4 - RULES FOR THE MANUFACTURE, USE, IMPORT, EXPORT AND STORAGE OF HAZARDOUS MICRO ORGANISMS, GENETICALLY ENGINEERED ORGANISMS OR CELLS

MINISTRY OF ENVIRONMENT AND FORESTRY

NOTIFICATION

(New Delhi, the 5th December, 1989)

***G.S.R. 1037 (E).-** In exercise of the powers conferred by sections 6,8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986) and with a view to protecting the environment, nature and health, in connection with the application of gene technology and micro-organisms, the Central Government hereby makes the following rules, namely:-

1. SHORT TITLE, EXTENT AND COMMENCEMENT

1. These rules may be called the Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms/Genetically engineered organisms or cells.
2. These rules shall come into operation on the date to be notified for this purpose in the Official Gazette.[1]

2. APPLICATION

1. These rules are applicable to the manufacture, import and storage of micro-organisms and Gene-Technological products.

2. These rules shall apply to genetically engineered organisms/micro-organisms and cells and correspondingly to any substances and products and food stuffs, etc., of which such cells, organisms or tissues hereof form part.

3. These rules shall also apply to new gene technologies apart from those referred to in clauses (ii) and (iv) of rule 3 and these rules shall apply to organisms /micro-organisms and cells generated by the utilisation of such ether gene-technologies and to substances and products of which such organism and cells form part.

    1. These rules shall be applicable in the following specific cases:

        a. sale, offers for sale, storage for the purpose of sale, offers and any kind of handling over with or without a consideration:

        b. exportation and importation of genetically engineered cells or organisms:

        c. production, manufacturing, processing, storage, import, drawing off, packaging and repackaging of the Genetically Engineered Products:

        d. production, manufacture etc. of drugs and pharmaceuticals and food stuffs distilleries and tanneries, etc. Which make use of micro-organisms/ genetically engineered microorganisms one way or the other.

4. These rules shall be applicable to the whole of India.

3. DEFINITIONS

In these rules unless the context requires.

i. "Biotechnology" means the application of scientific and engineering principles to the processing of materials by biological agents to produce goods and services;

ii. "Cell hybridisation" means the formation of live cells with new combinations of genetic material through the fusion of two or more cells by means of methods which do not occur naturally;

iii. "Gene Technology" means the application of the gene technique called genetic engineering, include selfcloning and deletion as well as cell hybridisation;

iv. "Genetic engineering" means the technique by which heritable material, which does not usually occur or will not occur naturally in the organism or cell concerned, generated outside the organism or the cell is inserted into said cell or organism. It shall also mean the formation of new combinations of genetic material by incorporation of a cell into a host cell, where they occur naturally (self cloning) as well as modification of an organism or in a cell by deletion and removal of parts of the heritable material;

v. "microorganisms" shall include all the bacteria, viruses, fungi, mycoplasma, cell lines, algae, protodoans and nematotes indicated in the schedule and those that have not been presently know to exist in the country or not have been discovered so far.

4. COMPETENT AUTHORITIES

1. **Recombinant DNA Advisory Committee (RDAC):** This committee shall review developments in Biotechnology at national and international levels and shall recommend suitable and appropriate safety regulations for India in recombinant research, use and applications from time to time. The Committee shall function in the Department of Biotechnology.

2. **Review Committee on Genetic Manipulation (RCGM):** This committee shall function in the Department of Biotechnology to monitor the safety related aspects in respect of on-going research projects and activities involving genetically engineered organisms/hazardous microorganisms. The Review Committee on Genetic Manipulation shall include representatives of (a) Department of Biotechnology (b) Indian Council of Medical Research (c) Indian Council of Agricultural Research (d) Council of Scientific and Industrial Research (e) other experts in their individual capacity. Review Committee on Genetic Manipulation may appoint sub groups.

   It shall bring out Manuals of guidelines specifying procedure for regulatory process with respect to activities involving genetically engineered organisms in research, use and applications including industry with a view to ensure environmental safety. All ongoing projects involving high risk category and controlled field experiments shall be reviewed to ensure that adequate precautions and containment conditions are followed as per the guidelines.

