2023-10-26

Course schedule for Genetic diversity and Plant breeding (BI1103), 2023

Yellow = Lectures

Blue = Sem (compulsory)

Green = Lab (compulsory)

Course leader:

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

Course assistants/teachers:

Laxmi Mishra (LM) laxmi.mishra@slu.se

Sonam Yadav (SY) sonam.yadav@slu.se

Kevin Sartori (KS) kevin.sartori@slu.se

Teachers , e-mail to SLU teachers: first name.surname@slu.se**:**

AK=Anders Kvarnheden
AW=Anna Westerbergh
CD=Christina Dixelius
JS=Jens Sundström
KL = Katarina Landberg
MS=Mohammad Sameri,
MRA = Martha Rendón Anaya
PS= Per Sandin
KS = Kevin Sartori

Guest teachers:

AC= Alf Ceplitis, Lantmännen
HH= Henrik Hallingbäck, Skogforsk
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

Please note that: all seminars (rows filled with blue) and Labs (rows filled with green) are compulsory.

Day	(No in Canvas) Kind[1]: Room/building[2]	Time: Subject (teacher)	Literature
Introduction			
Week 44			
Tue-31/10	(1) Sem – **Sal Y –Ulls hus D-blocket**	9:15-10.00: Roll call & introduction (**AS**)	
	(Lit.1) Sem: **Hebbe Ultunabiblioteket**	10:15-12:00 Literature project - topic decision (**KL**)	
	(Pract.1) Lab: **BÖL 3- biocentrum**	13:15-15:15: Introduction to the lab practicals & lab safety (**AS, KS**)	
Genetic diversity			
Wed-1/11	(Pract.2) Lab: **Greenhouse – biocentrum**	8:00-12:00 Transplanting of RILs, **(LM, SY, KS**)	
	(2) Lect: **Sal C216 -biocentrum**	13:15-15.00: Intro to Breeding (**AS**)	[3] Ch 1, 2
Thu-2/11	(3) Lect: **Datorsal 1 -UltunaBiblioteket**	10:15-12.00: Genetic diversity - basic concepts (**MRA**)	[4] Ch 21
	(4) Lect: **Sal C213 -biocentrum**	13:15-15:00: 10:15-12:00 Plant domestication (**AW**)	Article 1
Fri-3/11	(5) Sem: **Sal Q –Ulls hus B-blocket**	10:15-12:00 Genetic diversity, exercises (**MRA**)	[4] Ch 21
	Self-studies		
Statistical genetics			
Week 45			
Mon 6/11	**Zoom**	9:00-9:30: Questions to Adrien	
	(6) Sem: **Prima –Ultunabibioteket**	10:15 – 12:00 JC - Plant domestication (**AW**)	Article 1
	(7) Lect: **Prima –Ultunabibioteket**	13:15-15:00 Statistics in Genetic analyses (**KS**)	
Tue 7/11	(8) Lect: **Prima –Ultunabibioteket**	9:15-12:00: Quantitative genetics; concepts (**AS**)	[3] Ch 4 & 26
	(9)Sem: **Sal C213 -biocentrum**	13:15-15:00 Genetic diversity exercises (**MRA**)	[4] Ch 21
Wed 8/11	**Self-studies**	**Literature project**	
	Self-studies		
Thu 9/11	(Pract.3) Lab: **BÖL 3**: **- biocentrum**	9:15-16:00 Molecular lab: DNA extraction, PCR run – (**LM, SY, KS**)	
Fri 10/11	(Pract.4) Lab: **BÖL 3 - biocentrum**	9:15-16:00 Molecular lab: DNA extraction, PCR & gel run – Questions & discussion Questions, group discussions (**LM, SY, KS**)	

