

M. Sc. (Ag) Seed Science and Technology
Course Structure-Regular Batch

S. No	Sem	Course code	Course Title	Credits
1	I	SST-711	Floral biology, Seed development and Maturation	1+1=2
2	I	SST-712	Principles of Seed Production	2+2=4
3	I	SST-713	Seed Physiology	2+1=3
4	I	BSH-616	Statistics-I	2+1=3
5	I	COMP-609	Computer Orientation	2+1=3
6	I	PGS-501	Library and Information Services	0+1=1
7	I	PGS-502	Basic Concepts in Laboratory Techniques	0+1=1
1	II	SST-714	Seed Pathology	2+1=3
2	II	SST-715	Seed Processing and Storage	2+1=3
3	II	SST-716	Seed Marketing and management	1+1=2
4	II	BSH-617	Statistics-II	2+1=3
5	II		Minor Course I	2+1=3
6	II	PGS-503	Technical Writing and Communication Skills	0+1=1
7	II	PGS-504	Agricultural research, research Ethics and rural Development Programme	1+0=1
1	III	SST-717	Seed Quality Testing	2+1=3
2	III	SST-718	Seed Production in Field Crops	2+1=3
3	III	SST-719	Seed Legislation and Certification	2+1=3
4	III		Minor Course I	2+1=3
5	III		Minor Course II	2+1=3
6	III	PGS-505	Disaster management	1+0=1
7	III	PGS-506	Intellectual property and its management in Agriculture	1+0=1
1	IV	SST-880	Masters Seminar	1+0=1
2	IV	SST-899	Masters Research	20
Total Credits Offered				65

M. Sc. (Ag) Seed Science and Technology
Course Structure-Deficiency Batch

S. No	Sem	Course code	Course Title	Credits
1	I	AGRN – 311	Principles of Agronomy and Agricultural Meteorology	3*
2	I	AGRN – 411	Field Crops – I (<i>Kharif</i>)	4*
3	I	BIOL – 413	Crop Physiology	3*
4	I	PPR – 314	Plant Pathogens and Principles of Plant Pathology	3*
5	I	HORT – 313	Fundamentals of Horticulture	3*
6	II	ECON – 321	Principles of Agricultural Economics	2*
7	II	EXT – 322	Dimension of Agricultural Extension	2*
8	II	SES – 327	Soil Chemistry, Soil Fertility and Nutrient Management	3*
9	II	PPR – 428	Insect Ecology & Integrated Pest Management	3*
10	II	GPB – 323	Principles of Genetics	3*
11	II	PPR – 427	Diseases of Field Crops and their Management	3*
12	III	SST-711	Floral biology, Seed development and Maturation	1+1=2
13	III	SST-712	Principles of Seed Production	2+2=4
14	III	SST-713	Seed Physiology	2+1=3
15	III	BSH-616	Statistics-I	2+1=3
16	III	COMP-609	Computer Orientation	2+1=3
17	III	PGS-501	Library and Information Services	0+1=1
18	III	PGS-502	Basic Concepts in Laboratory Techniques	0+1=1
19	IV	SST-714	Seed Pathology	2+1=3
20	IV	SST-715	Seed Processing and Storage	2+1=3
21	IV	SST-716	Seed Marketing and management	1+1=2
22	IV	BSH-617	Statistics-II	2+1=3
23	IV		Minor Course I	2+1=3
24	IV	PGS-503	Technical Writing and Communication Skills	0+1=1
25	IV	PGS-504	Agricultural research, research Ethics and rural Development Programme	1+0=1
1	V	SST-717	Seed Quality Testing	2+1=3
2	V	SST-718	Seed Production in Field Crops	2+1=3
3	V	SST-719	Seed Legislation and Certification	2+1=3
4	V		Minor Course I	2+1=3
5	V		Minor Course II	2+1=3
6	V	PGS-505	Disaster management	1+0=1
7	V	PGS-506	Intellectual property and its management in Agriculture	1+0=1

1	VI	SST-880	Masters Seminar	1+0=1
2	VI	SST-899	Masters Research	20
Total Credits Offered				65

SYLLABI OF CORE COURSES

SST 711 FLORAL BIOLOGY, SEED DEVELOPMENT AND MATURATION

1+1

Objective

To refresh the basic knowledge of seed development and structures and apprise students with its relevance to production of quality seed.

