

**PIR MEHR ALI SHAH
ARID AGRICULTURE UNIVERSITY
RAWALPINDI**



DEPARTMENT OF HORTICULTURE

PhD

Self Assessment Report

2012-14

Program Self Assessment Team

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Introduction

Horticulture refers the intensive commercial production of high-value and high-yielding plants and keeping in view the importance of Horticulture the department started

working with the establishment of the Barani Agricultural College in 1979. When college was upgraded to University of Arid Agriculture in 1994; Ph.D. Program was initiated in 1999. The Department gained striking response from here onward. The eminent Horticulturists produced by this department have been contributing the nation in different capacities. The department is obligated to high standard teaching and advance research in the area of Horticulture.

Presently the department is awfully engaged in conducting professional degree courses of Ph.D. The department deals with three main disciplines of fruits, vegetables and floriculture & landscaping. The major areas of research are: Adaptation of Crop Varieties, Biotechnology for Genetic Crop Improvement /Synthetic Seed Technology, Micro-propagation through Tissue Culture Technology and Macro-propagation, Post-harvest Physiology/Technology, Protected Cultivation (off season & on season crops) and Studies on Value-addition of Horticultural Crops.

The faculty is actively involved in a number of research projects; some of which are internationally collaborated and funded. The department is equipped with the complete range of resources needed to meet the modern demands for education and research. The department faculty members are practically involved in various projects (topics include pathogen-free crops, soilless and soil-based crops, bulbous crops, medicinal plants, uses of edible coating for enhancement of shelf life, organic farming, Protected cultivation of different vegetables and uses of biotechnological tools for crop improvement) thus sharing the horticulture industry.

SECTION 1

Components of Self Assessment Process

This report has been prepared on the basis of criteria as guided by the Self- assessment manual.

Criterion-1: PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Introduction

Department of horticulture is concerned in the production of fruits, vegetables and flowers about the same horticultural principles for the management of crops production. Horticulture is the branch of agriculture that deals with multiplication, production technology and crop improvement of horticultural crops (Fruits, Vegetables, House Plant and Flowers). Crop improvement has a great impact on economic, social and political values of agricultural society. More emphasis is given on qualitative and quantitative improvement of horticultural crops by using modern techniques of horticultural crop production for Ph.D students. The objective of the department is to increase crop production, quality and profit by employing their potential skills and experienced expertise of the faculties. The introduction, evaluation, characterization, and development of horticultural crops are continuous processes of education and research at doctoral level.

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

Mission Statement of the Ph. D Program

The Mission of the Ph. D Program is to equip and impart training to Ph.D. students for high-quality education which should result in amplified generation of knowledge and skills resulting in enhanced standard of employment, potentially manpower, whose endeavours may result in a prosperous nation. The goal of the Department of Horticulture is to bestow quality education and research- oriented training, extension of agricultural knowledge for self-sufficiency in quality food and development of sustainable system for

profitable production which can be environment friendly to make the future of Pakistan Prosperous.

Programme Objectives of the Department

1. Broaden the vision of students by teaching them the integrated Horticulture.
2. Planning for current and future researchable issues along with attachment to the latest teaching & research methods
3. Development of Horticulture structure on advance and innovative lines for teaching
4. 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.
5. Development of Horticulture structure on advance and innovative lines for teaching and research activities for the Ph. D students.
6. To strengthen the discipline with integration of knowledge and approach of related fields such as Breeding, Biotechnology, Hydroponics, Plant Physiology and Landscape Horticulture.

Main Elements of Strategic Plan to Achieve Mission and Objectives

1. Frequent planning for updating the curricula of core &, elective subjects and specialized areas.
2. Improving the research labs. equipping with up to date facilities & equipment
3. Publication of research data in scientific journals of world repute, books and other literature.
4. Developing of a teaching structure based on the experience and vision assembled from latest knowledge, proceedings, symposia etc to uplift the capabilities of the Ph.D. students.
5. Coordination with other research organizations, universities, agriculture ministry and foundations for research matters.
6. Setting up of well-equipped specialized research laboratories to facilitate the students.

Table-1: Program objective assessment

	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 Doctoral students.	On the basis of recognition of Horticultural crops in the area and determining their impact	It is a continuous process as per requirement	Teaching and research methodology is needed to be improved	Teaching and research methods have been revised in order to make them more attractive and understandable
2	Integration of related field	By examining the students in integration of the things or different aspects in agri. Production	During semester and comprehensive exams. And research activities	Students to participate in the class, assignments and report preparation	Improvement is still going on
3	To lead students and conduct research on advanced scientific lines in the field of horticulture.	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 is still going on

4	Anticipation of new teaching/researchable areas	With the need of current advancement in the relevant areas	Continuous activity	Time need based new courses research problems are needed to be included in curriculum, problem - research	Approval of new curricula and research areas has been accorded
5	To counter new problems in Horticulture.	Through discussion, consultation and practical implementation with the farmers for better interaction	Regular activity	New courses to be included in curriculum, research on new problem	Recommendation of new curriculum is suggested
6	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

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 Vs Outcomes

Program Objectives	Program Outcomes					
	1	2	3	4	5	6
1	XXX	XX	X	XX	X	XX
2	XX	XX	XX	XXX	XX	XXX
3	XX	X	XX	XX	XX	XX
4	XX	XX	XX	XX	XX	XX
5	XX	XXX	XX	XX	XX	XXX
6	XX	XX	XXX	XX	XX	XX

X:- Relevant

XX:- Relevant and Satisfactory

XXX:- Very Relevant and Very Satisfactory

Meeting Standards 1-2: Program Outcome Measurement

A number of surveys based on the QAC questionnaires were initiated to assess the programme outcomes/graduates of the Department.

Performa 1 & 10 Course and Teacher Evaluation

Teacher Evaluation (2012-14)

Dr. Khalid Mahmood Qureshi

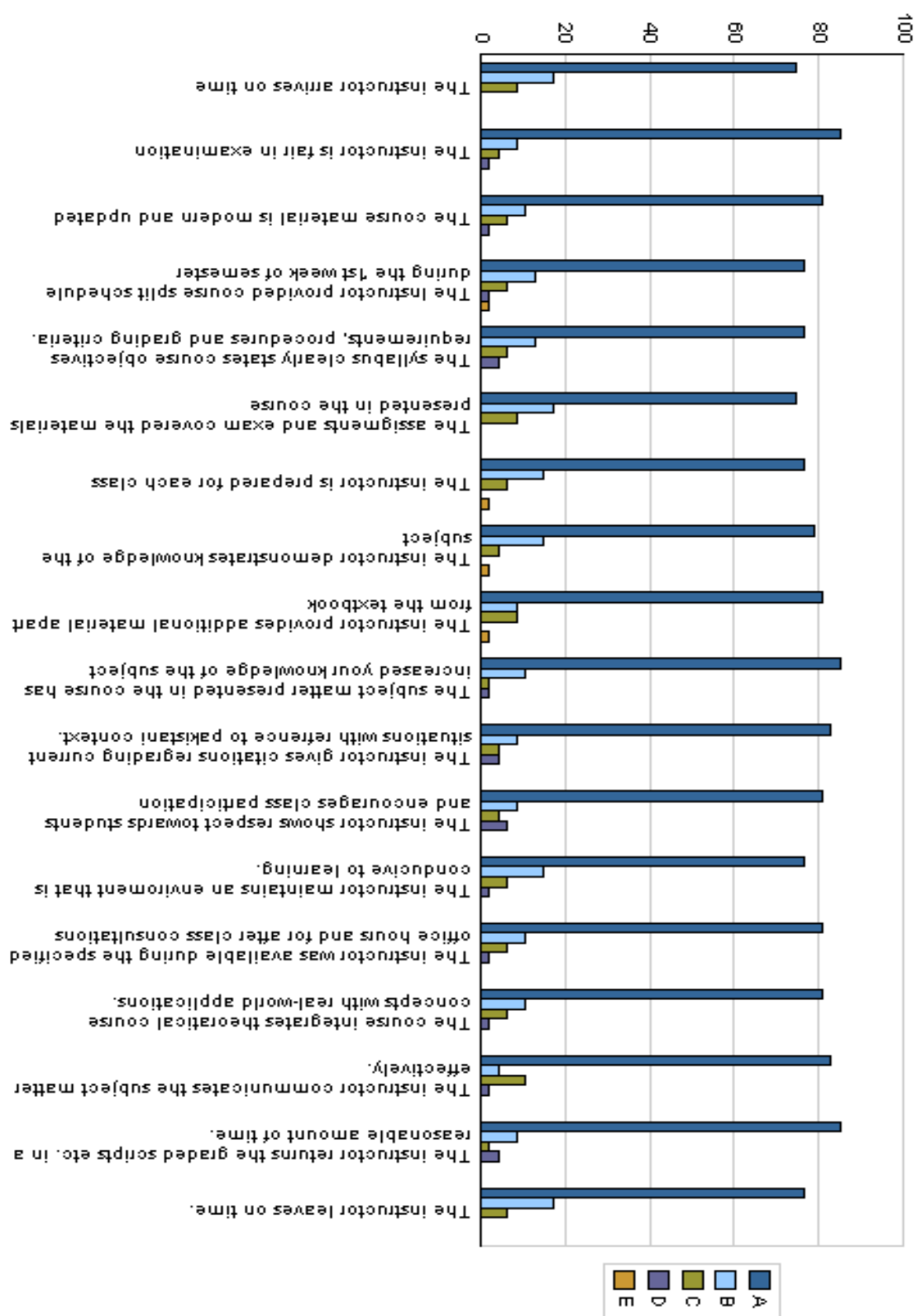
i. Teacher Evaluation

Data were collected from 7 Ph.D. The individual parameters showed that the 51% of the students strongly agreed, 32% agreed, 4% uncertain, 8% disagreed, and 4% strongly disagreed that the teacher prepared for each class. Similarly, most of the students agreed that instructor demonstrates knowledge of the subject, instructor had completed the whole course, the Instructor provided additional material apart from the textbook, the Instructor gave citations regarding current situations with reference to Pakistani context, 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 graded 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 states course objectives requirements, procedures and grading criteria, the course integrates theoretical course concepts with real-world applications, and the assignments and exams covered the materials presented in the course, the course material is updated.

Comments / Suggestions

1. Environment was gracious and supportive.
2. Good way of teaching, a man of foresight.
3. Scientific approach of teaching.

Teacher Evaluation Graph



i. Course Evaluation:

Hort-703	Advanced Fruit Production	3(2-2)	Dr. Khalid Mahmood Qureshi
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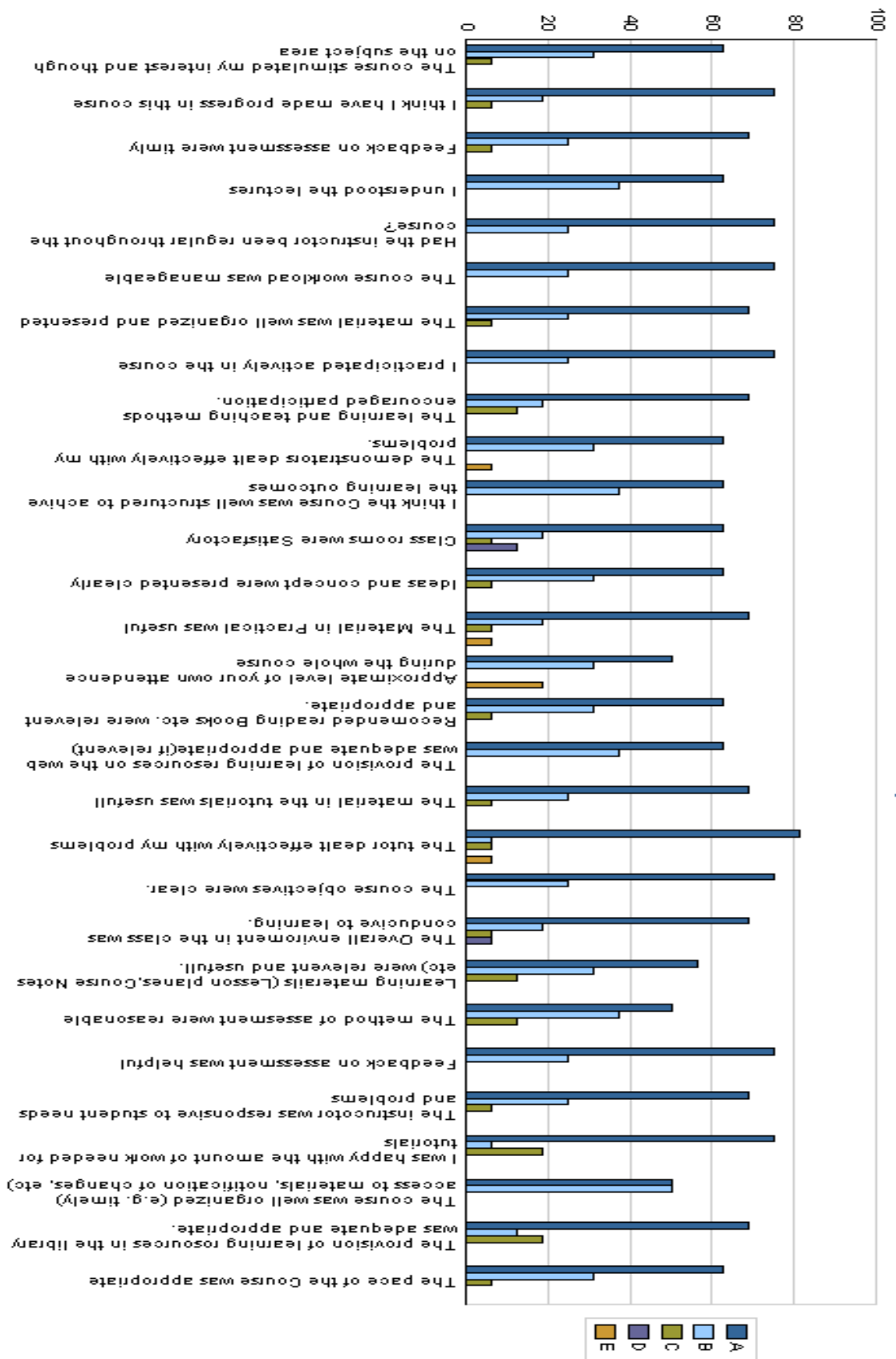
Data were collected from 7 Ph.D. students. The individual parameter showed that 45% the students strongly agreed, 38% agreed, 8% uncertain, 9% disagreed and 0% strongly disagreed that the course objectives were clear. For the remaining parameters most of the students agreed that the course was well structured to achieve the learning outcomes. Similarly, they agreed that the learning and teaching methods encouraged the overall environment in the class was conducive to learning, and classrooms were satisfactory, learning materials were relevant and useful, recommended reading books etc. were relevant and appropriate. They described that the provision of learning resources in the library was adequate and the course stimulated their interest and thought on the subject area. According to most of the students, the pace of the Course was appropriate, ideas and concepts were presented clearly, the method of assessment were reasonable, the material was well organized and presented, the instructor was responsive to student needs and problems, instructor was regular throughout the course and the material in the tutorials was useful.

