STUDIES ON BUD DORMANCY OF WOODY SPECIES

A thesis

submitted in partial fulfilment of

the requirements for the degree

of

Doctor of Philosophy in Plant Physiology

in the

University of Canterbury

by

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Christchurch, New Zealand

PART II

(Figures and Plates)

Figure 1. Outline of the generalised procedure used for the purification of free and bound ABA from methanolic extracts of *Alnus viridis* tissue.

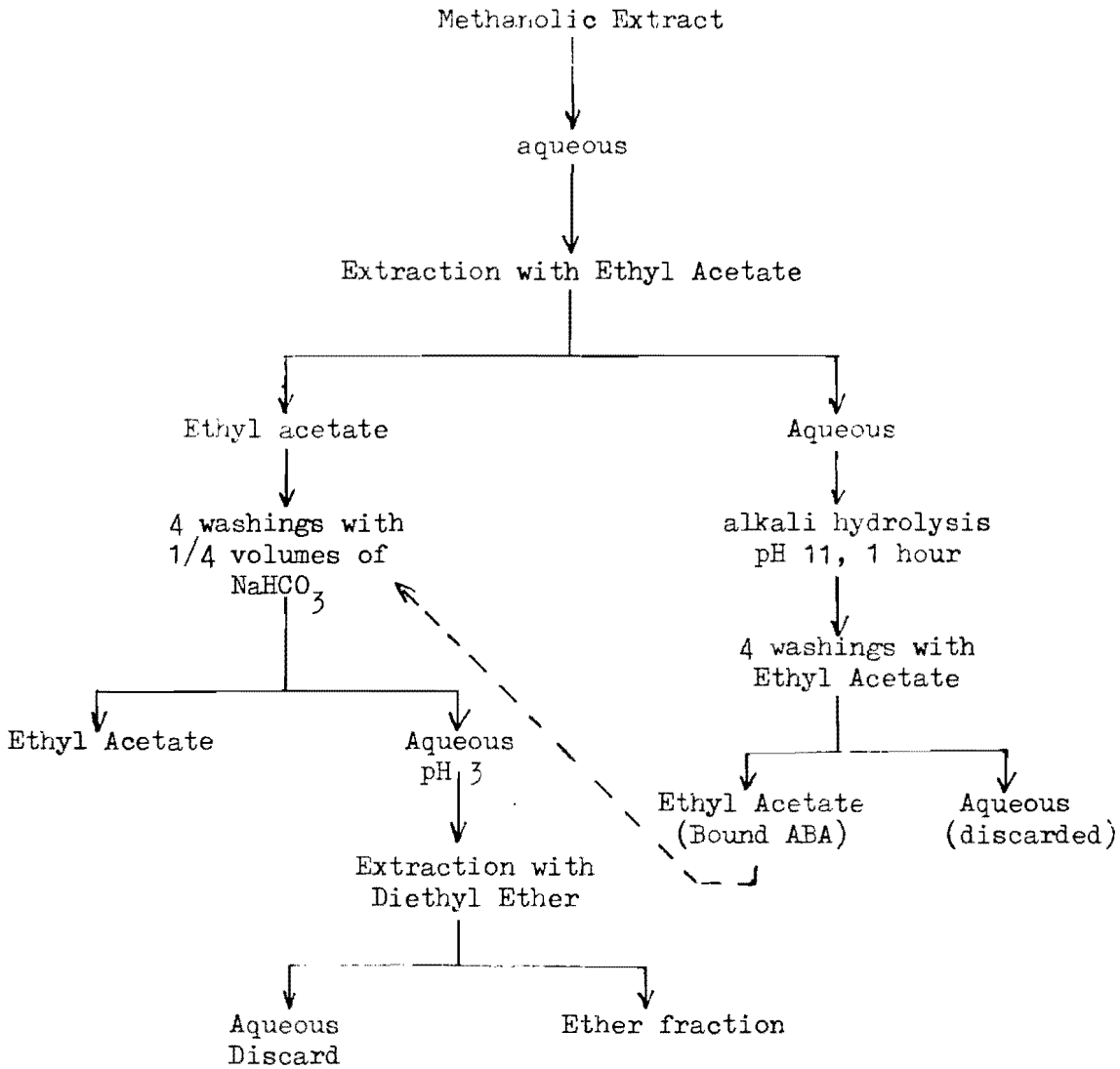

Methanolic Extract
aqueous
Extraction with Ethyl Acetate
Ethyl acetate
Aqueous
4 washings with 1/4 volumes of NaHCO3
alkali hydrolysis pH 11, 1 hour
4 washings with Ethyl Acetate
Ethyl Acetate
Aqueous pH 3
Ethyl Acetate (Bound ABA)
Aqueous (discarded)
Extraction with Diethyl Ether
Aqueous Discard
Ether fraction

Figure 2. Gas chromatographs of methylated extracts of *Alnus viridis* leaves and buds (A) before and (B) after co-chromatography with the mixed isomers of authentic Me-ABA. Chromatographs were obtained using ^{63}Ni electron capture detector and 3% OV 17 as stationary phase. Column and detector temperatures were 195°C and 295°C, respectively. Samples injected were equivalent to approx. 10^{-3}g DW of tissue and 100 pg of authentic Me-ABA. Arrows indicate peaks corresponding with cis,trans Me-ABA and trans,trans Me-ABA.

a free ABA fraction of a leaf extract

b bound ABA fraction of a leaf extract

c free ABA fraction of an apical extract

d bound ABA fraction of an apical extract

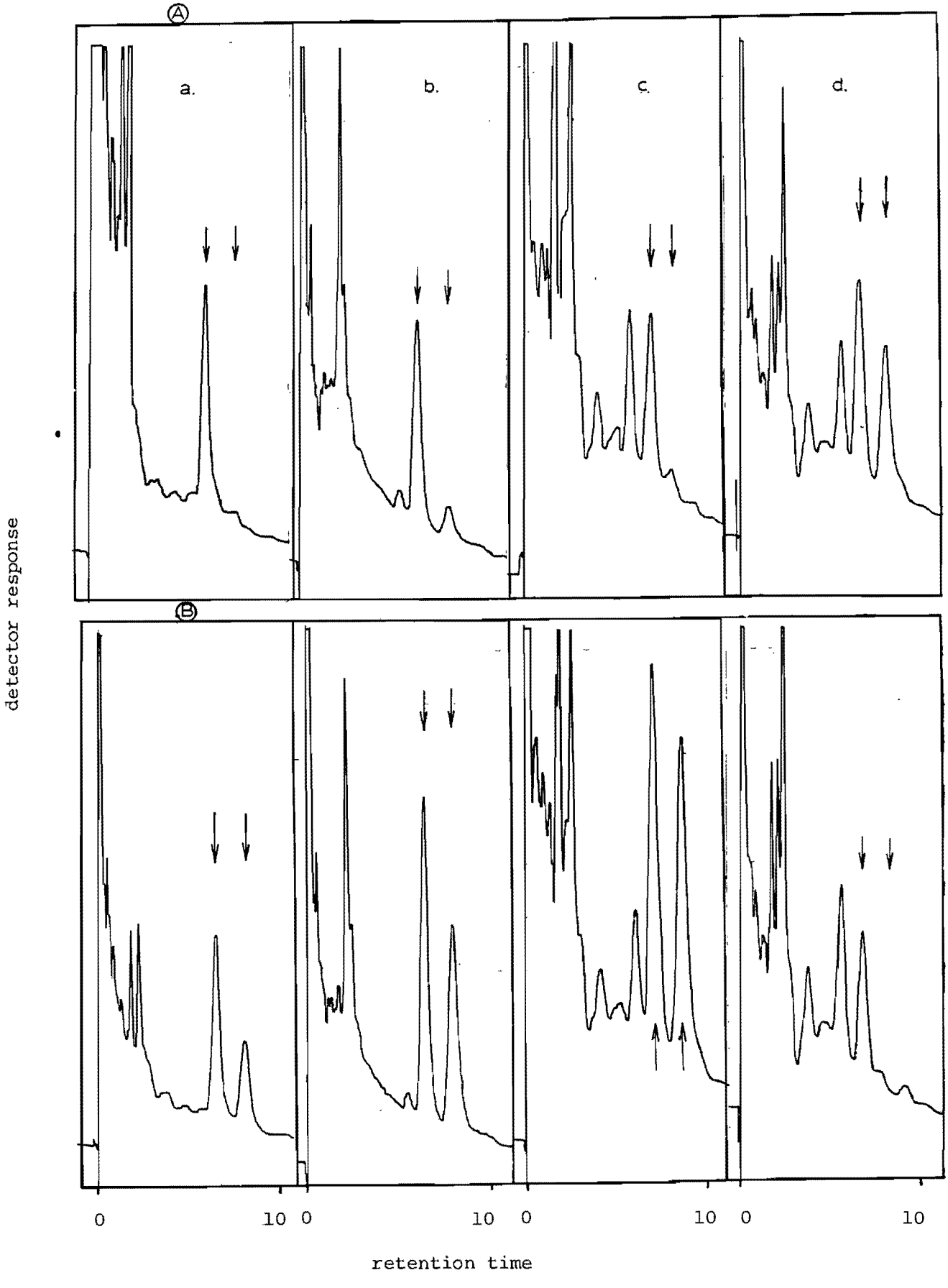

A
a.
b.
c.
d.
B
detector response
0
10
0
10
0
10
0
10
retention time

Figure 3. Gas chromatographs of the mixed isomers of authentic ABA on four stationary phases (a) 3% OV 17, (b) 3% OV 1, (c) 3% OV 210, and (d) 10% SE 30 using an electron capture detector. Column temperatures were 195°C, 205°C, 205°C and 210°C, respectively and the detector temperature was 195°C. Samples injected represent 100 pg of authentic Me-ABA. Arrows indicate peaks corresponding with cis,trans Me-ABA and trans,trans Me-ABA.

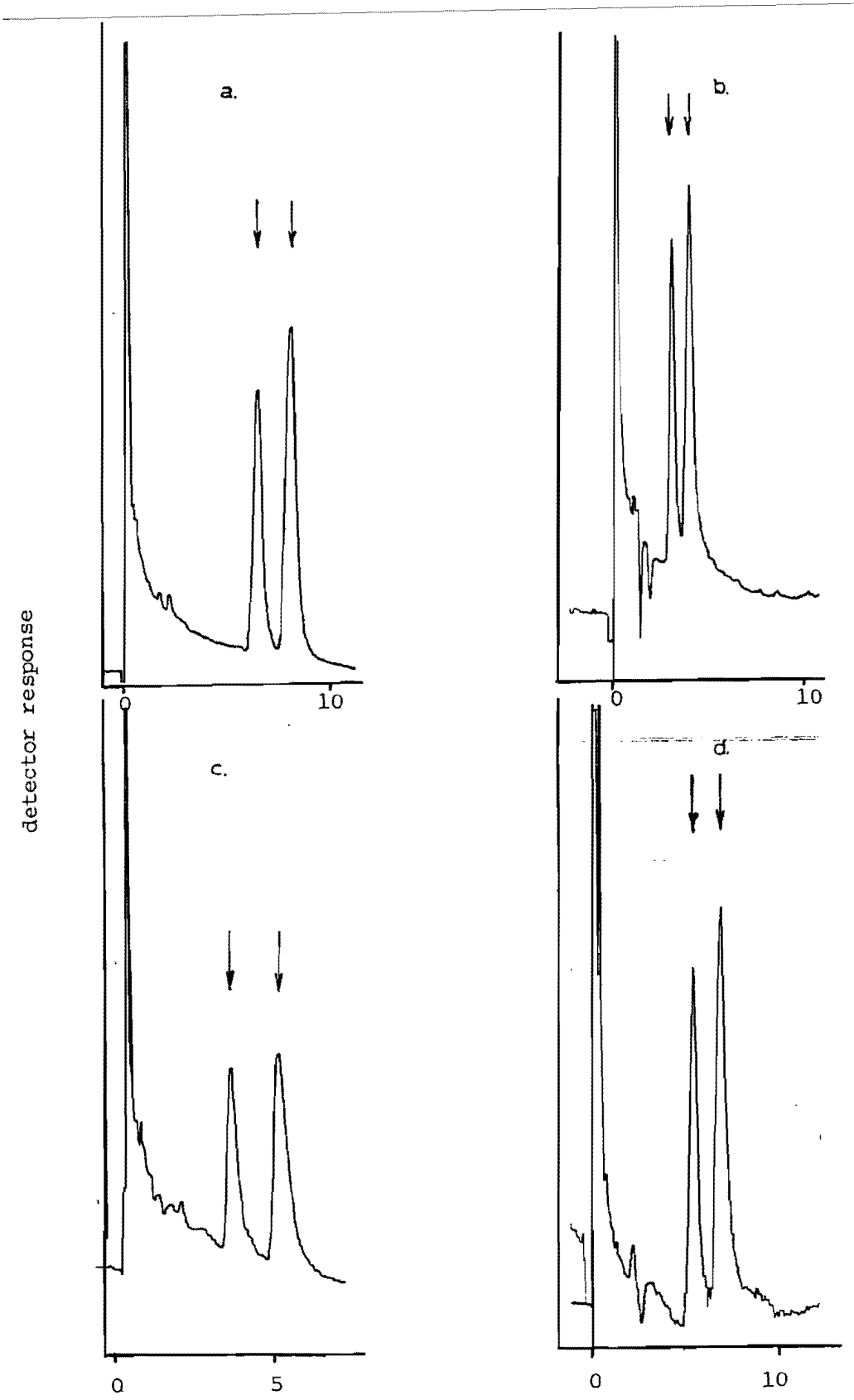

a.
b.
c.
d.
0
10
0
10
0
5
0
10
detector response
retention time (min)

Figure 4. Gas chromatographs of methylated extracts of *Alnus viridis* leaves and buds obtained using an electron capture detector and (A) 3% OV 210, (B) 3% OV1, and (C) 10% SE 30 as stationary phases. Column and detector temperatures were as in figure 3 and other details as in figure 2.

(a) free ABA fraction of a leaf extract
(b) bound ABA fraction of a leaf extract
(c) free ABA fraction of an apical extract
(d) bound ABA fraction of an apical extract

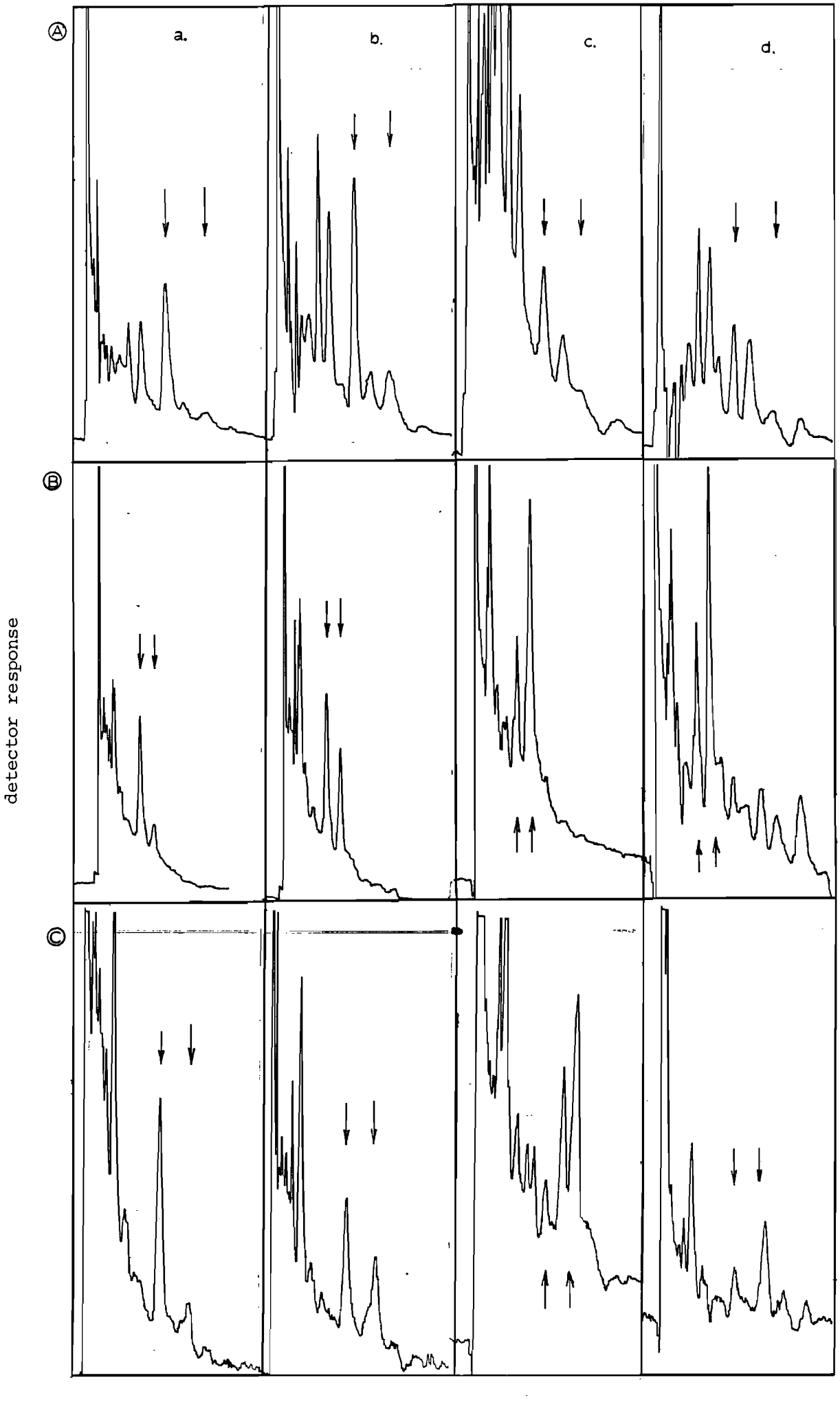

Ⓐ
a.
b.
c.
d.
Ⓑ
Ⓒ
detector response
retention time

Figure 5. Gas chromatographs of a methylated extract of *Alnus viridis* leaves obtained (A) before and (B) after co-chromatography with the mixed isomers of authentic Me-ABA. Chromatographs were obtained using an electron capture detector and (a) 3% OV 17, (b) 3% OV 1, (c) 3% OV 210 and (d) 10% SE 30 as stationary phases. Samples injected represent approx. 10^{-3}g DW Of tissue. Other details as in figure 3.

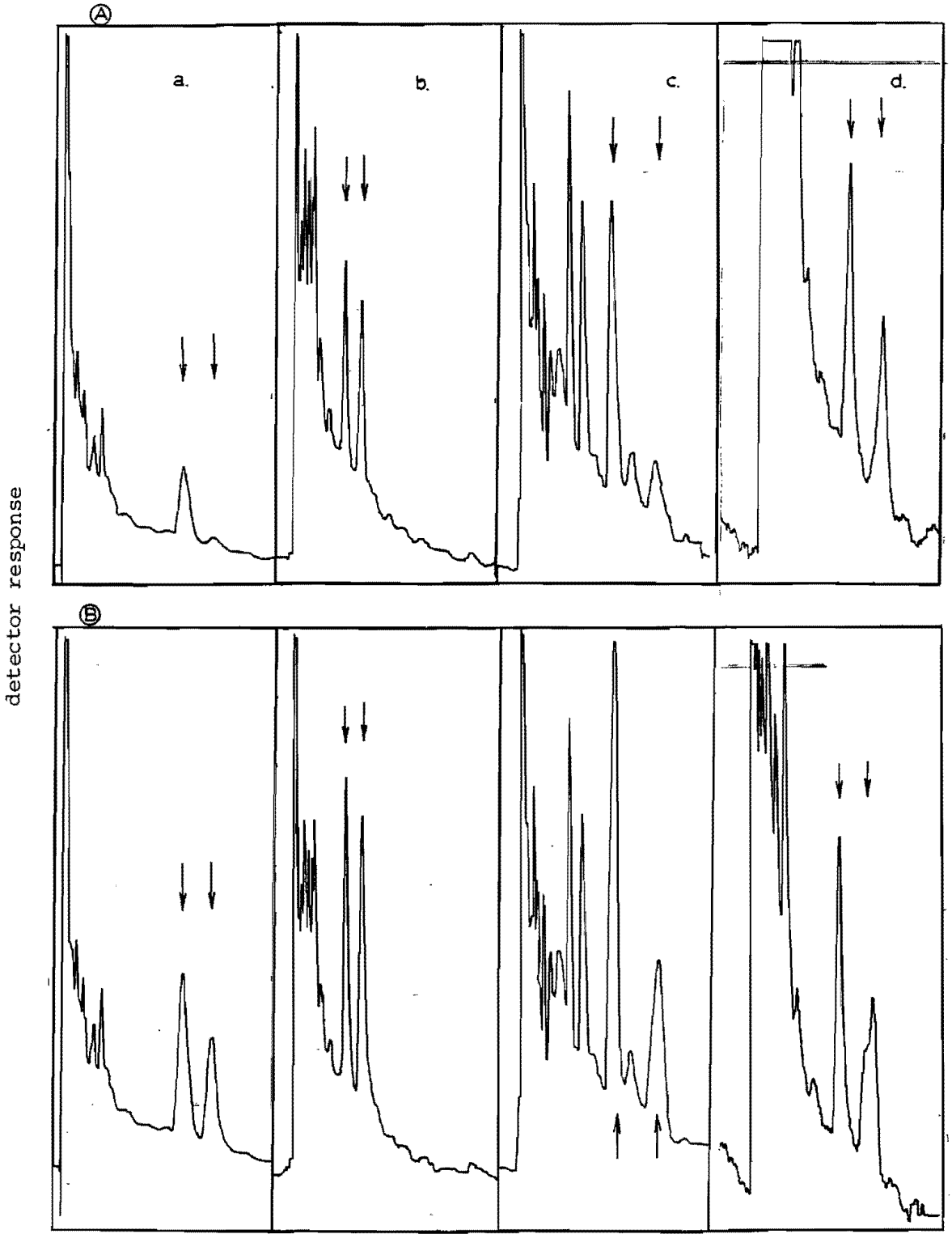

Ⓐ
a.
b.
c.
d.
Ⓑ
detector response
retention time

Figure 6. Gas chromatographs of methylated extracts of *Alnus viridis* leaves (A) before and (B) after 1 hour of U.V. light exposure, obtained using an electron capture detector and 3% OV 17 as the stationary phase. Other details as in figure 2.

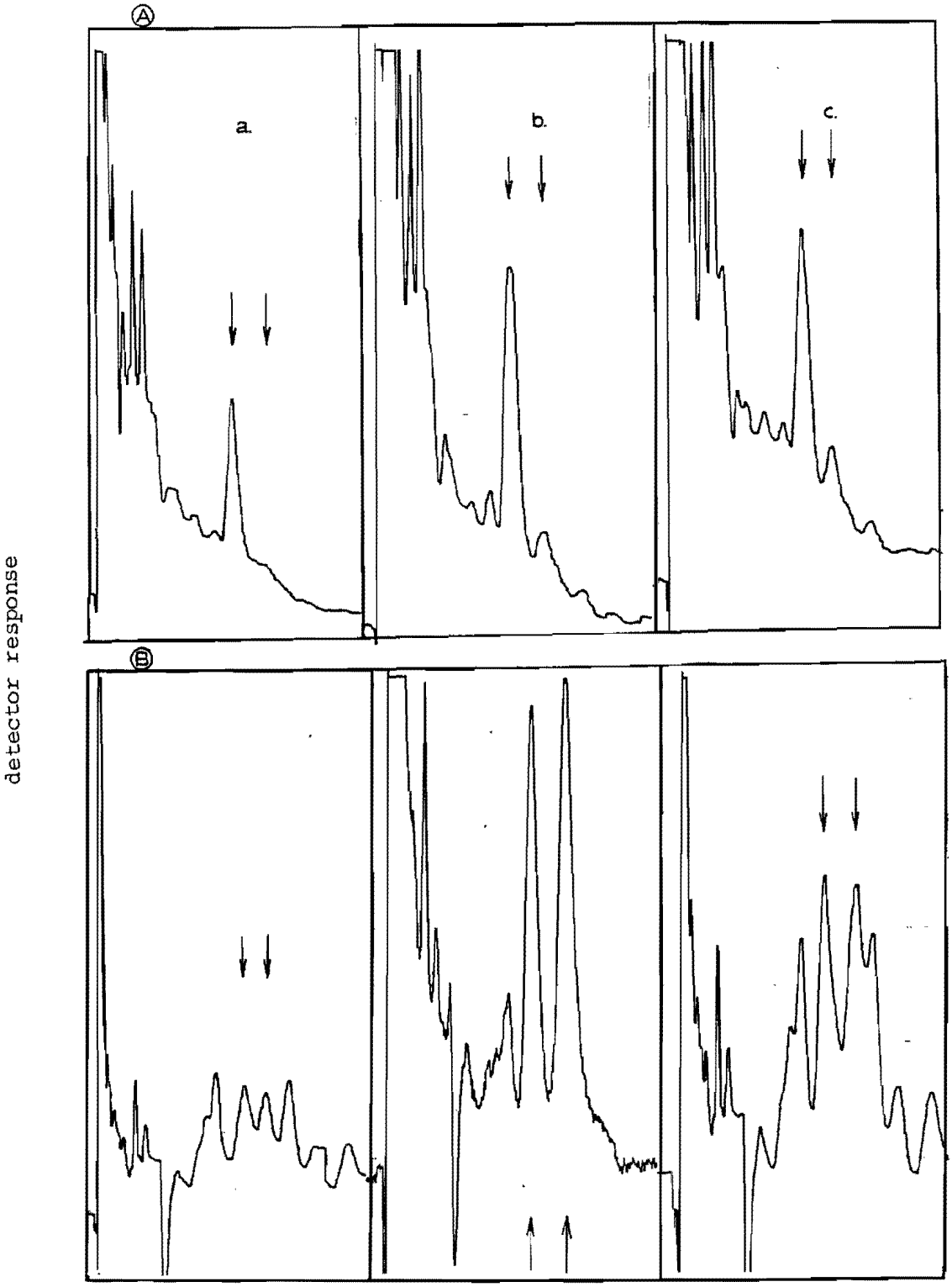

A
a.
b.
c.
B
detector response
retention time

Figure 7. Mass spectrum of the mixed isomers of authentic Me-ABA (A) and the methylated extracts of *Alnus viridis* (B) leaves and (C) apices. Ionizing voltage was 70 eV.

