

The Hebrew University of Jerusalem

Syllabus

GROWTH MEDIA AND THE ROOT ENVIRONMENT - 71620

Last update 10-09-2024

HU Credits: 2

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Soil and Water Sciences

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: Rehovot

Course/Module Coordinator: Prof. Moshe Shenker

Coordinator Email: Moshe.Shenker@mail.huji.ac.il

Coordinator Office Hours: Sunday 13-14

Teaching Staff:

Prof. Moshe Shenker

Course/Module description:

Growing plants in container media as a substitute for soils. The various materials used as a container media in agriculture. Introduction to soil less culture hydroponics as a model for an optimal system. Absorption of nutrients by the roots and interaction between the roots and the soil solution. Physical properties - air to water ratios,hydraulic conductivity,volume and shape of growth container. Chemical properties - pH,electrical conductivity,conductivity,concentration and composition of ions,cation exchange capacity and availability of nutrients. Container media analyses. Microbiology and phytosanitation in container media. Organic and inorganic materials as substrates and their mixtures - properties and uses. Agro technical methods for growing plants in soilless culture - fertilization,irrigation and control.

Course/Module aims:

Understanding the practice of soilless culture and processes in the root vicinity. Porous-media and hydroponics.

Learning outcomes - On successful completion of this module, students should be able to:

Recognize the principles of detached porous-media growing method
Use this tool for growing plants and for research on conditions in the root vicinity.

Attendance requirements(%):

100

Teaching arrangement and method of instruction: Two hour lectures, home exercises

Course/Module Content:

1. Concepts of soilless culture; hydroponics; similarities and differences between the soilless system and plant growth in soil; substrate materials,
2. Physical principles of plant culture in detached porous media; properties and characterization of substrates ; Porosity and effective porosity; water-air relationships; retention curves; saturated and unsaturated hydraulic conductivity; methods of testing.
3. Plant nutrition in soilless systems. interactions between the substrate and the

solution; nitrogen ammonia ratio.

4. Chemistry of various nutrients. Release and fixation; adsorption, precipitation and dissolution.

5. Nutrient solutions, composition and preparation.

6. Chemistry and physiology of essential micronutrients: the availability and uptake mechanisms; chelation of metals - uses, advantages and limitations.

7. Phytopathology and Suppressive media.

8. Closed and open systems; water recycling; salinity and ion ratios, agrotechnics, advantages and potential problems.

Required Reading:

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Additional Reading Material:

1. חן, י. וענבר, י. 1985. מצעי גידול מנותקים, תכונות ואפיון. המחלקה לקרקע ומים, הפקולטה לחקלאות ברחובות, האוניברסיטה העברית בירושלים.

2. Burt, C., K. O'Connor, and T. Ruehr. 1998. Fertigation. ITRC, California Polytechnic State University, San Luis Obispo, CA.

3. FAO. 1990. Soilless Culture for Horticultural Crop Production.

4. Jones, J. Benton. 1983. A Guide for the Hydroponic and Soilless Culture Grower. Timber Press.

5. Jones, J. Benton. 2005. Hydroponics: A Practical Guide for the Soilless Grower. 2nd ed. CRC Press. Boca Raton.

6. Kipp, J.A., G. Wever and C. de Kreijl. 2000. International Substrate Manual. Elsevier, the Netherlands.

7. Marschner, H. 1995. Mineral Nutrition of Higher Plants (2nd ed.). Academic Press, London.

8. Mengel, K. and Kirkby, E.A. 2001. Principles of Plant Nutrition (5th ed). Kluwer Academic Publishers, Dordrecht.

9. Raviv, M and Lieth, J.H. (eds.) 2008. Soilless Culture, Theory and Practice. Elsevier, London.

10. Schwartz, M. 1995. Soilless Culture Management. Springer-Verlag, Berlin.

11. Waisel, Y. Eshel, A., and Kafkafi U. (eds.) 2002. Plant Roots: The Hidden Half. Marcel Dekker, New York.

12. Issues of: International Society for Horticultural Sciences (ISHS), Commission for Protected Cultivation, commission for Plant Substrates: Acta Horticulturae: 26 (1972), 37 (1974), 98 (1979), 99 (1980), 126 (1982), 150 (1984), 172 (1985), 178 (1986), 221 (1988), 238 (1989), 361 (1993) 401 (1994), 408 (1995), 450 (1997), 469 (1998), 481 (1999), 548 (2001), 554 (2001), 634 (2004), 697 (2005), 779 (2008).

13. Proceedings of the World Congress, 1969. Las Palmas de Gran Canaria, International Working Group on Soilless Culture (IWOSC).

14. Issues of: Proceedings of the xx International Congress on Soilless Culture: 9th (1996), 6th (1984), 5th (1980), 4th (1976), 3rd (1973).

15. Proceedings of the World Congress on Soilless Culture: Agriculture in the coming

millennium. Editors, A. Bar-Tal, Z. Plau. 2001.

Theses

16. איזנשטדט יורם. 2003. חיסכון במים והפחתת זיהום ע"י יסודות דישון בגדולי חממה על גבי מצע מנותק. עבודת גמר לתואר שני, האוניברסיטה העברית.
17. דה-סילבה, פ. 1991. איפיון סטטי ודינמי של תכונות מצעי גידול מנותקים לתפעול ההשקיה. Static and dynamic characterization of container media for irrigation management. עבודת גמר לתואר שני, האוניברסיטה העברית.
18. זילבר, א. 1984. ראקציות של זרחן עם טוף מרמת הגולן. עבודת גמר לתואר שני, האוניברסיטה העברית.
19. זילבר, א. 1991. תכונות כימיות ותהליכי שטח פנים של חומרים פירוקלסטיים מהר פרס, רמת הגולן. עבודת דוקטורט, האוניברסיטה העברית.
20. סמואילוף לואיס. 1997. השפעת תוספת הפולימר התופח PAM על תכונות מצעי גידול מנותקים ועל קליטת מים בצמחים הגדלים בהם. עבודת גמר לתואר שני, האוניברסיטה העברית.
21. ענבר, י. 1989. יצירת חומרים הומים בתהליך הקומפוסטציה של חומרי פסולת חקלאים ואפיון התכונות הכימי-פיזיקליות שלהם. עבודת דוקטורט, האוניברסיטה העברית.

Journals

1. Soil Science and Plant Nutrition
2. Journal of Plant Nutrition
3. Journal of Environmental Horticulture
4. J. Am. Soc. for Horticultural Science
5. פרחים - דפי מידע
6. גן שדה ומשק
7. Soilless Culture (1985-1989)
8. HortScience

Grading Scheme:

Written / Oral / Practical Exam 100 %

Additional information:

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