Comments / Suggestions:

More practical must be arranged in labs.

1. Course should be up graded and updated.
2. Learning environment and resources were not satisfactory.
3. Usage of visuals, practical demonstrations and multimedia can make the course interesting and effective.
4. Course objectives must be clearly defined.

Course Evaluation Graph



Dr. Shahid J. Butt

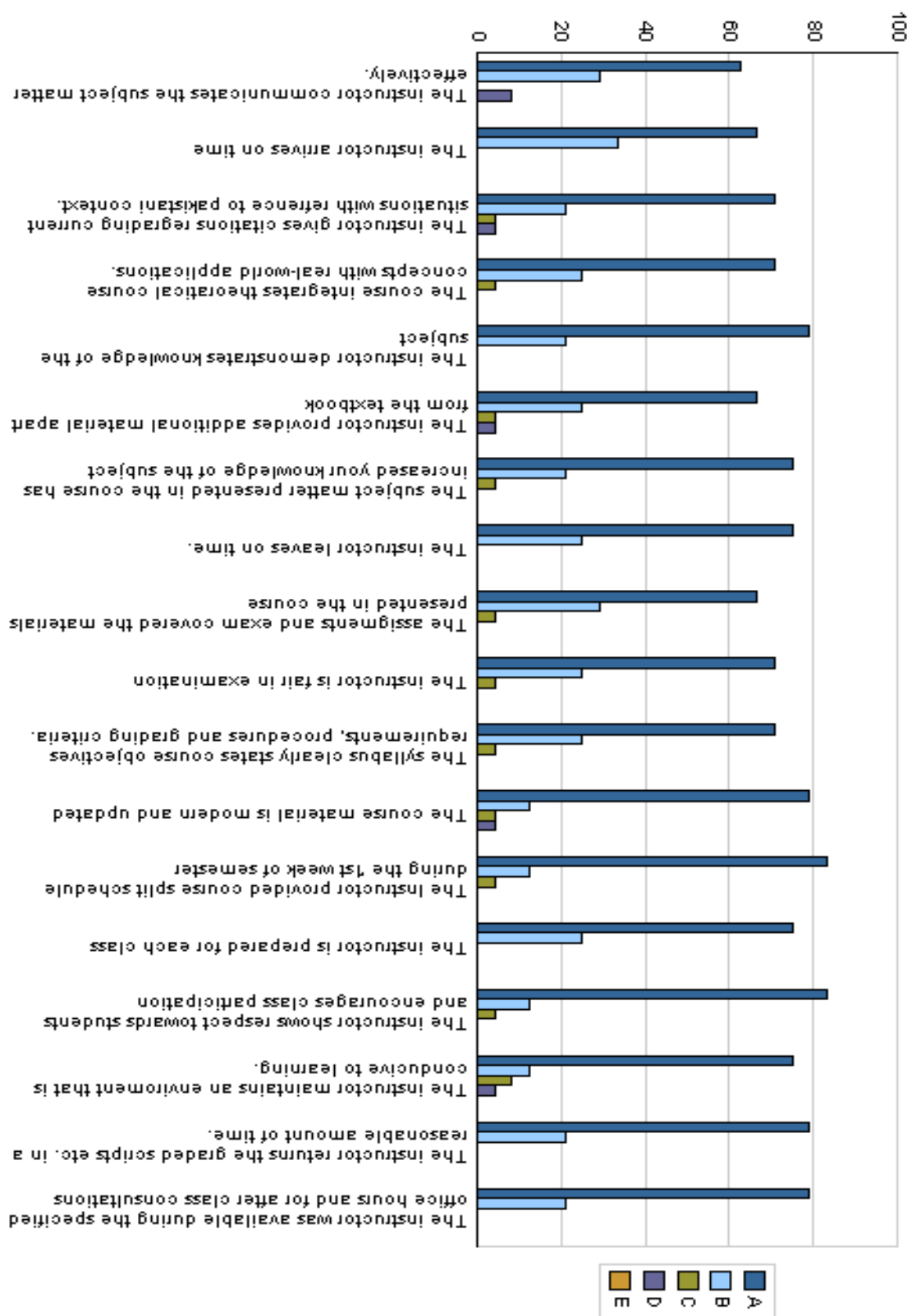
i. Teacher Evaluation

Data were collected from 7 Ph.D. students. The individual parameters showed that the 73% of the students strongly agreed, 24% agreed, 3% uncertain, 0% disagreed, and 0% strongly disagreed that the teacher is fair in examination. Most of the students agreed that the instructor came with good preparation in each class. Most of the students agreed that instructor demonstrates knowledge of the subject and completed the whole course, he provided additional material apart from the textbook, Citations regarding current situations were imparted, communicates the subject matter, 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 graded 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.

Comments/Suggestions

1. General information given by teacher based on his practical experience from the prevalent environment was indeed very effective.
2. Good behavior of the teacher and was available any time.
3. Course was completed in due time and was very interesting.

Teacher Evaluation Graph



ii. Course Evaluation

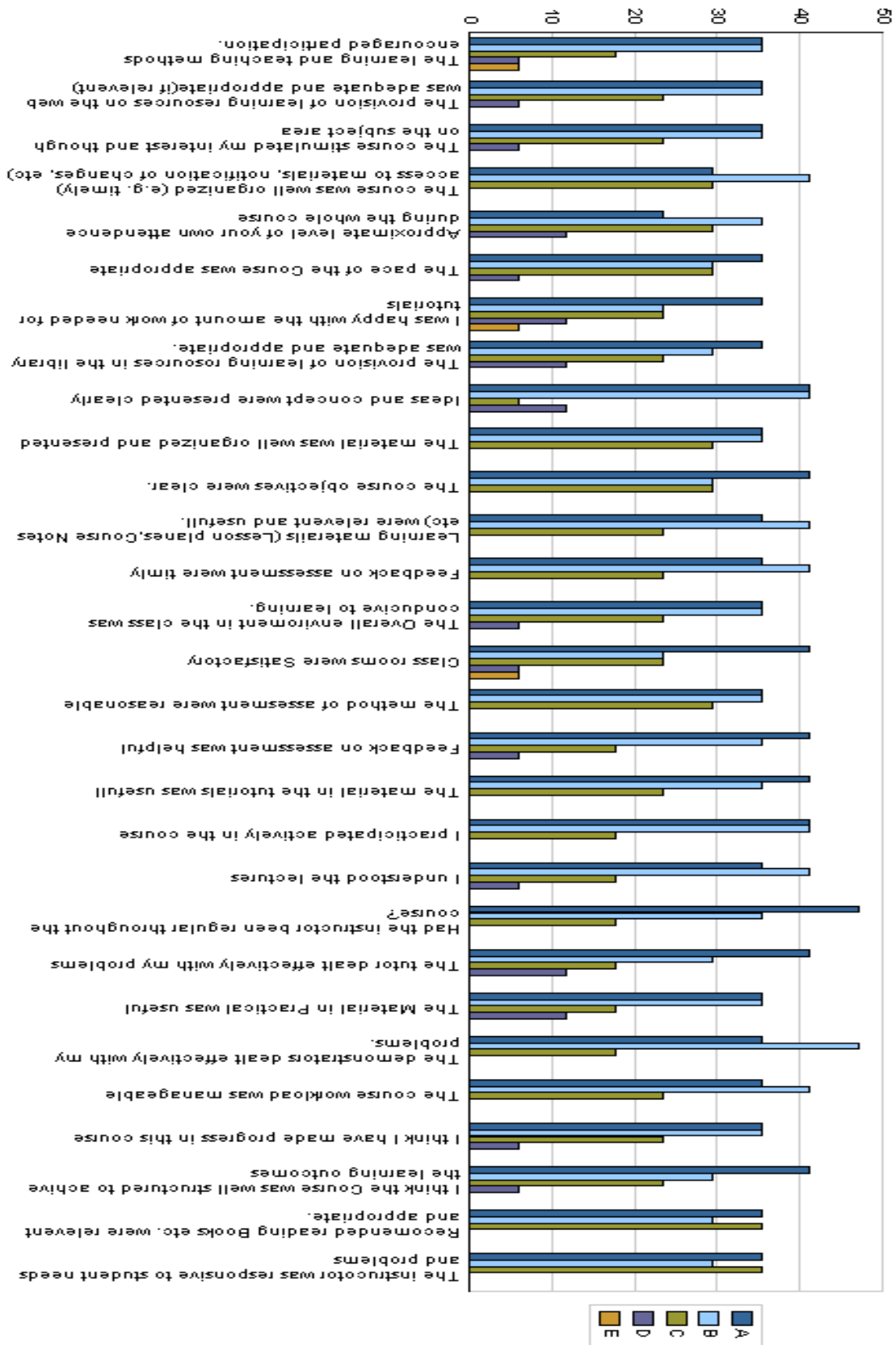
Hort-704	Advanced Vegetable Production	3(2-2)	Dr. Shahid J. Butt
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Data were collected from 5 Ph.D. students. The individual parameter showed that 76% the students strongly agreed, 16% agreed, 2% uncertain, 2% disagreed and 3% strongly disagreed that the course objectives were clear. Moreover, most of the students agreed that the course well organized, the course was well structured to achieve the learning outcomes, learning and teaching methods encouraged participation, the overall environment in the class was conducive to learning, and classrooms were satisfactory, learning materials were relevant and useful, recommended reading books etc. were relevant and appropriate. Also the provision of learning resources in the library was adequate and the course stimulated their interest and thought on the subject area, ideas and concepts were presented clearly, the material was well organized. The instructor was responsive to student needs and problems, regular throughout the course.

Comments/Suggestions:

1. More practical will improve the course.
2. Lab equipment was not adequate.
3. Projector and multimedia should be used to deliver lectures.
4. Proper materials were not available for practical demonstrations.
5. Course was informative and interesting

Course Evaluation Graph



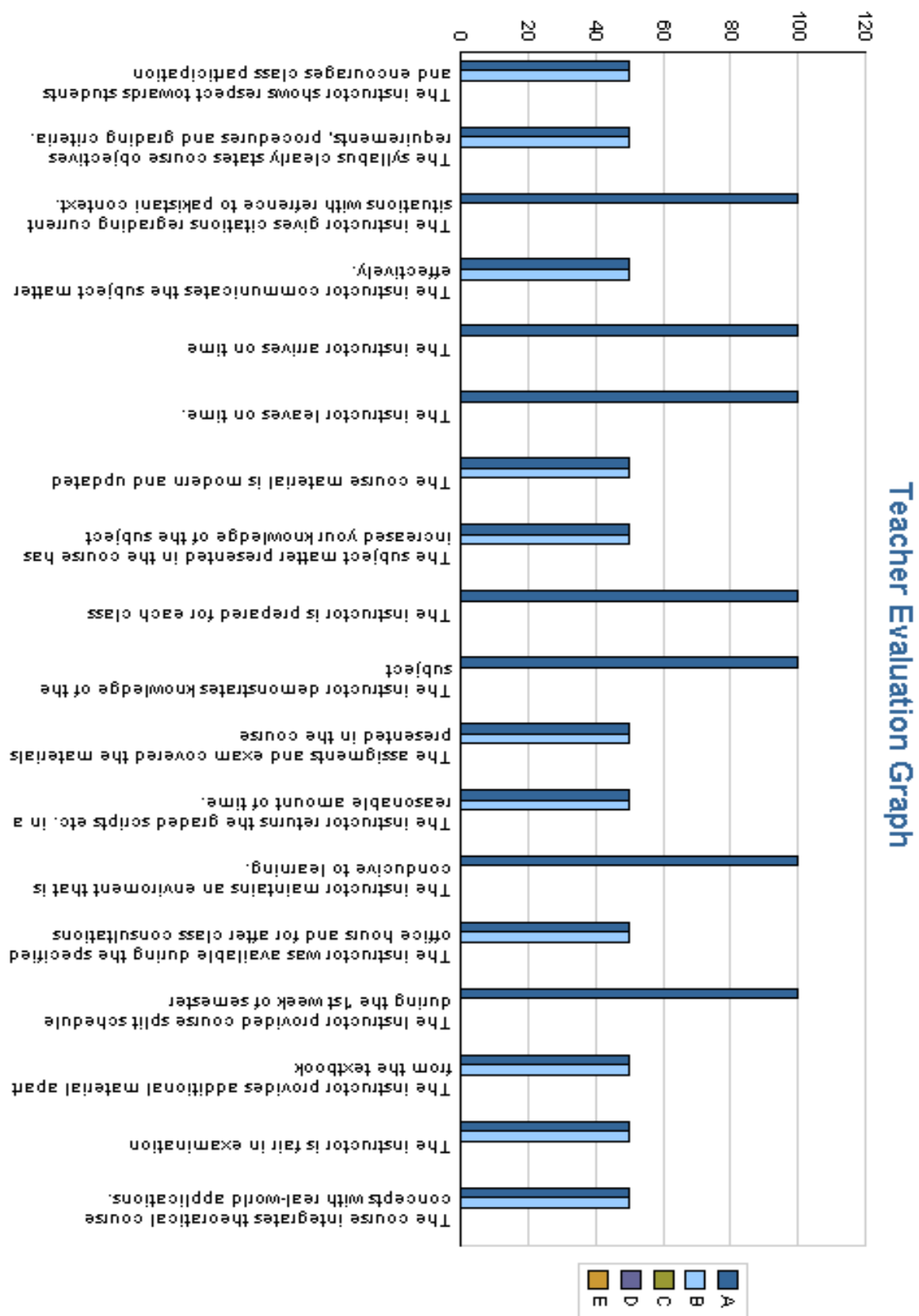
Dr. Ishfaq Ahmad Hafiz

i. Teacher Evaluation

Data were collected from 16 Ph.D. students. The individual parameters showed that the 60% of the students strongly agreed, 27% agreed, 7% uncertain, 6% disagreed, and 0 % strongly disagreed that the teacher is fair in examination. Most of the students agreed that the instructor came with good preparation in each class. Most of the students agreed that instructor demonstrates knowledge of the subject, instructor had completed the whole course, the Instructor provided additional material apart from the textbook, 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 graded 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.

