

Pir Mehr Ali Shah
ARID AGRICULTURE UNIVERSITY
RAWALPINDI

Self-Assessment Report
DEPARTMENT OF HORTICULTURE
October, 2017- February, 2019
M.sc (Hons.) / PhD

Program Self-Assessment Team:

- 1. Dr. Nadeem Akhtar Abbasi**
- 2. Dr. Ishfaq A. Hafiz**
- 3. Ms Najma yousaf Zahid**

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Introduction

Horticulture is currently challenging profession that has extended the business of multibillion dollars. The Horticulture department of this university is in full certainty to set up the responsible students by bestowing research-oriented quality of instruction to meet such challenges. The area of Horticulture is exceedingly innovative that encompasses production and management of food crops developed on-farm and additionally under controlled environmental conditions. In addition to the provision of knowledge-based services, another beneficial part of Horticulture is the marketing and utilization of intensively cultivated value-added commodities. A brighter face of this department is to set up the determined power of human asset that chiefly comprises of competent and confident Horticulture Specialists, Scientists, Teachers, Advisors, Landscape Designers, Specialized Technical Growers, Experts and Nursery workers. The introduction of product development in Horticulture, as result of latest research, is gaining momentum consequently a strong bond of relationship has been knotted between horticulture and other emerging technologies. In general, the zone of Horticulture Cultivation plays a pivotal part in practical agribusiness thus sharing to fortify the economy of a country.

The horticulture produce can be exported in fresh and processed form. As indicated by current appraisals, there are high prospects to acquire foreign exchange to the tune of US \$ 4.00 billion inside next couple of years from export of horticulture commodities and their products. Presently our instant duty is to train our students to meet the challenges posed by WTO on our exportable items. The department faculty members are practically associated with different activities (topics include sans pathogen crops, soilless and soil-based crops, bulbous crops, therapeutic plants, uses of edible coating to upgrade of time span of crops. Organic farming, ensured development of various vegetables and uses of biotechnological devices for crop improvement) thus sharing the horticulture industry. Not just we produce and extend learning for upgrading the enhance quality of food but also improve the environmental conditions of our peoples. Horticultural landscape designing in our country has created focal interest amongst the students of both genders. Therefore, because of overwhelming response, the office is concentrating to furnish every single possible facility in collaboration with the other organizations to polish and train such students with futuristic approach. So far, the department has produced 327 and 105 undergraduate and postgraduate students respectively. A large portion of them are serving in government offices and private associations of the country. Some of them continue abroad for higher studies. Likewise,

research work of member of faculty has been published in journals of national and international repute. Around 200 papers have been published by the horticulture department and conducted 10 instructional classes on tunnel farming and kitchen gardening, and one Plant Tissue Culture Lab Tech, Nursery management, Home Gardening, Professional Floristry and Flower Arrangement each.

Criterion-1: Program Mission, Objectives and Outcomes

To meet the above-mentioned criterion of the self-assessment, some standards must be satisfied. This section describes how the standards of the Criterion 1 are met.

Standard 1-1: The program must have documented measurable objectives that support faculty / college and institution mission statement.

Mission Statement

The Department of Horticulture is committed to discovery, education, and delivery to improve quality of life at the local, national, and international level. We enhance health, the environment, and the economy by advancing and sharing the science of production and use of food and ornamental plants

Horticulture is a dynamic department, recognized internally and externally as a valuable and relevant resource in the plant sciences for students, producers, and the general public. We aim to advance and share the science of production and management of fruit, vegetable, and ornamental plants and their use in communities to improve social, environmental, and economic sustainability. Innovative basic, applied and cross- disciplinary research will help solve environmental and economic problems.

Programme Objectives of the Department

1. To develop and maintain a strong human resource base for optimum performance in teaching of Science, technology and innovation (STI).
2. To integrate teaching and research in order to produce graduates with super skills in science, technology and innovation (STI).
3. To conduct research in order to improve teaching and develop technologies for increased production in order to alleviate poverty and hunger.
4. To participate in the dissemination and preservation of scientific knowledge and innovations for/to farmers, extension workers and peers.
5. To develop and promote quality and market driven academic programs in line with the aspirations of future vision.

6. To promote sustainable horticultural production and environment/biodiversity conservation.
 7. To expand, strengthen and sustain the University income base.
 8. To stimulate the intellectual participation of students and alumni in economic, technological, agricultural and professional development and promote cultural variety and social harmony in the country.
 9. To play an active role in national horticulture policy formulation, research and analysis.
 10. To contribute basic and applied high quality knowledge and skills in the field of horticulture applying highly advanced analytical techniques for crop management and improvement.
 11. Broaden the visualization of students by teaching them integrated horticulture.
- Adherence to new teaching methods & planning for current and upcoming researchable problems
- Build up the Department on modern lines for education and research at Ph.D. level.
- Employ the superior analytical approaches to impart the realistic scientific skills in the field of Horticulture.

Main Elements of Strategic Plan to Achieve Mission and Objectives

1. Developing a teaching structure based on the experience and vision assembled from latest knowledge, proceedings, symposia etc. to uplift the capabilities of the students.
2. Formatting and constantly updating the curricula involving core subjects, elective subjects, specialized areas, internship programs and study tours.
3. Setting up of well-equipped specialized research laboratories to facilitate the students.
4. Research oriented postgraduate thesis.
5. Publication of scientific papers, guide books/booklets, fact sheets and manuals etc.
6. Coordination with other research organizations, universities, agriculture ministry and foundations for research matters.
7. Coherent linkages with national and international research organizations and universities to improve the research level.

Expected Outcome

1. It will help to promote the profession of Horticulture and the professionalism of these working in the industry
2. Students agriculture sciences can act as an authoritative body; consulting with Government and other policy making bodies on matters of interest or concern to professional

horticulturists

3. Students will be able confer recognized status upon professionally qualified and experienced horticulturists
4. Strategy plan will promote educational and training opportunities and encourage the development of all disciplines within horticulture.
5. Research scholars will be able co-operate with other bodies on matters of common concern.
6. Advance research study will help to disseminate information on matters affecting the profession and provide opportunities for discussion amongst horticulturists through the website, publications, conferences, seminars, lectures etc.

S. #	Objective	How Measured	When Measured	Improvement Identified	Improvement made
1	Development of Horticulture structure on advance and innovative lines for teaching and research activities for the PhD students.	On the basis of recognition of integrated Post harvest losses and determining their impact.	It is a continuous & dynamic process.	Facilities provided for teaching are not sufficient.	Some steps have been taken to improve the teaching method
2	To contribute basic and applied high quality knowledge and skills in the field of Horticulture applying highly advanced analytical techniques for crop management and improvement.	Back ground information and status of knowledge of students through entry tests and student feed back.	At the time of admission or semester.	Some courses are to added and the existing required to be revised in the curriculum.	Curriculum changes have been made on required basis
3	To lead students and conduct research on advanced scientific lines in the field of	Evaluating the students demands and taking their feedback for the betterment	Before start up projects	Students to participate in the class, assignments and report preparation	Improvement still going on

4	To strengthen the discipline with integration of knowledge and approach of related fields	Through entry tests, interviews research interests	Subject/ courses attachment before start	The relevant subjects are emphasizing and recommended in the study programs	Enhancement of knowledge and vision
5	To counter new problems in Horticultural study.	Through discussion, consultation and practical implementation with the farmers for better interaction	Regular activity	New courses to be included in curriculum, research on new problems	Recommendation of new curriculum is suggested
6	Training of the teaching faculty and students on the basis of technological lines.	Through training courses in and outside the country	Regular activity	Finding the problem-oriented and solution-oriented research along with new teaching	Improved better than before and continued

Table-1: Program objective assessment

Standard 1-2: The program must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

PROGRAM OUTCOMES

The program outcomes are tabulated in the following Table 2. Each program aligned in the table with each objective

Table-2: Program objective vs. outcomes

Program Objectives	Program Outcomes				
	1	2	3	4	5
1	XX	XX	X	X	XXX
2	X	XX	X	XX	X
3	XX	XX	XX	XX	XX
4	XX	..	XX	XXX	XX
5	XX	XX	XX	XX	XXX

X: - Relevant

XX: - Relevant and Satisfactory

XXX: - Very Relevant and Very Satisfactory

Meeting Standards 1-2: Program Outcome Measurement

Evaluation of the performance of the most concerned with regard to achievement of the determined objectives; information was gathered from the target groups through proforma provided by the Quality Enhancement Cell of Pir Mehr Ali Shah, Arid Agriculture University, and Rawalpindi. The proformas were filled in by the respective class students, faculty members, department alumni, and the graduates (previously passed out from the university) working in different organizations, research institutes, and agriculture departments in different positions at national level.

Performa 1 & 10 Course and Teacher Evaluation

Teacher Evaluation (2014-16)

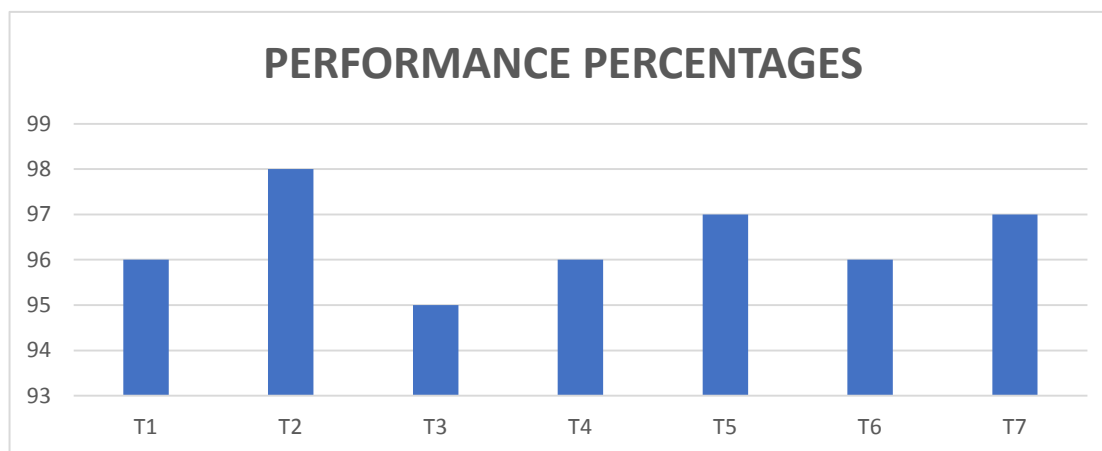


Fig.1 Teacher Evaluation for Ph.D. Courses (Fall 2017-18 & 2018-19)

The general compiled outcomes depicted that the execution of teachers was remarkable. It is evident from the diagram that Teacher 2 is on the best scoring 98 % taken after by teacher 5 , 7, 4,6,1 and 43respectively (Fig. 1) This was proposed Assessment which was directed twice every academic year 2017 – 19 toward the end of every semester: Fall. Semesters 2017-2018 and 2018-2019 and spring semesters 2018 and 2019. Whereas in spring semesters, the assessment of the considerable number of teachers was reviewed as satisfactory and appraised. More than 90 %. Prof. Dr. Ishfaq Ahmed Hafiz, was on top with

98% and Prof. Dr. Nadeem Akhtar Abbasi and Dr. Khalid Mehmood Qureshi 97% scoring taken after by teacher 1, 3, 4,5 and (Fig. 2). Seven teachers, Prof. Dr. Ishfaq Ahmad Hafiz, Prof. Dr. Na. Nadeem Akhtar Abbasi, Dr.Khalid Mehmood Qureshi, Dr.Shahid Javed Butt, Dr. Toqeer Ahmad, Miss Najma Yousaf Zahid and Mr. Usman Shaukat Qurashi 1-7 were assessed by the understudies as per Proforma-10. The combined results of fall semesters 2017-18 is introduced graphically in Fig. 1.

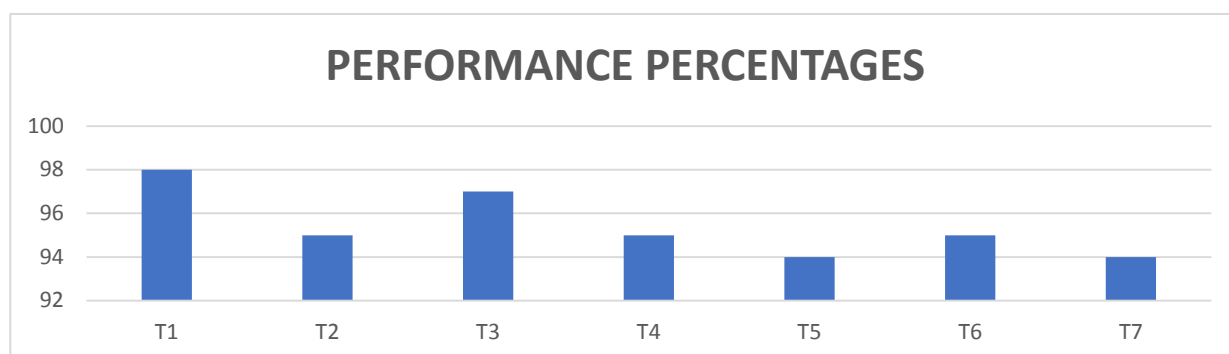


Fig.1 Teacher Evaluation for Ph.D. Courses (Fall 2017-18)

Graphs and Pie Diagram Showing Evaluation of Teachers in Details

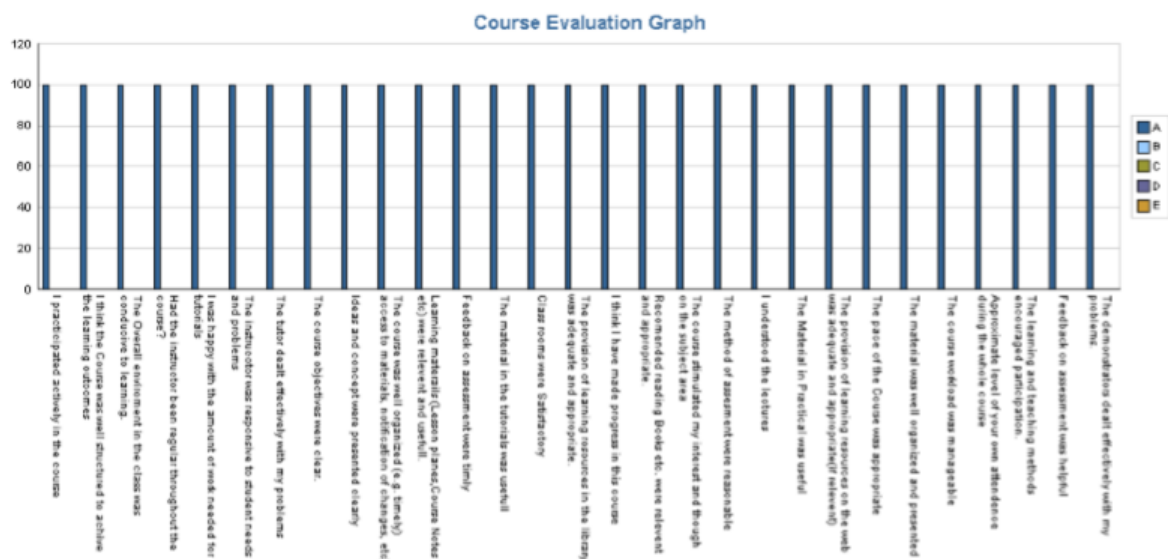
Dr. Touqeer Ahmad

Special Problem (Hort-719)

The course was very much organized to accomplish the learning results, the learning and training strategies supported investment, the general condition in the class was conducive to learning, and classrooms were tasteful, learning materials (Lesson Plans, Course Notes etc.) were significant and helpful, suggested perusing books and so on were important and proper. They depicted that the arrangement of learning assets in the library was sufficient and the course fortified their advantage and thought on the branch of knowledge. The individual parameter demonstrated that 53% of the students agreed, 15% disagree and 32% strongly disagree that the course was very much organized to accomplish the learning outcomes. Information with respect to different parameters demonstrated that real extent of the students agreed that the course workload was reasonable, efficient, the approximate level of student's attendance during the whole course was higher; students took an interest effectively in the course and have gained ground knowledge in this course, As indicated by the vast majority of the students, the pace of the Course was proper, thoughts and ideas were exhibited clearly, the strategy for assessment were reasonable.

Remarks/Suggestions

- No uncertainty the course was useful and fascinating.



Dr. Khalid Mehmood Qureshi

Mineral Nutrition of Horticultural Crops (Hort-701)

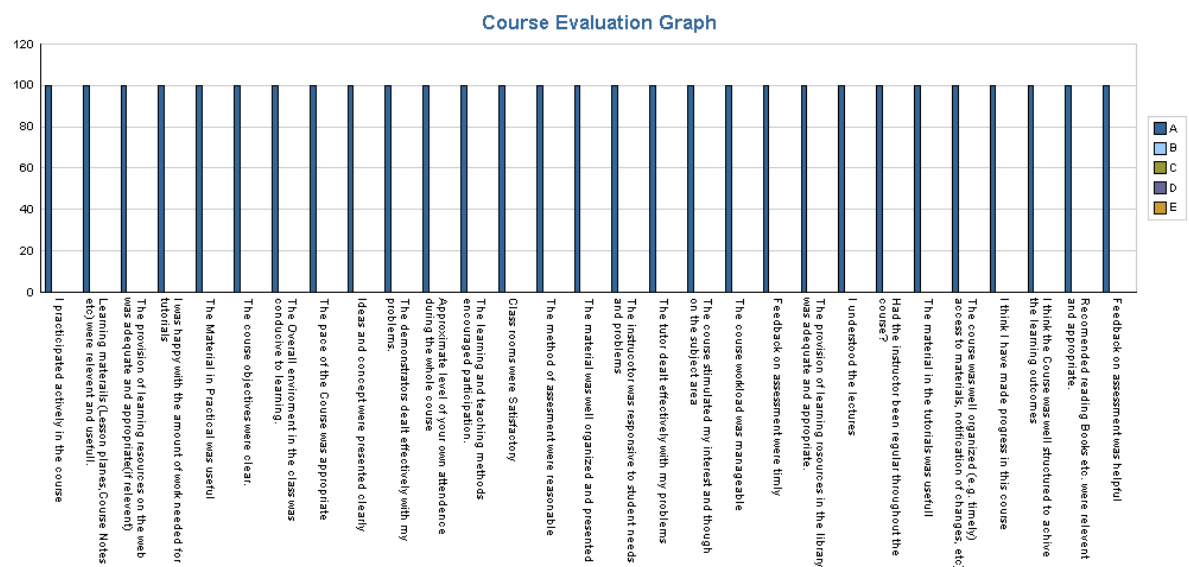
The overall compiled results showed that the performance of teachers was very good. The data of other parameters inferred that major proportion of the students is agreed that, the performance. The evaluation criteria parameters showed that the 90% of the students strongly agreed, 10% agreed, 0% uncertain, 0% disagreed, and 0% strongly disagreed that lectures were clearly understood, expertness of the teacher, the instructor came with good preparation. Instructor delivers information of the subject, teacher had finished the entire course, the Instructor gave extra conceptual material apart from the reading material, the Professor gave references in accordance with current circumstances with reference to Pakistani context, the teacher elaborates the topic more effectively, the Instructor is polite and respect towards students and appreciates active class performance of students, the professor kept up a decorum of class that is proven best environment for learning, Teacher is habitual of being punctual, the Instructor was also accessible after the predefined time and He was also available after class for meetings, the Subject problems introduced in the course that has expanded students insight into the subject, the syllabus course targets fundamentals, methods and evaluating criteria, the course incorporates hypothetical course ideas with certifiable

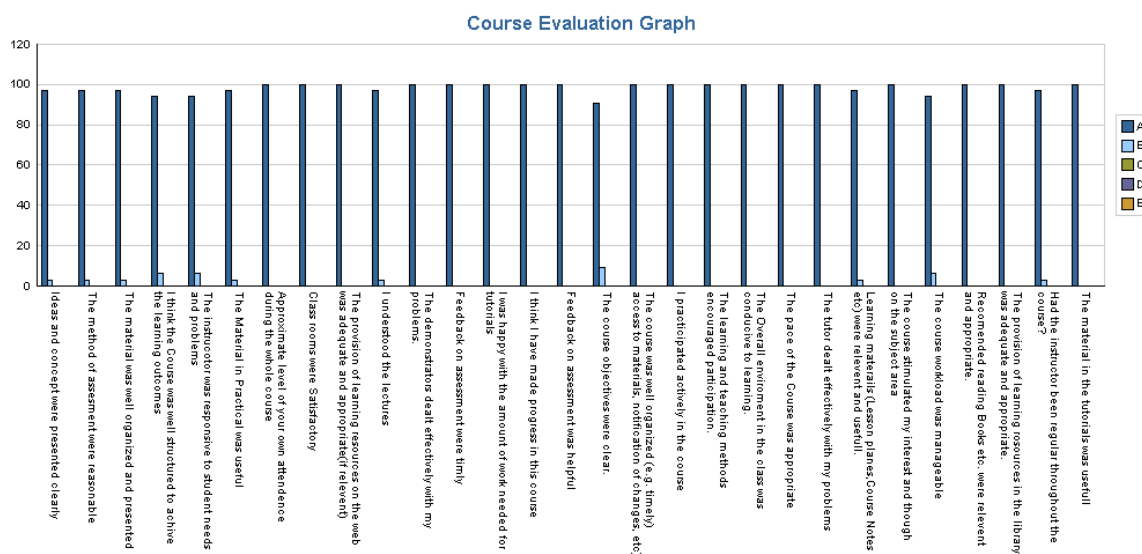
applications, and the assignments and exams covered the materials presented in the course, the course material is present day and updated

. It will also improve and diversify the portfolio of the Horticulture Department, educate horticulture students with knowledge in cutting- edge research technology for horticulture, and prepare them to be more competitive in their future careers

Comments / Suggestions

- Instructor was fine in conduct and always ready to assist.
- Instructors was prepared for each class.
- Instructor cleared the concepts in a good manner.





Every student agreed that course objectives were clear, course load was manageable and the course was well organized, yet students have to be present all the time. Similarly, the ideas and concepts were presented in an ideal environment and the method of assessment was impartial.

Comments:

- Teacher was friendly.

Dr. Khalid Mehmood Qureshi

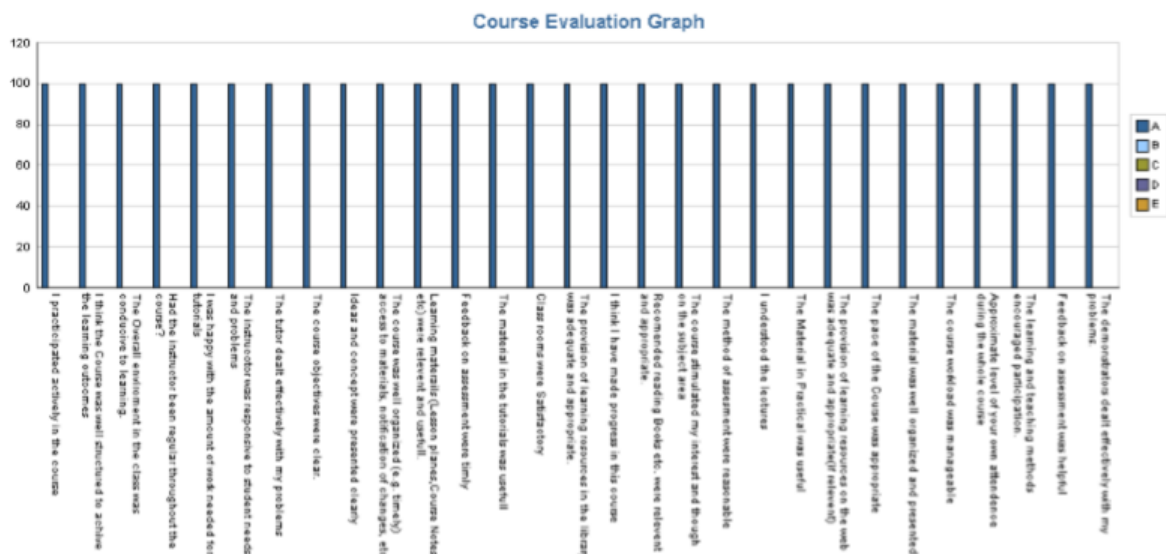
Viticulture (Hort-714)

The general condition in the class was conducive to learning, and classrooms were satisfactory, learning materials (Lesson Plans, Course Notes etc.) were significant and valuable, prescribed consulting books etc. were relevant and useful. The arrangement of learning resources in the library was satisfactory. The individual parameter demonstrated that 95.6 of the students emphatically agreed, 4.4% agreed, 0% were uncertain that the course objectives were clear. Information with respect to different parameters demonstrated that the significant extent of the students agrees the course was all around organized to accomplish the learning results (there was a decent lesson, instructional exercises, practical work etc.). Additionally, they agreed that the learning and training techniques empowered interest and the material in the instructional exercises was valuable.

Comments / Suggestions

- Learning atmosphere in class was not reasonable.

- The objectives of the course were very clear.
- Appropriate information about course was in the books available in library but it



must be updated. Practically, lab requirements were not satisfactory.

Prof. Dr. Ishfaq Ahmad Hafiz

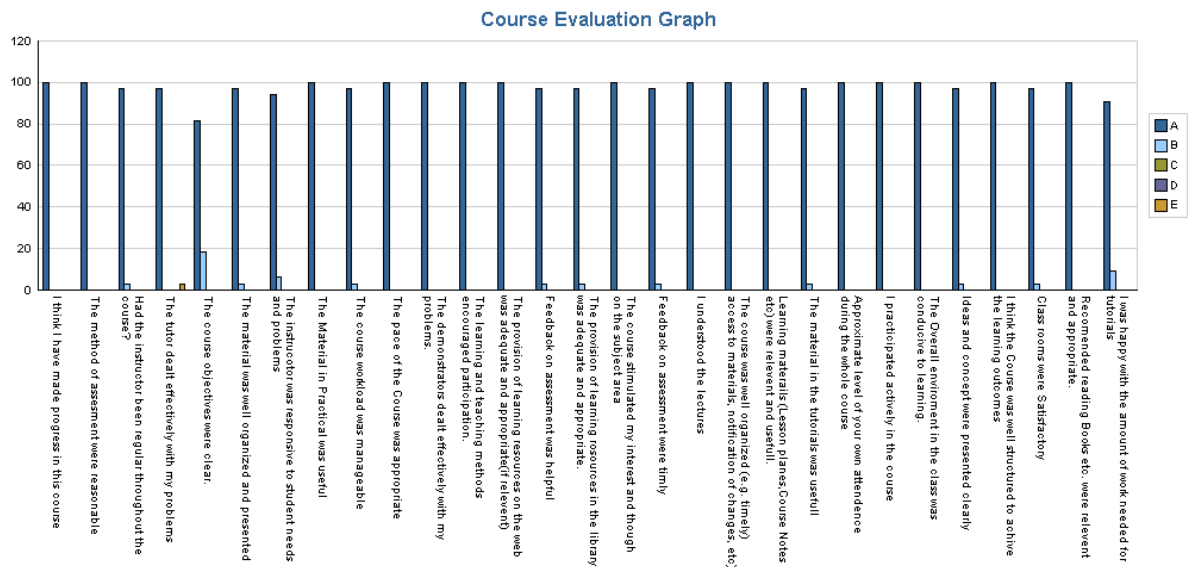
Biotechnology of Horticultural Crops (Hort 722)

The evaluation criteria parameters showed that the 83% of the students strongly agreed, 16% agreed, 7%uncertain, 0%disagreed, and 0%strongly disagreed that the Learning materials (Lesson plan, Course Notes etc.) were relevant and useful. The data of other parameters inferred that major proportion of the students is agreed that, the performance and expertness of the teacher, the instructor came with good preparation. Instructor demonstrates knowledge of the subject, Instructor had completed the whole course, the Instructor provided additional material apart from the text book, the Instructor gave citations regarding current situations with reference to Pakistani context, the Instructor communicates the subject matter, the Instructor shows respect towards students and encourages class participation effectively, the Instructor maintained an environment that was conducive to learning, the Instructor arrived on time, the Instructor returned the grade scripts etc. in a reasonable amount of time, the Instructor was available during the specified office hours after class for consultations, the Subject matter presented in the course has increased their knowledge of the subject, the syllabus clearly statescourseobjectivesrequirements,proceduresandgradingcriteria,the course integrates theoretical course concepts with real-world applications, and the

assignments and exams covered them a terials presented in the course, the course materials modern and updated.

Comments / Suggestions

- ☐ Instructor was fine in conduct and always appreciative to assist.
- ☐ Instructor was prepared for each class.
- ☐ Instructor cleared the concepts in a good manner.

