2022-10-05

Course schedule for Genetic diversity and Plant breeding (BI1103), 2022

Yellow = Lectures

Blue = Sem (compulsory)

Green = Lab (compulsory)

Course leader:

Adrien Sicard (AS) adrien.sicard@slu.se , 018 67 3231

Course assistants/teachers:

Silvana Moreno (SM) silvana.moreno@slu.se

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Teachers (from Dept. of Plant Biology if not anything else indicated), e-mail to SLU teachers: first name.surname@slu.se**:**

AK=Anders Kvarnheden
AW=Anna Westerbergh
CD=Christina Dixelius
JS=Jens Sundström,
MS=Mohammad Sameri,
MRA = Marha Rendón Anaya
PS= Per Sandin, Dept. of Ecology, SLU:
KS = Kevin Sartori
MO = Marion Orsucci

Guest teachers:
AC= Alf Ceplitis, Lantmännen
HH= Henrik Hallingbäck, Skogforsk
ML= Matti Leino, Dept. of Archaeology and Classical Studies, Stockholm University
AnC= Annelie Carlsbecker , The Swedish Gene Technology Advisory Board
MSa=Martin Sandberg, National Food Agency (study visit at the Swedish food agency)
PSn=Per Snell, Maribo-Hilleshög
SM= Salla Marttila

Schedule

Please note that all seminars (highlighted in blue) and Labs (highlighted in green) are compulsory.

Day	(No in Canvas) Kind[1]: Room[2]	Time: Subject (teacher)	Literature
Introduction			
Week 45			
Tue-1/11	(1) Sem - Sal **C216 -biocentrum**	9:15-10.00: Roll call & introduction (**AS**)	
	(2) Lect: Sal **C216 -biocentrum**	10:00-12.00: Intro to Breeding (**AS**)	[3] Ch 1, 2
	(Pract.1) Lab: **BÖL 2- biocentrum**	13:00-15:00: Introduction to the mapping lab & lab safety (**SM, GBC, KS**)	
Genetic diversity			
Wed-2/11	(Pract.2) Lab: **Sal C216 Greenhouse - biocentrum**	8:00-14:00 : Transplanting of RILs, **(SM, GBC, KS**)	
	Self-studies		
Thu-3/11	(3) Lect; **Sal C216 -biocentrum**	9:00-11:00: Genetic diversity - basic concepts (**MRA**)	[4] Ch 21
	(4) Sem: **Sal C216 -biocentrum**	11:00-12:00: Genetic diversity, exercises (**MRA**)	
	(5) Guest lect: **Sal C216 -biocentrum**	13:00-15:00 Preservation of genetic resources (ML)	[5] Article
Fri-4/11	(6) Lect; **Sal C216 -biocentrum**	10:00-12: Plant domestication (**AW**)	[6] **Article**

Statistical genetics			
Week 46			
Mon 7/11	**Zoom**	9:30-10: Questions to Adrien	
	(7) Sem: **Sal C216 -biocentrum**	10:00 – 12:00 JC - Plant domestication (**AW**)	
	(8) Lect **Sal C216 –biocentrum**	13:00-16:00 Statistics in Genetic analyses (**MO**)	
Tue 8/11	(9) Lect **Sal C216 -biocentrum**	9:15-12:00: Quantitative genetics; concepts (**AS**)	
	(10)Sem: **Sal C216 -biocentrum**	13:00-15:00 Quantitative genetics, exercises (**AS**)	[3] Ch 4, 26
Wed 9/11	(Lit.1) Sem: **Sal C216 -biocentrum**	10:00-12:00 Literature project - topic decision (**JS**)	[6] Article
	Self-studies		
Thu 10/11	(Pract.3) Lab **BÖL 2**: - biocentrum	9:00-16:00 DNA extraction, PCR run – (**SM, GBC, KS**)	
Fri 11/11	(Pract.4) Lab: **BÖL 2** - biocentrum	9:00-16:00 DNA extraction, PCR & gel run – Questions & discussion Questions, group discussions (**SM, GBC, KS**)	
Week 47			
Mon 14/11			
	(Lit.2) Sem: **Sal C216 -biocentrum**	10:00-12:00 Check point: presentations of lit. project outline (**JS**)	
	(Pract.5) Lab: **BÖL 2** - biocentrum	13:00-15:00 Crossings intro (**SM, GBC, KS, MS**)-	
Tue 15/11	(11) Sem: **Sal C216 -biocentrum**	9:15-12:00 Quantitative genetics, exercises (**AS**)	[3] Ch 4, 26