Comments/Suggestions

1. General information given by teacher based on his practical experience from the prevalent environment was indeed very effective
2. Good behavior of the teacher and was available any time.
3. Course was completed in due time and was very interesting.



ii. Course Evaluation

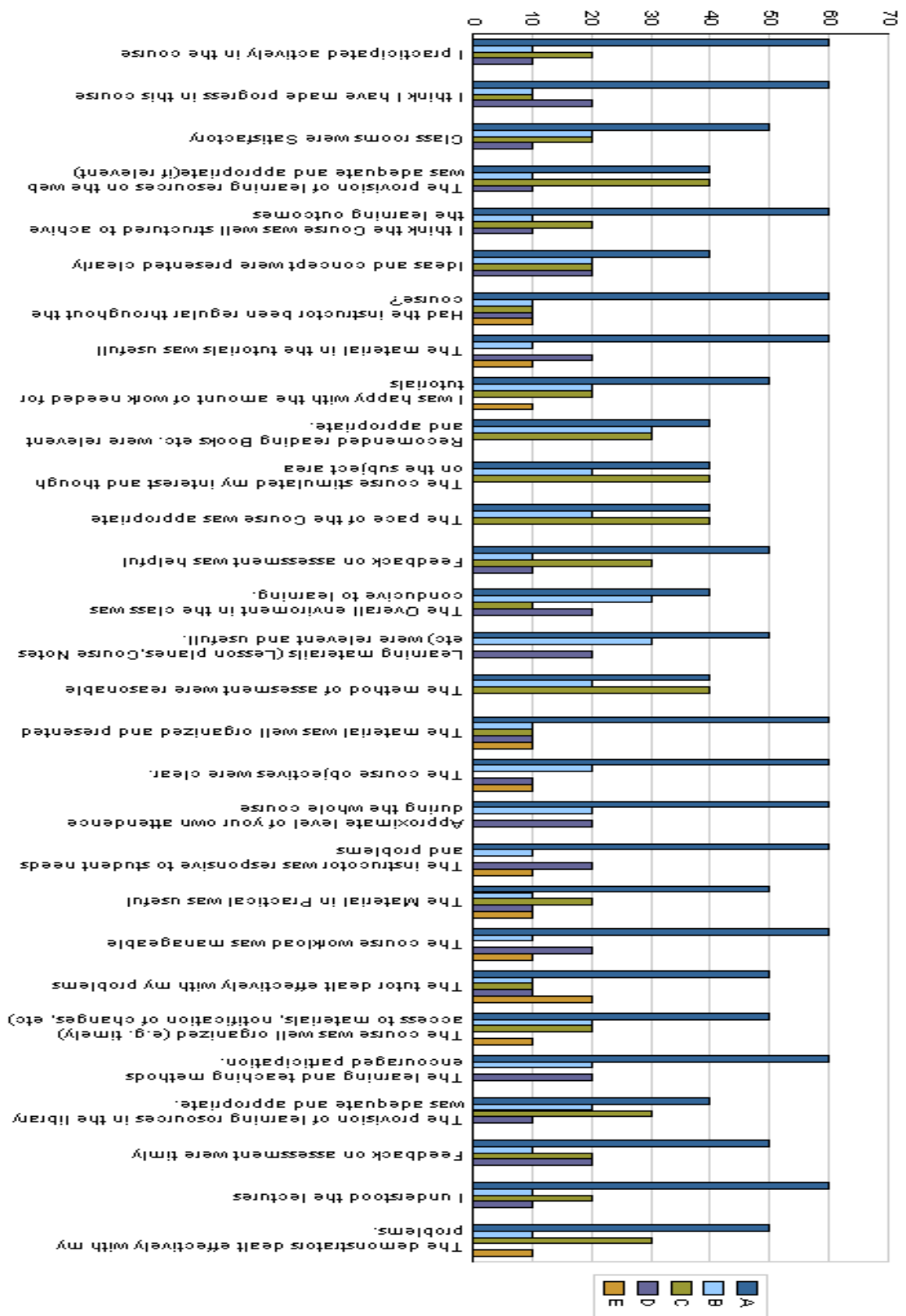
Hort-705	Breeding of Horticultural Plants	3(2-2)	Dr. Ishfaq Ahmad Hafiz
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Data were collected from 16 Ph.D. students. The individual parameter showed that 77% the students strongly agreed, 23% agreed, 0 % uncertain, 0% disagreed and 0% strongly disagreed that the course objectives were clear. Moreover, most of the students agreed that the course well organized, the course was well structured to achieve the learning outcomes, learning and teaching methods encouraged participation, the overall environment in the class was conducive to learning, and classrooms were satisfactory, learning materials were relevant and useful, recommended reading books etc. were relevant and appropriate. Also the provision of learning resources in the library was adequate and the course stimulated their interest and thought on the subject area, ideas and concepts were presented clearly, the material was well organized. The instructor was responsive to student needs and problems, regular throughout the course.

Comments/Suggestions:

1. More practical will improve the course.
2. Lab equipments were not adequate.
3. Projector and multimedia should be used to deliver lectures.
4. Proper materials were not available for practical demonstrations.
5. Course was informative and interesting

Course Evaluation Graph



Dr. Nadeem Akhtar Abbasi

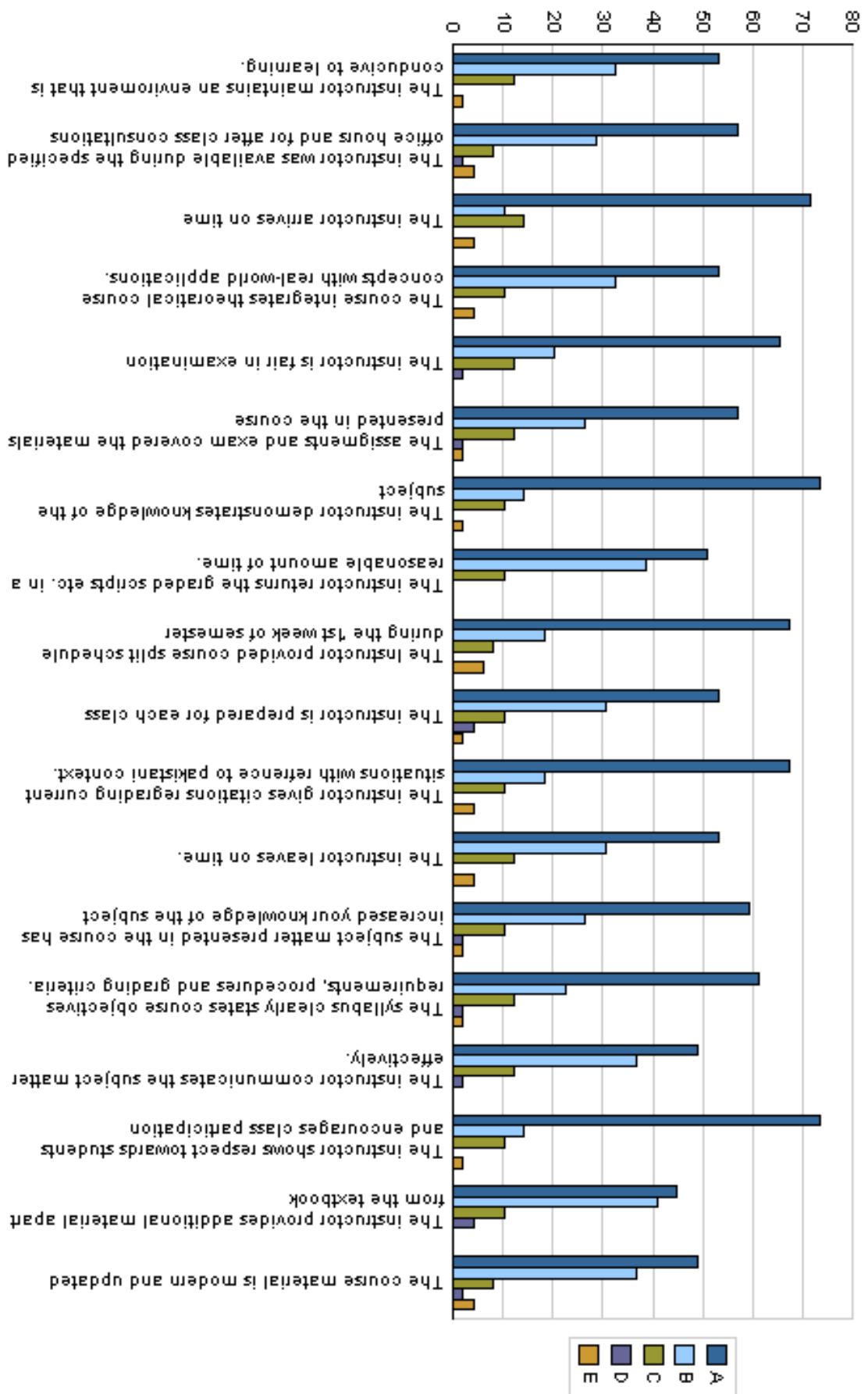
Teacher Evaluation

Data were collected from 10 students. The individual parameter showed that the students are strongly agreed (62% and 64 % respectively) that the teacher is prepared for each class and demonstrate the subject knowledge in a very effective way. More than 90 % of the students were strongly agreed and agreed that the instructor has completed whole the course in time, provide additional information and also fair in examination. Similarly, most of the students agreed that instructor showed respect towards students and encourages class participation effectively; the Instructor maintained an environment that was conducive to learning. More than 90% students are of the view that the Instructor arrived and leave the class on time and returned the graded scripts etc. in a reasonable amount of time. Most of the students agreed that 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 states course objectives requirements and the assignments and exams covered the materials presented in the course, the course material is modern and updated.

COMMENTS / SUGGESTIONS

1. Environment was friendly and conducive for learning.
2. Good way of teaching.
3. Scientific approach with good communication skills.
4. Teacher was punctual reached and leave the class in time.