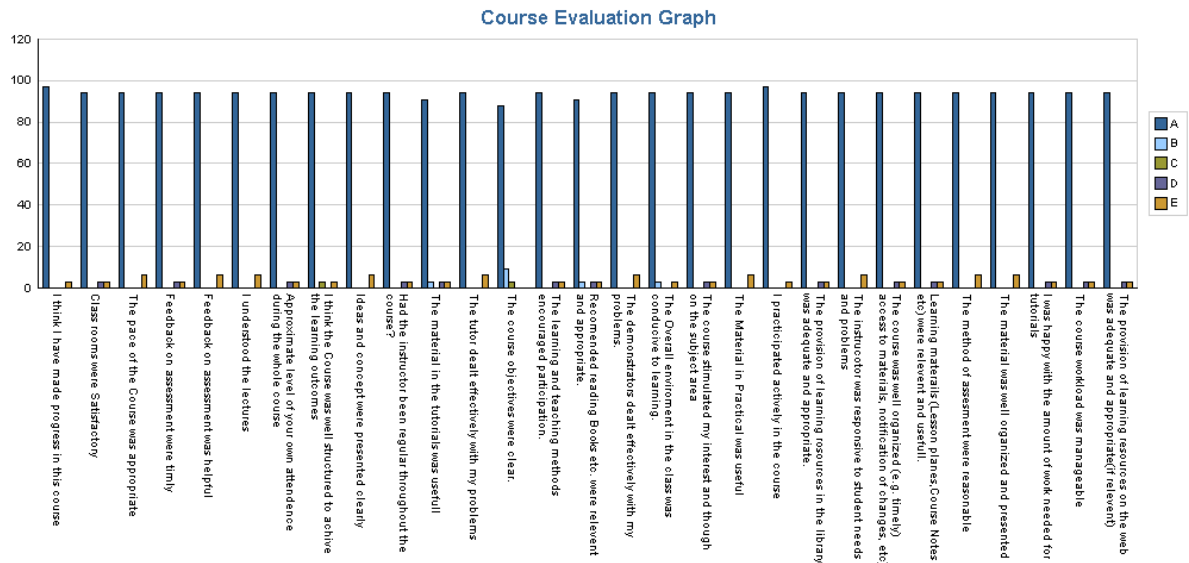


- ☐ Instructor encouraged to ask more questions.

Prof.Dr. Nadeem Akhtar Abbasi

Post-Harvest Physiology (Hort 725)

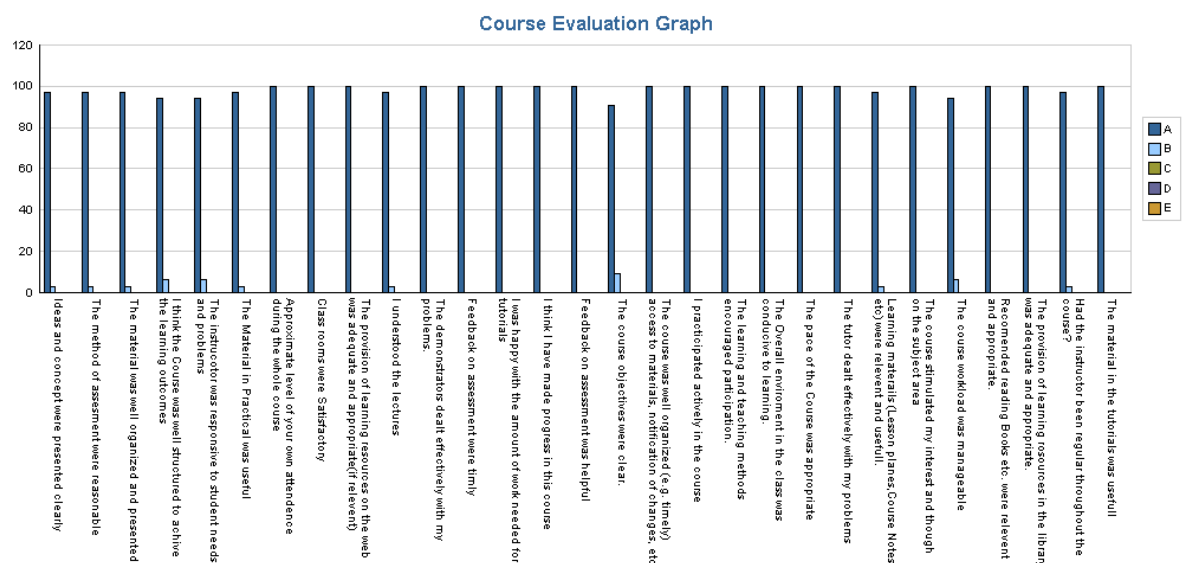
It is evident from the graph that most of the students strongly agreed with the statement that course objectives were clear, course work was manageable, learning and teaching method encouraged participation and the course was well organized. Participation of the students was also adequate. 80% of the students were present throughout the lectures. However, the relevant books and helping material needs to be provided in future.



Ms.Najma Yousaf Zahid

Horticultural Production under Abiotic Stresses (**Hort 725**)

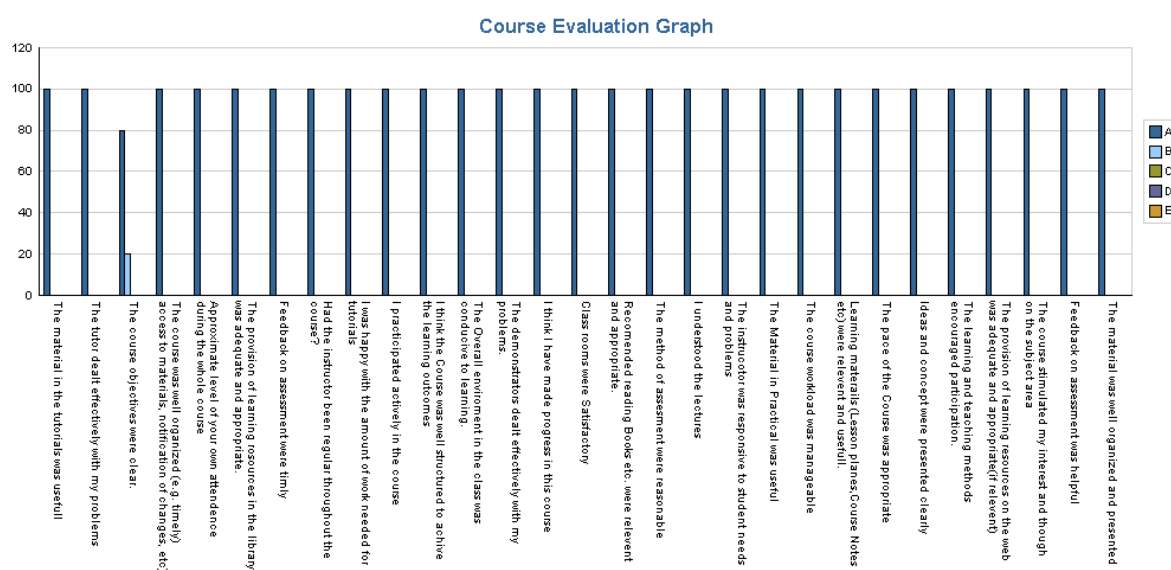
According to assessment, 80 % students were agreed and strongly agreed with the inquired statements, such as the clarity of the course objectives, course load was manageable and they understand lectures fully and feedback was given properly for the assessments. A few students expressed their view as uncertain. Details for the rest of the queries are given below in graph.



Prof. Dr. Ishfaq Ahmad Hafiz

Oliviculture (Hort 728)

The evaluation criteria parameters showed that the 83% of the students strongly agreed, 16% agreed, 7%uncertain, 0%disagreed, and 0%strongly disagreed that the Learning materials (Lesson plan, Course Notes etc.) were relevant and useful. The data of other parameters inferred that major proportion of the students is agreed that, the performance and expertness of the teacher, the instructor came with good preparation. Instructor demonstrates knowledge of the subject, Instructor had completed the whole course, the Instructor provided additional material apart from the text book, the Instructor gave citations regarding current situations with reference to Pakistani context, the Instructor communicates the subject matter, the Instructor shows respect towards students and encourages class participation effectively, the Instructor maintained an environment that was conducive to learning, the Instructor arrived on time, the Instructor returned the grade scripts etc. in a reasonable amount of time, the Instructor was available during the specified office hours after class for consultations, the Subject matter presented in the course has increased their knowledge of the subject, the syllabus clearly statescourseobjectivesrequirements,proceduresandgradingcriteria,the course



integrates theoretical course concepts with real-world applications, and the assignments and exams covered them a terials presented in the course, the course materials modern and updated.

Performa2

Faculty course review report

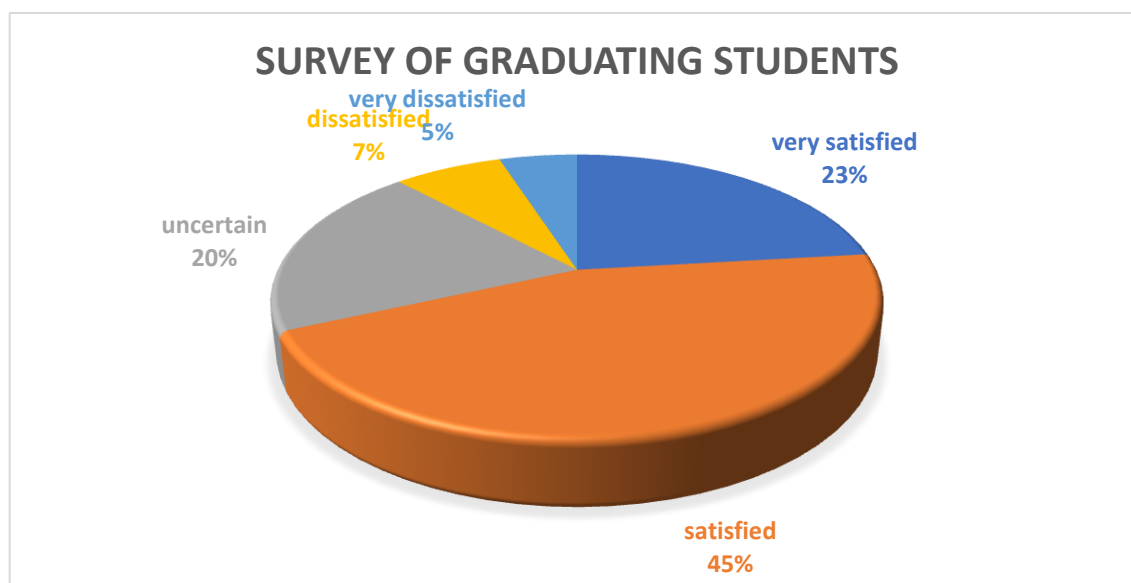
The evaluation showed that the faculty is satisfied with curriculum. Evaluation Questionnaire were filled by each faculty member regarding his course and then analyzed and presented in the table given below. The internal evaluation was done through with mid and final term examinations for all courses offered by department.

Course code	Title	Credit Value	Assessment Methods/ Exams	No. of Students	Comments on curriculum	Any changes for future in course	Semester	Course Instructor
Hort-	Mineral Nutrition of Horticultural Crops	3(2-2)	Midterm And Final	27	Good	Should be divided	Fall	Dr. Khalid Mehmood Qureshi
Hort-703	Environmental Horticulture	3(2-2)	Midterm And Final	26	Good but lengthy	Should be divided	Fall	Usman Shaukat Qureshi
Hort-714	Viticulture	3(2-2)	Midterm And Final	28	Good	Should be Divided	spring	Dr. Khalid Mehmood Qureshi
Hort-719	Special Problem	1(1-0)	Midterm And Final	27	Good	No	Fall	Dr. Touqeer Ahmad
Hort-720	Seminar-I Seminar-II	1(1-0) 1(1-0)	Midterm And Final	7	Good	No	Fall	Dr. Touqeer Ahmad
Hort-722	Biotechnology of Horticultural Crops	3(2-2)	Midterm And Final	27	Good	No	Spring	Dr. Ishfaq Ahmed Hafiz
Hort-724	Post-Harvest Physiology	3(2-2)	Midterm And Final	7	Good	No	Fall	Dr. Nadeem Akhtar Abbasi
Hort-725	Horticultural Production under Abiotic Stresses	3(2-2)	Midterm And Final	19	Excellent but lengthy	No	Spring	Ms.Najma Yousaf

Hort-728	Oliviculture	3(2-2)	Midterm And Final	91	Good	No	Spring	Dr. Ishfaq Ahmed Hafiz
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Performa 3: Survey of Post Graduating Students

Besides, the vast majority of the students were extremely satisfied with the program administration, development of analytical and problem-solving skills, the program is helping

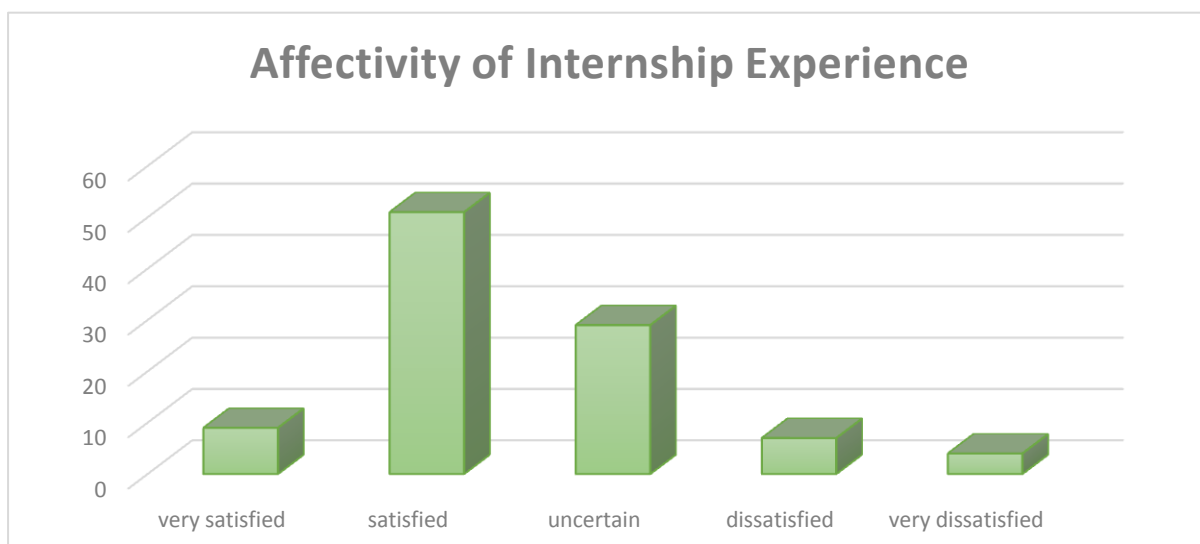


to make creative ideas and research track, written communication skills and planning abilities, the contents of the curriculum, the faculty could meet the program objectives and the environment was conducive for learning. An aggregate of 15 students were responses were included in the survey. The information depicted that 22.68% of the students were exceptionally satisfied (VS), 44.6% satisfied, 20.34% uncertain, 6.79% dissatisfied and 4.64% extremely dissatisfied for the work in the program is too heavy and is the reason of pressure-induction.

Fig. 6 Survey of Graduating Students Best Aspects of the Pogramme

Comments and suggestions:

1. Highly qualified faculty
2. Induction of national professors through the higher education commission
3. Helping attitude of the chairperson for all students in research and extra-curricular activities
4. Timely advice
5. Phyto doctor forum



Suggestions

1. Laboratories are not well equipped and research facilities such as ELISA, PCR etc are not available
2. Lecture rooms are not enough to take classes and some times teachers have to take classes in the laboratory where research students are working (UV/ autoclave is on)

Affectivity of Internship Experience

The internship experience was found effective in enhancing, ability to work in team, independent thinking, and appreciation of ethical values, professional development, time management skills, judgment and discipline Fig- 7.

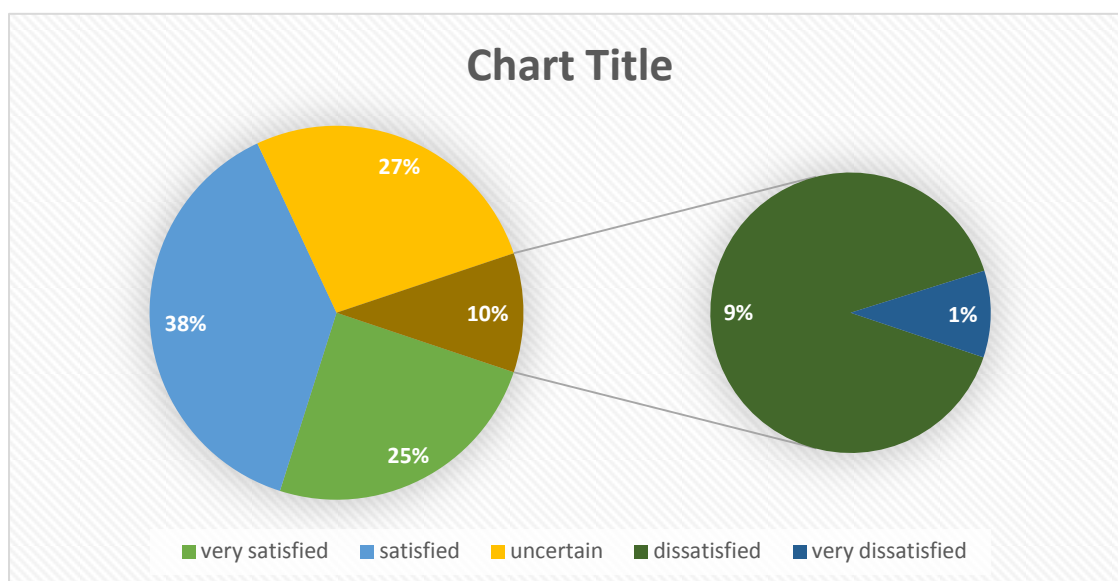
Fig. 7: Affectivity of Internship Experience

Performa 4: Research Student Progress Review Form

Abilities and Capabilities Reflected in Performance as a horticulturist. A total of 17 students were reviewed. A large portion of the students of the was occupied with lab work and anxious to work present day hardware. They brought up the issues in regards to the accessibility of room, PCs and the web which is exceptionally poor.

- Students will have the capacity to work in the field of Horticulture with certainty.
- To create capacities of successful Research work, oral introductions and demonstrations.
- To utilize current procedures/instruments to look into problems and difficulties.

Performa 5: Results of Faculty Survey



The least time availability to faculty to interact with their family is due to extra load on present teachers as sometimes of the faculty members proceed on training, workshops etc. so the poor strength of remaining faculty in the campus has to bear out the load of coursework and other assignments. While the survey analysis result demonstrated that 25.4% of employees were extremely satisfied, 38.32% satisfied, 26.68% uncertain, 8.78% dissatisfied and 1.34% exceptionally dissatisfied are satisfied with their performance and promotion. In any case, the vast majority of the staff themselves detailed as extremely satisfied and administrative support. Employer stability is due to encourage from the office, their promotion through positions.

Fig. 8: Results of Faculty Survey

Performa 6

SURVEY OF DEPARTMENT OFFERING Ph.D. PROGRAMS

The following information is required for each Department in which a Ph.D. program is offered.

General Information:		
1.1	Name of Department	Department of Horticulture
1.2	Name of Faculty	Faculty of FC &FS
1.3	Date of initiation of Ph.D. program	2000
1.4	Total number of academic journals subscribed in area relevant to Ph.D. program.	13
1.5	Number of Computers available per Ph.D.	Every student holds his/her PC.

	student	
1.6	Total Internet Bandwidth available to all the students in the Department.	Wi-Fi with open access in department is available for every student
2	Faculty Resources:	
2.1	Number of faculty members holding Ph.D. degree in the department.	9 Faculty members are Ph.D. Degree holder
2.2	Number of HEC approved Ph.D. Advisors in the department.	7
3	Research Output:	
3.1	Total Number of articles published last year in International Academic Journals that are authored by faculty members and students in the department.	11
3.2	Total number of ongoing research projects in the department funded by different organizations	6
3.3	Number of post-graduate students in the department holding scholarships/fellowships.	7
3.4	Total Research Funds available to the Department from all sources.	3
3.5	Number of active international linkages involving exchange of researchers/students/	4
4.1	Number of Ph.D. degrees conferred to date to students from the Department during the past three academic years.	15
4.2	Number of Ph.D students currently enrolled in the Departemnt	9
4.3	Ratio of number of students accepted to total number of applicants for Ph.D. Program.	3.0 CGPA
5	Program Information	
5.1	Entrance requirements into Ph.D. Program (M.Sc. / M.Phil.) Indicate subjects or M.Sc. / M.Phil.	N
5.2	Is your Ph.D. program based on research only? (Y/N)	Course no. and thesis right up
5.3	Maximum number of years in which a Ph.D. degree has to be completed after initial date of enrollment in Ph.D. program.	35 Credits
5.4	Total number of post M.Sc (16 years equivalent) courses required for Ph.D.	4-5
5.5	Total number of M.Phil. Level courses taught on average in a Term / Semester.	3-7
5.6	Total number of Ph.D. level courses taught on average in a Term / Semester.	Yes
5.7	Do your students have to take/write:	Yes
a. Ph.D. Qualifying examination (Y/N)		Yes
b. Comprehensive examination (Y/N)		Yes

c. Research paper in HEC approved Journal		01
d. Any other examination (Y/N)		NO
5.8	Total number of International examiners to which the Ph.D. dissertation is sent.	12
5.9	How is the selection of an examiner from technologically advanced countries carried out?	Relative Expertise
5.10	Is there a minimum residency requirement (on campus) for award of Ph.D. degree?	No
6	Additional Information	
6.1	Any other information that you would like to provide.	--

Performa 7: Alumni Survey

Results got from the alumni survey depicted that when the alumni were asked in regards to the information they got from this department, the general reaction was great. 68% of the students showed their positive response with respect to collecting and analyzing appropriate data. 72% alumni showed agreement which means department was able to impart research skills in students while 78% of the alumni agreed that the problem formulation and solving techniques and skills were very much familiar with the scientific study. With respect to Communication 70%, alumni showed agreement. Alumni showed positive response towards administration abilities by 51%. There was the most elevated reaction in report composing as appeared by a strongly positive response of 91% alumni and 6% uncertain. The most strong positive reaction was given by alumni with respect to a capacity to connect hypothesis to hone where 72% alumni showed agreement which means department was able to impart research skills in students.

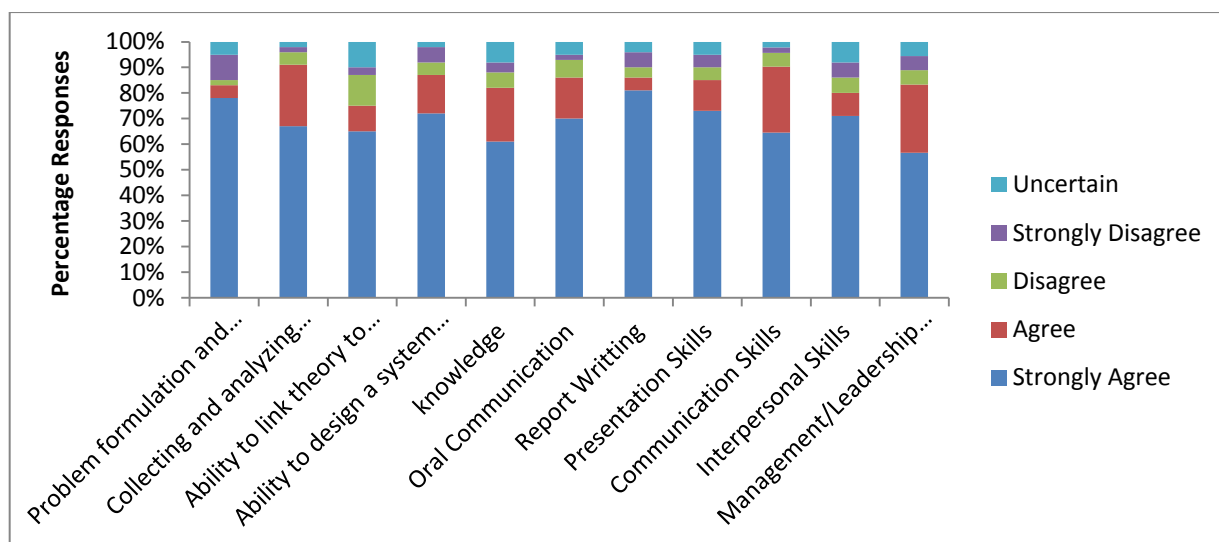
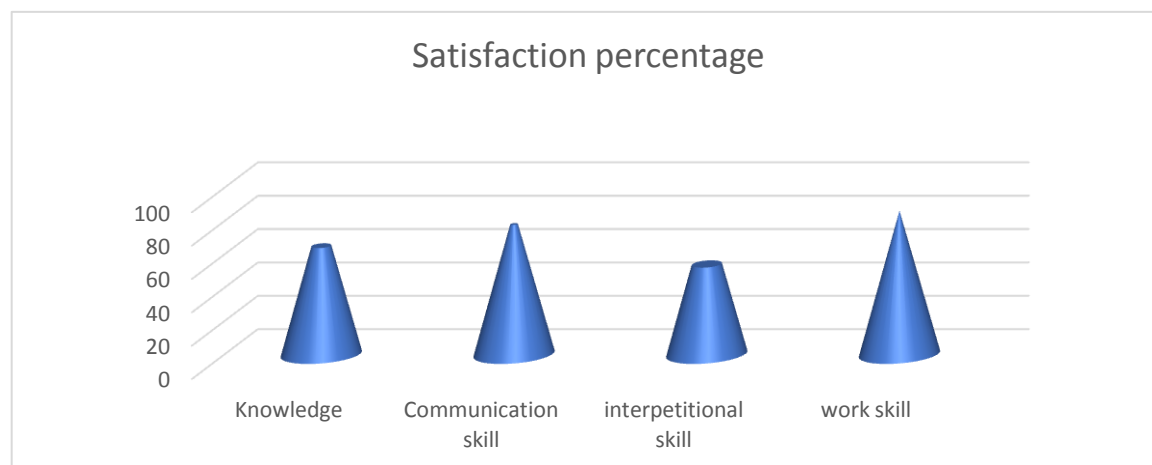


Fig 9. Alumni Survey

Performa 8: Employer Survey

Around 36 representatives organization were selected for employer survey purpose



viz. Pakistan Horticultural Authority, Khyber Pakhtoon Khaw Forest Department, NIGAB Research Institute-National Agriculture Research Centre Islamabad (NARC), Pir Mehr Ali Shah Arid Agriculture University Rawalpindi and Banks. Their perspectives were keenly observed and discussed with respect to the improvement of the department in many aspects. The significant accentuation was to know the employ comments on the quality of education with respect to learning, workability and related expertise these students have. The survey mirrors that our graduates fall better than expected and, in all zones, their capacities were appraised at 70%. The point has been well noted and will be tried to overcome for our future and current students. This demonstrates our graduates are well versatile and demonstrate their better potential in any given condition. In any case, a few bosses have given general remarks about a few shortcomings, especially the down to earth usefulness.

Fig .9 Employer Survey

Standard 1-3: The results of program’s assessment and the extent to which they are used to improve the program must be documented

Skills and capabilities reflected in performance as Horticulturist

Remarkable significance has been given to the practical research work in the profession of horticulture to build confidence and communication skills effectively in writing, oral and demonstration to use modern tools and techniques for their profession. Steps for improvement have also been taken additionally to explain and outline the tests/experiments

and to work successfully in a group, to deal with post-harvest losses and absorb capacity to perceive future needs.