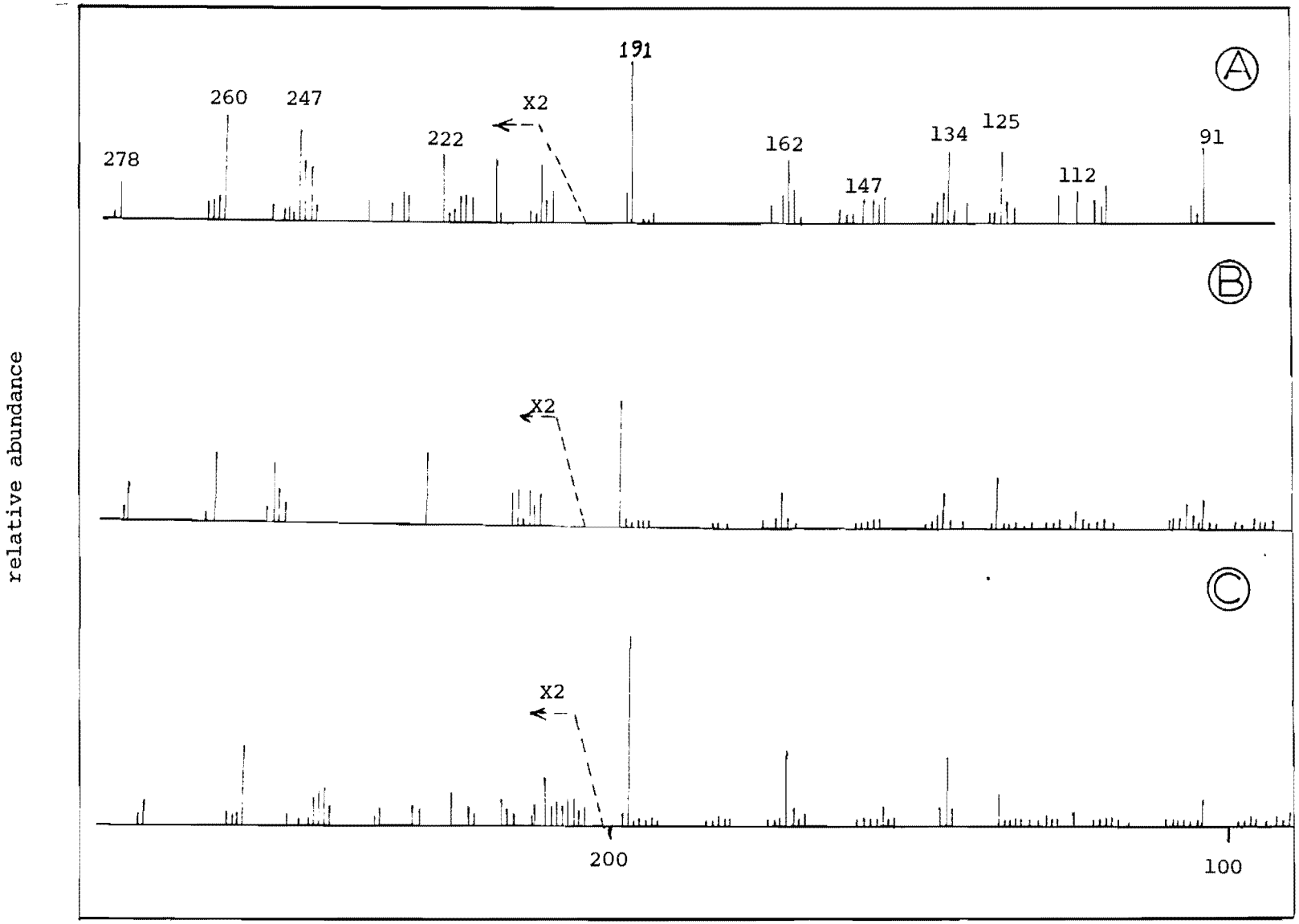

191
260
247
X2
222
278
162
147
134
125
112
91
A
B
X2
C
X2
200
100
relative abundance
m/e

Figure 8. Growth of *Alnus viridis* seedlings under 16 h (LD) and then transfer to 8 h (SD) photoperiods. Plants were maintained at 10^{o}C night and 14^{o}C day (equivalent to the high light intensity period). Arrow indicates the beginning of the SD treatment. Each value represents the percentage increase in height and is the mean of 10 replicates (LD's) or 7 replicates to day 12 and 4 replicates after day 12 of SD treatment. Each replicate consists of two plants and the vertical bars represent twice the S.E.'s of the means.

Leaves and apices were harvested from 3 replicates on day 0 and day 12 of SD treatment.

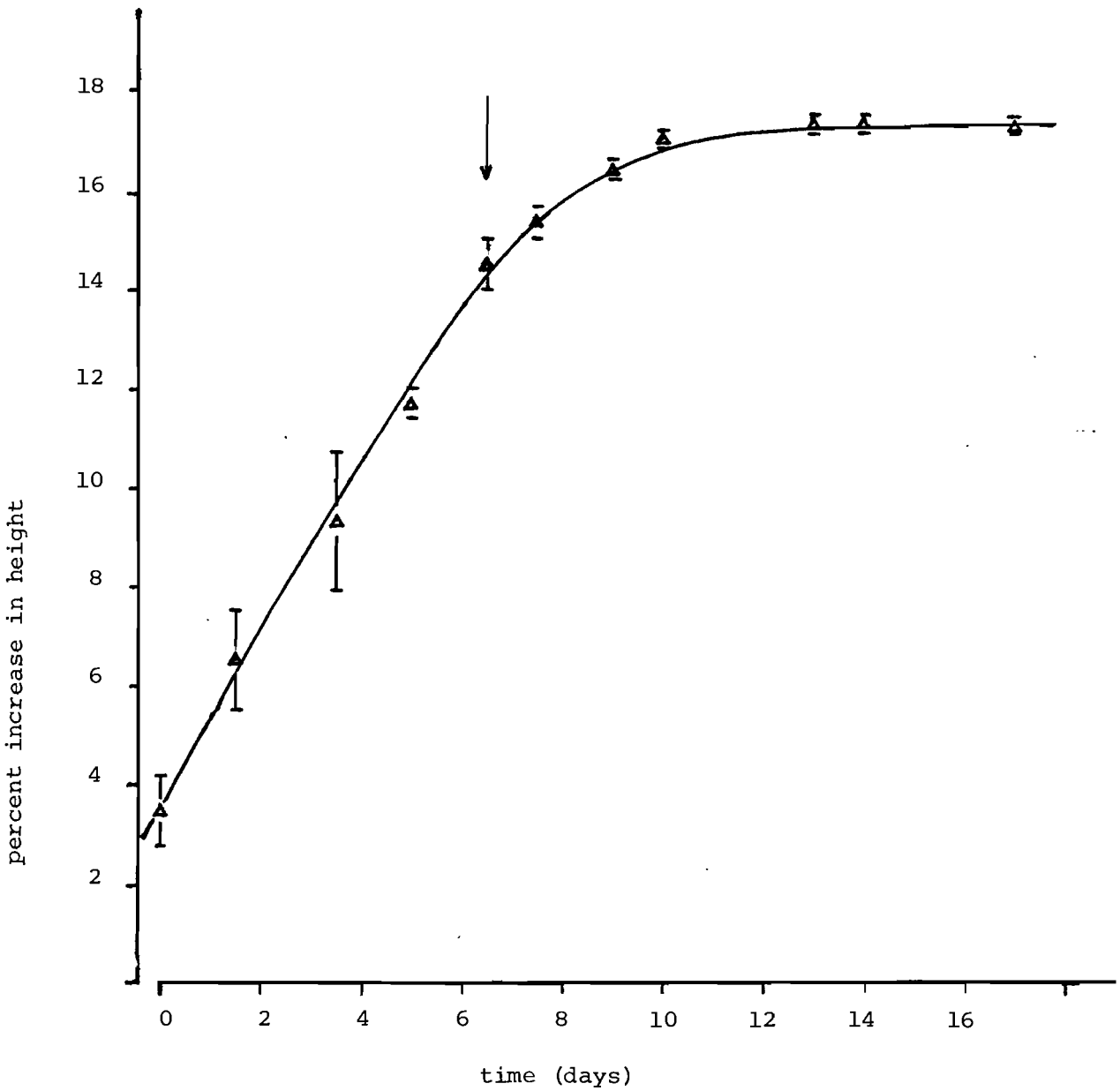

percent increase in height
18
16
14
12
10
8
6
4
2
0
2
4
6
8
10
12
14
16
time (days)

Figure 9. The response of wheat coleoptile sections to ABA. Each value represents growth as a percentage of the control (growth in water) and is the mean ± S.E. of three replicates, each consisting of 10 coleoptiles.

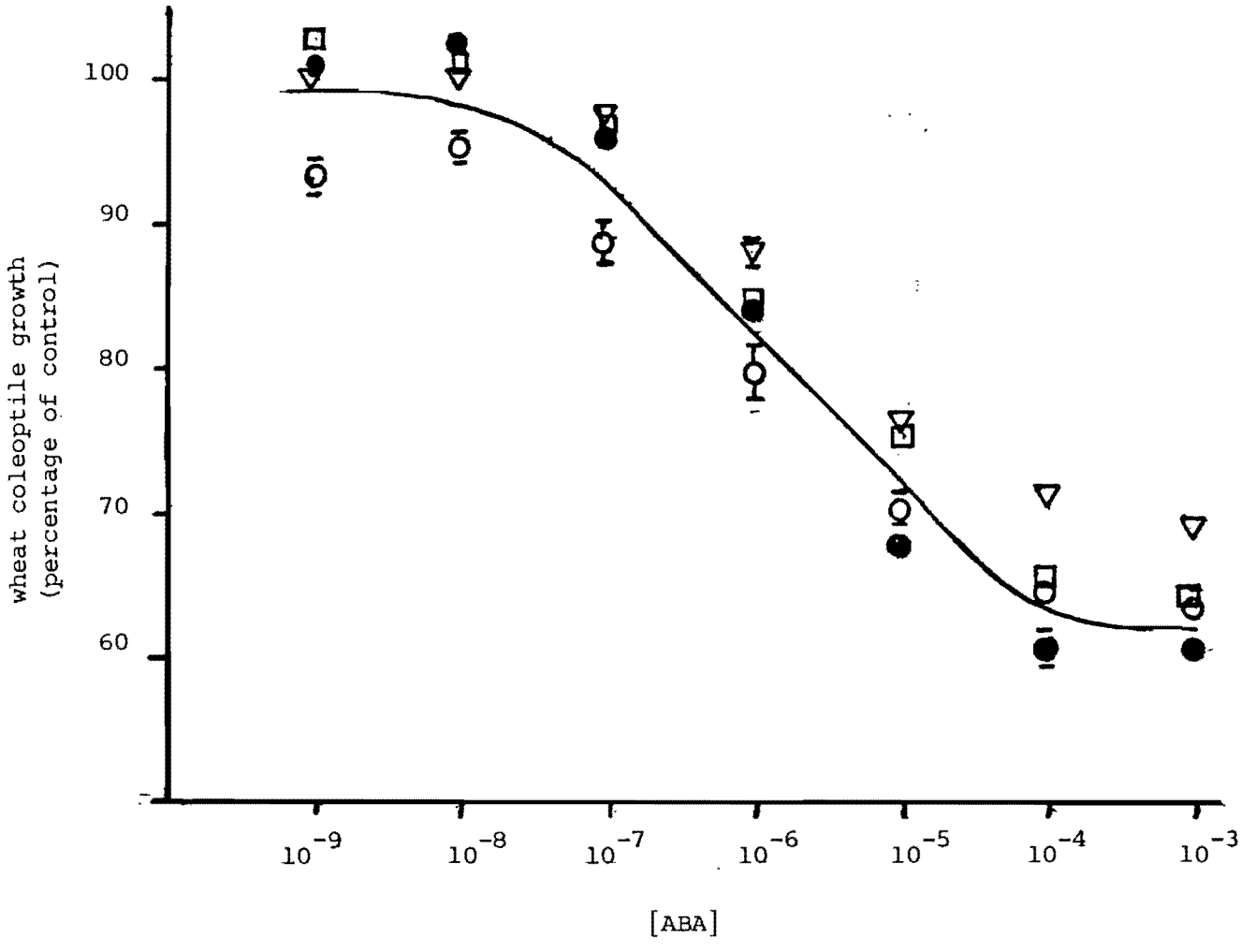

wheat coleoptile growth
(percentage of control)
100
90
80
70
60
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
[ABA]

Figure 10. The effect of serial concentrations of ABA and short chain fatty acids (C5 and C10) on the extension growth of wheat coleoptile sections. Each value represents growth as a percentage of the control (growth in water) and is the mean ± S.E. of 3 replicates, each consisting of 10 coleoptiles.

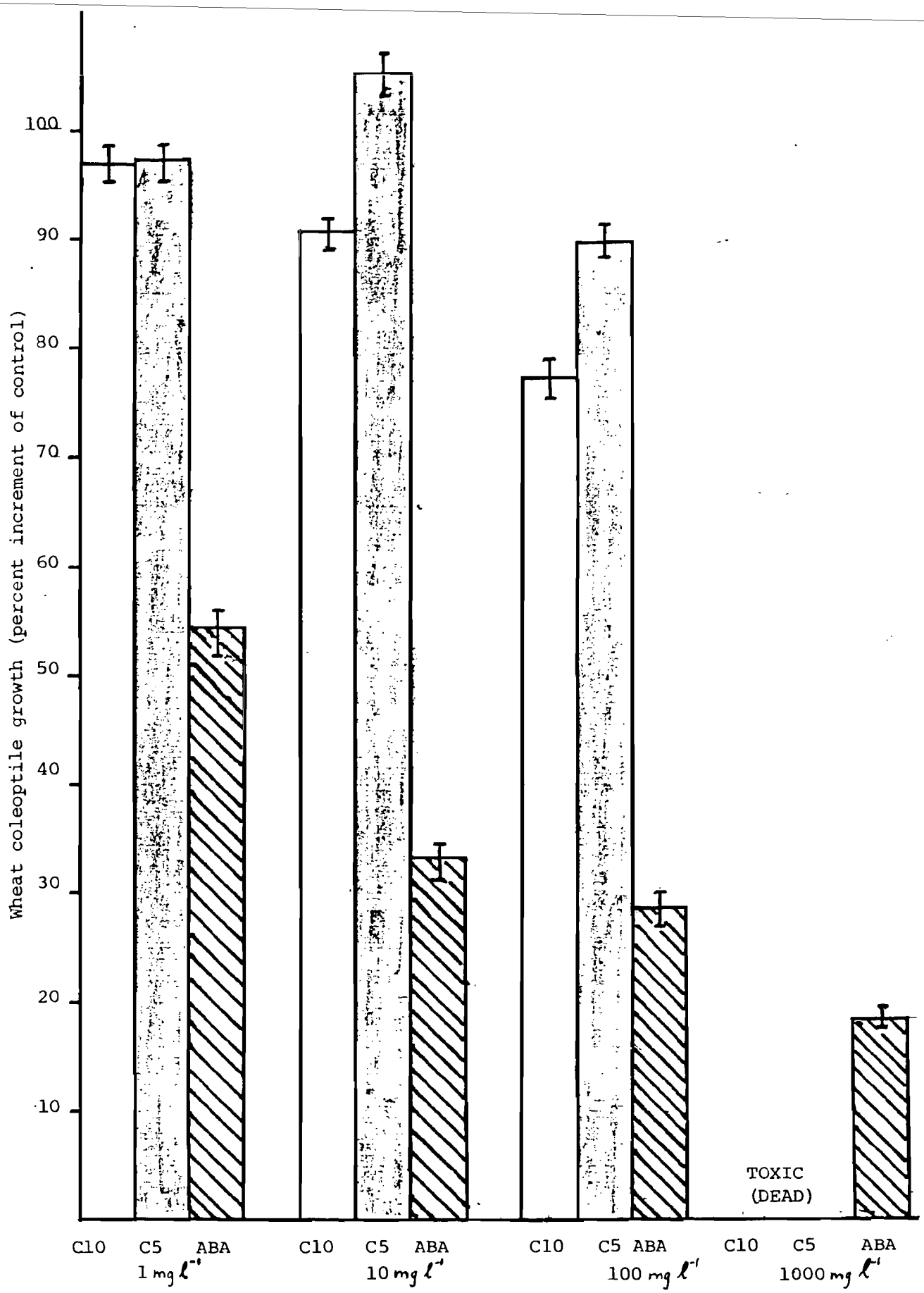

Wheat coleoptile growth (percent increment of control)
100
90
80
70
60
50
40
30
20
10
C10
C5
ABA
1 mg l⁻¹
10 mg l⁻¹
100 mg l⁻¹
1000 mg l⁻¹
TOXIC
(DEAD)

Figure 11. Wheat coleoptile section assay of unwashed chromatographs developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Each R_F section was assayed using 10 coleoptiles. Vertical bars represent twice the standard error.

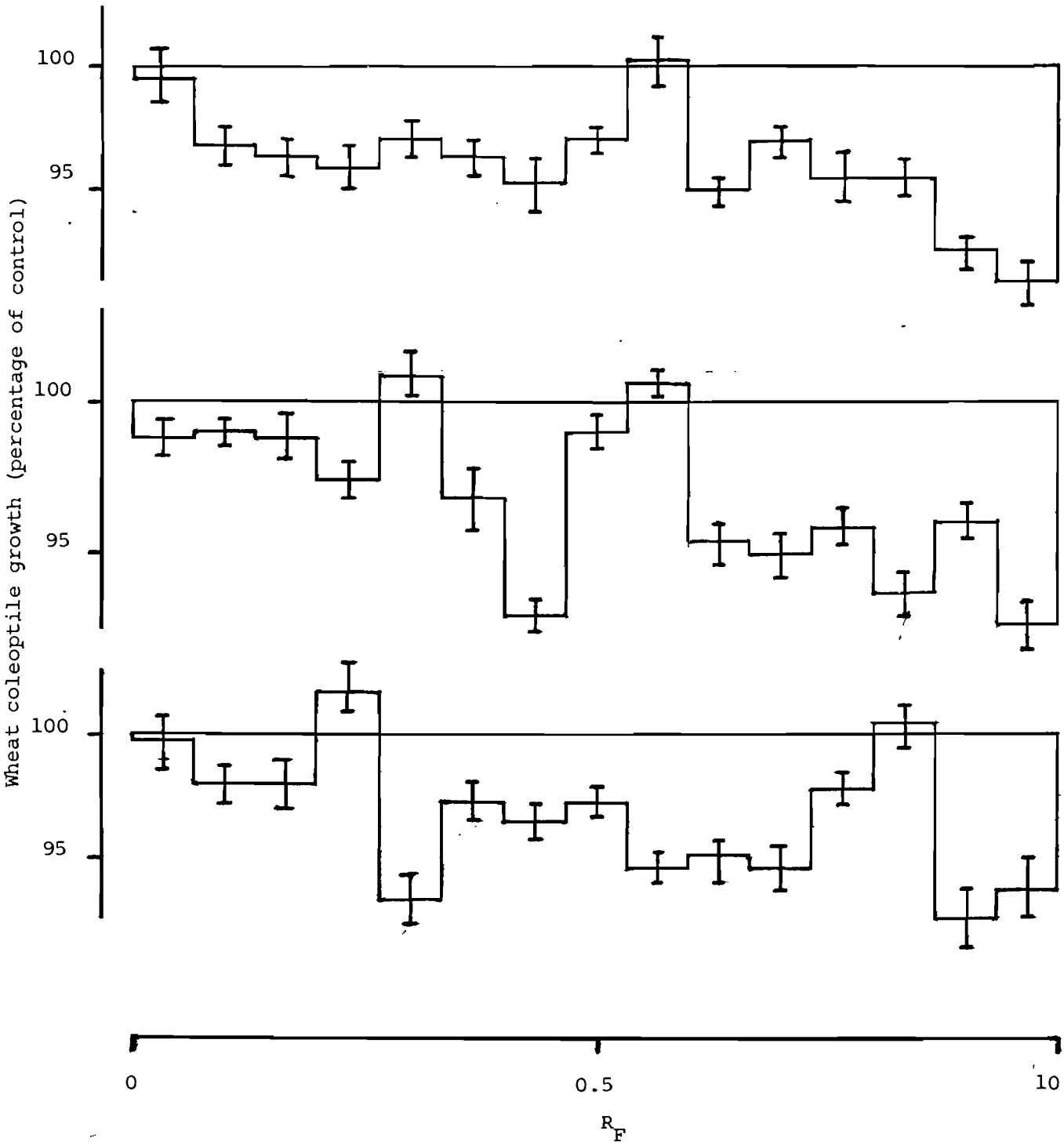

Wheat coleoptile growth (percentage of control)
100
95
100
95
100
95
0
0.5
10
R_F

Figure 12. Wheat coleoptile section assay of blank, undeveloped chromatographs. Each R_F section was assayed using 10 coleoptiles. Vertical bars represent twice the standard error.

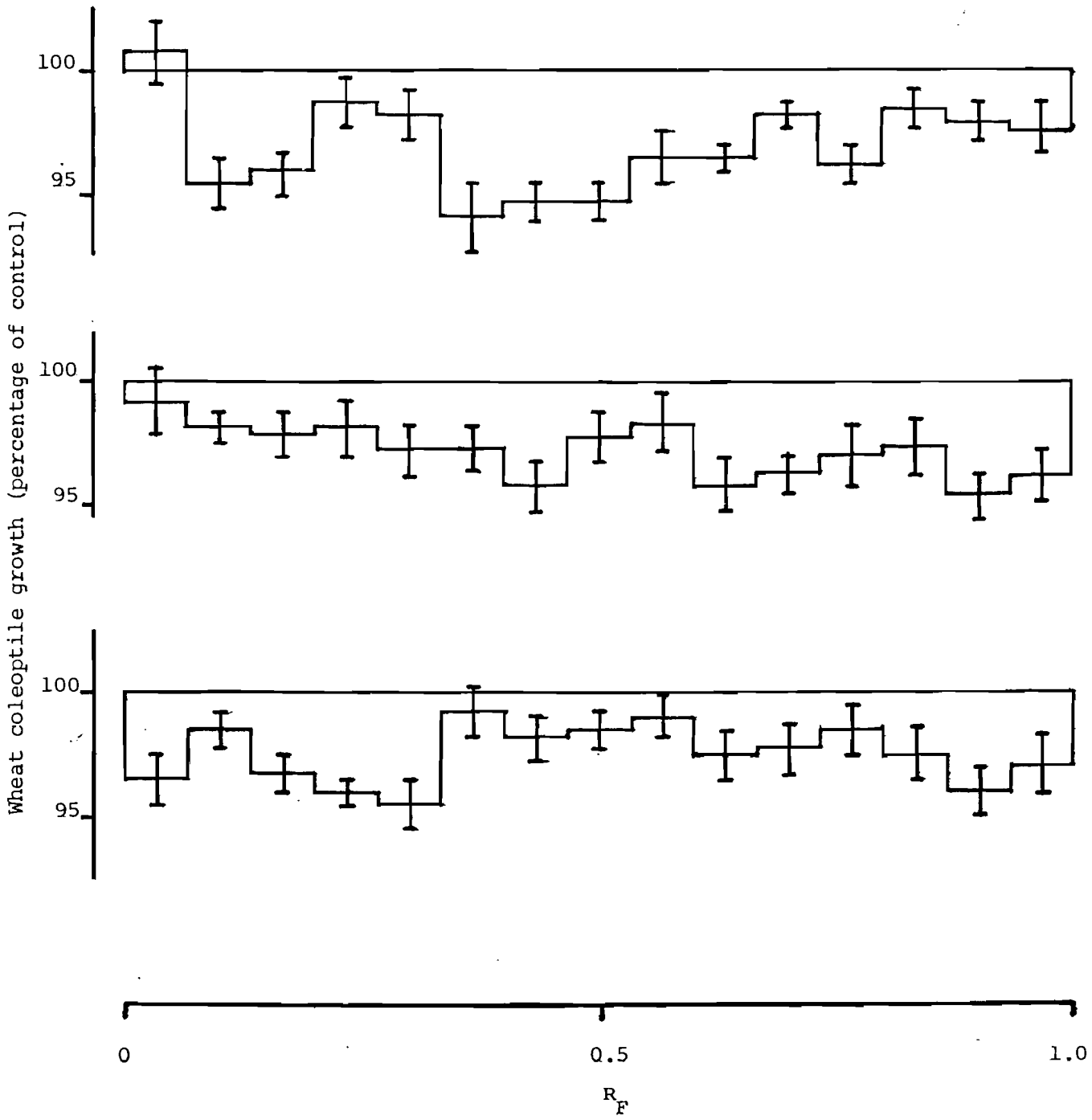


Figure 13. Wheat coleoptile section assay of pre-washed chromatographs developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. The chromatographs were pre-washed three times in 80% MeOH. Each R_F section was assayed using 10 coleoptiles. Vertical bars represent twice the standard error.