Teacher Evaluation Graph



Course Evaluation

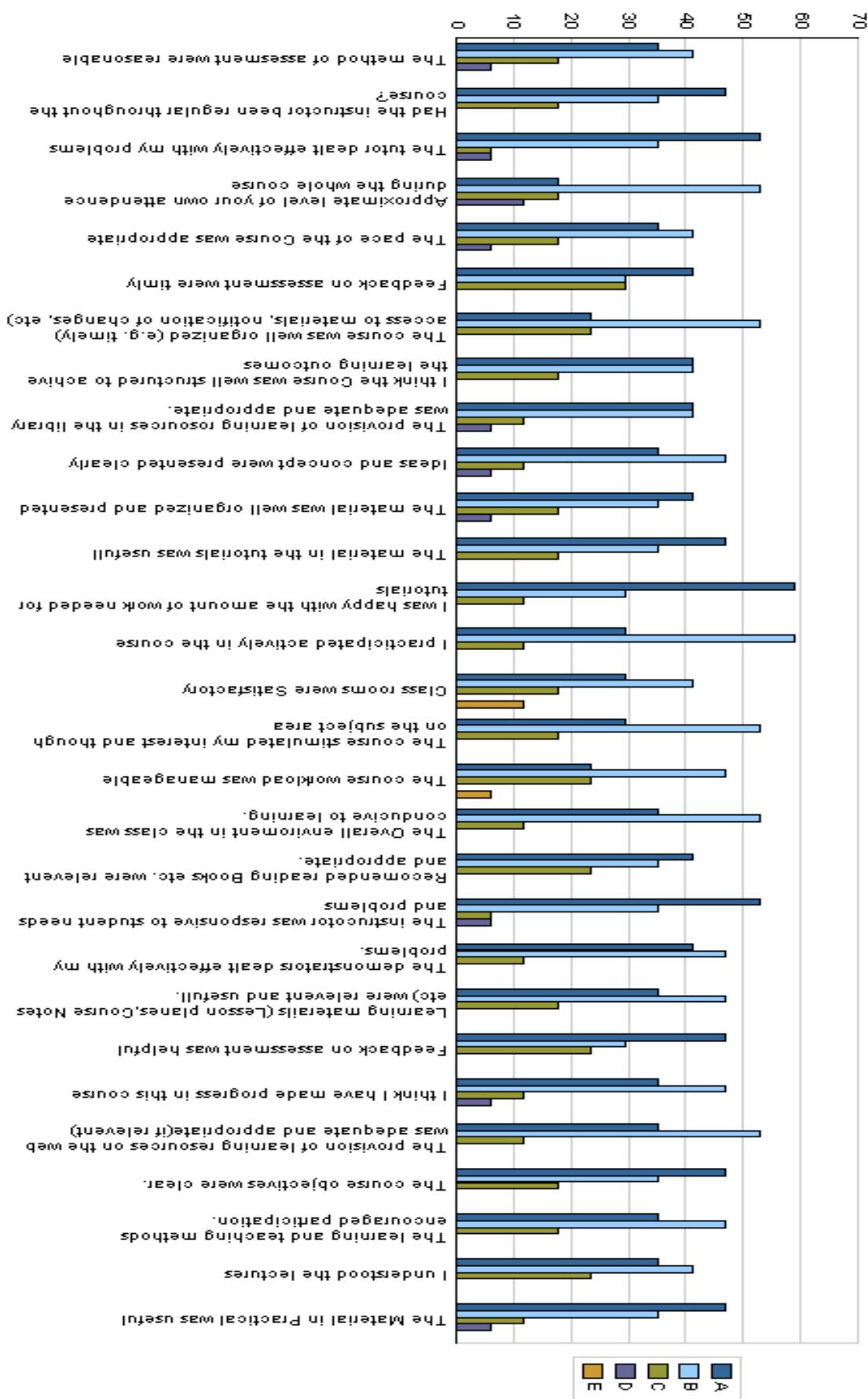
Hort-712	Post-Harvest Physiology of Horticultural Crops	3(2-2)	Dr. Nadeem Akhtar Abbasi
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Data was collected from 50 students. Overall 52% of the students strongly agreed and 42% were agreed that the course were clear. However the more than 80% of the students were strongly agreed and agreed that the course workload was manageable. More than 48% of the students are of the view that they made progress in the course. Data regarding individual parameter is depicted in the pie chart graph. According to most of the students, the pace of the Course was appropriate, ideas and concepts were presented clearly, the method of assessment were reasonable, the material was well organized and presented, the instructor was responsive to student needs and problems and the material in the tutorials was useful.

Comments/ Suggestions

1. The course presents the current and future of agriculture management.
2. Presentations are good part of this course.
3. Technical knowledge is good but internet facility is poor.
4. Course completed in due time and very interesting
5. Field visit and practical work improved our knowledge.
6. Class environment was friendly and conducive for learning.

Course Evaluation Graph



Dr. Imran Hassan

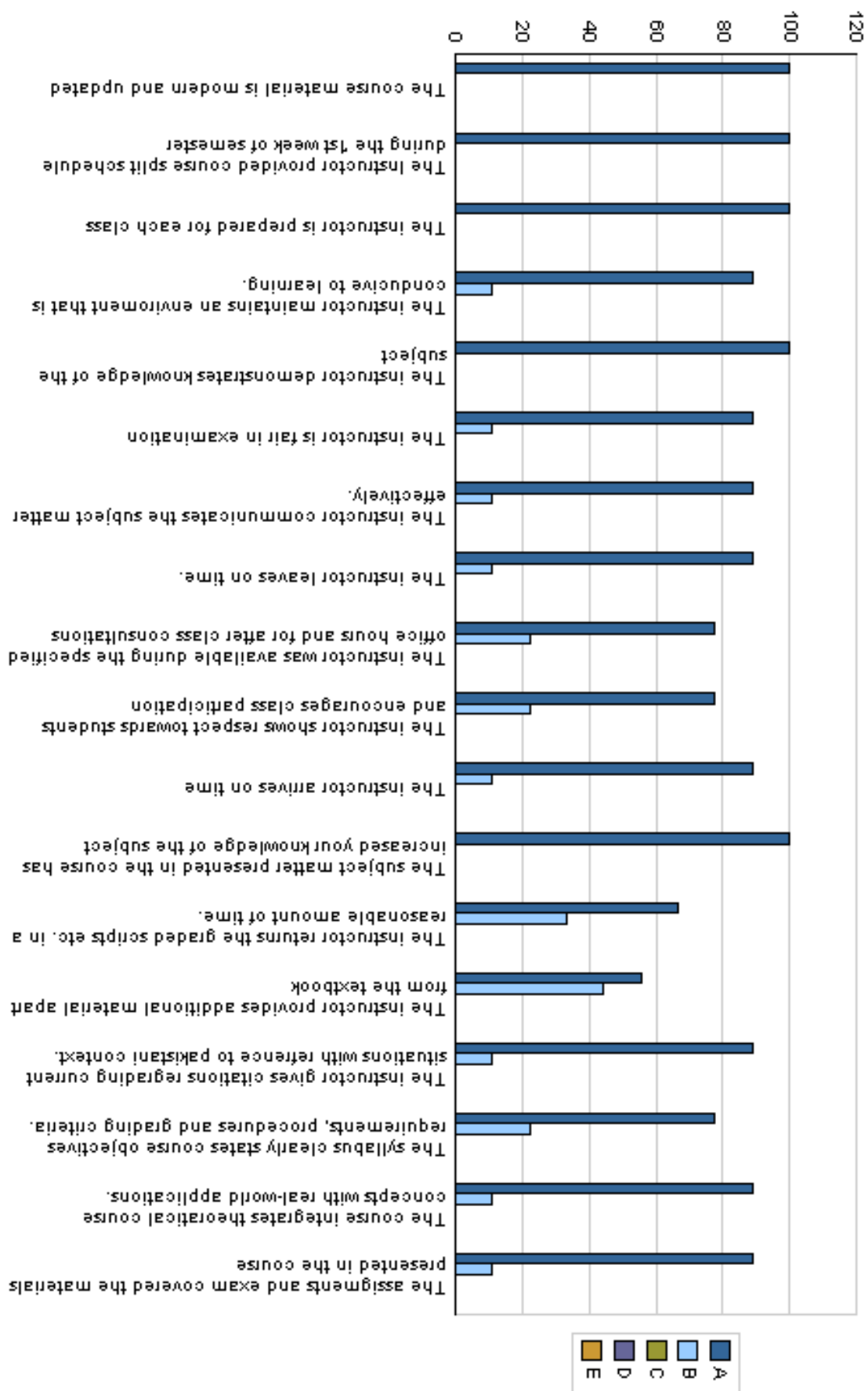
Teacher Evaluation

Data were collected from 187 students which showed that the students were strongly agreed (37% and 31 % respectively) that the teacher is prepared for each class and demonstrate the subject knowledge in a very effective way. More than 70 % of the students were strongly agreed and agreed that the instructor has completed whole the course in time, provide additional information and also fair in examination. Similarly, most of the students agreed that instructor showed respect towards students and encourages class participation effectively; the Instructor maintained an environment that was conducive to learning. More than 80% students are of the view that the Instructor arrived and leave the class on time and returned the graded scripts etc. in a reasonable time. Most of the students agreed that 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 states course objectives requirements and the assignments and exams covered the materials presented in the course, the course material is modern and updated.

COMMENTS / SUGGESTIONS

1. Environment was friendly.
2. Teaching method was good.
3. Has scientific approach with good communication skills.
4. Teacher was punctual reached and leave the class in time.

Teacher Evaluation Graph



Course Evaluation

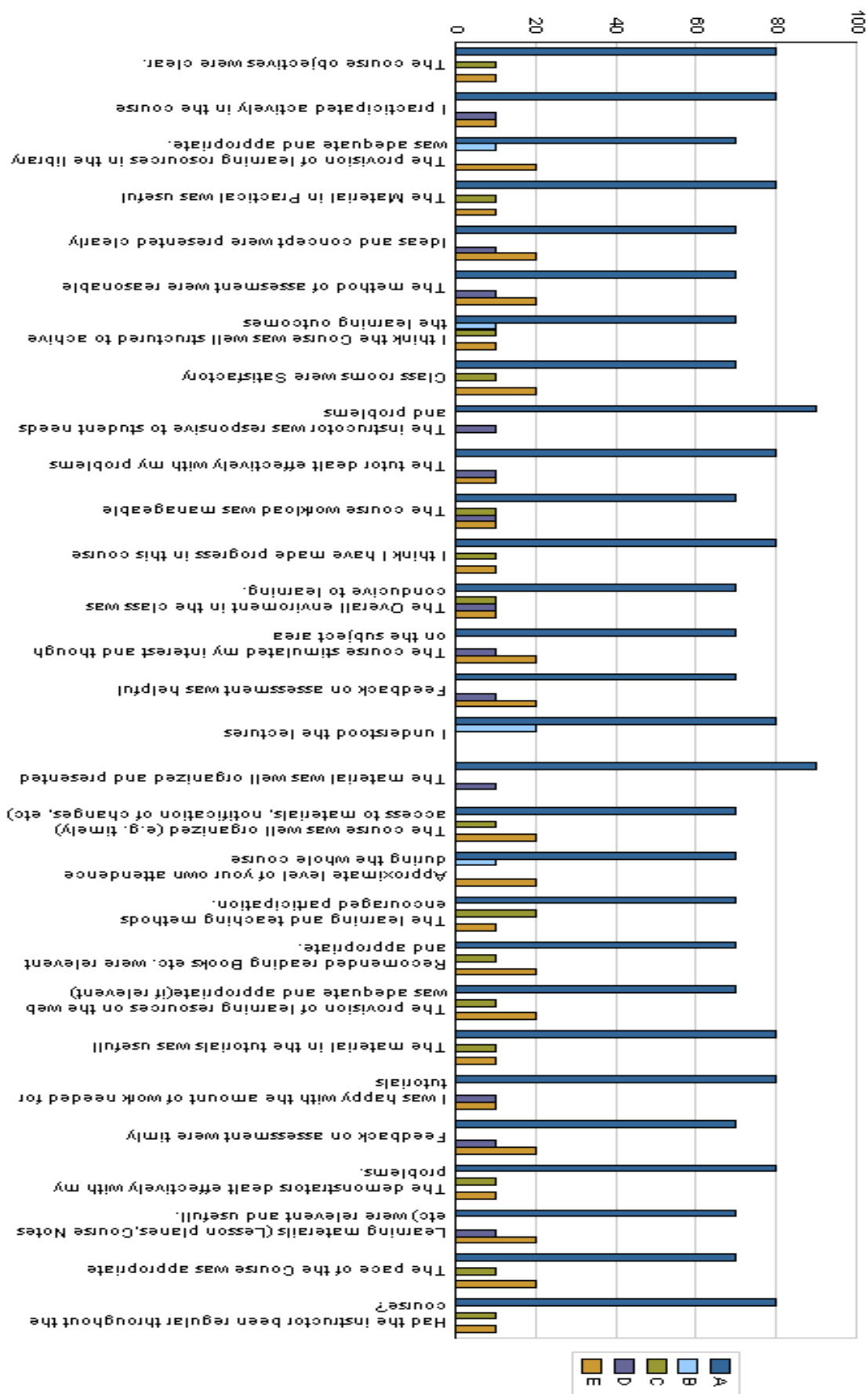
Hort-711	Advanced Ornamental Plants Production	3(2-1)	Dr. Imran Hassan
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Data was collected from 11 students. The individual parameter data showed that 67% of the students strongly agreed that the course objectives were clear. More than 58% of the students strongly agreed that the course workload was manageable, well organized (e.g. timely access to materials, notification of changes, etc.). The 75% of the students strongly agreed that the approximate level of student's attendance during the whole course was higher; students participated actively in the course and have made progress in this course. Most of the students agreed that the course was well structured to achieve the learning outcomes (there was a good balance of lectures, tutorials, practical etc.). The overall environment in the class was conducive to learning, and classrooms were satisfactory, learning materials (Lesson Plans, Course Notes etc.) were relevant and useful, recommended reading books etc. were relevant and appropriate. According to most of the students, the pace of the Course was appropriate, ideas and concepts were presented clearly, the method of assessment were reasonable, instructor was regular throughout the course and the material in the tutorials was useful.

Comments/ Suggestions

1. The course presents the current and future needs of agriculture management.
2. Technical knowledge is good but internet facility is poor.
3. Course completed in due time and very interesting
4. Seed is an important component for getting good yield and we got lot of information from this course which should be made more practical and farm visits should be included.

