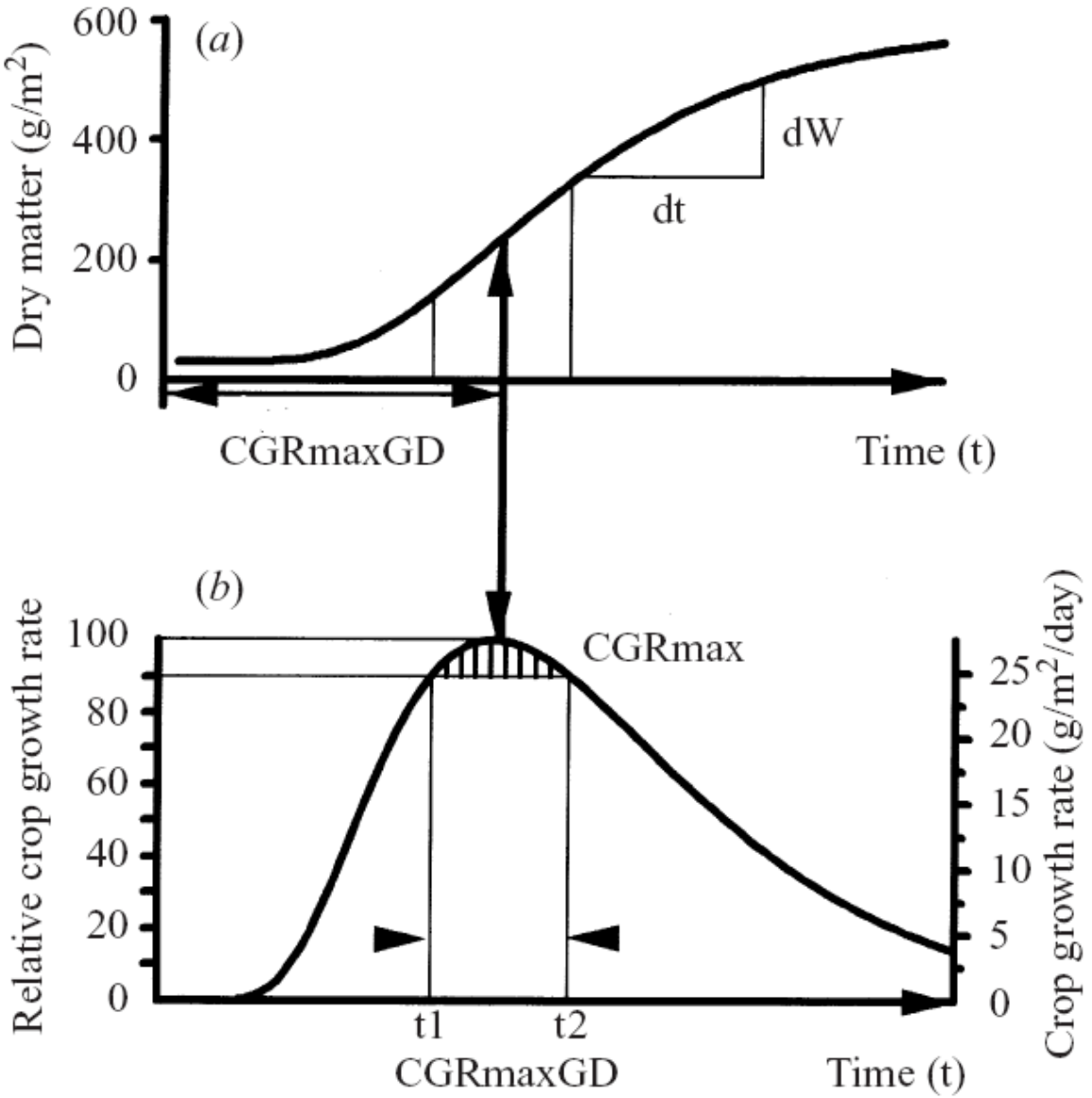
AGRY 515 2012

- Plant Growth Analysis
- Plant Responses to Nutrient Stress (General)
- Short-term Nutrient Stress

