2020-12-07

New - in red

**Course schedule for Genetic diversity and Plant breeding (BI1103), 2020**

Yellow = Lectures

Blue = Sem (compulsory)

Green = Lab (compulsory)

**Course leader:**

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**Course assistants/teachers:**

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| Day | (No in Canvas) Kind1: Room2 | Time: Subject (teacher) | Literature |
| **Introduction** | | | |
| **Week 45** | | | |
| Må 2/11 | (1) Sem: Zoom | 10.00-11.00: Roll call & introduction (ACRW+AT+FD+SM) |  |
| (2) Lect: Zoom | 11.00-12.00: Intro to Breeding (ACRW) | 3 Ch 1, 2 |
| (3) Lab: Zoom | 13-15: Introduction to the mapping lab & lab safety (AT+FD+SM) |  |
| **Genetic diversity** | | | |
| Tue 3/11 | (4) Lab: Zoom | 10-12: Transplanting of RILs - video, group discussion, quiz (AT+FD+SM) |  |
| (5) Lect; Zoom | 13-15: Genetic diversity - basic concepts (PI) | 4 Ch 21 |
| Wed 4/11 | (6) Sem: Zoom | 10-12: Genetic diversity, exercises (PI) |  |
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| Thu 5/11 | (7) Guest lect: Zoom | 10-12: Preservation of genetic resources (ML) | 5 Article |
| (8) Sem: Zoom | 13-15: Genetic diversity, exercises (PI) |  |
| Fri 6/11 | (9) Lect; Zoom | 10-12: Plant domestication (AW) | 6 Article |
|  |  |  |
| **Plant breeding theory** | | | |
| **Week 46** | | | |
| Mon 9/11 | (10) Zoom-meeting | 9-10: Questions to Anki |  |
| (11) Sem: Zoom | 10-12: Literature project - topic decision (JS) |  |
| (12) Lect: Zoom | 13-15: Quantitative genetics (ACRW) | 3 Ch 4, 26 |
| Tue 10/11 | Self-studies | Literature project |  |
| Wed 11/11 | (13) Lab: Zoom | 10-12: DNA extraction, PCR & gel run - videos, group discussion (AT+FD+SM) |  |
| 13-15: Questions & discussion (AT+FD+SM) |  |
| Thu 12/11 | Self-studies | Reading of article |  |
| (14) Sem: Zoom | 13-15: Journal club - domestication (AW) | 6 Article |
| Fri 13/11 | (15) Lab: Zoom | 10-12: Questions, group discussions & quiz (AT+FD+SM) |  |
| (16) Sem: Zoom | 13-15: Quantitative genetics, exercises (ACRW) | 3 Ch 4, 26 |
| **Week 47** | | | |
| Mon 16/11 | (17) Zoom-meeting | 9-10: Questions to Anki |  |
| (18) Sem: Zoom | 10-12: Check point: presentations of lit. project outline (JS) |  |
| (19) Lab: Zoom | 13-15: Crossings intro and video (AT+FD+SM) |  |
| Tue 17/11 | (20) Sem: Zoom | 10-12: Quantitative genetics, exercises (ACRW) | 3 Ch 4, 26 |
| Self-studies |  |  |
| Wed 18/11 | Self-studies |  |  |
| Thu 19/11 | Self-studies |  |  |
| Fri 20/11 | (21) Sem: Tentamenssal 1 | 10-14: Examination 1: Population genetics, quantitative genetics and domestication |  |
| **“Traditional” breeding** | | | |
| **Week 48** | | | |
| Mon 23/11 | (22) Zoom-meeting | 9-10: Questions to Anki |  |
| (23) Lect: Zoom | 10-12: Breeding of self- & cross-pollinating species (ACRW) | 3 Ch 16, 17 |
| (24) Sem: Zoom | 13-15: Breeding methods, group discussions | 3 Ch 16, 17 |
| Tue 24/11 | (25) Sem: Zoom | 10-12: Discussion, breeding methods (ACRW) | 3 Ch 16, 17 |
| (26) Sem: Zoom | 13-13:30: Seed certification, production and legislation: intro (CD)  13.30-16: Work with seed certifications |  |
| Wed 25/11 | (27) Sem: Zoom | 10-12: Presentations; seed certification, production and legislation (CD) |  |
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| Thu 26/11 | (28) Lect: Zoom | 10-12: CMS/hybrid breeding (HH) | 3 Ch 18 |
| (29) Lect: Zoom | 13-15: Polyploidy and breeding (AS) | 7, 8, 9, 10 Article |
| Fri 27/11 | (30) Presentation: Zoom | 10-- Breeding of forage crops - Lucy Seeger | 11 Article |
| (31) Sem: Zoom | 12: Half-time course evaluation |  |
| Fri 27/11 | Self studies | 17:00: Deadline send in literature project for comments from other students |  |
| **Molecular breeding** | | | |
| **Week 49** | | | |
| Mon 30/11 | (32) Zoom-meeting | 9-10: Questions to Anki |  |
| (33) Lect: Zoom | 10-12 Genotype – phenotype associations (ACRW) | 12Article  3 Ch 21, 22 |
| Group studies | Perform peer review of literature studies |  |
