TIME : TWO HOURS **MAX MARKS : 100**

SECTION I

Attempt **ANY 40** of the following.
Select the most appropriate answer from the alternatives provided; **40**

1. The "curving" of outer tracks in a TLC is primarily due to ;
   a) inadequate chamber saturation b) inappropriate solvent system c) loading higher volume of sample d) None of these
2. The important right of a subject in clinical trial is;
   a) subject can withdraw from trial with permission of PI b) subject can withdraw from the trial giving any reason c) subject can withdraw from trial at any time d) subject can withdraw from trial without giving any reasons
3. The consent of a subject in clinical trial is obtained in form of ;
   a) Consent agreement b) Informed consent document c) Informed permission statement d) Consent declaration
4. As per Indian regulations, the minimum members required in an ethics committee is
   a) 10 b) 5 c) 12 d) 7
5. Passive Transport needs _____.
   a) ATP b) Na+K+ pumps c) enzymes d) None of these
6. Clones are identified by hybridizing them with _____.
   a) vector b) probe c) virus d) antibody
7. The bond between the sugar, base and phosphate group in DNA is _____.
   a) 5'-3' phosphodiester linkage b) 3'-5' ester linkage c) hydrogen bond d) 3'-5' phosphodiester linkage
8. Turbidometry is based on_____
   a) Absorption of light b) Transmittance of light c) scattering of light d) reflectance of light
9. Median of 10, 20, 19, 21, 14, 10, 15 is _____
   a) 21 b) 15 c) 10 d) none of these
10. The purity of subcellular fractionation i.e. nucleus checked by the use of marker enzyme.
    a) glucose-6-phosphatase b) hexokinase c) DNA polymerase d) glutamate dehydrogenase
11. Impairment in the synthesis of dopamine by the brain is a major causative factor for the disorder _____.
    a) Goiter b) Parkinson's disease c) Cushing's syndrome d) Addison's disease
12. In competitive inhibition, the k_m value _____whereas V_{max} _____.
    a) both k_m and V_{max} decreases b) Km decreases and Vmax increases c) Km increases and Vmax remain unchanged d) Km unchanged while Vmax lowered
13. The mucopolysaccharides _____ serves as a lubricant and shock absorbant in joints.
    a) chitin b) chondroitin 4-sulfate c) hyaluronic acid d) keratin sulfate

[TURN OVER

14. _____ is sulfur containing essential amino acid.
a) Lysine b) histidine c) serine d) methionine

15. In which of the following techniques molecular fragmentation offer clues to the covalent chemical structures of biomolecules?
a) MALDI-TOF MS/MS b) MALDI-TOF/MS c) ESI-TOF/MS d) LC(coupled)-ESI-TOF/MS

16. The TCA cycle in respiration yields _____.
a) 1 GTP, 3 NADH, 1$FADH_2$, 2CO_2 b) 2 GTP, 6 NADH, 2$FADH_2$, 2CO_2 c) 4 GTP, 6 NADH, 4$FADH_2$, 2CO_2 d) 32 GTP, 2 NADH, 4$FADH_2$, 4CO_2

17. In enzymology, feedback regulation the end product binds to _____.
a) active site b) catalytic site c) allosteric site d) E-S complex

18. The simultaneous transport of two different molecules in the opposite direction through membrane is known as _____system.
a) cotransport b) symport c) uniport d) antiport

19. The number of ATP produced when a molecule of acetyl CoA is oxidized through citric acid cycle _____.
a) 12 b) 24 c) 38 d) 15

20. Which of the following cannot be protected by copyright?
a) Computer hardware b) Graphic works c) Music compositions d) Folklore

21. Which of the following is not a focus of intellectual property law?
a) To protect the product of mental effort b) To give the creator the right to benefit from it c) To encourage free flow of ideas d) To prevent people from copying other's idea

22. The Michaelis- Menton equation relates the rate of an enzyme catalysed reaction to
a) Product concentration b) Substrate concentration c) Activation energy d) Inhibitor concentration

23. Which of the following statements is **not** true regarding the active site of an enzyme?
a) An active site is normally a hollow cleft on the surface of an enzyme b) An active site is normally hydrophilic in nature c) Substrates fit into active sites and bind to functional groups within the active sit d) An active site contains amino acids which are important to the binding process and the catalytic mechanism

24. Full form of BLAST is
a) Basic Logical Alignment Search Tool b) Basic Local Alignment Search Tool c) Basic Local Alignment Sequence Tool d) Basic Local Align Search Tool

25. In calorimeter, the bandwidth is selected by
a) prism b) filter c) Diffraction gratings d) monochromotor

26. Prisms or gratings are used to obtain monochromatic light in
a) colorimeter b) flame photometer c) spectrophotometer d) fluorimeter