   The Review Committee on Genetic Manipulation shall lay down procedures restricting or prohibiting production, sale, importation and use of such genetically engineered organism of cells as are mentioned in the Schedule.

3. **Institutional Biosafety Committee (IBSC):** This committee shall be constituted by an occupier or any person including research institutions handling microorganism/genetically engineered organisms. The committee shall comprise the Head of the Institution, Scientists engaged in DNA work, a medical expert and a nominee of the Department of Biotechnology. The occupier or any person including research institutions handling microorganisms/genetically engineered organisms shall prepare, with the assistance of the Institutional Biosafety Committee (IBSC) an uptodate on site emergency plan according to the manuals/guidelines of the RCGM and make available copies to the District Level Committee/State Biotechnology Co-ordination Committee and the Genetic Engineering Approval Committee

   1. Genetic Engineering Approval Committee (GEAC): This committee shall function as a body under the Department of Environment, Forest and Wildlife for approval of activities involving large scale use of hazardous microorganisms and recombinants in research and industrial production from the environmental angle. The Committee shall also be responsible for approval of proposals relating to release of genetically engineered organisms and products into the environment including experimental field trials.

The composition of the Committee shall be

i. Chairman-Additional Secretary, Department of Environment, Forests and Wild life Co-Chairman-Representative of Department of Bio-technology

ii. Members: Representative of concerned Agencies and Departments, namely, Ministry of Industrial Development, Department of Biotechnology and the Department of Atomic Energy:

iii. Expert members: Director General Indian Council of Agricultural Research, Director General-Indian Council of Medical Research, Director General-Council of Scientific and Industrial Research, Director General-Health Services, Plant Protection Adviser, Directorate of Plant Protection, Quarantine and storage, Chairman, Central Pollution Control Board and three outside experts in individual capacity.

iv. Member Secretary: An official of the Department or Environment, Forest and Wild life.

The committee may co-opt other members/experts as necessary.

The committee or any person/s authorised by it shall have powers to take punitive action under the Environment (Protection) Act.

1. **State Biotechnology Co-Ordination Committee (SBCC):** There shall be a State Biotechnology Coordination Committee in the States wherever necessary. It shall have powers to inspect, investigate and take punitive action in case or violations of statutory provisions through the Nodal Department and the State Pollution Control Board/Directorate of Health/Medical Services. The Committee shall review

periodically the safety and control measures in the various industries/institutions handling genetically engineered Organisms/Hazardous microorganisms. The composition of the Coordination Committee shall be

i. Chief Secretary - Chairman

ii. Secretary, Department of Environment - Member Secretary

iii. Secretary, Department of Health - Member

iv. Secretary, Department of Agriculture - Member

v. Secretary, Department of Industries and Commerce - Member

vi. Secretary, Department of Forests - Member

vii. Secretary, Department of Public works/Chief Engineer, Department of Public Health Engineering - Member

viii. State microbiologists and Pathologists - Member

ix. Chairman of State Pollution Control Board

The Committee may co-opt other members/experts as necessary.

1. **District Level Committee (DLC):** There shall be a District Level Biotechnology Committee (DLC) in the districts wherever necessary under the District Collectors to monitor the safety regulations in installations engaged in the use of genetically modified organisms/hazardous microorganisms and its applications in the environment.

The District Level Committee/or any other person/s authorised in this behalf shall visit the installation engaged in activity involving genetically engineered organisms, hazardous microorganisms, formulate information chart, find out hazards and risks associated with each of these installations and coordinate activities with a view to meeting any emergency. The District Level Committee shall regularly submit its report to the State Biotechnology Co-ordination Committee/Genetic Engineering Approval Committee.

The District level Committee shall comprise of:

i. District Collector - Chairman

ii. Factory Inspector - Member

iii. A representative of the Pollution Control Board - Member

iv. Chief Medical Officer (District Health Officer) – Member (Convenor)

v. District Agricultural Officer - Member

vi. A representative of the Public Health Engineering Department - Member

vii. District Microbiologists pathologist (Technical expert) - Member

viii. Commissioner Municipal Corporation - Member

The Committee may co-opt other member/s/experts as necessary.

