AS Level Biology A

H020/01 Breadth in Biology

Question Set 10

1. The protease enzyme bromelain can be extracted from pineapples. A student investigated the effect of changing the concentration of the enzyme and measured the time taken to break down the protein gelatine.

(a) State **three** variables that the student would need to control in order to make the results ofthis investigation **valid**.

1 pH

2 Temperature

3 Mass of gelatine

[3]

(b) The data from the student's experiment is shown in Table 26.

Concentration ofbromelain (%)	Rate of protein digestion (s^{-1})	Standard deviation
0.010	0.0037	0.00014
0.025	0.0090	0.00034
0.050	0.0155	0.00260
0.075	0.0184	0.00371
0.100	0.0198	0.00340

Table 26

(i) Describe how the rate of reaction was calculated. **[1]**

1 ÷ time

(ii) Explain what the standard deviation shows in Table 26. **[2]**

A measure of the amount of variation around the mean. As the concentration of bromelain increases, the standard deviation increases (up to 0·075%) and thus repeatability decreases

(c) Fig. 26 shows the results plotted on a graph with the standard deviations as error bars.

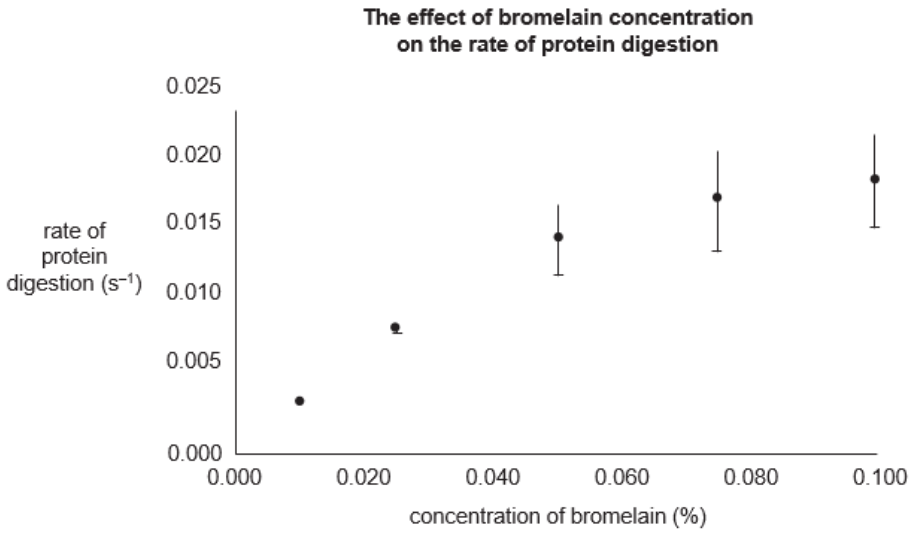

Fig. 26

Explain the pattern shown in the data using Table 26 and Fig. 26.

[3]

As the concentration of bromelain increases, the rate of protein digestion increases. This is because there is a greater number of active sites available so more enzyme-substrate complexes form. Substrate concentration remains the same throughout. The rate of digestion begins to plateau around $0.017\ s^{-1}$ because substrate concentration becomes a limiting factor. All substrate molecules are occupying active sites and many active sites are empty.

Total Marks for Question Set 10: 9

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