Figure A


(a)
600
400
200
0
Dry matter (g/m2)
dW
dt
CGRmaxGD
Time (t)
(b)
100
80
60
40
20
0
Relative crop growth rate
CGRmax
25
20
15
10
5
0
Crop growth rate (g/m2/day)
t1
t2
CGRmaxGD
Time (t)

Different views and use of the term "NUE"

Two components of NUE

1. NUE (or agronomic) efficiency: the product of physiological & uptake or assimilation efficiencies (PE & UE)
2. What matters from the environmental perspective is the overall NUE not just the PE
3. Tissue conc. alone not enough of the story

NUE = ΔYield / Fertilizer Incre.
NUE = ΔYield / ΔSoil Nut. Supply
NUE = PE x UE

$$UE = \frac{\Delta \text{ Tissue Nutrient Cont. (kg)}}{\text{Fertilizer increment (kg)}}$$

$$PE = \frac{\Delta \text{ Yield (kg)}}{\Delta \text{ Tissue Nutrient Cont. (kg)}}$$

Figure B1: Law of the minimum

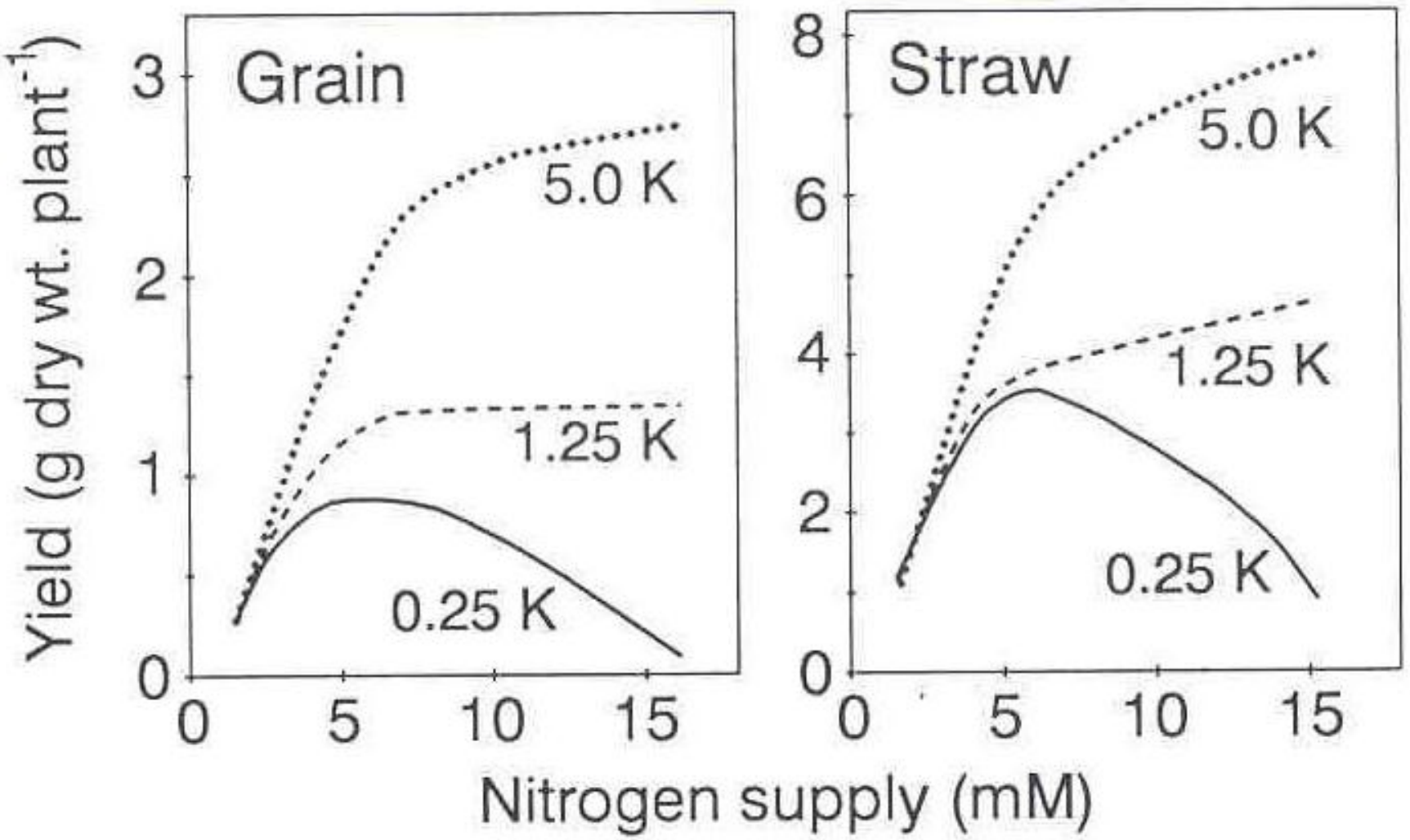
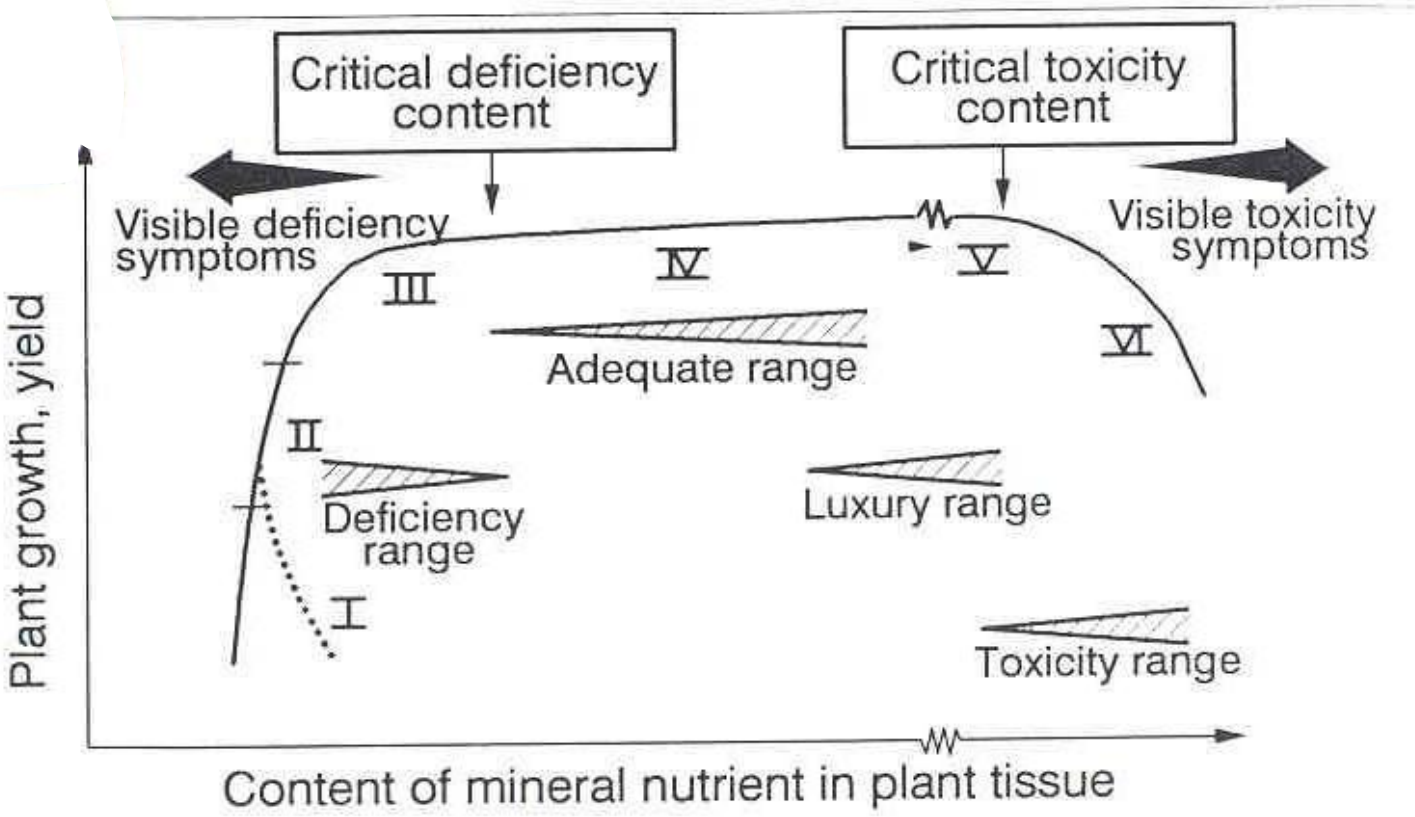


