A level Biology A

H420/03 Unified biology

Question Set 18

1 All organisms exchange gases with their environment.

(a) Organisms can use simple diffusion to exchange gases when the diffusion pathway is less than 1 mm.

A beet armyworm larva:

- has a cylindrical shape
- is 15 mm long
- has a volume of 30 mm^3.

Calculate the diffusion pathway of the larva and state whether it **could** or **could not** rely on simple diffusion across its external surface to meet its gas exchange requirements.

Use the formula: Volume of a cylinder = $\pi r^2 l$

$30 = \pi r^2 \times 15$

$r = 0.798 mm$

diffusion pathway = ... 0.8 ..... mm

larva .... could ..... rely on simple diffusion

[2]

(b) Beet armyworm larvae eat a variety of plants, including tomato plants.

Scientists wanted to investigate how effective a chemical called methyl jasmonate was in stopping beet armyworm larvae from eating plants. They sprayed tomato plants with different concentrations of methyl jasmonate and recorded the final biomass of the plants.

The results are shown in Fig. 5.1.

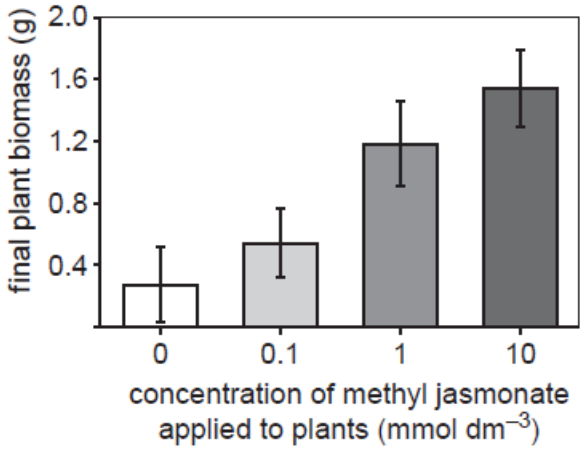

Fig. 5.1

scientists need to know whether
- tomato plants produce methyl jasmonate
- natural concentrations are as high as experimental ones
- other plants respond in the same way as tomatoes

The scientists wrote the following hypothesis:

Plants use methyl jasmonate as a defence against herbivory.

(i) What additional information do the scientists need to confirm their hypothesis? **[2]**

(ii) Suggest **one** valid conclusion it is possible for the scientists to draw from the results in Fig. 5.1. **[1]**

methyl jasmonate increases the final mass of tomato plants

(iii) The scientists also recorded the level of cannibalism amongst the beet armyworm larvae. Cannibalism was measured as the number of beet armyworm larvae eaten by other beet armyworm larvae.

The results are shown in Fig. 5.2.

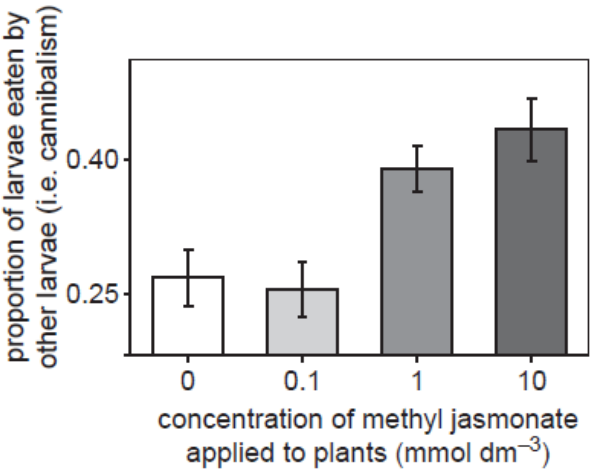

Fig. 5.2

Suggest **one** valid conclusion it is possible for the scientists to draw from their results shown in Fig. 5.2. **[1]**

methyl jasmonate causes increased cannibalism

Total Marks for Question Set 18: 6

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