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
Tissue Culture Lab-I					
1	Dawlance Refrigerator	Dawlance	Refrigerator 91996 WB MDS (18 CFT)	Chemical Storage	Working
2	Waves Triplet Deep Freezer	Waves	WT 219 (18 TL)	Chemical Storage	Working
3	Micro Pipette Adjustable Digital Type	Eppendorf	Range 0.5-10 ul Range 10-100 ul Range 100-1000 ul Pipette 500-5000ul Range 1-5 ml	Liquid chemicals measurement	Working
4	Vacuum Pump	Utech	Model: Rocker 400 Utech USA	Create vacuum	Working
5	Tissue Homogenizer	IKA Germany	(T8 Ultra TURRAX IKA Germany) volume range: 0.05ml-1.8l speed: Variable 5000-30,000rpm. ACCESSORIES: Dispersing elements, working range 0.5-5ml, 1-50ml, with T8 Dispersing station	Mixing	Working
6	Hot plate Stirrer	Vdp scientifica	ARE help Italy with magnet bar set, 135 mm diameter plate	Stirring and heating	Working
7	Laminar Flow Cabinet	Lab. Tech	(Lab tech) vertical air flow type dimension mm inner (1200 x 600 x 650), outer (1320 x 840 x 1850), microprocessors LCD Display controller, 9 stage velocity, total UV/FL lamp on/off, HEPA filter, class 100,99.97% of 0.3um particle, prefilter 3-30um, purity class 100 wind velocity 0.35-0.50m/sec, lamp UV lamp 40 wx2EA, FI lamp 40wx2EA, material inner/outer, power coated stainless steel door tempered safety glass	Sapling works condition	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
			sliding door, utility device air clock gas cock 110/220v, 50/60 Hz		
8	Stopwatch	Eppendorf	Digital	Treatment duration measure	Working
9	Laminar flow cabinet	Labtech korea	(Biohazard clean bench) model: LCB-1503B labtech korea Serial No. 06011002, 06011003	Sapling works condition	Working
10	Digital Camera	Olympus	Olympus E 410 Dual Lens Lit with (Supplied) standard Accessories. XD 2.0 GB picture card BLS-1 Battery Carrying case Tripod.	Photography	Working
11	Fire Alarm	China	Fire alarm	Alarm in emergency	Working
12	Insect killer	Local made	Floricont camp2	For killing insects	Working
13	Top loading balance	Sitra USA	1mg to 1000mg	Weight measurement	Working
14	Laminator machine	Local made	Temperature 50c to 200c	Lamination	Working
15	Sealer Machine	Local made	Sealer machine	For sealing	Working
16	UPS	Local made	2 KV	Control electricity fluctuation	Working
17	Filtration assembly	Sertorius Germany	Consists of cup holder, flask disk complete sattorius	Water filtration	Working
18	Stabilizer	Local made	Automatic voltage regular with sewo mortar	Electricity control	Working
19	Elsa reader with washer	HT Company	HER-480	Vires detector and washer	Working
20	Lab. Cart	Local made	Three shelves stainless steel	Transportation	Working
21	Sterilizer bacti-cinerator ref	Fisher scientific USA	Cat No: 14-489 fisher scientific USA	Sterilizing	Working
Tissue Culture Lab-II					

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
22	Dawlance Refrigerator	Dawlance	Refrigerator 91996 WB MDS (18 CFT)	Chemical Storage	Working
23	Waves Triplet Deep Freezer	Waves	WT 219 (18 TL)	Chemical Storage	Working
24	Micro Pipette Adjustable Digital Type	Eppendorf	Range 0.5-10 ul Range 10-100 ul Range 100-1000 ul Pipette 500-5000ul Range 1-5 ml	Liquid chemicals measurement	Working
25	Vessels for liquid	YDS 30 China	Nitrogen capacity 30 liter YDS 30 china	Storage of liquid nitrogen	Working
26	Water Bath Shaker	China	With stainless steel Glass covers shaking motion (38mm), Agitation Rate 30-285 stokes per minute (+5%), temperature range 5-100 C Dimensions L x W x Lt (58 x 47 x 43cm)local made	Wet heat treatment	Working
27	Glassware Dryer	Local made	Same as Fisher scientific Pak made	Drying of glass wear	Working
28	Hot plate Stirrer	Vdp scientifica	ARE help Italy with magnet bar set, 135 mm diameter plate	Stirring and heating	Working
29	Micro Balnce	Dhimadzu Japan	(AX-200,Shimadzu Japan) 0.0001g to 200g	Weighting	Working
30	Drying oven	Memmert Germany	(UNE-600 Memmert Germany) hot air forced draft temperature range: +5 to 250 C capacity 220 liters. Material interior: Stainless steel plate	Drying of samples	Working
31	Laminar Flow Cabinet	Lab. Tech	(Lab tech) vertical air flow type dimension mm inner (1200 x 6000 650), outer (1320 x 840 x 1850), microprocessors LCD Display controller, 9 stage velocity, total UV/FL lamp on/off, HEPA filter, class 100,99.97% of 0.3um particle, prefilter 3-30um, purity class 100 wind velocity 0.35-0.50m/sec, lamp UV lamp 40 wx2EA,	Sapling works condition	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
			FI lamp 40wx2EA, material inner/outer, power coated stainless steel door tempered safety glass sliding door, utility device air clock gas cock 110/220v, 50/60 Hz		
32	Distillation	Lab Tech	Apparatus lab tech (Automatic) capacity 7.5 l/h dimension mm 260x260x610, heater 6kw, cooling 601, material inner, outer, heater, stainless steel/w power coating, stainless steel, controller, hydraulic thermostat, electric requirements 220v,50/60Hz, switch, main power with pilot lamp and water float switch, sealing, silicone gasket safety low water and over heating cut out water storage tank capacity 25-50 liter.	For distilled water	Working
33	Mortar	Marble		Grinding	Working
34	Pestle			Grinding	Working
35	Lab. Cart	Local made	Three shelves stainless steel	Transportation	Working
36	Laminar flow cabinet	Labtech korea	(Biohazard clean bench) model: LCB-1503B labtech korea Serial No. 06011002, 06011003	Sapling works condition	Working
37	Glassware Cart	Local made	Two shelves stainless steel	Transportation	Working
38	Shaker	Brunswick Scientific	Model: C10. New Brunswick scientific. 250ml Elenmeyer flask dedicated platform capacity 40 flask. Shaking speed 40-400rpm	Shaking	Working
39	Orion Benchtop pH meter	Orion benchtop pH	Meter model 420Aplus, S/No.089781,089790 complete with Electrode	pH measurer	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
			9157BN, pH buffers 4,7,10, AC/DC Adapter Electrode holder stand and instruction Manuals		
40	Orion 4-star pH meter	Orion 4-star	PH/Conductivity meter cat no.111700,S/No.004147,0 04707 complete with electrode 9157BNMD, Conductivity probe 013005, stand 1110001, AC/DC adapter electrode storage solution 91001,pH buffers 4,7,10, conductivity standards 01006,011007 & operator manuals.	pH measurer	Working
41	L.G. Microwave oven	Model: 724	Model: 724,42 LTR		
42	pH meter Martini	MI-150	With spare electrode	pH measurer	Working
43	Laboratory fume hood	Local made	(locally fabricated)	Fuming chemicals	Working
44	Sterilizer (locally)	Local made		steriling	Working
45	Lab Trolley	Local made	(Non magnetic stainless steel with three shelves and lockable imported two inch wheels)	Transportation	Working
46	Zoom Stereo microscope	Meiji Techno Japan	Meiji techno japan model RZ-B with accessories	Magnification	Working
47	Thermometer	Local made	Digital max min	Temperature measurement	Working
48	Leaf area meter	CID INC. USA	CI-202	Leaf area measurer	Working
49	Distillation plant	England	Distillation plant WDA4 R&M England	For distal water	Not Working
50	Hot plate stirrer	Velp scientifica	Hot plate stirrer model ARE VELP Italy	Staring	Working
51	Leaf area meter	ADE England	Model No. AM-100	Leaf measurement	Not Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
52	pH meter digital model phimolab level IWTN Germany	ITWN Germany	pH meter digital model phimolab level IWTN Germany	pH measurement	Working
53	Microscope	Swift Japan	SM-88 HF Swift Japan	Magnification	Working
54	Lux meter digital	China	DT-1300 range 200lux-50000lux	Light measurement	
55	Relative humidity digital	China	Max-mine	Humidity measure	Not Working
56	Seed moisture tester	USA-dickey john	Model no.462331230A	Moisture measure	Working
57	Balance	Japan	Electronic top loading capacity 12000gm model elb-12k	Weighting	Working
58	Temperature logger & connected reader	Make New Zealand	Temperature and temperature model RH connected USB SR2 USB Port connection	Humidity and temperature measurement	Working
59	Centrifuge Machine	Hermle	Model Z206A Germany	Separation	Working
60	UV.Transilluminator	Wealtec	Filter size 25x25 model MD-25 Wealtec	DNA band	Working
61	Gel Unit	Belgium	Horizontal electrophoresis Size 17x7 cm s/n 78444	Gel run for DNA	Working
62	Gel Unit	Belgium	Horizontal electrophoresis size 15x15 cm	Gel run for DNA	Working
63	Vortex Mixer	Heidolph	Model reax 51W Top heidopph	Mixing	Working
64	Centrifuge Machine	Sigma	Speed 30000 RMP temperature Range 21 to + 40o C, With rotor single Knob operated model #K30 sigma made in Germany	Separation of serum	Working
65	Micro Centrifuge	Sigma	With speed 14,000 RPM & RCF 24 & 1.5ml 220 volts signal-15, Germany/UK/USA	Separation of serum	Working
66	Micro Centrifuge	Sigma	(Model Sigma-14) Microprocessors controlled, max capacity	Separation of serum	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
			12 x 1.5/2 ml. Max speed rpm 14800, min speed rpm 200, rotor 12092, and adapters 0.5ml and 0.2ml, digital display noise level 58dB, set time up to 99min, 59 sec, continuous run, automated opening of lid emergency opening of lid 220 volts.		
67	Soil Moisture Meter	Aquaterr USA	Aquaterr USA M-300, type: vertical with digital meter sensor location number 91-225portable: both for mineral and organic soils.	Measuring of moisture content of soil	Working
68	Satplizer puma PVSL	Puma	Puma PVSL	Voltage control	Working
Post Harvest Lab					
69	Analytical Balance	Shimadzu Japan	Electronic Digital top loading in glass Case Capacity 220gm readability External Calibration and separate weight of 200gm operated model Ay-220	Weighting of chemicals	Working
70	Hot Cold Cabinet	JP Slecta	(Refrigerated oven) with light control temp. Range 0-60c with illumination control (0-12000 lum) with light Humidity 50% to 98% fan circulation programmable capacity 557 lext. Dim 208x70x95 cm ³ hwd 1300 wats made in spain can be with in time & temp printer.	Growth Chamber	Working
71	Blander	West point	Three piece blender	Grinding	Working
72	Chroma Meter	Minolta Corporation USA	CR-410, Minolta Corporation. USA Data processor DP-400 Color Data software CRS4W, CM-S100W with accessories	Color measures	Working
73	Lab oven	Local	PA-115-T	Heating	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
74	Refectro Meter	Brix	FG-103 measuring range 0-32%	TSS	
75	Vernier Caliper	China	Digital 0-150mm No. 01010259	Measure length and diameter	Working
76	Weighting Balance digital model 6000 SA shimadzu Japan	Shimadzu Japan	Weighting balance digital model 6000 SA Shimadzu Japan	Weighting	Working
77	Sighting copass	Made in UK	Sighting compass part no. 101900 UM360LA	Direction	Working
78	Clinometers	Made un UK	Clinometers made in UK	Direction	Working
79	Seed counter digital	USA-dickey john	Electronic Grain counter	Counting seed	Working
80	Fruit pressure tester	Italy	FT-327	Famines measure	Working
81	Conductivity meter	WTM Germany	Inolab cond 720/set operated	Electric conductivity	Working
82	Ethylene gas cylinder	N-35	N 35 grade filled in 5 liter(with regulators)	For Ethylene gas	Working
83	PH meter	Ino lab Germany	Model No. 720	pH measurement	Working
84	Refractor meter	Japan	Model No. PAL-3	Tss	Working
85	ULT Freezer	Sanyo	MDF U73v (240v.5)	Extreme freezing	Working
86	GC Coulmn	Supelco agelent USA	CAT. 12437 length 6ft OD 1/8 inch type 80/100	For GC analyses	Working
87	Distillation apparatus	Germany	Model 1M-100Irmeco Germany	For distal water	Working
88	UV vis Spectrophopt Meter	Optima	Optima 3000plus	Light wane length	Working
89	Meffle furnace	Raypa	HM-9MP	Heating	Working
90	Electronic Penetrometer	Willow bank Electronic New Zealand	Penetrometer stand, tips, splash plate, extension shaft, power supply, foot pedal, data lead, soft wear CD and Callabration check weight	Famines measure	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
91	Soxhlet Apparatus	Pyrex	Complete set with 500ml flask extension and condenser	For soil extraction	Working
92	Digital camera	Sony	Sony cybershot p-150	Photography	Working
Autoclave					
93	Autoclave	Hirayama japan	Temperature 105 to 135 C capacity 50 liter, pressure 0.4mpa with built in timer 1-250mins elector mechanical lock system, double internal lock with steel basket stainless steel, model:EAC-4000D Japan	Sterilization	Working
94	Autoclave Japan	Hirayama japan	HL-36	Sterilizing	Working
95	Autoclave	Hirayama Japan	HVA-110 Hirayama Japan (Large) temperature 105 to 135 C capacity 100 liter, pressure 1.9kg/cm ² sterilization timer 01-250 minutes. Elector mechanical lock system, double internal lock with steel basket stainless steel. Safety devices	Sterilization	Working
Cold Storage					
96	Cold storage chamber supplied by MED Lab services	Local made		storage of research items	Working
Pak-Korea Capacity Building Centre- Horticulture lab					
97	Model Hydroponic unit (10 X30X12 ft) for practical experience	Imported	(10 X30X12 ft) for practical experience	Hydroponic	working
98	Small drip irrigation system for demonstration	local	-	Irrigation	Working

S. No.	Name of Equipment	Make	Model & Specification	Function of Equipment	Availability (Working/ not Working)
99	Multipurpose Rotary Cultivator (HT105FB 9HP Gasoline “Huitian”)		Cultivator (HT105FB	Cultivator	working
100	One row disc ridger Motorized	Imported	--		Working
101	Plastic mulch spreader attached with motor	Imported	--	Mulch	Working
102	Independent type power sprayer ASS-100L	Imported	--	Spray	Working
103	AS-770 Knapsack type Agriculture engine sprayer	Imported	--	Spray	Working
104	Spray pump, 20 liter Power Knapsack	Imported	--	Pump	Working
105	Seed moisture tester digital instruments.0.1-0.05% AC adopter	-	0.1-0.05% AC adopter		Working
106	Wooden bins and shelves for seed storage				
107	Vegetable harvesting ladder 8ft height, stainless steel				
108	Expendable stores (Agricultural field tools)				

Major future improvement plans

- An essential and distinguishing attribute of horticulture education through audio visual aids and modern tools along with provision of latest literature, journals, books, reviews and access to internet.
- Flourishing the facilities for horticulture crop improvement, hydroponics setup, germplasm units and extension material may be developed.
- To increase former know-how through publishing material and advisory services

- To improve the post-graduate laboratories (Post- harvest physiology, Plant Tissue culture, Horticulture Laboratory) by introducing and sophisticated equipment and tools.
- Human Resource development in Horticulture for future challenges.
- To conduct research on specific horticultural issues prevailing in arid zone.
- To train & equip the teaching staff through widen skill spectrum of horticulture in and outside Pakistan.

Strength and Weaknesses of the Horticulture Department

Strength

The main strength of the department is the availability of highly qualified teachers including (9 PhDs and 2 Msc hons), with good experience of their respective subjects, having vast knowledge of horticultural production and management systems and associated problems. Faculty members have local as well as foreign degrees (USA, UK, Turkey, China etc) and are experts in their area of specialization. Four faculty members got postdoctoral research experience from Australia, Italy, UK and China. Many faculty members have national research projects and are highly conscious of the problems to be taken by the post-graduate students. 2 professors, 1 Associate Professor, 5 Assistant Professor & 4 Lecturers specialized in their subjects are currently engaged in their academic and research activities. Latest research facilities for conducting experiments on tissue culture and post-harvest are available to students.

Weaknesses

Advanced teaching and research is being handicapped due to lack of important equipment as hydroponics system including a fully equipped and the set of automated greenhouses and cold storage facilities for post-graduate students. To introduce the most economical protected horticulture, there is a dire need to establish the chain of greenhouse based on the Chinese energy saving technology (in progress). For the research to solve the problems in the area of post- harvest there is need for controlled atmosphere storage and multi-temperature storage chambers. In case of biotechnology, there is need for vector construction, electro oration and gene transformation equipment. Additionally, to ensure the production of pathogen-free plant material, a complete system of ELISA and other diagnostic

kits for detection and determination of plant pathogens. Areas for seed production of vegetables and ornamentals are not available. Lecture rooms and survey / offices for faculty members are also lacking. A landscape studio is indispensable to couple up the present needs of landscape horticulture. There is a need to have a computer with efficient internet access for every faculty member.

Name	Designation	Qualification	Status
1. Dr Nadeem Abbasi	Professor	Ph.D. USA, Post doc Australia	Pro-VC, PMAS-AAUR
2. Dr Ishfaq Ahmad Hafiz	Professor	Ph.D. China, Post doc Italy	Chairman
3. Dr.Khalid Mehmood Qureshi	Associate Professor	Ph.D	On duty
4. Dr. Muhammad Azam Khan	Assistant Professor	Ph.D	DAS
5. Ms Najma Yousaf Zahid	Assistant Professor	M.Sc. (Hons)	On duty
6. Dr. Shahid J. Butt	Assistant Professor	Ph.D. Turkey	On duty
7. Dr. Imran Hassan	Assistant Professor	Ph.D. China Post doc Australia	On duty
8. Dr Touqeer Ahmed	Assistant Professor	Ph.D. China	On duty
9. Dr. Umer Habib	Lecturer	Ph.D	On duty
10. Mr. Usman Shoukat Qureshi	Lecturer	M.Sc. (Hons)	On duty
11. Dr. Irfan Ali	Lecturer	Ph.D. Arid Agriculture, Rwp	Koont farm

Field of specialization:

1. Post-harvest

- Dr. Nadeem Akhtar Abbasi
 - production, pre-& post physiology of fruit
- Dr. Imran Hassan
 - Post-harvest physiology of Flowers
- Dr. Irfan Ali
 - Post-harvest physiology of Fruits

2. Plant Biotechnology/ Tissue Culture

- Dr Hafiz Ishfaq Ahmad
 - Plant biotechnology/ Horticulture Crops
- Dr Touqeer Ahmed
 - Plant tissue culture, protoplast fusion / transformation.
- 3. Soil less / Hydroponics, Vegetables
 - Dr. Shahid J. Butt
 - Vegetable Production, Hydroponics/ Soil less culture Technology
- 4. Medicinal, Aromatic Plant
 - Miss Najma Yousaf Zahid
 - Medicinal, Aromatic plants
- 5. Landscape/ Floriculture
 - Dr. Umar Habib
 - Mr. Usman Shoukat Qureshi .

Completed and ongoing research projects by Department of Horticulture

Sr. #	NAME OF THE PROJECT	PRINCIPAL INVESTIGATOR	DURATION (Months)	APPROVED COST (Million Rs.)	UNSPENT AMOUNT * (Completed Projects only)	DATE OF APPROVAL	DATE OF COMPLETION	STATUS Completed/ Ongoing	FUNDING AGENCY
1	Collection of loquat genotypes of Pakistan and their multiplication through conventional vegetative methods and tissue culture techniques	Prof. Dr. Nadeem Akhtar Abbasi	36	25,65,300	0	30-03-2010	31-12-2013	Completed	HEC
2	Pre and postharvest treatments of food grade chemicals to improve peach fruit quality and shelf life	Prof. Dr. Nadeem Akhtar Abbasi	36	2,406,911	0	20/07/2010	31-09-2013	Completed	PSF
3	Improving Yield Quality and Storage Life of Bell Pepper by Use of Food Grade Chemicals	Prof. Dr. Nadeem Akhtar Abbasi	24	28,75,176	0	19/02/2013	21-10-2016	Completed	PSF
4	Improvement of Berry Quality and Post Harvest Performance of Grapes cv. Parlette and King's Ruby by Using Food Grade Chemicals	Prof. Dr. Nadeem Akhtar Abbasi	36	101,94,980	0	6/6/2014	Nov-17	ongoing	HEC
5	Effect of Time of Harvest on Olive Oil Yield and Quality	Prof. Dr. Ishfaq Ahmad Hafiz	12	0.2	0	23-1-2017		ongoing	NESCO

6	Component-III: Technology transfer to potato growers in relation to pathogen free seed potato, management of diseases and adoption of improved agro techniques	Prof. Dr. Ishfaq Ahmad Hafiz	24	2512750	0	1/7/2011	30-06-2014	Completed	UAF EFS
7	Production of pathogen free, true to type olive plants through tissue culture	Prof. Dr. Ishfaq Ahmad Hafiz	36	3876856	0	30-3-2010	22-7-2015	Completed	HEC
8	Varietal improvement of gladiolus through in vitro mutation	Prof. Dr. Ishfaq Ahmad Hafiz	36	3079624	0	-	-	ongoing	HEC
9	Water Conservation Demonstration Model for Rainfed Vineyard	Dr. Touqeer Ahmad	12 months	8000 US\$	0	18-03-2016	13-01-2017	Completed	UC Davis USA
10	Establishment of Demonstration Model of Vineyard	Dr. Touqeer Ahmad	24 months	15151.95 US\$	651.95 US\$	13/10/2014	15-02-2017	Completed	UC Davis USA
11	Promotion of Olive Cultivation on Commercial Scale in Pakistan	Dr. Touqeer Ahmad	60 month	128.27 PMAS-AAUR Component	0	4/10/2014	4/10/2019	ongoing	MNFSR
12	Up-gradation and Strengthening the Lab, Department of Horticulture under the project Institutional Strengthening	Dr. Touqeer Ahmad		1.9765	0	8/12/2015		ongoing	HEC
13	Somatic Hybridization for Citrus Improvement: A Way Towards a Low Input Sustainable Citrus Culture in Pakistan	Dr. Touqeer Ahmad	36 months	12.51	0	3/12/2015	3/12/2018	ongoing	HEC
14	Screening of wild grape biodiversity for drought tolerance and their rootstock-scion compatibility for sustainable grape production in Pakistan	Dr. Touqeer Ahmad	36 months	7.77	0	5/4/2017	5/4/2020	tentative date of release of funds Sept/Oct 2017	HEC
15	Evaluation and Introduction of some Exotic Kiwi Cultivars	Prof. Dr. Nadeem Akhtar Abbasi	60 months	10.00				Ongoing	PARB

Research Publications

➤ International journal with impact factor	76
➤ HEC recognized national journal	61
➤ Total	137
➤ Proceedings of national and international	40
➤ Conferences	20

Development of new courses

- Viticulture 3(2-2)
- Oliviculture 3(2-2)

(For MSc and PhD students)

Short Training Courses

Training courses offered by department

Course Name	Persons trained
Kitchen gardening (Female Ext. Worker)	25
Tunnel Farming (9 different Courses)	250
Plant Tissue Culture Lab Tech	19
Nursery Management	30
Home Gardening	49
Professional Floristry	33
Flower Arrangement	35
Gardening training course (CDA Workers)	25

Further Achievements

- Varietal development of fruit crop in process i.e. loquat, Olive and brachyhiton
- Development of brochures on Grapes, Potato, Peach and Olive.
- Books on olive and grapes
- Establishment of Vineyard at Koont farm
- Initiation of rose breeding farm at Koont Farm
- Establishment of library for postgraduate students

Weaknesses identified in the Program

Although department is making progress in teaching, research and community services but in advanced research there is a lack of instruments such as HPLC. Post graduate laboratories, common room and lecture/class room are few in numbers. The student work indicates that

there is some room for improving communication skills and the focusing on the practical aspects. Service obliged field diagnostic aids are also required on priority bases.

Standard 1-4 The department must assess its overall performance periodically using quantifiable measures.

In the past the enrollment was significantly less compared with the present status. The new trend is that applicant gives high preference to opt the horticulture as major subject in the agriculture faculty as illustrated in the following table

Table 3: Quantitative assessment of the department (last three years)

Sr. #	Particular	No.	Remarks
1	Percentage (%) of honor students	15	82% of them joined M.Sc 9% got jobs soon after the degree
II	Students/ Faculty ratio	3:1	
III	Technical/ Non- Technical ratio	4:1	
IV	Average Grade Point	3	Fulfills HEC criteria

The evaluation process pointed high efficiency of system and satisfactory impact of outcomes. Almost all the students got jobs in various organizations, provincial, department, universities, research organizations, banks and private firms except those started PhD program.

Performance for research activities

The faculty staff of horticulture department is awfully engaged in teachings and research activities, consequently the findings are being published in reputed national and international journals along with the presentation of finding problem-oriented and solution-oriented research outcomes at different national and international forums. The following table shows some laudable performance in the form of publication.

The staff is well trained in horticulture crop production, postharvest technology, biotechnology, protected cultivation, vegetable breeding, hydroponics/soilless crop production, floriculture, landscape horticulture and many other specialized fields in horticulture.

Community services

- Holding of national/international conferences/workshops and training programs on horticulture for students, teachers and farming community.
- Advisory services to the farmers specially for pothowar region.
- Knowledge dissemination for the promotion of greenhouse and tunnel technology in arid region.
- To guide the educational institutes for improved landscaping.
- Guidance and supervision of students and interested people for the promotion of horticulture
- Coordination and participations in different horticulture competitions (e.g. fruit, flower and vegetable shows)
- Supervision of students on internships in various organizations

Departmental administrative services for faculty and students

- To achieve the task assigned by competent authority
- The department maintains the ratio of 4 : 1 for the academic (technical) and administrative (non-technical) staff which fulfill this standard set by the HEC.
- Administrative meetings (departmental, university, academic council, and syndicate) are attended as and when required. Generally, two meetings of academic council are held per month. Board of studies of the department meets quarterly.
- Sharing the role in publishing university magazine.
- Quick office disposal i.e. no complaint pertaining to delay has ever received from authorities.
- Proper records of individual students, their thesis record maintains.

Standard 1-4: The department must assess its overall performance periodically using quantifiable measures.

Present students' enrolment

In the past, the enrolment was significantly less compared with the present status. The new trend is that the applicants give high preference to opt the horticulture as a major subject in the agriculture faculty as illustrated in the following table

The evaluation process pointed high efficiency of system and satisfactory impact of outcomes. Almost all the students got jobs in various organizations (provincial department, universities, research organizations, banks and private firms) except those started PhD program.

Performance for research activities

The faculty staff of Horticulture department is awfully engaged in teaching and research activities, consequently the findings are being published in reputed national and international journals along with the presentation of the findings of problem-oriented and solution-oriented research outcomes at different national and international forums. The following table shows some laudable performance in the form of publication:

Table- 4: Performance for research activities

Faculty	Journal Publications (National & International)	Conference Publications (Proceedings/ Abstract)
Dr. Nadeem Akhtar Abbasi	82	26
Dr. Ishfaq Ahmad Hafiz	101	14
Dr. Imran Hassan	24	11
Ms. Najma Yousaf Zahid	07	18
Dr.Touqeer Ahmad	30	31

The staff is well trained in horticultural crop production, post-harvest technology, biotechnology, protected cultivation, vegetable breeding, hydroponics/soilless crop production, floriculture, landscape horticulture, and many other specialized fields in horticulture.

Criterion 2: CURRICULUM DESIGN AND ORGANIZATION

M.Sc. (Hons) Agri. (Horticulture)

A minimum of 2 years / four semesters duration program after B.Sc. (Hons) Agriculture majoring Horticulture.

Definition of credit hour

A student must complete a definite number of credit hours. One credit hour is one theory lecture or two hours laboratory (practical/week). One credit hour carries 20 marks.

Pre-requisites A candidate seeking admission to the course must have passed the B.Sc. (Hons) Horticulture Degree with C.G.P.A. of 2.75 and must be a resident of the Punjab Barani Area. Merit for post graduate program is determined as per the following formula

Matric	10%
Intermediate	15%
B. Sc. (Hons.)	35%
Entry test	40%

Degree requirements for M.Sc. (Hons) Agric.

The requirement is 45 credits comprising 35 credits of course work and 10 credits of research thesis. All M.Sc. students are required to pass a comprehensive examination and thesis evaluation and examination by an external examiner and supervisory committee.

Table-5: Post graduate courses (M.Sc. (Hons) Horticulture)

Course No.	Course Title	Credit Hours
HORT-701	Mineral Nutrition of Horticultural Crops	3(2-2)
HORT-702	Plant Growth Regulators	3(2-2)
HORT-703	Environmental Horticulture	3(2-2)
HORT-704	Plant Tissue Culture	3(1-2)
HORT-705	Prospective Horticultural Crops	3(2-2)
HORT-706	Rootstock for Horticultural Crops	3(2-2)
HORT-707	Fruit Breeding	3(2-2)
HORT-708	Citriculture	3(2-2)

HORT-709	Mango and Date Palm Culture	3(2-2)
HORT-710	Minor Fruits	3(2-2)
HORT-711	Vegetable Breeding	3(2-2)
HORT-712	Vegetable Seed Production and Marketing	3(2-2)
HORT-713	Solanaceous Crops	3(2-2)
HORT-714	Viticulture	3(2-2)
HORT-715	Mushroom Biology and Technology	3(2-2)
HORT-716	Landscape Designs	3(2-2)
HORT-717	Turfgrass Management	3(2-2)
HORT-718	Advanced Fruit Science	3(2-2)
HORT-719	Special Problem	1(1-0)
HORT-720	Seminar-I	1(1-0)
HORT-720	Seminar-II	1(1-0)
HORT-721	Horticulture Seed Science and Technology	3(2-2)
HORT-722	Biotechnology of Horticultural Crops	3(2-2)
HORT-723	Physiology of Horticultural Plants	3(2-2)
HORT-724	Post-Harvest Physiology	3(2-2)
HORT-725	Horticultural Production under Abiotic Stresses	3(2-2)
HORT-726	Advanced Vegetable Science	3(2-2)
HORT-727	Landscape Ecology	3(3-0)
HORT-728	Oliviculture	3(2-2)
HORT-799	Research & Thesis M.Sc. (Hons.)	10(0-20)
HORT-799	Research & Thesis (Ph.D.)	50(0-100)

OUTLINE OF COURSES FOR POSTGRADUATE STUDIES IN HORTICULTURE:

Hort. 701 MINERAL NUTRITION OF HORTICULTURAL CROPS 3(2-2)

Specific Objectives

To develop understanding among students about role of nutrients, their uptake and utilization in horticultural crops.

Theory

Nutrient elements in plants and their classification, Criteria of essentiality and role of mineral nutrients in plants, Requirements and plant composition, Mechanism and factors affecting absorption and translocation of nutrients, Ion interactions, Nutrient concepts, Methods for evaluation of nutrients and their application, Deficiencies and toxicities, Growth yield and quality as affected by nutrient status.