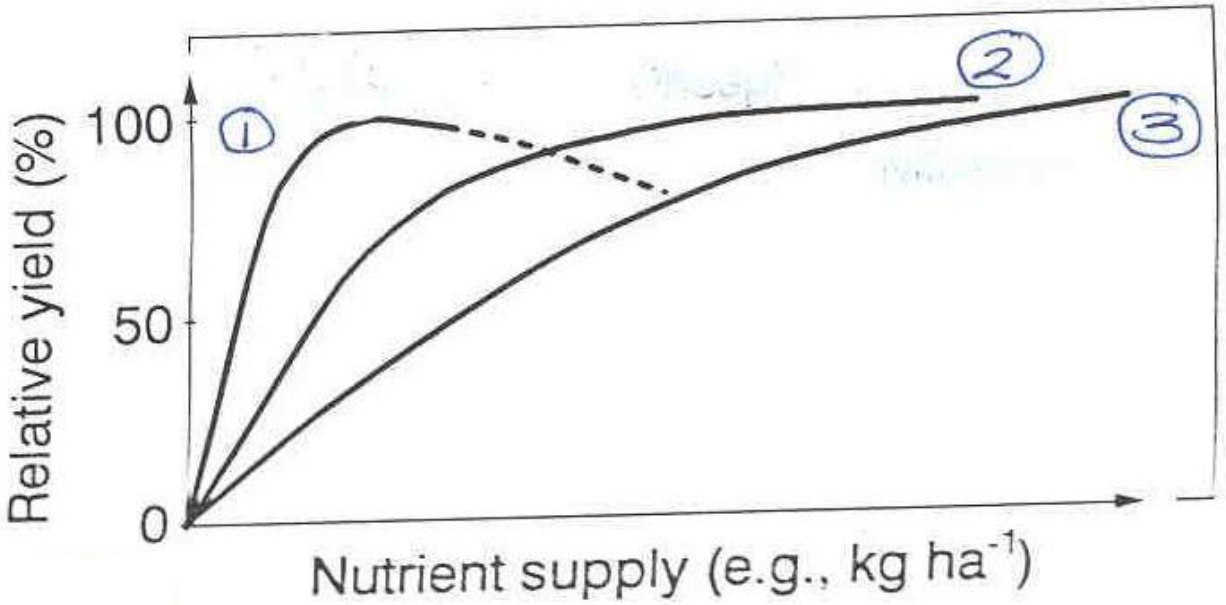
Figure C (Fig. 11.5 in text)



Range	I II deficient	II III low	IV adequate	V high	VI toxic
Element *					
P (%)	<0.16	0.16-0.25	0.26-0.50	0.51-0.80	>0.80
K (%)	<1.26	1.26-1.70	1.71-2.50	2.51-2.75	>2.75
Mn (mg kg^{-1})	< 15	15 - 20	21 -100	101 - 250	> 250

* Soybean, upper leaves (from Jones, 1967)

Figure B2 (Fig. 5.1 & 5.3 in text)