	(12) Sem: **Sal C216 -biocentrum**	13:00-16:00 Genetic diversity, exercises (**MRA**)	
Wed 16/11	Self-studies		
Thu 17/11	Self-studies		
Fri 18/11	**Exam I:** Tentamensal 2	8:00-12:00 Examination 1: Population genetics, quantitative genetics and domestication	
Traditional breeding methods and regulation			
Week 48			
Mon 21/11	**Zoom**	9:00-9:15: Questions to Adrien	
	(13) Sem: **Sal C216 - biocentrum**	9:15-9:45: Seed certification, production and legislation: intro (**CD**) 9:45-12:15: Work with seed certifications	
	(14) Lect **Sal C216 -biocentrum**	13:00-16:00 Breeding method: self- & cross-pollinating species / (**MRA**)	[3] Ch 16, 17
Tue 22/11	(15) Sem: **Sal C216 - biocentrum**	9:00-12:00 Breeding methods, group discussions (**MRA**)	[3] Ch 16, 17
	(16) Lect **Sal C216 -biocentrum**	13:00-16:00 Hybrid breeding and Polyploidy and breeding (**AS**)	[3] Ch 18
Wed 23/11	Self studies	Preparation literature project	
	Self studies		
Thu 24/11	Self Studies	Seed certification	
	(Pract.6) Lab: Library Datorsal 1 & 2	13:00-17:00: Introduction to computational genomics (**KS**)	[7, 8, 9, 10] Article
Fri 25/11	(17) Sem: **Sal C216 -biocentrum**	10:00-12:00 Presentations; seed certification, production and legislation (**CD**)	
	Deadline	Half-time course evaluation	
	(Lit.3)Self studies/ **Deadline**	Preparation literature project/19:00: send in literature project for comments from other students	

Phenotype-genotype associations			
Week 49			
Mon 28/11			
	(18) Lect **Sal C216 -biocentrum**	10:00-12:00 Genotype – phenotype associations (**MRA**)	[12]Article [3] Ch 21, 22
	Group studies	Perform peer review of literature studies (**JS**)	
Tue 29/11	(Pract.7) Lab: BÖL 2 - biocentrum	9:00-16:00 Phenotyping & mapping - intro, group work, summary (**SM, GBC, KS**)	
Wed 30/11	(19) Lect: Sal C216 -biocentrum	9:00-12:00 Introduction to Genomic data: concepts and discussion (**AS**)	[23, 24, 25] Article
	Self-studies		
Thu 1/12	(20) Lect Sal C216 -biocentrum	9:00-12:00 Next generation breeding: concepts and discussion (**AS**)	[23, 24, 25] Article
	(21) Lect Sal C216 -biocentrum	13:00-16:00 Genomic selection: concepts and discussion (**AS**)	[23, 24, 25] Article
Fri 2/12	(Pract.8) Lab: Library Datorsal 1 & 2	10:00-15:00 Computer lab: QTL-mapping (**KS+AS**)	[12] Article
	(Lit.4) Self-studies/ **Deadline**	24:00: Deadline for sending in peer-review of literature studies.	
Week 50			
Mon 5/12	(Pract.9) Lab: Library Datorsal 1 & 2	9:30-10:00 Question to Adrien 10:00-15:00 Computer lab: Genomics (**KS+AS**)	