Practical

Relevant field and laboratory studies, Survey for deficiency/toxicity symptoms (Identification and sample collection) of fruits, vegetables and ornamental plants, Techniques for evaluations of nutrients, Practice of nutrient application (spreading, dressing, foliar application, fertigation etc.), Visit of nutrient analytical laboratories.

Learning Outcomes

Students must be skilled to diagnose specific nutrient deficiency and toxicity symptoms and suggest the remedies.

Books Recommended

- Alloway, B. J. 2008. Micronutrient Deficiencies in Global Crop Production. CPL Scientific Publishing Services Limited, U.K.
- Emanuel E. and Arnold. J.B. 2005. Mineral Nutrition of Plants: Principles and Perspectives. Academic Press. Sinauer Associates. 23 Plumtree Road, Sunderland, U.S.A.
- Schilling, G. 2000. Plant Nutrition and Fertilizer Application. Verlag Eugen Ulmer, Stuttgart.
- Marschner, H. 1995. Mineral Nutrition of Higher Plants. Academic Press, London.
- Mengel, K., and E.A. Kirkby. 2001. Principles of Plant Nutrition. International Potash, Institute, Bern, Switzerland.

- Nijjar, G.S. 1996. Nutrition of Fruit Trees. Kalyani Publisher, New Delhi.
- Kumar, D.D. 2000. Micronutrients-Their Behaviour in Soil and Plants. Kalyani Publisher, New Delhi.
- Allen, V.B. and D.J. Pilbeam. 2007. Handbook of Plant Nutrition. CRC Somerset Press.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 702 PLANT GROWTH REGULATORS 3(2-2)

Specific Objectives

To acquaint the students with growth manipulation in horticultural crops.

Theory

Introduction, History, classification of growth regulators (PGRs), Biosynthetic pathways, Source sink relationship in relation to PGR, Occurrence and role of growth regulators in plants, Chemical nature of plant regulators and its relation with physiological activities, Theories of action and interactions of growth regulators, Interrelationships between growth regulators and other organic and inorganic plant substances, Applications in horticulture; growth, propagation, parthenocarpy, flower and fruit thinning, control of pre-harvest drop, fruit maturity, dormancy and storage, seed treatment and weed control, Uses in vegetable and flower nursery, Advances in PGR's.

Practical

Relevant field and Laboratory studies, surveys and assignments, Study of effects of PGRs in propagation, physiology, growth, flower manipulation, ripening and yield of different horticultural plants.

Learning Outcomes

Students must have knowledge of various plant growth regulators and their application for growth manipulation.

Books Recommended

- Jeremy A. R., Richard H. Plant Growth Regulators. ISBN: 978-1-4615-7594-8 (Print)
978-1-4615-7592-4 (Online)

- Louis, G. N. Plant Growth Regulators in Agriculture and Horticulture. Nickell Research, Inc., Hot Springs Village, AR 71909
- Arteca, R.N. 1997. Plant Growth Substances: Principles and Applications. CBS Publishers and Distributors, New Delhi, India.
- Basra, A.S. (Ed.). 2007. Plant Growth Regulators in Agriculture and Horticulture: Their Role and Commercial Uses. CRC Press.
- Davis, P.J. 1995. Plant Hormones: Physiology, Biochemistry and Molecular Biology (2nd Ed.) Kulwer Academic Publishers, Netherlands.
- Nickell, L.G. 2011. Plant Growth Regulators: Agricultural Uses. Springer, London, UK.
- Hayat, S. and A. Ahmad. 2007. Salicylic Acid: A Plant Hormone. Springer, Dordrecht. The Netherlands.
- Srivastava, L.M. 2002. Plant Growth and Development: Hormones and Environment. Academic Press, U.S.A.
- Nickell, L.G. 1982. Plant Growth Regulators (Agricultural Uses). Springer-Verlag, Berlin, Heidelberg, New York.
- Wearer, R.V. 1992, Plant Growth Substances in Agriculture. W.H. Freeman Co., San Francisco.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 703 ENVIRONMENTAL HORTICULTURE 3(2-2)

Specific Objectives:

To impart knowledge about the role of Horticulture to combat environmental hazards.

Theory:

Introduction and importance, Plant and their environments, Biodiversity and conservation, Ecologically sound and sustainable designs, Functional uses of plants; plants for the control of environment and bio-remediation; Pollutants types and role of plants to minimize pollution, Selection of plants for various environments, Environmental problems caused by plants, Horticultural science in sociosphere, Aesthetic horticulture, Amenity horticulture; Phyto-remediation, types and uses.

Practical:

Identification of plants for control of environmental hazards, Monitoring plant health in polluted areas (industries and motor-ways etc.) and their comparison with field grown plants, Vegetation impact on microclimate, Visits to industrial areas causing pollution, Morphological changes in plants due to pollution, Environmental impact studies, Poster preparation about environmental hazards and role of plants.

Learning Outcomes:

Students must be able to conduct environmental impact studies and reduce environmental hazards through plantation.

Books Recommended:

- Saliba, C. 2009. A Book about Environmental Toxins. Knopf, Canada.
- Kaushik, A. and C.P. Kaushik. 2006. Perspectives in Environmental Studies. New Age International Publishers, New Delhi, India.
- Hussain, M. 1998. Environmental Degradation: Realities and Remedies. Feroz Sons Pvt. Ltd., Lahore.
- Hussain, S.S. 1992. Pakistan Manual of Plant Ecology. National book foundation, Islamabad, Pakistan.
- McKinney, M.L. and R.M. Schoch. 1998. Environmental Science: Systems and Solutions. Jones and Bartlett Pub. Inc., Sadbury.
- Smith, K. 1992. Environmental Hazards: Assessing Risk and Reducing Disaster. Rutledge, London.
- Robinette, G.O. 1977. Plants, People and Environmental Quality. US Department of Interior, National Park Service, Washington, DC.

Relevant Journals/Periodicals and Worldwide Webs.**Hort. 704 PLANT TISSUE CULTURE****3(1-2)****Specific Objectives:**

To impart training of students in the field of plant cell, tissue and organ culture techniques and their applications in Horticulture.

Theory:

Introduction, history and importance, Tissue culture media, Asepsis, Types of culture (organ, callus, cell suspension, protoplast culture etc.), Types of regeneration (callogenesis, organogenesis and embryogenesis), Micropropagation, micrografting, Synthetic seed technology, Indexing of tissue cultured-plants for pathogens, Physiology and anatomy of tissue cultured-plants, Germplasm conservation, Secondary plant products.

Practical:

Laboratory equipment and supplies, Stock solutions and media preparation, Maintenance of asepsis, Different types of explants culture (shoot-tip, nodal segments, leaf disks, embryo, ovule, anther/pollen, callus, cell suspension, Protoplast fusion, Plantlet regeneration), *In vitro* grafting, Production and testing of virus free plants, Transfer of plantlets from tissue culture to greenhouse and field, Preparation of synthetic seeds, Visits to tissue culture laboratories.

Learning Outcomes:

Students must be able to culture different ex-plants *in vitro* and regenerate plantlets

Books Recommended:

- Chawla, H.S. 2003. Plant Biotechnology. Laboratory Manual for Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Evans, D.E., J.O.D. Coleman and A. Kearns. 2003. Plant Cell Culture (The Basics). BIOS Scientific Publishers, London, New York.
- Kumar, U. 2005. Methods in Plant Tissue Culture. Agrobios, Jodhpur, India.
- Lindsey, K. (Ed.). 2007. Plant Tissue Culture Manual. Springer – Kluwer Academic Publishers, New Delhi, India.
- Neumann, K.H., A. Kumar, J. Imani. 2009. Plant Cell and Tissue Culture: A Tool in Biotechnology: Basic and Application. Springer Verlag, Berlin, Heidelberg.
- Kumar, B. 2014. Culture of Plant Cells, Tissues and Organs. Random Publications, New Delhi, India.
- Razdan, M.K. 2004. Introduction to Plant Tissue Culture (2nd Ed.). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. Stafford, A. and G. Warren. 1991. Plant Cell and Tissue Culture. Open University Press, Milton Keynes. U.K.
- Scoggins, H. and M. Bridgen. 2014. Plants from Test Tubes: An Introduction to Micro propagation (4th Ed.) Tiber Press.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To make the students familiar with minor horticultural crops having potential in selected areas of the country.

Theory:

Introduction, importance, present status and future scope, Soil and climatic requirements, propagation, cultural operations, harvesting, processing and marketing of following crops: oil palm, jojoba, amla, avocado, pecans, hazel nut, jack fruit, cashew nut, kiwi fruit, kronda, tea, saffron, leek, celery, asparagus, and Brussel's sprout etc.

Practical:

Identification of plants, propagation, raising of nursery, management practices, harvesting and handling.

Learning Outcomes:

Students must be able to propagate and grow prospective horticultural crops as per regional climatic conditions.

Books Recommended:

- Bose, T.K. and S.K. Mitra. 1990. Fruits: Tropical and Subtropical. NayaProkash, Calcutta-Six.
- Mazumdar, B.C. 2004. Minor Fruit crops of India: Tropical and Subtropical. Daya Publishing House, India.
- Singh, A.P. 2002. Vegetable Growing in India. Kalyani Publisher, New Delhi.
- Das, P.C. 2003. Vegetable Crops of India. Kalyani Publisher, New Delhi.
- Das, B.C. and S.N. Das. 2000. Cultivation of Minor Fruits. Kalyani Publisher, New Delhi.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To make students familiar with various rootstocks and stionic interaction in horticultural crops.

Theory:

Introduction and importance, Types of rootstocks, Role of rootstocks in fruits and ornamental plants, Factors affecting stock-scion relationship. Compatibility and incompatibility, types and their impact on rootstock efficiency, Rootstock adaptability under various soils and climatic conditions, Rootstock of major fruits and ornamental plants in relation to vigor, quality, longevity, fruitfulness and resistance to drought, salinity, pest and diseases, Improvement of rootstocks in changing climate scenario, Role of rootstocks in high density plantation.

Practical:

Identification, selection and multiplication of important rootstocks, Identification of different types of incompatibility, Survey of rootstocks used in various commercial gardens, research stations and plant nurseries.

Learning Outcomes:

Students must be able to identify, propagate various types of rootstocks.

Books recommended:

- Adriance, G.W., and F.R. Brison. 2000. Propagation of Horticultural Plants. Biotech Books, Delhi, India.
- Hartmann, H.T., D.E. Kester, E.T. Davies and R.L. Geneve. 2009. Plant Propagation: Principles and Practices (7th Ed.). Prentice-Hall India Learning Pvt. Ltd., New Delhi, India.
- Rajan, S. and P.L. Markose. 2007. Propagation of Horticultural Crops. New India Publishing Agency, India.
- Rom, R.C. and H.F. Carlson (Eds.). 1987. Rootstocks for Fruit Plants. John Wiley and Sons, New York.
- Sharma, R.R. 2002. Propagation of Horticultural Crops: Principles and Practices. Kalyani Publishers, Ludhiana, New Delhi, India.

- ### Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

Theory:

Practical:

Learning Outcomes:

Books Recommended:

- ### Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To in-calculate awareness of scientific knowledge about citrus fruits, and induce aptitude of research.

Theory:

Introduction; Present status and future prospects, history and species concept; Botany; Pomological classification; Phenology; Mineral nutrition; Rootstocks; Spacing of trees; Water relations; Pests, disease and weed control; Pre and Post-harvest physiology; Production problems (decline, alternate bearing, fruit drop and unfruitfulness) and export issues; Varietal improvement; Modern trends in citriculture. Measures for the improvement of Citrus Industry in Pakistan.

Practical:

Morphological studies of flowers, leaves and fruits of different citrus species and their varieties; Identification of different physiological disorders; Diagnosing various nutritional deficiencies, insects and diseases effect; Crossing for inter- and intra-specific hybridization.

Learning Outcomes:

Students must be able to establish and manage citrus orchards.

Books Recommended:

- Alebrigo, L.G., L.W. Timmer and M.E. Rogers. 2014. Citrus, Vol:II. Crop Production Science in Horticulture. CABI.
- Davies, F.S. and L.G. Albrigo. 2003. Citrus Fruits. CAB International, Wallingford, UK.
- Mukhopadhyay, S. 2004. Citrus Production, Postharvest, Diseases and Pest Management. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, India.
- Khan, I. 2007. Citrus Genetics, Breeding and Biotechnology. CAB International, London, UK.
- Singh, S., V.J. Shivanker, A.K. Srivastava and I.P. Singh. 2004. Advances in Citriculture. Jagminder Book Agency, New Delhi, India.
- Rajput, C.B.S. and R. Sri Hariu. 1985. Citriculture. Kalyani Publishers, New Delhi.
- Reuther, W., H.J. Webber, L.D. Batchelor and others. 1967-1989. The Citrus Industry - Vol. I to V. Univ. of Calif. Press, Berkeley.

- Wardowski, W.F., S. Nagy and W. Grierson. 1986. Fresh Citrus Fruits. Avi Publishing Company Inc., Westport, Connecticut.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 709 MANGO AND DATE PALM CULTURE 3(2-2)

Specific Objectives:

To equip the students with scientific knowledge about the most important fruits of the region.

Theory:

History and distribution; Importance, Present status and future prospects, Botany, classification, phenology, climate and environments; Vegetative and reproductive physiology; Orchards management operations and practices, Curing and post-harvest handling; Post harvest chemistry and physiology; Physico-chemical changes; Production problems and disorders; Export issues.

Practical:

Identification of different varieties of mango and date palm; Fruit description Propagation techniques; Date palm pollination; Maturity indices and Curing of mango and date palm. Preparation for export market.

Learning Outcomes:

Students must be able to grow and manage mango and date palm cultivars.

Books Recommended:

- Singh, H.S., V. Nath, A. Singh and S. Mandal. 2008. Mango: Preventive Practices and Curative Measures. Satish Serial Publishing House, Delhi, India.
- Yadav, P.K. 2007. Fruit Production Technology. International Book Distributing Co. (Publishing Division), Lucknow, India.
- Srivastava, R.P. (Ed.). 1998. Mango Cultivation. International Book Distributing Co. (Publishing Division), Lucknow, India.
- Litz, R.E. 2009. The Mango: Botany, Production and Uses. 2nd Edition. CAB International, Wallingford, UK..
- Ahmad, S. 2004. Mangoes in Pakistan. The Horticultural Foundation of Pakistan, Islamabad.
- The Date Palm Journal. Published half yearly by the F AO Regional Project for Palm and Dates Research Center in the Near East and North Africa.

- Proceedings of the 1st & 2nd Symposia on Date palm in Saudi Arabia. 1983 & 1991. King Faisal Univ., Al-Hassa, K.S.A.
- **Relevant Journals/Periodicals and Worldwide Webs.**

Hort. 710

MINOR FRUITS

3(2-2)

Specific Objectives:

To create know how among the students about different fruits grown in different areas of Pakistan at small scale.

Theory:

Introduction and importance, Acreage, production, botany, composition and uses, climate, soil, propagation, rootstocks, cultural practices, cultivars, important insect-pests and diseases, harvesting, post-harvest handling and marketing of fruits such as ber, berries, chiku, coconut, custard apple, fig, falsa, jaman, loquat, mulberry, olive, papaya, pecan pineapple and quince etc.

Practical:

Identification of minor fruit plants and their fruits, layout systems, propagation methods, pruning, harvesting and handling techniques.

Learning Outcomes:

Students must be able to identify and grow minor fruits of the region.

Books Recommended:

- Alford, D.V. 2007. Pests of Fruit Crops. Manson Publishing Delhi, India.
- Das, D.C. and S.N. Das. 2006. Cultivation of Minor Fruits. Kalyani Publishers, Ludhiana, New Delhi, India.
- Philip, S. 2002. Fruit Crops. Kalyani Publishers, Ludhiana, New Delhi, India.
- Singh, S.P. 2005. Commercial Fruits. Kalyani Publishers, Ludhiana, New Delhi, India.
- Steferud, A. 2005. Diseases of Fruits and Nuts. Publisher Biotech Books, Delhi, India.

Journals/Periodicals: Worldwide Web:

Specific Objectives:

To make students familiar with breeding techniques and methodologies in vegetable crops.

Theory:

Objectives of vegetable breeding, Planning breeding programmes, Development of inbred lines, Combining ability, Exploitation of male sterility, Hybrid seed production, Breeding for diseases and stress resistance, Breeding of commercially important vegetables, Improvement of asexually propagated vegetables.

Practical:

Study of floral characters of self and cross-pollinated vegetables, Crossing techniques for important self and cross pollinated vegetables, Selection procedure in cultivars development, Methods of hybrid seed production.

Learning Outcomes:

Students must be skilled in different breeding techniques and their application in vegetable crops.

Books Recommended:

- Bassett, M.J. 1986. Breeding Vegetable Crops. Avi. Pub. Co. Inc., Westport, Connecticut.
- Singh, P.K, S.K. Dasgupta and S.K. Tripathi (Eds.). 2005. Hybrid Vegetable Development. CRC Press, Boca Raton, USA.
- Singh, A.P. 2003. Vegetable Breeding and Seed Production. Kalyani Publishers, New Delhi.
- Basra, A.S. 2000. Hybrid Seed Production in Vegetables. CRC Press, Boca Raton, USA.
- Ram, H.H. 2005. Vegetable Breeding, Principles and Practices. Kalyani Publisher, New Delhi.
- Peter, K. V. and T. Pradeepkumar. 2008. Genetics and Breeding of Vegetable Crops. Indian Council of Agricultural Research , New Dehli, India .
- Acquaah, G. 2012. Principles of Plant Genetics and Breeding. Blackwell publishing, Oxford, UK.
- Kumar, N. 2006. Breeding of Horticultural Crops: Principles and Practices. New India publishing Agency, new Dehli, India

- Rai, N. and M. Rai. 2006. Heterosis Breeding in Vegetable Crops. . New India publishing Agency, new Dehli, India.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 712 VEGETABLE SEED PRODUCTION AND MARKETING 3(2-2)

Specific Objectives:

To make students familiar with techniques and methodologies of seed production, handling, storage, certification, quality control and marketing of vegetable crops.

Theory:

Concept and benefits, Issues in seed production, Ecological aspects of seed production, Seed production and its problems in Pakistan, Seed Production planning and Methods, Seed formation and Development, Hybrid Seed Production, Seed Harvesting Techniques, Seed conditioning and Handling, Quality control and seed marketing, Pests, diseases and their Control.

Practical:

Seed identification, pollination techniques, seed production techniques, Rouging and maintaining isolation, Seed harvesting, Seed extraction, drying and storage.

Learning Outcomes:

Students must be able to understand the various aspects of seed production and marketing.

Books Recommended:

- George, R. A. T. 2009. Vegetable Seed Production (3rd Ed.). CAB International.
- Singh, P. and B.S. Asati. 2008. Seed Production Technology of Vegetable Crops. Daya Publishing House, Delhi, India.
- Kumar, V., N. Singh, Y.K. Singh and D.K. Singh. 2006. Vegetable Seed production technology. International Book Distributing Co., Lucknow, India.
- Singh, T., and K. Agrawal. 2001. Seed Technology and Seed Pathology. Pointer Pub. Rajasthan, India.
- Doijode, S.D. 2002. Seed Storage of Horticultural Crops. CBS Publishers & Distributors, India.
- Copeland, L.O. and M.B.McDonald. 2005. Principles of Seed Science and Technology. 4th Ed. Springer (India) Private Ltd., New Delhi, India.

- Arya, P.S. 2001. Vegetable Seed Production Principles. Kalyani Publishers, India.
- Syed, I.A. 1992. Seed Certification Manual. National Book Foundation, Islamabad.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 713 SOLANACEOUS CROPS

3(2-2)

Specific Objectives:

To equip the students with scientific knowledge about the most important vegetables of the region and world.

Theory:

Introduction, Botany, Classification, Centers of origin, Distribution in the world, Physiology, Nursery raising and crop establishment, Production problems, Seed production and supply of certified seed, Breeding and improvement of the following crops: potato, tomato, brinjal (aubergine), chilies and peppers.

Practical:

Morphology, identification and handling of the seed materials; Seed diseases; Planting methods; Varietal evaluation. In vitro pre-basic seed production.

Learning Outcomes:

Students must be able to identify and grow Solanaceous crops.

Books Recommended:

- Rai N. and D.S. Yadav. 2005. Advances in Vegetable Production. Researchco Book Centre, New Delhi.
- Swiader, J.M. and G. W. Ware. 2002. Producing Vegetable Crops. 5th Ed. Interstate publishers Inc. Danville, Illinois.
- Singh, D.K. 2007. Modern Vegetable Varieties and Production Technology. International Book Distributing Co., Lucknow, India.
- Razdan, M.K. and A. K. Mattoo. 2005. Genetic Improvement of Solanaceous Crops. Vol. 1: Potato. Science Publishers, Inc., Enfield, NH.
- Razdan, M.K. and A. K. Mattoo. 2006. Genetic Improvement of Solanaceous Crops, Vol. 2: Tomato. Science Publishers, Inc., Enfield, NH.

- Bose, T.K., M.G. Som and J. Kabir. 1993. Vegetable Crops. NayaProkash, Calcutta-Six.
- Libner, N.S. 2006. Vegetable Production. Vedams Books Pvt. Ltd. New Delhi, India.
- Decoteau, D.R. 2002. Vegetable Crops. Prentice-Hall of India, New Delhi, India.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 714 VITICULTURE

3(2-2)

Specific Objectives:

To develop human resource familiar with production technology of table grapes

Theory:

Anatomy and Physiology; Botany, root, shoots and buds, leaves and clusters, phenology and growth cycle, fruit composition, environmental strains. Growing grapes; Introduction to grape production, site selection and land preparation, cultivars, rootstocks and propagation, trellising, pruning and training systems, new vineyard establishment, vineyard trellis construction and maintenance, canopy management, cover crops/intercrops, crop management, harvest determination vs. phonological ripeness, winter freezes and spring frosts, vineyard equipments. Soil and nutrient management; Nutrient deficiencies & management, soil management, site preparation. Grapevine Irrigation; Irrigation scheduling, irrigation systems, high efficiency irrigation systems, conventional system. Diseases and Management; Introduction to disease management, concepts in disease management, grape powdery & downy mildew, botrytis, bunch rot, black rot & blight, other grape diseases. Insects and Biological Control; Insect and mite pests in Pakistani vineyards, biological control of insects and mites, beneficial insects and mites. Weed Managements; Non-chemical control strategies, chemical control strategies.

Practical:

Layout of vineyard, preparation of trellis poles, installation of trellis, training of vine on trellis, pruning of spur varieties, pruning of cane varieties, hands on practice of grape propagation; preparation of cuttings, grafting and budding. Use of spray machine, water requirement and irrigation, vineyard floor management, weed management, identification of different grape cultivars, disease identification and control, insect identification and control,

control of bird & hail storm damage, nutrient deficiency symptoms, fruit care on vine, harvesting, grading, packing, storage and transportation, fruit analysis in laboratory, visits of commercial vineyards to observe different varieties and training systems, testing grape maturity, canopy management techniques, calculating fertilizer rates, scouting and monitoring grapevine diseases.

Learning Outcomes:

Students must be having understanding of grape plant physiology, growth and development. They must also be having the skills to develop profitable vineyards and resolve the field issues.

Books Recommended:

- Glen, L. Creasy and Leroy, L. Creasy. 2009. Grapes (Series: Crop Production Science in Horticulture; 16). CPI Group (UK) Ltd. Croydon CR04YY.
- Stephen S.M.W. 2009. VITICULTURE: An introduction to commercial grape growing for wine production. ISBN: 978-0-9514703-2-9. Lulu Print Version. Amazon.co.uk. Publisher SP Sekelton Ltd. Ashford, United Kingdom.
- Winkler, A.J., Cook, J.A., Kliewer, W.M., Lider, L.A. 1974. General Viticulture. University of California Press.
- Rombough, L. 2002. The Grape Grower: A Guide to Organic Viticulture. Publisher: Chelsea Green Publishing Co. White River Junction, United States.
- Powers, T. 2012. The Organic Backyard Vineyard: A step-by-step Guide to Growing your own Grapes. Timber Press United States.
- Choudhary, D., Metha, A. 2010. Commercial Grape Production. In: Fruit Crops. Oxford Books Company, Dehli. Pp: 169-224.
- Rajan, S., Markrose, B.L. 2007. Grapes. In: Propagation of Horticultural Crops. New India Publishing Agency, New Dehli. Pp: 56-61.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To impart knowledge about the mushrooms and develop skills about production technology of commercially important mushrooms.

Theory:

Introduction; present status and future prospects, Nutritional and medicinal values; Classification, morphology and general biology; Spawn preparation; Growing structures and systems; Substrates; Fruiting body formation; Cultivation technology with emphasis on *Agaricus*, *Pleurotus*, *Lentinus* and *Volvariella* species etc.; production problems and disorders, Postharvest handling and value addition, Economics of mushroom production.

Practical:

Media and substrate preparation; Isolation of pure culture for spawn; Structural demonstration of mushroom houses; Environmental control systems; Compost preparation; Practices in growing methods of different cultivated mushrooms.

Learning Outcomes:

Students must be able to identify and grow different species of mushrooms

Books Recommended:

- Biswas, S., M. Datta and S.V. Ngachan. 2011. Mushrooms: A Manual For Cultivation. PHI learning private Ltd., New Delhi, India.
- Chang, S.T., & P.G. Miles: 2004. Mushrooms. Cultivation, Nutritional Value, Medicinal Effects, and Environmental Impact. 2nd Edition CRC, Press.
- Stamets, P. 1993. Growing Gourment& Medicinal Mushrooms. Ten Speed Press, Berkeley, CA.
- Bahl, N. 1994. Handbook on Mushrooms (3rd edition). Oxford & IBH Publishing Company. New Delhi.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To impart knowledge and develop skills about aesthetical and environment-friendly planning of public and private open spaces.

Theory:

Importance of landscape gardening and design, Principles and elements of landscape design, Landscape design materials, Types of designs; formal and informal garden designs, Rockeries, terrace, roof and aquatic gardens, different land forms and their manipulation; functional, architectural and aesthetic uses of plants, landscape design for parks, play fields, highway and roadside plantations, Efficient irrigation system, Cost estimates for landscape, Recent trends in modern landscape.

Practical:

Design process; site inventory and analysis; client interview; base map; master plan; scale drawings; Introduction to computer added designs, Small projects of landscape design (self designed and executed), Water features (ponds, fountains, waterfalls) design and execution; Demonstration of water efficient irrigation systems, Visits to different parks and gardens.

Learning Outcomes:

Students must have skills to design, develop and maintain different landscapes.

Books Recommended:

- Biondo, R.J., and C.B. Schroeder. 2006. Introduction to Landscaping Design, Construction and Maintenance (3rd Ed.). International Book Distributing Company (Publishing Division), Lucknow, India.
- Simonds, J.O. and B. Strake. 2006. Landscape Architecture: A Manual of Land Planning and Design (4th Ed.). McGraw Hill, New York, USA.
- Robinson, P. 2005. The Practical Rock and Water Garden. Anness Publishing Limited, London, U.K.
- Bhattacharjee, S.K. 2004. Landscape Gardening and Design with Plants. Aavishkar Publishers, Distributors, Jaipur, India.
- Raj, D. 2002. Floriculture and Landscaping. Kalyani Publishers, New Delhi, India.

- Ingels, J.E. 1992. Landscaping: Principles and Practices. Delmar Publishing Inc. New York.
- Khan, M.A. and T.A. Bader. 1992. Landscape Designs, Student Manual. University Printing Press, University of Agriculture, Faisalabad.
- Sovinski, R.W. 2009. Materials and their applications in Landscape Design. John Wiley and Sons Inc., Hoboken, New Jersey, U.S.A.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 717 TURFGRASS MANAGEMENT

3(2-2)

Specific Objectives:

To develop knowledge about various turfgrasses for different purposes and their management.

Theory:

Introduction and Importance, Types of grasses and their comparisons for different purposes (lawns, golf courses, playfields), Climate and grass growth. Land preparation, Soil test and soil amendments, Propagation, seeding, sodding/plugging and carpeting, Care for lawn grasses, Cultural practices; watering, mowing, fertilization, weeding, insects-pests, diseases and their control, thatching and aeration etc.

Practical:

Identification of lawn grasses. Establishing lawn plots by seed, sodding and carpeting, Growth monitoring, Mowing regimes, Aeration, thatching and other management practices, Identification of turf insects, pests and diseases.

Learning Outcomes:

Students must be able to establish and maintain turf grasses in different premises.

Books Recommended:

- Aldous, D. 1991. Lawn Care and Lawn Care Alternatives. Lothian Publishing, Australia.
- Hessayon, D.G. 1998. The Lawn Expert, PBI Publishing, England.
- Christians, N. 2003. Fundamentals of Turfgrass Management (2 sub edition)Wiley
- Puhalla, J., J. Krans and M. Goathley. 1999. Sports Fields: A Manual for Design, Construction and Maintenance. John Wiley and Sons, New Jersey, U.S.A.

- Quast, D.H. and W. Otto. 2004. Golf Course Turf Management: Tools and Techniques. McGraw Hill Book Co, U.S.A.
- John, R. 2003. Turfgrass Installation, Management and Maintenance. McGraw Hill Co., U.S.A.
- Turgeon, A.J.J. 2007. Turfgrass Management (8th Ed.). Prentice-Hall.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 718 ADVANCED FRUIT SCIENCE

3(2-2)

Specific Objectives:

To equip the students with recent advances in fruit science.