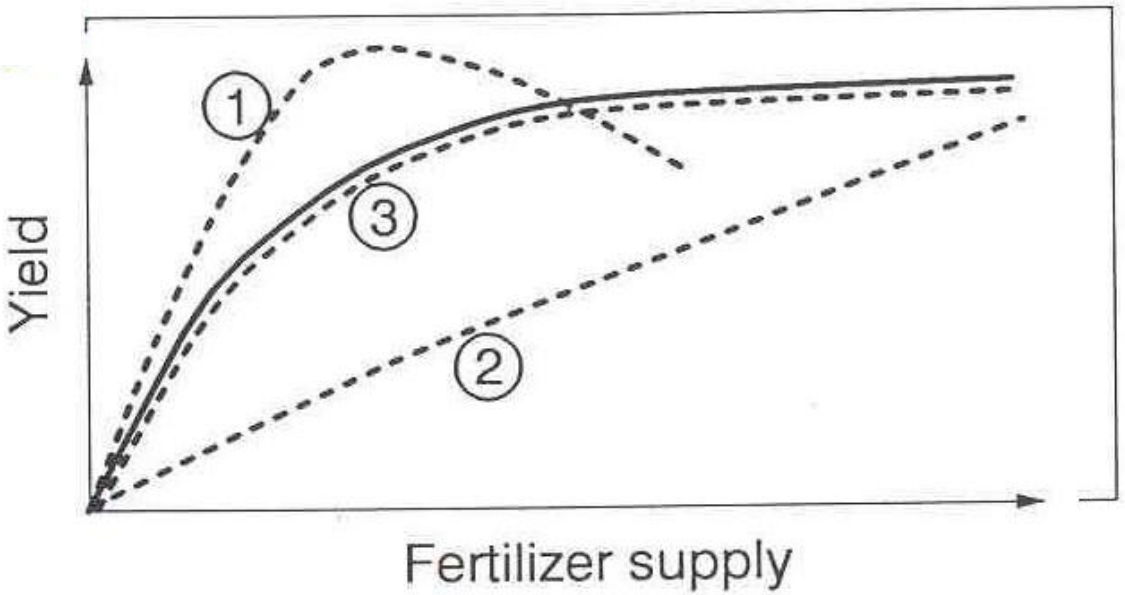


Figure D1

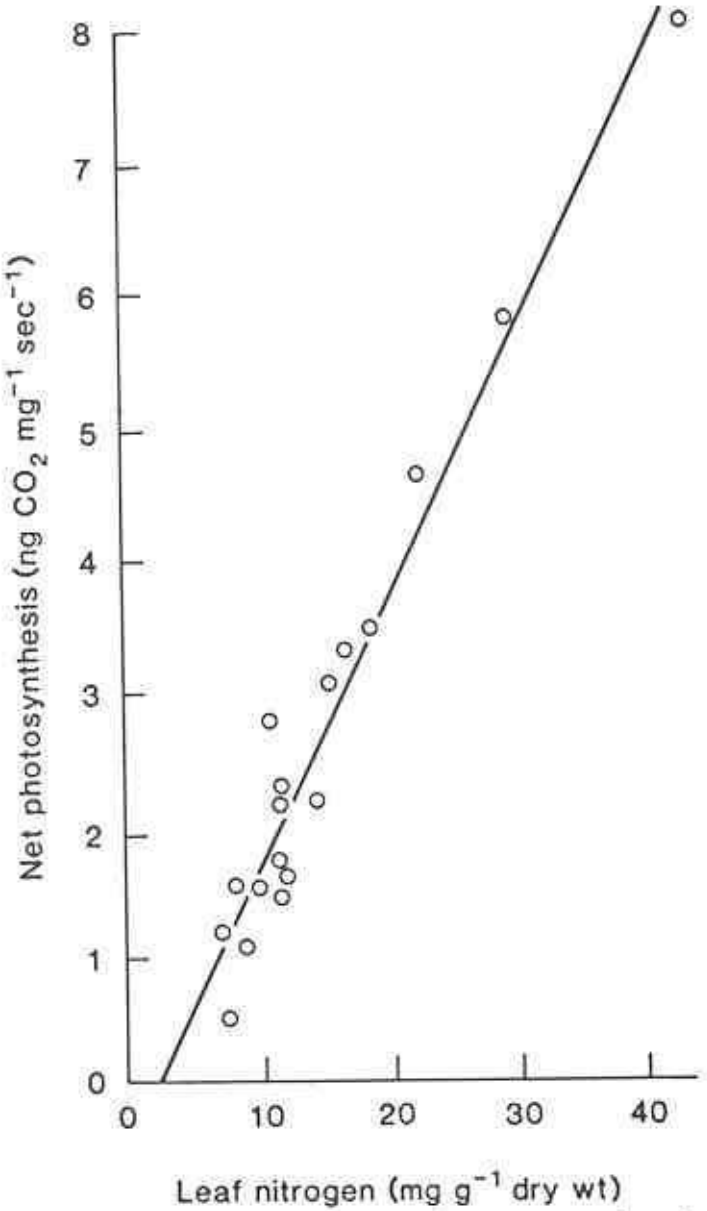


Fig. 12. Light-saturated net photosynthesis rates of leaves of *Eucalyptus* species with differing nitrogen contents. (After MOONEY et al. 1978)