| Tue 1/12 | Extra lecture | 8:30-9:30: Genotype – phenotype associations (ACRW) | 12Article  3 Ch 21, 22 |
| (34) Lab: Zoom | 10-12: Phenotyping & mapping - intro, video, group work, summary (AT+FD+SM) |  |
| Self-studies | 13🡪: reading of articles |  |
| Wed 2/12 | (35) Guest lect: Zoom | 10-12: Breeding at MariboHilleshög |  |
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| Thu 3/12 | (36) Sem: Zoom | 10-12: Journal club - genotype-phenotype associations (ACRW) | 13,14 Article |
| (37) Lect: Zoom | 13-15: Breeding for disease resistance (CD) | 3 Ch 14 + 15, 16 Articles |
| Fri 4/12 | (38) Lect: Zoom | 10-12: Breeding for virus resistance (AK) | 4 Ch 14 + 17Article |
| (39) Lect: Zoom | 13-15: Breeding for abiotic stress (MS) | 18, 19, 20Articles |
| Self-studies | 24:00: Deadline for send in peer-review of literature studies. |  |
| **Week 50** | | | |
| Mon 7/12 | (40) Lab: Library Datorsal 1 & Zoom | 10-15: Computer lab: QTL-mapping (ACRW+AT+FD) | 12 Article |
| **Biotechnology and GMO in breeding** | | | |
| Tue 8/12 | (41) Zoom-meeting | 9-10: Questions to Anki about the lab & lab report |  |
| (42) Lect: Zoom | 10-12: Generation of transgenic plants (JS) | 21 Article |
| (43) Lect: Zoom | 13-15: New breeding technologies (JS) | 21 Article |
| Wed 9/12 | (44) Guest lect: National Food Agency (Livsmedelsverket) Zoom | 10:30-ca11:30: National Food Agency (MSa) |  |
| (45) Guest lect: Zoom | 13-15: Lantmännen and their oat breeding (AC) |  |
| Thu 10/12 | (46) Guest lect: Zoom | 10-12: Science and politics – The controversial story of GM-crops (MN) |  |
| (47) Guest lect: Zoom | 13-17: Ethics and Genetic modifications + discussion (PS) | 22 Article |
| Fri 11/12 | (48) Guest lect: Zoom | 10-12: Tree breeding at Skogforsk (HH) |  |
| (49) | 13-15: Open |  |
| **Week 51** | | | |
| **Plant genomics in breeding** | | | |
| Mon 14/12 | (50) Zoom-meeting | 9-10: Questions to Anki |  |
| (51) Lect: Zoom | 10-12: From QTLs to genomics (AS) | 23, 24, 25 Article |
| (52) Sem: Zoom | 13-15: Discussion genomics (AS) | 23, 24, 25 Article |
| Tue 15/12 | (53) Lab: Library Datorsal 1 & Zoom | 10-15: Computer lab: Genomics (AT+FD+SM) |  |
| Wed 16/12 | (54) Optional, Zoom | 9-12: Optional: Lit. project - individual discussion with teachers (JS & ACRW) |  |
| (55) Optional, Zoom | 13-16: Optional: Lab report - individual discussion with teachers (AT+FD+SM) |  |
| Thu 17/12 | Self-studies | Work with lab report/literature project |  |
| Fri 18/12 | Self-studies | Work with lab report/literature project |  |
| **Week 52** | | | |
| Mon 21/12 | (56) Zoom-meeting | 9-10: Questions to Anki |  |
| Self-studies | Work with lab report/literature project |  |
| Tue 22/12 | Self-studies | Deadline, 24:00: Lab report send in |  |
| **Merry Christmas and Happy New Year!** | | | |
| **Week 1, 2021** | | | |
| Mon 4/1 | Self-studies |  |  |
| Tue 5/1 | Self-studies | Deadline, 24:00: Send in literature project to opponent and to JS+ACRW for comments |  |
| Wed 6/1 |  | Holiday |  |
| Thu 7/1 | (57) Lect: Zoom | 10.00-12.00: Questions to teachers |  |
| Fri 8/1 | (58) Sem: Room N and K | 10-14: Examination II |  |
| **Week 2** | | | |
| Mon 11/1 | Self-studies | Work with literature project presentation & opposition |  |
| Tue 12/1 | (59) Sem: Zoom | 9-16: Presentations and opposition of literature projects (JS+ACRW) |  |
| Wed 13/1 | (60) Sem: Zoom | 9-16: Presentations and opposition of literature projects (JS+ACRW) |  |
| (61) Sem: Evald | 16-17: Course evaluation |
| Thu 14/1 | Self-studies | 1 Work with literature project |  |
| Fri 15/1 | Self-studies | Deadline 24:00: Final send in of literature project |  |

1 Lect = Lecture; Sem = Seminar (compulsory); Lab = Laboratory practical (compulsory).

2 BioC = BioCentre SLU, Lennart Kennes sal is in BioC, Framtiden is in the MVM-house, Room L is in the main teaching building, Bibliotekets datorsal 1 & 2 = computer room 1, 2 at the SLU library.