27. The half life of 14C isotope is
a) 5 years b) 510 years c) 1000 years d) 5000 years

28. Which of the following affects the secondary structure of proteins and changes itselectrophoretic mobility ?
a) Polyacrylamide b) Urea c) SDS d) Ammonia

29. The application of genetic engineering in producing therapeutic products is called
a) Pharmacology b) Molecular farming c) Molecular pharming d) Pharmaco engineering

30. The octadecyl bonded stationary phase _____
a) is non polar b) is highly polar c) has lowest polarity d) is moderately polar

31. In reversed phase HPLC the first eluted solutes are
a) least polar b) most polar c) intermediately polar d) non polar

32. The color of light given off when a sample of an element is heated corresponds to
a) the amount of energy added during the heating b) The energy difference between the ground state and excited state c) the calorific value of the sample d) the amount of energy lost from the sample

33. Adding SDS to gel electrophoresis is advantageous because
a) SDS reduces disulfide bonds b) SDS colors the proteins for visualization c) SDS allows proteins to be separated on the basis of their mass d) None of the above

34. Functionality of a protein is determined by its
a) Amount of proline b) N-terminal amino acids c) Structure d) None of the above

35. The rate of migration of a solute through a stationary phase is determined by its
a) distribution ratio b) mobility ratio c) separation ratio d) molecular radius

36. The process by which a solute is transferred from the mobile phase to the stationary phase is called;
a) adsorption b) desorption c) exclusion d) inclusion

37. The most common form of silica used in Chromatographic columns is
a) aminopropyl b) octadecyl c) cyanopropyl d) nitrile

38. A reversed phase chromatography column is used for samples that are soluble in
a) inorganic solvents b) organic solvents c) water d) Acids

39. Changes the pH and the charge of the solute will promote elution in
a) affinity chromatography b) thin layer chromatography c) paper chromatography d) ion exchange chromatography

40. Quantitative and qualitative separation of ionic compounds is easily possible with
a) electrophoresis b) centrifugation c) HPLC d) GC

41. For obtaining a patent, the patent application should;
a) be submitted at the patent office with full technical specifications that cannot be amended afterwards. b) be submitted at the patent office after complying to the formal and technical requirements c) be submitted at the patent office after demonstrating that the invention works. d) be submitted at the patent office mentioning the date on which the invention was first "reduced to practice".

42. With respect to IPR, the acronym "PCT" stands for ;
a) Patent Cooperation Treaty | b) Patents and Copyrights Treaty | c) Patent Compliance Terms | d) Patents Confidentiality Treaty

43. Phylogenetic relationships between species can be depicted by ;
a) Dendrogram | b) Family Flowchart | c) Evolutionary tree | d) Missing links

44. WAN means –
a) Wide Area Network | b) Wired Area Network | c) Wide Available Network | d) Within Area Network

45. 'OS' abbreviation in computers usually means;
a) Order of Signaling | b) Open Software | c) Operating System | d) Optical Sensor

46. In Computer network, "terminal" refers to ;
a) device used to give power supply to a computer | b) Point at which data may leave or enter the computer | c) point where wires are interconnected | d) an input/output device

47. The most widely used commercial programming computer language is
a) PASCAL | b) BASIC | c) FORTRAN | d) COBOL

48. In computer terminology, VGA is
a) Video Graphics Array | b) Visual Graphics Array | c) Visual Graphics Adapter | d) Video Graphics Adapter

49. MICR stands for
a) Magnetic Ink Character Reader | b) Magnetic Ink Code Reader | c) Magnet Identified Character Reader | d) Magnified Individual Character Recognition

50. UNIVAC is
a) Unique Automatic Computer | b) Universal Automatic Computer | c) Universal Array Computer | d) Unvalued Automatic Computer

51. Insertion of cry gene in plant genome provides :
a) Drought resistance | b) Herbicide resistance | c) Virus resistance | d) Insect resistance

52. Acidic amino acids are
a) Nonpolar and negatively charged at physiological pH | b) Nonpolar and positively charged at physiological pH | c) Polar and negatively charged at physiological pH | d) Polar and positively charged at physiological pH

53. The most convenient and popular source of plant protoplast is the :
a) Coleoptile | b) Leaf | c) Root nodules | d) Shoot tips

54. HEPES buffer is used in :
a) Animal Tissue culture medium | b) Plant tissue culture medium | c) Acterial nutrient medium | d) Yeast nutrient medium.

