Dr. PANJABRAO DESHMUKH KRISHI VIDYAPEETH, AKOLA

SEMESTER END THEORY EXAMINATION

B.Sc. (Hons.) Agriculture

Semester	:	IV (New)	**Term**	:	II	**Academic Year**	: 2020-21
Course No.	:	ELE PATH - 243	**Title**	:	Biofertilizers, biocontrol agents and biopesticides		
Credits	:	(2+1)					
Day & Date	:	**17/6/2021**	**Time**	:	12.00 - 14.00	**Total Marks**	: 80

Note : 1) Solve ANY EIGHT questions from SECTION-A
2) Solve ANY TWELVE questions from SECTION-B
3) ALL questions from SECTION-C are compulsory
4) Send the PDF file of answer sheet to the email id of respective course teacher

MODEL ANSWERS

SECTION-A	
	(Write the answers in 4-5 sentences only. Each question carries 4 marks)
Q. 1	**Write the biochemical process involved in nitrogen cycle.**
Ans.	Write the Biochemical process involved in nitrogen cycle: a) Proteolysis, b) Ammonification, c) Nitrification, d) Nitrate reduction, e) Denitrification.
Q. 2	**Give the classification of biofertilizers based on microorganism used by citing suitable example.**
Ans.	The Answer should be including: bacterial, actinomycetal, fungal, algal biofertilizers in related to nitrogen fixing (symbiotic, associative symbiotic, non symbiotic), nutrients solubilisation, mobilization and P absorbing microorganisms.
Q. 3	**Enlist the Cross inoculation groups of Rhizobia. Discuss the mechanism of nodule formation.**
Ans.	Answer should be include legume crop wise *Rhizobium* sp. **(1 Mark)** Answer should also include the process of nodule development: **(3 Marks)** Bacteria attracted towards **flavonoids** ----- secrete specific **oligosaccharide** --- root hair becomes deformed and curl at the tip --- enclosed in small pocket --- **Penetrate** --- **Invasion** --- cortical **cell division** --- Infected root cells swell --- become endosymboitic **bacteroids** --- nodule provides an **oxygen-controlled** environment.
Q. 4	**Describe the growth characteristics of *Rhizobium* and *Azotobacter*.**
Ans.	Answer should be include morphological and physiological characteristics of each organism: Morphology - Unicellular, cell size, shape, motility, Gram reaction. Physiology - Nature, C-source, N-source, respiration, media.
Q. 5	**Write the Indian standard specification for *Azotobacter* and *Trichoderma*.**
Ans.	Answer should be includes according to Indian standard specifications on following parameters: Base, cell number at the time of manufacture and at the time of expiry, Expiry period, Permissible contamination, pH, strain, carrier, others (nodulation, dry matter etc).
Q. 6	**Discuss the mechanism of *Trichoderma* sp. in respect of controlling plant diseases.**
Ans.	Discuss the mechanism: Competition, mycoparasitism, antibiosis, stimulation of plant resistance and defense mechanism, lysis etc.
Q. 7	**What are the factors responsible for effectiveness of biocontrol agent on soil borne plant pathogen?**
Ans.	Abiotic factors- soil temperature, type, pH, moisture, nutritional status, concentration of heavy metals and interaction among the abiotic factors. Biotic factors- soil organisms, host plant.