Theory

UNIT I

Floral types, structure and biology in relation to pollination mechanisms; sporogenesis: microsporogenesis and megasporogenesis; gametogenesis - development of male and female gametes and their structures; effect of environmental factors on floral biology.

UNIT II

Fertilization – embryo sac structure, process, barriers to fertilization, incompatibility and male sterility, factors affecting fertilization.

UNIT III

Embryogenesis - development of typical monocot and dicot embryos; endosperm development, modification of food storage structures with reference to crop plants; different types of embryos, endosperm and cotyledons; development and their structure in representative crop plants with reference to food storage; external and internal features of monocot and dicot seed; seed coat structure and development in representative crop plants.

UNIT IV

Apomixis – identification, classification, significance and its utilization in different crops for hybrid seed production; Polyembryony - types and significance; haplontic and diplontic sterility, causes of embryo abortion, embryo rescue and synthetic seeds.

Practical

Study of floral biology of monocots and dicots; microsporogenesis and megasporogenesis; study of pollen grains - pollen morphology, pollen germination and pollen sterility; types monocot and dicot embryos; external and internal structures of monocot and dicot seeds; seed coat structure, preparation of seed albums and identification.

Suggested Readings

Bhojwani SS & Bhatnagar SP. 1999. *The Embryology of Angiosperm*.
Vikas Publ.

Black M, Bewley D & Halmer P. 2006. *The Encyclopedia of Seeds: Science, Technology and Uses*. CABI.

Chhabra AK. 2006. Practical Manual of Floral Biology of Crop Plants.
Deptt. of Plant Breeding, CCS HAU, Hisar.

Copeland LO & McDonald MB. 2001. *Principles of Seed Science and Technology*. 4th
Ed. Chapman & Hall.

Frankel R & Galun E. 1977. *Pollination Mechanisms, Reproduction and Plant Breeding*.
Springer Verlag.

SST 712 PRINCIPLES OF SEED PRODUCTION

2+0

Objective

To introduce the basic principles of quality seed production.

Theory

UNIT I

Introduction : Seed as basic input in agriculture; seed development in cultivated plants; seed quality concept and importance of genetic purity in seed production; types of

cultivars, their maintenance and factors responsible for deterioration; seed production in self and cross pollinated crops.

UNIT II

Mode of pollination and reproduction in crop plants and their modification in relation to hybrid seed production. Principles of hybrid seed production, isolation distance, synchronization of flowering, roguing etc. male sterility and incompatibility system in hybrid seed production, role of pollinators and their management.

UNIT III

Seed multiplication ratios, seed replacement rate, demand and supply; suitable areas of seed production and storage, agronomy of seed production agro climatic requirements and their influence on quality seed production; generation system of seed multiplication; maintenance of Nucleus seed, production of Breeder, Foundation and Certified seed—criteria involved; life span of a variety and causes for its deterioration; certification standards for self and cross pollinated and vegetatively propagated crops.

UNIT IV

Hybrid Seed - Methods of development of hybrids; use of male sterility and self-incompatibility and CHA in hybrid seed production; one, two and three line system; maintenance of parental lines of hybrids; planning and management of hybrid seed production technology of major field crops and vegetables.

UNIT V

Planning of seed production for different classes of seeds for self and crosspollinated crops, Seed quality control system and organization, seed village concept; Seed production agencies, seed industry and custom seed production in India.

Suggested Readings

Agarwal RL. 1997. *Seed Technology*. 2nd Ed. Oxford & IBH.

Chhabra AK. 2006. *Practical Manual of Floral Biology of Crop Plants*.

Dept. of Plant Breeding CCS HAU, Hisar.

Desai BB. 2004. *Seeds Handbook*. Marcel Dekker.

Kelly AF. 1988. *Seed Production of Agricultural Crops*. Longman. McDonald MB Jr & Copeland LO. 1997. *Seed Production: Principles and Practices*. Chapman & Hall.

Musil AF. 1967. Identification of Crop and Weed Seeds. Handbook No. 219, USDA, Washington, DC, USA.

Poehlman JM & Sleper DA. 2006. *Breeding Field Crops*. Blackwell.

Singh BD. 2005. *Plant Breeding: Principles and Methods*. Kalyani.

Singhal NC. 2003. *Hybrid Seed Production in Field Crops*. Kalyani.

Thompson JR. 1979. *An Introduction to Seed Technology*. Leonard Hill.

Tunwar NS & Singh SV. 1985. *Handbook of Cultivars*. CSCB, GOI.