**Course literature:**

Book chapters:

3 Acquaah George: Principles of Plant Genetics and Breeding, Second Edition, Wiley-Blackwell Publishing, 2012, chapters 1, 2, 4, 14, 16, 17, 18, 21, 22, 26

4 Russel, Peter J. iGenetics. A molecular approach, (Pearson international edition), chapter 21, Population genetics, pp: 603-649

Articles:

5 Dulloo, M. E., Rege, J.E.O., Ramirez, M. *et al.* 20xx. Conserving agricultural biodiversity for use in sustainable food systems. Chapter 5 in:

6 Doebly, J. F., Brandon, S. G., Smith B. D. 2006. The molecular genetics of crop domestication. Cell 127: 1309-1321.

7 Soltis, D. E., Visger, C. V., Marchant, D. B., Soltis, P. D. 2016. Polyploidy: Pitfalls and paths to a paradigm. Am. J. Bot. 103 (10): 1-21.

8 De Storme, N., Geelen, D. 2013. Sexual polyploidization in plants – cytological mechanisms and molecular regulation. New Phytologist 198: 670-684.

9 Lloyd, A., Bomblies, K. 2016. Meiosis in autopolyploid and allopolyploid Arabidopsis. Curr. Opi. Plant Biol. 30:116-122.

10 Sattler, M. C, Carvalho, C. R., Clarindo, W. R. 2015. The polyploidy and its key role in plant breeding. Planta 243:281-296.

11 Thornström, C-G. 2016. Dimensional analysis of international regulations of biological matter. Genetic resources and Agro-biodiversity. Indian J. Plant Genet. Resour. 29(3): 420-422.

12 Collard, B.C.Y., Jahufer, M.Z.Z., Brouwer, J.B., Pang, E.C.K. 2005. An introduction to markers, quantitative trait loci (QTL) mapping and marker-assisted selection for crop improvement: The basic concepts. Euphytica 142: 169-196.

13 Carletti, C., Carra, A. et.al. 2016. QTLs for Wolly poplar aphid (*Phloeomyzus passerinii* L.) resistance detected in an interspecific *Populus deltoids* x *P. nigra* mapping population. PLoS One. DOI:10.1371

14 Frankenkrog, A.M., Neves, L.G., et al. 2016. Genome-wide association study reveals putative regulators of bioenergy traits in *Populus deltoides*. New Phytologist. DOI: 10.1111/nph.14154.

15 McDonald, B., Linde, C. 2002. Pathogen population genetics, evolutionary potential, and durable resistance. Annu. Rev. Phytopathology. 40: 349-79.

16 Nelson, R., Wiesner-Hanks, T., Wisser, R., Balint-Kurti, P. 2018. Navigating complexity to breed disease-resistant crops. Nat. Rev. Genet. Vol. 19:21-33. doi:10.1038/nrg.2017.82

17 Gómez, P., Rodríguez-Hernández, A.M., Moury, B., Aranda, M.A. 2009. Genetic resistance for the sustainable control of plant virus diseases: breeding, mechanisms and durability. European Journal of Plant Pathology 125: 1-22.

18 Fritsche-Neto, R., Do Vale J.C. A. 2012. Breeding for stress-tolerance or resource-use efficiency? In Plant Breeding for abiotic stress tolerance. Eds: Fritsche-Neto, R., Borém, A. DOI: 10.1007/978-3-642-30553-5\_2

19 Pourkheirandish, M., *et al*. 2015. Evolution of the grain dispersal system in barley. Cell 162, 527–539.

20 Sameri, M., *et al*. 2009. A quantitative trait locus for reduced culm internode length in barley segregates as a Mendelian gene. TAG: 118:643–652.

21 To be decided

22 Siipi, H. 2015. Is genetically modified food unnatural? J Agric Environ Ethics. 28:807-816.

23 Weigel, D., Norborg, M. 2015. Genomics for understanding adaptation in wild plants species. Annu Rev Genet. 49:315-38.

24 Gelli, M., Konda, A. R., et al. 2017. Validation of QTL mapping and transcriptome profiling for identification of candidate genes associated with nitrogen stress tolerance in sorghum. BMC Plant Biology 17:123.

# 25 Choquet, M., Smolina, I., et al. 2019. Towards population genomics in non-model species with large genomes: a case study of the marine zooplankton *Calanus finmarchicus*. Ro. Soc. open sci. 6:180608.

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AW=Anna Westerbergh

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MN=Marie Nyman, The Swedish Gene Technology Advisory Board

MSa=Martin Sandberg, National Food Agency

MS=Mohammad Sameri

PI=Pär Ingvarsson

PS=Per Sandin, Dept. of Ecology, SLU

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