5. CLASSIFICATION OF MICROORGANISMS OR GENETICALLY ENGINEERED PRODUC

i. For the purpose of these rules, microorganisms or genetically engineered organisms, products or cells shall be dealt with under two major heads; animal pathogens and plant pests and these shall be classified in the manner specified in the Schedule.

ii. If any of the microorganism, genetically engineered organism or cell falls within the limits of more than one risk class as specified in the Schedule, it shall be deemed to belong exclusively to the last in number of such classes.

6. MICROORGANISMS LAID DOWN IN THE SCHEDULE ARE DIVIDED INTO THE FOLLOWING

i. Bacterial agents:

ii. Fungal Agents:

iii. Parasitic Agents

iv. Viral, Rickettsial and Chlamydial Agents:

v. Special Category

7. APPROVAL AND PROHIBITIONS

1. No person shall import, export, transport, manufacture, process, use or sell any hazardous microorganisms or genetically engineered organisms/substances or cells except with the approval of the Genetic Engineering Approval Committee.

2. Use of pathogenic microorganism or any genetically engineered organisms or cell for the purpose of research shall only be allowed in laboratories or inside laboratory areas notified by the Ministry of Environment and Forests for this purpose under the Environment (Protection) Act, 1986.

3. The Genetic Engineering Approval Committee shall give directions to the occupier to determine or take measures concerning the discharge of micro-organisms/genetically engineered organisms or cells mentioned in the schedule from the laboratories, hospitals and other areas including prohibition of such discharges and laying down measures to be taken to prevent such discharges.

4. Any person operating or using genetically engineered organism microorganisms mentioned in the schedule for scale up or pilot operations shall have to obtain licence issued by the Genetic Engineering Approval Committee for any such activity. The possessor shall have to apply for licence in prescribed proforma.

5. Certain experiments for the purpose of education within the field of gene technology or microorganism may be carried out outside the laboratories and laboratory areas mentioned in sub-rule (2) and will be looked after by the Institutional Biosafety Committee.

8. PRODUCTION

Production in which genetically engineered organisms or cells or micro-organism are generated or used shall not be commenced except with the consent of Genetic Engineering Approval Committee with respect of discharge of genetically engineered organisms or cells into the environment. This shall also apply to production taking place in connection with development, testing and experiments where such production, etc, is not subject to rule 7.

9. DELIBERATE OR UNINTENTIONAL RELEASE

1. Deliberate or unintentional release of genetically engineered organisms/hazardous microorganisms or cells, including deliberate release for the purpose of experiment shall not be allowed.

   Note: Deliberate release shall mean any intentional transfer of genetically engineered organisms/hazardous microorganisms or cells to the environment or nature, irrespective of the way in which it is done:

2. The Genetic Engineering Approval Committee may in special cases give approval of deliberate release.

10. PERMISSION AND APPROVAL FOR CERTAIN SUBSTANCES

Substances and products, which contain genetically engineered organisms or cells or microorganisms shall not be produced, sold, imported or used except with the approval of genetic engineering approval committee

11. PERMISSION AND APPROVAL FOR FOOD STUFFS

Food stuffs, ingredients in food stuffs and additives including processing aids containing or consisting of genetically engineered organisms or cells, shall not be produced, sold, imported or used except with the approval of the Genetic Engineering Approval Committee.

12. GUIDELINES

1. Any person who applies for approval under rules 8-11 shall, as determined by the Genetic Engineering Approval Committee submit information and make examinations or cause examinations to be made to elucidate the case, including examinations according to specific directions and at specific laboratories. He shall also make available an on-site emergency plan to GEAC before obtaining the approval. If the authority makes examination itself, it may order the applicant to defray the expenses incurred by it in so doing.

2. Any person to whom an approval has been granted under rules 8-11 above shall notify the Genetic Engineering Approval Committee of any change in or addition to the information already submitted.