SST 713 SEED PHYSIOLOGY

1+1

Objective

To provide an insight into physiological processes governing seed quality and its survival.

Theory

UNIT I

Physiology of seed development and maturation; chemical composition, synthesis and accumulation of seed reserves, induction of desiccation tolerance, hormonal regulation of seed development.

UNIT II

Seed germination; factors affecting germination; role of embryonic axis; growth hormones and enzyme activities, effect of age, size and position of seed on germination. Physiological processes during seed germination; seed respiration, breakdown of stored reserves in seeds, mobilization and interconversion pathways. Seed dormancy- types, significance, mechanism, endogenous and exogenous factors regulating dormancy, role of phytochrome and PGR, genetic control of dormancy.

UNIT III

Seed viability and longevity, pre and post-harvest factors affecting seed viability ; seed ageing ; physiology of seed deterioration ; lipid peroxidation and other viability theories;

means to prolong seed viability; mechanism of desiccation sensitivity and recalcitrance with respect to seed longevity.

UNIT IV

Seed vigour and its concept, vigour test methods, factors affecting seed vigour, physiological basis of seed vigour in relation to crop performance and yield. Seed invigoration and its physiological and molecular control.

Practical

Proximate analysis of chemical composition of seed; methods of testing viability; kinetics of seed imbibition and solute leakage; seed germination and dormancy breaking methods; seed invigoration and priming treatments; accelerated ageing and controlled deterioration tests; enzymatic activities and respiration during germination and effect of accelerated ageing; vigour testing methods etc.

Suggested Readings

Agrawal PK & Dadlani M. (Eds.). 1992. *Techniques in Seed Science and Technology*. South Asian Publ.

Baskin CC & Baskin JM. 1998. *Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination*. Academic Press. Basra AS. 2006. *Handbook of Seed Science and Technology*. Food Product Press.

Bench ALR & Sanchez RA. 2004. *Handbook of Seed Physiology*. Food Product Press.

Bewley JD & Black M. 1982. *Physiology and Biochemistry of Seeds in Relation to Germination*. Vols. I, II. Springer Verlag.

Bewley JD & Black M. 1985. *Seed: Physiology of Seed Development and Germination*. Plenum Press.

Copeland LO & Mc Donald MB. 1995. *Principles of Seed Science and Technology*. 3rd Ed. Chapman & Hall.

Khan AA. 1977. *Physiology and Biochemistry of Seed Dormancy and Germination*. North Holland Co.

Kigel J & Galili G. (Eds.). *Seed Development and Germination*. Marcel Dekker.

Murray DR. 1984. *Seed Physiology*. Vols. I, II. Academic Press. Sadasivam S &

Manickam A. 1996. *Biochemical Methods*. 2nd Ed. New Age.

SST 714 SEED PATHOLOGY

2+1

Objective

To acquaint the students with principles and practices of seed health testing and management of seed borne diseases.

Theory

UNIT I

History and economic importance of seed pathology in seed industry and plant quarantine; terminology, important seed transmitted pathogens; seed microbes and their mode of action, detection techniques and identification of common seed borne pathogens.

UNIT II

Morphology and anatomy of typical monocotyledonous and dicotyledonous seeds; mode and mechanism of transmission of seed borne pathogens and microorganisms. Rate of transmission of major plant pathogens, microorganisms in relation to seed certification and tolerance limit; type of losses caused by seed- borne diseases.

UNIT III

Role of microorganisms in seed quality deterioration; management of seedborne plant pathogens/diseases and procedure for healthy seed production; different seed health testing methods for detecting microorganisms; treatments to control seed borne diseases.

UNIT IV

Pest Risk Analysis (PRA) and disease free seed production, Sanitary & Phytosaintory (SPS) requirements in seed trade, International regulation (ISHI) in respect of seed health standards.

Practical

Different methods of examination of seeds to assess seed-borne microorganisms and to quantify infection percentage, detection of seedborne fungi, bacteria and viruses, identification of storage fungi, control of seed borne diseases, seed treatment methods.

Suggested Readings

Agarwal VK & Sinclair JB. 1997. *Principles of Seed Pathology*. Boca Raton.

Karuna V. 2007. *Seed Health Testing*. Kalyani.

Neergaard P. 1988. *Seed Pathology*. Mac Millan.

SST 715 SEED PROCESSING AND STORAGE

2+1

Objective

To impart knowledge on the principles and techniques of seed processing for quality upgradation and of storage for maintenance of seed quality.