Theory:

Present status and future scope of fruit industry, Recent advances in fruit science, Plant relations with water, nutrition, light, temperature etc. Tree phenology; vegetative and reproductive physiology, Source sink manipulation, Problems related to fruitfulness, Fruit setting and development, High density planting and its management, Commercial uses of growth substances.

Practical:

Relevant field and laboratory studies, surveys and assignments, Identification of fruit production problems, Nutrition management, high efficiency irrigation, pruning and training of fruit trees, Visits of global GAP registered orchards and nurseries.

Learning Outcomes:

Students must be able to apply recent advances in fruit science for quality production of fruits.

Books Recommended:

- Singh, A. 2003. Fruit Physiology and Production (5th Ed.). Kalyani Publishers, New Delhi.
- Gardener, V.R. 2001. The Fundamentals of Fruit Production (5th Ed.). McGraw Hill Book Company, USA.
- Barooh, S. 1998. Modern Fruit Culture. Kalyani Publishers, New Delhi.
- Chottopadhyay, T.K. (Ed.). 2003. A Textbook on Pomology, Vol. I: Fundamentals of Fruit Growing. Kalyani Publishers, Ludhiana, New Delhi, India.

- Jackson, D.I., N.E. Looney (Eds.). 1999. Temperate and Subtropical Fruit Production (2nd Ed.). CAB International Publishing, Wallingford, U.K.
- Joseph, H.G. 2008. Modern Fruit Production. Stratford Press Inc., New York.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 719 ADVANCED VEGETABLE SCIENCE 3(2-1)

Specific Objectives:

To equip the students with recent advances in vegetable science.

Theory:

Introduction, Principles of crop establishment and flower induction in vegetables, Role of environment on physiology, growth, development and yield, Recent advances in vegetable science, Trends in organic vegetable production, Soil-less culture, Mechanization in vegetable production and harvesting, Seedlessness in vegetables (watermelon, cucumber tomatoes, etc), Conservation of indigenous germplasm, Concepts for production, grading and quality standards according to GLOBALGAP certification and WTO regimes.

Practical:

Relevant field and laboratory studies (including biochemical analysis), Surveys and assignments, Identification of vegetable production problems and their remedies, Food safety measures, Visit to progressive vegetable farms.

Learning Outcomes:

Students must be able to apply recent advances in vegetable science for quality production of vegetables.

Books Recommended:

- Rana, M.K. 2008. Scientific Cultivation of Vegetables. Kalyani Publishers, Ludhiana, New Delhi, India.
- Rana, M. K. 2012. Modern Concepts of Vegetables Production. Biotech. Books, New Delhi.
- Rai N. and D.S. Yadav. 2005. Advances in Vegetable Production. Researchco Book Centre, New Dehli.

Implications of landscape pattern with focus on populations and meta-populations, communities, and ecosystem processes. Landscape management: Humans approach in managing complex landscapes to achieve management objectives, Conservation biology and ecosystem management.

Learning Outcomes:

Students must be able to understand the ecological aspects of landscape establishment and management.

Books Recommended:

- Wu, J. and R.J. Hobbs. 2009. Key Topics in Landscape Ecology. Cambridge University Press, Cambridge, UK.
- Burel, F. and J. Baudry. 2003. Landscape Ecology: Concepts, Methods and Applications. Science Publishers, Enfield NH.
- Turner, M.G., R.H. Gardner and R.V. O'Neill. 2001. Landscape Ecology in Theory and Practice: Pattern and Process. Springer-Verlag, New York.
- Hitchmough, J.1994. Urban Landscape Management. Inkata Press, Sydney.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 721 HORTICULTURAL SEED SCIENCE AND TECHNOLOGY 3(2-2)

Specific Objectives:

To acquaint students with modern seed production, processing and handling techniques.

Theory:

Introduction and importance, Seed classification, Pre and postharvest factors affecting seed quality, Seed harvesting techniques, Conditioning and handling, Quality control, Seed dormancy, after ripening and their treatments, Seed moisture and desiccation in relation to seed quality, Storage and longevity, Seed testing; Ageing and deterioration, Priming, Coating, their merits and demerits, Seed certification and registration systems.

Practical:

Seed identification of horticultural crops, Demonstration on cross sectional diagrams of seed structures, Harvesting and extraction, Handling of seed, Drying and storage of seed, Seed desiccation and moisture determination methods, Seed viability and vigor tests.

Learning Outcomes:

Students must be able to understand the various aspects of seed science and technology.

Books Recommended:

- Basra, A.S. 2006. Handbook of Seed Science and Technology (1st Ed.). CRC Press.
- Chakrabarti, S.K. 2010. Seed Production and Quality Control. Kalyani Publishers, Ludhiana, India.
- George R.A.T. 2009. Vegetable Seed Production (3rd Ed.). CAB International.
- McDonald, M.B. and F.Y. Kwong. 2005. Flower Seeds: Biology and Technology. CAB International.
- Vanangamudi, K., N. Natarajan, A. Bharathi, R. Umarani, K. Natrajan and T. Saravanan. 2006. Advances in Seed Science and Technology, Vol. 1: Recent Trends in Seed Technology and Management. Agrobios, India.
- Roberto, L., B. Arnold and R.A. Sanchez. 2004. Handbooks of Seed Physiology: Applications to Agriculture. Food Products Press.
- Doijode, S.D. 2002. Seed Storage of Horticultural Crops. CBS Publishers & Distributors, India.
- Arya, P.S. 2001. Vegetable Seed Production Principles. Kalyani Publishers, India.
- Syed, I.A. 1992. Seed Certification Manual. N.B.F., Islamabad.
- Singh, T., and K. Agrawal. 2001. Seed Technology and Seed Pathology. Pointer Pub. Rajasthan, India.
- Anonymous. 1976. Seed Act. Government of Pakistan, Federal Seed Certification Department. Ministry of Food, Agriculture and Cooperatives, Islamabad.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To acquaint the student with the genetic tools and their use for improvement of horticultural crops.

Theory:

Definition & origin, Basic terminologies, Modern concept of Biotechnology, Multiple faces of Biotechnology, Biotechnology for the improvement of Horticultural crops, Somaclonal variation, Somatic hybridization, Cytoplasmic hybridization, Isolation of plant DNA, DNA Sequencing, Molecular markers and markers assisted selection of crop cultivars (MAS), Genetic engineering techniques, Cell & tissue culture technology, Genetic transformation, *In vitro* mutation breeding, Serological and biochemical methods for plant indexing.

Practical:

Protoplast isolation and fusion, Isolation and quantification of DNA & RNA, Polymerase Chain Reaction (PCR), DNA markers, General procedure for ELISA, Protein extraction, Gel Electrophoresis, Agro-bacterium mediated transformation, *In vitro* mutation breeding methods, Use of different mutagens.

Learning Outcomes:

Students must be able to understand the biotechnological aspects of horticultural crops establishment and management.

Books Recommended:

- Chawla, H.S. 2002. Introduction to Plant Biotechnology. Science Publishers, USA.
- Vyas, S.P. and D.V. Kohli. 2003. Methods in Plant Biotechnology and Bioengineering. CBS Publishers & Distributors, New Delhi, India.
- Debnath, M. 2011. Tools and Techniques of Biotechnology. Pointer Publishers, Jaipur, India.
- Keshavachandran, R. and K.V. Peter. 2008. Plant Biotechnology: Methods in Tissue Culture and Gene Transfer. Orient Blackswan Pvt. Ltd., Chennai, India.
- Prasad, S. 2004. Impact of Plant Biotechnology on Horticulture (3rd Ed.). Agrobios, Jodhpur, India.
- Purohit, S. S. 2007. A Laboratory Manual of Plant Biotechnology (2nd Ed.). Agrobios, Jodhpur, India.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To impart knowledge on physiological processes of growth and productivity in horticultural crops.

Theory:

Introduction and importance, Physiological basis of growth and crop productivity, Crop responses to various environmental factors (light, temperature, water and nutrient regimes etc.), Source-sink relationship, Dormancy; important types, mechanism and management, Floral development mechanism, Physiology of fruit setting, development, maturation, ripening, abscission and senescence, Pigmentation, Physiology of climacteric and non-climacteric commodities in relations to respiration, Photosynthetic efficiency of C₃, C₄ and CAM plants, Physiological responses in relation to drought, water logging, temperature and salinity, Crop responses to CO₂ fertilization.

Practical:

Experiments to study the effects of drought, water logging, temperature (high and low) and salinity on germination, growth, yield and quality, Study of cell membrane stability under stress conditions through conductivity meter, Studies on vegetative and reproductive buds development stages in various horticultural crops, Physiology of ripening stages of fruits and vegetables. Visit to horticulture fields and laboratories of advance research.

Learning Outcomes:

Students must be able to identify, propagate various types of rootstocks.

Books Recommended:

- Bleasdale, J.K.A. 2014. Plant Physiology in Relation to Horticulture, 2nd Ed. Scientific publishers, Jodhpur, India.
- Dugger, B.M. 2009. Plant Physiology with special reference to plant production. Bibliobazaar, LLC.
- Salisbury, F.B. and C.W. Ross. 2007. Plant Physiology (4th Ed.) Thomson Wadsworth, Inc., Anubha printers, Noida U.P.

- Trivedi, P.C. 2006. Advances in Plant Physiology. ICAR, Punjab Agricultural University, Ludhiana, India.
- Taiz, L. and E. Zeiger. 2002. Plant physiology (4th Ed.) Sinauer Associates, Inc., Publishers Sunderland, Massachusetts.
- Davis, P.J. 1995. Plant Hormones: Physiology, Biochemistry and Molecular Biology (2nd Ed.). Kulwer Academic Publishers, Netherlands.
- Wein, H.C. (Ed.). 1997. The Physiology of Vegetable Crops. CAB International Publications, New York.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 724 POST-HARVEST PHYSIOLOGY

3(2-2)

Specific Objectives:

To teach the students about physiology of horticultural produce to minimize post-harvest losses.

Theory:

Introduction, Factors affecting produce quality and shelf-life, Perishable and non-perishable commodities, Compositional changes, Physiological and biochemical processes in horticultural commodities under different types of storage in relations to maturation, ripening and senescence, Role of ethylene in ripening, Ethylene scrubbers, Role and regulation of environmental factors in storage, temperature, humidity, oxygen, carbon dioxide and ethylene, Physiological and pathological disorders in storage.

Practical:

Methods of assessing maturity indices of horticultural produce, Starch iodine test, Firmness, TSS, sugars and ascorbic acid; Calculation of titratable acidity, Vase life of cut flowers; Identification of postharvest physiological disorders; Electrolyte Leakage; Packaging methods of different horticultural commodities, Other Relevant field and laboratory studies, Visit of grading and processing plant and cold stores.

Learning Outcomes:

Students must be able to apply their knowledge to maintain quality and extend storage life of horticultural produce.

Books Recommended:

- Bleasdale, J.K.A. 2014. Plant Physiology in Relation to Horticulture, 2nd Ed. Scientific publishers, Jodhpur, India.
- Kader, A.A. 2002. Postharvest Technology of Horticultural Crops. Oakland University of California, Division of Agriculture and Natural Resources Publication.
- Kays, S.J. 1998. Postharvest Physiology of Perishable Plant Products. CBS Publishers & Distributors, New Delhi, India.
- Kumar, P.S. and M. Kanwat. 2009. Post-harvest Physiology and Quality Management of Fruits and Vegetables. Publisher: Agrotech Books, India.
- Mitra, S.K. 1997. Post-Harvest Physiology and Storage of Tropical and Sub-tropical Fruits. CAB International Publishing, Wallingford, U.K.
- Sadiq M., J. Ahmed, M.G. Lobo and F. Ozadali. 2012. Tropical and Subtropical Fruits: Postharvest Physiology, Processing and Packaging. Wiley-Balckwell Publisher.
- Shewfelt, R.L. and S.E. Prussia (Eds.). 1993. Postharvest Handling: A Systems Approach. Academic Press, California, USA.
- Wills, R.B.H., B. McGlasson and D. Graham, 1998. Post-Harvest: An Introduction to the Physiology and Handling of Fruits, Vegetables and Ornamentals. CABI.

Relevant Journals/Periodicals and Worldwide Webs.

Specific Objectives:

To train students about horticultural crop production under environmental stresses stressed and their mitigation

Theory:

Introduction, Types of abiotic stresses and their impacts on growth and productivity, (salinity, drought, temperature, herbicide and heavy metals), Potential morpho-physiological and biochemical indicators of stresses, Mechanism of stress tolerance; Role of enzymatic and non-enzymatic systems in stress tolerance, Strategies to mitigate stress induced phytotoxicity and augmentation in stress tolerance potential.

Practical:

Relevant field and Laboratory studies, surveys and assignments, Study of effects of abiotic stresses in propagation, physiology, growth, flower manipulation and yield of different horticultural crops.

Learning Outcomes:

Students must have knowledge of various abiotic stresses, their phytotoxicity and alleviation techniques.

Books Recommended:

- Shahbala, S. 2012. Plant Stress Physiology. CABI, USA.
- Rao, K. V. M., Raghavendra, A. S., Reddy, J. K. 2006. Physiology and Molecular Biology of Stress Tolerance in Plants. Springer
- Pareek, A. S. 2009. Abiotic Stress Adaptation in Plants. Springer, Dordrecht, Neatherland.
- Upadhyay, R. 2012., Plant Stress Physiology; Physiological and Biochemical Perspectives. LAP Lambert Academic Publishing, Germany.
- Venkateswarlu, B. 2012. Crop Stress and its Management: Prospective and Strategies. Springer Dordrecht Heidelberg London, New York.
- Tuteja, N. 2011. Omics and Plant Abiotic Stress Tolerance. Bentham Books, USA.

- Rao, K.V. M., A.S. Raghavendra, K. J. Reddy . 2006. Physiology and Molecular Biology of Stress Tolerance in Plants. Springer, Dordrecht, The Netherlands.
- Peter, K. V. 2011. The Science of Horticulture (Vol.II). New India publishing Agency, New Delhi, India
- Vahdati, K. and C. Leslie. 2013. Abiotic Stress - Plant Responses and Applications in Agriculture. InTech, Rijaka, Croatia.

Hort. 726

ADVANCED VEGETABLE SCIENCE

3(2-2)

Specific Objectives:

To equip the students with recent advances in vegetable science.

Theory:

Introduction, Principles of crop establishment and flower induction in vegetables, Role of environment on physiology, growth, development and yield, Recent advances in vegetable science, Trends in organic vegetable production, Soil-less culture, Mechanization in vegetable production and harvesting, Seedlessness in vegetables (watermelon, cucumber tomatoes, etc), Conservation of indigenous germplasm, Concepts for production, grading and quality standards according to GLOBALGAP certification and WTO regimes.

Practical:

Relevant field and laboratory studies (including biochemical analysis), Surveys and assignments, Identification of vegetable production problems and their remedies, Food safety measures, Visit to progressive vegetable farms.

Learning Outcomes:

Students must be able to apply recent advances in vegetable science for quality production of vegetables.

Books Recommended:

- Rana, M.K. 2008. Scientific Cultivation of Vegetables. Kalyani Publishers, Ludhiana, New Delhi, India.
- Rana, M. K. 2012. Modern Concepts of Vegetables Production. Biotech. Books, New Delhi.
- Rai N. and D.S. Yadav. 2005. Advances in Vegetable Production. Researchco Book Centre, New Delhi.
- Swiader, J.M. and G. W. Ware. 2002. Producing Vegetable Crops. 5th Ed. Interstate publishers Inc. Danville, Illinois.

- Singh, D.K. 2007. Modern Vegetable Varieties and Production Technology. International Book Distributing Co., Lucknow, India.
- Nonnecke, I.L. 2006. Vegetable Production. Springer Publishers, India.
- Singh, J., S. K. Jain and L. K. Dashora. 2013. Precision Farming in Horticulture. New India publishing agency. New Dehli India.
- Arunkumar, R., K.R. Vijayalatha, K. Kannan, V. Thirumalmurugan, K. Latha and S.N. Kumar. 2008. Innovative Horticulture. New India publishing Agency, new Dehli, India.
- Singh, P. K., S. K. Dasgupta, S. K. Tripathi. 2006. Hybrid vegetable development. International book distributing co. Lucknow, India.
- Sharaf, S. 2012. Green House Management of Horticulture Crops. Oxford Book Company New Dehli, India.
- Wein, H.C. 1997. The Physiology of Vegetable Crops. CAB. International Publications, New York.
- Gupta, S.K. 2008. Organic Vegetable Production. Rajat Publications, India.

Relevant Journals/Periodicals and Worldwide Webs.

Hort. 727 LANDSCAPE ECOLOGY 3(3-0)

Specific Objectives:

To acquaint students with ecological approaches to Landscape design for sustainable environment.

Theory:

Introduction, Spatial pattern and process, Characterization of spatial pattern, Detecting and characterizing landscape patterns, Finding the characteristic scale of spatial pattern, defining the elements of pattern, connectedness, fractal geometry and percolating networks, and their interrelation in landscapes, Development of landscapes patterns, Agents of pattern formation: the physical template of environmental constraints, biotic processes and disturbance regimes. Landscape dynamics, Change of landscape patterns and processes through time, including techniques for detecting, analyzing, or simulating landscape change; Modeling populations or communities in landscape mosaics (including spatially implemented meta-population models). Implications of landscape pattern with focus on populations and meta-populations, communities, and ecosystem processes. Landscape management: Humans approach in

managing complex landscapes to achieve management objectives, Conservation biology and ecosystem management.

Learning Outcomes:

Students must be able to understand the ecological aspects of landscape establishment and management.

Books Recommended:

- Wu, J. and R.J. Hobbs. 2009. Key Topics in Landscape Ecology. Cambridge University Press, Cambridge, UK.
- Burel, F. and J. Baudry. 2003. Landscape Ecology: Concepts, Methods and Applications. Science Publishers, Enfield NH.
- Turner, M.G., R.H. Gardner and R.V. O'Neill. 2001. Landscape Ecology in Theory and Practice: Pattern and Process. Springer-Verlag, New York.
- Hitchmough, J.1994. Urban Landscape Management. Inkata Press, Sydney.

Relevant Journals/Periodicals and Worldwide Webs.

Standard 2-1: The curriculum must be consistent and supports the program's documented objectives.

The assessment of curriculum given in the following table and the courses are cross tabulated according to the program outcomes.

Table-6: Courses vs. program Objectives

Course/ Groups of Course	Objectives				
	1	2	3	4	5
Hort-712	XXX	X	X	X	XX
Hort-707	X	XX	XXX	X	XX
Hort-702	XXX	XX	X	XXX	XX
Hort-706	XX	X	XXX	XX	X
Hort-719	X	XX	XXX	X	XX
Hort-720	XXX	XX	X	XXX	XX

Course/ Groups of Course	Objectives				
	1	2	3	4	5
Hort-703	XXX	XX	XX	X	XX

Hort-704	X	XXX	XX	X	XX
Hort-705	XXX	X	XXX	XXX	XX
Hort-710	XX	XX	X	XX	X
Hort-711	X	XXX	XX	X	XX
Hort-713	XXX	XXX	XX	XXX	XX
Hort-719	XX	XX	XXX	XX	X
Hort-7 20	XXX	X	XXX	XX	XXX

X: relevant

XX: relevant and satisfactory

XXX: very relevant and satisfactory

- The curriculum fits very well and satisfies the core requirements for the program, as specified the respective accreditation body.
- The curriculum satisfied the general arts and professional and other discipline required for the program according to demands and requirements set by HEC.

Standard 2-2: Theoretical background, problem analysis and solution design must be stressed within the problem core material.

The meeting standard of this clause is tabulated in the following:

Table-7: Standard 2-2 requirement (percentage of elements in courses)

Elements	Courses	Title of the Courses
Theoretical background	Hort - 701	Rootstock for Horticulture Crops
	Hort - 706	Landscape horticulture
	Hort - 709	Plant growth regulator
	Hort - 713	Environmental Horticulture
	Hort- 720	Seminar
Problem analysis	Hort - 702	Physiology of Horticulture Crops
	Hort - 703	Advanced fruit production
	Hort - 704	Advanced Vegetable production
	Hort - 707	Nutrition of horticulture crop
	Hort - 711	Advance ornamental Plant Production
	Hort - 719	Special Problem
Solution design	Hort - 705	Breeding Of Horticulture Plants
	Hort - 710	Plant Tissue Culture
	Hort - 712	Post Harvest Physiology of Horticulture Crops

Standard 2-3 to standard 2-5

The above cited standards have already been justified in table 8.

Standard 2-6: Information Technology Component of the Curriculum must be developed and applied in the Program.

While the curriculum was prepared, all aspects of information technology were considered and after a critical analysis, relevant aspects were integrated into the program as: Computer and I.T. courses (3 credit hours) have been integrated in the curriculum of M.Sc (Hons). Students which fulfill the requirements for equipping the students with I.T knowledge.

Standard 2-7: Oral and written communication skills of the student must be developed and applied in the program.

- Two seminars having one credit hour each are compulsory at the Post-graduate level.

- Assignments are given to M.Sc. (Hons) students on specific titles (part of the course) which are presented orally and are submitted as written report, to increase their oral and written communication skills.

Criterion 3: LABORATORIES AND COMPUTING FACILITIES

There are four laboratories in the department. The facilities and shortcomings of these laboratories are listed as under.

- **Laboratory Title:**
 1. Tissue Culture Laboratory I
 2. Tissue Culture Laboratory II
 3. Horticulture Analytical Post harvest laboratory
 4. Horticulture lab Koica Capacity building
 5. University research farm Koont (3-Rooms)
- **Location and Area:** Faculty of Crops and Food Sciences, A-Block, 1st Floor, Main Campus, Koica building, University Research Farm Koont.
- **Objectives:** Laboratories are used for: Practical exercise and demonstrations to graduate students in their introductory and major courses. Research work for the graduate and post-graduate students.

Shortcoming:

More number of labs are required for increasing number of students. The standard requirements in view of operation and quality, available resources and expansion programs are vitally required. Major apparatus viz. equipment: along with necessary chemicals are needed. Teachers usually arrange the lecture material and helping literature at their own expense. Some manuals/broachers are being prepared by the academic staff.

- **Safety Regulations:**

Safety measures are not available against fire (Extinguishers), minor hazards and accidents, injuries (First Aid Kit). However, the University maintains a Medical Dispensary for such incidents where the required apparatus is insufficient.

Standard 3-1: Laboratory Manuals/ documentation/instructions experiments must be available and readily accessible to faculty and students.

Laboratory manuals (tissue culture lab, horticulture manuals etc) are available. The department library has the collection of books but still a number of books are required.

Standard 3-2: There must be adequate support personnel for instruction and maintaining laboratories

There is shortage of laboratory assistants and laboratory attendants and are direly needed to maintain laboratory, equipment, glassware, chemicals, material etc.

Standard 3-3: The University computing infrastructure and facilities must adequate to support program's objectives.

- **Computing facilities support:** Not available to all faculty members and the post graduate students.
- **Shortcoming in computing infrastructure:** Computers with internet facilities should be available to all faculty members and postgraduate students on individual basis.
- **Safety Arrangements:** There are no proper safety arrangements and no security plan is available in case of emergency. The department is located on the 2nd floor; there are no emergency exits for the labs. No fire extinguishers have been installed in any laboratory or in the offices. No first aid kits/facilities provided in the laboratories/department.

MAIN LIBRARY AND DEPARTMENTAL LIBRARY

- Books in Main Library related to Horticulture Subject : 346
- Departmental Library : 263
- Dr. Dawood has donated Books : 97

Total Books related to Horticulture Department : 706

Criterion 4: STUDENT SUPPORT AND ADVISING

Our University organizes support programs for students and provide information regarding admission, scholarship schemes etc. Department in its own capacity arranges orientation and guided tours of the department. Director Students Affairs is also there and

arranges various cultural and social activities and solves the students' problems. However currently there is no Parent/Teacher association.

Standard 4-1: Courses must be offered with sufficient frequency and number for students to complete the program in a timely manner.

- Courses are taught as per criteria of HEC.
- At undergraduate level subjects/ courses are offered as per scheme of study provided by the HEC and approved by Academic Council. Postgraduate level courses are however offered according to the availability of the teacher and number of students.
- Elective courses are offered as per policy of HEC and the University.
- For post graduate programs, a variety of courses is offered according to demand of the profession.

Standard 4-2: Courses in the major area of study must be structured to ensure effective interaction between students, faculty and teaching assistants.

To ensure effective interaction and understanding between students, faculty and teaching assistants, at the time of course formulation both theoretical and field/practical aspects are focalized. Theoretical problems are explained and assignments are also given to the students whereas practical are carried out in the labs and filed. Field visits and study tours to various research organizations are also organized to keep them update on the latest developments in the area and to stimulate them for discussion through teacher/student interaction.

- Courses are developed and decided in the board of studies meeting.
- At the commencement of the semester, faculty members interact frequently among themselves and with students. Students are welcome to ask question in class and even after the class.

Standard 4-3: Guidance on how to complete the program must be available to all students and access to academic advising must be available to make course decisions and career choices.

Several steps have been taken to provide students guidance such as:

- Students are informed about the program requirement through the office of the head of the department.

- Through the personal communication of the teachers with the students.
- Monthly meetings are organized by the head of the department for counseling of the students. In addition, students can also contact with the relevant teachers whenever they face any problem.
- It is necessary for the students to participate in the monthly meeting.
- In case of some problem Director Student Affairs appointed by the university, helps the students.
- Student can interact with the teachers/scientist in universities or research organization whenever they needed and there is an open option for the students to get the membership in the professional societies like National Rose Society Islamabad, Horticultural Society of Pakistan, National Horticulture Society, Pakistan Horticulture Society, Pakistan Botanical Society and other relevant professional societies.
- Realizing the need for exploring job opportunities for the university graduates, Directorate of Placement Bureau has been established.

Criterion 5: PROCESS CONTROL

It includes student admission, students' registration, faculty recruitment activities, which are dealt by various statutory bodies and the university administration.

Standard 5-1: The process by which students are admitted to the program must be based on quantitative and qualitative criteria and clearly documented. This process must be periodically evaluated to ensure that it is meeting its objectives.

- The process of admission is well established and followed as per rules and criteria set by HEC. For this purpose an advertisement is published in the National News Papers by the Registrar Office.
- An admission criterion for M.Sc. (Hons) is same as mentioned in section 2.
- An admission criterion is revised every year before the announcement of admissions.

Standard 5-2: The process by which students are registered in the program and monitoring of students progress to ensure timely completion of the program must be documented This process must be periodically evaluated to ensure that it is meeting its objectives.

- The student name, after completion of the admission process, is forwarded to the Registrar Office for proper registration in the specific program and the registration number is issued to the student.
- Students are evaluated through Mid, Final and Practical exams and through Assignments.
- Registration is done for one time for each degree but evaluation is done through the result of each semester. Only those students who fulfill the criteria of the University, they are promoted to the next semester.
- In general, the students are registered on competition bases keeping in view the academic and research standards.

Standard 5-3: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institution mission statement. These processes must be periodically evaluated to ensure that it is meeting with its objectives.

- Vacant and newly created positions are advertised in the national newspapers, applications are received by the Registrar office, and call letters are issued to the short-listed candidates on the basis of experience, qualification, publications and other qualities/activities as determined by the University.
- The candidates are interviewed by the University Selection Board and Principal and alternate candidates are selected.
- Selection of candidates is approved by the Syndicate for issuing orders to join within a specified period.
- Induction of new candidates depends upon the number of approved vacancies.
- Standard set by HEC are followed.
- At present, no procedure exists for retaining highly qualified faculty members. However, the revised pay scales structure is quite attractive.
- HEC also supports appointment of highly qualified members as foreign faculty Professors, National Professors and deputed them in concerned departments of the University.

Standard 5-4: The process and procedures used to ensure that teaching and delivery of course material to the students emphasizes active learning and that course learning outcomes are met. The process must be periodically evaluated to ensure that it is meeting its objectives.

- To provide high quality teaching, department periodically revises the curriculum depending upon requirements, innovations and new technology.
- With the emergence of new fields, new courses are introduced, and included in the curriculum.
- The easily available books in the University library are provided to the students for the preparation of different courses. Additionally, copying and internet facilities are also available to the students.
- Notes are also prepared by the teachers and given to the students other than different handouts
- Most of the lectures are supplemented by overheads, slides and pictures.
- All efforts are made that the courses and knowledge imparted meet the objectives and outcome. The progress is regularly reviewed in the staff meetings.

Standard 5-5: The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.

- The controller of examinations announces the dates of commencement of examination. After each semester, the controller office notifies the results of the students. The evaluation procedure consists of quizzes, mid and final examinations, practical, assignments and reports, oral and technical presentations. The minimum pass marks for each course is 40% for Master degree in theory and practical separately.
- In theory, weightage to each component of examination is as prescribed here under:

Mid Examination	30%
Assignments	10%
Final Examination	60%

- Grade points are as follows

Marks obtained	Grade	Grade point	Remarks
80-100 %	A	4	Excellent
65-79 %	B	3	Good
50-64 %	C	2	Satisfactory
40-49 %	D	1	Pass
Below 40 %	F	0	Fail

- Gold medals are awarded to the students who secure highest marks. Degrees are awarded to the students on the annual convocation that is held late every year.

