for volatiles contributing to flavor, Poster presentation at 2022 PBGG Retreat Poster Competition, May 2022.
- Sapkota M.**, Zhang L., Pereira L., Qiu Z., and van der Knaap E., *Identification of novel loci underlying fruit weight in tomato*, Virtual poster presentation at 2021 PBGG Retreat Poster Competition, May 2021.
- Sapkota M.**, Zhang L., Pereira L., Qiu Z., and van der Knaap E., *Identification of novel loci underlying fruit weight in tomato*, Virtual poster presentation at Sol International Online Meeting, November 2020
- Sapkota M.**, Zhang L., Pereira L., Qiu Z., and van der Knaap E., *Identification of novel loci underlying fruit weight in tomato.*, Virtual poster presentation at Plant Biology 2020, Worldwide summit July 2020
- Sapkota M.**, Zhang L., Pereira L., Qiu Z., and van der Knaap E., *Identification of novel loci underlying fruit weight in tomato*, Virtual poster presentation at 2020 PBGG Retreat Poster Competition, July 2020.

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- Sapkota M.**, Li Q., Pereira L., Keyhaninejad N., Tieman D., Frick E., Razifard H., Caicedo A., and van der Knaap E., *Studying the genetics of negative flavor volatiles: propyl acetate, methyl salicylate and guaiacol for breeding tastier tomatoes*, Poster presented at Plant Center Fall Retreat. Helen, GA, October 2019.
- Sapkota M.**, Li Q., Pereira L., Keyhaninejad N., Tieman D., Frick E., Razifard H., Caicedo A., and van der Knaap E., *Elimination of negative flavor volatiles: propyl acetate, methyl salicylate and guaiacol for breeding tastier tomatoes*, Poster presented at National Association of Plant Breeders Annual Meeting. Callaway Gardens, GA, August 2019.
- Sapkota M.**, Li Q., Pereira L., Keyhaninejad N., Tieman D., Frick E., Razifard H., Caicedo A., and van der Knaap E., *Elimination of negative flavor volatiles: propyl acetate, methyl salicylate and guaiacol for breeding tastier tomatoes*, Poster presented at CROPS 2019. Huntsville, AL: June 2019.
- Sapkota M.**, Li Q., Pereira L., Keyhaninejad N., Tieman D., Frick E., Razifard H., Caicedo A., and van der Knaap E., *Elimination of negative flavor volatiles: propyl acetate, methyl salicylate and guaiacol for breeding tastier tomatoes.*, Poster presented at Institute of Plant Breeding, Genetics and Genomics Retreat, Dawsonville, GA, May 2019. Achieved 1st position in the poster competition.
- Sapkota M.**, Li Q., Pereira L., Tieman D., Frick E., Razifard H., Caicedo A., and van der Knaap E. *Breeding for tastier tomatoes: Eliminating negative flavor volatiles*. Poster presented at Plant Center Retreat. Helen, GA: September 2018
- Sapkota M.**, Li Q., Pereira L., Tieman D., Frick E., Razifard H., Caicedo A., and van der Knaap E. *Breeding for tastier tomatoes: Eliminating negative flavor volatiles*. Poster presented at Institute of Plant Breeding, Genetics and Genomics Retreat. Callaway Garden, GA: May 2018

CAMPUS & COMMUNITY INVOLVEMENT

Plant Breeding, Genetics and Genomics Graduate Student Association

- Journal club chair, May 2021 – May 2022
- Webmaster, May 2018 – May 2021
 - Managed and handle following social handles:
 - o <https://www.facebook.com/PBGGatUGA>
 - o <https://twitter.com/PBGGatUGA>
 - Designed [IPBGG Graduate Student Handbook](#)
- Volunteered for several student recruitment events for the department as a host and greenhouse/lab tour guide

UGA Plant Center Symposium Organizing Committee

- Member, Social media manager, 2018 – 2023
 - Manage and update following social handles:
 - o <http://plantsymposium.uga.edu/>
 - o <https://www.facebook.com/PlantCenterUGA>
 - o <https://twitter.com/PlantCenterUGA>
- Invite speakers, communicate, and host the speakers during symposium

UGA Integrated Plant Sciences (IPS)

- Hosted and assisted recruits during the recruitment week every year
- Volunteered as a tour guide from UGA greenhouses and lab buildings

Nepalese Students Association at UGA

- President, 2018- 2020
 - o Organize social and cultural events for Nepalese Community in Athens, GA
 - o Assist new Nepalese students attending UGA to settle in Athens, GA
- Secretary, 2017-2018

COMPUTATIONAL SKILLS

- Linux shell script programming and several Bioinformatics analyses
 - o Bulk segregant and QTLseq analysis
 - o RNAseq, differential expression, WGCNA and GO term analysis
 - o Genetic map construction and QTL mapping
 - o Genome-wide Association Study (GWAS)
 - o Genotyping by Sequencing (GBS)
 - o Genetic diversity and haplotype analysis
 - o Big data and whole genome sequencing analysis
- Graphic designing: Adobe Illustrator and Photoshop
- Programming: R, bash, Python, Perl, Matlab
- Cloud computing: Globus, Cyverse
- Website designing and management
- Gas Chromatography chromatograms analysis

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- Proficient in using Microsoft Office package (Word, Excel and Powerpoint)

MOLECULAR SKILLS

- Marker assisted selection and assays
 - o Developing and using molecular markers (CAPS, dCAPS, KASP)
 - o PCR, RT-qPCR, KASP-PCR
 - o DNA and RNA extraction
- Gene editing and cloning
 - o CRIPSR/Cas9 gRNA designing
 - o Plasmid preparation, transformation, and cloning
 - o Tissue culture (tomato)
- Microscopy, imaging, and image analysis