Theory

UNIT I

Introduction: Principles of seed processing; methods of seed drying including dehumidification and its impact on seed quality. Relative humidity and equilibrium moisture content of seed; Thumb rules of seed storage; loss of viability in important agricultural and horticultural crops, viability equations and application of nomograph.

UNIT II

Seed cleaning equipment and their functions: Preparing seed for processing; functions of scalper debearder, scarifier, huller, seed cleaner and grader. Screen cleaners, specific gravity separator, indented cylinder, velvet-spiral-disc separators, colour sorter, delinting machines; seed blending.

UNIT III

Assembly line of processing and storage, receiving, elevating and conveying equipments, plant design and layout, requirements and economic feasibility of seed processing plant.

UNIT IV

Seed treatments-methods of seed treatment, seed treating formulations and equipments, seed disinfestations, identification of treated seeds; Packaging: principles, practices and materials; bagging and labeling.

UNIT V

Seed storage: Seed drying and storage; drying methods-importance and factors affecting it, changes during storage, concepts and significance of moisture equilibrium, methods of

maintaining safe seed moisture content. Methods to minimize the loss of seed vigour and viability; factors influencing storage losses. Storage methods and godown sanitation. Storage structures. Storage problems of recalcitrant seeds and their conservation.

Practical

Operation and handling of mechanical drying equipments; effect of drying temperature and duration on seed germination and storability with particular reference to oil seeds; seed extraction methods; seed processing equipments; seed treating equipments; visit to seed processing plant and commercial controlled and uncontrolled Seed Stores;. seed quality upgradation; measurement of processing efficiency; seed blending, bag closures; study of orthodox, intermediary and recalcitrant seeds; evaluating seed viability at different RH and temperature levels and packaging materials; prediction of storability by accelerated ageing controlled deterioration tests.

Suggested Readings

Agrawal RL. 1996. *Seed Technology*. Oxford Publ.

Barton LV. 1985. *Seed Preservation and Longevity*. International Books and Periodicals Supply Service, New Delhi.

Hall CW. 1966. *Drying of Farms Crops*. Lyall Book Depot.

Justice OL & Bass LN. 1978. *Principles and Practices of Seed Storage*.

Castle House Publ. Ltd.

Mathews RK, Welch GB, Delouche JC & Dougherty GM. 1969. *Drying,*

Processing and Storage of Corn seed in Tropical and Subtropical

Regions. Proc. Am. Agric. Eng. St. Joseph, Mich. Paper No. 69-67.

Sahay KM & Singh K K. 1991. *Unit Operations in Food Engineering*.

Vikas Publ.

Viridi SS & Gregg BG. 1970. *Principles of Seed Processing*. National Seed Corp., New Delhi.

Objective

To apprise students about the seed supply system, concepts and principles of effective marketing of seed and strengths and weaknesses of the seed sector.

Theory

UNIT I

Importance and promotion of quality seed, formal and informal seed supply systems. Basic concepts of marketing with special reference to seed; importance and scope of seed industry in India, major constraints/problems in seed industry/seed sector role of seed association / federation in seed trade.

UNIT II

Demand and supply of seed; Role of seed replacement rate (SRR), seed multiplication ratio (SMR), cost of production and returns; determining seed needs; seed pricing and price policy, seed processing and /packaging, demand forecasting.

UNIT III

Seed marketing intelligence and product mix, sales promotion, distribution channels, marketing costs and margins.

UNIT IV

Salient features of national seed policies, role of various sectors/agencies in efficient seed marketing, quality control and assurance programme. Responsibilities of seed companies and dealers under Seed Act, EXIM policies for seed trade etc.

Practical

Statutory requirements in seed business including R&D, estimation of cost of seed production, marketing costs and margins of seeds of different crops, case studies to compare public & private sectors in different conditions, impact analysis., seed pricing, cost benefit ratio, economic feasibility of seed industry etc.

Suggested Readings

Kohls RL & Uhl JN. 1980. Marketing of Agricultural Products.
MacMillan.

Kundu KK & Suhag KS. 2006. *Teaching Manual on Seed Marketing and Management*. Department of Agricultural Economics CCS HAU Hisar.

Venugopal P. 2004. *State of Indian Farmers: A Millennium Study*. Vol. VIII. *Input Management*. Academic Foundation, Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi.