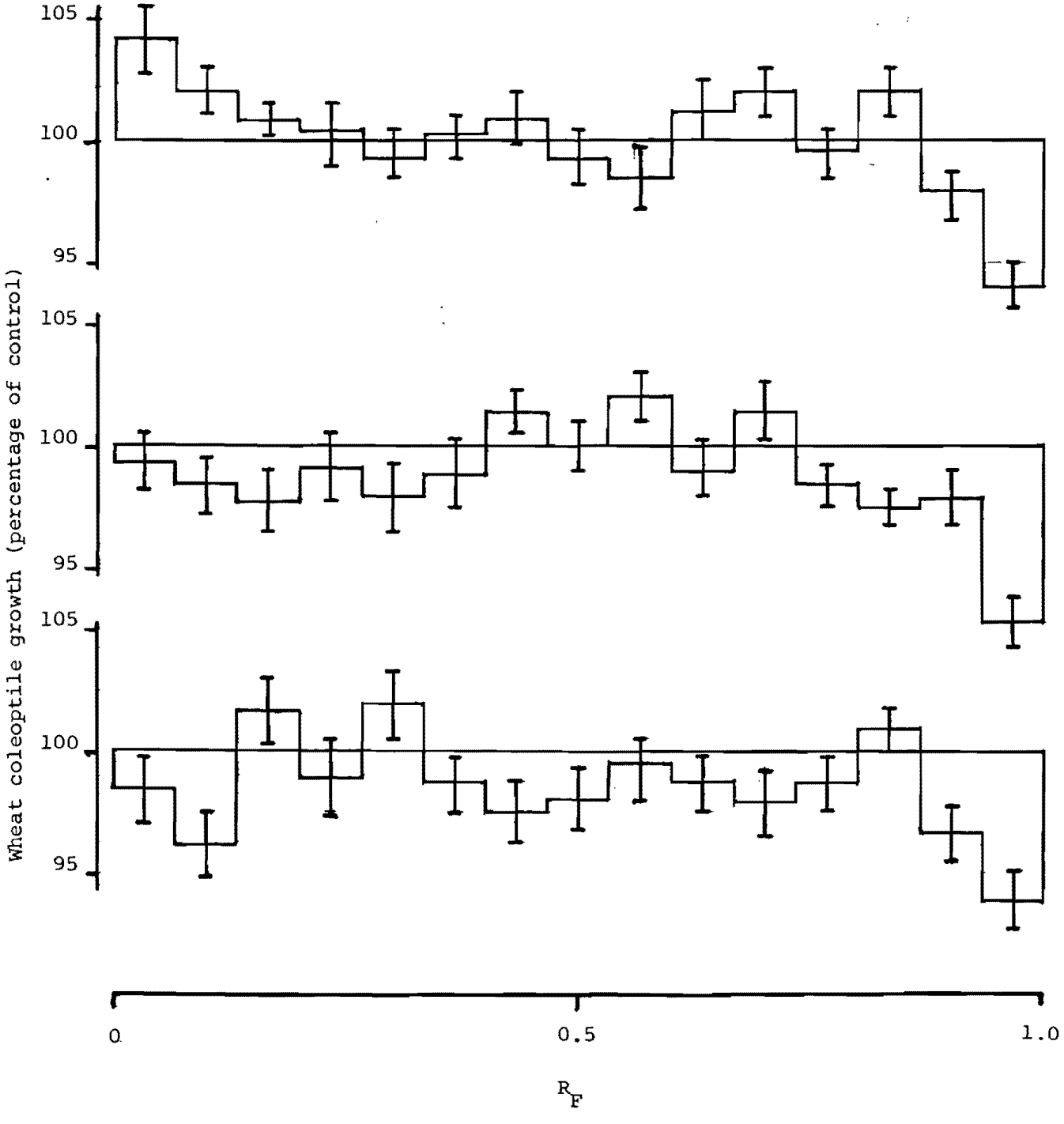

105
100
95
105
100
95
105
100
95
Wheat coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 14. The response of lettuce hypocotyls to ABA. Each value represents growth as a percentage of the control (growth in water) and is the mean ± S.E. of three replicates, each consisting of 16 hypocotyls.

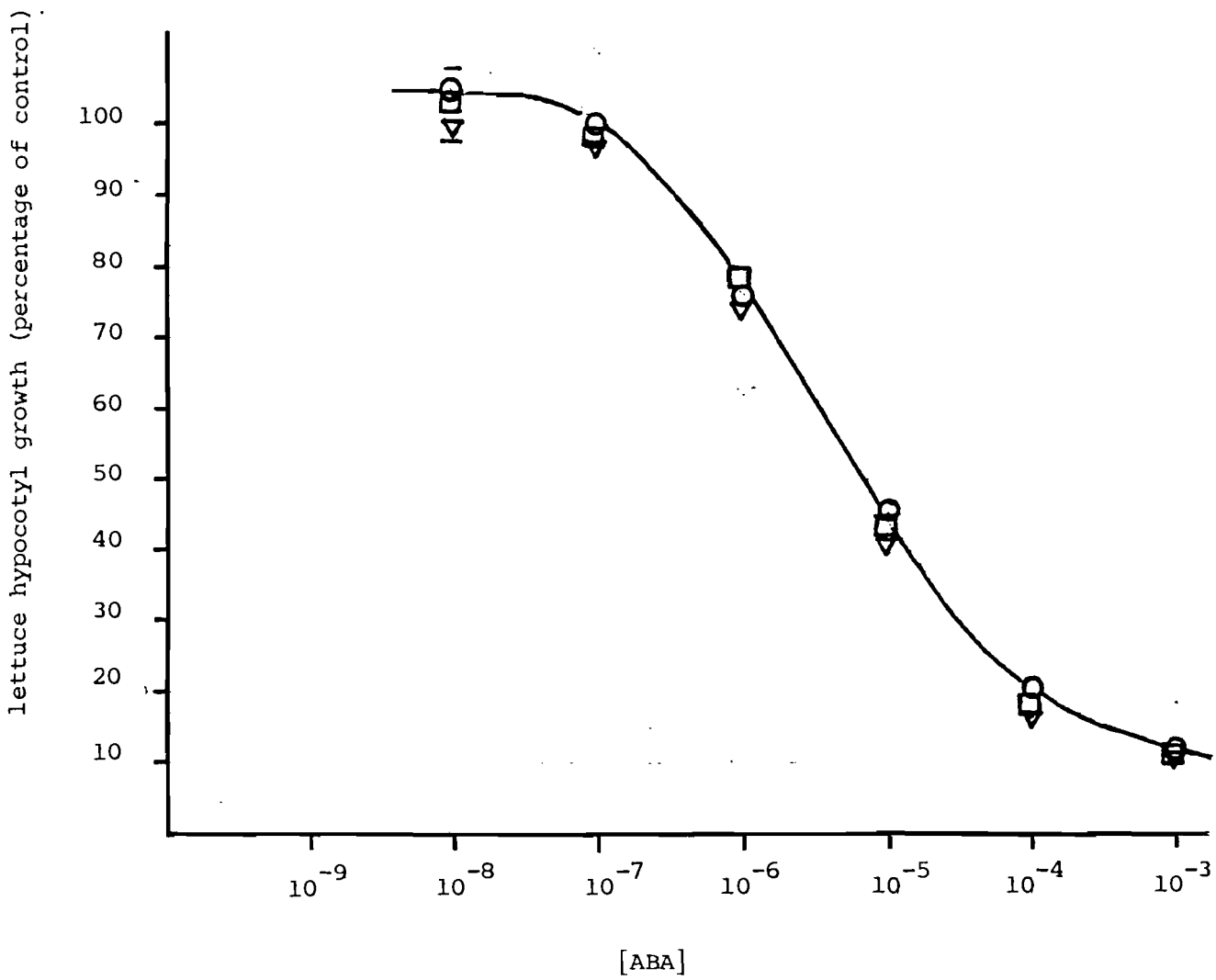

lettuce hypocotyl growth (percentage of control)
100
90
80
70
60
50
40
30
20
10
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
[ABA]

Figure 15. The effect of serial concentrations of ABA, C5, C10 and IAA on the growth of lettuce hypocotyls. Each value represents growth as a percentage of the control (growth in water) and is the mean ± S.E. of three replicates, each consisting of 16 hypocotyls.

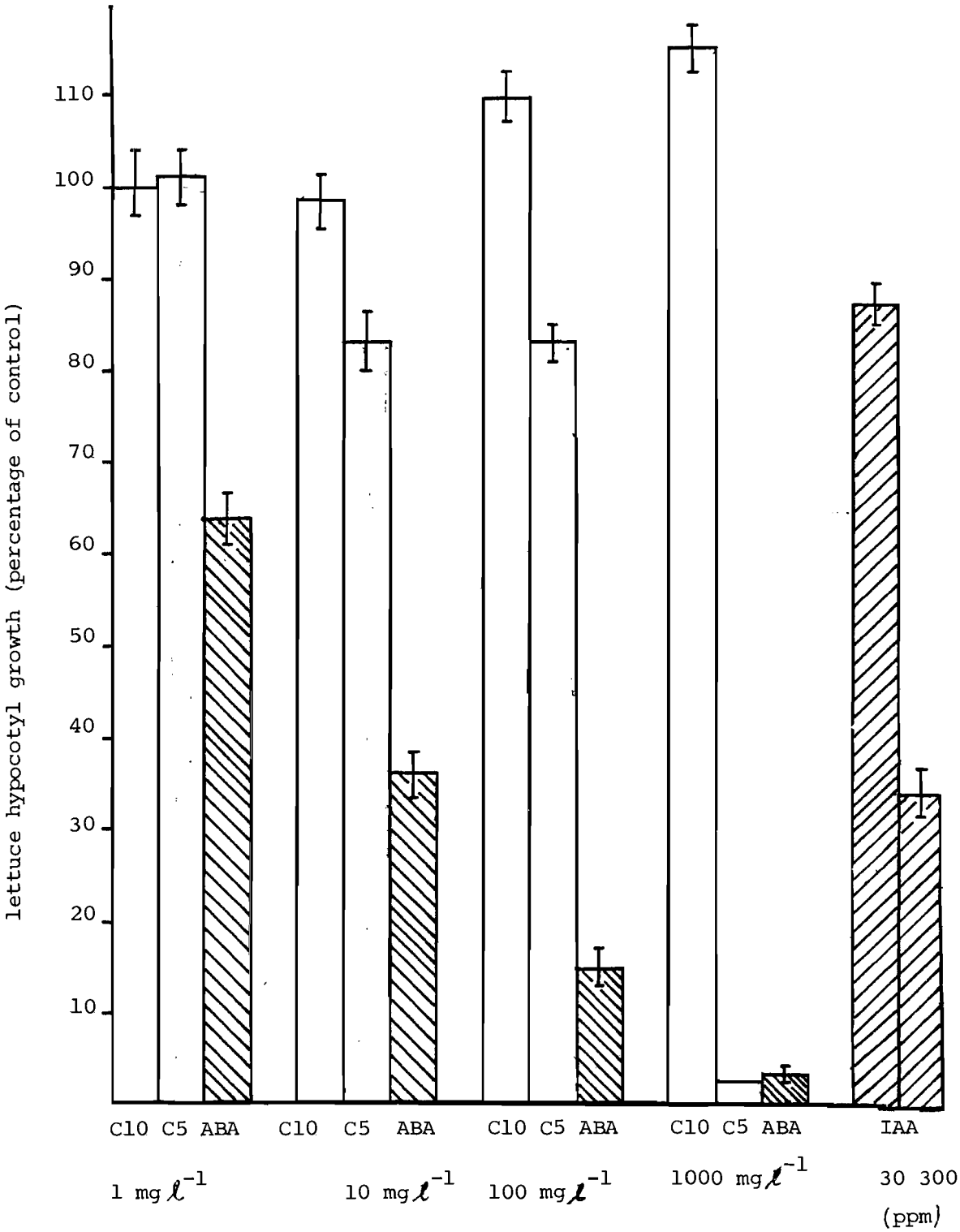

lettuce hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
40
30
20
10
C10 C5 ABA
C10 C5 ABA
C10 C5 ABA
C10 C5 ABA
IAA
1 mg ℓ-1
10 mg ℓ-1
100 mg ℓ-1
1000 mg ℓ-1
30 300
(ppm)

Figure 16. Lettuce hypocotyl assay of pre-washed chromatographs developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. The chromatographs were pre-washed three times in 80% MeOH. Each R_F section was assayed using 16 hypocotyls and the vertical bars represent twice the standard error.

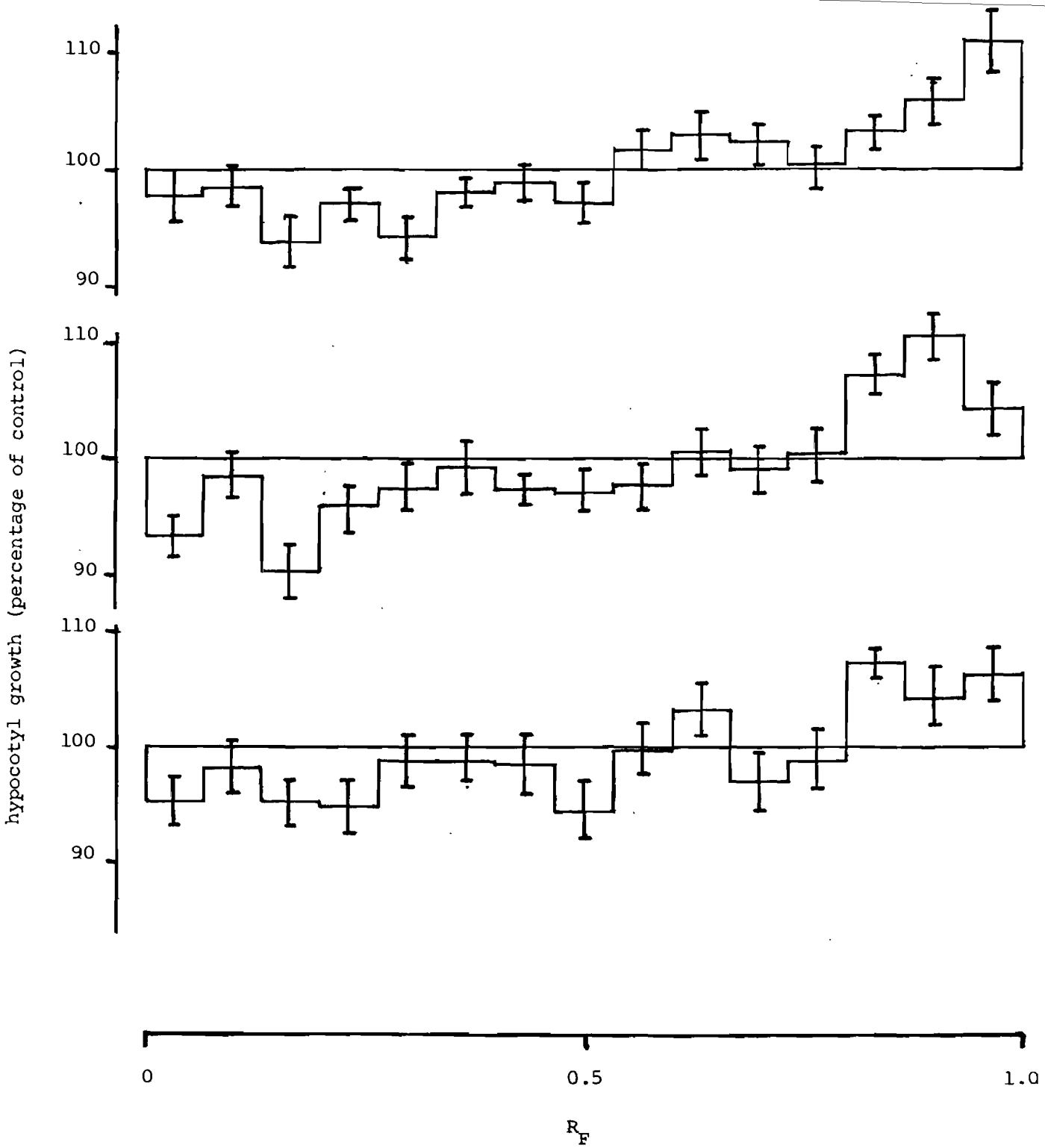

hypocotyl growth (percentage of control)
110
100
90
110
100
90
110
100
90
0
0.5
1.0
R_F

Figure 17. Diagram of a typical chromatograph of an acidic ether-soluble extract of *Alnus* tissue as seen under (A) visible and (B) U.V. light. The chromatographs were loaded with the equivalent of approx. 0.2 g DW of tissue and developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v).

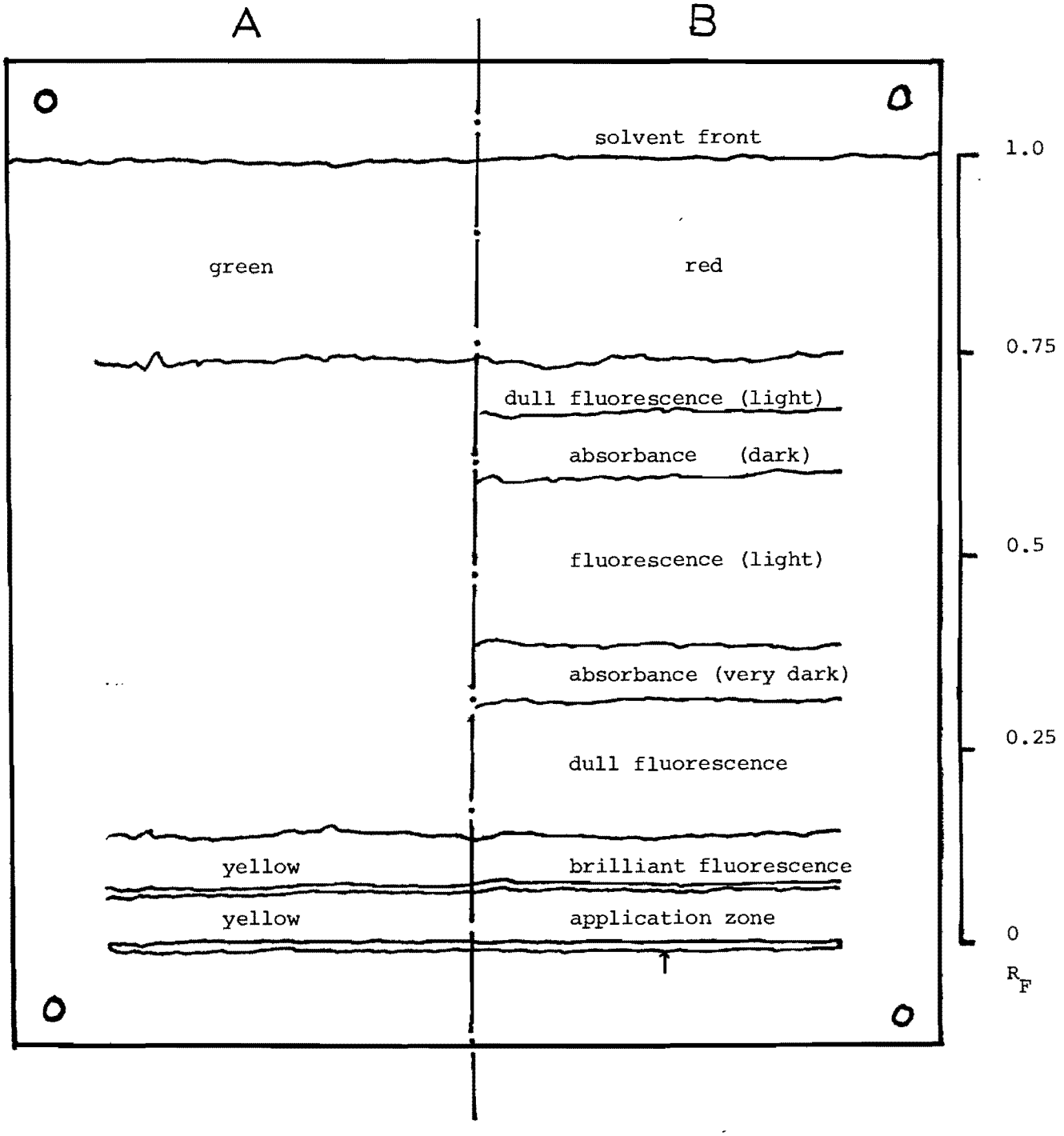

A
B
solvent front
1.0
green
red
0.75
dull fluorescence (light)
absorbance (dark)
0.5
fluorescence (light)
absorbance (very dark)
0.25
dull fluorescence
yellow
brilliant fluorescence
yellow
application zone
0
R_F

Figure 18. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Each R_F section was assayed on 10 coleoptiles and each histogram represents the mean ± S.E. of three replicate chromatographs. The broken line represents the assay of a control (pre-washed, solvent developed) chromatograph, and the R_F of authentic ABA is indicated by the horizontal bar under some of the histograms.

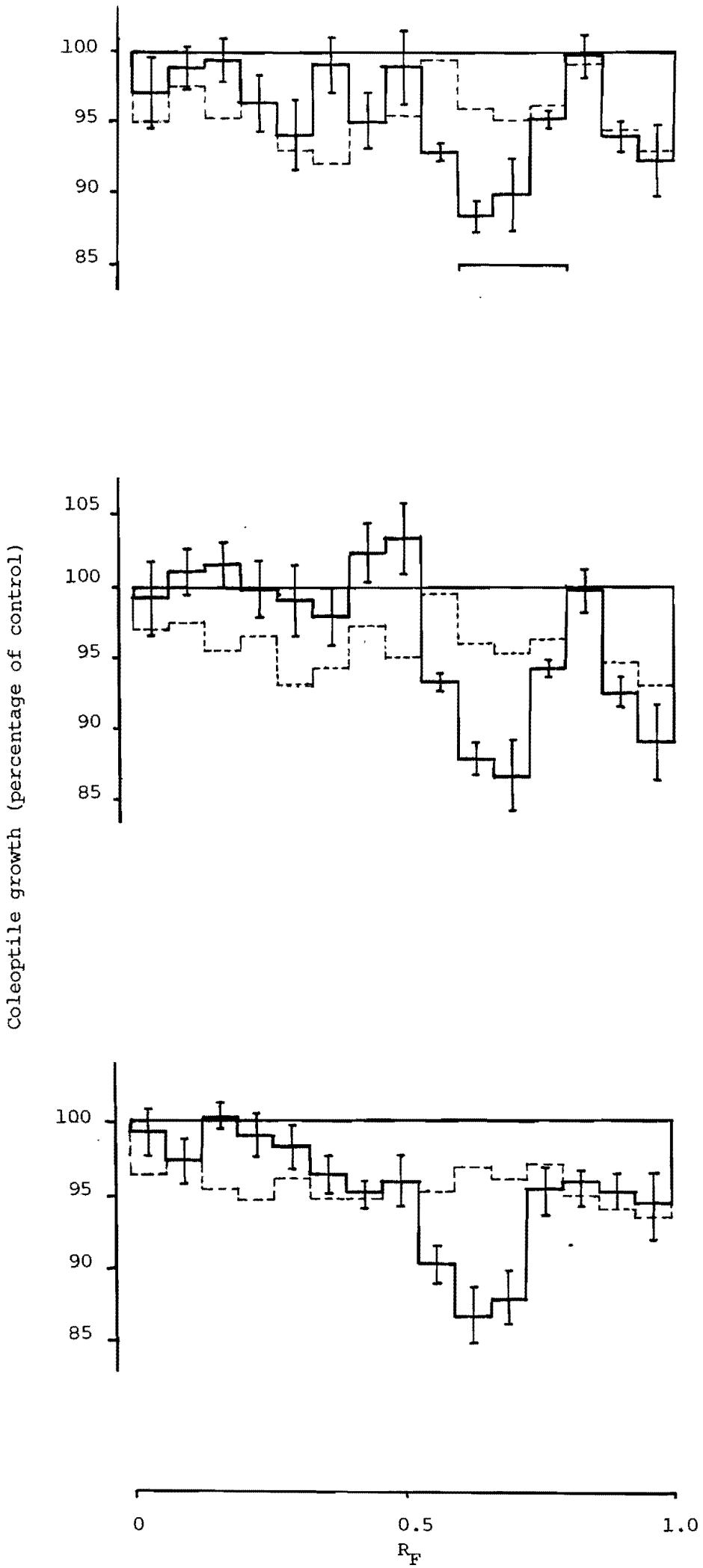

100
95
90
85
105
100
95
90
85
100
95
90
85
Coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 19. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 25 March 1977 (H2). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

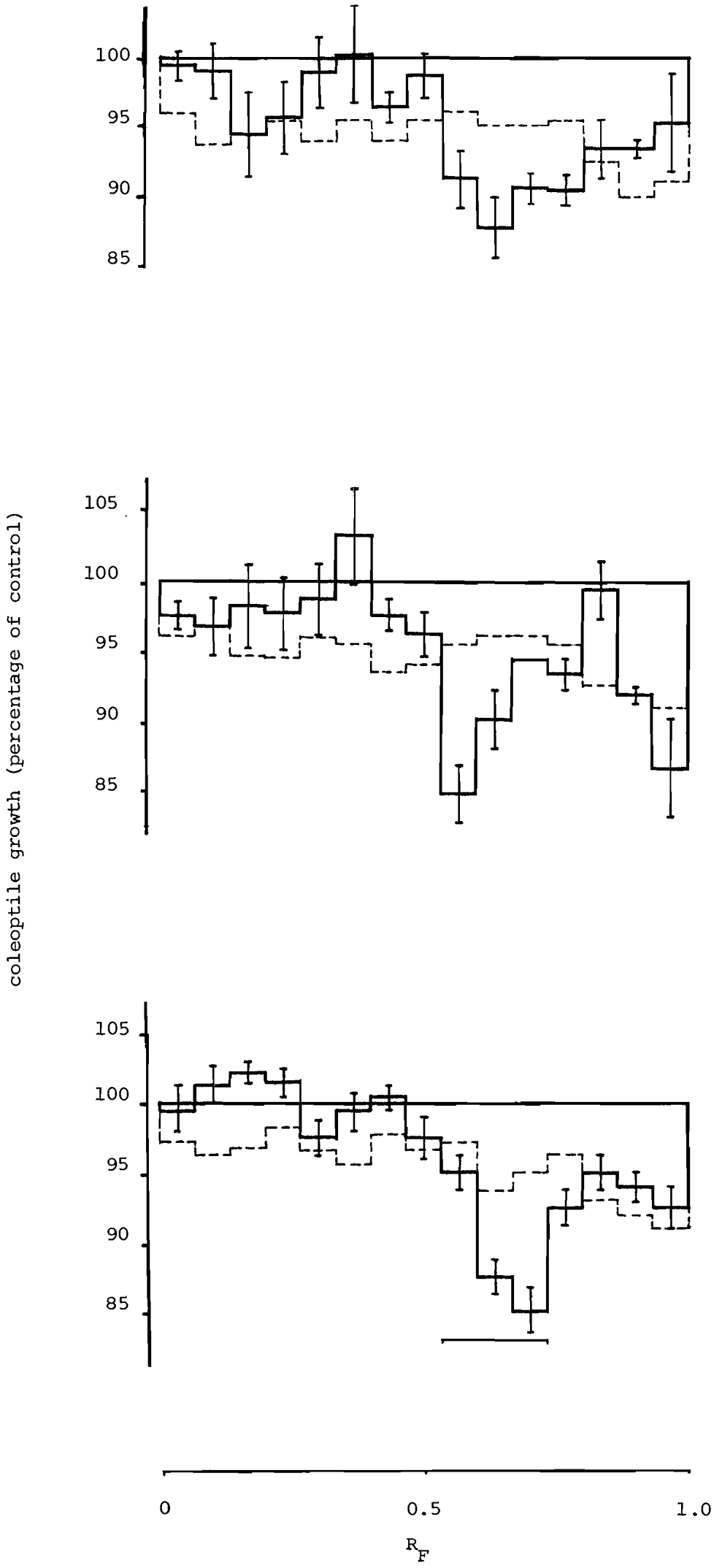

100
95
90
85
105
100
95
90
85
105
100
95
90
85
coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 20. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 15 April 1977 (H3). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH :H O (10:1:1::v:v:v). Other details as in figure 18.

