



UNIVERSITAS SEBELAS MARET
FACULTY OF TEACHER TRAINING AND EDUCATION
BIOLOGY EDUCATION STUDY PROGRAM

Jl Ir. Sutami No 36A Kentingan Surakarta 57126
Telephone (0271) 669124, Facsimile (0271) 648939
Website: <http://biologi.fkip.uns.ac.id>, Email: biologi@fkip.uns.ac.id

Tissue Culture

Undergraduate Programme in Biology Education

Module Handbook

Module Name	Tissue Culture																				
Module level	Undergraduate Programme																				
Course Code	02013152008																				
Abbreviation, if applicable	-																				
Courses included in the module, if applicable	-																				
Semester/Term	5 th																				
Module coordinator (s)	Dr. Harlita, M.Si																				
Lecturer (s)	Dr. Ir. Endang Yuniastuti, M.Si																				
Language	Bahasa Indonesia (Indonesian Language)																				
Classification within the curriculum	Compulsory/ Elective																				
Teaching format/class hours per week during the semester	Direct instruction/face to face/blended learning: 26.7 hours / week: lecture, discussion, workshop Structured Activity: 32 hours / week (Through the analysis of journal articles to study Plant Tissue Culture. Through Team-based projects students practice of making tissue culture) Self-study Activity: 32 hours / Week (Students learn plant tissue culture) Practiucum in field: 1 x 170 minutes/week/topic																				
Workload	<table><tr><td>Type</td><td>CSU</td><td>Face to Face</td><td>Structured Activities</td><td>Self-study</td></tr><tr><td>T</td><td>2</td><td>26.7h (1.0 ECTS)</td><td>32h (1.21 ECTS)</td><td>32h (1.21 ECTS)</td></tr><tr><td>P</td><td>1</td><td colspan="3">28.3 h (1.07 ECTS)</td></tr><tr><td>Total</td><td>3</td><td colspan="3">119 h (4.5 ECTS)</td></tr></table>	Type	CSU	Face to Face	Structured Activities	Self-study	T	2	26.7h (1.0 ECTS)	32h (1.21 ECTS)	32h (1.21 ECTS)	P	1	28.3 h (1.07 ECTS)			Total	3	119 h (4.5 ECTS)		
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Credit Points	3 CSU (4.5 ECTS)																				
Requirements	Plant Physiology																				



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Learning goals/competencies

PLO 2 They are able to apply the basic advance knowledge in biology to solve the problem in biology

PLO 4 They are able to demonstrate the research methodology in biology, its teaching and learning, and publish the results of the research

PLO 6 They are able to demonstrate laboratory works, design and implement the experiment based on laboratory knowledge, skills, safety, environmental issue, and social ethics problem.

CLO 1

Explain the scope and history of tissue culture in agriculture

CLO 2

Explain the meaning, benefits, and factors, that affect tissue culture

CLO 3

Mastering sterilization techniques and plant prooagation through tissue culture

CLO 4

Understand the methods used in tissue culture

CLO/ PLO	P L O 1	P L O 2	P L O 3	P L O 4	P L O 5	P L O 6	P L O 7	P L O 8	P L O 9	P L O 10
CLO1		*								
CLO2		*		*						
CLO3						*				
CLO4				*		*				



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Content	<ol style="list-style-type: none"> 1. Definition, Scope and history of tissue culture development in agriculture 2. Introduction of tissue culture laboratories along with tools and media used in the multiplication of tissue culture 3. Sterilization of Tools, Media, Explants and Spaces 4. Tissue Culture Systems 5. Plant regeneration: Organogenesis and Embryogenesis and Influencing Factors 6. Haploid Culture; Ovule Culture 7. Synthetic seeds. - Embryo rescue (embryo rescue) Methods of preservation of germplasm with tissue culture; Cryopreservation method 8. Somaklonal variations and selection get biotic and abiotic strangle resistance varieties 9. Meristem culture; In Vitro Propagation for virus -free plants 10. In Vitro Culture for Drought Resistance and Heavy Metals 11. In Vitro Propagation for salinity resistance 12. In Vitro culture for secondary metabolite production and influential factors 												
Attribute Soft skill	<ol style="list-style-type: none"> 1. Able to think conceptually, analitically, and logically 2. Have good communication skills 3. Able to demonstrate the research methodology in biology 												
Study/exam achievements	<p>Students are required to attend the face-to-face lecture minimum 75% to be able to take the Mid and Final exam. It is considered to complete the course and pass if students obtain at least 60% of maximum final score. The final score (FS) is calculated based on the following ratio:</p> <table border="1"> <thead> <tr> <th>Aspect</th><th>(%)</th></tr> </thead> <tbody> <tr> <td>Task/quiz/presentation</td><td>30</td></tr> <tr> <td>Participation</td><td>10</td></tr> <tr> <td>Mid-Term Test</td><td>30</td></tr> <tr> <td>Final Exam</td><td>30</td></tr> <tr> <td>Final Score</td><td>100</td></tr> </tbody> </table>	Aspect	(%)	Task/quiz/presentation	30	Participation	10	Mid-Term Test	30	Final Exam	30	Final Score	100
Aspect	(%)												
Task/quiz/presentation	30												
Participation	10												
Mid-Term Test	30												
Final Exam	30												
Final Score	100												
Form of Media	PC, LCD, Whiteboard, PPT, Web education (SPADA), etc.												