55. The first bioinformatics database was created by
a) Pearson | b) Richard Durbin | c) Dayhoff | d) Michael J.Dunn

56. BLOSUM matrices are used for
a) Pair wise sequence alignment | b) Multiple sequence alignment | c) Phylogenetic analysis | d) All of the above

57. A data base of current sequence map of the human genome is called
a) OMIM | b) HGMD | c) Golden path | d) Gene Cards

58. Mitochondrial DNA is now a "HOT" topic of research in bioinformatics because;
a) It contains over 50% of the genes in the human genome | b) It is only present in vertebrates closely related to humans | c) It replicates by synthesizing an mRNA that then acts as a DNA polymerase | d) It mutates rapidly and allows us to study evolution over short time scale

59. Submission to Genbank are made using
a) BankIt and BankIn | b) BankIt and Sequin | c) Sequin and BankIn | d) Entrez

60. A comprehensive database for the study of human genetics and molecular biology is
a) PSD | b) OMIM | c) PDB | d) STAG

SECTION II

Attempt **ANY THREE** of the following; 30

Q1. Write an essay on the Indian Herbal pharmacopeia and the Ayurvedic Formulary of India. How are they useful in ensuring quality of drugs prescribed under ISM.
Q2. What is the role of an interface in a hyphenated method? Explain the working of ESI in LC-MS system.
Q3. How is sterility testing done for injectables ? Add a note on the sources of microbial contamination during drug manufacture ?
Q4. "IPR treats creativity of human brain as a personal property." Comment. Add a note on the various options available for protecting intellectual property and and owning IPR?
Q5. What is partition coefficient ? How does it influence sample processing during bioanalysis ?
Q6. What is a gene library ? How does bioinformatic tools help in identifying functional genes ?
Q7. "A nutraceutical is not a drug but it has significant role in managing lifestyle diseases." Comment giving suitable examples.
Q8. What are Trademarks and Service Marks? What are the two main characteristics of a trademark? What are the advantages of obtaining trademark protection?

SECTION III

Attempt **ANY TWO** of the following; 30

Q1. You are provided with a published research paper as an attachment to this question paper. Read the paper carefully and write an abstract for the same. (***Not** more than 300 words*)
Q2. Explain the role of bioanalyst in evaluating quality of medicinal plant raw materials ?
Q3. Explain the regulatory provisions that ensure GCP compliance in clinical trials ?
Q4. What is copyright and what does it cover ? How is copyright regulated and protected?
Q5. How is a DNA sequenced ? Add a note on c-DNA library.
Q6. Explain some important nutraceutical preparations for managing malnutrition in human.

PHARMACOGNOSTIC STUDY AND DEVELOMENT OF QUALITY PARAMETERS OF WHOLE PLANTS OF TRICHODESMA INDICUM (Linn.) R.Br.

INTRODUCTION

The plant has numerous medicinal values such as anti diarrhoeal [1], cough suppressant [2] and anti inflammatory [3]. In folklore medicine the paste of the leaves of *Trichodesma indicum* along with rhizomes of *Acorus calamus* and *Allium sativum* were used for the wound healing potentials [4].

The present study aims to study the pharmacognostical charcters and to develop quality parameters of the whole plant of *Trichodesma indicum*.

MATERIALS AND METHODS

Collection and authentication of the plant

Whole plants were collected from the campus of Madurai Medical College, Madurai and authenticated by Dr. Stephenk, Lecturer in Botany, The American College, Madurai. A herbarium was deposited in the Department of Pharmacognosy as PCG/001/2010 in Madurai Medical College, Madurai.

Pharmacognostic studies [5-7]

Morphological characters of the leaf, stem and root were studied.

Transverse section of the leaf, stem and root were also studied. Leaf constants were also determined by using camera Lucida and stage micrometer (Table 1). The plant materials were cleaned, shade dried and powdered.

Physicochemical evaluation [8&9]

Various physicochemical parameters like FOM, LOD, ash values (total ash, water insoluble ash, acid insoluble ash, water soluble ash), extractive values (petroleum ether, ethanol, methanol), swelling index and foaming index of the powdered materials were established (Table 2). The behavior of the powdered materials was also determined [10, 11] (Table 3).

Phytochemical studies [5, 7 & 12-13]

The powdered materials were extracted with solvents like petroleum ether, ethanol and methanol and the active principles present in the extracted plant materials were determined by their respective chemical tests with suitable reagents (Table 4).

Table 1: Quantitative analytical microscopical parameters of the leaf of T. indicum

S. No.	Parameters*	Values obtained
1	Stomatal number in upper epidermis	10.17 ± 0.27
2.	Stomatal number in lower epidermis	15.92 ± 1.32
3.	Stomatal index in upper epidermis	26.5 ± 0.55
4.	Stomatal index in lower epidermis	23.76 ± 1.96
5.	Vein islet number	10.5 ± 1.27
6	Vein termination number	6.4 ± 0.86
7	Palisade ratio in upper epidermis	9.25 ± 0.70

*** mean of 6 readings ± SEM**

Table 2: Standardization parameters of T. indicum

S. No	Parameters*	Values* expressed as %
1	**Volatile oil**	Nil
2	**Foreign organic matter**	0.02 ± 0.12
3	**Moisture content**	8.746 ± 0.02
4	**Ash values**	
	Total ash	15.56 ± 0.56