13. GRANT OF APPROVAL

1. In connection with the granting of approval under rules 8 to 11 above, terms and conditions

shall be stipulated, including terms and conditions as to the control to be excercised by the applicant, supervision, restriction on use, the layout of the enterprise and as to the submission of information to the State Biotechnology Co-ordination Committee or to the District Level Committee

2. All approvals of the Genetic Engineering Approval Committee shall be for a specified period not exceeding four years at the first instance renewable for 2 years at a time. The Genetic Engineering Approval Committee shall have powers to revoke such approval in the following situations:

   a. If there is any new information as to the harmful effects of the genetically engineered organisms or cells.

   b. If the genetically engineered organisms or cells cause such damage to the environment, nature or health as could not be envisaged when the approval was given, or

   c. Non compliance of any condition stipulated by Genetic Engineering Approval Committee.

14. SUPERVISION

1. The Genetic Engineering Approval Committee may supervise the implementation of the terms and conditions laid down in connection with the approvals accorded by it.

2. The Genetic Engineering Approval Committee may carryout this supervision through the State Biotechnology Coordination Committee or the State Pollution Control Boards/District Level Committee or through any person authorised in this behalf.

15. PENALTIES

1. If an order is not complied with, the District Level Committee or State Biotechnology Co-ordination Committee may take measures at the expenses of the person who is responsible.

2. In cases where immediate interventions is required in order to prevent any damage to the environment, nature or health, the District level Committee or State Biotechnology Coordination Committee may take the necessary steps without issuing any orders or notice. The expenses incurred for this purpose will be repayable by the person responsible for such damage.

3. The State Biotechnology Co-ordination Committee /District Level Committee may take samples for a more detailed examination of organisms and cells.

4. The State Biotechnology Co-ordination Committee/District Level Committee shall be competent to ask for assistance from any other Government authority to carry out its instructions.

16. RESPONSIBILITY TO NOTIFY INTERRUPTIONS OR ACCIDENTS

1. Any person who under rule 7-11 is responsible for conditions or arrangements shall immediately notify the District Level Committee \State Biotechnology Co-ordination Committee and the state medical officer of any interruption of operations or accidents that may lead to discharges of genetically engineered organisms or cells which may be harmful to the environment, nature or health or involve any danger thereto.

2. Any notice given under sub-rule (1) above shall not lessen the duty of the person who is responsible to try effectively to minimise or prevent the effects of interruptions of operations of accidents.

17. PREPARATION OF OFF-SITE EMERGENCY PLAN BY THE DL

1. It shall be the duty of the DLC to prepare an off-site emergency plan detailing how emergencies relating to a possible major accident at a site will be dealt with and in preparing the plan, the DLC shall consult the occupier and such other person as it may deem necessary.

2. For the purpose of enabling the DLC to prepare the emergency plan required under sub-rule(I), the occupier shall provide the DLC with such information relating to the handling of hazardous microorganisms/genetically engineered organisms under his control as the DLC may require including the nature, extent and likely off-site affects of a possible major accident and the DLC shall provide the occupier with any information from the off-side emergency plan which relates to his duties under rule 16.

18. INSPECTIONS AND INFORMATIONS REGARDING FINANCE

1. The State Biotechnology Co-ordination Committee or the Genetic Engineering Approval Committee/the DLC or any person with special knowledge duly authorised by the State Biotechnology Co-Ordination Committee or the Genetic Engineering Approval Committee or the DLC where it is deemed necessary,

at any time on due production if identity be admitted to public as well as to private premises and localities for the purpose of carrying out supervision.

2. Any person who is responsible for activities subject to rules 7-11 above shall at the request of District level Committee or State Biotechnology Coordination Committee or the GEAC submit all such information including information relating to financial conditions and accounts, as is essential to the authority's administration under these rules. He shall also allow supervision or inspection by the Authorities or persons indicated in sub-rule(I).

3. The Genetic Engineering Approval Committee may fix fees to cover, in whole or in part, the expenses incurred by the authorities in connection with approvals, examinations, supervision and control.

19. APPEAL

1. Any person aggrieved by a decision made by Genetic Engineering Approval Committee/State Biotechnology Co-ordination Committee in pursuance of these rules may within thirty days from the date on which the decision is communicated to him, prefer an appeal to such authority as may be appointed by Ministry of Environment and Forests provided that the appellate authority may entertain the appeal after the expiry of the said period of thirty days if such authority is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time

20. EXEMPTION

The Ministry of Environment and Forests shall, wherever necessary, exempt an occupier handling a particular microorganism/genetically engineered organism from rule 7-11.