SST 717 SEED QUALITY TESTING

2+1

Objective

To provide a comprehensive knowledge on all aspects of seed quality evaluation and their relevance to crop performance.

Theory

UNIT I

Introduction: Structure of monocot and dicot seeds; seed quality:

objectives, concept and components and their role in seed quality control; instruments, devices and tools used in seed testing. ISTA and its role in seed testing.

UNIT II

Seed Sampling: definition, objectives, seed-lot and its size; types of samples; sampling devices; procedure of seed sampling; sampling intensity; methods of preparing composite and submitted samples; sub-sampling techniques, dispatch, receipt and registration of submitted sample in the laboratory, sampling in the seed testing laboratory.

UNIT III

Physical Purity: definition, objective and procedure, weight of working samples for physical purity analysis; components of purity analysis and their definitions and criteria; pure seed definitions applicable to specific genera and families; multiple seed units; general procedure of purity analysis; calculation and reporting of results, prescribed seed purity standards; determination of huskless seeds; determination of weed seed and other seed by number per kilogram; determination of other distinguishable 60 varieties (ODV); determination of test weight and application of heterogeneity test.

UNIT IV

Seed moisture content: importance of moisture content; equilibrium moisture content; principles and methods of moisture estimation - types, instruments and devices used; pre-drying and grinding requirements, procedural steps in moisture estimation; calculation and reporting of results.

UNIT V

Germination: importance; definitions; requirements for germination, instrument and substrata required; principle and methods of seed germination testing; working sample and choice of method; general procedure for each type of method; duration of test; seedling evaluation; calculation and reporting of results; dormancy: definition, importance, causal mechanisms, types and methods for breaking dormancy.

UNIT VI

Viability and Vigour Testing: definition and importance of viability tests; different viability tests; quick viability test (TZ- test) - advantages, principle, preparation of seeds and solutions, procedure, evaluation and calculation of test results. Vigour testing: concept, historical development, definitions, principles and procedures of different methods used for testing vigour.

UNIT VII

Genetic purity testing : objective and criteria for genetic purity testing; types of test; laboratory, Growth Chamber and field testing based on seed , seedling and mature plant morphology; principles and procedures of chemical, biochemical and molecular tests.

UNIT VIII

Seed health Testing: field and seed standards ; designated diseases, objectionable weeds - significance of seed borne disease vis-a-vis seed quality - seed health testing and detection methods for seed borne fungi, bacteria, viruses and nematodes.

UNIT IX

Testing of GM seeds and trait purity, load of detection (LOD).

UNIT X

Preparation and dispatch of seed testing reports; storage of guard samples; application and use of seed standards and tolerances.

Practical

Structure of monocot and dicot seeds of important plant species; identification and handling of instruments used in seed testing laboratory; identification of seeds of weeds and crops; physical purity analysis of samples of different crops; estimation of seed moisture content (oven method); seed dormancy breaking methods requirements for conducting germination test, specifications and proper use of different substrata for germination; seed germination testing in different agri-horticultural crops; seedling evaluation; viability testing by tetrazolium test in different crops; seed and seedling vigour tests applicable in various crops; species & cultivar identification; genetic purity testing by chemical, biochemical and molecular methods; seed health testing for designated diseases, blotter 61 methods, agar method and embryo count methods; testing coated/pelleted seeds.

Suggested Readings

Agarwal RL. 1997. *Seed Technology*. Oxford & IBH.

Agrawal PK & Dadlani M. 1992. *Techniques in Seed Science and Technology*. 2nd Ed. South Asian Publ.

Agrawal PK. (Ed.). 1993. *Handbook of Seed Testing*. Ministry of Agriculture, GOI, New Delhi.

Copland LO & McDonald MB. 1996. *Principles of Seed Science and Technology*. Kluwer.

ISTA 2006. *Seed Testing Manual*. ISTA, Switzerland.

Martin C & Barkley D. 1961. *Seed Identification Manual*. Oxford & IBH.

Tunwar NS & Singh SV. 1988. *Indian Minimum Seed Certification Standards*. Central Seed Certification Board, Ministry of Agriculture, New Delhi.

SS T718 SEED PRODUCTION IN FIELD CROPS

2+1

Objective

To impart a comprehensive knowledge of seed production in field crops with adequate practical training.

Theory

UNIT I

Basic principles in seed production and importance of quality seed. Floral structure, breeding and pollination mechanism in self-pollinated cereals and millets viz, wheat, barley, paddy, ragi etc.