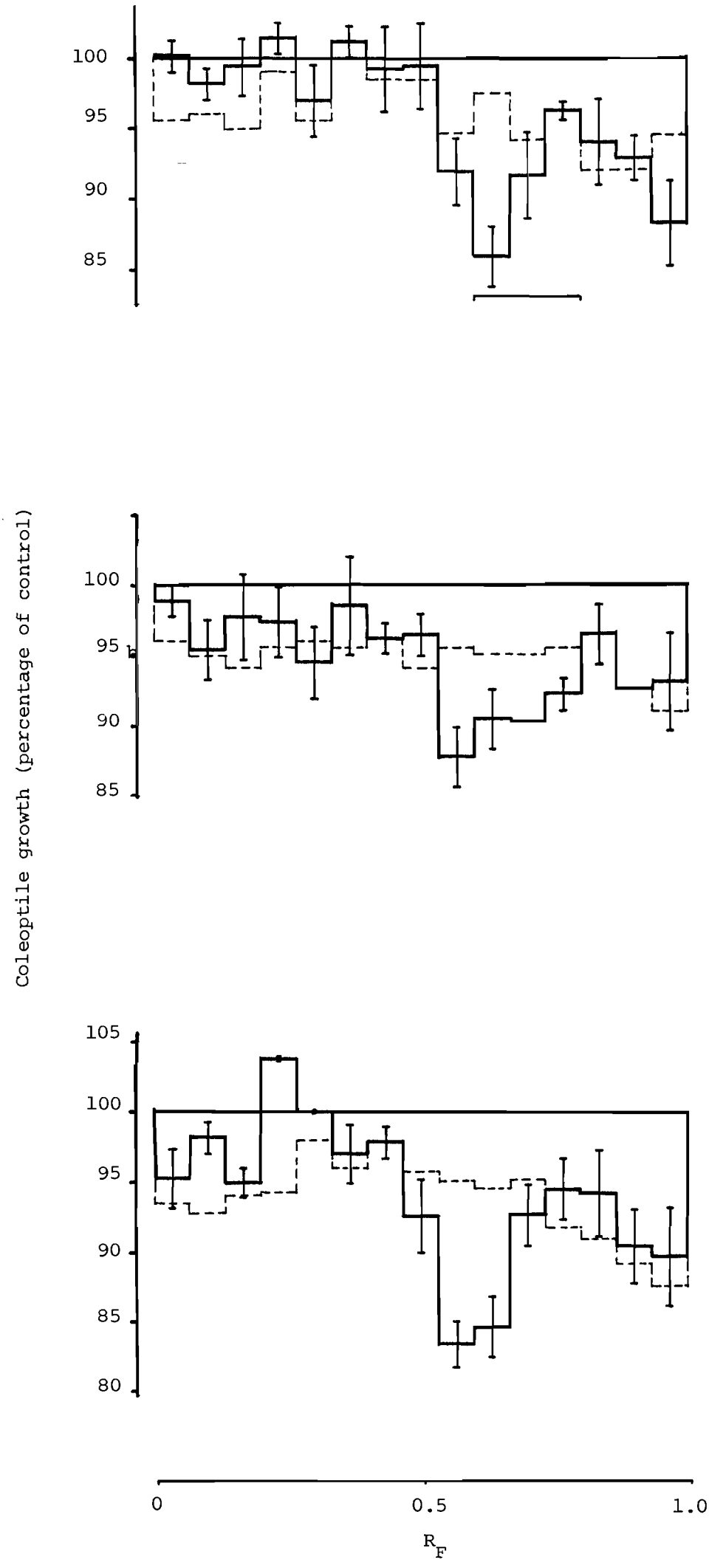

100
95
90
85
100
95
90
85
105
100
95
90
85
80
Coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 21. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* trees harvested on 28 April 1977 (H4). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

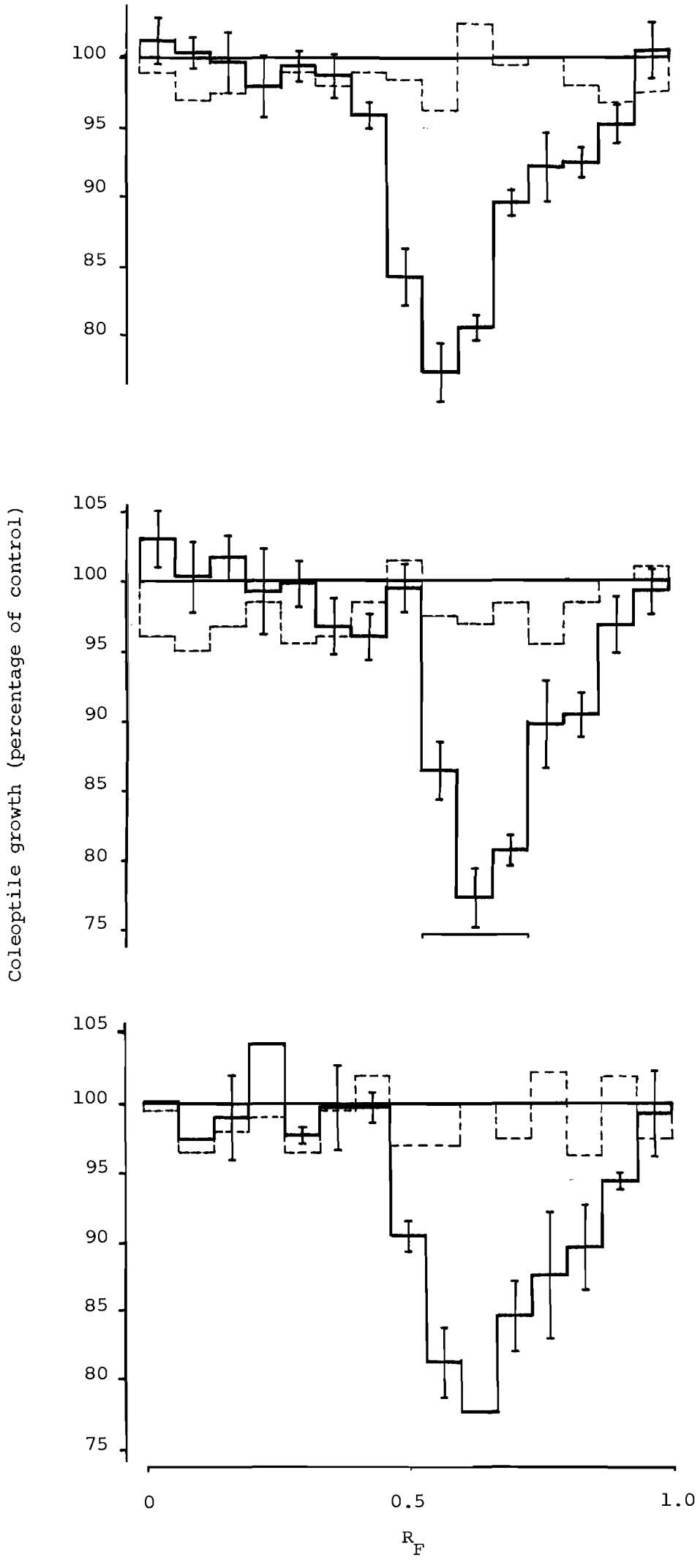

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
80
75
105
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 22. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

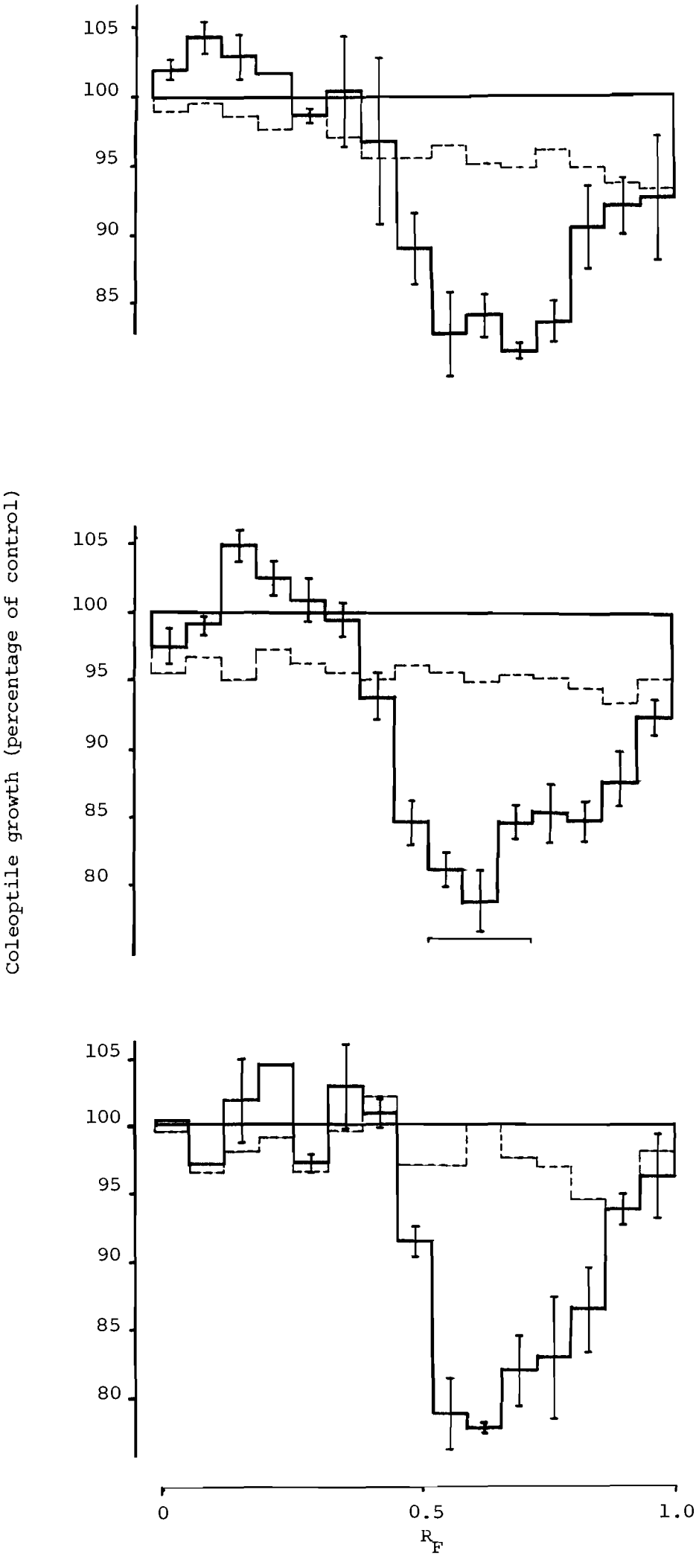

Coleoptile growth (percentage of control)
105
100
95
90
85
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 23. Wheat coleoptile section assay of authentic ABA standards. Aliquots equivalent to (a) 0.0512, (b) 0.512, (c) 5.12 and (d) 51.2 µg of the mixed isomers of authentic ABA were loaded on to the chromatographs. The solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

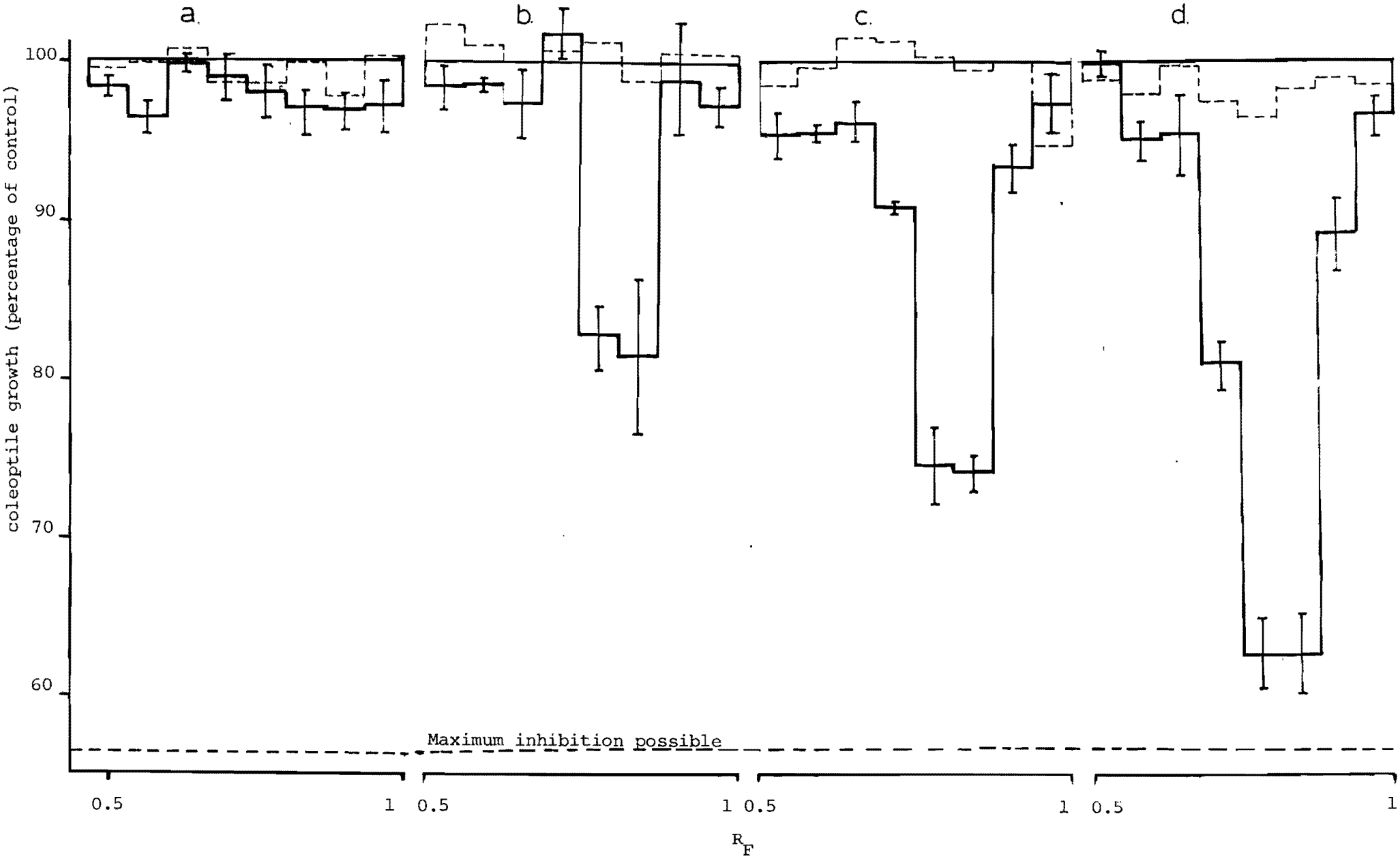

a.
b.
c.
d.
100
90
80
70
60
coleoptile growth (percentage of control)
Maximum inhibition possible
0.5
1
0.5
1
0.5
1
0.5
1
R_F

Figure 24. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25, and (d) 0.375 g DW of leaf material was assayed. Other details as in figure 18.

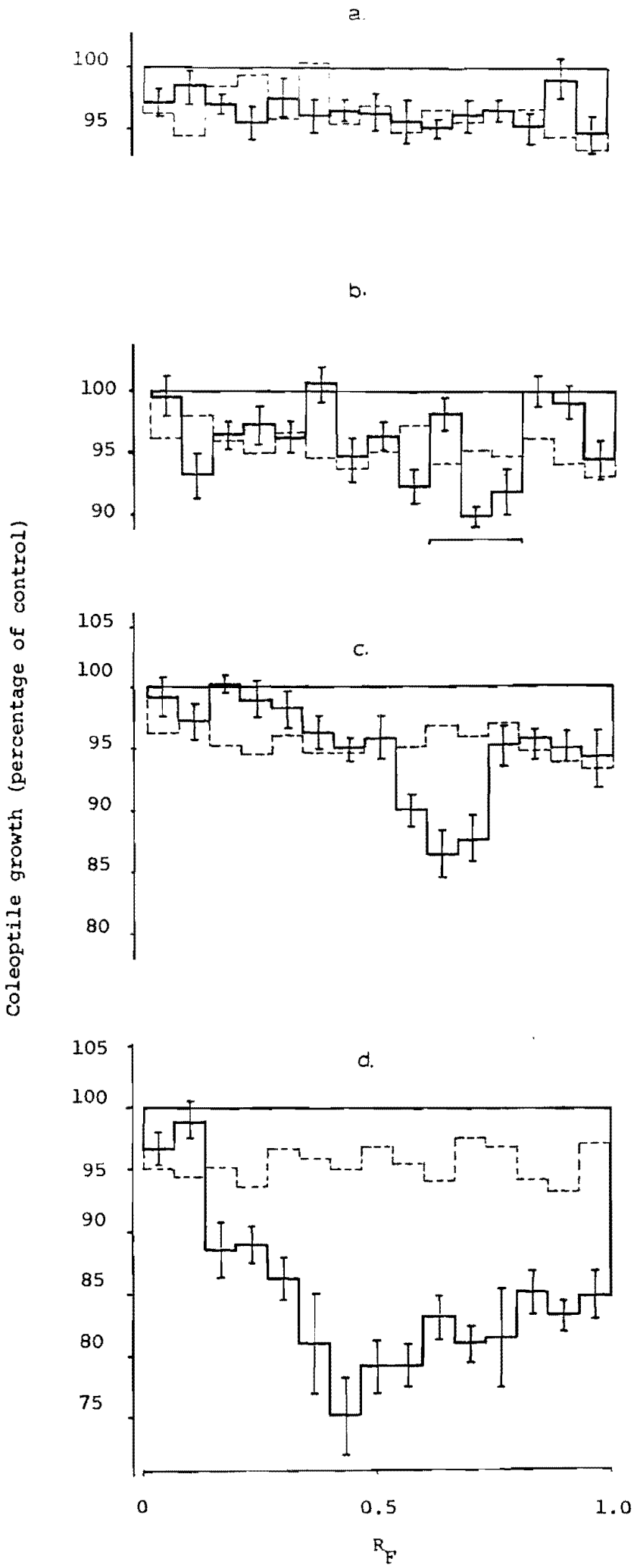

a.
100
95
b.
100
95
90
c.
105
100
95
90
85
80
d.
105
100
95
90
85
80
75
0
0.5
1.0
R_F
Coleoptile growth (percentage of control)

Figure 25. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.375 g DW of leaf material was assayed. Other details as in figure 18.

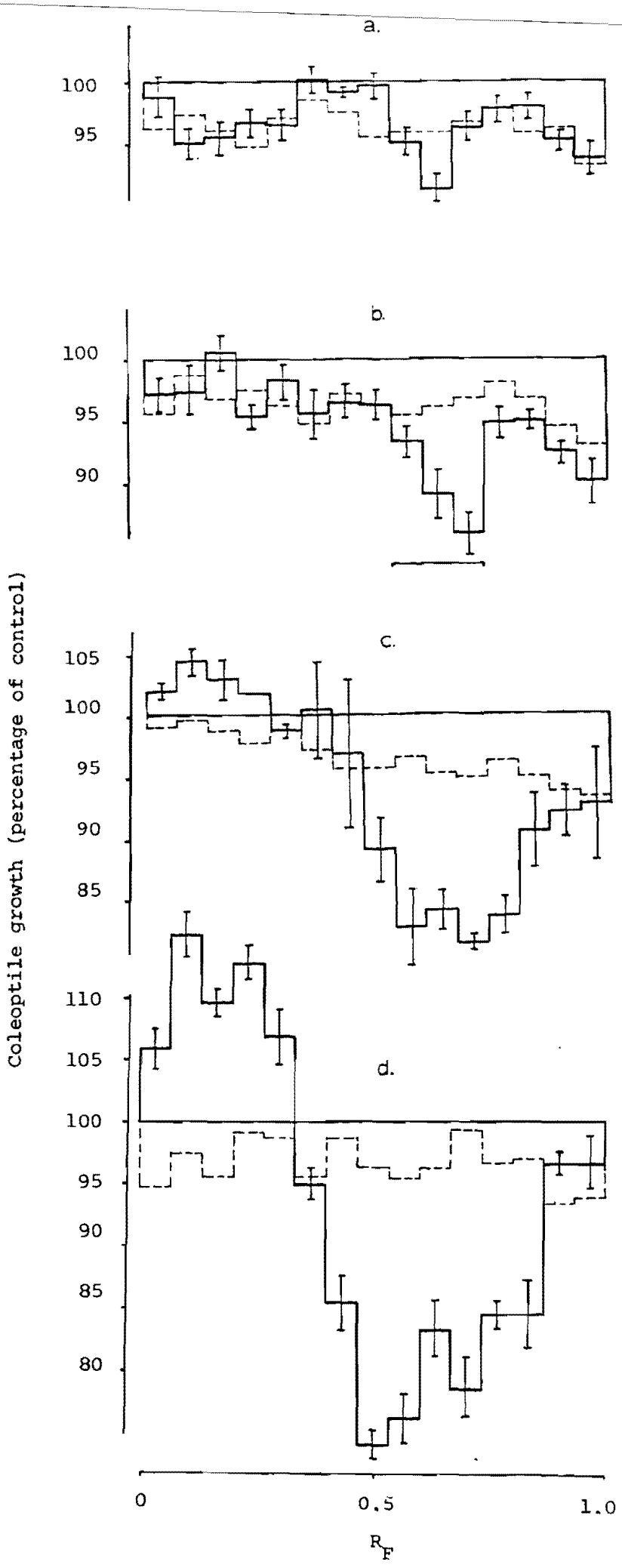

a.
100
95
b.
100
95
90
c.
105
100
95
90
85
d.
110
105
100
95
90
85
80
Coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 26. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol: NH_3:H_2O (10:1:1::v:v:v). Each R_F section was assayed on 10 coleoptiles and each histogram represents the mean ± S.E. of three replicate chromatographs. The broken line represents the assay of a control (pre-washed solvent developed) chromatograph and the R_F authentic ABA is indicated by the horizontal bar under some of the histograms.