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Literature (primary references)	<ol style="list-style-type: none">1. Djati Waluyo Djoar dan Nandariyah. 2011. <i>Perbaikan sifat tanaman</i>. UNS Press.2. Edwin, F.G, 1993. <i>Plant Propagation by Tissue culture (The Technology)</i>3. Pierik, R.L. 1987. <i>In Vitro Culture of Higher Plant</i>4. Gunawan, L.W. 1995. <i>Teknik Kultur Jaringan</i>5. Sherington, G. <i>Fisiologi tanaman</i>, Suryowinoto, M. 1996. Kultur jaringan6. Yusnita. 2004. <i>Kultur jaringan: Cara Perbanyakan Tanaman yang Efisien. Management Service</i>. Rome. Italy7. Russel, E. W. 1973. <i>Soil Condition and Plant Growth 10th edition Longman-ELBS</i>, London.8. Mengel, K. Kirkby EA. 2001. <i>Principle of Plant Nutrition</i>. 5th edn. Academic Publishers. 849p.9. Singh, B. M. S. (2019). Effects of N-Benzyl-9-(2-tetrahydropyranyl) and Indole-3-Acetic Acid in Vitro Culture of Bauhinia purpurea L. <i>International Journal of Scientific Research and Technology</i>. 6(3). 238-242.10. Yancheva, S., & Kondakova, V. (2018). Plant tissue culture technology: present and future development. Bioprocessing of plant in vitro systems. <i>Phytochemical reference series.</i>, 3(4). 39-63.11. Bednarek, P. T., & Orłowska, R. (2020). Plant tissue culture environment as a switch-key of (epi) genetic changes. <i>Plant Cell, Tissue and Organ Culture (PCTOC)</i>. 140(2). 245-257.
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Assessment

MID TEST Tissue Culture Technology

Plant tissue culture is a technique of vegetative propagation of plants by manipulating somatic tissue by growing plant parts, whether in the form of cells, tissues or organs under aseptic conditions in vitro. Tissue culture techniques are characterized by aseptic or sterile conditions from all kinds of contaminants, using culture media that have complete nutritional content and using ZPT (growth regulators), and the room conditions where tissue culture is carried out are regulated by temperature and lighting. Tissue Culture cultivates plant tissue into new plants that have the same characteristics as the parent. The theory that forms the basis of tissue culture is the theory of cell totipotency, written by Schleiden and Schwann, that living parts of plants that have totipotency, if cultivated in an appropriate environment, can grow into perfect plants. In tissue culture there are several techniques that can be



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applied, such as cell suspension culture, protoplast culture, anther culture and others.

1. Explain some terms in tissue culture, as follows: **[score 20]**
 - a. Organogenesis
 - b. Embryogenesis
 - c. Solid media
 - d. Liquid media
 - e. Cell suspension
 - f. Micropropagation
 - g. Tissue culture
 - h. Semi-solid media
 - i. Callus
 - j. Planlet
 - k. Acclimatization
 - l. Explant
 - m. Proliferation
 - n. PLB
 - o. Artificial seed
2. What is the purpose of cell suspension culture? **[score 20]**
3. What is a haploid culture and describe the method used? **[score 20]**
4. Mention and explain the types of synthetic seeds! **[score 20]**
5. Briefly describe the tissue culture lab in terms of facilities, infrastructure and tools needed! **[score 20]**

Presentation Assessment Rubric

Dimension	Weight (%)	Score	WxS	Comments
Material mastery	30			
The accuracy of solving the problem	30			
Communication skills	20			
Ability to deal with questions	10			
Props/presentations	10			
Final Score	100			

DIMENSION	Scale				
	Very Good	Good	Sufficient	Deficient	Very Deficient
	≥85	71-80	60-70	50-60	<50
Organization	Well organized by presenting facts that are supported by examples that have been analyzed according to the concept	well organized and present convincing facts to support conclusions.	The presentation has focus and presents some evidence to support the conclusion	Sufficiently focused, but insufficient evidence to be used in drawing conclusions	There is no clear organization. Facts are not used to support statements.
Content	Content can inspire	Contents are accurate and	Content is generally	The content is less accurate,	The content is inaccurate or too