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Q. 8	**Discuss on bio- decomposition of major constituents of soil organic matter/plant residues.**
Ans.	Answer should be including on following points: Decomposition of cellulose, hemicelluloses, chitin, lignin, protein, lipids, starch, and pectin with microorganism involved.
Q. 9	**Explain in detail mass multiplication of *Trichoderma* and *Pseudomonas* culture.**
Ans.	Answer should be including on following points: i. Product formulation technology - eg. agar based and broth culture, frozen concentrater, granular inoculants, carrier based, paste, pelleting, precoated seeds etc. ii. Raw materials highly absorptive, nontoxic, easy to sterilize, availability, good adhesion, have pH buffering capacity.
Q. 10	**Describe the importance of *Beauveria* and *Metarhizium* biopesticides.**
Ans.	Answer should be include the economic importance of the *Beauveria* and *Metarhizium*, morphology, taxonomy class, medium, formulations, types of insect controlled with examples, microbial insecticide.
SECTION-B	
(Write the answers in one sentence only. Each question carries 2 marks)	
Q. 11	**Do as directed.**
	a) Write the important contribution of M.W. Beijerinck.
	Ans.: 1) He was the first to isolate N-fixing bacteria from root nodules of legumes and name is *Bacillus radicicola* (now known as *Rhizobium* sp.) -1888. 2) Also isolated *Azatobacter* in1902 and *Azospirillum* (then *spirillum*) in 1925. **(Mentioned any one)**
	b) **'Nitragin'** a laboratory culture of *Rhizobia* was launched by **Nobbe and Hiltner** in 1895.
	Ans.: 'Nitragin' and Nobbe and Hiltner
	c) Define Biofertilizer.
	Ans.: Biofertilizer is the product which content living or latent cells of effective strains of different microorganisms which either fix the atmospheric nitrogen or solubilize/mobilize the nutrients and make it in available form through biological process.
	d) Define Microbial pesticide.
	Ans.: Microbial pesticide is a population of pathogenic microorganisms that are antagonistic to particular pest and provide natural control.
	e) What do you mean by enzyme nitrogenase?
	Ans.: Nitrogenase - Enzymes which mediates the reduction of N_2 to NH_3, acetylene to ethylene.
	f) Which method is used for studying selection of efficient strain of *Rhizobium?*
	Ans.: Nodulation test, Nitrogen estimation test, Pot infection test etc. **(Mentioned any one method)**
	g) Enlist any two bioagents used for the management of plant diseases.
	Ans.: Bioagents: *Trichoderma harzianum*, *T. aspirillum, T. hamatum, T. viride Pseudomonas fluorescence*, *Bacillus subtiliis*, etc. **(Mentioned any two)**
	h) The *Cryptolaemus* sp. is effective against _____. (Fill in the blank)
	Ans.: Aphids, Mealy Bugs and White flies.
	i) The NPV is effective against _____. (Fill in the blank)
	Ans.: Cotton bollworms (*H. armigera*) and Tobacco leaf eating caterpillar (*S. litura*).
	j) Guidelines detail for the Registration of Bioagents in India developed by _____. (Fill in the blank)
	Ans.: Guidelines detail for the Registration of Bioagents in India developed by **Central Insecticides Board (CIB).**
	k) Enlist any two methods of application of carrier based biofertilizers.
	Ans.: i) Seed treatment/pelleting, ii) Root dipping, iii) Set treatment, iv) Soil application, v) Biofertigation, vi) Foliar application**. (Mentioned any two method)**