Course Evaluation Graph



Performa 2

Faculty course review report

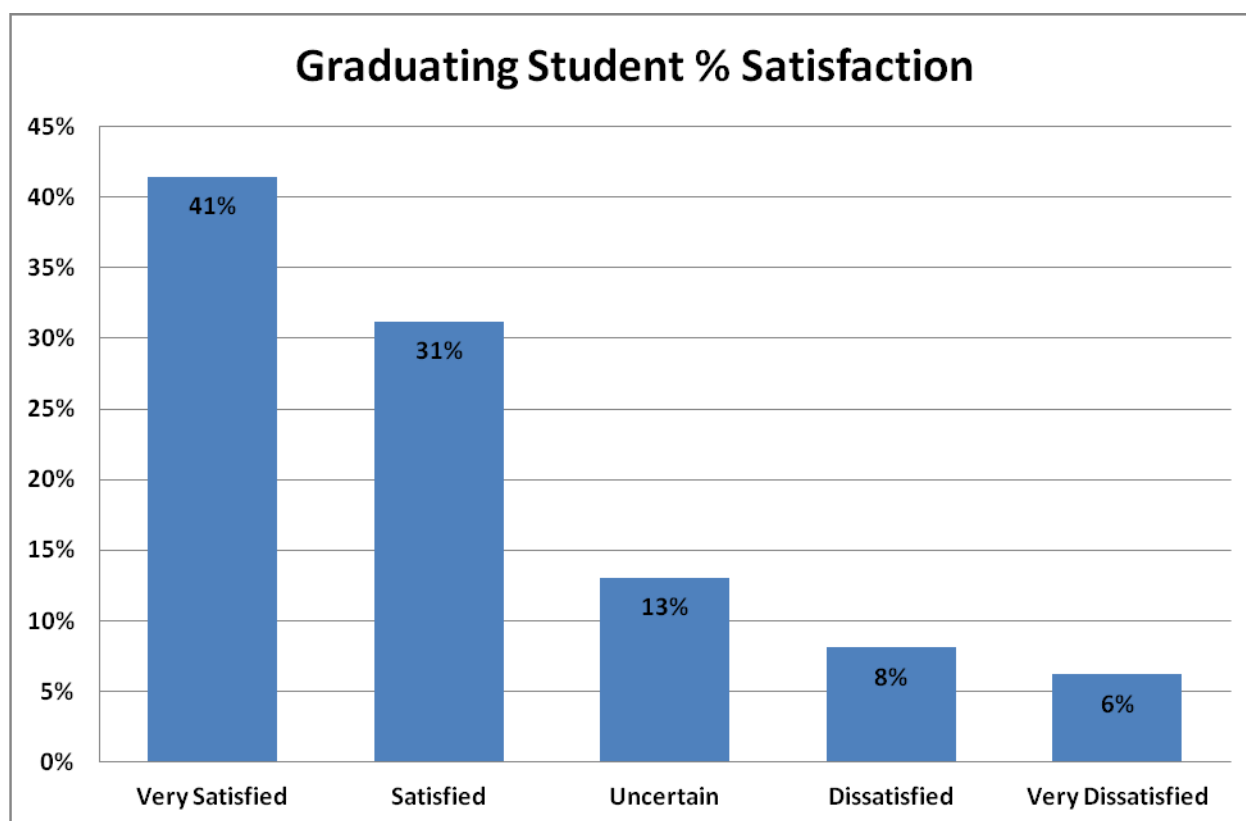
The evaluation showed that the faculty is satisfied with curriculum. Evaluation Questionnaire were filled by each faculty member regarding his course and then analyzed and presented in the table given below. The internal evaluation was done through with mid and final term examinations for all courses 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-703	Advanced Fruit Production	3(2-2)	Mid term And Final	6	Good	Should be divided	Fall	Dr. Khalid Mahmood Qureshi
Hort-704	Advanced Vegetable Production	3(2-2)	Mid term And Final	4	Good but lengthy	Should be divided	Spring	Dr. Shahid J. Butt
Hort-705	Breeding of Horticultural Plants	3(2-2)	Mid term And Final	3	Good	Should be divided	Fall	Dr. Ishfaq Ahmad Hafiz
Hort-712	Post-Harvest Physiology of Horticultural Crops	3(2-2)	Mid term And Final	5	Excellent but lengthy	Should be divided	Spring	Dr. Nadeem Akhtar Abbasi
Hort-711	Advanced Ornamental Plants Production	3(2-2)	Mid term And Final	7	Very good	No	Fall	Dr. Imran Hassan
Hort-703	Advanced Fruit Production	3(2-2)	Mid term And Final	2	Well prepared	No	Fall	Dr. Khalid Mahmood Qureshi
Hort-704	Advanced Vegetable Production	3(2-2)	Mid term And Final	3	Well prepared	No	Fall	Dr. Shahid J. Butt
Hort-707	Nutrition of Horticultural Crops	3(2-2)	Mid term And Final	4	Well prepared	No	Fall	Dr. Touqeer Ahmad

Hort-710	Plant Tissue Culture	3(1-4)	Mid term And Final	5	Well prepared	No	Fall	Dr. Touqeer Ahmad
Hort-711	Advanced Ornamental Plants Production	3(2-2)	Mid term And Final	7	Well prepared	No	Spring	Dr. Ambreen Bhatti

Performa 3: Survey of Graduating Students

A survey is conducted for the students of last semester and feedback is collected on Performa 3. The results are summarized. A set of questions is present in the Performa 3. The graph from the summarized results shows that 41% students are very satisfied from program, 31% are satisfied, 13% are uncertain, 8% are dissatisfied and 6% are very dissatisfied.



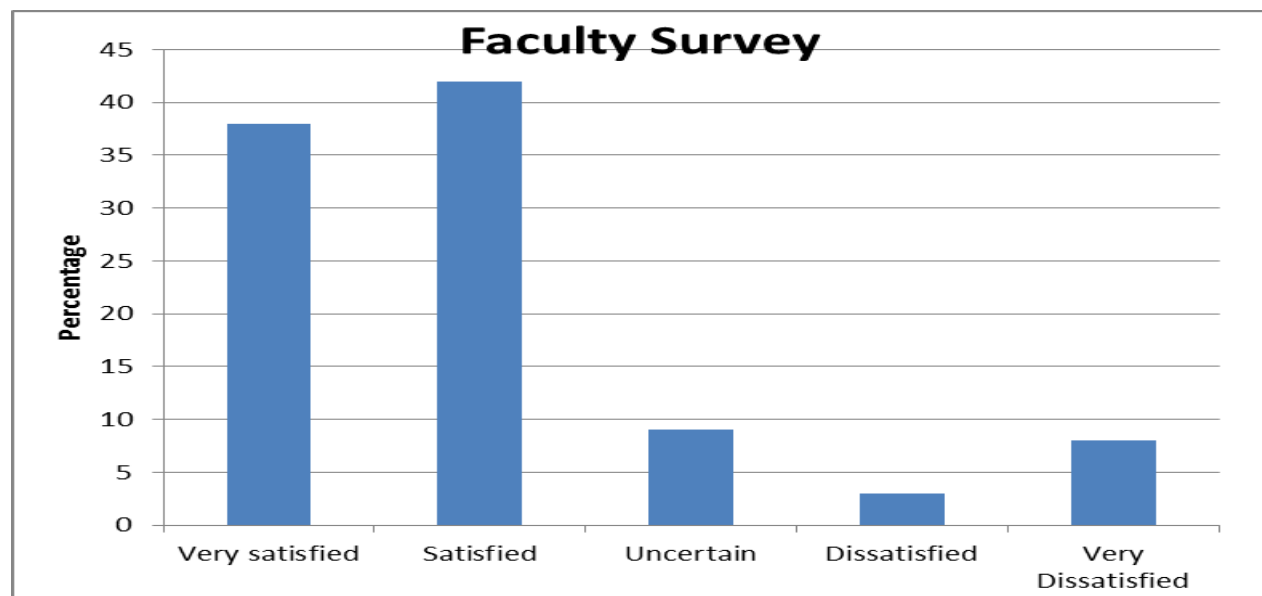
Performa 4: Research Student Progress Review Form

A total of 09 students of Ph.D. were surveyed. Most of the students are interested in laboratory work and eager to operate modern equipments. They pointed out the problems regarding the availability of space, computers and internet. In fact these facilities are very poor.

1. Students will be able to work in the field of Horticulture with confidence.
2. To develop the abilities of effective writing, oral presentations and demonstration.
3. To use modern techniques/ tools in research studies

Performa 5: Results of Faculty Survey

The data generated as a result of faculty survey, showed that 38% of faculty members were very satisfied ,42% satisfied, 09 uncertain, 03% dissatisfied and 08% very dissatisfied are satisfied with their job clarity about promotion process. However, most of the faculty themselves reported as very satisfied mentoring and administrative support, job security, support from the department, their progress through ranks. The least time availability to faculty to interact with their family is due to extra load on present teachers as some times 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 course work and other assignments.

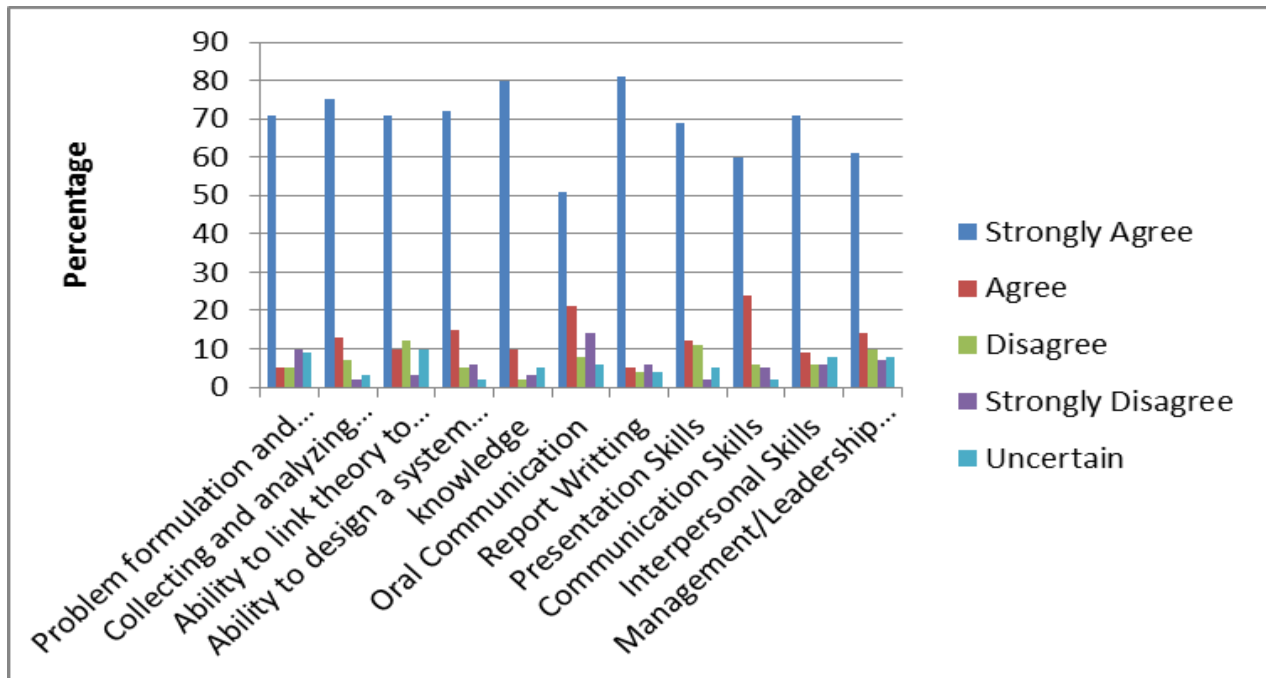


Performa 6: Survey of department offering Ph.D. programs

Department of Horticulture started its Ph.D. program during 1998 and 05 students have completed Ph.D. from the department while 11 students are currently enrolled in department. Admission in Ph.D. requires M.Sc. (Hons.) Horticulture with a minimum CGPA of 3.0 along with thesis. Ph.D. scholar has to complete minimum 18 credit hours in addition to research thesis with minimum time duration of 3 years. Comprehensive examination is pre-requisite to qualify as candidate for Ph.D. degree and is taken at the end of course work. A research paper is must to publish from Ph.D. thesis in HEC recognize journal. Thesis is sent to two internationally good reputed scientists from academically advanced countries for evaluation. There are 07 permanent faculty members holding Ph.D. degree in the department out of them 04 are HEC approved supervisors. Faculty members are running 03 research projects in the department funded by different organizations. There are 5 Ph.D. scholars in the department holding HEC indigenous scholarships.

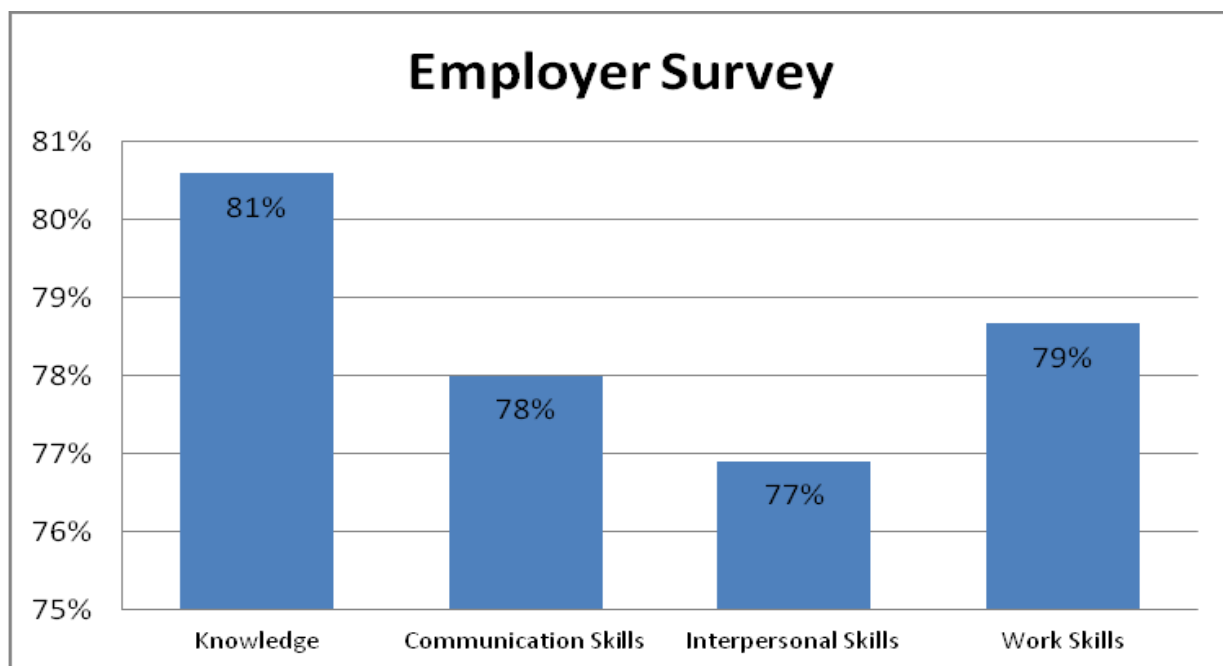
Performa7: Alumni Survey

Results obtained from alumni survey showed that when the alumni were asked regarding the knowledge they obtained from this department, the overall response was very good. 71% of the alumni agreed that the problem formulation and solving skills were well acquainted with scientific knowledge. 76% of the students showed their agreement regarding collecting and analyzing appropriate data. Most strong positive response was given by alumni regarding report writing where 91% alumni showed agreement which means department was able to impart research skills in students. Regarding knowledge skills 89% alumni showed agreement. Alumni showed agreement towards management skills by 61%. There was a lowest response in Oral Communication as shown by agreement of 50% alumni.