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	listeners to develop their minds.	complete. Listeners get new insights about the topic.	accurate, but incomplete. Listeners can learn some implied facts, but they don't add new insight into the topic	because there is no factual data, it does not add to the listener's understanding	general. Listeners don't learn anything or are sometimes misled.
Presentation Style	Speak with passion, transmit enthusiasm and enthusiasm to listeners	The speaker is calm and uses proper intonation, speaks without relying on notes, and interacts intensively with the listener. The speaker always makes eye contact with the listener.	In general the speaker is calm, but with a flat tone and quite often relies on notes. Sometimes eye contact with the listener is ignored.	Based on the notes, no ideas are developed outside the notes, the sound is monotonous	The speaker is anxious and uncomfortable, and reads notes rather than speaking. Listeners are often ignored. There is no eye contact because the speaker is looking more at the whiteboard or screen.

PRACTICUM PERFORMANCE ASSESSMENT

Practicum Performance Observation Sheet

No	Name	Aspects of Performance Assessment										Total Score	Note
		1	2	3	4	5	6	7	8	9	10		
1													
2													
3													
4													
5													
Ds t													

Information:

1 = Practical equipment

2 = Physical appearance readiness

3 = Interpret

4 = Predict

5 = Applying the concept

6 = Planning an experiment

7= Doing an experiment

8 = Communicate

Practicum Performance Assessment Rubric

No	Aspect	Criteria	Score
Preparation			
1	Practical equipment	Bring/prepare all (100%) tools and materials.	4



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		Not bringing 25% of the total tools/materials or 25% of the total tools/materials not in accordance with the provisions.	3
		Not bringing 50% of the total tools/materials or 50% of the total tools/materials not in accordance with the provisions	2
		Not bringing 75% of the total tools/materials or 75% of the total tools/materials not in accordance with the provisions	1
2	Physical appearance readiness	Lab coat worn and neat appearance.	4
		Wearing a lab coat and looking untidy (wearing t-shirts, shorts, or not wearing shoes)	3
		Do not wear a lab coat and look presentable.	2
		Not wearing a lab coat and looking untidy (wearing t-shirts, shorts, or not wearing shoes).	1
Using tools and materials			
3	Discipline of practical tools/materials	All tools/materials are taken neatly and not scattered.	4
		25% of the total tools/materials were taken untidy and scattered.	3
		50% of the total tools/materials were taken untidy and scattered.	2
		75% of the total tools/materials were taken untidy and scattered.	1
4	Appropriateness of practical tools/materials	All tools/materials are taken as needed.	4
		Take 25% of the total tools/materials that are not as needed.	3
		Take 50% of the total tools/materials that are not as needed.	2
		Taking 75% of the total tools/materials that are not as needed.	1
5	Correct operation of the tool	All tools are operated properly.	4
		25% of the total tools are operated incorrectly.	3
		50% of the total tools are operated incorrectly.	2
		75% of the total tools are operated incorrectly.	1
6	Practicum Procedure	Do 100% of the practical steps correctly.	4
		Do 75% of the practical steps correctly.	3
		Do 50% of the practical steps correctly.	2
		Do 25% of the practical steps correctly.	1
Result			
7	Practical result	Using as many senses as possible in making observations and doing it carefully according to procedures	4
		Using few senses in making observations and doing it according to procedures	3
		Using as many senses as possible in making observations but not being thorough	2
		Observing the practical results at a glance	1
8	Practical data	Complete the table according to the results of observations, accompanied by pictures, and accompanied by additional data (information) on the results of the practicum (3 aspects are all fulfilled)	4
		Complete the table according to the results of observations, accompanied by pictures, or accompanied by additional data (information) on the results of the practicum (2 aspects are well fulfilled)	3
		Complete the table according to the results of observations, accompanied by pictures, and accompanied by additional data (information) on the results of the practicum (1 aspect is well fulfilled)	2
		Complete the table according to the results of observations, accompanied by pictures, and accompanied by additional data (information) on the results of the practicum (no aspect is fulfilled properly)	1



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Closing

9	Cleanliness of tools that have been used	All tools that have been used are cleaned properly and returned	4
		Clean all tools that have been used but are not completely clean and return them	3
		Only clean half of used tools and return them	2
		Only clean one or two tools and don't restore all tools	1
10	Practice table cleaning	Clean the table until it's really clean	4
		Cleaning the table but still leaving dirt or trash	3
		Only clean part of the side of the table	2
		The table is still dirty, but throw away the dirt or trash	1