	Acid insoluble ash	7.17 ± 0.36
	Water soluble ash	2.98 ± 0.90
	Water insoluble ash	13.75 ± 0.59
5	**Extractive Values**	
	Petroleum extract	1.473 ± 0.03
	Ether extract	6.180 ± 0.02
	Chloroform extract	4.201 ± 0.04
	Ethyl acetate extract	3.358 ±0.01
	Ethanol extract	4.200 ±0.03
	Methanol extract	8.598 ± 0.01
	Aqueous extract	9.913 ± 0.03
6	**Foaming index**	less than 100
7	**Swelling index**	**expressed as mL**
	Initial volume	2.6 ± 0.10
	Final volume	9.3 ± 0.17

*** mean of three readings**

Table 3: Behavior of the *T. indicum* powder with various chemical reagents

Powder + Reagents	Colour / Precipitate	Presence of active principle
Picric acid	Yellow precipitate	Protein present
Conc. sulfuric acid	Reddish brown color	Phyto sterols present
Lieberman Burchard reagent	Reddish brown color	Phyto sterols present
Aqueous ferric chloride	Greenish black color	Tannins present
Iodine solution	Blue color	Starch present
Mayer's reagent	No cream color	Absence of alkaloids
Spot test	No stain	Fixed oils absent
Sulfosalicylic acid	White precipitate	Protein present
Aq. Sodium hydroxide	Yellow color	Flavanoids present
Mg – HCl	Magenta color	Flavanoids present
Aq. Lead acetate	White precipitate	Presence of tannins

Note: - Colour reactions are viewed under natural light by naked eye

Table 4: Preliminary phytochemical tests for various crude extracts of T. indicum

S. No.	Chemical Test	Petroleum ether extract	Methanol extract	Ethanol extract
1.	Terpenoids	-	-	-
2.	Flavones	-	+	+
3.	Steroids	+	+	+
4.	Anthraquinones	-	-	-
5.	Glycosides	-	-	-
6.	Sugars	-	+	+
7.	Alkaloids	-	-	-
8.	Quinones	-	-	-
9.	Phenols	-	+	+
10.	Tannins	-	+	+
11.	Saponins	-	+	+
12.	Proteins & free amino acids	-	+	+

Note: (+) Present (-) Absent

RESULTS

The leaf is a dorsiventral and hypostomatic with anomocytic stomata. It has amoeboid outlined epidermal cells. It has a thick epidermal trichomes and the midrib is deeply grooved on adaxial side with a semi circular abaxial part. It has well defined vein islets and once or twice forked vein termination on its venation pattern.

The microscopical studies of the young stem showed thin layer of narrow rectangular epidermal cells and vascular bundles whereas thick stem showed well preserved epidermal cells and also has primary, secondary xylem cylinders with phloem and vessels up to 40µm wide.

The microscopical studies of the young root showed solid central secondary xylem cylinder with thin layer of secondary phloem. It also has lignified xylem fibers. The narrow vessels are 40µm and wider ones are 130µm in diameter. The thick root showed secondary xylem as major component and also has narrow central core of vessels and fibers with few islands of less stained phloem elements.

Evaluation of powder microscopy showed non glandular, unbranched, unicellular trichomes with 350-900µm long. Xylem fibers are also seen narrow one is 500µm long and wider one is >500µm long. It has a peculiar character of fiber – tracheids cells it has a multi seriate pits resembling the tracheids. The vessel elements vary from 50-480µm in length and 70-130µm in width. It has masses of starch grains when seen under a polarizing microscope.

DISCUSSION

The present study deals with the macroscopical, microscopical, physicochemical and phytochemical evaluation of the whole plant materials of *Trichodesma indicum*. The microscopic characters revealed that the leaf was dorsiventral in shape with hypostomatic (anamocytic stomata). The stem on its thick stage showed the presence of both primary and secondary xylem elements. The root section showed the presence of islands of less stained phloem. The powder microscopy showed the presence of unicellular, unbranched covering trichomes, starch grains and fibre-tracheids. The behavior of the powder, phytochemical examination of the ethanol and methanolic extracts indicate the presence tannins, phenolic compounds, flavonoids, sugars, saponins, mucilage, proteins and free amino acids. A detailed information will be useful for the development of standardization parameters, isolation of

phytoconstituents, screening of preclinical and clinical investigation, manufacturing of formulations and also distinguishing it from its closely related species.

CONCLUSION

Trichodesma indicum Linn R.Br was used in the folklore medicine as a anti inflammatory. Hence this study provide useful information for the identification of this plant for the future plan and also give standardization parameters for the development of herbal formulation.

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