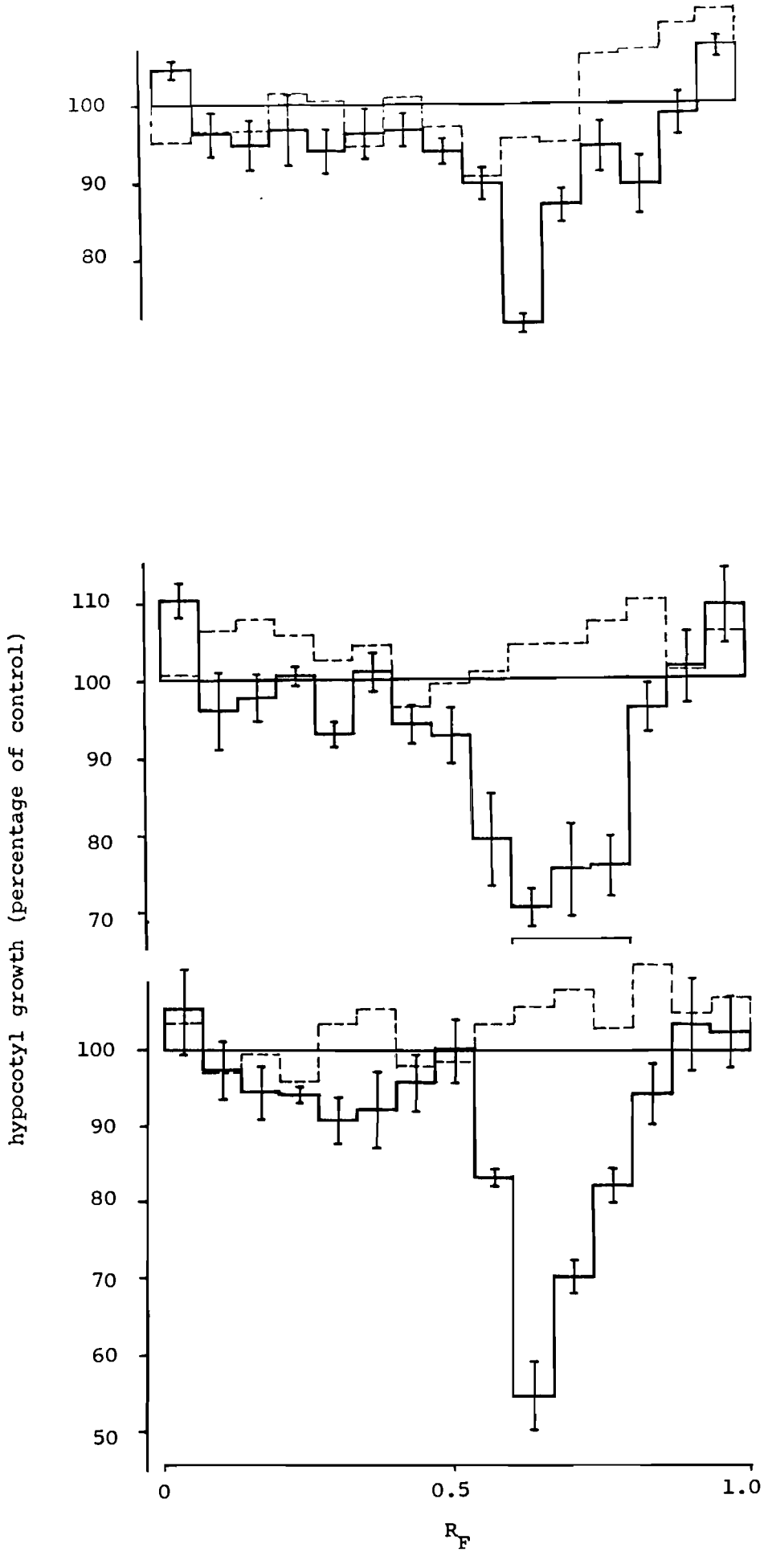

100
90
80
110
100
90
80
70
100
90
80
70
60
50
hypocotyl growth (percentage of control)
0
0.5
1.0
R_F

Figure 27. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 25 March 1977 (H2). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

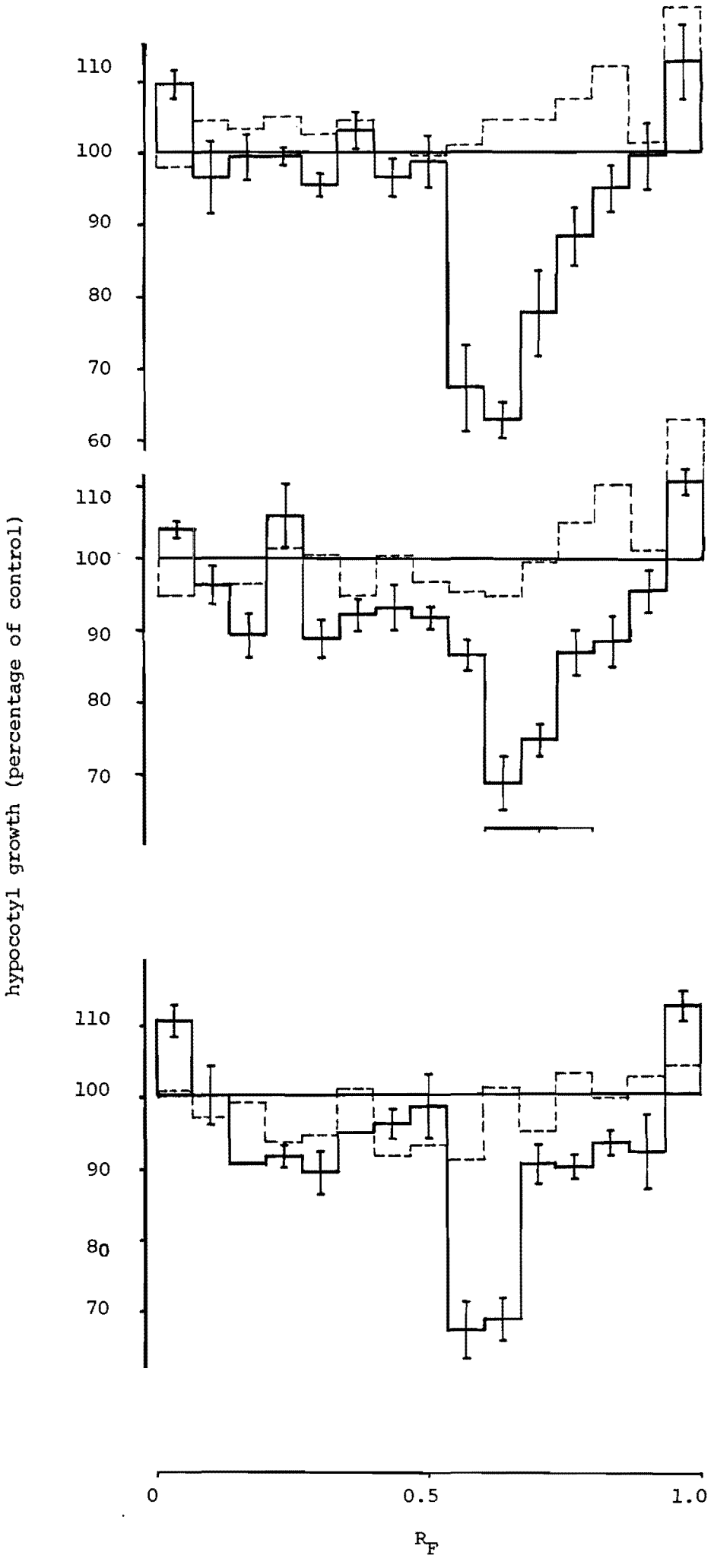

hypocotyl growth (percentage of control)
110
100
90
80
70
60
110
100
90
80
70
110
100
90
80
70
0
0.5
1.0
R_F

Figure 28. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 15 April 1977 (H3). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

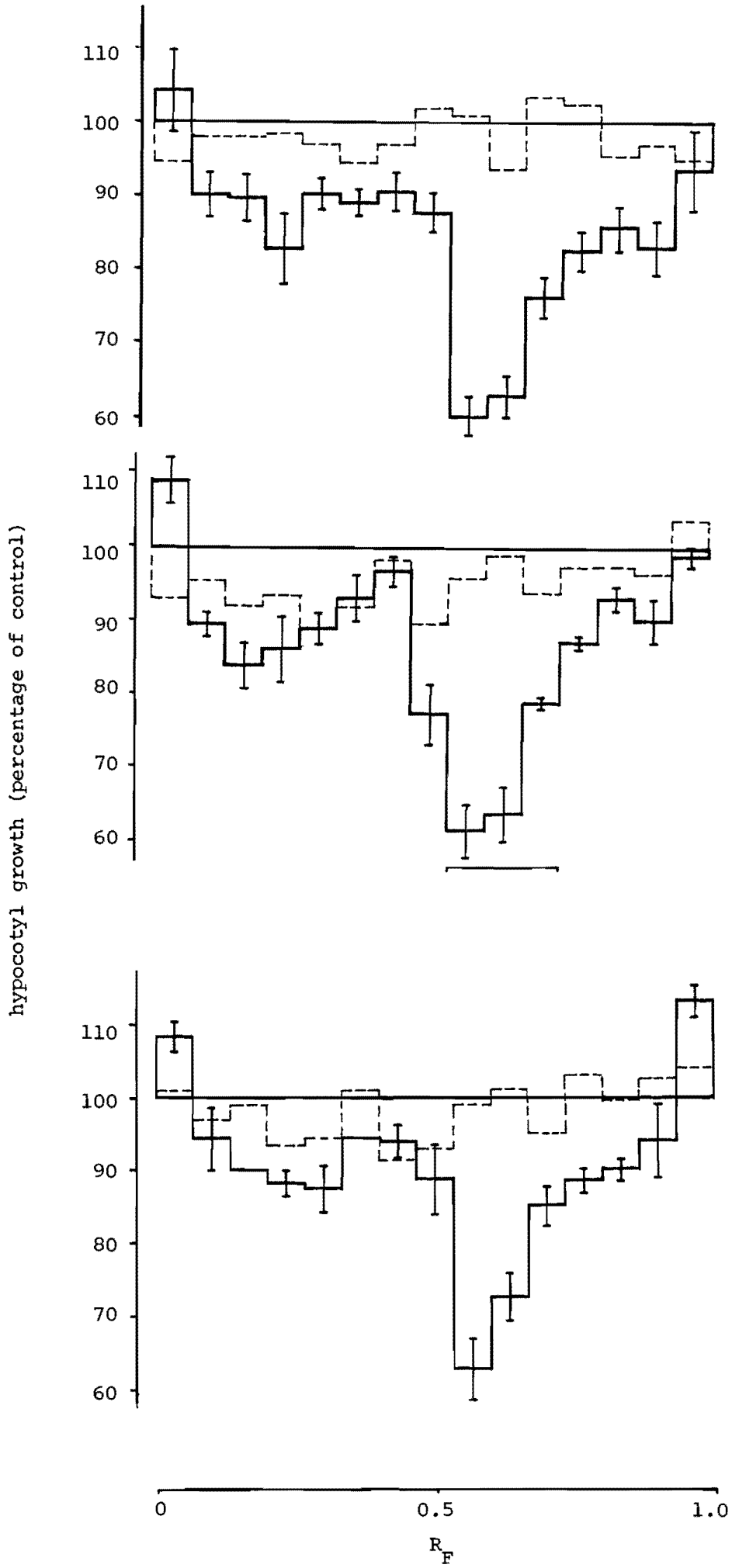

hypocotyl growth (percentage of control)
110
100
90
80
70
60
110
100
90
80
70
60
110
100
90
80
70
60
0
0.5
1.0
R_F

Figure 29. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 28 April 1977 (H4). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

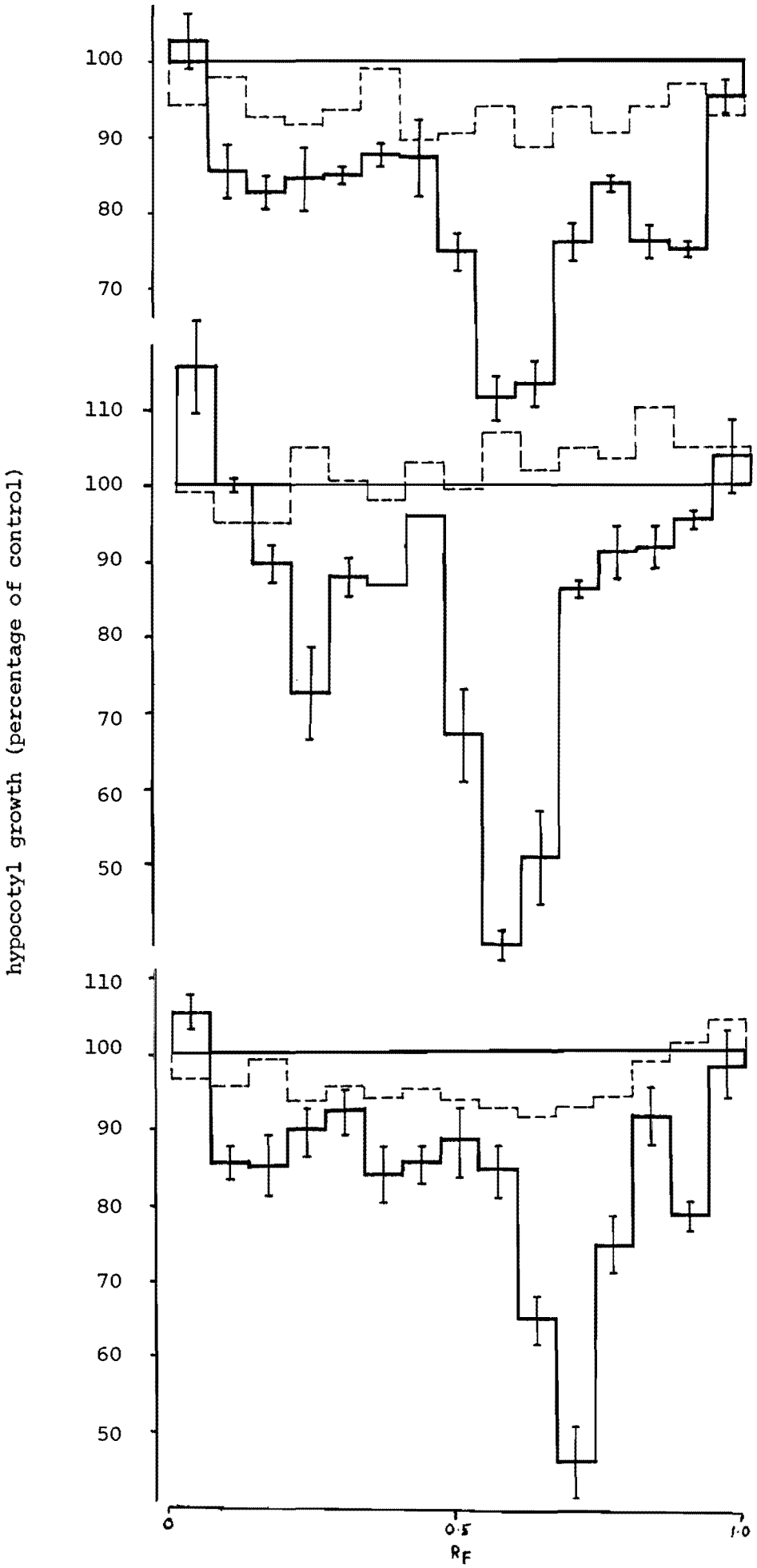

hypocotyl growth (percentage of control)
100
90
80
70
110
100
90
80
70
60
50
110
100
90
80
70
60
50
0
0·5
1·0
RF

Figure 30. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

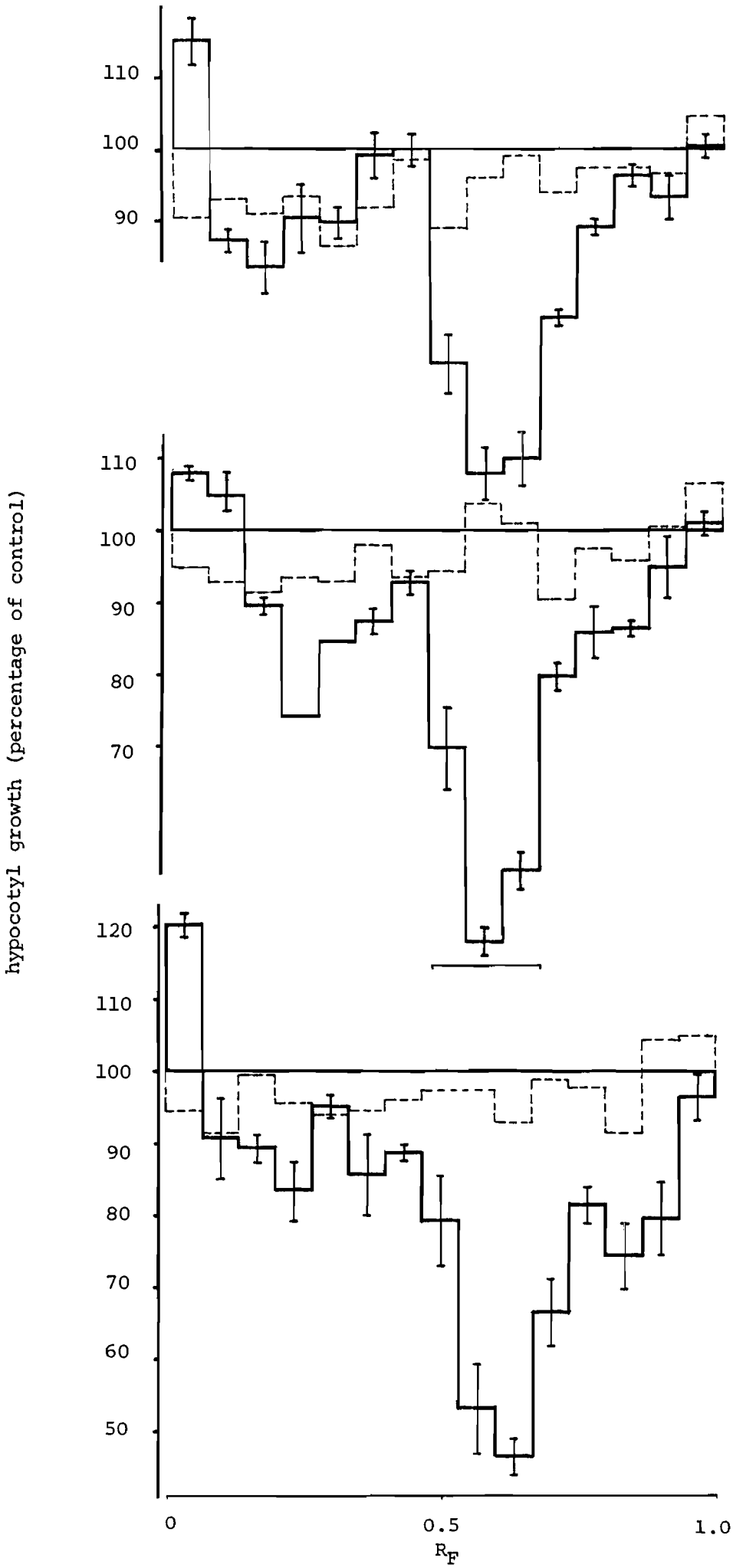

hypocotyl growth (percentage of control)
110
100
90
110
100
90
80
70
120
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 31. Lettuce hypocotyl assay of authentic ABA standards. Aliquots equivalent to (a) 0.0512, (b) 0.512, (c) 5.12) and (d) 51.2 µg of the mixed isomers of authentic ABA were loaded on to the chromatographs. The solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

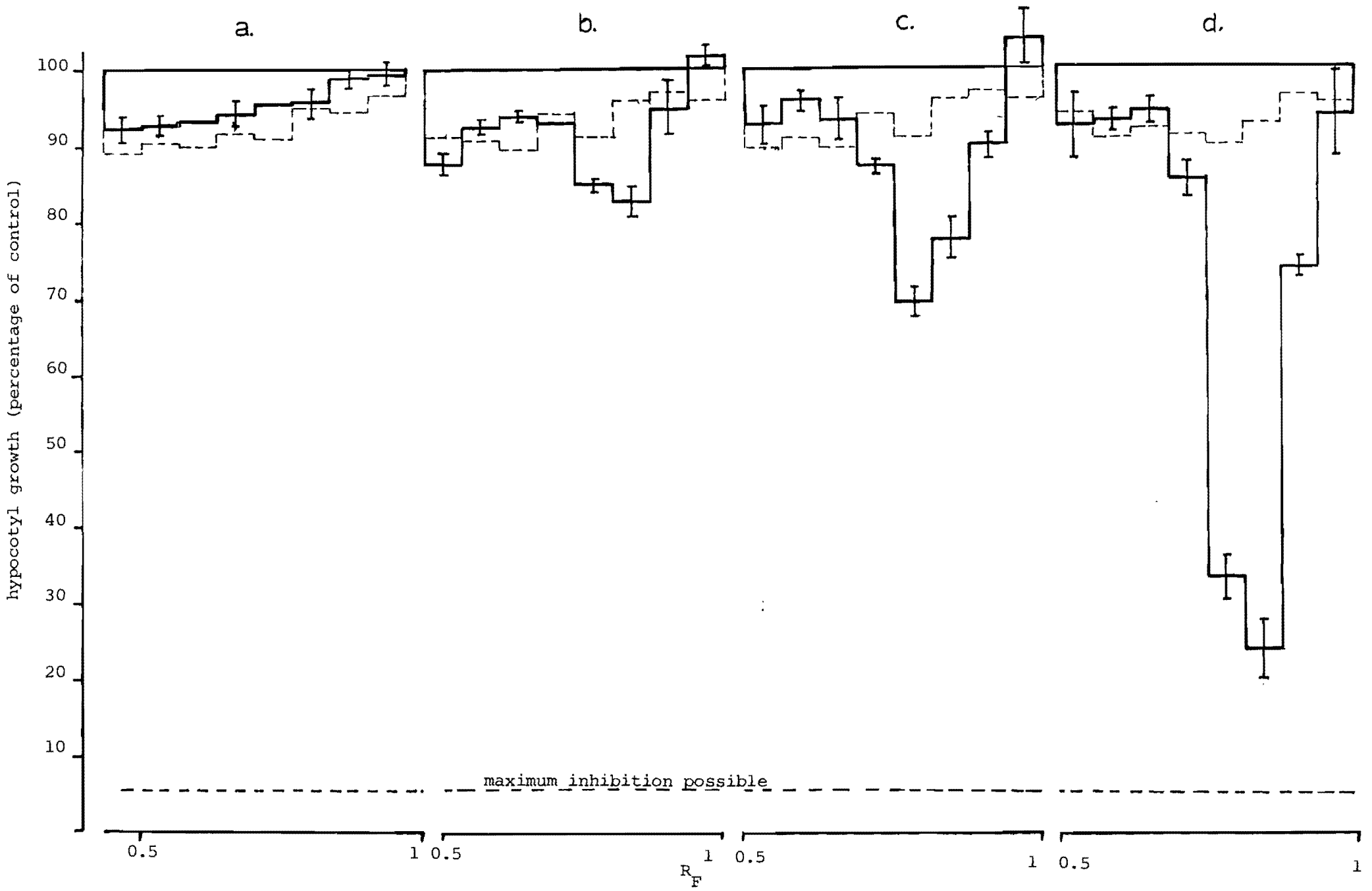

a.
b.
c.
d.
hypocotyl growth (percentage of control)
100
90
80
70
60
50
40
30
20
10
maximum inhibition possible
0.5
1
0.5
1
0.5
1
0.5
1
R_F

Figure 32. Lettuce hypocotyl assay of the serial dilution of an acid ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.375 g DW of leaf material was assayed. Other details as in figure 26.

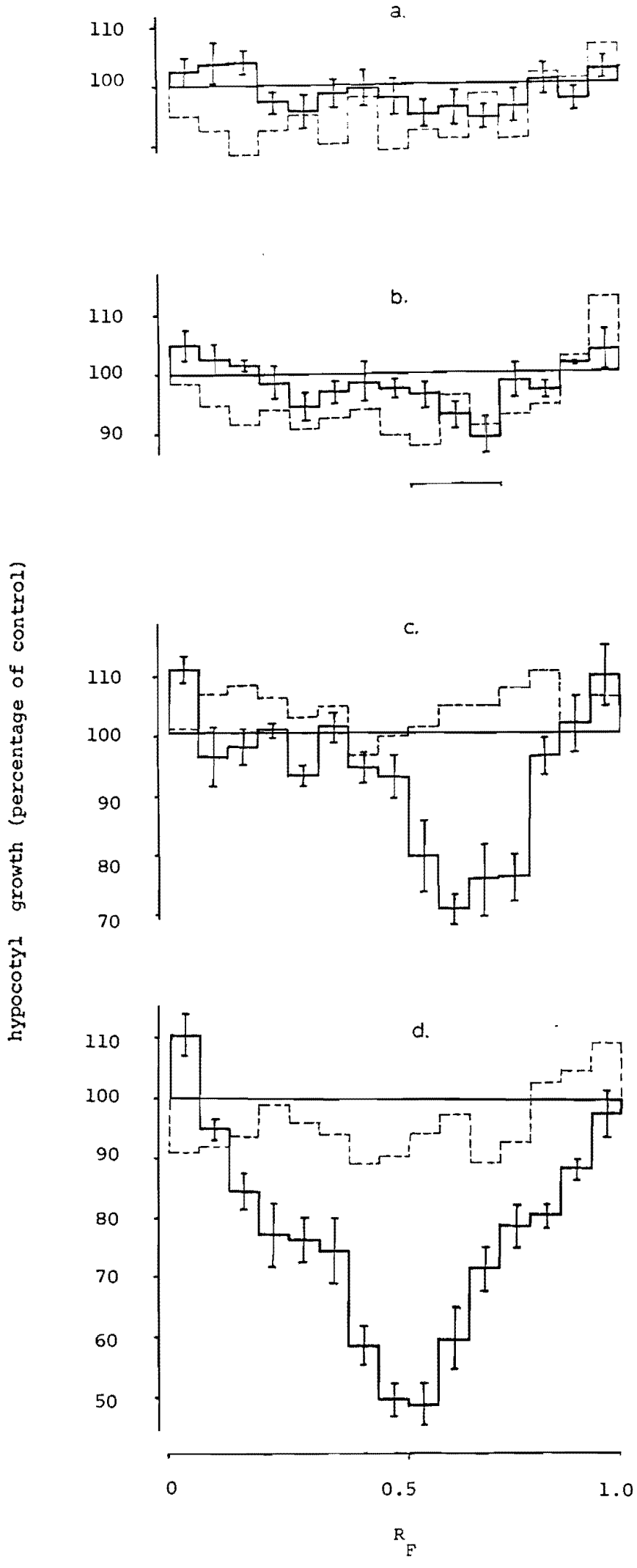

a.
110
100
b.
110
100
90
c.
110
100
90
80
70
d.
110
100
90
80
70
60
50
0
0.5
1.0
R_F
hypocotyl growth (percentage of control)

Figure 33. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.375 g DW of leaf material was assyed. Other details as in figure 26.

