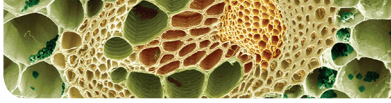

Topic 9 – data-based questions

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1. the rate of water uptake decreases from 17 $cm^3\ hr^{-1}$ to 0;

2. cutting the top of the shoot resulted in a decrease from 10 $cm^3\ hr^{-1}$ to 4 $cm^3\ hr^{-1}$;

3. 10 $cm^3\ hr^{-1}$ to −5 $cm^3\ hr^{-1}$ to = 5 $cm^3\ hr^{-1}$;

4. the pressure generated in the xylem by the leaves on the shoot resulted in a greater uptake of water than that of the vacuum (18 $cm^3\ hr^{-1}$ vs 5 $cm^3\ hr^{-1}$);

Page 408

1. a) addition of the fungus has an effect on both shoot dry mass and root dry mass, but a greater effect is observed on shoot dry mass; different species have different effects; *paxiliis* has the greatest effect; *pisolithus* has least effect;

b) increases surface area of roots; allowing greater mineral absorption and greater water absorption; promoting plant growth;

2. a) as root dry mass increases, shoot dry mass also increases – the relationship is direct;

b) more roots can support greater shoot mass;

c) the two species of *Laccaria* and the two species of *Thelophora* all have a significant effect. Conclusion is supported by *Thelophora* less so by *Laccaria*;

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assume labels: A C

B D

1. C has more negative solute potential which will draw water

2. water is under positive pressure because of solute having drawn the water there; forced downward due to positive pressure;

3. as solute is withdrawn, pressure difference causes water to move down from C to D

4. pressure potential differences lead water to move from D to B;

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1. a) (i) active transport of sugar

(ii) create high solute concentration; water drawn in by osmosis;

b) (i) no oligosaccharides at sucrose concentration below 0.25 mol dm^{-3}; oligosaccharides concentration rises between 0.25 and 0.50 mol dm^{-3}; no further increase above 0.50 mol dm^{-3};

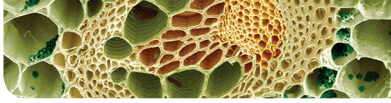
(ii) to reduce water loss from aphid/gut cells by osmosis;

c) (i) poor source of amino acids, with many (especially essential amino acids) at a lower percentage in phloem sap that aphid proteins;

(ii) plants synthesize amino acids for making plant proteins; plant and aphid proteins have different amino acid composition;

d) (i) feed aphids on phloem sap containing antibiotics; test aphid growth rates/protein synthesis rates/amino acid contents;

(ii) physiological problems have to be overcome; problem of phloem sap dehydrating cells by osmosis; problem of lack of essential amino acids;



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a) direct relationship; as photosynthesis rate climbs, translocation climbs;

b) **(i)** the higher the light intensity, the greater the translocation rate;

(ii) greater light intensity should lead to greater rates of photosynthesis which will lead to more sugar production which would lead to greater rates of translocation so it is a cause and effect relationship;

c) 5: 245 = 0.02;
3: 131 = 0.02;

d) it is a growing leaf as net photosynthesis rate is far in excess of what is being translocated; sugar must be used for storage in leaf or leaf development;

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(i) leaves 1 and 6;

(ii) on the same side as the source leaf; above the source leaf; youngest leaves (though this is less relevant to location);

(iii) drawing is not clear so difficult to conclude; 4 and 3 appear to be lateral rather than above or below; pruning causes re-routing: hypothesis unsupported; photosynthate appears in leaves on the opposite side after pruning;

Page 424–425

a) IAA causes a lowering of pH, with large initial changes; the pH then stabilizes; IAA could trigger proton pumping;

b) at about 50 minutes;

c) once pH reaches its lowest level, the maximum increase in length occurs;

d) the rate of elongation is greater in pH 3 than in pH 7; elongation stops at pH 7, but not at pH 3;

e) IAA promotes elongation again at neutral pH;

f) addition of KCN prevents elongation;

g) hypothesis supported; figure 5 shows that IAA lowers pH; figure 6 shows that IAA promotes elongation even with neutral pH; figure 7 shows that IAA has no effect with the addition of proton pump blocker;

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1. for all planting dates there is an initial low rate of increase in the number of nodes; a linear increase in the number of nodes; all groups produce nodes at the same rate/slope of lines are approximately equal; all plants stop producing new nodes at the same time; the earliest plantings produce the greatest number of nodes;

2. **a)** approximately 20 August;

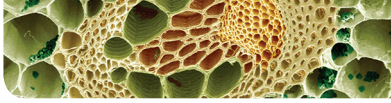
b) day length is a key factor; day (light) length grows shorter in late August; critical day length reached/soybeans are short day plants;

3. **a)** earlier planting yields more nodes; by flowering time more fruits produced per plant;

b) possible frost risk; possible drought risk; early flowering if day length is critical length early in season;

Page 432–433

1. the diameter of the pollen grain is likely to be the cause of both the mean growth of the pollen tube and the optimal sucrose concentration; these can be represented on a single graph or on two different graphs;



2. as the diameter of the pollen grain increases, mean growth of the pollen tube decreases, though this is a weak correlation; as the diameter increases, the optimal sucrose concentration decreases; this is a reasonably strong correlation; one possible explanation for a certain concentration of sucrose triggering germination may be that this concentration matches the concentration on the stigma of the species;
3. the experiment could have been improved by increasing the number of trials;

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1. 0.5 μm;
2. the dye appears only on the outside of the cuticle; it was able to penetrate through the testa but was not able to reach through to the embryo;
3. **a)** in the control seed, the stain is only on the surface of the cuticle; in the smoke treated seed, the stain has penetrated further (nearly to the embryo);

   b) fire damages/melts cuticle; allowing water to penetrate and promote germination; in the absence of fire seeds do not germinate because of the cuticle;
4. in climax ecosystem the plant can't compete – *Emmenannthe* is a colonizer species; after fire, more nutrients and more light are available.