Week 46			
Mon 13/11	**(Lit.2)** Sem: **Prima - Ultunabiblioteket**	10:15-12:00 Check point: presentations of lit. project outline (**KL**)	
	(Pract.5) Lab: BÖL 3 - biocentrum	13:15-15:00 Crossings intro (**LM, SY, KS, MS**)	
Tue 14/11	(10) Sem: **Sal C216 -biocentrum**	9:15-12:00 Quantitative genetics, exercises (**AS**)	[3] Ch 4, 26
	(11) Sem: **Sal C213 -biocentrum**	13:15-16:00 Quantitative genetics, exercises (**AS**)	[4] Ch 21
Wed 15/11	Self-studies		
Thu 16/11	Self-studies		
Fri 17/11	**Exam I: Tentamensal 1 - Undervisningshuset**	13:00-17:00 Examination 1: Population genetics, quantitative genetics and domestication	
Traditional breeding methods and regulation			
Week 47			
Mon 20/11	**Zoom**	9:00-9:30: Questions to Adrien	
	Self-studies	Literature project: Preparation of 1st draft.	
	(12) Lect: **Sal C216 -biocentrum**	13:15-15:00 Breeding method: self- & cross-pollinating species (**MRA**)	[3] Ch 16, 17
Tue 21/11	**(13)** Lect: **Prima, Ultunabiblioteket**	9:15-12:00 Hybrid breeding and Polyploidy and breeding (**AS**)	[3] Ch 18, 24 Article 2,3
	Self Studies	Breeding methods, group discussions	
Wed 22/11	Self studies	Preparation literature project/breeding methods	
	Self studies		
Thu 23/11	(14) Sem: **Sal Q, Ulls Hus B-blocket**	10:15-12:00: Breeding method: self- & cross-pollinating species: Presentations (**MRA**)	[3] Ch 16, 17
	(Pract.6) Lab: **UltunaLibrary Datorsal 1**	13:15-17:00: Introduction to computational genomics (**KS**)	
Fri 24/11	(15) Lect: **Prima, Ultunabiblioteket**	10:15-12:00: Seed certification, production and legislation (**CD**)	
	Deadline	Half-time course evaluation	
	(Lit.3)Self studies/ Deadline	Preparation literature project: send in literature project for comments from other students	

Phenotype-genotype associations			
Week 48			
Mon 27/11	(16) Lect: **Sal P in Ulls**	9:15-12:00 Introduction to Genomic data: concepts and discussion (**AS**)	Article 5,6
	Self-studies	Perform peer review of literature studies	
Tue 28/11	(Pract.7) Lab: **BÖL 3 - biocentrum**	9:15-16:00 Phenotyping & mapping - (**LM, SY, KS**)	
Wed 29/11	(17) Lect: **Sal C213 - Biocentrum**	10:15-12:00 Genotype – phenotype associations (**MRA**)	Article 4 [3] Ch 21, 22
	Group-studies	Perform peer review of literature studies	
Thu 30/11	(18) Lect: **Sal Y in Ulls**	9:15-12:00 Next generation breeding: concepts and discussion (**AS**)	Article 5,6
	(19) Lect: Sal C216 -Biocentrum	13:15-16:00 Genomic selection: concepts and discussion (**AS**)	Article 5,6
Fri 1/12	(Pract.8) Lab: Library Datorsal 1 **Ultunabiblioteket**	10:15-16:00 Computer lab: QTL-mapping (**KS+AS**)	Article 4
	(Lit.4) Self-studies/ **Deadline**	24:00: Deadline for sending in peer-review of literature studies.	
Week 49			
Mon 4/12	(Pract.9) Lab: Library Datorsal 1 **Ultunabiblioteket**	9:30-10:00 Question to Adrien 10:15-16:00 Computer lab: Genomics (**KS+AS**)	
Biotechnological applications and considerations in plant breeding			
Tue 5/12	(20) Lect: **SalC213 -biocentrum**	10:15-12:00 Generation of transgenic plants (**JS**)	
Wed 6/12	(22) **Sem:** Visit and Guest lect: National Food Agency (Livsmedelsverket) -	10:15-12:00 National Food Agency (**MSa**)	
	Self-studies		
Thu 7/12	(23) Sem: **Guest lect: Sal X –Ulls hus D-blocket**	9:15-12:00 00 Ethics and Genetic modifications + discussion (**PS**)	Article 7
	(Lit.5) **Zoom**	13:15-16:00 Optional: Lit. project - individual discussion with teachers (**KL & AS**)	