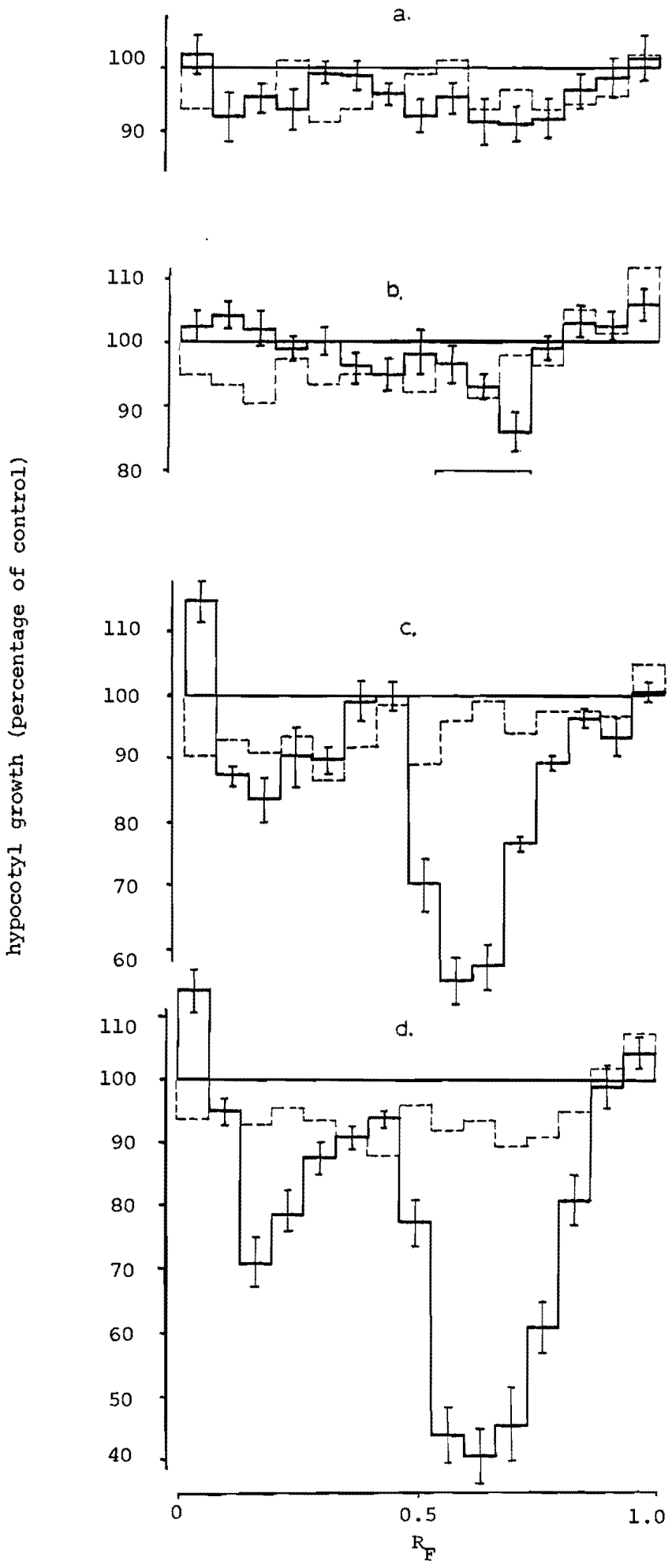

a.
100
90
b.
110
100
90
80
c.
110
100
90
80
70
60
d.
110
100
90
80
70
60
50
40
0
0.5
1.0
R_F
hypocotyl growth (percentage of control)

Figure 34. Wheat coleoptile section assay of acid ether-soluble extracts obtained from apical of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

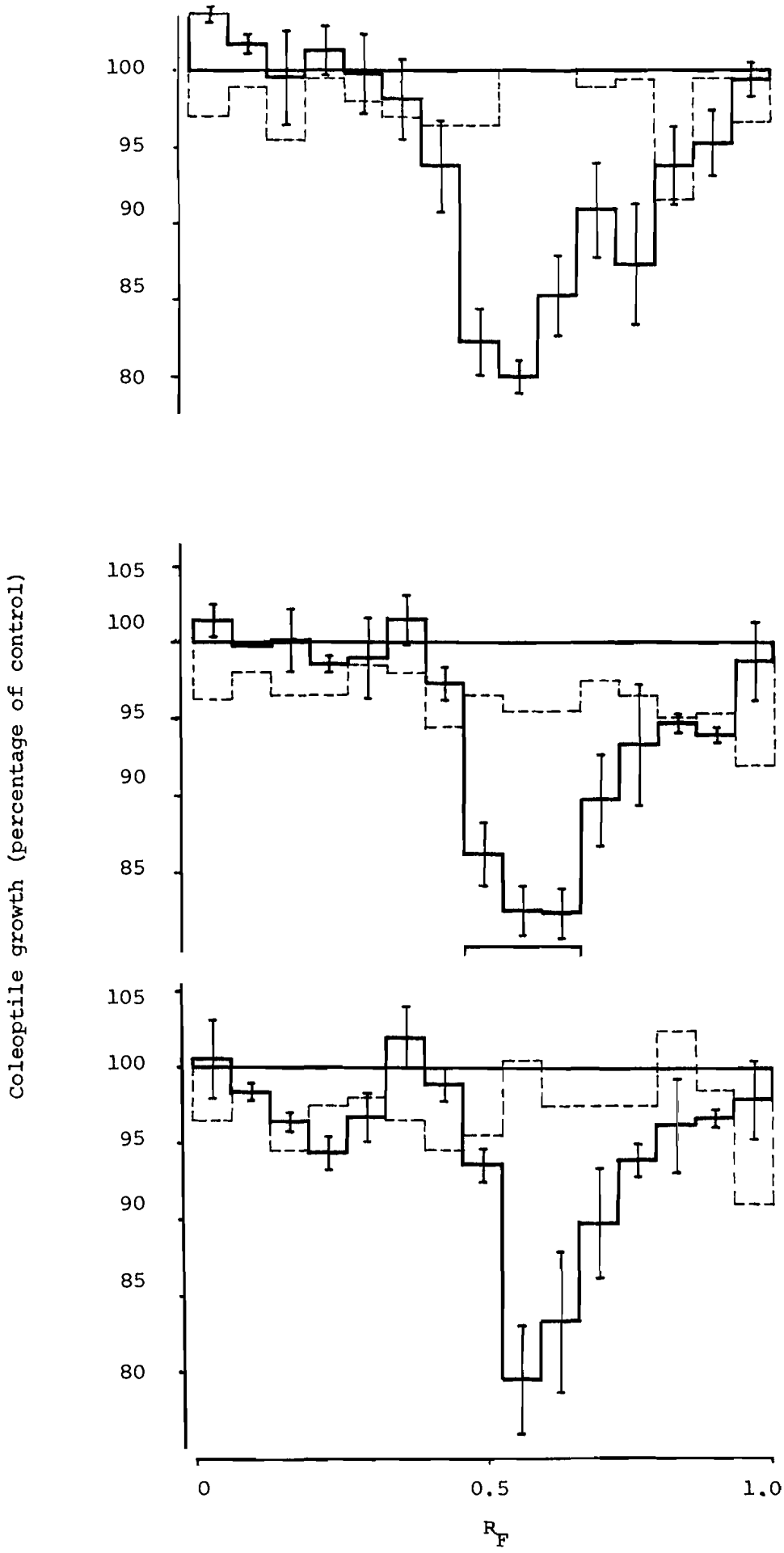

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 35. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 25 March 1977 (H2). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

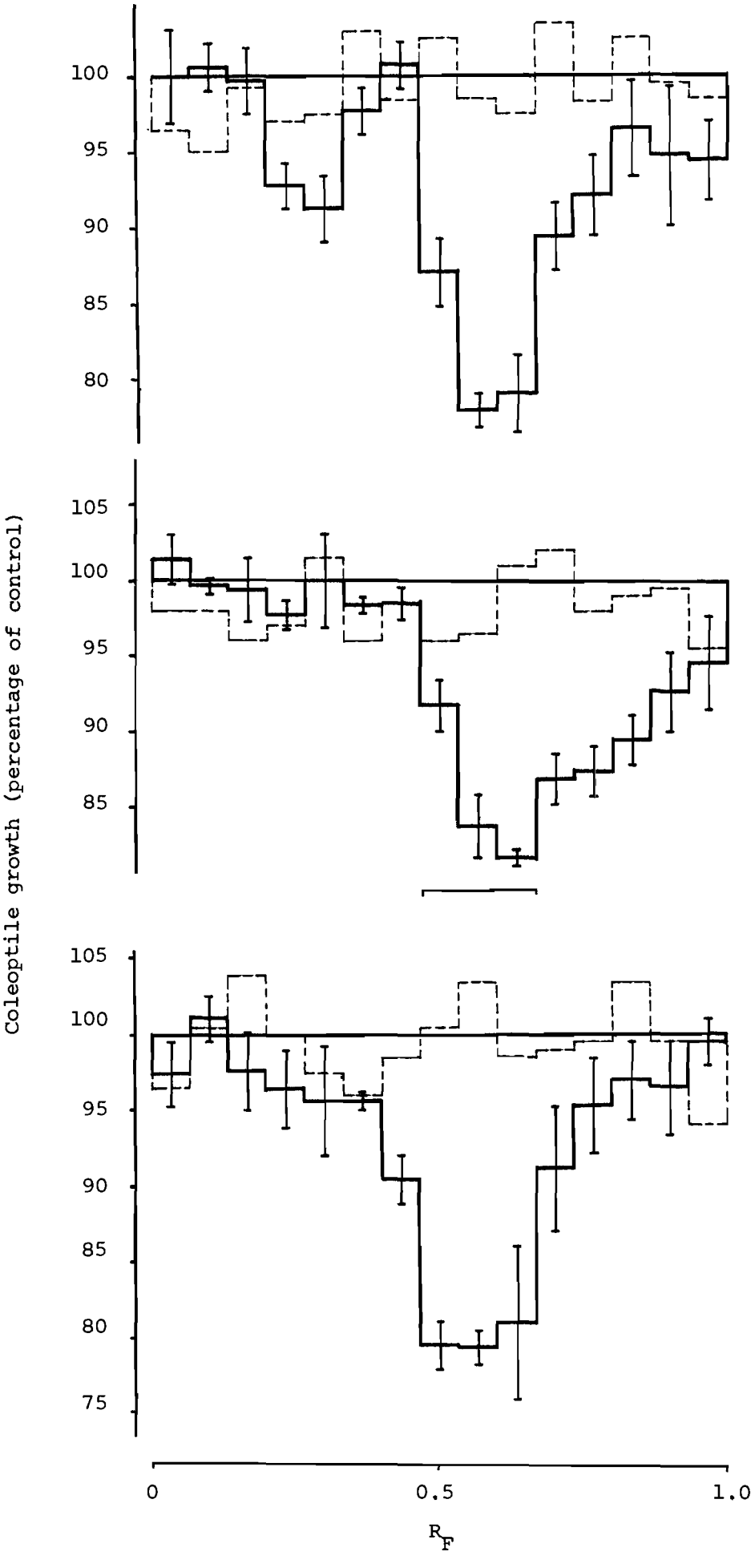

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
105
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 36. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 15 April 1977 (H3). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

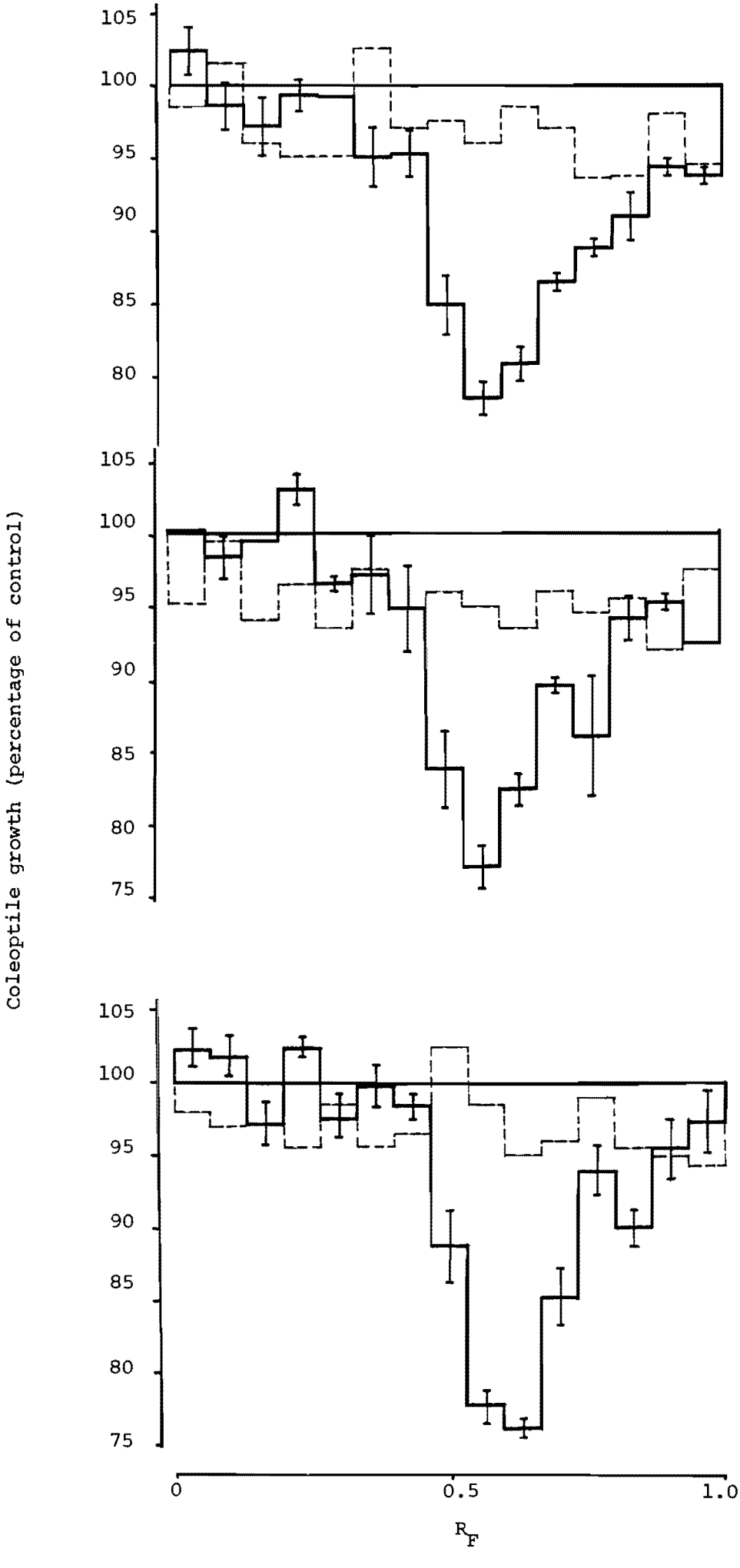

Coleoptile growth (percentage of control)
105
100
95
90
85
80
75
105
100
95
90
85
80
75
105
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 37. Wheat coleoptile assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 25 April 1977 (H4). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

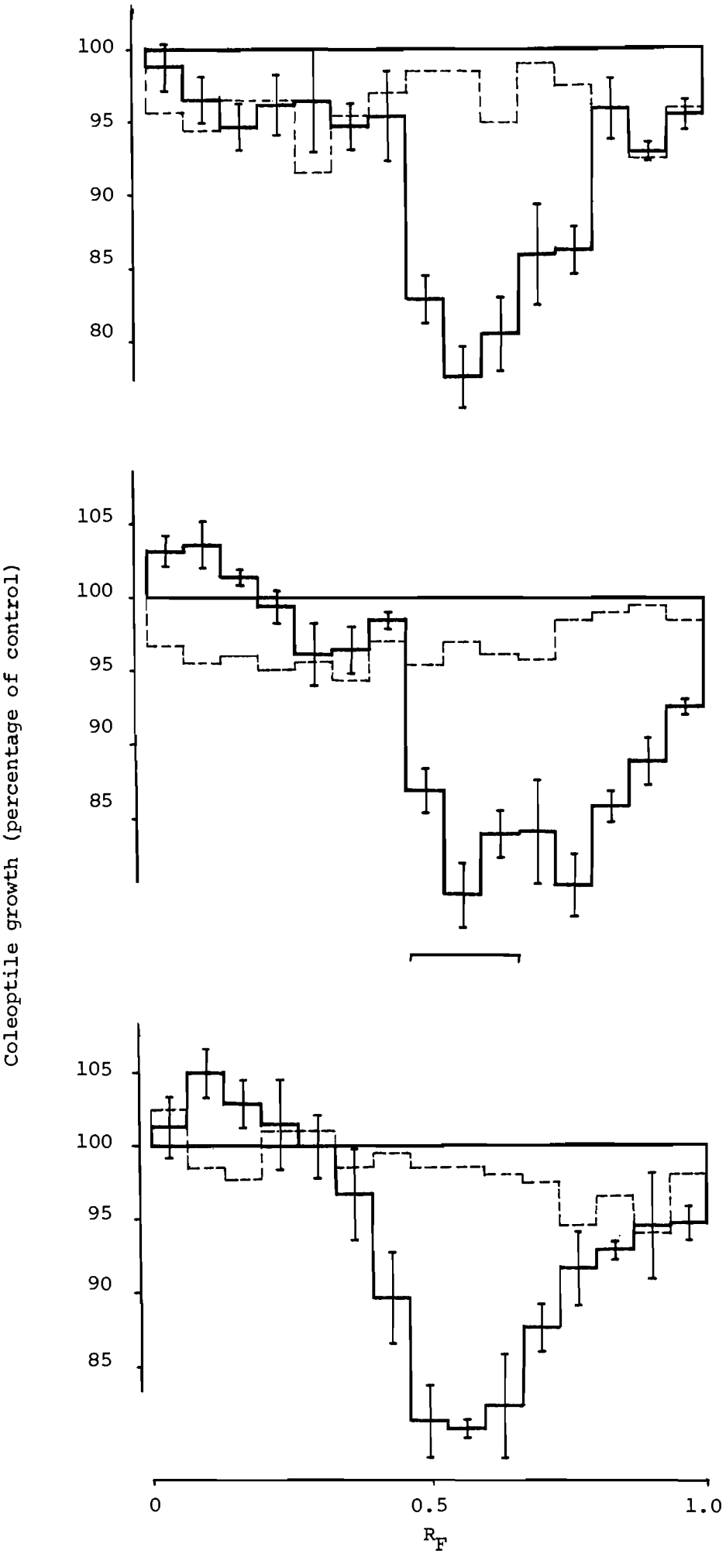

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
105
100
95
90
85
0
0.5
1.0
R_F

Figure 38. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

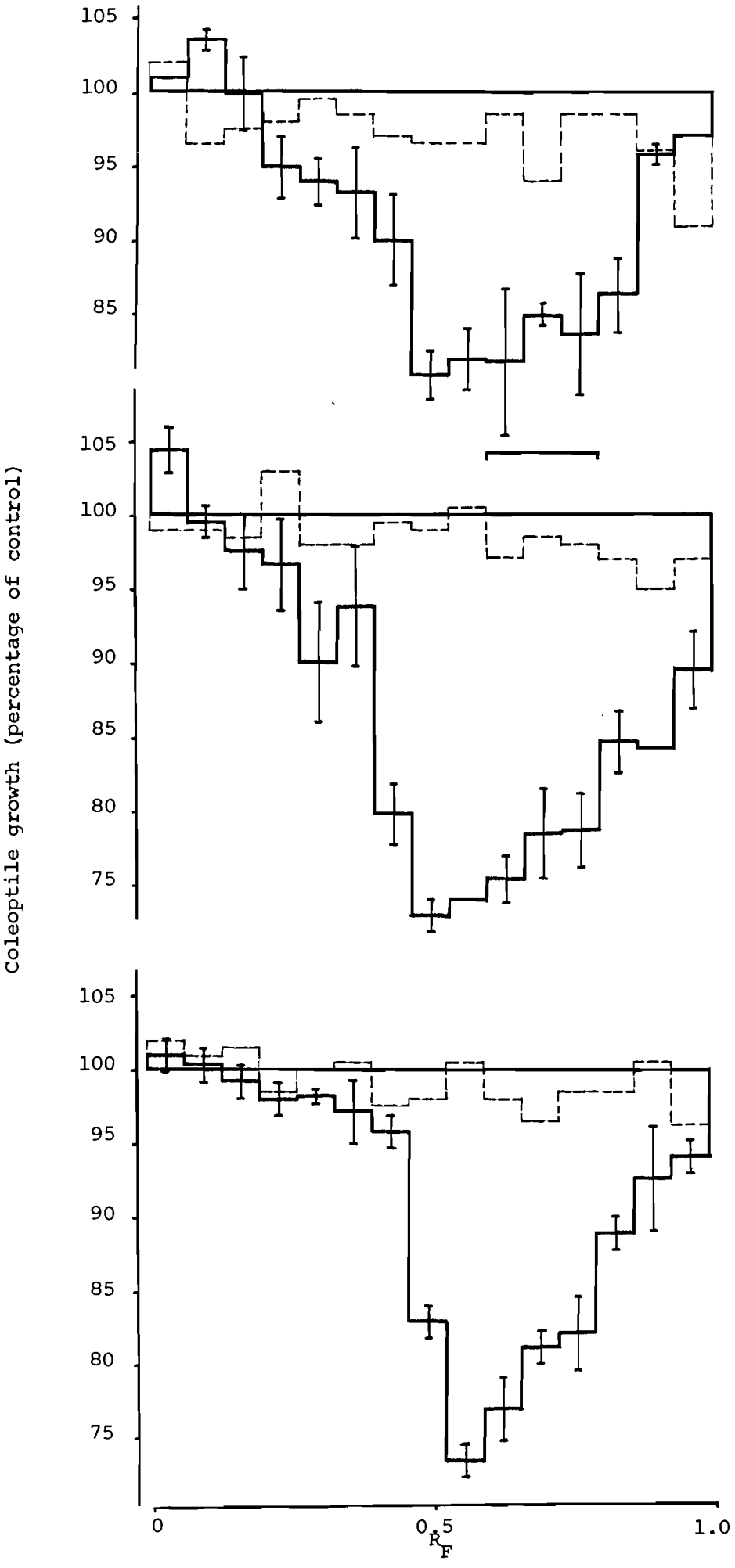

Coleoptile growth (percentage of control)
105
100
95
90
85
105
100
95
90
85
80
75
105
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 39. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of (a) 0.02, (b) 0.10 and (c) 0.20 g DW of apical material was assayed. Other details as in figure 18.

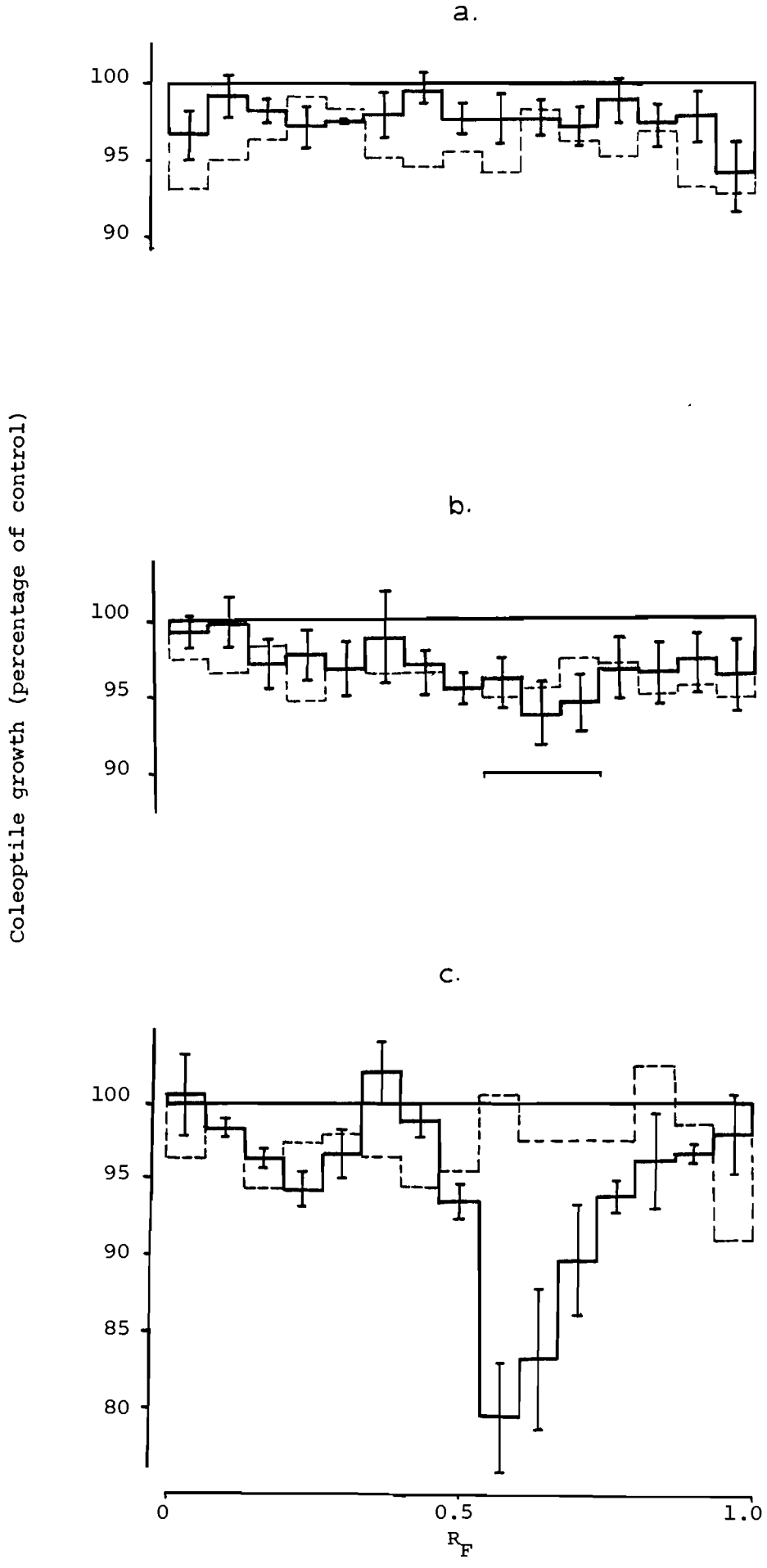

a.
100
95
90
b.
100
95
90
c.
100
95
90
85
80
0
0.5
1.0
R_F
Coleoptile growth (percentage of control)

Figure 40. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of (a) 0.02, (b) 0.10 and (c) 0.20 g of apical material was assayed. Other details as in figure 18.