A. ANIMAL AND HUMAN PATHOGENS

Schedule

BACTERIAL

Risk Group II

- Acinetobacter calcoacetieus
- Actinobacillus-all species except A mallei, which is in Risk Group III
- Aeromonoas hydrophila
- Arizona hinshawii-all serotypes
- Bacillus anthracis
- Bordetella all species
- Borrelia recurrentis.B.Vincenti
- Campylobacter fetus
- Camphylobacter jejuni, Chalamydia psittaci
- Cheamydia trachomatics
- Clostridium chauvoei, Cl.difficile Cl/fallax. Cl haemolyticum Q.histolyticum, Cl novyi (Cl,Pefringes) Cl.speticum, Cl.sordelli
- Corynebacterium diptheriae, C.equi, C. haemolyticum, C.Pseudotuberculosis, C.pyogenes, C.renale
- Diplococcus (Streptococcus) pneumoniae
- Edwardsiila tarda
- Erysipelothix insidiosa
- Escherichia Coli-all enteropathogenic serotypes, enterotoxigenic
- Haemophilus ducrevi, H.influenzae, H. pneumoniae
- Herellea vaginicola
- Klebsiella-all species and all serotypes
- Legionlla pneumophila
- Letionella
- Leptospira interrogans-all serotypes reported in India
- Listeria, all species
- Mima polymorpha
- Moraxella-all species
- Mycobacteria-all species including Mycobacterium avium
- M.Bovis M.tuberculosis, M.Leprae

- Mycoplasma-all species except M.Mycoides and M.angalactiae
- Meosseroc gonorrhoea,N. Leprae
- Mycoplasma-all species except M.Mycoides and M.angalactiae
- Neisseric gonorrhoea,N. meningitis
- Pasteurella-all species except those listed in Risk Group III
- Salmonella-all species and all setotypes
- Shigella-all species and all serotypes
- Sphaerophorgs necrophorus
- Staphylococcus aureus
- Streptobacillus moniliformis
- Streptococcus pneumoniae
- Streptococcus pyogenes.S.equi
- Streptomyces madurae,s.pelleteri, s.somaliensis
- Treponema carateum, T.pallidam and T.pettenue
- Vibrio foetus V.comma including biotype EI Top and
- V. parahemolyticus
- Vibrio cholerae

Risk Group III:

- Actinobacillus mallei
- Bartonella-all species
- Brucella-all species
- Clostridium botulium Cl.tetani
- Francisella tularensis
- Mycobacterium avium,. M.bovis, M.tuberculosis,m.leprae
- Pasteurella multocida type B("buffalo" and other foreign virulent strains)
- Pseudomonas pseudomallai
- Yersinia pestis

FUNGAL

Risk Group II

- Actinomycetes (including Nocardia SP, Actinomyces species and Arachina propinica)
- Aspergillus fumigatus
- Blastomyces dermatitis
- Cryptococcus neoformans C. fersiminosos
- Epidermophyton madurella, microsporon
- Paracoccidiodes brasiliensis
- Sporothrix
- Trichoderma
- Trichophyton

Risk Group III

- Coccidioides immitis
- Histoplasma capulatum
- Histoplasma capsulatum var duboiss

PARASITIC

Risk Group II

- Entahoeba histolytica
- Leishmania species
- Naegleria gruberia
- Plasmodium theilera, *P. babesia, P. falcoparum*
- Plasmodium babesia
- Schistosoma
- Toxoplasma gondii
- Toxocana canis
- Trichinella spiralis
- Trichomanas
- Trypanosoma cruzi

Risk Group III

- Schisistosoma mansoni

VIRAL RICKETTSIAL AND CHALMYDIAL

Risk Group II

- Adenoviruses - Human all types
- Avian loukosis
- Cache Valley virus
- CELO (avian adenovirus)
- Coxsackie A and B viruses
- Corona viruses
- Cytomegalo viruses
- Dengue virus, when used for transmission experiments
- Echo viruses - all types
- Encephalomyocarditis virus (EMC)
- Flanders virus
- Hart Part virus
- Hepatitis - associated antigen material - hepatitis A and B viruses, non A and non B, HDV
- Herpes viruses - except herpesviruses simiae (monkey B virus) which is in Risk Group IV.
- Infectious Bovine Rhinotraechitis virus (IBR)
- Infectious Bursal diseases of poultry and Infectious Bronchitus
- Infectious Laryngotraechitis (ILT)
- Influenza virus - all types, except A PR 834 which is in Risk Group I

