



NTNU – Trondheim
Norwegian University of
Science and Technology

Department of Biology

Examination paper for BI2022 Plant Growth and Development

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Examination date: 19. December 2013

Examination time (from-to): 15:00 to 18:00

Permitted examination support material:

This is an open-book exam. Students may bring in and consult any printed or written material, including the textbook, dictionaries, copies of journal articles, and their own notes.

Other information:

The exam will be evaluated quantitatively; the point totals are given at the end of each question.

Language: By prior agreement, the questions are given in English, but answers may be written in Bokmål, Nynorsk, or English.

Number of pages: 2 (including cover page)

Number of pages enclosed: 1 (examination questions)

Checked by:

Date

Signature

Merk! Studentene må primært gjøre seg kjent med sensur ved å oppsøke sensuropslagene. Evt. telefoner om sensur må rettes til instituttet eller sensurtelefonene. Eksamenskontoret vil ikke kunne svare på slike telefoner.

Part I. Journal article comprehension and evaluation.

You have been provided with the following journal article, including the supporting online material, to read before the exam:

Perilleux C, Pieltain A, Jacquemin G, Bouche F, Detry N, D'Aloia M, Thiry L, Aljochim P, Delansnay M, Mathieu AS, Lutts S, Tocquin P (2013) A root chicory MADS box sequence and the Arabidopsis flowering repressor FLC share common features that suggest conserved function in vernalization and de-vernalization responses. *Plant J.* 75:390-402.

Answer the following questions concerning the introduction, methods, results, and conclusions in the article and your evaluation of its place in the general physiology of growth and development.

1. Briefly summarize the effects of vernalization and the subsequent temperature regime on bolting and flowering in chicory seeds and seedlings. How might these temperature requirements act to optimize reproductive success of the plant in its natural environment? Why is bolting undesirable in chicory cultivation? (20)
2. List the genotypes, mutants, or genetic constructs of chicory and Arabidopsis, the experimental treatments, and the kinds of measurements that were used in the research and explain how different combinations of these were used to gain insight into the function of *CiFL1* in vernalization and flowering. (40)
3. Evaluate Figure 4. What observations or conclusions does this figure illustrate or support, and how well does it do the job? Which means are being compared against one another in the statistical tests shown in Figures 4a and 4c? Is this a rigorous way to do these statistical comparisons? (20)
4. What other methods or experiments could be applied to gain insight into genetic control of vernalization and flowering in chicory? How could the results of this study be applied in improving performance of chicory as a food crop? (20)

Part II. Additional questions

Answer these questions in as much detail as your time allows, but be sure to allow time to answer all questions.

5. In the Green Revolution in the 1960s, modification of height growth was critical in the development of high-yield wheat and other cereal crops. Discuss the genetic variants discovered and developed by controlled breeding of these crops, and the later discoveries that revealed the mechanisms by which these genes affect height growth. (25)
6. Polar or localized transport of auxin plays an important role in many plant growth and developmental processes. Identify the main types of auxin transport proteins, and discuss how they are involved in three different processes or events in plant growth and development. (25)