Figure D2

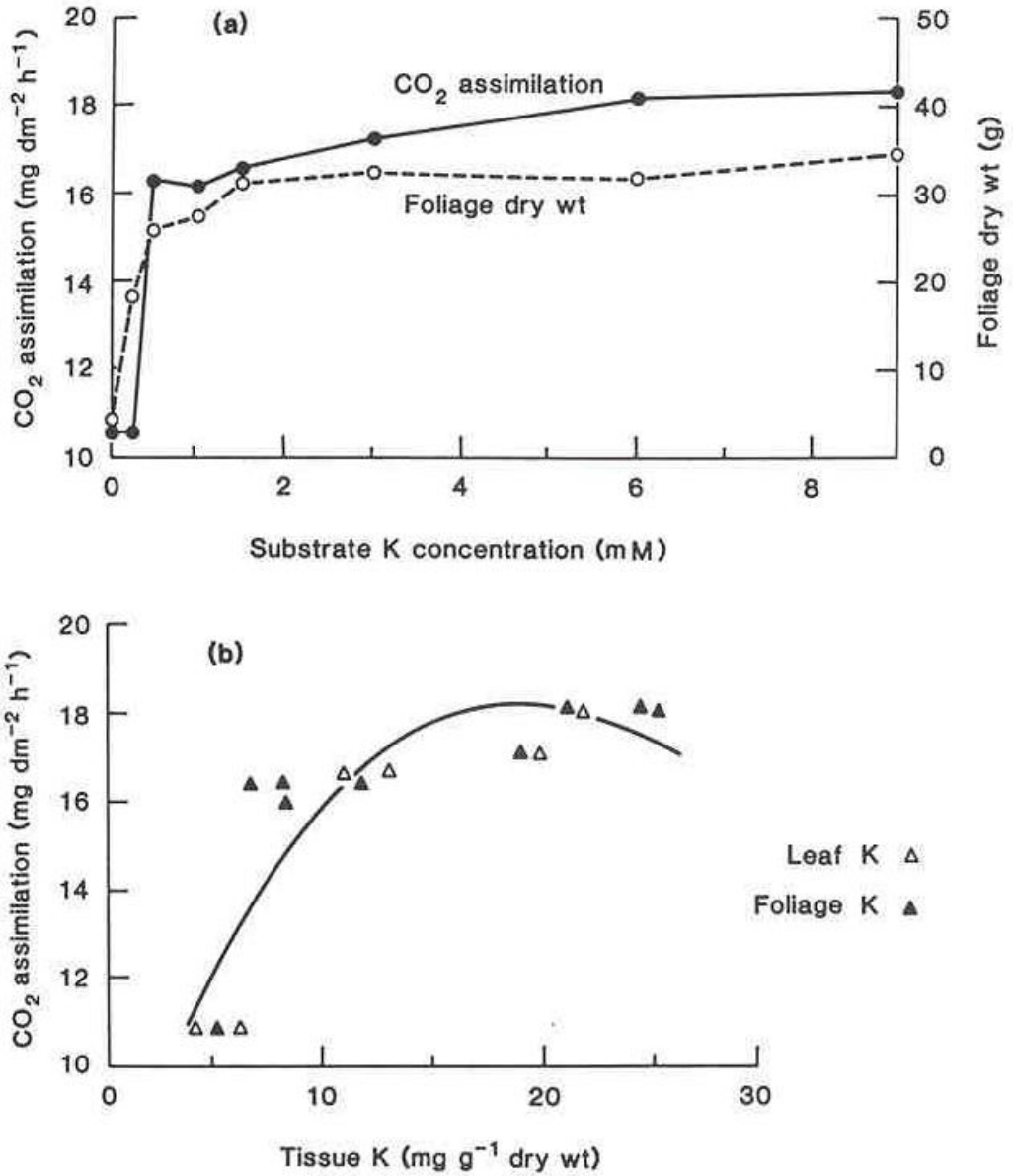


Fig. 10. a The influence of substrate potassium concentration on the rate of CO_2 assimilation of the youngest fully expanded leaf and on the dry weight of the foliage: mean of three replicates. **b** The relationship between CO_2 assimilation and the mean potassium concentration in the total foliage and the specific leaf sampled: mean of three replicates. (After ESTES et al. 1973)