- Langat virus Leucosis Complex
- Lymphogranuloma venereum agent
- Marek's Disease virus
- Measles virus
- Mumps virus
- Newcastle disease virus (other than licenced strain for vaccine use)
- Parainfluenza viruses - all type except parainfluenza virus 3, SF4 strain, which is in Risk Group I.
- Polio viruses - all types, wild and attenuated
- Poxviruses - all types except Alastrim, monkey pox, sheep pox and white pox, which depending on experiments are in Risk Group III or IV.
- Rabies virus - all strains except rabies stret virus, which should be classified in Risk Group III when inoculated into cornivores
- Reoviruses - all types
- Respiratory syncytial virus
- Rhinoviruses - all types
- Rinderpest (other than vaccine strain in use)
- Rubella virus
- Stimian viruses - all types except herpeavirus simlae (Monkey Virus) which is in Risk Group IV.
- Simian virus 40 -
- Ad 7 SV 40 (defective)
- Sindbis virus
- Tensaw virus
- Turlock virus
- Vaccinia virus
- Varicella virus
- Vole rickettsia
- Yellow fever virus, 17D vaccine strain

Risk Group III

- African House Sickness (attenuated strain except animal passage)
- Alastrim, monkey pox and whitepox, when used in vitro
- Arboviruses - All strains except those in Risk Group II and IV.
- Blue tongue virus (only serotypes reported in India)
- Ebola fever virus
- Feline Leukemia Epstein-Barr virus
- Feline sarcoma
- Foot and Mouth Disease virus (all serotypes and sutbypes)
- Gibbon Ape Lymphosarcoma
- Herpesvirus ateles

- Herpesvirus saimiri
- Herpes simplex 2
- HIV-I & HIV-2 and strains of SIV
- Infectious Equine Anaemia
- Lymphocytic choriomeningitis virus (LCM)
- Monkey pox, when used in vitro
- Nen-defective Adeno-2 SV-40 hybrids
- Psittacosis-ornithosis-trachoma group of agents
- Pseudorabies virus
- Rabies street virus, when used inoculations of carnivores
- Rickettsia-all species except Vole rickettsia and Coxiell burnetti when used for vector transmission or animal inoculation experiments
- Sheep pox (field strain)
- Swine Fever virus
- Vesicular stomatitis virus
- Woolly monkey Fibrosarcoma
- Yaba pox virus

Risk Group IV

- Alastrim, monkeypox, whitepox, when used for transmission or animal inoculation experiments
- Hemorrhagic fever agents, including Crimean hemorrhagic fever (congo)
- Korean hemorrhagic fever and others as yet undefined
- Herpesvirus simlae (monkey B virus)
- Tick-borne encephalitis virus complex, including - Russian
- Spring Summer Encephalitis, Kyasanur Forest Diseast, omsk hemorrhagic fever and Central European encephalitis viruses

SPECIAL CATEGORY

BACTERIAL

- Contagious Equine Metritis (H. equigenitalis)
- Pestis petit de ruminantium

VIRAL RICKETTSIAL AND CHLAMYDIAL

- African Horse Sickness virus (serotypes not reported in India and challenge strains)
- African Swine Fever
- Bat rabies virus
- Blue tongue virus (serotypes not reported in India)
- Exoitic FMD virus types and sub-types
- Junin and Machupo viruses
- Lassa virus
- Marburg virus
- Murrey valley encephalitis virus
- Rift Valley Fever virus
- Smallpox virus - Archieval storage and propagation Swine Vesicular Disease
- Veneseulan equine encephalitis virus - epidemic strains
- Western Equine encephalitis virus Yellow fever virus - Wild strain
- Other Arboviruses causing epizootics and so far not recorded in India

B. PLANT PESTS

Any living stage (including active and dormant forms) of insects, mites nematodes, slugs, snails, bacteria, fungi, protozoa, other parsitic plants or reproductive parts thereof: viruses; or any organisms similar to or allied with any of the foregoing; or any infectious agents or substances, which can directly or indirectly injure or cause disease or damage in or to any plants or parts thereof, or any processed, manufactured, or other products of plants are considered plant pests.