Performa 8: Employer Survey

A survey has been conducted and feedback has been collected on Performa 8 from the employees where students have Ph. D degree from Department of Horticulture, are working. The results are summarized in the figure given below. The graph shows the employees view regarding the students. The 81% students have enough knowledge regarding their field. The 78% have communication skills to communicate with the people of their own field. The 77% students have Interpersonal skills and 79% students have work skills related to the field.



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

Special importance has been given on the practical 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. Efforts also have been made to explicate and design the experiments/project and to work effectively in a team, to manage a crop problem and assimilate ability to recognize future needs.

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 develop extension material.
- 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 equipments 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 out side Pakistan.

Strength and weaknesses of the department

Strength

The main strength of the department is the availability of highly qualified teachers including (8 Ph.Ds), 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 and 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 professor, 1 Associate Professor, 3 Assistant Professor & 4 Lecturers specialized in their subjects are currently engaged in their academic and research activities.

Weaknesses

Advanced teaching and research is being handicapped due to lack of important equipments 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, electroporation 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, post-graduate laboratories and survey / offices for faculty members are also lacking. A landscape studio is indispensable to coup up the present needs of landscape horticulture. There is a need to have a computer with efficient internet access for every faculty member

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:

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

Particular	No.	Remarks
Ph.D.	18	In employment
Post-Doc fellowship	5	UK, Australia, Italy
Students: Faculty rates	5:1	
Average grade point	3	Fulfil HEC criteria

The evaluation process pointed high efficiency of system and satisfactory impact of outcomes. Almost all the graduate and post graduates got jobs in various organizations (provincial department, universities, research organizations, banks and private firms).

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)	Projects
Dr. Nadeem Akhtar Abbasi	19	01	02
Dr. Ishfaq Ahmad Hafiz	07	--	01
Dr. Khalid Mahmood	4	1	-
Dr. Imran Hassan	--	--	--
Ms. Najma Yousaf Zahid	3	-	-
Dr. Shahid J. Butt			
Dr. M. Azam Khan	--	--	--
Mr. Umer Habib	1	--	-
Ms. Mehwish Yaseen	5	--	1
Dr. Touqeer Ahmad	02	--	--

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.

Community services

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

Departmental administrative services for faculty and students

- To achieve the task assigned by the competent authority.
- The department maintains a ratio of 4:1 for the academic (technical) and administrative non-technical staff which fulfils 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 the university magazine.
- Quick office disposal; no complaint pertaining to delay has ever received from authorities.
- Proper records of individuals' students, their theses etc. are maintained.

Ph.D.

The duration of course of the degree of Doctor of Philosophy in full residence is not less than six semesters and not more than ten semesters.

Pre-requisites

A candidate seeking admission to the Course must have passed the Master Degree with CGPA of 3.00. 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

The program contents meet the program objectives as highlighted and provided by the Higher Education Commission.

Minimum 18 credits of course work is compulsory; out of which 9 credits are of core/compulsory courses. Course work following a synopsis defense seminar, comprehensive exam and submission of thesis to be approved by the University and examined by two foreign internationally recognized scientists from the university of technically advanced countries.

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

Course No.	Course Title	Credit Hours
Hort-701	Rootstock for Horticultural Crops	3(2-2)
Hort-702	Physiology of Horticultural Crops	3(2-2)
Hort-703	Advance Fruit Production	3(2-2)
Hort-704	Advance Vegetable Production	3(2-2)
Hort-705	Breeding of Horticultural Plants	3(2-2)
Hort-706	Landscape Horticulture	3(2-2)
Hort-707	Nutrition of Horticultural Crops	3(2-2)
Hort-708	Propagation of Horticultural Plants	3(2-2)
Hort-709	Plant Growth Regulator	3(3-0)
Hort-710	Plant Tissue Culture	3(1-4)
Hort-711	Advance Ornamental Plant Production	3(2-2)
Hort-712	Post Harvest Physiology of Horticultural Crops	3(2-2)
Hort-713	Environmental Horticulture	3(2-2)
Hort-714	New Trends in Horticulture	2(2-0)
Hort-719	Special Problem	1(1-0)
Hort-720	Seminar	1(1-0)

Criterion 2: Curriculum Design and Organization

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 outcomes

Course/ Groups of Course	Outcomes					
	1	2	3	4	5	6
Hort-712, Hort-719, Hort-720	XX	XXX	XXX	XX	X	XXX
Hort-701	XX	XXX	XX	XX	X	XX
Hort-702	XXX	XX	XX	XX	XXX	XXX
Hort-703	XX	XX	XX	XXX	XXX	XXX
Hort-704	XXX	XX	XXX	XX	XXX	XXX
Hort-705	XX	X	XX	X	X	XXX
Hort-706	XXX	XXX	XX	XX	XX	XX
Hort-710	XX	XX	XX	XX	X	XX
Hort-711	XX	XXX	XX	XX	X	XX

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
Theoretical backgrounds	Hort-702, Hort-712, Hort-705 , Hort-713, Hort-703, Hort-701, Hort-706
Problem analysis	Hort-704, Hort-710, Hort-711
Solution design	Hort-719, Hort-720

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) and Ph.D. 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 hours each are compulsory at the Post-graduate level.
- Assignments are given to M.S.c (Hons) & Ph.D. 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 Laboratory
 4. Horticulture Analytical Post harvest laboratory.
- Location and Area: Faculty of Agriculture and Food Sciences, A-Block, 1st Floor, Main Campus and Ground Floor
- Objectives: Laboratories are used for: Practical exercise and demonstrations to graduate students in their introductory and major courses. Research work for the post-graduate students.
- Shortcoming: *The number of labs is not sufficient.* 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 also needed.
- 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 post graduate students.
- **Shortcoming in computing infrastructure:** Computers with internet facilities should be available to all 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.

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 and 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.
- Emphasis is always given for an effective interaction between classes.

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. Tutorial System in all departments has been efficiently working. Two period on Thursday are reserved for students for extracurricular activities. However, there is no such counseling Cell in the department.
- 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.
- Admission criteria for M.Sc. (Hons) and Ph.D. are same as mentioned in section 2.
- Admission criteria are 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 deposes 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, practicals, assignments and reports, oral and technical presentations. The minimum pass marks for each course is 40% Master degree and 50 % for Ph.D. 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	1
Tissue Culture	2	2	1
Protected Cultivation	2	2	1
Floriculture	2	1	1
Landscape Horticulture	1	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 theses 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.

Survey of graduating students

The graduating students in last semester were surveyed as per Performa 3 before the award of degree. The results of graduating students were summarized in the form of bar charts 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. In- sufficient library's technical collection of books. Recommended books, relevant journals of the programs are not 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 multi media facility and offices must be adequate to enable faculty to carry out their responsibilities. In horticulture, offices for faculty staff are not available, thus they are accommodated minimum two/room, and in spite the rooms are quite narrow in space, subsequently affecting the quality performance.

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 poor. 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 is either out of order or outdated.
- Latest and modern molecular equipments or apparatus are lacking.
- Untrained supporting staff.
- Faculties lack practical knowledge of modern and molecular techniques.
- Scanty budget for consumables.
- Fans and tube lights are out of order and are not properly and timely repaired.

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 the class rooms are not enough and the space is not only limited but also some basic facilities are lacking. Multimedia are not available for the lecture halls. Practical lab space is also lacking. This affects the quality of teaching. The faculty offices are another

serious problem of the department. Some faculty members are sharing small rooms and the other are having their desks in the laboratories.

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 post graduate 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 2006-14

Discipline	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Ph.D.	02	05	03	01	04	05	06	09

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 2012-14 is **Rs 8,10,000** which hardly fulfill the departmental needs particularly for the purchase of contingency items. Limited resources are provided from the university budget. The computing facilities were provided on limited basis from the approved HEC project of Horticulture department, where more facilities for library, laboratories and computers are suggested for quality improvement of the department.

Executive Summary

The Department of Horticulture has well research based program of Ph. D Horticulture guided by highly qualified faculty. The course aims to develop and strengthen students' capacity to grasp principles and practices based on scientific basis and gets research training on farmers' oriented problems. The strong academics learned during Ph. D helps them to design and conduct quality research for their doctorate degree. In addition they have sufficient specialist knowledge in selected areas to allow them to pursue a research degree in crop science. Doctorate students acquire scientific background as well as having gained experience in problem solving and have developed the communication, numerical and computer skills required for a wide range of careers. 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 students 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. The availability of internet and access to various scientific journals is limited. Course evaluation survey showed that students are satisfied with workload and value of knowledge provided to them. Similarly, department has limited budget for research purposes which cannot support laboratories and research activities.

According to employer students are good at job but they have very basic knowledge of information technology and computer skills. Faculty members are satisfied with their salaries but they have severe concerns about the workload as most of them are agreed that they have very less time for themselves.

- The performance of the department may be further improved considering; separate class rooms are required to enable the Ph.D students to continue laboratory works without breaks.
- Departmental Laboratories need strengthening through new equipment.
- There is also need to improve mix of research and teaching proportion to produce professionally sound graduates,

- At present there are no arrangements for professional training of the staff. Such trainings will improve their abilities for enhancing the quality of research and teaching. It would be worthy to mention here that proper man at proper place is not being practiced.
- The budget allocated to the department hardly meets the requirements of the research,

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DETAILED COURSE CONTENTS OF SCHEME OF STUDIES FOR M.Sc (Hons)/Ph.D HORTICULTURE

HORT 701 ROOTSTOCK FOR HORTICULTURAL CROPS 3(2 -2)

THEORY

Importance; types of rootstocks. Role of rootstock especially for fruit and ornamental plants. Factor effecting Stock-scion relationship. Types of incompatibilities especially delayed incompatibilities; Its reason and effects on rootstock efficiencies. Rootstock adaptability under various soil and climatic conditions. Rootstocks of the major fruits and ornamental plants in relation to vigor, longevity, fruitfulness and resistance to drought, pests and diseases. Special emphasis on drought resistance rootstock for different trees. Rootstock adaptability for different areas especially for rain fed areas.

PRACTICAL

Identification, selection and multiplication of important rootstock especially for arid areas. Survey of rootstocks used at various research, experimental and commercial orchards.

BOOKS RECOM MENDED

1. Royc. Rom and Robert F. Carloson. (1987). Rootstocks for fruit crops. Johnwiley & Sons.
2. Adams C.R, and Early M.P (2005). Principles of Horticulture. 4th edition, Elsevier Private Ltd, New Delhi India.
3. Hartman. H. (2004). Plant propagation principles and practices. 6th edition, Prentice- Hall of India, Private. Ltd, New Dehli.
4. Sharma. V.K (1996). Plant nurseries, techniques, production and management Indus Publishing Company.
5. George. A (1999). Horticulture principles and practices. Prentice Hall, New Jersey.

THEORY

Physiology of horticultural crops by looking at the manipulation of environmental factors to control the growth, yield etc. Water relations to plants. Photosynthesis, rest & dormancy, Carbon assimilation and effect of drought on the different physiological processes of the plants CAM plants and their physiology. Source and sink relationship in plants. Fruit set and development, control of flower and fruit drops.

PRACTICAL

Anatomical studies on phloem and xylem placement in various Horticultural plant organs. Study on seed dormancy.

BOOKS RECOMMENDED

1. Delvin, R, M., and F. H. Witham. 1983. Plant Physiology. Willard Grant Press, Boston.
2. Bonner, J., and J. E. Varner. 1976. Plant Biochemistry. Academic Press, NY

THEORY

Present and future status of fruit industry in Pakistan. Cultural practices and improvement of important fruits of Barani areas. Problems and remedies of fruit production. Water, light, and temperature relations. Plant nutrition, plant spacing, pre and post harvest problems. pests, diseases and their control. Pruning. and its types, principles, objectives. Production trends in the world for various fruits. Suggestions for the improvement of fruit culture with special reference to Harvesting, grading, packing, transportation, storage and marketing of important fruits.

PRACTICAL

Field and market surveys to identification of tree and fruit problems, diseases, pests and their control. Pruning and training of fruit trees.