	l) Write any two working area in organic farming institute.			
	Ans.: i. Main working laboratory, ii. Incubation room, iii. Fermentation room, iv. Media preparation room, v. Chemical store, vi. Carrier/row material store, vii. Packaging room, viii. Finished goods store and other infra-structure requirement such as electric connection, water connection etc. **(Mentioned any two)**			
	m) Write any two Entomofungal pathogens.			
	Ans.: *Beauveria bassiana, Metarhizium anisopliae, Verticillium lecanni* **(Mentioned any two)**			
	n) Write any one bacterial pesticide.			
	Ans.: *Bacillus popilliae, Bacillus thuringiensis* **(Mentioned any one)**			
SECTION-C				
(Choose the correct option. Each question carry 1 mark)				
Q. 12	1) The *Paecilomyces lilacinus* is effective to manage _____.			
	a)	Fungal disease	b)	Bacterial disease
	c)	Viral disease	**d)**	**Nematode disease**
	2) The *Trichoderma harzianum* is mostly used to manage _____.			
	a)	**Fungal disease**	b)	Bacterial disease
	c)	Viral disease	d)	Nematode disease
	3) The *Trichogramma* spp. is _____.			
	a)	Predator	**b)**	**Egg parasitoid**
	c)	Larval parasitoid	d)	Adult parasitoid
	4) The _____ is infecting the midgut cells of the insects.			
	a)	*Beauveria bassiana*	b)	*Metarhizium anisopliae*
	c)	***Bacillus thuringiensis***	d)	*Verticillium lecanni*
	5) Species of *Thiobacillus* are noted for their ability to oxidize _____.			
	a)	Hydrocarbons	b)	Methane
	c)	Hydrogen gas	**d)**	**Sulfur compounds**
	6) Is the actinomycete which is responsible for nitrogen fixation?			
	a)	*Rhizobium*	b)	*Azotobacter*
	c)	***Frankia***	d)	All of these
	7) Cyanobacteria secrete _____.			
	a)	Uric acid	**b)**	**IAA**
	c)	Alcohol	d)	None of these
	8) _____ is a selective medium for isolation of *Azospirillum* sp.			
	a)	**NFB semi solid medium**	b)	*Pikovaskya's medium*
	c)	CRYEMA	d)	Jenesen's medium
	9) _____ is a selective medium for isolation of PSB.			
	a)	NFB semi solid medium	**b)**	***Pikovaskya's medium***
	c)	CRYEMA	d)	Jenesen's medium
	10) _____ is the associative symbiotic nitrogen fixer.			
	a)	*Rhizobium*	b)	*Azotobacter*
	c)	*Frankia*	**d)**	***Azospirillum***
	11) The _____ encoding enzymes involved in fixation of atmospheric nitrogen into available form of nitrogen.			
	a)	**Nif gene**	b)	Nod gene
	c)	Both a & b	d)	None of these
	12) In carrier based biofertilizer, by weight proportion of broth culture and carrier powder is _____.			
	a)	1 : 10	b)	1 : 5
	c)	1 : 4	**d)**	**1 : 2**

Contd..

13) Who discovered the antibiotic "Streptomycin" produced by *Strptomyces griseus?*				
a)	S.N. Winogradsky (1891)	b)	Hiltner (1904)
c)	**S.A. Waksman (1944)**	d)	M.W. Beijerinck (1925)
14) Who coined the term "Rhizosphere"?				
a)	S.N. Winogradsky (1891)	**b)**	**Hiltner (1904)**
c)	S.A. Waksman (1944)	d)	M.W. Beijerinck (1925)
15) Who discovered the antibiotic "Penicillin" from the fungus *Penicillium notatum?*				
a)	**Alexander Fleming (1929)**	b)	Hiltner (1904)
c)	S.A. Waksman (1944)	d)	M.W. Beijerinck (1925)
16) Who discovered the autotrophic mode of bacteria?				
a)	M.W. Beijerinck	b)	B. Frank
c)	S.A. Waksman	**d)**	**S.N. Winogradsky**
17) Microbes convert proteins into amino acids with the help of enzyme proteinases and peptidases.				
a)	**Proteolysis**	b)	Ammonification
c)	Nitrification	d)	Denitrification
18) A fungus responsible for decomposition of cellulose in dead organic matter.				
a)	*Beauveria* spp.	b)	*Metarhizium* spp.
c)	***Trichoderma* spp.**	d)	*Verticillium* spp.
19) A bacteria that play major role in the plant growth promotion, induced systemic resistance and biocontrol of pathogens.				
a)	*Bacillus thuringiensis*	**b)**	***Pseudomonas fluorescence***
c)	Both a & b	d)	None of these
20) In CRYEMA medium, yeast extract is used as a source of _____.				
a)	Carbon	b)	Nitrogen
c)	**Both a & b**	d)	None of these
21) Which aquatic fern is used to increase the yield in paddy crop?				
a)	Marsilea	b)	Salvinia
c)	**Azolla**	d)	None of these
22) A genus belongs to Vesicular Arbuscular Mycorrhiza (VAM) is _____.				
a)	*Pseudomonas* spp.	b)	*Micromonospora* spp.
c)	*Nocardia* spp.	**d)**	***Gigaspora* spp.**
23) Which is the Phosphate Solubilizing as well as Mobilizing Bacteria?				
a)	***Fraturia aurantia***	b)	*Bacillus stearothermophilus*
c)	*Cellulomonas folia*	d)	None of these
24) A symbiosis between a root and bacteria.				
a)	Bacteriophage	b)	Bacteriolysis
c)	**Bacteriorhiza**	d)	Mycorhiza

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