Organisms belonging to all lower Taxa contained within the group listed are also included.

1. Viruses:

All viroids

All bacterial, fungal, algal, plant, insect and nematode viruses; special care should be take for:

i. Geminiviruses,

ii. Caulimoviruses,

iii. Nuclear Polyhedrosis viruses,

iv. Granulosis viruses, and

v. Cytoplasmic polyhedrosis viruses.

2. Bacteria:

Family Pseudomonadaceae

Genus Pseudomonas

Genus Xanthomonas

Genus Azotobacter

Family Rhizobiaceae

Genus Rhizobium/Azorhizobium

Genus Bradyrhizobium

Genus Agrobacterium

Genus Phyllobacterium

Genus Erwinia

Genus Enterobacter

Genus Klebzieller

Family Spirollacea

Genus Azospirillum

Genus Acquspirillum

Genus Oceonospirillum

Family Streptomycetaceae

Genue Streptomyces

Genue Nocardia

Family Actinomycetaceae

Genue Actinomyces

Coryneform Group

Genus Clavibacter

Genus Arthrobacter

Genus Curtobacterium

Genus Bdellovibro

Family Rickettsiaceae

Rickettsial-like organisms associated with insect diseases

Gram-negative phloem-limited bacteria associated with plant diseases

Gram-negative xylem-limited bacteria associated with plant diseases

Cyanobacteria - All members of blue-green algae

Mollicutes

Family Spiroplasmataceae

Mycoplama-like organisma associated with plant diseases

Mycoplasma-like organisms associated with insect diseases

Algae

Family Chlorophyceae

Family Euglenophyceae

Family Pyrophyceae

Family Chrysophyceae

Family Phaephyceae

Family Rhodophyceae

Fungi

Family Plasmodiophoraceae

Family Chytridiaceae

Family Olpidiopsidaceae

Family Synchytriaceae

Family Catenariaceae

Family Coelomomycetaceae

Family Saprolegniaceae

Family Zoopagaceae

Family Albuginaceae

Family Peronosporaceae

Family Pythiaceae

Family Mucoraceae

Family Choanephoraceae

Family Mortiercllaceae

Family Endogonaceae

Family Syncephalastraceae

Family Dimargaritaceae

Family Kickxellaceae

Family Saksenaeaceae

Family Entomophthoraceae

Family Ecerinaceae

Family Taphrinaceae

Family Endomycetaceae

Family Saceharomycetaceae

Family Eurotiaceae

Family Gymnoascaceae

Family Aseophaeriaceae

Family Onygenaceae

Family Microascaceae

Family Protomycetaceae

Family Elsinoeaceae

Family Myriangiaceae

Family Dothidiaceae

Family Chaetothyriaceae

Family Parmulariaceae

Family Phillipsiellaceae

Family Hysteriaceae

Family Pleosporaceae

Family Melamomataceae

Family Ophiostomataceae

Family Aseosphaeriaceae

Family Erysiphaceae

Family Meliolaceae

Family Xylariaceae

Family Diaporthaceae

Family Hypoereaceae

Family Clavicipataceae

Family Phacidiaceae

Family Ascocorticiaceae

Family Hemiphacidiaceae

Family Dermataceae

Family Sclerotiniaceae

Family Cyttariaceae

Family Helosiaceae

Family Sarcostomataceae

Family Sarcoscyphaceae

Family Auricolariaceae

Family Ceratobasidiaceae

Family Corticiaceae

Family Hymenochaetaceae

Family Echinodintiaceae

Family Eistuliniaceae

Family Clavariaceae

Family Polyporaceae

Family Tricholomattaceae

Family Ustilaginaceae

Family Sporobolomycetaceae

Family Uredinaceae

Family Agaricaceae

Family Graphiolaceae

Family Pucciniaceae

Family Melampsoraceae

Family Gandodermataceae

Family Labonlbeniaceae

Family Sphaeropsidaceae

Family Melabconiaceae

Family Tuberculariaceae

Family Dematiaceae