Criterion 6: FACULTY

Standard 6-1: There must be enough full time faculty who are committed to the program to provide adequate coverage of the program areas/ courses with continuity and stability. The interests and qualifications of all faculty members must be sufficient to teach all courses, plan, modify and update courses and curricula. All faculty members must have a level of competence that would normally be obtained through graduate work in the discipline. The majority of the faculty must hold a Ph.D. in the discipline.

Table-8: Faculty distribution by program areas in Horticulture

Program area of specialization	Courses in the area and average number of sections per year	Number of faculty members in each area	Number of faculty with Ph.D. degree
Post-harvest	2	2	2
Tissue Culture	2	2	2
Protected Cultivation	2	2	2
Floriculture	2	2	1
Landscape Horticulture	1	1	1
Olericulture	2	2	2
Mushroom and Medicinal plants	2	1	-

Standard 6-2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programs for faculty development must be in place.

- Professional training and availability of adequate research and academic facilities are provided to the faculty members according to the available resources.
- Currently two faculty members are abroad on study leave for doctoral degree as sponsored by the different organizations.

- Incentives in the form of allowances to these supervisors have been implemented lately to promote high standard research.
- Existing facilities include mainly internet access, which is available through networking system in addition to library facility with latest books is also available.
- Effective programs for faculty development have been just introduced since the last semester.

Standard 6-3: All faculty members should be motivated and have job satisfaction to excel in their profession

- Time to time provision of enthusiasm to the young faculty by the senior faculty members.

Faculty survey

The results of faculty survey were summarized in the form of bar charts quoted in the previous pages.

Criterion 7: INSTITUTIONAL FACILITIES

The university administration has been struggling hard to strengthen all the departments and up-gradation of departments and establishing new faculties and Institutes. The university is also trying to attract highly qualified faculty. Following needs to focus on:

- The institution must have the infrastructure to support new trends in learning such as e-learning including digital publications, journals etc.
- The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel. Department main library's have technical collection of 360 books. Recommended books, relevant journals of the programs are available to the students and to the teachers as well.
- These aspects need to be strengthened in number and space.
- Class rooms must be adequately equipped, especially the multimedia facility.
- In horticulture, offices for faculty staff are available, thus each faculty member is accommodated with separate room and the rooms are quite enough to carry out their official responsibilities.

Standard 7-1: The institution must have the infrastructure to support new trends in learning such as e-learning

The faculty has access to E-library which is very helpful for the high quality education and producing research of international standard. They also have access to the internet. However the department has the following shortcomings/problems:

- Majority of the faculty members do not have access to the PCs. Computers are not provided by the university.
- The internet services provided by the university are good enough but the speed of internet is slow and often internet does not work. The telephones are also connected with the internet and the services are often breached.
- Breach of power intermittently, due to which research and academic work both are suffered.
- Majority of equipments are out of order thus they need repairment.
- Latest and modern molecular equipments or apparatus are available.
- Untrained supporting staff.
- Faculties lack practical knowledge of modern and molecular techniques.
- Scanty budget for consumables.

Standard 7-2: The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel.

The University Central Library has very limited number of books, journals and periodicals. It's a small library in term of space and facilities with no catalogue systems. It does not meet the standards of a University Library. However department itself owns few books.

Standard 7-3: Class-Rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities.

Currently only 2 class rooms are available but the space is limited. 3 Multimedia are available for the lecture halls. Practical lab space is also available. This affects the quality of teaching. Faculty members are accommodated with 11 offices.

Criterion 8: INSTITUTIONAL SUPPORT

The following are mentioned against this criterion:

- Due to unavailability of class rooms, classes are taken in the laboratories. Therefore, it is imperative to arrange more classes for quality teaching.
- As mentioned earlier, faculty offices are inadequate and therefore two or three teachers have one office room.
- Space limitation is the major constraint in the development and strengthening of discipline.
- There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars.
- The experienced teachers are not provided the house accommodation by the university and are living in the rented houses with exorbitant rent within the source of mere salary, thus become difficult to concentrate on the efficient working. Therefore house accommodation is indispensably required for the department staff.
- Insufficient secretarial support, technical staff and office equipment.
- Staff attendant/s not available.

Standard 8-1: There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars.

- At present department is not having sufficient financial resource to maintain the present needs of the department. Individual research grants for students and faculty are mainly supporting the departmental research activities. Due to lack of proper facilities like fruit orchard the students conduct their research at different areas. There is a dire need for increasing the financial resources allocated to the department to establish a library, laboratories and computer facilities. Horticulture department has submitted a project for strengthening of department and it is hoped to be funded during the next year. Suggestions and factors that can contribute to the motivation of the faculty are given as follows:
- Research grants for young faculty members may be allocated.
- Trainings should be arranged in abroad to train the faculty members.

Standard 8-2: There must be an adequate number of high quality graduate students, research assistants and Ph.D. students

The intake of M.Sc. (Hons) students is once in a year. A strict merit policy is applied during admission coupled with GRE/NTS or entry test. A detail of the Students enrolled during the past seven years is given in the following Table.

Table-9: Enrollment in different programs from 2006-18

Discipline	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
M.Sc. (Hons)	05	08	08	11	05	09	12	20	53	24	16	34

Standard 8-3: Financial resources must be provided to acquire and maintain Library holdings, laboratories and computing facilities.

Total budget of the department for the financial year 2017-18 is **Rs 50,000** which hardly fulfill the departmental needs particularly for the purchase of contingency items. University also used to provide additional amount upon request if required. The computing facilities were provided on limited basis from the approved HEC project of Horticulture department.

Executive Summary

Horticulture department initiated functioning during 1979 with in shortest possible time; the department achieved the possible success in the area for teaching, research and training. The degree course of MSc. (Hons) in Horticulture is being offered to 50 students each year. The admissions in M.Sc (Hons) are open in both autumn and spring semesters. Short courses on various aspects of horticulture including tunnel farming, fruit nursery raising and flower arrangements (for female) are also conducted for skilled labor/gardeners for those who are unable to continue higher education in horticulture. Different research projects have been completed/approved or in the pipeline for higher degree programmes. Problem oriented research matters are emphasized for better sharing of horticulture discipline in the agriculture section. A number of constraints and their solution have also been reported in the report for efficient improvement of the department which consequently will bring a positive change in the coming years. In order to assess whether department is fulfilling its objectives or not,

surveys on various aspects such as course evaluation, teacher evaluation, alumni survey, research/graduating

Student's surveys and faculty survey etc. have been conducted by the departmental members of the program team. The data were collected on prescribed Performa and later on analyzed and presented in the form of graphs and tables. The data revealed that students are satisfied with the subject approach of faculty members, their fairness in examination, and level of knowledge.

Name / Designation of Faculty	Students Supervision (Enrolled)		Research Project		Publication
	Ph.D.	M.Sc (Hons.)	On Going	Completed	2018
Prof. Dr. Nadeem Akhtar Abbasi	03	06	01	01	9
Prof. Dr. Ishfaq Ahmad Hafiz	05	5	-	03	06
Miss Najma Yousaf Zahid	---	08		-	03
Dr. Imran Hassan	02	06	-	-	10
Dr. Touqeer Ahmad	02	07	03	-	14
Dr. Shahid Javed Butt	1	07	-	-	04
Dr. Muhammad Azam Khan	-	02	-	-	
Dr. Umer Habib	1	05	-	-	01
Dr. Irfan Ali	1	05			02
Mr. Usman Shoukat Qureshi	-	04	-	-	02
Total	11	15	04	04	53

Prepared by:

Prof. Dr. Ishfaq A. Hafiz

Department of Horticulture

Pir Mehr Ali Shah

Arid Agriculture University Rawalpindi

Reviewed By;

Prof. Dr. Nadeem A. Abbasi

Department of Horticulture

Checked by: **Dr. Riaz Ahmad**

Director, Quality Enhancement Cell

Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi.

Annex- XII

FACULTY

The brief summary of CV's regarding all faculty staff is given below, where as detail of each faculty member is given in the proceeding paragraphs:

FACULTY RESUME

Name	Nadeem Akhtar Abbasi
Personal	Father's Name : Muhammad Akhtar Abbasi Date of Birth : 03-03-1965 N.I.C. NO. : 61101-1748794-1 Nationality : Pakistani Postal Address : Pir Mehr Ali Shah Arid Agriculture University, Murree Road Rawalpindi. Permanent Address : Village Phulgran (Korang Valley) Distt. Islamabad, Pakistan. Phone : +92-51-9290771; 0300-8550882 Email : nadeemabbasi65@yahoo.com : nadeem.abbasi@uaar.edu.pk
Experience	29 years <u>Assistant Research Officer (Horticulture)</u> : Hill Fruit Research Station Murree under Ayyub Agriculture Research Institute, Faisalabad. Govt. of the Punjab from January 6, 1990 to December 1, 1999. Duties Performed: ☞ Training Farmers/students ☞ Management of Fruit/Nursery farms. ☞ Report Writing. Conducting research work on different fruit plants to solve farmers' problems. Additional Duties Performed under Chief Minister of the Punjab Project for Beautification of Murree 1997 to 1999: ☞ Planning and Execution of landscape projects to beautify Murree

	city. ☞ Management of the floriculture farm/nursery. ☞ Training farmers/students in the area of floriculture. ☞ Conducting research work on ornamental plants to determine the suitability for different areas of Murree. <u>Assistant professor:</u> Department of Horticulture, University of Arid Agriculture, Rawalpindi, Pakistan, from 01-12-1999 to 2-12-2002. <u>Associate Professor:</u> Department of Horticulture, University of Arid Agriculture, Rawalpindi, Pakistan, from 02-12-2002 to 02-08-06. <u>Professor:</u> Department of Horticulture, University of Arid Agriculture, Rawalpindi, Pakistan, from 02-08-2006 to date. Responsibilities: ☞ Responsible for organising teaching and research programs in the department. ☞ Active participation in teaching of various courses on fruits, vegetables, and floriculture/landscaping, Horticulture Business Management. ☞ Supervising Research Projects of Ph.D., M.Sc. and B.Sc. students. ☞ Incharge of the University lawns/gardens. Organized Mega Flower Shows, Flower Arrangements in the university two times every year since 2009. <u>Professor on Tenure Track System:</u> 28-05-2010 to date <u>Affiliation with International Organizations:</u> • With permission from University worked part time with Fincon Services Pakistan, H # 798, St # 16, I-8/2, Islamabad during 2011 in a research project “Agriculture Value Chain Assessment-USAID” as Horticulture Specialist. • Having permission from University working part time with FAO as Technical Specialist (Agriculture) for "Institutional Assessment for Integrating Disaster Risk Management into Agriculture Planning and Programming Process" Incharge Research Farm, Store & Transport at Hill Fruit Res. Station Murree from Jan. 1990 to Aug. 1992. Responsible for Farm management, Purchase of store items for the entire station, maintaining record of purchase, issue orders, auctions and dead stock. Managing and maintaining transport and its record.
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	Incharge Research Farm & Nursery at Hill Fruit Res. Station Murree from May. 1996 to Nov. 1999. Responsible for Farm & nursery management. Member Purchase Committee for the Chief Minister Project for “Beautification of Murree” from 1997 to Nov. 1999. Chairman: Department of Horticulture, University of Arid Agriculture, Rawalpindi, Sept. 2003 to 25 Feb. 25, 2004 and Dec. 1, 2004 to Date. Responsibilities: • Administrative and financial management of the department. • To disseminate the production technology of horticultural crops through publications, students and direct contact with farmers. Project Director: Higher Education Commission Project “Production of Pathogen Free Horticultural Plants”. Dec. 1, 2004 to Sep. 30, 2007 (Project completed successfully). Chairman University Purchase Committee: 27-09-07 to 10-09-12. Responsible to conduct purchase of all university items like equipment, chemicals, glass ware, furniture etc. according to the prescribed criteria. Coordinator of PMAS-AAUR Sub-Campus Khushab: 05-01-07 to 01-01-2014. Established the sub-campus and after that provided support/guidance in running different academic programs. Financial matters of the sub-campus with the treasury at main campus are also handled. Principal Officer Estate Care/Security: of PMAS AAUR. 31-03-08 to 04-03-2014. Responsible to take care of the university property, paying bills and keeping the university environment secure for smooth working. Professor Incharge University Gardens/Lawns: of PMAS-AAUR. 13-12-12 to date. Responsible for management of university lawns, landscape designing and its implementation including financial handling. Member of the National Curriculum Committee on Agriculture under Min. of Education Member in the Examination Committees of Management Sciences and Agri-Business: • Teaching and evaluating students of Agri. Business.
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	Member of the Working Group on Provincial Horticulture Business: - Has to formulate policies to be included in the short term and long term planning for Ministry of Food, Agriculture & Livestock, Agribusiness Development & Diversification Project, Govt. of Pakistan. Member of the Working Group on Horticulture constituted by Govt. of Pakistan Planning Commission vide letter No. F. 178(88) PC/AGR/08-H dated: 14-01-08. Member Executive Council, Parks and Horticulture Authority, Rawalpindi Member of the GlobalGAP's National Technical Working Group (NTWG) by Agribusiness Support Fund in 2011. Vice President Pakistan Botanical Society for 2008-2011. General Secretary, Islamabad Horticulture Society. Member in Panel of Referees for following journals: Scientia Horticulturae Pakistan Journal of Botany Sarhad Journal of Agriculture International Journal of Agriculture and Biology Pakistan Journal of Agri. Science New Zealand Journal of Crop and Hort. Science Member of the Project Review Committees of: Higher Education Commission Islamabad Punjab Agri. Res. Board - Pakistan Science Foundation.
Honors and Awards	Best University Teacher Award in 2008 from Higher Education Commission, Islamabad. Research Productivity Award on basis of research achievements for the Year 2010-11 from Ministry of Science and Technology, Pakistan Council for Science and Technology, Islamabad, Govt. of Pakistan. Accredited supervisor of Pakistan Council for Science and Technology and Higher Education Commission to supervise Ph.D. students having indigenous scholarships. Won Merit Scholarship for M.Sc. (Hons.) in 1990 from Min. of

	Education, Govt. of Pakistan. Won Merit Scholarship for Ph.D. in 1991 from Min. of Education, Govt. of Pakistan. Got merit scholarship for Post doctorate in 2004 from Higher Education Commission, Islamabad.
<i>Memberships</i>	Life member Pakistan Botanical Society Member of Life Saver Blood Donor Society PMAS-AAUR
<i>Service Activity</i>	<i>Worked as Incharge Library in PMAS-AAUR sub campus Attock</i> <i>Worked as Laboratory incharge at PMAS-AAUR sub campus Attock</i> <i>Worked as Store incharge at PMAS-AAUR sub campus Attock</i>
<i>Brief Statement of Research Interest</i>	<i>Pre and postharvest treatments to improve quality and shelf life of fruits.</i>
PROJECTS:	1. Maximization of gladiolus corms production through soil amendments, Rs. 87000/ Sponsored by PMAS-AAUR (2004). 2. Production of pathogen free horticultural plants, Rs. 35.884 million, Sponsored by HEC (2004-2007). 3. Collection of loquat genotypes of Pakistan and their multiplication through conventional vegetative methods and tissue culture techniques, Rs. 2.5 million, Sponsored by HEC. (2010-2013) 4. Pre and post harvest treatments of food grade chemicals to improve peach fruit quality and shelf-life, Rs.1.992 million, Sponsored by PSF (2010-2013). 5. Jelly seed disorder in mango fruit-causes and control, Rs. 4,99,290 Sponsored by HEC. (2012-2013) 6. Oil extraction and mass propagation of scented rose species, Rs. 50000 Sponsored by HEC. (As a Co-PI). (2012-2013) 7. Improving yield, quality and storage life of bell pepper by use of food grade chemicals. Rs. 3.14million, Principal Investigator Dr. Nadeem Akhtar Abbasi. Project No.PSF/NSLP/P-UAAR (264). Sponsored by Pakistan Science Foundation. (2014-2016). 8. Improvement of berry quality and postharvest performance of grapes cv. Perlette and King's Ruby by using food grade chemicals. Rs. 10.96 Million sponsored by HEC. (2014 – 2016). 9. Value addition of selected stone fruits by osmotic dehydration and hot air drying. Rs. 4.0128 Million sponsored by HEC (As Co-PI). (2014-16).
TRAININGS/ WORKSHOPS/ CONFERENCES	1. Participated in Annual International Conference of International Society of Horticultural Sciences in Montreal, Canada in August 1995. (July 30 to August 3) 2. Training on “Diagnosis and management of fruit and

	vegetable crop diseases”, held at National Agriculture Research Center, Islamabad, Pakistan (12th May to 3rd June, 1998). 3. Seminar on “Efficient and Rapid HPLC and LC/MS Methods Development” on 21-05-04 at Perth, WA, organized by WATERS Asia Pacific. 4. Participated in seminar on “Gas Chromatography: How to Gain Efficiency and Improve Results, June 2004 in Perth, WA organized by BIOLAB Ltd. 5. Workshop for information forming the basis of ‘Salty Business’, on 11-06-04 at Perth, WA, organized by Department of Agriculture, Govt. of WA. 6. Conference on “Postharvest Unlimited Down under 2004” organized by Food Science Australia co-bagged by International Society of Horticultural Sciences from 10-12 Nov. 2004 in Sydney, Australia. 7. International workshop on “Sanitary and Phytosanitary Measures in the Wake of Trade Liberalization: Challenges to Agriculture in Developing Countries 12–14 Jan., 2005 organized by UAAR, sponsored by Pakistan Academy of Sciences. 8. “Improving the quality and safety of fresh fruits and vegetables: a practical approach” Sub-regional workshop organized by FAO in cooperation with the Thailand DOA, Bangkok, Thailand, 28 Feb. – 4 Mar., 2005. 9. First International Conference on Mango and Date Palm: Culture and Export held on 20th – 23rd June, 2005 at Univ. of Agriculture Faisalabad, Pakistan. 10. Seminar on Food Safety Standards for Better Export of Fruit and Vegetable Products Organized by the Asian Productivity Organization, implemented by NPO and PARC from 12 to 16 Dec. 2005 in Islamabad, Pakistan. 11. Attended “International Training Workshop on Protected Agriculture” in Yangling, Shaanxi, Min. of Science & Tech., China from Nov. 20 to Dec. 3, 2006. 12. Participated in Conference on “Olive Oil Production: National Prospective and Sustainable Expansion” held at NARC – Islamabad on 12 May, 2008. Organized by Embassy of Italy and Istituto Abgronomico Per l’Oltremare. 13. Organized two training courses on “Poly Tunnel Farming” during Feb. 2-8 and 16-22, 2009 at PMAS-Arid Agriculture Univ. Rawalpindi in collaboration with Agribusiness Support Fund. 14. Participated and delivered lecture in “National Workshop on Streamlining Commercial Floriculture on Modern lines to gain foothold in Niche Markets” lecture titled “Postharvest management of cut flowers” on 26th March, 2009 held at NARC, Islamabad, organized by Horticultural Foundation of Pakistan.
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	15. Participated and presented country paper in “Seminar on Good Agricultural Practices (GAP) and Safety for Fruit Crops and Vegetables: Managing Food Quality” 29 June – 3 July, 2009, Yogyakarta, Indonesia organized by DG of Horticulture, Min. of Agriculture Indonesia, sponsored by APO Japan. 16. Participated and presented paper and posters in International Conference on Postharvest Pacifica 2009 from 15 to 19 Nov. 2009, in Napier, New Zealand. 17. Participated and presented papers in III International Symposium on Loquat in Antakya - Hatay, Turkey from 03-06 May, 2010. 18. Participated and presented paper in “Expert Consultation Meeting on Postharvest and Value Addition of Horticultural Produce 2010” from Nov. 29 to Dec. 2, 2010 at Marriott Hotel, Putrajaya, Malaysia organized by Malaysian Agricultural Research and Development Institute (MARDI) and Asia-Pacific Association of Agricultural Research Institutions (APAARI). 19. Participated and presented paper “Foliar spray of ethanol affected fruit growth, yield and postharvest performance of ‘Sahil’ tomato” in 4th ISHS Conference on “PostharvestUnlimited” from May 23 – 26, 2011 in Leavenworth, Washington, USA. 20. Attended Workshop, GLOBAL G.A.P., Risk Assessment on Social Practices (GRASP), GRASP Module – DRAFT Interpretation for Pakistan, For Stakeholders Consultation in PC Lahore on April 19, 2012. 21. Participated and chaired a session in “Citrus Growers Conference” May 9-10, 2012 under Australia-Pakistan Agriculture Sector Linkages Program (ASLP Citrus Project) organized by IHS, Univ. of Agri. Faisalabad, HRI, NARC Islamabad. 22. Participated in Training Program (21st – 24th May, 2012) on International Featured Standards (IFS-6) offered by Star Farm Pakistan (Pvt.) Ltd. by Mr. Peter Wang (IFS Asia Representative and Head of IFS Asia Office, China). 23. Professional Development Training Program on “Agri – Business Management” 5 -16 November 2012 at Asian Institute of Technology, Thailand. 24. Training course on “Treatment and Utilization of Agriculture Waste for Developing Countries” July 16 to Aug. 12, 2013 in Chengdu, China, organized by Biogas Institute of Ministry of Agriculture sponsored by Ministry of Commerce P.R. China. 25. Participated in Multicountry Observational Study Mission on Innovative Farm Management Practices to enhance Agricultural Productivity held in Tokyo Japan on 18-22 Nov., 2013 sponsored by Asian Productivity Organization vide project No. 13-AG-04-GE/DC-OSM-B. 26. Participated in Seminar on “Characterization of native & potential mango varieties in relation to
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	ceratocystismanginecans and other economic traits” at University of Agric. Faisalabad on Sep. 10, 2014, sponsored by PARB, organized by HIS and ORIC UAF.
Publications with impact factors	1. Abbasi, N. A., M. M. Kushad, and A. G. Endress. 1998. Active oxygen-scavenging enzymes activities in developing apple flowers and fruits. <i>Scientia Horticulturae</i> 74:183-194. (Impact Factor = 1.527). 2. Abbasi, N. A. and M. M. Kushad. 2006. The activities of SOD, POD, and CAT in ‘Red Spur Delicious’ apple fruit are affected by DPA but not calcium in postharvest drench solutions. <i>J. Amer. Pomologic. Soc.</i> 60(2): 84-89. (Impact Factor = 0.522) 3. Hafiz, I.A., N. A. Abbasi, A. Hussain and S.M.S. Naqvi. 2006. The methylation-sensitive amplification polymorphism in juvenile and adult phase crab apple (<i>Malus micromalus</i>). <i>Pak. J. Bot.</i>, 38(4):1149-1157. (0.947) 4. Ahmad, T., N. A. Abbasi, I.A. Hafiz and A. Ali. 2007. Comparison of sucrose and sorbitol as main carbon energy sources in micropropagation of peach rootstock GF-677. <i>Pak. J. Botany</i> 39(4): 1269-1275. (IF = 0.947) 5. Khan, A. S., Z. Singh, N. A. Abbasi. 2007. Pre-storage putrescine application suppresses ethylene biosynthesis and retards fruit softening during low temperature storage in ‘Angelino’ plum. <i>Postharvest Biol. Technol.</i> 46:36-46. (IF = 2.411) 6. Hasnat, R., N. A. Abbasi, T. Ahmad, I.A. Hafiz and A. Hussain. 2007. Induction and regeneration of hypocotyls derived calli in hot chilli (<i>Capsicum frutescens</i> L.) varieties. <i>Pak. J. Botany</i>, 39(5): 1787-1795. (IF = 0.947) 7. Abbasi, N. A., M. M. Kushad, I. A. Hafiz and M. Maqbool. 2008. Superficial scald has relationship with fruit maturity, PPO, and SOD activities in ‘Red Spur Delicious’ apples. <i>Asian J. Chemistry</i> 20(8): 5986-5996. (IF = 0.266) 8. Abbas, H., N. A. Abbasi, M. Maqbool and T. Yaseen. 2008. Influence of irradiated chitosan coating on post harvest quality of Kinnow (<i>Citrus reticulata</i> Blanco.). <i>Asian J. Chemistry</i> 20(8): 6217-6227. (IF = 0.266) 9. Khan, A. S., Z. Singh, N. A. Abbasi and E. E. Swinny. 2008. Pre- or post-harvest applications of putrescine and low temperature storage affect fruit ripening and quality of ‘Angelino’ plum. <i>J. Sci. Food Agric.</i> 88: 1686-1695. (IF = 1.436) 10. Hassan, I., T. Ahmad, I. A. Hafiz, N. A. Abbasi, B. Rashid. 2008. Effect of various auxin treatments (IBA and NAA) on root initiation of olive cultivars, Coratina and Carolea. <i>Asian J. Chem.</i> 20(8): 6509-6517. (IF = 0.266) 11. Hafiz, I. A., N. A. Abbasi, T. Ahmad and A. Hussain. 2008. DNA methylation profiles differ between juvenile and adult phase leaves of crab apple (<i>Malus Micromalus</i>) seedling tree. <i>Pak. J. Bot.</i> 40(3): 1025-1032 (0.947)

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<i>Research Grants and Contracts.</i>	<i>Research Grants and Contracts.</i>
<i>Other Research or Creative Accomplishments</i>	<i>Other Research or Creative Accomplishments</i>
<i>Selected Professional Presentations</i>	<i>Selected Professional Presentations</i>

Name	Dr. Ishfaq Ahmad Hafiz
Personal	Father's Name : Muhammad Sharif Date of birth : July 19, 1960 N.I.C. No. : 37405-6839567-5 Postal Address : Department of Horticulture, University of Arid Agriculture Murree Road Rawalpindi, Pakistan Permanent Address: Main Bazar Ashraf Town Pindorian, Distt. & Teh. Islamabad E.mail : decenthafiz60@yahoo.com
Experience	30 years Professor. PMAS- Arid Agriculture University, Rawalpindi 27-03-2014 to date Associate Professor: PMAS- Arid Agriculture University, Rawalpindi 2-08-2006 to 26-3-2014 Assistant Professor: University of Arid Agriculture Rawalpindi 30-8-2003 to 01-08-2006 Assistant Research Officer Horticulture Section, Ayub Agricultural Research Institute, Faisalabad. 08-04-2000 to 29-8 2003 Assistant Research Officer Mango Research Station, Shujabad. 21.07.98 to 07.04.2000 Ph. D Scholar ZAU, P.R. China 9/95-7/98 Assistant Research Officer Barani Agricultural Research Institute Chakwal 1/90-8/95. Agricultural Officer Agriculture Extension Wing 2/88-12/89
Honor and Awards	1 Acquired first position in Horticulture Major Subject in B.Sc. (Hons), Degree 1986. 2 Secured Ph.D. degree with excellent grade A 3 First, best individual performer in Barani Agriculture Research Institute, Chakwal. 4 Author and co-author of several research and technical papers. 5 Appreciation from the worthy Vice Chancellor University of Arid Agriculture Rawalpindi. 6 Research Productivity Award from Govt. of Pakistan 2010-11
Memberships	1. Agricultural Foundation of Pakistan 2. International Society for Horticultural Science (ISHS) 3. Islamabad Horticultural Society, Islamabad 4. Pakistan Botanical Society (Life time Member since 2007)

Service Activity	• Teaching of Courses of Horticulture Science to B.Sc (Hons), M.Sc. (Hons) and PhD Students • Management of progeny orchards, Glasshouse and nursery management • Incharge Laboratory
Brief Statement of Research Interest	1. Lawn In-charge of the PMAS- Arid Agriculture University, Rawalpindi. 2. Director of Farmers Market Private (Hydroponic Project) 3. Area In-charge of Experimental Orchard Technology Transfer 1. Participated in different farmer's field days in Punjab. 2. Advised the officers of Horticultural Research Institutes on planning and development of horticulture industry. 3. Addressed to the fruit growers and grower groups on production technology and marketing/export. 4. Promoted new technology through TV, radio and newspapers. 5. Provided the technical information on fruit production and quality management according to the needs of target export markets.
Projects	Submitted • Designing production technology for promising grapes varieties. Rs. 10.928 million, as Co PI. PARB. • Mass propagation of promising varieties of olive through in vitro techniques. Rs. 42 million, as PI. PARB. Approved/Ongoing • Varietal Improvement of Gladiolus through in vitro Mutation. Rs 3.2 million, as PI approved by HEC. • Technology transfer to potato growers in relation to pathogen free seed potato, management of diseases and adoption of improved agro techniques. Rs. 3.245 million, as PI. Approved by Endowment Fund Secretariat (FDTTPC) UAAR. • Production of Pathogen Free, True to Type Olive Plants through Tissue Culture. Rs 5.859million. As Co PI, approved by HEC. Completed • Development of <i>In Planta</i> Transformation System for Wheat worked as CO PI in the Project of HEC
Publications with impact factor	1. Hafiz I. A., Abbasi N. A., Hussain A., and Naqvi M. S. 2006. The methylation sensitive amplification polymorphism in Juvenile and adult phase crab apple (<i>Malus micromalus</i>) Pak. J. Bot., 38 (4):1149-1157. (IF

