GENETIC dilemmas

GM plant dilemmas

HIGHER BIOLOGY

Teacher guide

Photosynthesis, food production and turbocharging

Curriculum links

This activity supports the following area of the *CfE* Higher Biology curriculum UNIT 3 - Sustainability and Interdependence:

1 The science of food production

(a) Food supply.

(i) Food security and sustainable food production.
Increase in human population and concern for food security leads to a demand for increased food production. Food production must be sustainable and not degrade the natural resources on which agriculture depends.

(ii) Agricultural production depends on factors that control plant growth.
The area to grow crops is limited. Increased food production will depend on factors that control plant growth: breeding of higher yielding cultivars, protecting crops from pests, diseases, competition.

(b) Plant growth and productivity

(i) The enzyme RuBisCO fixes carbon dioxide by attaching it to ribulose bisphosphate (RuBP) in the Calvin cycle. The intermediate produced is phosphorylated by ATP and combined with hydrogen from NADPH to form glyceraldehyde-3-phosphate (G3P). G3P is used to regenerate RuBP and for the synthesis of sugars.

(c) Plant and animal breeding by manipulation of heredity for improved plant crops, improved animal stock, to support sustainable food production.

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(i) Plant field trials are carried out in a range of environments to compare the performance of different cultivars or treatments and to evaluate GM crops.

The activity encourages learners to develop as scientifically literate citizens by:

- assessing risk and benefit of science applications;
- expressing opinions and showing respect for others' views;
- developing informed social, moral and ethical views of scientific, economic and environmental issues;
- discussing and debating scientific ideas and issues.

More information about the science behind the developments can be found in the background information along with suitable web-links. Additionally pdfs of three relevant scientific papers are available.

This activity contains 2 sets of cards containing GM related dilemmas:
- Turbocharged rice;
- New potatoes.

One way of using the activity is as a class discussion about the moral questions which this technology raises. It may be appropriate to have a class discussion at the start of the activity about what is meant by morally right and wrong. The teacher could read the 'Response Instruction Card' with the class and then ask the class to give some examples of things which society would consider to be morally right, wrong and neutral. Then the teacher would explain that they are going to make some moral decisions about some issues for society. The 2 sets of cards could then be used and the learners would be asked to make a moral judgement for each statement. In some cases there is a statement which is not a moral dilemma at all and the learners can respond to say that such a statement is morally neutral. Each dilemma has a set of 5 cards numbered (1- 5) and they must be read in sequence. After each card is read a judgement is made. A response instruction card must be available for each group - this tells the students how to record their decisions. A response record card is also available for each dilemma.

The idea and format for this resource is based on an activity adapted from The Wellcome Trust Lab Notes (issue No 1, pages 5-8) courtesy of the Wellcome Trust (www.wellcome.ac.uk/lab notes).