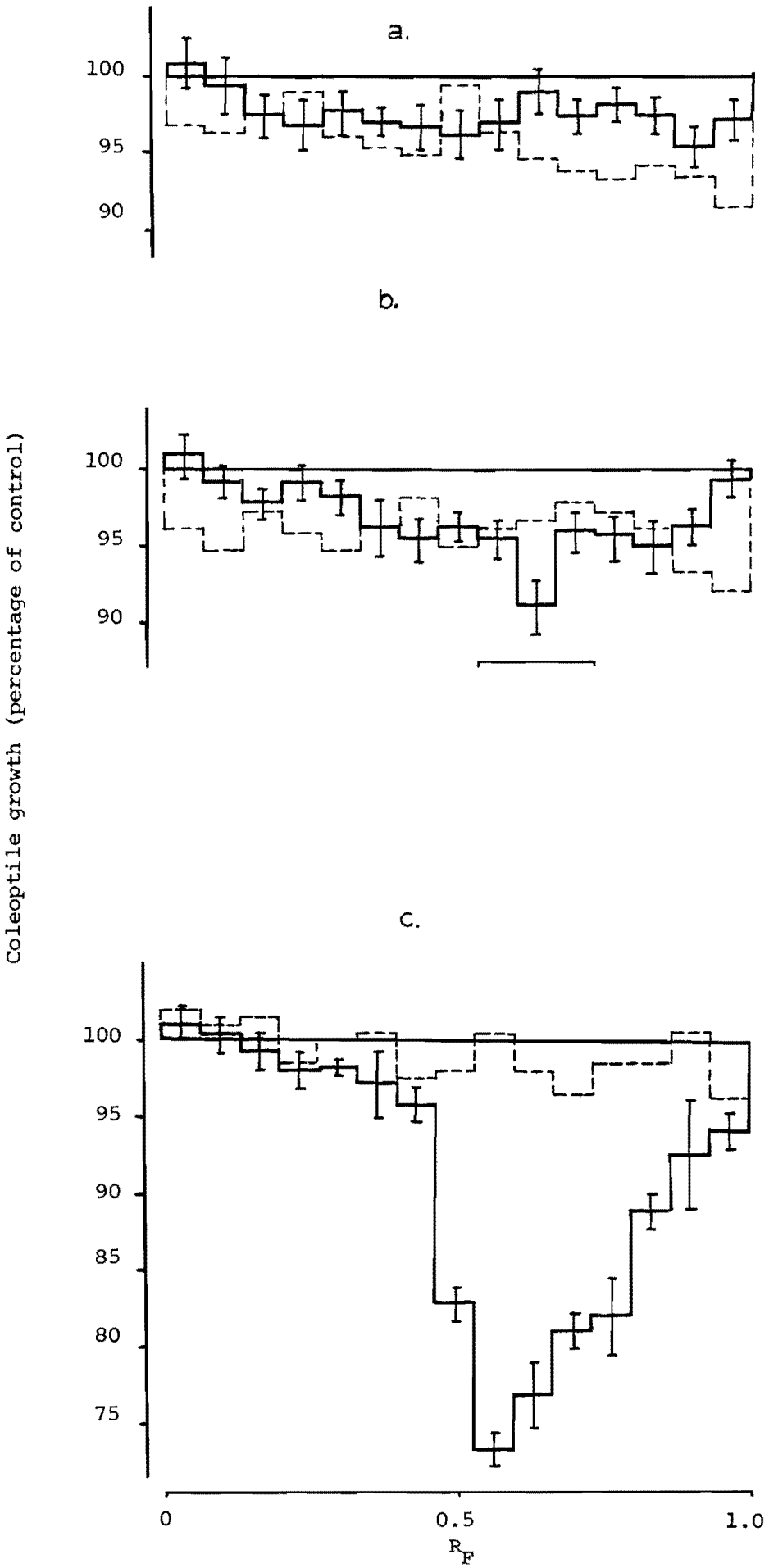

a.
100
95
90
b.
100
95
90
Coleoptile growth (percentage of control)
c.
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 41. Lettuce hypocotyl assay of acid ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

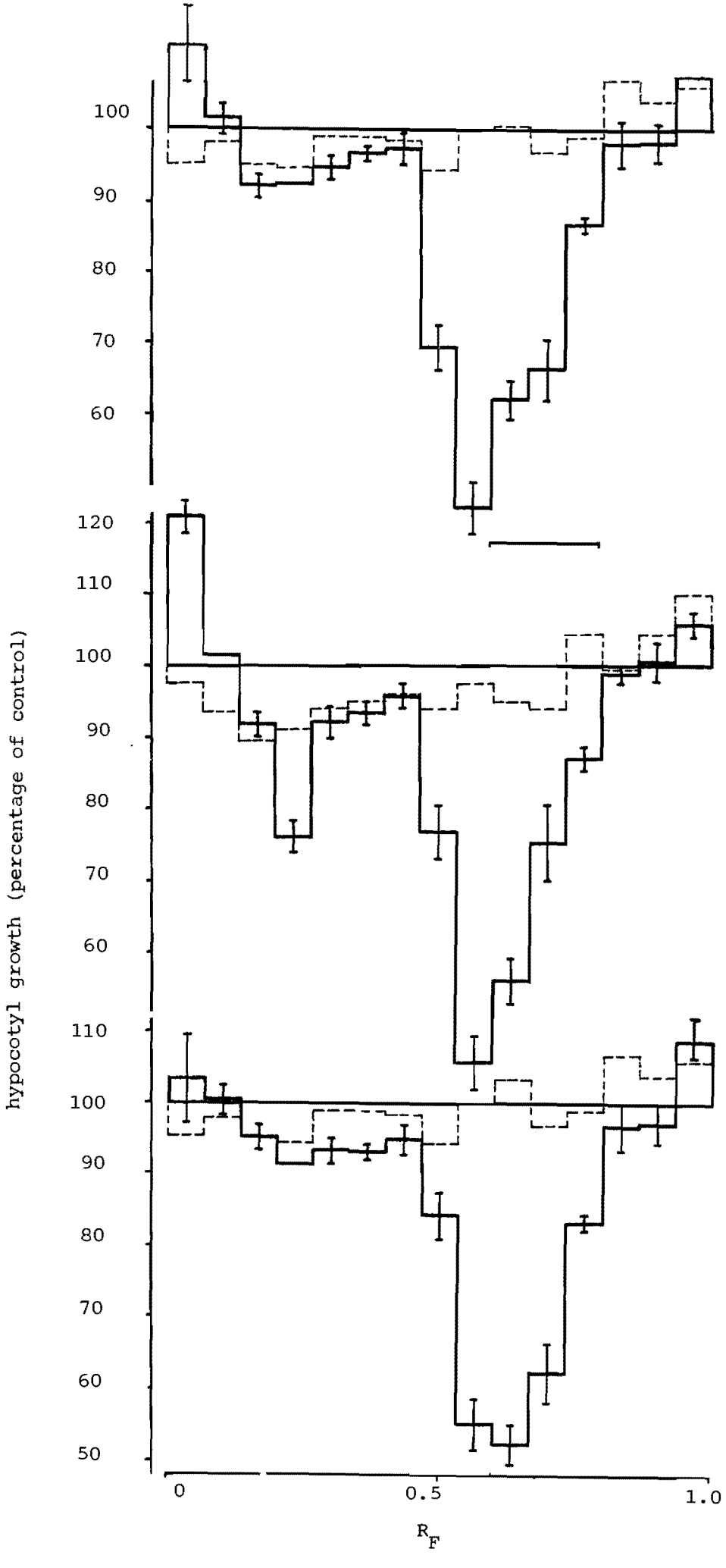

hypocotyl growth (percentage of control)
100
90
80
70
60
120
110
100
90
80
70
60
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 42. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 25 March 1977 (H2). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

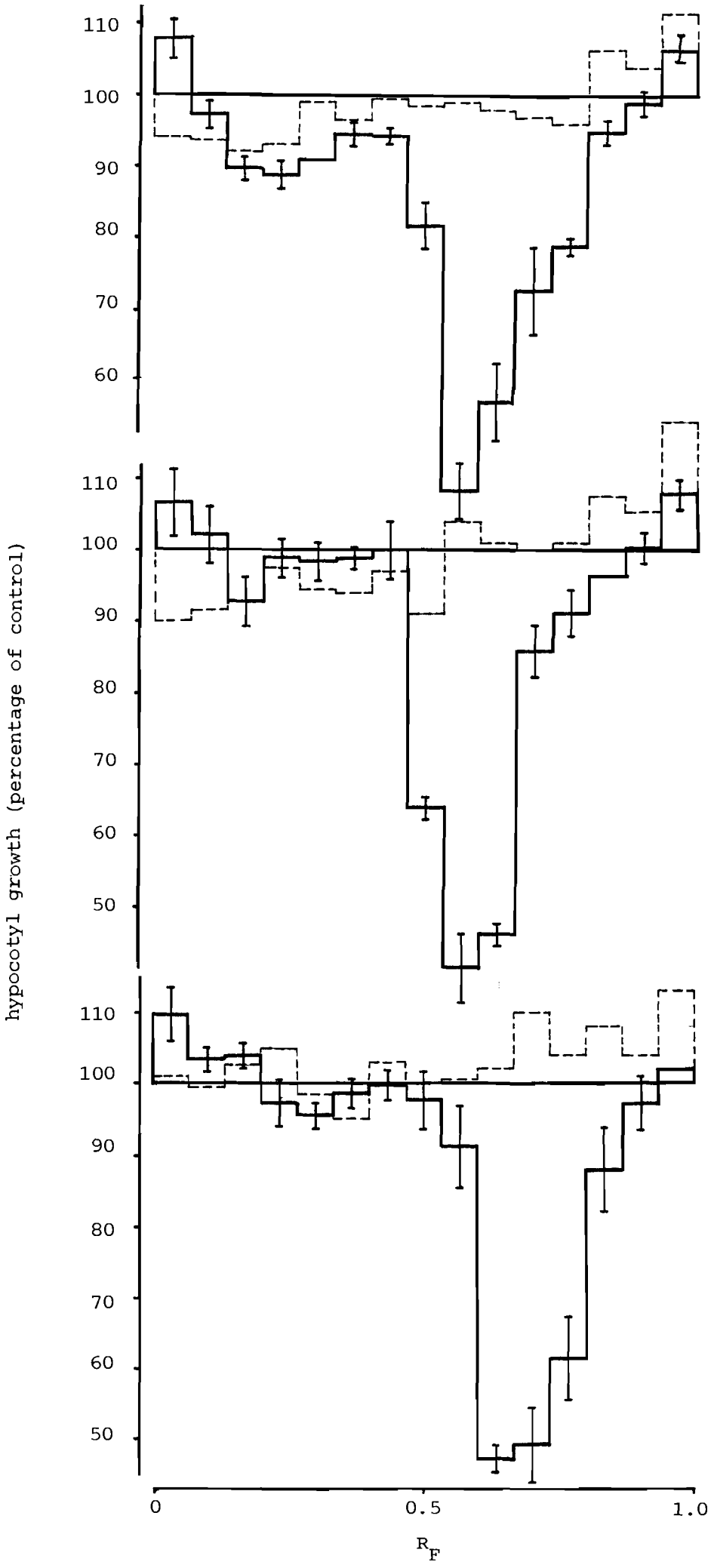

hypocotyl growth (percentage of control)
110
100
90
80
70
60
110
100
90
80
70
60
50
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 43. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 15 April 1977 (H3). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

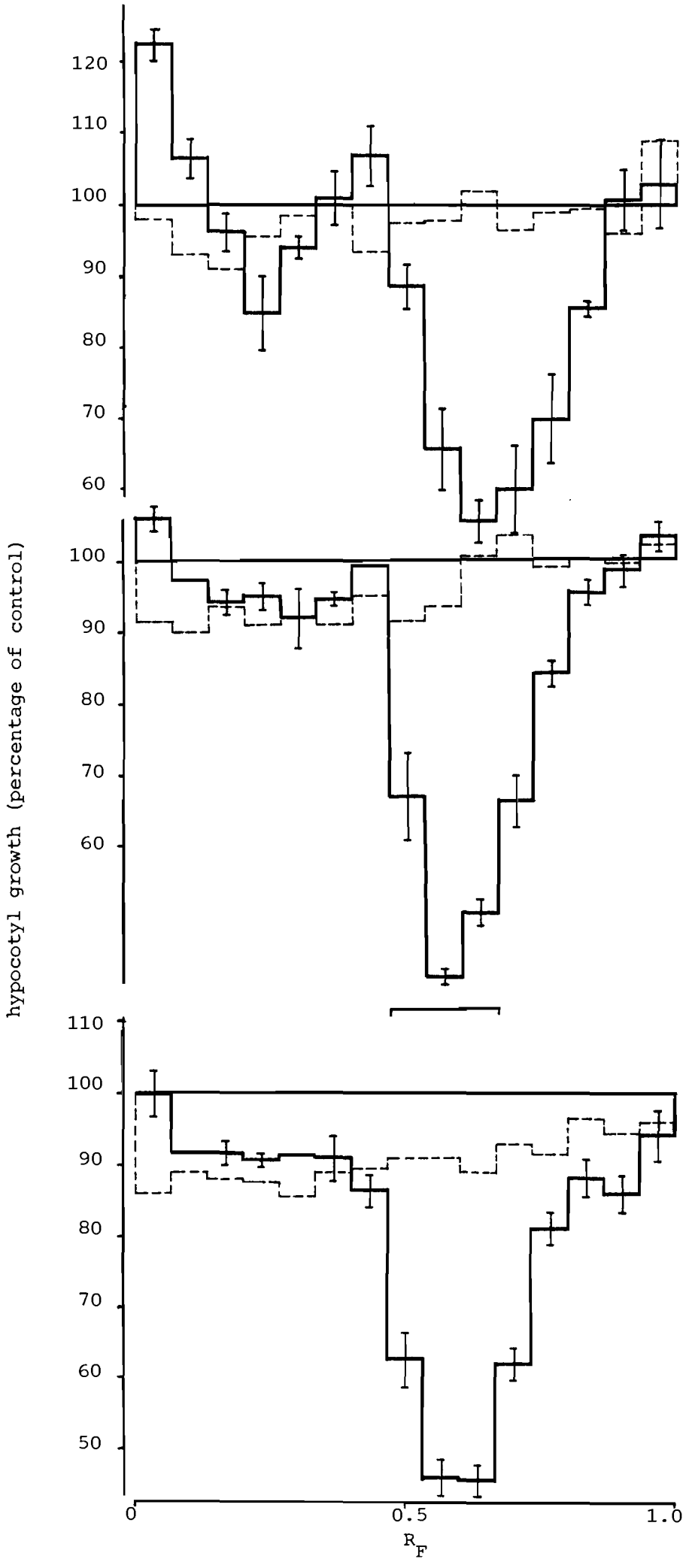

hypocotyl growth (percentage of control)
120
110
100
90
80
70
60
100
90
80
70
60
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 44. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 28 April 1977 (H4). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

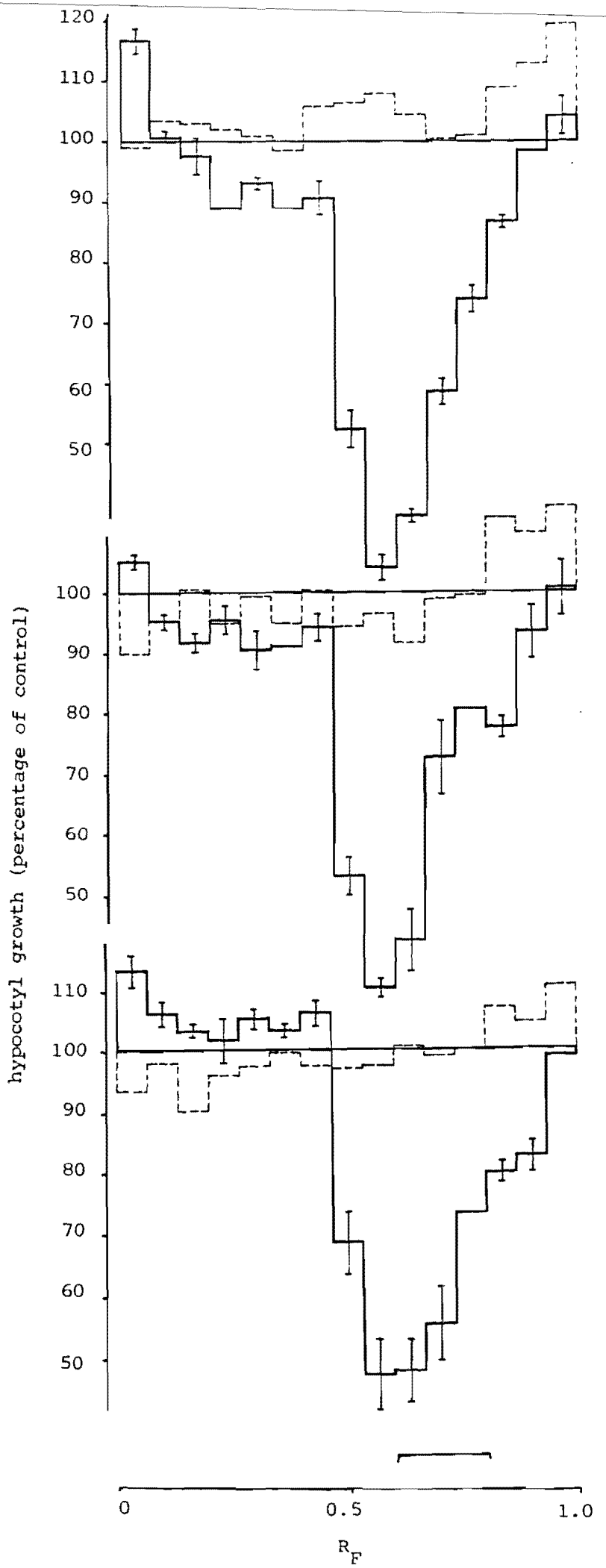

hypocotyl growth (percentage of control)
120
110
100
90
80
70
60
50
100
90
80
70
60
50
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 45. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 25 May 1977 (H5). The equivalent of 0.20 g DW of dry material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

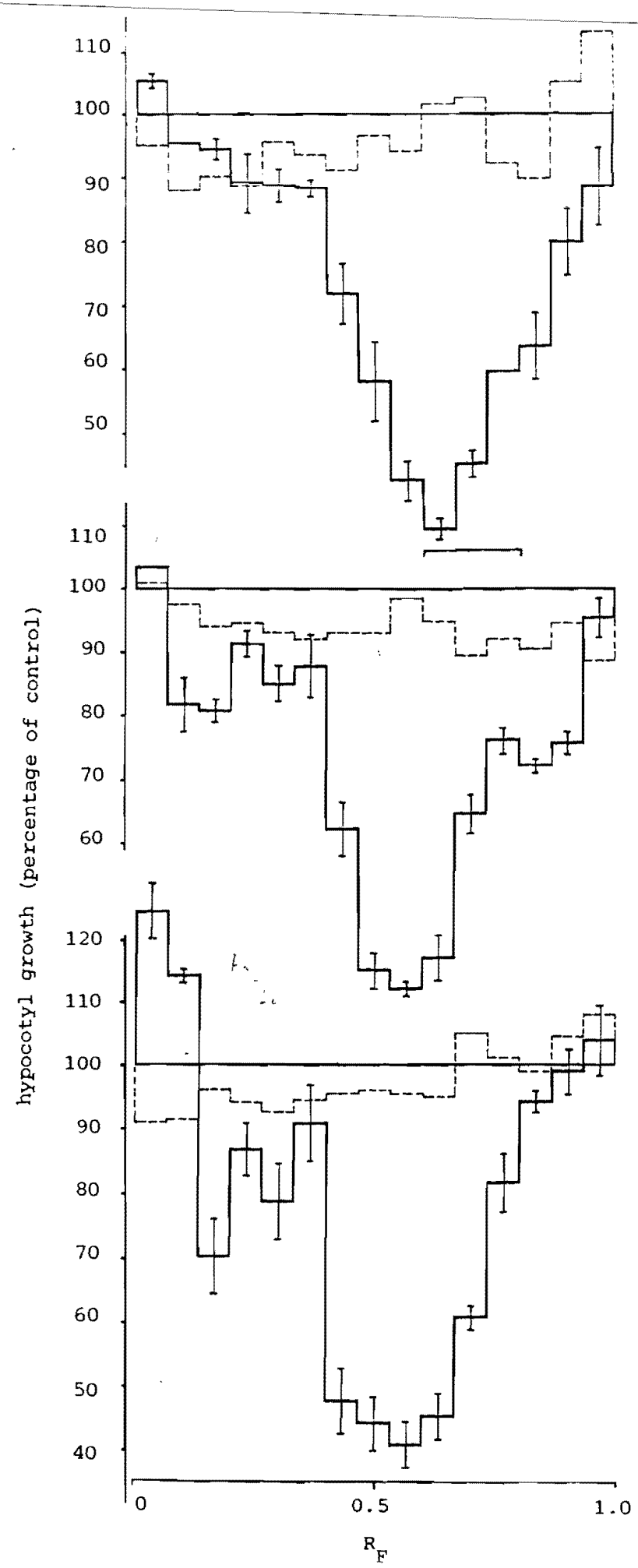

hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
110
100
90
80
70
60
120
110
100
90
80
70
60
50
40
0
0.5
1.0
R_F

Figure 46. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 7 March 1977 (H1). The equivalent of (a) 0.02, (b) 0.10 and (c) 0.20 g DW of apical material was assayed. Other details as in figure 26.

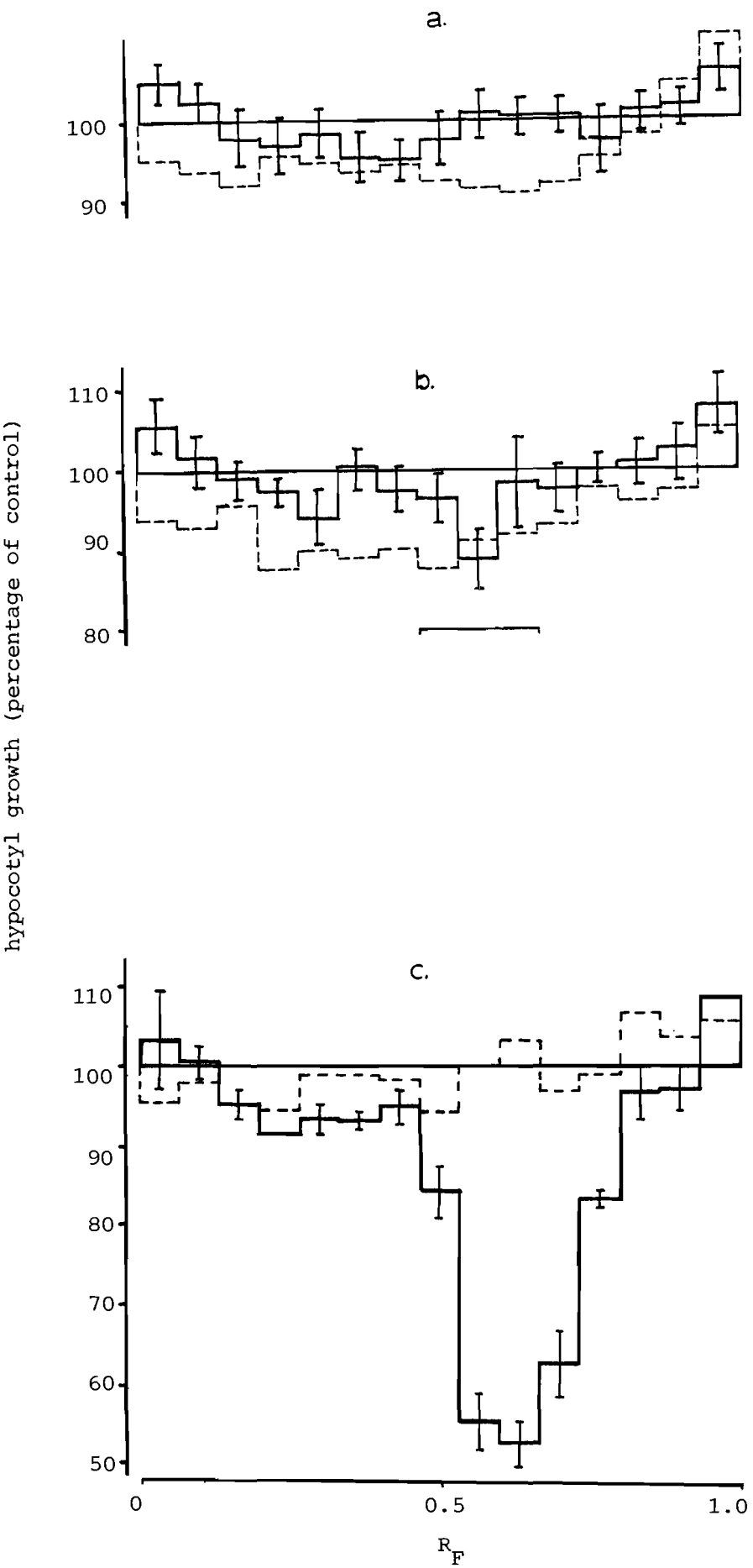

a.
100
90
b.
110
100
90
80
c.
110
100
90
80
70
60
50
0
0.5
1.0
R_F
hypocotyl growth (percentage of control)

Figure 47. Lettuce hypocotyl assay of the serial dilution of an acid ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 15 May 1977 (H5). The equivalent of (a) 0.02, (b) 0.10 and (c) 0.20 g DW of apical material was assayed. Other details as in figure 26.