BOOKS RECOMMENDED

1. Bal. J. S. (1997). Fruit Growing. Kalyani publishers, Ludhiana, India
2. Malik, M. N., E. Bashir, and R. Bantel. 1994. Horticulture. National Book Foundation, Pakistan
3. Mitra, S. K. D. S. Rathore and T. K. Boss (1991). Temperate Fruits. Horticulture and Allied Publishers, Calcutta. India
4. Sawson, J. A. (1986). Tropical Fruits. Longman Scientific and Technical. Harlow, Essex. UK.

THEORY

Cultural practices and improvement of important vegetables. Problems and remedies of vegetable production. Soil, water, light and temperature relation to vegetable growth. Pre and post harvest vegetable problems. Pests, diseases of vegetables and their control. Vegetables forcing. Hybrid seed production, grading and quality standards for vegetables. Storage, transportation and marketing of vegetables.

PRACTICAL

Field and market survey to identify vegetable problems and identify their control. Botanical and structural description of some selected vegetables. Identifying techniques / practices to grow vegetables in arid areas.

BOOKS RECOMMENDED

1. George, R. A. T. 1995. Vegetable seed production. Longman group Ltd., London.
2. Price, L. C. 1987. Vegetable: Characteristics, Production and Marketing. John Willey and sons, Inc. NY.
3. Swiader, J. M. G. W. Ware and J.P. Mecollum (1992) Production Vegetable Crops 4th Ed. Interstate Publishers Inc. Daniville, Illinois.
4. Wein, H, C. (1997). The physiology of vegetable crops CAB. International Productions, New York.

THEORY

Objectives of breedings. Classification of breeding systems. Techniques of breedings in horticulture. Constrains and their control. Methods of propagation for self, cross, and clonal propagated crops. Breeding with special emphasis for the improvements of horticultural crops for the rainfed areas. Hybrid seed production and problems. Role of biodiversity in the improvement of crops. Utility of wild horticultural varieties Germplasm maintenance.

PRACTICAL

Floral studies of horticultural plants. Practices of breeding the self and cross pollinated crops, selection procedures in various horticultural crops. Storage and maintenance of the germplasm.

BOOKS RECOMMENDED

1. Briggs, D., and S. M. Walters. 1998. Plant variation and evolution. Cambridge Univ., Press, NY
2. Mark, J.B. 1986. Breeding Vegetable Crops. The Avi Pub. Co., Inc. Wesport, Connecticut.
3. Moore, G.N., and J. Janicks. 1983. Methods in Fruits Breeding. Purdu Univ. Press, West Lafayette, Indiana.

THEORY

Importance of landscape gardening and design; principles of landscape development; types of designs; formal and informal garden designs, Chinese and Japanese gardening; rockeries; terrace, roof and water gardens; plants suitable for various; design; landscape design for public and private buildings, parks and grounds; highway and roadside plantations. Developmental cost estimates for landscape.

PRACTICAL

Visits to different parks and gardens; landscape designs for individual houses, municipal and national parks; establishing various types of gardens.

BOOKS RECOMMENDED

1. Arora, J. S. (1992). Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
2. Carpenter, P. L., T. D. Walker and F. A. Lanphear (1975). Plants in the Landscape. W. H. Freeman and Company, San Francisco
3. Khan, A. K. (1994). The Gardener. Elite Publishers Limited, Karachi, Pakistan
4. Khan, M.A. and T.A. Bader (1992). Landscape Designs, Student Manual. Univ. Printing Press, University of Agriculture Faisalabad.
5. McDaniel, G. L. Ornamental Horticulture. The Reston publishing Company; Apprentice hall Co., Reston, Virginia.

THEORY

Role of mineral nutrient in plants. Factor effecting nutrient absorption. Concentration of different nutrients required for various horticultural crops. Surplus and deficiency symptoms and their control. Soil and plant analysis techniques for the evaluation of nutrient requirements. Problems of nutrient absorption in rainfed areas.

PRACTICAL

Survey for deficiency / surplus symptoms. Learning of different techniques for evaluations. Developing recommendation of fertilizers for different areas with special reference to arid areas.

BOOKS RECOMMENDED

1. Marschner, H. (1995). Mineral nutrition of higher plants. Academic Press, London.
2. Mengell, K, and E.A. Kirkly, 1987. Principles of Plant Nutrition. Int. Potash Inst., Switzerland.
3. Tisdale, S. KL., and W.L. 1975. Soil Fertilizers. Macmillan Pub. Co. Inc., NY.

THEORY

Life cycles in plants. Cellular basis for propagation, types of propagation; sexual, asexual propagation, with special emphasis on micro-propagation. Seed development, apomixis, spore development, production of genetically pure seed, seed germination process, Environmental factors affecting seed germination, seed testing, pre-conditioning of seeds to stimulate germination. General aspects of asexual propagation anatomical, and physiological basis of asexual propagation.

PRACTICAL

Study of seeds, Scarification and stratification techniques. Testing the viability of seeds. Practice in asexual propagation techniques. Visits of different horticultural nurseries. Visit to tissue culture laboratories.

BOOKS RECOMMENDED

1. Hartmann, H. T., D.E. Kester. 1975. Plant Propagation, Principles and practices. Prentice-Hall, Inc., Englewood Cliff,. NY.
2. Malik, M.N., E. Bashir, and R. Bantel. 1994. Horticulture, National Book foundation, Pakistan.

THEORY

Classification. Mode of actions of different growth regulators. Role for growth regulators in plants; chemicals nature of plant growth regulators and their relations with different physiological processes of plants. Application and their role in horticulture. Application methods. Manipulation of growth regulators for the improvements of horticultural crops in rainfed areas. Biosynthesis, pathways, source-sink relationship in relation to PGR.

BOOKS RECOMMENDED

1. Leopold, A.C., and P.E. Kriedmann. 1975. Plant Growth and Development McGraw Hill Book Co., NY.
2. Nivkell, L.G. 1982. Plant growth Regulators. Springer-virlag, Berlin Heideriberg, NY.
3. Weaver, R.V. (1982). Plant Growth Substanceds in Agriculture W. H. Freeman Co. San Francisco.

THEORY

Introduction; history and importance; Types of culture (organic culture, callus culture, cell Suspension culture, protoplast culture). Types of regeneration, callogenesis, organogenesis and embryogenesis. Micropropagation, micrografting, Germplasm conservation, Somatic hybridization, Cytoplasmic hybridization, Genetic transformation, Somaclonal variation. Secondary plant products.

PRACTICALS

Laboratory equipment and supplies; stock solutions and media preparation; Maintenance of asepsis; shoot-tip culture; nodal culture; leaf culture; embryo Culture; ovule culture; anther culture; callus culture; cell suspension culture; protoplasm culture; protoplast fusion; plantlet regeneration, In-vitro grafting; Production and testing of virus free plants; transfer of plantlets from tissue culture of green house and field. Leaf disk culture for genetic transformation Visits to tissue culture labs.

BOOKS RECOMMENDED

1. Chaleff, R. S. (1981). Genetics of Higher Plants-Applications of Cell Culture. Cambridge University Press, London.
2. Dods, J. H., and L.W. Roberts (1982). Experiments in Plant Tissue Culture. Cambridge University Press, London.
3. Mantell, S. H. J. A. Mathews & R. A. Mckee (1985). Principles of Plant Biotechnology, An Introduction to Genetic Engineering. Blackwell Scientific Publications.
4. Pierik, R. (1987). In Vitro Culture of high plants. Martinus Nijhoff Publishers, Amsterdam.
5. Reinert, J., and Y.P.S. Bajaj (1977). Plant cell, Tissue and Organ Culture, Springer-Verlag, New York.
6. Shoeman, R. (1984). Protoplast Fusion. Springer-Verlag, New York.

THEORY

Flowers and ornamental industry in Pakistan. Description of major flowering and other ornamental plants. Culture practices and improvements of ornamental plants. Cut flowers industry. Pruning and training of ornamental trees. Problems, diseases and pests, and remedies of ornamental production. Harvesting, grading, packing, transportation, storage, and marketing of ornamental plants.

PRACTICAL

Botanical and structural description of available ornamental plants. Field and market surveys to identification of ornamental plants, diseases, pests and their control. Pruning and training of ornamental plants. Study of different cut flowers, technologies to increase the vase life of cut flowers, packing and storage of different cut flowers.

BOOKS RECOMMENDED

1. Bose, T. K. and L. P. Yadav (1989). Commercial Flowers. Naya Prokash, Calcutta, India.
2. Chasha, K.L. and B. Choudhary (1989). Ornamental Horticulture in India. India Council of Agriculture Research, New Dehli.
3. Larson. R.A. 1980. Introduction to Floriculture. Academic Press, NY.
4. Laurie, A., D.C. Kiplingerr and K. S. Nelson (1958). Commercial Flower Forcing. McGraw Hill Book Co., Inc., New York.
5. McDaniel, G.L. 1982. Ornamental Horticulture. The Reston Pub. Co., Virginia.
6. Salinger, J.P. (1985). Commercial Flower Growing. Buterworth, Horticultural books.
7. Yadav, I. S. and M. L. Choudhary (1997). Progressive Floriculture-Production Technologies of Important Commercial Flower Crops. The house of Sarpan, Bangalore.

**HORT-712 POSTHARVEST PHYSIOLOGY OF HORTICULTURAL
CROPS**

3(2-2)

THEORY

Postharvest biology and technology; Respiration; Plant hormones in postharvest physiology; Biosynthesis and metabolism of ethylene; Ethylene scrubbers; Composition and compositional changes; Role and regulation of environmental factors in storage, temperature, humidity, oxygen, carbon dioxide and ethylene; Physiological disorders of fresh fruit, flowers and vegetables; Postharvest diseases and their control; Postharvest biology and handling of: Cut flowers; Leafy vegetables; Underground vegetables; Fruit vegetables; Pome fruits; Stone fruit; Soft fruit; Citrus; Mango; Avocado.

PRACTICAL

Relevant field and laboratory studies, surveys and assignments.

BOOK RECOMMENDED

1. Kader. AA (1992). Postharvest Technology of Horticultural Crops. University of California, Division of Agriculture and Natural Resources.
2. Salunkhe, D.K., N.R. Bhatt and B.B. Desai (1989). Post harvest Biotechnology of Flowers and Ornamental Plants. Bidhan Chandra Krishi Viswavidyalaya, Kalyani, India.
3. Wills, R.B.H., T.H. Lee, D. Graham W.B McGlasson and E.G Hall (1989). Post harvest (3rd Ed.) BSP Professional Books, Oxford.

THEORY

Introduction. Plant and their environments. Plants for the control of environments. Plant and atmospheric purification. Plants and climate control., Plant and chemical pollutions control. Plants and dust control. Plants and noise control. Plants and social environments. Aesthetic horticulture. Amenity horticulture. Environmental impacts.

PRACTICAL

Selecting and listing the useful plants controlling environments. Collecting of plants and preparing albums. Monitoring plant health in smoky areas. Lab. experiments and study of anatomical difference among anti-pollutants and field plants.

BOOK RECOMMENDED

1. Gary, O.R Plants, People and environmental quality. US Department of interior, National Park Service.
2. Hussian M. (1998). Environmental Degradation: Realities and Remedies. Ferozesons Pvt. Ltd., Lahore.
3. McKinney, M.L. and R.M. Schoch (1998). Environmental Sciences: Systems and solutions. Jones and bartlett Pub.,. Inc., Sadbury, USA.
4. Rorison I.H. and R. Hunt (1980). Amenity Grassland: An Ecological Perspective. John Willey and sons, New York.
5. Simonds, J.O. (1978). Earthscape: A Manual of Environmental Planning. McGraw Hill Book Company, London.