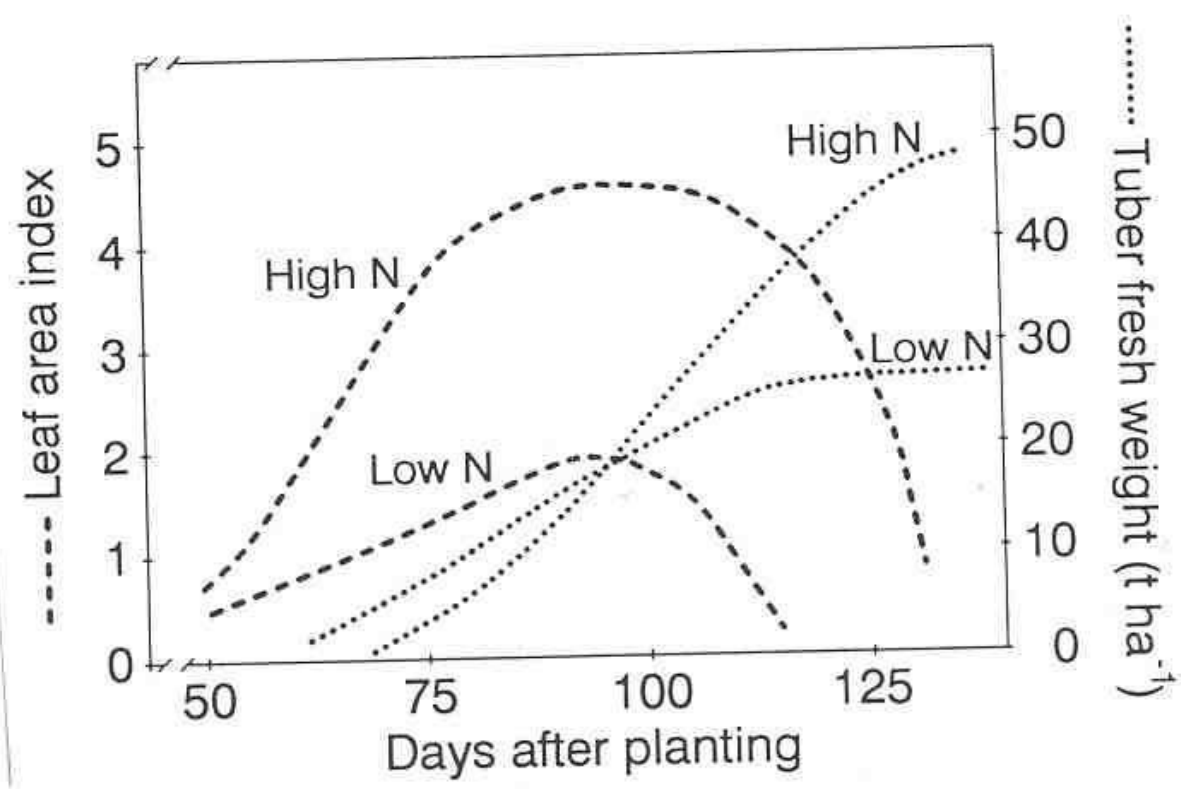
Figure D3

Table 3. The effect of potassium concentration in the substrate on the concentration of potassium in the leaves, the rate of photosynthesis, RuBP carboxylase activity, and rates of photorespiration and dark respiration (PEOPLES and KOCH 1979)

Substrate potassium (mM)	Leaf potassium (mg g^{-1})	Photo-synthesis (mg dm^{-2} h^{-1})	RuBP carboxylase activity (μ mol CO_2 mg^{-1} protein h^{-1})	Photo-respiration (dpm dm^{-2})	Dark respiration (mg dm^{-2} h^{-1})
0	12.8a	11.9a	1.8a	4.0a	7.6a
0.6	19.8b	21.7b	4.5b	5.9b	5.3b
4.8	38.4c	34.0c	6.1b	9.0c	3.1b

Means within a column followed by the same letter are not significantly different ($P < 0.05$)

Figure E (Fig. 5.20 in text)



Time course of leaf area index and fresh weight of potato tubers at two levels of N supply. (Based on Ivins and Bremner, 1964, and Kleinkopf *et al.*, 1981.)