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43. Ozair, M. **I. A. Hafiz**, M. Yaseen, and N. A. Abbasi, 2011. Effect of different mutagens on invitro propagation of explants of olive. cv. Moraiolo. International conference on prospects and challenges to sustainable agriculture. University of Azad Jammu & Kashmir. 293.
44. Baig, M.M.Q., **I.A. Hafiz**, N.A. Abbasi, T.Ahmad and D.J. Donnelly. 2011. Reduced-stature Rosa species through in vitro mutagenesis. Plant Canada Conference on plant adaptation to environmental change, Halifax, Canada.82 (1345)
45. **Hafiz, I. A.**, S. Ishaq, T. Ahmad, N. A. Abbasi and I. A. Malik. 2016. Development of an effective and economical protocol for the micro-propagation of olive. 2nd International Conference on Horticultural Sciences, Institute of Horticultural Sciences, University of Agriculture Faisalabad, Pakistan, February 18-20. 2016: 60 pp.
46. Nawaz R, Abbasi NA, **Hafiz I A**, Khalid A, Ahmad T, et al. (2019) Impact of Climate Change on Kinnow Fruit Industry of Pakistan. Agrotechnology 8: 186. doi: 10.4172/2168-9881.1000186

	47. Nawaz R, Abbasi NA, Hafiz I A, Khalid A, Ahmad T (2018) Economic Analysis of Citrus (Kinnow mandarin) during on-Year and Off-Year in the Punjab Province, Pakistan. J Hortic 5: 250. doi: 10.4172/2376-0354.1000250 48. Muhammad Faisal Khan, Ishfaq Ahmad Hafiz, Nadeem Akhtar Abbasi, Muhammad Kausar Nawaz Shah. 2019. Performance comparison of Rosa hybrida varieties under Pothwar climate. Int. J. Biosci. 14(1), 101-111. 49. Qureshi, A. A., N. A. Abbasi, I. A. Hafiz and M. K. N. Shah, 2017. Effect of sodium hypochlorite on in vitro sterilization of six promising potato cultivars. Int. J. Biosci. 11(2): 49-57.
	• International Workshop on Protected Horticulture, February 27 – March 01, 2008 held at PMAS Arid Agriculture University Rawalpindi in collaboration with Higher Education Commission Islamabad, Pakistan and Pakistan Science Foundation Islamabad, Pakistan • Training Course in Tunnel Farming, February 2-8, 2009, held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Lahore, Pakistan. • Training Course in Tunnel Farming February 16-22, 2009, held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Lahore, Pakistan • Training Course in Tissue culture Lab. Technician, August 03-17, 2009, held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Lahore, Pakistan • Training Course in Nursery Management August 10-15, 2009 held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Lahore, Pakistan • Training Course in Flower Arrangement September 28-October 03, 2009 held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Lahore, Pakistan • Training Course in Professional Floristry October 12-21, 2009 held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Lahore, Pakistan • Seminar on the Recent Trends in Landscape Design and Floriculture, November 28, 2011 held at PMAS Arid Agriculture University Rawalpindi in collaboration with Higher Education Commission Islamabad, Pakistan • Training Program on “Olive Cultivation –Profitable Business”, July 28, 2011 held at PMAS Arid Agriculture

	University Rawalpindi in collaboration with SMEDA, Pakistan • Training Course in Vegetable Cultivation and Tunnel Farming, 09 April, 2012 to 08 May, 2012 held at PMAS Arid Agriculture University Rawalpindi in collaboration with National Rural Support Program, Islamabad, Pakistan • Training in Tunnel Gardening, 17-21 September, 2012 to 08 May, 2012 held at PMAS Arid Agriculture University Rawalpindi in collaboration with Agribusiness Support Fund Islamabad, Pakistan • High Value Vegetable Production (Enterprise and Skill Development Training), 04-06) October, 2012 held at PMAS Arid Agriculture University Rawalpindi in collaboration with ASF, Islamabad & ECI (Pvt.) Ltd, Islamabad, Pakistan • Tips and Techniques of Tunnel Farming (Training of BDSP's), 05-09 November, 2012 held at PMAS Arid Agriculture University Rawalpindi in collaboration with collaboration with ECI (Pvt.) Ltd, Islamabad, Pakistan • International seminar on promotion of floriculture in Pakistan Dr. Johan M. Dole USA and Dr. Van Kester of Netherland Experts on, , Monday, 6th-7th March, 2017 , held at PMAS Arid Agriculture University Rawalpindi in collaboration with Pakistan Society for Horticultural Science. (PSHS),UAF, Faisalabad
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Name:	Dr. Khalid Mahmood Qureshi	
Designation:	Associate Professor Horticulture	
Personal:	Father's Name:	Allah Loke Qureshi
	Nationality:	Pakistani
	Phone Number:	Office: 051 - 9092178 Mobile: 03005241628, 03369913851
	Email:	Kmq_2008@hotmail.co.uk
Experience:	34 years Date: January 10. 06.1985 to 02. 02. 2002 Title: Scientific Officer Institution: Fruit Crops, National Agriculture Research Centre. Park Road Islamabad. Date: 02. 02. 2002 to 29-02-2007 Title: Senior Scientific Officer Institution: Fruit Crops, National Agriculture Research Centre. Park Road Islamabad. Date: 29.11. 2003 to 2005 Title: Project Incharge ICUC-UTFANET Institution: National Agriculture Research Centre. Park Road Islamabad. Date: 30.07. 2003 to 01.03.2007 Title: Program Incharge ALP Project Institution: National Agriculture Research Centre. Park Road Islamabad. Date: 01.03. 2007 to 11.12.2013 Title: <u>Associate Professor (BPS-20)</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi Date: 19.12. 2011 to 11.12.2013 (<u>BPS-20</u>) Title: Director Students Affairs (Additional Charge) Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi Date: 12.12.2013 to 03-08-2017 (<u>BPS-20</u>) Title: Chief Scientific Officer/Senior Director Institution: Horticultural Research Institute, NARC, Islamabad Date: 03.08. 2017 to date Title: <u>Associate Professor (BPS-20)</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi	
Honor and Award	• HEC Approved Supervisor	

	- Awarded University BSc and MSc Merit Scholarships during 1980-1984. - Won ARP 11 Merit Scholarship for Ph.D. in 1994 funded by USA. - Got merit scholarship for Post doctorate in 2007 from Higher Education Commission, Islamabad - Participated in International 7th International Strawberry Symposium (VII ISS), 18 – 22, February 2012, Beijing, China funded by ISHS. HEC: Evaluator NAEAC
Membership	*Islamabad Horticultural Society, Islamabad. *Pakistan Botanical Society, Karachi *Course Development Committee Alama Iqbal Open University Islamabad
Service Activity Brief Statement of Research Interest	- Teaching of courses of horticulture science at graduate, postgraduate and Ph.D. level students. - Research and execution of developmental projects - Production and management systems of horticultural crops - Plant physiology and Soft fruit production technology

National and international trainings:

Place	Field of Study	Duration
Catania, Italy	Citrus and soft fruit crop technique.	April, 1988 to October, 1988\
United Kingdom	Ph.D. in Horticulture	April 1994-August 1999
Hanoi, Vietnam	Management of underutilized fruit crops in Pakistan	April 2003
NARC Pakistan	Accounting and Financial Management	March, 29 to April,02, 2004
STI, Pakistan	Pension & Gratuity	Oct, 11 to Oct, 16 2004
APO	Development of Sustainable Commercial Floriculture	March7-12, 2005
AAUR	Controlled and Modified Atmospheres to Preserve post Harvest Quality of stored grains	July 30-3,1 2007
United Kingdom	Post Doctoral	August 2009-2011
AAUR	Campus Management System	Feb 25,2011
AAUR	Financial Management & Students assessment and evaluation.	March 8,2011
HEC, Islamabad	Training of Program Evaluators of NAEAC on the Accreditation Process	June 27 th -29 th 2011
HEC, Islamabad	Training of Program Evaluators of NAEAC on the Accreditation Process	Dcember 11-13, 2012
Beijing, China	7 th International Strawberry Symposium	February 18-22,2012

Name	Usman Shoukat Qureshi
Personal	Marital Status: Married Gender: Male Nationality: Pakistani Religion: Islam Date of Birth: January 15, 1986
Experience	• Currently working as Lecturer (BS-18), Department of Horticulture, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan. • Also having an additional charge of ‘Campus Management Officer (CMO)’ at Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan. • Worked as a ‘Member of Nursery Production Unit’, PMAS Arid Agriculture University Rawalpindi, Pakistan. • Internship at National Agriculture Research Centre (NARC) Pakistan in Horticulture Research Institute.
Honor and Awards	1. Microsoft Office: Can prepare reports and use MS office for different purposes 2. Auto CAD: Can use auto CAD programme for making Layouts of gardens, structures etc. 3. Flower Show: I have organized and managed flowers show held by “PMAS, Arid Agriculture University Rawalpindi Pakistan”, “Parks and Horticulture Agency (PHA) Rawalpindi Pakistan”, “Attock Refinery Limited (ARL) Pakistan” and “Capital Development Authority (CDA) Islamabad Pakistan”. 4. Private Projects: I have designed three residential lawns at Rawalpindi. Also I have worked with DHA Phase I authority and design Children Park.
Publications	• Qureshi, U. S., U. Habib, S. Chughtai, N. A. Abbasi and K. M. Qureshi. 2011. Impact of hydrogel application to

	Bermuda grass in combating drought under rainfed condition. J. Arid Environ. (Accepted). • Qureshi, K. M., S. Chughtai and U. S. Qureshi. 2012. Impact of Exogenous Application of Salt and Growth Regulators on Growth and Yield of Strawberry. Proc. In: 7th International Strawberry Symposium (VII ISS), 18-22, February 2012, Beijing, China. • Qureshi, K. M., F. ul Hassan, Q. ul Hassan, U. S. Qureshi, S. Chughtai and A. Saleem. 2012. Impact of cultivation systems on growth and yield of strawberry (<i>Fragariaananassa</i>) cv. “Chandler”. Pakistan J. Agric. Res., 25 (2): 120-135. • Qureshi, K. M., S. Chughtai, U. S. Qureshi and N. A. Abbasi. 2013. Impact of Exogenous Application of Salt and Growth Regulators on Growth and Yield of Strawberry. Pak. J. Bot., 45(4): 1179-1185. • Qureshi, U. S., U. Habib and N. A. Abbasi. 2011. Hydrogels: Phenomenal Approach for Water Conservation in Ornamental Industry. Proc. In: International Conference on Prospects and Challenges to Sustainable Agriculture, 14-16, July 2011. Projects: • Research Project on “Phenological studies of Citrus” • Research Project on “Effect of Calcium Chloride on Post Harvest quality of Tomatoes”
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Personal	Najma Yousaf Zahid.Cell No 0347-9428315
Experience	1:Assistant Professor Horticulture.(27 th April 1998-to date)PMAS-AAUR 2: Worked with AKRSP (Agha Khan Rural Support Programme), Gilgit as consultant Agriculturist from (16 th August 1995 to 2 nd April 1998.)
Honors and Awards	➤ Indigenous PhD scholarship through ministry of science and technology in 2001. ➤ Awarded by research project by University in 2007
Memberships	• Life Time Member "Pakistan Botanical Society" • Member of Horticulture Foundation of Pakistan • Member of Pakistan Horticulture Society
Graduate Students Postdocs Undergraduate Students Honor Students	Thesis completed: 1: Charcterization of indigenous Banufsha (<i>viola odorata</i>) Germplasm for oil contents.(2008) 2:Studies on acclimatization of advanced lines of sweet pepper and chillies under pothwar conditions.(2009) 3:Evaluation of intraspecific variation of Kalongi (<i>Nigella sativa</i>) Based on SDS Page.(2009) 4: Evaluation of intraspecific variation of Methi (<i>Trigonella foenum grecum</i>) through DNA analysis.(2009) 5: Studies on acclimation of advanced lines of sweet pepper and chilies under pothwar condition.(2009) 6: Effect of different doses of fertilizers on menthol contents in Mint.(2011) 7: Standardization on invitro techniques for mass propagation of Aloe Vera.(2011) 8: Screening of Capsicum Cultivars (<i>Capsicum annum</i>) For Stress Tolerance using In vitro Techniques.(2013) 9: Evaluation of different varieties of Basil for oil contents and higher yield.(2013) 10: Improvement in cultivation technology of Shiitake Mushroom in Pakistan conditions (2014) 11:Evaluation of different industrial wood waste for

	cultivation of shiitake mushroom(2015) 12: Cultivation of oyster mushroom by chemical and physical methods of sterilization using different substrate (2015). 13:Growth and yield response of ginger to different growing media (2015) 14: Physiological and biochemical response of local onion cv phulkara to different storage temperatures and fresh cut (2015) 15: Efficacy of Fennel accessions to different levels of nitrogen (2016) 16: Characterization of organically produced lettuce varieties for nutritional status.(2016) 17:Effect of plant density and transplanting date on yield and antioxidants in local onion cv Phulkara (2016) 18: Quality changes of extra virgin olive oil from different cultivars during storage conditions.(2016) 19: Phytochemical Characterization of Organically Grown Lettuce Varieties for Antioxidant Status(2017) 20: Evaluation of allopathic potential of Nigella sativa on germination and seedling growth of leafy vegetables (2017) 21: Essential oil composition and antifungal activity of different local carrot cultivars.(2017) 22: Application of mycorrhiza on different cucumber rootstocks for high yield and quality under controlled conditions.(2017) 23: Effect of different growth medias on growth and yield of chilli germplasm.(2017). 24:Physio-morphological characterization of Ocimum Spss for oil contents (2018). 25:Evaluation of rootstock for improving fruit yield and quality in Capsicum genotype.(2019) 26: Application of bio stimulants for improving the growth
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	of local fennel (<i>foeniculum vulgare</i>) under salinity stress(2019) 27:Studies on response of chilli <i>C.frutesens</i> genotype to salinity and excess of Boron.2019 28:Boron toxicity tolerance in hot peppers through grafting on different rootstocks.(2019) 29:Assesment of the Allelopathic effect of different crops on physio-chemical characteristics and fruit growth in chilli crop.(2019) 30: Mitigation of adverse effects of heavy metals in chilli cultivars through different rootstocks.(2019---continue)
Service Activity	1: Delivered lectures and practical training in 10 different girls school, Teachers, and housewives about kitchen Gardening at Islamabad/Rawalpindi schools. Januarary, 2017 2: As member of M.Sc (Hons.)Hort written and oral comprehensive examination, 2016-2017. 3: Trained women farmers on kitchen gardening .Manal valley, Manshera.May 2-6 in 2017. 4: Paper setter and as external examiner diploma courses on horticultural crops production in diploma courses governed by UAF.Oct 2017. 5: Delivered practical lecture on kitchen and fruit culture to female members of horticulture society, Islamabad.Oct 9, 2017. 6. As a trainer in the Training Course of Gardner's organized by PMAS-AAUR and Navitec , Oct –Dec, 2017). 7. As trainer of kitchen gardening to train female employ of Pakistan Tobacco Company Akora Khatak. April 2019.Islamabsd.
Brief Statement of Research Interest	Medicinal plants and Mushroom cultivation through different modern techniques and technologies for high yield and profit.
Publications	➤ Zahid, N.Y.Studies on the variation of NPK content in the leaves of Peach Cv. Early Grand as affected by Macro (NPK) and micro (Fe) nutrient.(1995) ➤ Zahid,N.Y;N.Abbassi,Z.Ahmed;H.Ishfaq,(2004). Indigenous

	Medicinal Plants Resources in Salt Range Regions of Pakistan. International Conference on Drug Biotechnology and Medicinal Plants. Aman-Jordan ➤ Zahid,N.Y;N.Abbassi,Z.Ahmed;H.Ishfaq,Z.Ahmad.(2005).An Overview: Status of Medicinal Plants and Aromatic Plants in Pakistan. Proceedings of the national seminar on cut flower &house plant production.HFP. ➤ Zahid, N.Y;N.Abbassi(2006).Fennel as Value Additive Crop: Essential Oils and Plant Extract .Proceeding International Conference on Value addition in Horticulture Products. ➤ Zahid,N.Y;N.Abbassi(2007).Use of Allelopathic Potential of Vegetables in weed management. Proceedings of Arid Agriculture University, Rawalpindi. ➤ Zahid,N.Y;N.Abbassi,H.Ishfaq(2008).Morphological Characterization and Oil Contents of Fennel (<i>Foeniculum vulgare</i> Mill.) Accessions from Different Regions of Pakistan.J.Chem.Soc.Pak.,vol30,No.6,2008 Impact factor: 0.221 ➤ Zahid,N.,N.Abbasi.Z.Ahmed;H.I.Ishfaq;Z. Yousaf(2009).Genetic diversity of Fennel Germplasm in Pakistan assessed by RAPD markers.J.Bot,41(3);june2009. Impact factor 0.524 ➤ Zahid,N.Y;N.Abbassi,Z.Ahmed;H.Ishfaq(2012). Antifungal Properties of local fennel (<i>Foeniculum vulgare</i> Mill.) response to some soil diseases. Afrincan J of Microbiology research.vol 6(1) pp 46-51.jan 2012.0.533 Impact factor. ➤ Zakia,S;Zahid,N.Y;N.Abbassi;H.Ishfaq;M.Nasir.2012. Booklet on Micropopagation of Aloe vera (<i>Aloe barbadensis</i>). Laplambert Accademic Publishing Germany.ISBN:978-3-8443-23788.2012 ➤ Zakia,S.Zahid,N.Y;N.Abbassi;H.Ishfaq;M.Nasir. 2013.Standarization of micro propagation for Aloe vera-A Pharamaceutically important. Pak.J.of Pharmaceutical Sciences, 6 Nov 2013.vol 26, pp 1083-1087. Impact factor 0.947 ➤ Arslan,M, Zahid.N.Y.2016. Evaluation of the sensory qualities of ready to serve blends of Aloe vera (ALOE BARBADENSIS MILL). International Journal of Botany and Research (IJBR) ISSN(P): 2277-4815; ISSN(E): 2319-4456;Vol. 6, Issue 2, Apr 2016, 1-10© TJPRC Pvt. Ltd. Impact factor 1.4573 ➤ Arslan,M, Zahid.N.Y 2019.Development and sensory evaluation of ready to serve blends of Aloevera.J.Agric Res,2019.vol57(1)33-38.Agriculture Department .Government of Punjab. Pakistan. impact factor(Thomson Reuters, USA which is expected in near future.
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Research Grants and Contracts	Research project by University in 2007
Selected Professional Presentations	1. First training workshop on Ethno botany and its application to conservation at NARC, Islamabad, September (1996). One week 2. Project monitoring and evaluation in Asian institute of technology Bangkok Thailand. February (1997).One week 3. International course in vegetable production organized by The Netherlands, Holland August (1999).Three and half month 4. International Symposium on Medicinal Plants: linkages beyond national boundaries September, 07- 09 (2004). NARC Islamabad. 5. International Conference on Drug Biotechnology and Medicinal Plants. Oct, (9-11) 2004. Amman-Jordan. 6. National Workshop on Production and Export of Cut flowers. Horticultural Foundation of Pakistan, 2-3 March (2005).Islamabad. 7. National Conference on Conservation of Natural Resources of Herbs and Medicinal Plants for Commercial Exploitation. April 12-14, 2005. NARC Islamabad. 8. Training Course for Researchers to Equip with Latest Bioinformatics Tools, 2005.Kust university kohat. 9. International Training Course on Kitchen gardening & Fruit Processing, NARC – Islamabad, May 8-21, (2006). 10.International Conference on Value Addition in Horticultural Products.26-28 June, (2006).UAAR. 11.International Conference on role of Allelopathy in Sustainable Agriculture. UAAR, March 22-24, (2007) 12.International Symposium on Prospects of Horticultural Industry in Pakistan. UAF –March 28-30, 2007. 13.International workshop on Protected Horticulture. UAAR- February 27-March 01, (2008). 14.Role of Medicinal Plants in Poverty Alleviation. UAF –

	Faisalabad, May 27, (2008). 15. Participated in the “National Conference on Increased Vegetable Production to Alleviate Poverty in Rural Areas” organized by The Horticultural Foundation of Pakistan. Islamabad. June 2008. 16. As a Resource Person in National Workshop on adaptation of GACP and Guideline. NIH- Islamabad. April, (2010) NIH- Islamabad. 17 Participated and presented scientific paper in National Sciences Conference held at PMAS-AAUR. Pakistan 10-12 jan, 2012 18: Delivered lectures on home gardening and tunnel farming - one month training course. PMAS-AAUR. Nov, 2012 19: Delivered lectures in training course of kitchen gardening for forest guards at Gora gali. Murree. 18-19 jan 2013. 20 As resource person in delivering lectures in tunnel training and kitchen gardening with collaboration of NRSP and PMAS-AAUR. April 2013 21: Participated in a training programme for University lectures at Korea funded by Korea International Cooperation Agency (KOICA). July 5 to July 19. 2013. 22: Conduct exam of different training courses on mango orchard management, GAP for vegetable and fruit production. At star farms Bahawlpur, Arpil, june ,August 2014. 23 As organizer in conducting a seminar on Stevia-a natural sweetener zero caloric. 2015 funded by NIAB. Faisalabad. 24 Delivered lectures and practical training in 10 different girls school, Teachers, and housewives about kitchen Gardening at Islamabad/Rawalpindi schools. January, 2017 25 Trained women farmers on kitchen gardening .Manal valley, Manshera. May 2-6 in 2017. 26 Delivered practical lecture on kitchen and fruit culture to female members of horticulture society, Islamabad. oct 9, 2017.
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Name	TOUQEER AHMAD
<i>Personal</i>	Nationality: Pakistani N. I. C. No: 37202-1589897-7 Date of Birth: 23rd January 1977 Domicile: Punjab (Chakwal) Gender: Male Language Skills: Full command on English, Urdu and Punjabi. Chinese (basic spoken) Mailing Address: Department of Horticulture, PMAS, Arid Agriculture University Rawalpindi, Pakistan Email : touqeer@uaar.edu.pk, ahmadarid@gmail.com
<i>Experience</i>	Position: Assistant Professor Period: 3rd March 2015 to date Position: Lecturer Horticulture Period: 14th Feb 2005 to 2nd March 2015 Organization: PMAS, Arid Agriculture University Rawalpindi, Pakistan Field of Work: Teaching of various courses at PhD. M.Sc. and B.Sc. level. Supervise the Post Graduate students in their research work. Creating technical manpower through providing training in respective fields. Collaborated with farmers/fruit industry in order to improve management and solve horticulture issues. Position: Field Officer Period: 15th June 2004 To 14th Feb 2005 Organization: Pakistan Horticulture Development & Export Board Field of Work: Carry out research activities with the citrus industry to minimize the post-harvest losses in Citrus. Introduce improved orchard management practices (Good Agricultural Practices). Create awareness among different stakeholders specially the forming communities and traders on changing trade requirements regarding SPS and other issues under the WTO regime. Position: Research Fellow Period: 1st November 2002 To 14th June 2004 Organization: National Agriculture Research Center Islamabad, Pakistan Field of Work: Conduct project entitled “Production of Pathogen Free True to type Peach Rootstock GF 677 Plantlets through Tissue Culture”. Propagation of Fruit through Conventional & Tissue Culture Method.
<i>Honor and Awards</i>	PhD Scholarship from China Scholarship Council (2009-2013) HEC PhD Approved Supervisor

Memberships	• Member of Pakistan Society for Horticultural Science • Member of Horticultural Foundation of Pakistan. • Member of Pakistan Botanical Society. • Member of Islamabad Horticultural Society.		
Graduate Students	PhD ongoing : one		
	As a supervisor completed M. Sc. (Hons): Fourteen		
Postdocs	Years	Degree	Name
Undergraduate	2007	M.Sc.(Hons)	Ansar Ali
	2008	M.Sc.(Hons)	Mehwish Yaseen
Students Honour Students	2008	M.Sc.(Hons)	Inam Ul Haq
	2009	M.Sc.(Hons)	Sana Asghar
	2009	M.Sc.(Hons)	Khaliqa Shabbir
	2009	M.Sc.(Hons)	S. Z. U. Hasan,
	2014	M.Sc.(Hons)	Irsa Jabeen Anwar
	2016	M.Sc.(Hons)	Ayesha Manzoor
	2017	M.Sc.(Hons)	Meher Afroz
	2017	M.Sc.(Hons)	Nimra Asghar
	2017	M.Sc.(Hons)	Muhammad Rehan
	2018	M.Sc.(Hons)	Javeria Malik
	2019	M.Sc.(Hons)	Iqra Bashir
	2019	M.Sc.(Hons)	M. Amir Muawiya
		As a member supervised M.Sc. (Hons.): Fifteen	
Service Activity	• Coordinator External Linkages, PMAS-AAUR • Incharge Central Research Laboratory, PMAS-AAUR • Incharge Plant Tissue Culture Laboratory, Department of Horticulture, PMAS-AAUR • Incharge Horticulture Research Area, Department of Horticulture, PMAS-AAUR • Incharge Library, Department of Horticulture, PMAS-AAUR • Incharge Laptops Scheme, Department of Horticulture, PMAS-AAUR • Member of Sub-Committee of Olive Development Group constituted by Secretary Agriculture Punjab for recognition of missing gaps related to research data in the Olive sector • Member University Post-graduate Research Evaluation and Review Committee • Member Technical Purchase Committee of Department Research Projects • PI of research projects • Member Faculty Board of Studies, Faculty of Crop & Foods Sciences • Member Department Board of studies • Member MSc (Hons) Comprehensive Exam • Member PhD Comprehensive Exam		
Brief Statement of Research Interest	Plant Biotechnology (Somatic Hybridization, Genetic Transformation), & Abiotic Stress.		
Publications	Research Papers Published IN International Peer-Reviewed Journals (HEC RECOGNIZED)		

	1. Manzoor, A., T. Ahmad, M. A. Bashir, M. M. Q. Baig, A. A. Quresh and M. K. Nawaz Shah and I.A.Hafiz. 2018. Induction and identification of colchicine induced polyploidy in <i>Gladiolus grandiflorus</i> 'White Prosperity'. <i>Folia Horticulturae</i>, 30(2): 307-319. (IF= 0.244) 2. Javed, H., S. Mumtaz, T. Ahmad, M. A. Bashir, I. A. Hafiz and A. Razzaq. 2018. Role of Different Nutrient Elements and AgNPs for <i>In Vitro</i> Shoot Proliferation of GF-677 Rootstock. <i>Philipp Agric. Scientist</i>, 101 (4): 368-375. (IF= 0.256) 3. Baig, M. M. Q., T. Ahmad, I. A. Hafiz, N. A. Abbasi and M. J. Tareen. 2016. <i>In vitro</i> improvement of characters in <i>Rosa spp.</i> through colchicine. <i>Journal of Animal and Plant sciences</i>. 26(6): 1666-74. (IF= 0.422) 4. Aamir, S. S., M. M. Q. Baig, T. Ahmad, A. Ghafoor, I. A. Hafiz, N. A. Abbasi, I. Ali and M. Yaseen. 2016. Molecular and morphological characterization of rose mutants produced via <i>in vitro</i> mutagenesis. <i>The Philippine Agricultural Scientist</i>. 99(1):25-33. (IF= 0.256) 5. Mumtaz, S., T. Ahmad, I. A. Hafiz, M. Yaseen and N. A. Abbasi. 2015. Callogenesis and plant regeneration from leaf explants of citrus cultivars. <i>Pakistan Journal of Agricultural Sciences</i>. 52(4):1017-1023. (IF= 1.049) 6. Baig, M. M. Q., I. A. Hafiz, N. A. Abbasi and T. Ahmad. 2015. Evaluating and validating the protocol for gamma (γ) radiation induced mutations in floral distinct <i>Rosa spp.</i> <i>Pakistan Journal of Botany</i>. 47(5):1847-1854. (IF= 0.822) 7. Ahmad, T., G. Sablok, T. V. Tatarinova, Q. Xu, X. X. Deng and W. W. Guo. 2013. Evaluation of codon biology in citrus and <i>Poncirus trifoliata</i> based on genomic features and frame corrected expressed sequence tags. <i>DNA Research</i>. 20(2):135-150. (IF= 5.267) 8. Baig, M. M. Q., I. A. Hafiz, A. Hussain, T. Ahmad and N. A. Abbasi. 2011. An efficient protocol for <i>in vitro</i> propagation of <i>Rosa gruss an teplitz</i> and <i>Rosa centifolia</i>. <i>African Journal of Biotechnology</i>. 10(22):4564-4573. (IF=0.573) 9. Asghar, S., T. Ahmad, I. A. Hafiz and M. Yaseen. 2011. <i>In vitro</i> propagation of orchid (<i>Dendrobium nobile</i>) var. Emma White. <i>African Journal of Biotechnology</i>. 10(16):3097-3103. (IF= 0.573) 10. Hasan, S. Z. U., T. Ahmad, I. A. Hafiz and A. Hussain. 2010. Direct plant regeneration from leaves of <i>Prunus</i> rootstock GF-677 (<i>Prunus amygdalus</i> x <i>P. persica</i>). <i>Pakistan Journal of Botany</i>. 42(6):3817-3830. (IF= 0.872) 11. Ramzan, A., I. A. Hafiz, T. Ahmad and N. A. Abbasi. 2010. Effect of priming with potassium nitrate and dehusking on seed germination of gladiolus (<i>Gladiolus alatus</i>). <i>Pakistan journal of Botany</i>. 42(1):247-258. (IF= 0.872) 12. Ikhlaq, M., I. A. Hafiz, M. Micheli, T. Ahmad, N. A. Abbasi and A. Standardi. 2010. <i>In vitro</i> storage of synthetic seeds: Effect of different storage conditions and intervals on their conversion ability. <i>African Journal of Biotechnology</i>. 9(35):5712-5721. (IF= 0.573) 13. Zulfiqar, B., N. A. Abbasi, T. Ahmad and I. A. Hafiz. 2009. Effect of explant sources and different concentrations of plant growth regulators on <i>in vitro</i> shoot proliferation and rooting of avocado (<i>Persea americana</i> Mill.) cv. Fuerte. <i>Pakistan Journal of Botany</i>. 41(5):2333-2346. (IF=
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	BOOKS/PROCEEDINGS/LAB. MANUAL/EXTENSION LITERATURE: Books: • Ahmad, T. Ahmad, R. N. and I. Ali. Rehnumay Nursery Baraye Zaitoon. 2017. Public Relations and Publications, PMAS Arid Agriculture University Rawalpindi. 87. pp. • Ahmad, R. N. and T. Ahmad. Zaitoon. 2016. Public Relations and Publications, PMAS Arid Agriculture University Rawalpindi. 208 p. • Abbasi, N. A., I. Ali, I. A. Hafiz and T. Ahmad. 2015. Angoor Ki Kaasht. Department of Horticulture, PMAS-Arid Agriculture University Rawalpindi. 109 p. Proceedings: • Abbasi, N. A., (Chief Editor), I.A. Hafiz, T. Ahmad, A. A. Qurasi and S. Z. ul Hasan (Eds.). 2019. Proceedings of the International Horticulture Conference, Pakistan 25-17 April 2018, Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. 510 p. • Abbasi, N. A., T. Ahmad, A. A. Qurasi and S. Z. ul Hasan (Eds.). 2018. Abstracts Book. International Horticulture Conference, Pakistan 25-17 April 2018, Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. 210 p. • Khan, K. M., N. A. Abbasi and T. Ahmad. 2006. Proceedings international conference on value addition in horticultural products. University of Arid Agriculture Rawalpindi. ISBN: 978-969-8374-08-02. 311 p. Extension Leaflet and Calendar: • Abbasi, N. A., I. A. Hafiz and T. Ahmad and I. Ali. Zaitoon Ki Kashat. Public Relations and Publications, PMAS Arid Agriculture University Rawalpindi 2017. 11p. • Abbasi, N. A., I. A. Hafiz, T. Ahmad and I. Ali. Angoor Ki Negadast Ka Salana Calendar. Department of Horticulture, PMAS-Arid Agriculture University Rawalpindi. • Ahmad, T. Establishment of certified olive nursery through tissue culture. Extension leaflet, Department of Horticulture, PMAS-Arid Agriculture