Family Moniliaceae

Family Aganomucetaceae

Parasitic Weeds

Family Balanophoraceae-parasitic species

Family Cuscutaceae-parasitic species

Family Ttydonoraceae-parasitic species

Family Lauraceae-parasitic species Genus Cassytha

Family Lennoaceae-parasitic species

Family Loranthaceae-parasitic species

Family Myzodendraceae-parasitic species

Family Olacaceae-parasitic species

Family Orobanchaceae-parasitic species

Family Rafflesiaceae-parasitic species

Family Santalaceae-parasitic species

Family Scrophulariaceae-parasitic species

Protozoa

Genus Phytomonas

And all protozoa associated with insect diseases.

Nematodes

- Family Anguinidae
- Family Belonolaimidae
- Fmaily Caloosiidae
- Family Criconematidae
- Family Dolichodoridae
- Family Fergusobiidae
- Family Hemicycliophoridae
- Family Heteroderidae
- Family Hoplolaimidae
- Family Meloidogynidae
- Family Neotylenchidac
- Family Nothotylenchidae
- Family Paratylenchidae
- Family Pratylenchidae
- Family Tylenchidae
- Family Tylenchulidae
- Family Aphelenchoidiae
- Family Longidoridae
- Family Trichodoridae

Mollusca

- Superfamily Planorbacea
- Superfamily Achatinacea
- Superfamily Arionacea
- Superfamily Limacacea
- Superfamily Helicacea
- Superfamily Veronicellacea

Arthropoda

- Superfamily Ascoidea
- Superfamily Dermanyssoidea
- Superfamily Erjophyoidea
- Superfamily Tetranychoidea
- Superfamily Eupodoidea
- Superfamily Tydeoidea
- Superfamily Erythraenoidea
- Superfamily Trombidioidea
- Superfamily Hydryphantoidea

Superfamily Tarasonemoidea

Superfamily Pyemotoidea

Superfamily Hemisarcoptoidea

Superfamily Acaroidea

Order Polydesmida

Family Sminthoridae

Family Forfieulidae

Order Isoptera

Order Thysanoptera

Family Acrididea

Family Gryllidae

Family Gryllacrididae

Faily Gryllotalpidae

Family Phasmatidae

Family Ronaleidae

Family Tettigoniidae

Family Tetragidae

Family Thaumastocoridae

Superfamily Piesmatoidea

Superfamily Lygacoidea

Superfamily Idiostoloidea

Superfamily Careoidea

Superfamily Pentatomoidea

Superfamily Pyrrhocoroidea

Superfamily Tingoidea

Superfamily Miroidea

Order Homoptera

Family Anobiidae

Family Apionidae

Family Anthribidae

Family Bostrichidae

Family Brentidae

Family Bruchidae

Family Buprestodae

Family Byturidae

Family Cantharidae

Family Carabidae

Family Ceambycidae

Family Chrysomelidae

Family Coecinellidae

Family Curculionidae

Family Dermestidae

Family Elalteridae

Family Hydrophilidae

Family Lyctidae

Family Meloidae

Family Mordellidae

Family Platypodidae

Family Scarabaeldae

Family Scolytidae

Family Selbytidae

Order Lepidoptera

Family Agromyzidae

Family Anthomiidae

Family Cecidomiidae

Family Chioropidae

Family Ephydridae

Family Lonchaeidae

Family Muscidae

Family Otitidae

Family Syrphidae

Family Tephritidae

Family Tipulidae

Family Apidae

Family Caphidae

Family Chalcidae

Family Cynipidae

Family Eurytomidae

Family Formicidae

Family Psilidae

Family Sircidae

Family Tenthredinidae

Family Torymidae

Family Xyloiopidae and

Also unclassifed organisms and/or organisms whose classification is unknown and all other organisms associated with plant and insect diseases.

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[1]. *W.e.f. 1.10.1993, vide S.O. 677(E), dt. 13.9.1993.*