Figure F

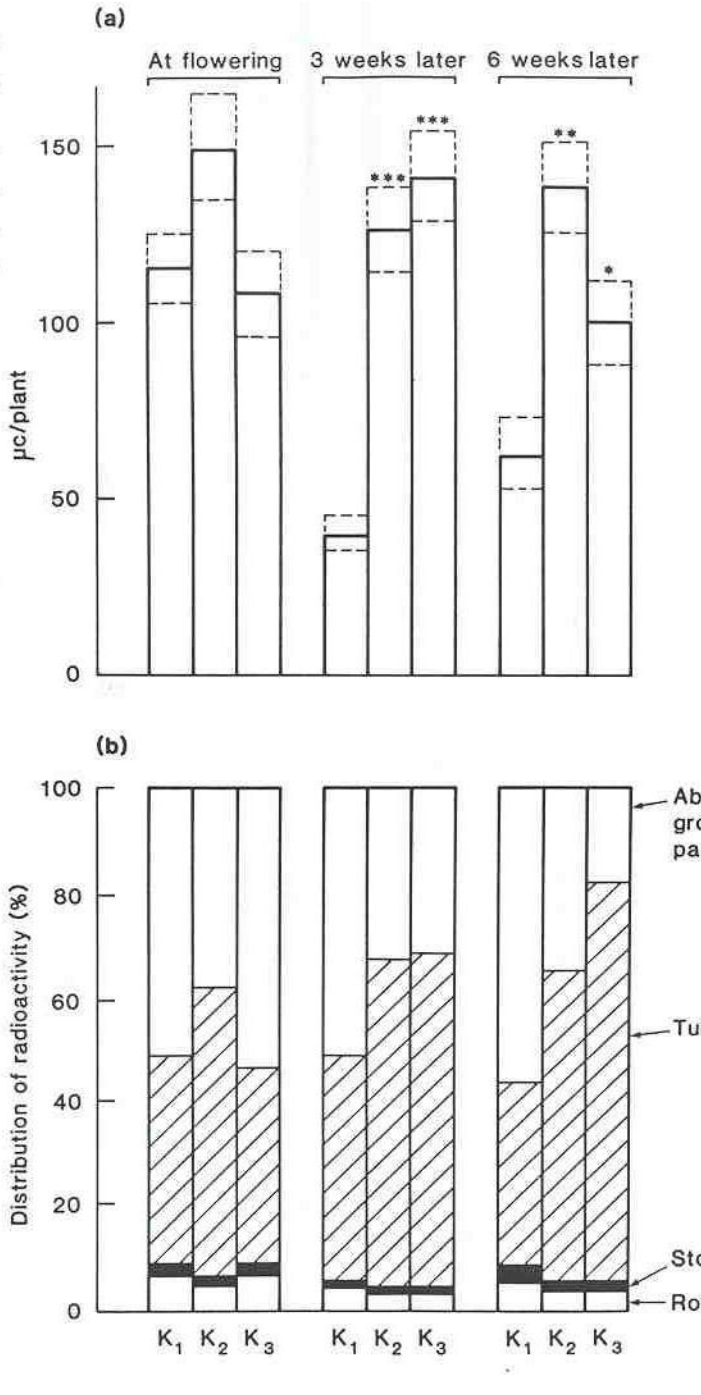


Fig. 18. a ^{14}C assimilation of whole potato plant (---, Standard error; *P < 5%; **, P < 1%; ***, P < 0.1%; compared with K_1); **b** percentage distribution of total radioactivity in plant organs. $K_1 = 0.2$ mM, $K_2 = 1.0$ mM, $K_3 = 5.0$ mM K_2SO_4. (After HAEDER et al. 1973)