Biotechnological applications and considerations in plant breeding			
Tue 6/12	(22) Lect: **Sal C216 -biocentrum**	10:00-12:00 Generation of transgenic plants (**JS**)	[21] Article
	(23) Lect: **Sal C216 -biocentrum**	13:00-15:00 New breeding technologies (**JS**)	[21] Article
Wed 7/12	(24) Visit and Guest lect: National Food Agency (Livsmedelsverket) -	10:00-12:00 National Food Agency (**MSa**)	
	Self-studies		
Thu 8/12	(25) Guest lect**: Sal C216 -biocentrum**	10:00-12:00 Science and politics – The controversial story of GM-crops (**AnC**)	
	(26) Guest lect: **Sal C216 -biocentrum**	13:00-16:00 Ethics and Genetic modifications + discussion (**PS**)	[22] Article
Week 51			
Phenotypic and developmental targets in plant Breeding			
Fri 9/12	(27) Lect: **Sal C216 -biocentrum**	10:00-12:00 Breeding for disease resistance (**CD**)	[3] Ch 14 + [15, 16] Articles
	(28) Lect: **Sal C216 -biocentrum**	13:00-15:00 Breeding for virus resistance (**AK**)	[4] Ch 14 + [17]Article
Mon 12/12	**Zoom**	9:30-10:00 Questions to Adrien	
	(29) Lect: **Sal C216 -biocentrum**	10:00-12:00 Breeding for abiotic stress (**MS**)	[18, 19, 20]Articles
	(30) Guest lect: **Zoom**	13:00-15:00 Lantmännen and their oat breeding (**AC**)	
Tue 13/12	(31) Guest lect: **Sal C216**	10:00-12:00 Breeding at MariboHilleshög (PSn)	
	(32) Guest lect: **Sal C216**	13:00-15:00 Tree breeding at Skogforsk (**HH**)	
	(33) Guest lecture **-Webinar**	15:00-16:00 'SLU Grogrund – Centre for Breeding of Food Crops' (Salla Marttila)	
Wed 14/12	(Lit.5) Optional, **Zoom**	9:00-12:00 Optional: Lit. project - individual discussion with teachers (**JS & AS**)	

Thu 15/12	(Pract. 10) Optional, **Zoom**	9:00-12:00 Optional: Lab report - individual discussion with teachers (**SM, GBC, KS**)	
	(34) Sem**: Zoom**	9:00-12:00 Journal club/discusion - genotype-phenotype associations genomics (**MRA**)	[18, 19, 20]Articles
Fri 16/12	Self-studies	Work with lab report/literature project	
Week 52			
Mo 19/12	Self-studies	Work with lab report/literature project	
Tue 20/12	(Pract.11) **Deadline** Self-studies	Deadline, 24:00: submission of Lab report	
Christmas break!			
Week 1, 2021			
Mon 2/1	Self-studies		
Tue 3/1	(Lit.6) **Deadline**	, 24:00: Send in literature project to opponent and to JS+AS for comments	
Wed 4/1	Lect: **Zoom**	9.45-11.50: Questions to teachers	
Thu 5/1			
Fri 6/1		Holiday	
Week 2			
Mon 9/1	**Exam II: Särimner**	8:00-12:00 Examination II	
Tue 10/1	Self-studies	Work with literature project presentation & opposition	
Wed 11/1	Self-studies	Work with literature project presentation & opposition	
Thu 12/1	(Lit.7) Sem: **Sal A132 -biocentrum**	9:00-17:00 Presentations and opposition of literature projects (**JS+AS**)	

Frid 13/1 toSun 15/1	(Lit.8) Self-studies/ **Deadline**	Deadline 24:00: Final send in of literature project	

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

[2] Biocentrum = BioCentre SLU, Lennart Kennes sal is in BioC, Sal O2 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.