Phenotypic and developmental targets in plant Breeding			
Fri 8/12	(24) Lect: **Sal Q –Ulls hus D-blocket**	10:15-12:00 Breeding for disease resistance (**CD**)	[3] Ch 14 + Articles 8, 9
	(25) Lect: **Sal C216-biocentrum**	13:15-15:00 Breeding for virus resistance (**AK**)	[4] Ch 14 + Article 10
Week 50			
Mon 11/12	**Zoom**	9:00-9:30 Questions to Adrien	
	(26) Sem: Guest Lect: **Sal R, Ulls hus B-blocket**	10:15-12:00 Science and politics – The controversial story of GM-crops (**AnC**)	
	(27) lect: **Sal C216-biocentrum**	13:15-15:00 Breeding for abiotic stress (**MS**)	Articles 11, 12, 13
Tue 12/12	(28) Sem:Guest lect: **Sal U, Ulls hus E-blocket**	10:15-12:00 Breeding at MariboHilleshög (PSn)	
	(29) Sem:Guest lect: **Sal C216-biocentrum**	13:15-15:00 Tree breeding at Skogforsk (**HH**)	
	(30) Guest lecture **–Webinar-Zoom**	15:15-16:00 'SLU Grogrund – Centre for Breeding of Food Crops' (Salla Marttila)	
Wed 13/12	(31) Sem:Guest lect: **Zoom**	10:15-12:00 Lantmännen and their oat breeding (**AC**)	
Thu 14/12	(32) Sem**: Biocentrum (4th floor) A436**	10:15-12:00 Journal club/discusion - genotype-phenotype associations genomics (**MRA**)	Articles to be determined
	(21) Lect: **Arenander - Ultunabiblioteket**	13:15-15:00 New breeding technologies (**JS**)	
Fri 15/12	(Pract. 10) Optional, **Zoom**	9:15-12:00 Optional: Lab report - individual discussion with teachers (**LM, SY, KS**)	
	Self-studies	Work with lab report/literature project	
Week 51			
Mo 18/12	Self-studies	Work with lab report/literature project	
Tue 19/12	(Pract.11) **Deadline** Self-studies	Deadline, 24:00: submission of Lab report	
Christmas break!			
Week 1, 2024			
Mon 1/1	Self-studies		
Tue 2/1	(Lit.6) **Deadline**	24:00: Send in literature project to opponent and to KL+AS for comments	
Wed 3/1	Lect: **Zoom**	9.45-11.50: Questions to teachers	
Thu 4/1	Self-studies		

Fri 5/1	**Exam II: Tentamenssal 2, Undervisninghuset**	**8:00-12:00 Examination II**	
Week 2			
Mon 8/1	Self-studies	Work with literature project presentation & opposition	
Tue 9/1	Self-studies	Work with literature project presentation & opposition	
Wed 10/1	Self-studies	Work with literature project presentation & opposition	
Thu 11/1	(Lit.7) Sem: **Biocentrum 502**	9:15-17:00 Presentations and opposition of literature projects (**KL+AS**)	
Frid 12/1	(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:

[1] Doebly, J. F., Brandon, S. G., Smith B. D. 2006. The molecular genetics of crop domestication. Cell 127:

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

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

[4] 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.

[5] Varshney RK, Terauchi R, McCouch SR (2014) Harvesting the Promising Fruits of Genomics: Applying Genome Sequencing Technologies to Crop Breeding. PLOS Biology 12(6): e1001883.

https://doi.org/10.1371/journal.pbio.1001883.

[6] 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.

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

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

[9] 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

[10]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.

[11]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.

[12]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

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