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:

Name	Position	Qualification	Specialization
Dr. Nadeem Akhtar Abbasi	Professor	Ph. D	Pre and Post harvest physiology of horticulture crops
Dr. Ishfaq Ahmed Hafiz	Professor	Ph. D	1. Protected Vegetable Farming 2. In-Vitro propagation of Horticultural Crops 3. Certified Seed and Nursery Production of Horticultural Crops
Dr. Khalid Mahmood Qureshi	Associate Professor	Ph. D	1. Arid Zone Horticulture
Dr. Imran Hassan	Assistant Professor	Ph.D	1. Introductory Horticulture 2. Commercial Flower Production 3. Horticultural Crop Production
Ms. Najma Yousaf Zahid	Assistant Professor	M. Sc. (Hons)	1. Production of Tropical & Sub-tropical Fruits 2. Medicinal and Aromatic Plants
Dr. Shahid J. Butt	Assistant Professor	Ph.D	1. Winter Vegetables 2. Temperate Fruit Production
Dr. Muhammad Azam Khan	Assistant Professor	Ph.D	Protected Vegetable Farming
Mr. Umer Habib	Lecturer	M. Sc. (Hons)	Ornamental Horticulture
Ms. Mehwish Yaseen	Lecturer	M. Sc. (Hons)	Physiology of Horticultural Plants
Dr. Touqeer Ahmad	Lecturer	Ph. D	Biotechnology/tissue culture of horticulture

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 : University of Arid Agriculture, Murree Road Rawalpindi. Permanent Address : Village Phulgran (Korang Valley) Distt. Islamabad, Pakistan. Phone : +92-51-9290771; 0300-5069600 Email : nadeemabbasi65@yahoo.com nadeem.abbasi@uaar.edu.pk
Experience	<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"
Administrative/ Financial Responsibilities	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. 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.
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 Downunder 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. 15. Participated and presented country paper in “Seminar on Good Agricultural Practices (GAP) and Safety
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	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 “Postharvest Unlimited” 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 &
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	potential mango varieties in relation to ceratocystis manginecans and other economic traits” at University of Agric. Faisalabad on Sep. 10, 2014, sponsored by PARB, organized by HIS and ORIC UAF.
ORGANIZATIONAL MEMEBERSHIP	1. International Society for Horticultural Science (ISHS) currently suspended for non-payment of fee. 2. Agricultural Foundation of Pakistan. 3. Life Member of Islamabad Horticultural Society, Islamabad; General Secretary for 2014-2015.. 4. Life member of Pakistan Botanical Society, Vice President for 2008 – 2011. 5. Member Pakistan National Society of Horticulture

Publications	• 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) • Chaudhry, M. I., N. A. Abbasi, and W. Ahmed. 1995. Effect of time of fertilizer application on winter injury and yield in some commercial citrus cultivars. <i>Pak. J. Agri. Sci.</i> 3(2): 137-140. • Ayyub, C. M., M. A. Hanjra, T. Saeed, A. U. Malik, and N. A. Abbasi. 1998. Nature farming, profitability, and sustainable development in vegetable production-II. <i>Pak J. Sci. Res.</i> 50(3-4):1-7. • Ahmed, C. M. S., S. Sajjad, and N. A. Abbasi. 2001. Performance of seedling potato tubers from true seed in second generation in comparison with local varieties. <i>Sarhad J. Agri.</i> 17: 69-73. • Ahmed, I. and N. A. Abbasi. 2002. Landscaping with a low cost dry rockery. <i>Science, Technology, and Development, International Journal.</i> 21(2): 49-51. • Rabbani, A.; B. Askari; N. A. Abbasi and M. Bhatti. 2001. Effect of growth regulators on in-vitro multiplication of potato. <i>Int. J. Agric. and Biology</i> 3:181-182. • Hussnain, R. R., N. A. Abbasi and R. S. Rehman. 2002. A quantitative analysis of residual organo chlorine insecticide (endosulfan) from brinjal. <i>Paki. J. Arid Agric.</i> 5(1): 29-33. • Zahoor, S., N. A. Abbasi and C. M. S. Ahmed. 2002. Effect of different phosphorus levels and EM inoculum on head cabbage (<i>Brassica oleracea</i> var. Capitata). <i>Pak. J. Arid Agric.</i> 5 (2): 7-10. • Abbasi, N.A., A.N. Nazir and C.M.S. Ahmed. 2002. Evaluation of Nutrient Requirements for Production of Cut Flowers in <i>Rosa hybrida</i> cv. "Peace" under Rawalpindi Conditions. <i>Pak. J. Arid Agric.</i> 5(1): 43-47. • Zahoor, S., M.S. Ahmed, N.A. Abbasi. 2003. Effect of phosphorus levels and effective microorganisms on seed
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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 5.859 million. 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
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Name	Dr. Khalid Mahmood
Personal	Father's Name : Allah Loke Qureshi Date of Birth : 07-03-1959 N.I.C. NO. : 61101-1748794-1 Nationality : Pakistani Postal Address : University of Arid Agriculture, Murree Road Rawalpindi. Permanent Address : Village & P.O. Panjwarian, The: Kharian Distt. Gujrat, Pakistan or House # 359, Street # 13, Shehzad Town Islamabad Phone : +92-51-9290771; 0300-5241628 Email : kmq_2008@hotmail.co.uk
Experience	Date: January 10. 06.1985 to 02. 02. 2000. Title: Scientific Officer Institution: Fruit Crops, National Agriculture Research Centre. Park Road Islamabad. Date: 02. 02. 2000 to 29-02-2007 Title: Senior Scientific Officer Institution: Fruit Crops, National Agriculture Research Centre. Park Road Islamabad. Date: 01.03. 2007 to date Title: <u>Associate professor</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi
Honor and Awards	• Awarded University BSc and MSc Merit Scholarships during 1980-1984. • Awarded six months training on citrus production and management in 1989 • 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.
Memberships	Islamabad Horticultural Society, Islamabad.
Service Activity	• Teaching of courses of horticulture science at graduate, postgraduate and Ph.D. level students. • Research and execution of developmental projects.
Brief Statement of Research Interest	• Production of Horticultural Crops • Plant Physiology • Soft Fruit Production
Publications	•
Research Grants and Contracts	PROJECTS: • Four years project on “Introduction of soft fruits (strawberry, blackberry, raspberry, black currant) in potential areas of Pakistan for economic return” has been completed successfully. • Three years project on “Underutilized Tropical fruit crops of Pakistan” funded by International Centre for Underutilized Crops (ICUC) has been completed successfully .
Other Research or Creative Accomplishments	No

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
Experience	Fourteen years & 10 months work experience of teaching, research and conducting examination of the under-graduate & post-graduate student in the Department of Horticulture, Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi Additional Managerial Charge Experience: Worked for 7 years in 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 for 12 years and 8 months in all as from August, 1997 to Feb, 2002 and from May, 2005 to May 2009 nominated by Chairmen, Department of Horticulture, PMAS, AAUR. Worked as Coordinator, Time Table & Date Sheet of Horticulture Department from 2010 to date as nominated by 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

Publications	• 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. Pusa Sawani”. The Journal of Animal and Plant Sciences. JAPS, Vol. 11(2):80-82. ISSN.1018-7081). • Banaras M., N. A. Abbasi and I. Hassan. 2006. HACCP System, Quality and safety of Fresh Fruits and Vegetables. Proceeding of International Conference on Value addition in Horticultural Products. Page 127-131 • Chaudhry A. N., S. Ali and I. Hassan. 2002. Effect of different colored plastic mulches on yield and nutrients content of tomato plant. Asian Journal of Plant Sciences. Vol 1(4):388-389. (ISSN. 1682-3974). • Hassan I., T. Ahmad, I. A. Hafiz, N. A. Abbasi and B. Rashid. (2008). Effect of various auxin treatments (Indole butyric acid & Nephthalene acetic acid) on root initiation of olive cultivars, coratina & carolea. Asian Journal of Chemistry. Vol 20(8):6509-6517 (Impact Factor) • 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. Frontiers of Agriculture in China. Vol. 1(4): 456-459. • Jilani G., S. Mehmood, A. N. Chaudhry, I. Hassan and M. Akram. (2008). Allelochemicals: sources, toxicity, microbial transformation in soil. a review. Annals of Microbiology. Vol. 58(3):351-357. (Impact Factor) • 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. Journal of Agric. Uni. Hebei, China. Vol 26(1):24-27
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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. Ac • Internship at National Agriculture Research Centre (NARC) Pakistan in Horticulture Research Institute.
Honor and Awards	7 Microsoft Office: Can prepare reports and use MS office for different purposes 8 Auto CAD: Can use auto CAD programme for making Layouts of gardens, structures etc. 9 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”. 10 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. <i>J. Arid Environ.</i>, (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. <i>Proc. In: 7th International Strawberry Symposium (VII ISS)</i>, 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>fragaria ananassa</i>) cv. “Chandler”. <i>Pakistan J. Agric. Res.</i>, 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. <i>Pak. J. Bot.</i>, 45(4): 1179-1185. • Qureshi, U. S., U. Habib and N. A. Abbasi. 2011. Hydrogels: Phenomenal Approach for Water Conservation in Ornamental Industry. <i>Proc. In: International Conference on Prospects and Challenges to Sustainable Agriculture</i>, 14-16, July 2011. Projects: • Research Project on “Phenological studies of Citrus” 11 Research Project on “Effect of Calcium Chloride on Post Harvest quality of Tomatoes”

Name	NAJMA YOUSAF ZAHID
Personal	Father's Name Muhammad Yousaf Zahid Date of Birth 17-04-1970 Nationality Pakistani N.I.C. No 37405-0555365-2 Language Skill English & Urdu Marital Status Married Citizenship Pakistani
Experience	Worked with AKRSP (Agha Khan Rural Support Programme), Gilgit as consultant Agriculturist from August 1995 to April 1998. ▪ In 1999, I worked as Co. P.I in three years project funded by German with collaboration of UAAR, at chitral (NAs areas). ▪ Worked as advisor horticulturist in a one year project funded by china and UAAR at Chatta Bakhtawar village, Islamabad. ▪ As member academic council at UAAR ▪ Technical talk programmes regarding Horticulture to communicate information's to farmers in Kisan time programme on PTV world and Sohni Darti Tv Channels. ▪ As Supervisor & committee member of M.Sc (Hons.) Hort students for thesis and 2 years research every year.
Honor and Awards	1. Indigenous PhD scholarship through ministry of science and technology in 2001. 2. Awarded by research project by University in 2007
Publications	• 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. Booklet on Micropopagation of Aloe vera (Aloe barbadensis). Laplambert Accademic Publishing Germany.ISBN:978-3-8443-23788.2012 Zakia,S.Zahid,N.Y;N.Abbassi;H.Ishfaq;M.Nasir.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
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Name	TOUQEER AHMAD	
Personal	Nationality: Pakistani. N. I. C. No: 37202-1589897-7 Passport No: KH427022 Date of Birth: 23rd January 1977 Domicile: Punjab(Chakwal). Marital Status: Single. Gender: Male. Language Skills: Full command on English, Urdu and Punjabi. Chinese (basic spoken)	
Experience	Position: Lecturer Horticulture Period: 14th Feb 2005 To date 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
Honor and Awards	- Establishment and Development of Plant Tissue Culture Lab in Horticulture Department of PMAS, AAUR. This landmark was achieved by my technical expertise and inspirational encouragement of Project Director, Prof. Dr. Nadeem Akhtar Abbasi - Standardization of protocols for mass scale <i>in vitro</i> propagation of economical important fruit and ornamental crops
Publications	Touqeer Ahmad, G. Sablok, T. V. Tatarinova, Q. Xu, X. X. Deng and W.W. Guo. 2013. Evaluation of codon biology in Citrus and Poncirus trifoliata based on genomic features and frame corrected expressed sequence tags. DNA-Research. 20 (2): 135-150. IF. 5.15 Mirza Muhammad Qadeer Baig, Ishfaq Ahmad Hafiz, Azhar Hussain, Touqeer Ahmad and Nadeem Akhtar Abbasi. 2011. An efficient protocol for in vitro propagation of Rosa gruss an teplitz and Rosa centifolia. Afr. J. Biotechnol. 10(22):4564-4573. IF. 0.573 Sana Asghar, Touqeer Ahmad, Ishfaq Ahmad hafiz and Mehwish Yaseen. 2011. In Vitro Propagation of Orchid (Dendrobium nobile) Var. Emma White. Afr. J. Biotechnol. 10(16): 3097-3103. IF. 0.573 Syed Zia ul Hasan, Touqeer Ahmad, Ishfaq Ahmad Hafiz, and Azhar Hussain. 2010. Direct Plant Regeneration From Leaves of Prunus Rootstock GF-677 (Prunus Amygdalus x P. Persica). Pak. J. Bot., 42(6): 3817-3830. IF. 0.872 Asia Ramzan, Ishfaq Ahmad Hafiz, Touqeer Ahmad and N. A. Abbasi. 2010. Effect of Priming with Potassium Nitrate and Dehusking on Seed Germination of Gladiolus (gladiolus alatus). Pak. J. Bot., 42(1): 247-258. IF. 0.872 Bushra Zulfiqar, Nadeem Akhtar Abbasi, Touqeer Ahmad, and Ishfaq Ahmed Hafiz. 2009. Effect of Explant Sources and Different Concentrations of Plant Growth Regulators on In vitro Shoot Proliferation and Rooting of Avocado (Persea americana Mill.) CV. Fuerte. Pak. J. Bot., 41 (5): 2333-2346. IF. 0.872 Ansar Ali, Touqeer Ahmad, Nadeem Akhtar Abbasi and Ishfaq

	Ahmed Hafiz. 2009. Effect of Different Concentrations of Auxins on In Vitro Rooting of Olive Cultivar 'Moraiolo'. Pak. J. Bot., 41 (3): 1223-1231. IF. 0.872 Mehwish Yaseen, Touqeer Ahmed, Nadeem Akhtar Abbasi, and Ishfaq Ahmed Hafiz. 2009. In Vitro Shoot Proliferation Competence of Apple Rootstocks M. 9 and M. 26 on Different Carbon Sources. Pak. J. Bot., 41 (4): 1781-1795. IF. 0.872 Inam ul Haq Touqeer Ahmad, Ishfaq Ahmed Hafiz and Nadeem Akhtar Abbasi. 2009. Influence of Micrcutting Sizes and IBA Concentrations on In Vitro Rooting of Olive Cv. "Dolce Agogia". Pak. J. Bot., 41 (3): 1213-1222. IF. 0.872 Mehwish Yaseen, Touqeer Ahmed, Nadeem Akhtar Abbasi, and Ishfaq Ahmed Hafiz. 2009. Assessment of Apple Rootstocks M. 9 and M. 26 for In Vitro Rooting Potential, Using Different Carbon Sources. Pak. J. Bot., 41 (2): 769-781. IF. 0.872 Ansar Ali, Touqeer Ahmad, Nadeem Akhtar Abbasi and Ishfaq Ahmed Hafiz. 2009. Effect of Different Media and Growth Regulators on In Vitro Shoot Proliferation of Olive Cultivar Moraiolo. Pak. J. Bot., 41 (2):783-795. IF. 0.872 Imran Hassan, Tauqeer Ahmad, Ishfaq Ahmad Hafiz, Nadeem Akhtar Abbasi and Basit Rashid 2008. Effect of Various Auxin Treatments (Indole Butyric Acid and Naphthalene Acetic Acid) on Root Initiation of Olive Cultivars, Coratina and Carolea. Asian Journal of Chemistry. 20 (8): 6509-6517. IF. 0.253
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