	University Rawalpindi. University's Magazine Article: • Ahmad, T. M. Faisal, Zaitoon Ka Tail. Public Relations and Publications, PMAS Arid Agriculture University Rawalpindi 2017. p 71-75 Laboratory SOP: • Ahmad. T., A. Ali and S. Zaman. Standard operating procedures (SOPs): Plant Tissue Culture Lab. Department of Horticulture, University of Arid Agriculture University Rawalpindi. 14 p. PAPERS PUBLISHED IN PROCEEDINGS: 1. Malik, J., T. Ahmad, I. Ali, S. I. Malik, A. A. Qureshi and N. A. Abbasi. (2018). Differential responses of potato cultivars against <i>in vitro</i> drought inducing agents in relation to morphological changes, antioxidants, oxidative stress damage and osmolyte accumulation. <i>International Horticulture Conference Pakistan</i>, 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 27-28. First position in poster competition. 2. Manzoor, A., T. Ahmad, M. M. A. Q. Baig, M. K. N. Shah, I. A. Hafiz, M. A. Bashir and A. A. Qureshi. (2018). Induction and identification of colchicine induced ploidy in <i>Gladiolus grandifloras</i> cv. white prosperity. <i>International Horticulture Conference Pakistan</i> 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 34-35. 3. Baig, M. M. Q., I. A. Hafiz, N. A. Abbasi and T. Ahmad. (2018). Improvement of quality traits in <i>Rosa borboniana</i> through <i>in vitro</i> use of colchicine. <i>International Horticulture Conference Pakistan</i>, 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 36. 4. Rehan, M., T. Ahmad, A. A. Qureshi, M. A. Bashir and M. K. N. Shah. (2018). <i>In vitro</i> induction of Polidy through colchicine and oryzalin to enhance the quality traits of okra (<i>Abelmoschus esculentus</i>). <i>International Horticulture Conference</i>, Pakistan 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 35-36. 5. Saeed, Q., N. A. Abbasi, T. Ahmad and S. I. Malik. (2018). Direct <i>In vitro</i> regeneration from leaf disc of different potato varieties, a prerequisite in genetic transformation. <i>International Horticulture Conference Pakistan</i>, 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 37-38. 6. Hasan, S. Z. U., T. Ahmad, I. A. Hafiz and A. Hussain. (2018). Direct <i>In vitro</i> regeneration from leaves of economically important peach rootstock GF 677. <i>International Horticulture Conference Pakistan</i>, 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 38-39. 7. Iqbal, M. A., M. Tariq, I. A. Hafiz, N. A. Abbasi and T. Ahmad. (2018). Rooting response of olive varieties using different IBA and media regimes under shaded plastic tunnel (SPT) in Pothwar (Pakistan). <i>International Horticulture Conference Pakistan</i>, 25-17 April 2018. Department of
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9.	Aamir, S. S., M. M. Q. Baig, T. Ahmad , A. Ghafoor, I. A. Hafiz, N. A. Abbasi, I. Ali and M. Yaseen. (2018). Identification of rose mutants via morphological and SSR markers. <i>International Horticulture Conference Pakistan</i> , 25-17 April 2018. Department of Horticulture, PMAS Arid Agriculture University Rawalpindi, Pakistan. p 65-66. First position in poster competition.
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<i>Research Grants and Contracts.</i>	Completed
	• “Up-gradation and Strengthening the Lab, Department of Horticulture under the project Institutional Strengthening”. Rs. 1.9765 million. Funded by Higher Education Commission of Pakistan. Project Role: Principal Investigator. • “Water Conservation Demonstration Model for Rainfed Vineyard”. US\$. 16000. Funded Agricultural Innovation Program, UC Davis, USA. Project Role: Principal Investigator. • “Establishment of Demonstration Model of Vineyard Trellising System”. US\$. 19500. Funded Agricultural Innovation Program, UC Davis, USA. Ongoing.

	Project Role: Principal Investigator. • “Production of Pathogen Free, True to Type Olive Plants through Tissue Culture”. Rs. 3.8 million. Funded by Higher Education Commission of Pakistan. Ongoing. Project Role: Principal Investigator. Handed over to Co. PI because of PhD Study abroad. • “Impact of Trellising Systems on Production Efficiency and Fruit Quality of Early Maturing Table Grape Variety King’s Ruby”. Rs. 0.199 million. Funded by PMAS-AAUR. Completed. Project Role: Principal Investigator.
	Funded and in progress
	• “Screening of Wild Grape Biodiversity for Drought Tolerance and their Rootstock-Scion Compatibility for Sustainable Grape Production in Pakistan”. Rs. 14.477813. million. Higher Education Commission of Pakistan. Project Role: Principal Investigator. • “Promotion of Olive cultivation on Commercial scale in Pakistan” Funded by M/o NFS & R. Government of Pakistan. Rs. 128.270 million. Project Role: Principal Investigator. • “Somatic hybridization for citrus rootstock improvement: A way towards a low input sustainable citrus culture in Pakistan”. Rs. 12.51 million. Funded by Higher Education Commission of Pakistan. Project Role: Principal Investigator.
	Total Award Amount for Projects 164.7833 million rupees
<i>Other Research or Creative Accomplishments</i>	• Establishment and Development of Plant Tissue Culture Lab in Horticulture Department of PMAS, AAUR. • Establishment of Vineyard at University Research Farm Koont • Standardization of protocols for mass scale <i>in vitro</i> propagation of economical important fruit and ornamental crops
<i>Selected Professional Presentations</i>	• Presentation on “Olive Industry Vision: To Produce High Quality Olive Fruit for Table and Oil Production of International Standard” in ODGs Working Group Meeting at BARI Chakwal, 6th June 2016 • Presentation on establishment of “Olive Research Center” in ODGs Working Group Meeting at BARI Chakwal, 29th June 2016 • Presentation on “Olive Propagation for Certified Nursery” in Training Seminar at PMAS-AAUR Arid Agriculture University Rawalpindi in collaboration with USAID and Agriculture Department, Government, 27th July 2016

Name	Dr. Imran Hassan
Personal	Father Name : Maqsood-ul-Hasan Date of Birth : 23-03-1970 N.I.C No : 37405-5803547-7 Nationality : Pakistani Domicile : Rawalpindi Marital Status : Married Postal Address : Assistant Professor, Department of Horticulture, Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi. (Ph: Off: 051-9290771, Mob: 0345-9738965). Email: imranhc2000@yahoo.co.in Permanent address : H/No. 410-A, St. No. 03, Gulrez Extension Phase III, High Court Road, Near Ayesha Motors, Rawalpindi, (Mob: 0345-9738965).
Experience	22 years Currently working as a “Assistant Professor” in the Department of Horticulture, Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi Work Experience: 21 years and 6 months work experience of teaching and research of the under-graduate & post-graduate students in the Department of Horticulture, Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi. Additional Managerial Charge Experience: Worked for 7 years at all on additional charge as Incharge University Lawns from August, 1997 to May, 2000 and from May 2005 to May 2009 in PMAS, AAUR. Served as Coordinator, Time Table & Date Sheet for 14 years and 8 months of Horticulture Department in all from August, 1997 to Feb, 2002 and from May, 2005 to May 2009 nominated by Chairmen, Department of Horticulture, PMAS, AAUR. Served again from 2010 to date as nominated by chairman and Dean, FC& FS, PMAS, AAUR Served for 7 years from 1997 to 1999 and from May, 2005 to May 2009 as Incharge Laboratory, Department of Horticulture, PMAS, AAUR
Honor and Awards	Hec Approved PhD Supervisor since 2006
Membership	Executive member for 2013 & 2014 of “Islamabad Horticulture Society”, (Reg’d) Pakistan. Life time member of “National Horticulture Society”, Islamabad, Pakistan. Life time member of “Rose Society, Islamabad”, Pakistan. Life time member of Pakistan Society for Horticulture Science (PSHS)

Service Activity	In charge Date Sheet and Time Table Focal Person PM Laptop Scheme
Publications in impact factor journal	1. Saeed T., I. Hassan, N. A. Abbasi and G. Jilani. 2016. Antioxidative activities and qualitative changes in gladiolus cut flower in response to salicylic acid application. <i>Scientia Hort.</i> Vol. 210. 236-241 (Impact Factor:1.375) 2. Shaheen R., I. Hassan, I. A Hafiz, G. Jilani and N. A. Abbasi. 2015. Balanced zinc nutrition enhanced the antioxidative activities in Oreintal lily cut-flower leading to improved growth and vase quality. <i>Scientia Hort.</i> Vol.197, 644-649. (Impact Factor:1.375) 3. Khan, M. I., S. A. Cheema, C. Shen, I. Hassan and Y, Chen. 2014. Phytotoxicity assessment of phenanthrene and pyrene in soil using two barley genotypes. <i>Toxicological and Environmental Chemistry</i> 96:1, 94-105. (Impact Factor: 0.723) 4. Adnan A., S. Asma, M. Tariq, L. Asia, T. Saima, S. J. Butt and I. Hassan. (2014). Physico-chemical and antimicrobial assessment of honey of Apisdorsata from different geographical regions of Pakistan. <i>IJAR Vol. 3(2): 025-030.</i>(Impact Factor: 0.5833) 5. Saleem, B. A., I. Hassan, Z. Singh, A. U. Malik, and M. A. Pervez. (2014). Comparative changes in the rheological properties and cell wall metabolism in rind of healthy and creased fruit of Washington Navel and Navelina sweet orange (<i>Citrus sinensis</i> L.) <i>AJCS</i> Vol. 8 (1): 62-70. (Impact Factor:1.63) 6. Saeed T., I. Hassan, N.A. Abbasi and G. Jilani. (2014). Effect of gibberelic acid on the vase life and oxidative activities in senescing cut gladiolus flowers. <i>Plant Growth Regul</i> Vol. 72(1): 89-95. (Impact Factor:1.67) 7. Saeed T., I. Hassan, G. Jilani and N.A. Abbasi. (2013). Zinc augments the growth and floral attributes of gladiolus, and alleviates oxidative stress in cut flowers. <i>Scientia Hort.</i> Vol. 164: 124-129. (Impact Factor:1.375) 8. Zobia J., A. Riaz, K. Sultana, A. Ikram. M. Ansar, I. Hassan and I. Ahmad. (2012). Incidence of <i>Aspergillus flavus</i> and extent of aflatoxin contamination in peanut samples of Pothwar region of Pakistan. <i>Afr. J. of Mic. Res.</i> Vol. 69 (9): 1942-1946. (ImpactFactor, 0.52) 9. Jilani G., S. Mehmood, A. N. Chaudhry, I. Hassan and M. Akram. (2008). Allelochemicals: sources, toxicity, and microbial transformation in soil. a review. <i>Annals of Microbiology.</i> Vol. 58(3):351-357. (ImpactFactor: 1.549) 10. Hassan I., T. Ahmad, I. A. Hafiz, N. A. Abbasi and B. Rashid. (2008). Effect of various auxin treatments (Indole butyric acid &Nepthaleneacitic acid) on root initiation of olive cultivars, coratina&carolea. <i>Asian Journal of Chemistry.</i> Vol 20(8):6509-6517 (ImpactFector: 0.253)

	11. Amjad M., M. A. Anjum and I. Hassan. 2001. Effect of N, P and K fertilizers on seed production of Okra (<i>Abelmoschus esculentus</i> L. Moench) cv. PusaSawani”. The Journal of Animal and Plant Sciences. JAPS, Vol. 11(2):80-82. ISSN.1018-7081). (ImpactFactor, 0.638)
Publications	12. Farooq, M.S., A. Nawaz, T. Iqbal, I. Hassan, M. Umair, M. Arif, Ehsanullah, M. Naseem, N. Shakoor. 2018. Investigating the release of phosphorus from rock phosphate pretreated with humic acid, farm yard manure and effective microbes, Int. J. Bioscie. 13(6): 36-42 13. N. Mehmood,[†] A. Riaz, F. Naz, I. Hassan, N. Jaabeen S. Anwaar, H. Rosli and M. L. Gleason. 2018. First Report of Strawberry Leaf Spot Caused by <i>Alternaria alternata</i> in Pakistan. Plant Disease. Volume 102, Number 4, Page 820 14. Safia Ramzan, Imran Hassan and Salman Mushtaq. 2018. Improvement in Quality and Vase Life of Iris Flower by Salicylic Acid. Asian Journal of Advances in Agricultural Research, 2456-8864, Vol.: 5, Issue.: 1 15. Safia Ramzan, Imran Hassan and Salman Mushtaq. 2018. Vegetative and Floral Traits of Iris Improved by Altered NPK Doses. Asian Journal of Advances in Agricultural Research, 2456-8864, Vol.: 5, Issue 1 16. Gulshan Irshad, Hira Gazal, Farah Naz, Imran Hassan, Amir Bashir, Salman Ghuffar. 2017. Detection And In-Vitro Management of Seed Borne Mycoflora Associated With Sunflower And Zinnia. Pak. J. Phytopathol., Vol. 29 (01) 2017. 07-16 17. Nasir Mehmood, Abid Riaz, Farah Naz, Imran Hassan, Salman Ghuffar, Abdul Sattar, Saba Zafar and Sadaf Anwaar . 2017. First Report of pre-harvest fruit rot of strawberry caused by <i>Botrytis cinerea</i> in Khyber Pakhtunkhwa (KPK) province & Islamabad (Pakistan). Plant Disease · October 2017 DOI: 10.1094/PDIS-08-17-1209-PDN 18. Anwar M., H. A. Sahito, I. Hassan, N. A. Abbasi, H. A. Ahmed, M. A. Bhatti, A. Hussain, Z. Iqbal and A. H. Abro. 2014. Effect of pre harvest treatment of salicylic on growth and vase life of tuberose with aroma environment. Wudpecker Journal of Agricultural Research Vol. 3(2), pp. 050 – 057. (ISSN 2315-7259). 19. Sattar, A., A. Riaz, S. Ahmed, I. Hassan. 2014. Efficacy of selected plant extracts for inhibition of <i>Penicillium expansum</i> growth on apple fruits. Pak. J. Phytopathol., Vol. 26 (01) 63-66. (HEC Recognized) 20. Tariq R., K. M. Qureshi, I. Hassan, M. Rasheed and U. S. Qureshi. (2013). Effect of planting density and growing media on growth and yield of strawberry. Pak. J. Agric. Res. Vol. 26 (2): 113-123. (HEC Recognized) 21. Hassan I., Y. Zhang, G. Du, G. Wang, and J. Zhang. 2007.

	Effect of salicylic acid (SA) on delaying fruit senescence of Huang kum pear. <i>Frontiers of Agriculture in China</i>. Vol. 1(4): 456-459. 22. Banaras M., N. A. Abbasi and I. Hassan. 2006. HACCP System, Quality and safety of Fresh Fruits and Vegetables. <i>Proceeding of International Conference on Value addition in Horticultural Products</i>. Page 127-131 23. WANG G., X. LI, G. QI, R. Huang, L. Wang and I. Hassan. 2003. Effect of different techniques of regulating soil water on soil water contents and fruit quality of Ya-pear. <i>Journal of Agric. Uni. Hebei, China</i>. Vol 26(1):24-27. (HEC Recognized) 24. Chaudhry A. N., S. Ali and I. Hassan. 2002. Effect of different colored plastic mulches on yield and nutrients content of tomato plant. <i>Asian Journal of Plant Sciences</i>. Vol 1(4):388-389. (ISSN. 1682-3974). (HEC Recognized) Conference papers 25. Samia Nisar, Imran Hassan, Ishfaq Ahmad Hafiz, Ghulam Jilani and Syed Zia ul Hasan. 2018. Effect of zinc nanoparticles on seed priming, growth and production of cucumber. 1st International & 2nd National Conference “Challenges and Opportunities to Boost Agriculture in Changing Climate” March 26-28, 2018 26. Ishrat Batool, Imran Hassan, Ishfaq Ahmad Hafiz, Khalid Saifullah Khan, Adnan Saleem and Syed Zia ul Hasan. 2018. Effect of copper nanoparticles on quality enhancement of sweet pepper. 1st International & 2nd National Conference “Challenges and Opportunities to Boost Agriculture in Changing Climate” March 26-28, 2018 27. Muhammad Mazhar Qayyum, Imran Hassan and Nadeem Akhtar Abbasi. 2018. Augmenting gladiolus quality and antioxidant activity by pre Harvest application of calcium during low temperature stress in two growing conditions. 1st International & 2nd National Conference “Challenges and Opportunities to Boost Agriculture in Changing Climate” March 26-28, 2018 28. Muhammad Mazhar Qayyum*, Imran Hassan and Nadeem Akhtar Abbasi. 2018. Beneficial role of magnesium and green net shad in high Temperature stress alleviation and growth improvement in gladiolus grandiflora. 1st International & 2nd National Conference “Challenges and Opportunities to Boost Agriculture in Changing Climate” March 26-28, 2018
Conference Seminars attended	Participated in workshop on “ICT use of Pakistani girls in rural farming households” held on 20-08-2015 in PMAS, Arid Agriculture University Rawalpindi by USAID and PARC. Participated in international training titled as “Seminar on Agricultural Environment Controlling Technologies for Arid Areas for developing countries 2015, organized by “International

	Exchange Center, Yangling, Province; Shaanxi by Ministry of Commerce PR, China from May 12, 2015 to June 1, 2015. Participated in international training titled as “Training Course on Treatment and Utilization of Agriculture Waste for Developing Countries” funded by Biogas Institute of Ministry of Agriculture (BIOMA), from July 13, 2013 – August 12, 2013 at city; Chengdu, Province; Sichuan, P.R. China. Participated in International Science Conference on “Utilization of Modern Agriculture Technology in Changing Environmental Perspectives” dated July 21-23, 2010 at University Azad Jammu & Kashmir, Rawalakot. Participated in “International Workshop on Protected Horticulture” dated Feb.27 - March 1, 2008 at University of Arid Agriculture Rawalpindi (Pakistan). Participated in “International Conference on Trade Liberalization and SAFTA: Opportunity, Concerns and Challenges” dated March 29-31, 2007 at University of Arid Agriculture Rawalpindi (Pakistan). Participated in International Conference on Value addition in Horticultural Products” dated 26-28/06/2006 at University of Arid Agriculture Rawalpindi. (UAAR). Participated in “International Workshop on Phyto remediation of Contaminated Soils and Water” dated December 12-15, 2006 at UAAR. Pakistan
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Name	Dr. Umer Habib
Personal	Date of Birth : 01 October, 1980 NIC. No. : 33303-2924087-7 Passport No : AN6030871 Domicile : Punjab (Toba Tek Singh) Religion : Islam Marital Status : Unmarried Email : umer_habib@hotmail.com
EDUCATION	Ph.D. (Landscape Horticulture) (2018) Institute of Agriculture and Environment, Massey University, New Zealand M.Sc. (Hons.) Horticulture (2007) (CGPA: 3.55/4.00) 1st Div. Institute of Horticultural Sciences, University of Agriculture Faisalabad. B.Sc. (Hons.) Agriculture (2002) (CGPA: 3.53/4.00) 1st Div. Institute of Horticultural Sciences, University of Agriculture Faisalabad. Intermediate (Pre-Medical) (1997) (Marks: 739/1100) 1st Div. Govt. Municipal Degree College, Toba Tek Singh. BISE Faisalabad. Matriculation (1995) (Marks: 670/850) 1st Div. Govt. Islamia Secondary High School, Toba Tek Singh. BISE Faisalabad.
Experience	▪ 16 years ▪ Working as Lecturer January, 2008 - Todate Department of Horticulture, PMAS-Arid Agriculture University Rawalpindi Pakistan. <u>Responsibilities</u> 1. Academics (Undergraduate and Postgraduate) 2. Research (Landscape and Floriculture) 3. Incharge Horticulture Research Area 4. University Horticultural Research Farm Development ▪ Worked as “Consultant Horticulturist” June, 2007 – December, 2007 Crescent Textile Mills, Sargodha Road, Faisalabad ▪ Worked as ““Landscape Consultant” June, 2003 – June, 2007

	Various projects at Faisalabad • Faisal Valley, Canal Road, Faisalabad. • Marriam Villas, Canal Road Fiasalabad. • Samarkand Restaurant & Banquets, Madina Town, Faisalabad. • M.K. Sons, Khurianwala, Jaranwala Road, Faisalabad. • Union Bank Limited, Kotwali Road, Faisalabad. • Metropolitan Bank Limited, Kotwali Road, Faisalabad. • Abdullah Gardens I, Canal Road, Faisalabad. • The Dynesty, Jaranwala Road, Faisalabad. • Layallpur Golf Club, Race Course Road, Faisalabad. • New Nazimabad, Nazimabad, Faisalabad. • International Housing Complex, U.A.F., Faisalabad. • Khawaja Gardens, Chak# 209, Faisalabad. • Abdullah Gardens II, Canal Road, Faisalabad. • SOS Village, Canal Road, Faisalabad. • Barkat Villas, Jaranwala Road, Faisalabad • Judges Colony, Road, Faisalabad. • Raza Gadens, Canal Road, Faisalabad • Greenview Nursery Farms, Sheikhpura Road, Faisalabad
RESEARCH EXPERIENCE	▪ Master research completed entitled “<i>Significance of Landscape to Create a Prolific School Environment: Perceptional Study of Children with Different I.Q. Levels</i>” ▪ Many studies conducted on social aspects of urban green spaces and public parks. ▪ Effect of different growth medias on quality and shelf life of tuberoase.
Publications	Books ▪ Protected Horticulture 2008 Edited by Nadeem Akhtar Abbasi and Umer Habib Chapters 1. Abbasi, N.A. and U. Habib. 2008. Recent development in research and application in protected agriculture. <i>In N.A. Abbasi and U. Habib.</i> Protected Horticulture. Megalink printers, Rawalpindi, Pakistan. 2. Butt, S.J. and U. Habib. 2008. Recent development in research and application in protected agriculture. <i>In N.A. Abbasi and U. Habib.</i> Protected Horticulture. Megalink printers, Rawalpindi, Pakistan. Articles

	Abbasi, N.A. and U. Habib. 2009. Post harvest management of cut flowers. National conference on streamlining commercial floriculture on modern lines to gain foot hold in niche market, Horticultural Foundation of Pakistan, Rawalpindi, Pakistan. p-32-37 Butt, S.J. and U. Habib. 2008. Rose Climbers in Landscape, Pakistan Rose Annual 2008, Pakistan National Rose Society, Islamabad, Pakistan. p-47-52 Abstract Prospects of rose cut flower production under poly tunnels in sub temperate regions of Pakistan. Abstract book International Science conference on “Utilization of Modern Agriculture Technology in Changing Environment Perspectives” at University of AJK, faculty of Agriculture, Rawlakot.
Conference Seminars attended	- International Science conference on “Utilization of Modern Agriculture Technology in Changing Environment Perspectives” at University of AJK, faculty of Agriculture, Rawlakot. - International workshop on “Plant Conservation and Reversing Desertification: A Way Forward” Department of Environmental Sciences, PMAS-AAUR. “Workshop on Floriculture and Landscape Management” at University of Agriculture, Faisalabad. “International Workshop on Protected Horticulture” at PMAS Arid Agriculture University Rawalpindi. - International symposium on “Prospects of Horticultural Industry in Pakistan” at University of Agriculture, Faisalabad. - First International Conference on “Mango and Date Palm Culture and Export” at University of Agriculture, Faisalabad.
MEMBERSHIPS	- Rotary International, District 3270 (Pakistan, Afghanistan) - Rover Scouts Unit, University of Agriculture, Faisalabad, Pakistan. - Horticulture Society of Pakistan, Inst. of Hort. Sci., University of Agri., Faisalabad, Pakistan. - SRCD (Society for Research in Child Development), New York, U.S.A. - Pakistan Botanical Society - Pakistan National Rose Society - National Horticulture Society of Pakistan - Horticulture Society of Pakistan, Inst. of Hort. Sci., University of Agri., Faisalabad, Pakistan.
EXTRA CURRICULAR	Participation in “IEFR Flower Show” at NFC Institute of Engineering & Fertilizer Research, Faisalabad (2004)

ACTIVITIES	2. Participated and won various categories in “Cut Flower Display and Arrangement” in 3. “Rang-e Bahar Competitions” by Gardners Club of Faisalabad at Serena Hotel, Faisalabad. (2001-2005) 4. 3rd Position in “Rifle Shooting” in Inter-hall Championship. (2002-2003) 5. Team event “Intervarsity Rifle Shooting Championship” 1st Position (2003) 6. 1st Position in “Rifle Shooting” in Inter-hall championship. (2000-2001) 7. Team event “Intervarsity Rifle Shooting Championship” 1st Position (2000-2001) 8. 1st Position in “Fresh Flower Arrangement” in Intervarsity Competition at Fatima Jinnah Women University, Rawalpindi. (2000-2001) 9. 1st Position in “Fresh Flower Arrangement” in Intervarsity Competition at Quaid-e-Azam University, Islamabad (1999) 10. 2nd Position in “Dry Flower Arrangement” in Intervarsity Competition at Quaid-e-Azam University, Islamabad (1999)
THESIS SUPERVISED	1. Effect of different levels of NPK and photoperiod shortening on growth and development of chrysanthemum (<i>chrysanthemum cinerarium</i>) 2. Impact of rejuvenation of parks, people preferences and planning for sustainable landscape development 3. Influence of chitosan on growth and flower quality of gladiolus(<i>Gladiolus hortulanus</i>) at different sowing dates 4. Influence of various soil mixes and chitosan on quality production of pot grown chrysanthemum (<i>Chrysanthemum morifolium</i> L.) 5. Pre and post harvest effect of Giberalllic acid (GA3) Seaweed and chitosan foliar application on nutrient uptake, plant growth and shelf life of Zinnia (<i>Zinnia elegans</i> L.) 6. Design evaluation of urban green spaces: their role in community well being and social safety.
THESIS UNDER SUPERVISION	1. Studies on mass propagation of Rose (<i>Rosa centifolia</i> L.)through tissue culture technique 2. Application of Hydro gel in Bermuda grass (<i>Cynodon dactylon</i> L.) combating drought under rainfed conditions 3. Influence of mowing height and intensity on quality and performance of Bermuda grass (<i>Cynodon dactylon</i> L.) 4. Role and value of playgrounds in educational institutes: A Case Study on Child Perception 5. Stimulatory impacts of interior plant-scaping in offices to reduce stress and increase work efficiency