UNIT II

Floral structure, breeding and pollination mechanism in cross-pollinated cereals and millets viz maize, sorghum, bajra etc ; methods and techniques of quality seed production incross-pollinated cereals and millets.

UNIT III

Floral structure, breeding and pollination mechanism; methods and techniques of seed production in pulses (pigeon pea, chick pea, green garm, black garm, field beans, peas etc.).

UNIT IV

Floral structure, breeding and pollination mechanism; methods and techniques of seed production in major oil seeds (groundnut, castor, sunflower, safflower, rape and mustard, linseed, sesame etc.).

UNIT V

Floral structure, breeding and pollination mechanism; methods and techniques of seed production in commercial fibers (cotton, jute, mesta etc) and vegetatively propagated crops like sugar cane, potato etc.

Practical

Planning of Seed Production, requirements for different classes of seeds in field crops - unit area and rate; Seed production in cross pollinated crops with special reference to land, isolation, planting ratio of male and female lines, synchronization of parental lines and methods to achieve synchrony; supplementary pollination, pollen storage, hand emasculation and pollination in Cotton, detasseling in Corn, identification of rogues and pollen shedders; Pollen collection, storage, viability and stigma receptivity; gametocide application and visits to seed production plots etc.

Suggested Readings

Kelly AF. 1988. *Seed Production of Agricultural Crops*. John Wiley. McDonald MB Jr & Copeland LO. 1997. *Seed Production: Principles and Practices*. Chapman & Hall. Singhal NC. 2003. *Hybrid Seed Production in Field Crops*. Kalyani.

SST 719 SEED LEGISLATION AND CERTIFICATION

2+1

Objective

To apprise students with the legislative provisions and processes and the mechanisms of seed quality control.

Theory

UNIT I

Historical development of Seed Industry in India; Seed quality: concept and factors affecting seed quality during different stages of production, processing and handling; seed quality control- concept and objectives;

Central Seed Certification Board (CSCB).

UNIT II

Regulatory mechanisms of seed quality control- organizations involved in seed quality control programmes; seed legislation and seed law enforcement as a mechanism of seed quality control; the Seed Act (1966), Seed Rules (1968), Seed (Control) Order 1983; Essential Commodities Act (1955); Plants, Fruits and Seeds Order (1989); National Seed Development Policy (1988) and EXIM Policy regarding seeds, plant materials; New Seed Bill-2004 etc. Introduction, objectives and relevance of plant quarantine, regulations and plant quarantine set up in India.

UNIT III

Seed Certification- history, concept and objectives of seed certification; seed certification agency/organization and staff requirement; legal status and phases of seed certification; formulation, revision and publication of seed certification standards; Indian Minimum Seed Certification Standards (I.M.S.C.S.)- general and specific crop standards including GM varieties, field and seed standards; planning and management of seed certification programmes- eligibility of a variety for certification, area assessment, cropping history of

the seed field, multiplication system based on limited generation concept, isolation and land requirements etc.

UNIT IV

Field Inspection- principles, phases and procedures; reporting and evaluation of observations; pre and post-harvest control tests for genetic purity evaluation (grow-out tests); post harvest inspection and evaluation; seed sampling, testing, labeling, sealing and grant of certificate; types and specifications for tags and labels; maintenance and issuance of certification records and reports; certification fee and other service charges; training and liaison with seed growers. OECD seed certification schemes.

UNIT V

Introduction to WTO and IPRs; Plant Variety Protection and its significance; UPOV and its role; DUS testing- principles and applications; essential features of PPV & FR Act, 2001 and related Acts.

Practical

General procedure of seed certification ; identification of weed and other crop seeds as per specific crops; field inspection at different stages of a crop and observations recorded on contaminants and reporting of results; inspection and sampling at harvesting/threshing, processing and after processing for seed law enforcement; testing physical purity, germination and moisture; specifications for tags and labels to be used for certification purpose; grow-out tests for pre and post-harvest quality control; visits to regulatory seed testing laboratory, including plant quarantine lab and seed certification agency.

Suggested Readings

Agarwal RL. 1997. *Seed Technology*. Oxford & IBH.

Anonymous 1992. *Legislation on Seeds*. NSC Ltd., Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi. Nema NP. 1986. *Principles of Seed Certification and Testing*. Allied Pubs. Tunwar NS & Singh SN. 1988. *Indian Minimum Seed Certification Standards*. CSCB, Ministry of Agriculture, New Delhi.