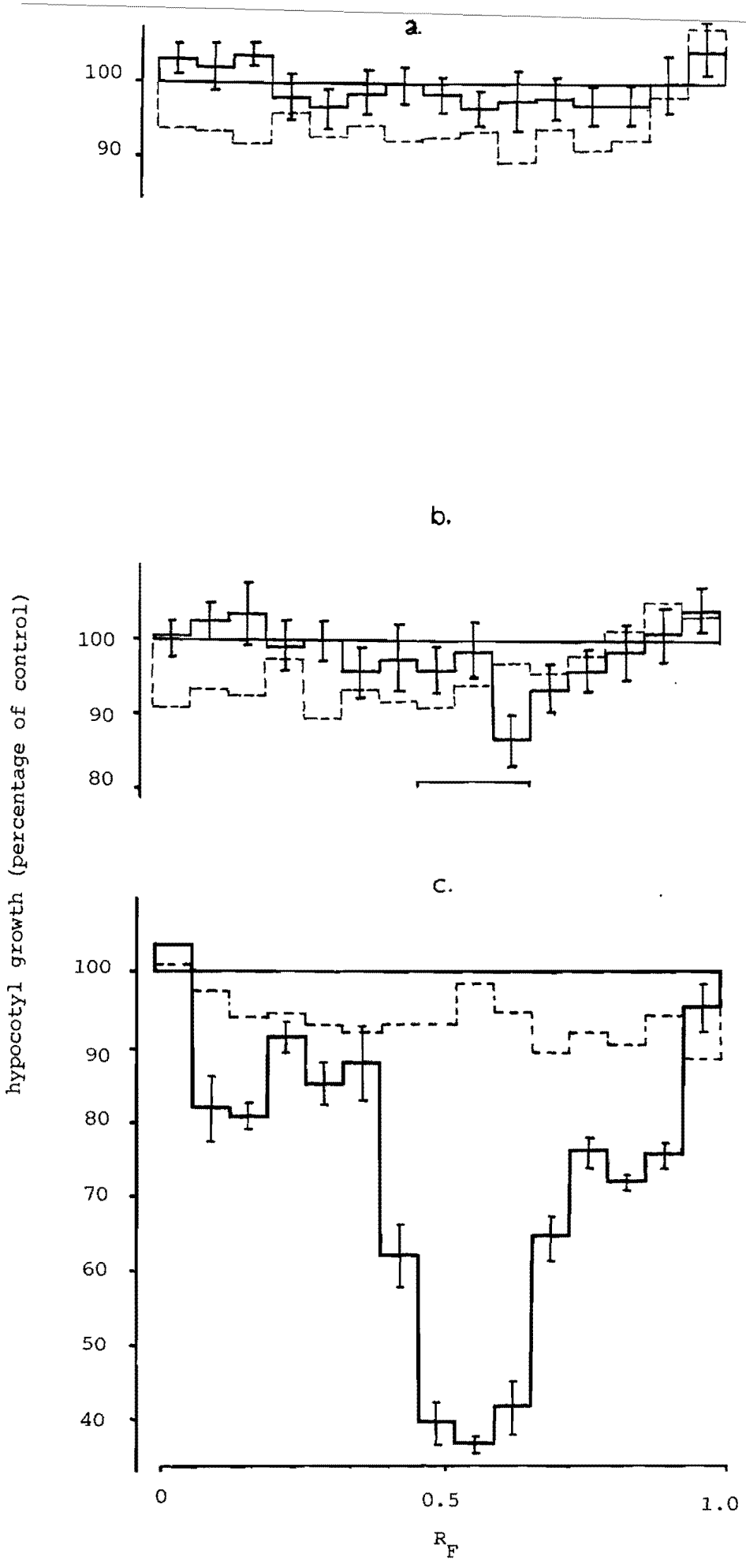

a.
100
90
b.
100
90
80
c.
hypocotyl growth (percentage of control)
100
90
80
70
60
50
40
0
0.5
1.0
R_F

Figure 48. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 13 March 1978 (H1). The equivalent of (a) 0.02, (b) 0.125 and (c) 0.25 g DW of leaf material was assayed. Other details as in figure 18.

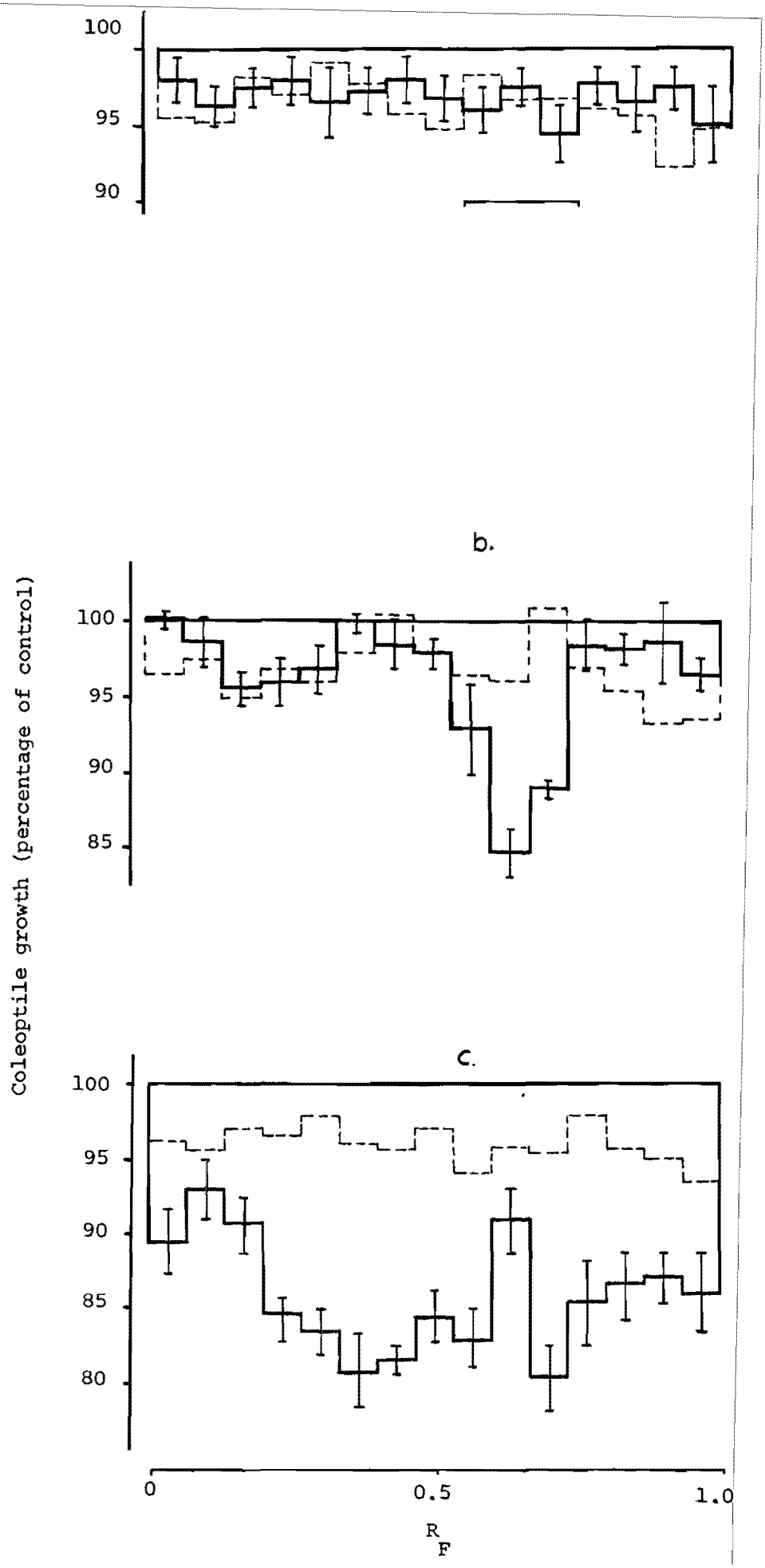

100
95
90
b.
100
95
90
85
Coleoptile growth (percentage of control)
c.
100
95
90
85
80
0
0.5
1.0
R_F

Figure 49. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 2 May 1978 (H3). The equivalent of (a) 0.02, (b) 0.125 and (c) 0.25 g DW of leaf material was assayed. Other details as in figure 18.

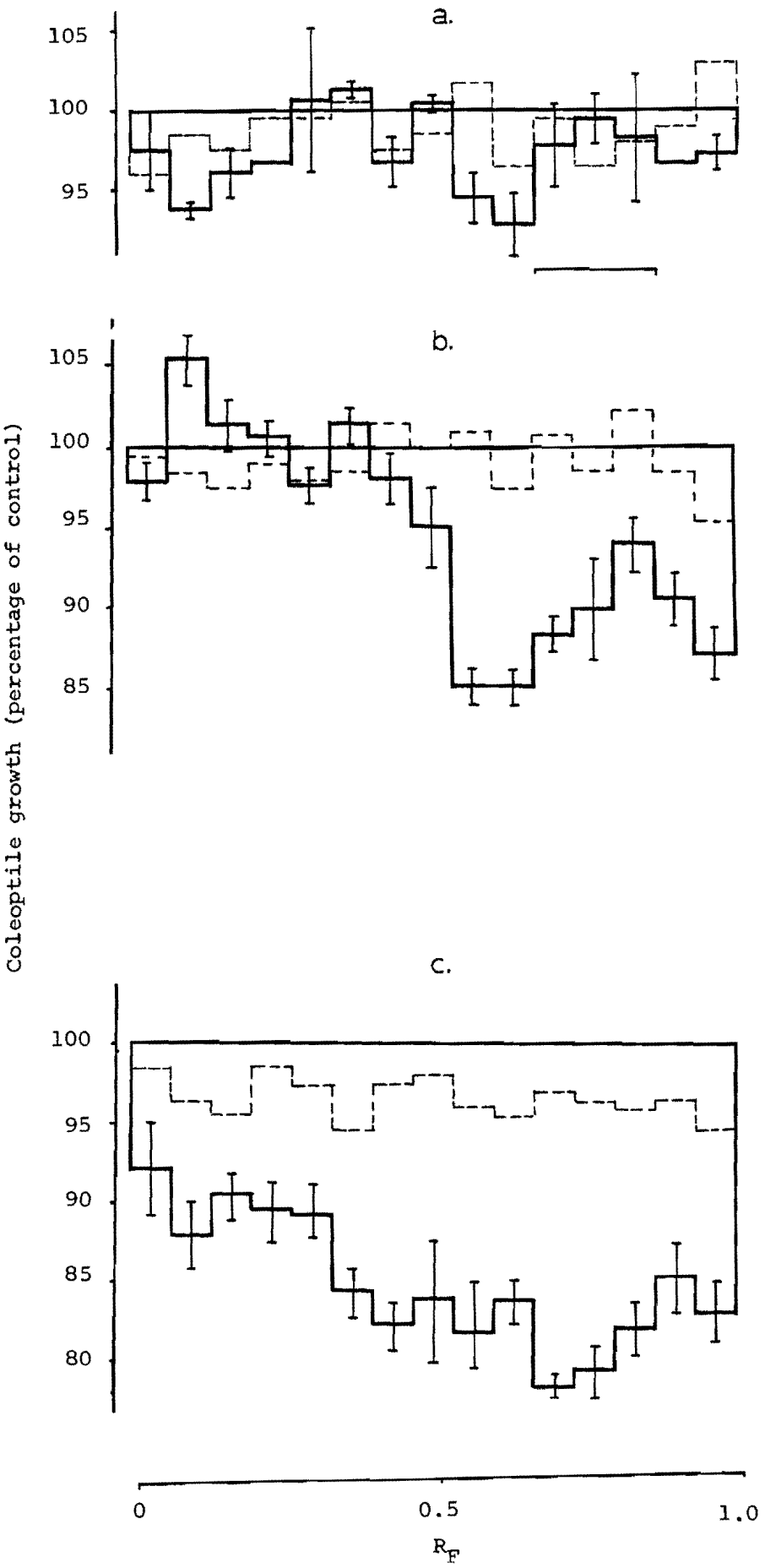

a.
105
100
95
b.
105
100
95
90
85
Coleoptile growth (percentage of control)
c.
100
95
90
85
80
0
0.5
1.0
R_F

Figure 50. Lettuce hypocotyl assay of the serial dilution of an acid ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 13 March 1978 (H1). The equivalent of (a) 0.02, (b) 0.125 and (c) 0.25 g DW of leaf material was assayed. Other details as in figure 26.

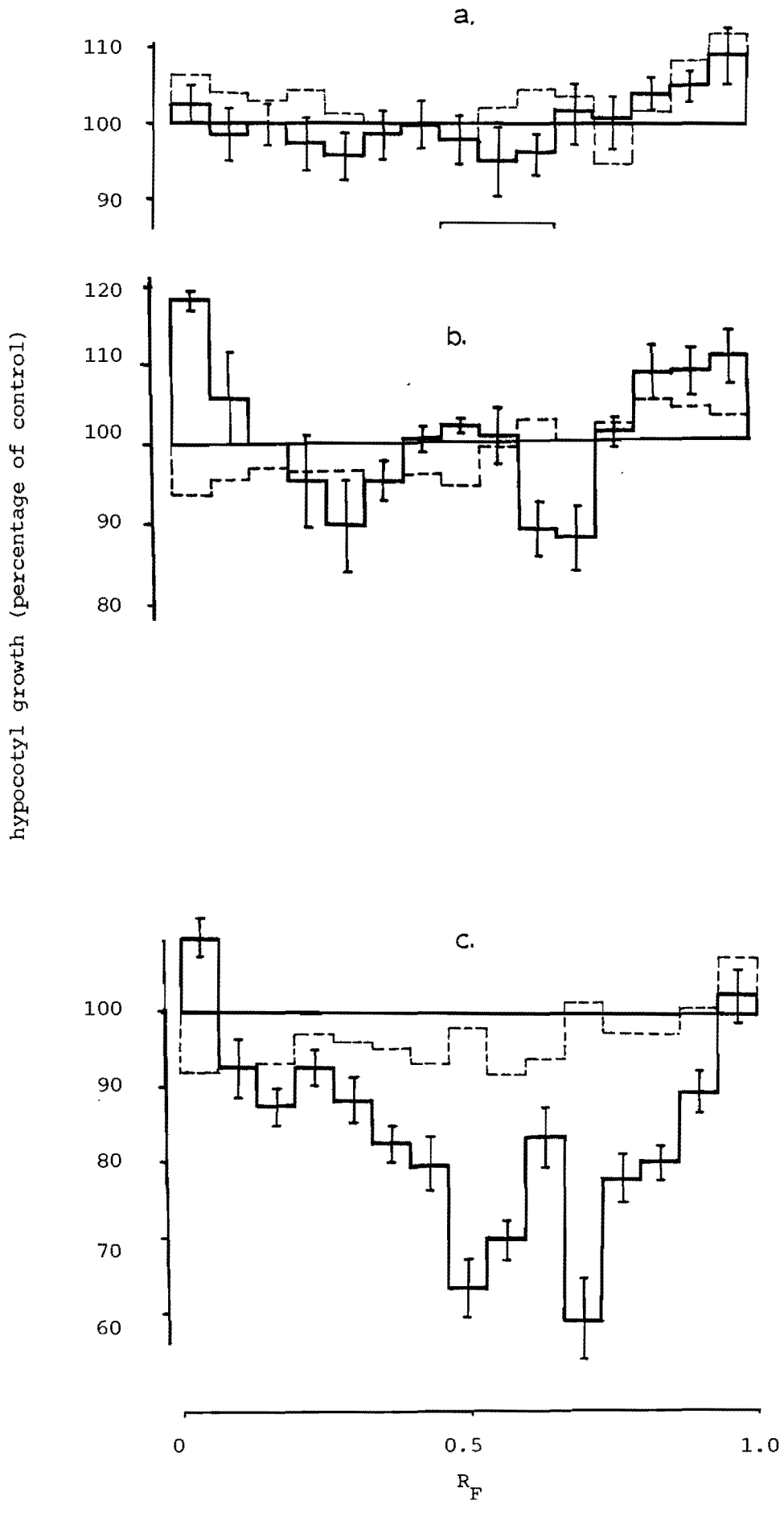

a.
110
100
90
b.
120
110
100
90
80
hypocotyl growth (percentage of control)
c.
100
90
80
70
60
0
0.5
1.0
R_F

Figure 51. Lettuce hypocotyl assay of the serial dilution of an acid ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 2 May 1978 (H3). The equivalent of (a) 0.02, (b) 0.125 and (c) 0.25 g DW of apical material was assayed. Other details as in figure 26.

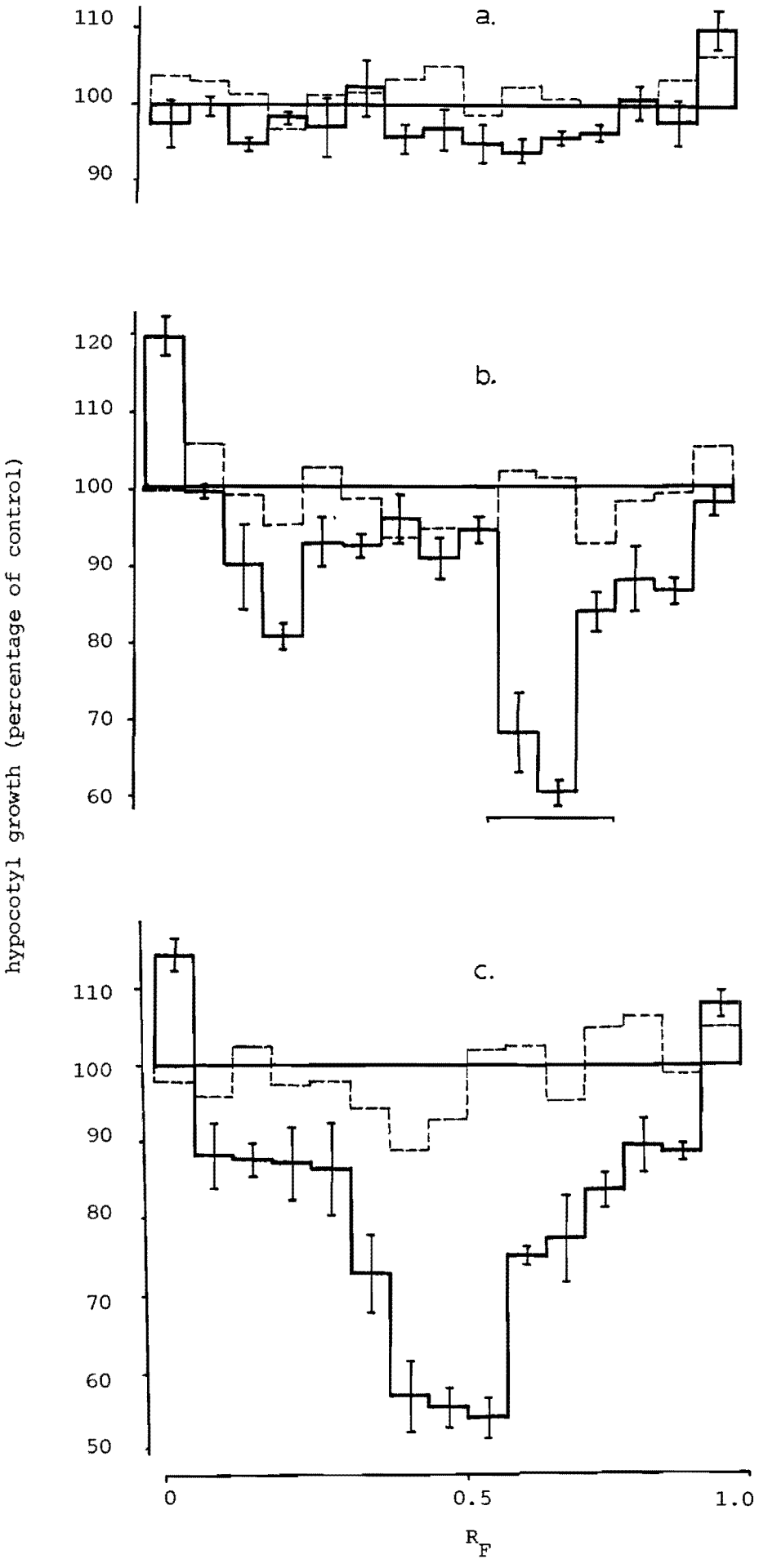

a.
b.
c.
110
100
90
120
80
70
60
50
hypocotyl growth (percentage of control)
0
0.5
1.0
R_F

Figure 52. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 13 March 1978 (H1). The equivalent of 0.125 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

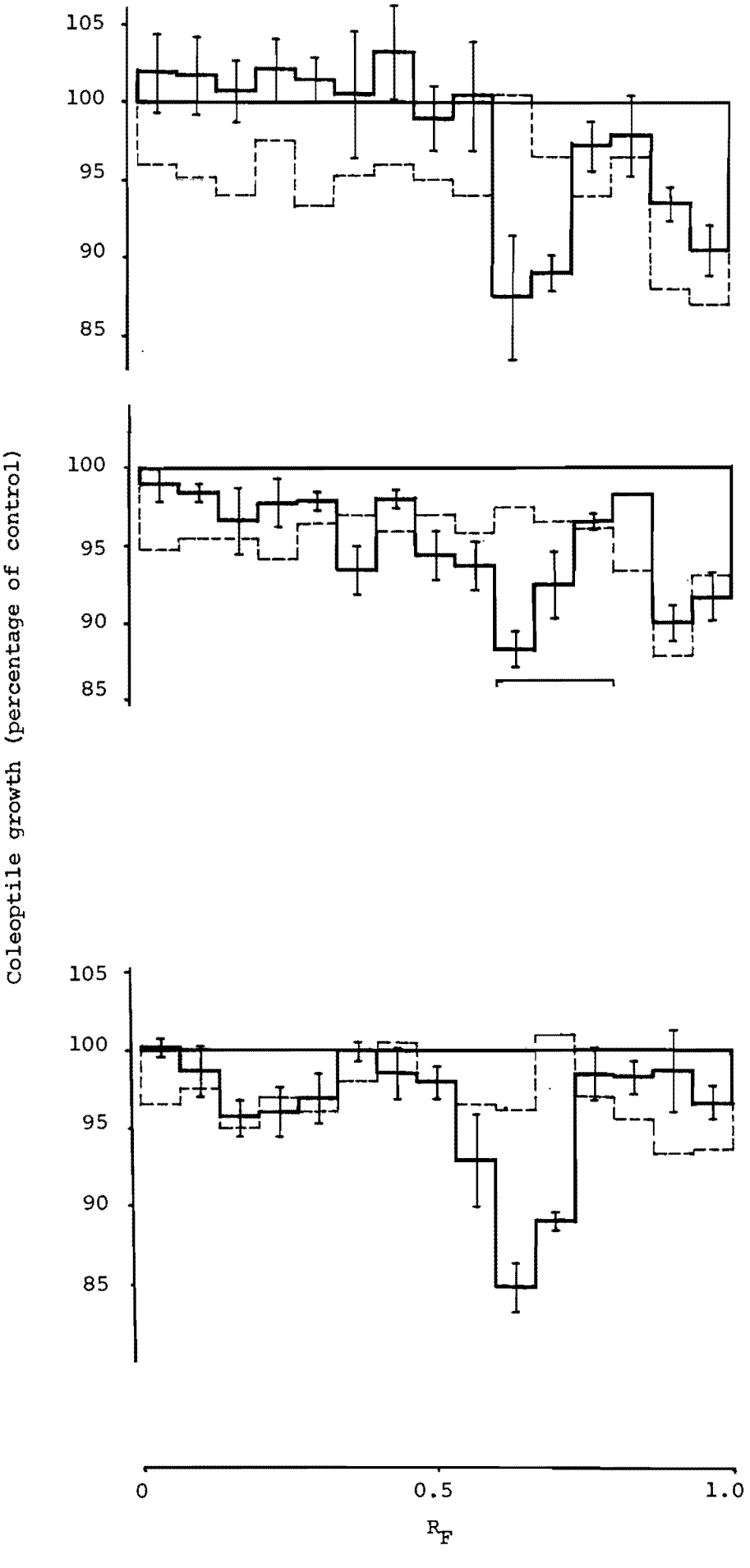

105
100
95
90
85
100
95
90
85
105
100
95
90
85
Coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 53. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 14 April 1978 (H2). The equivalent of 0.125 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

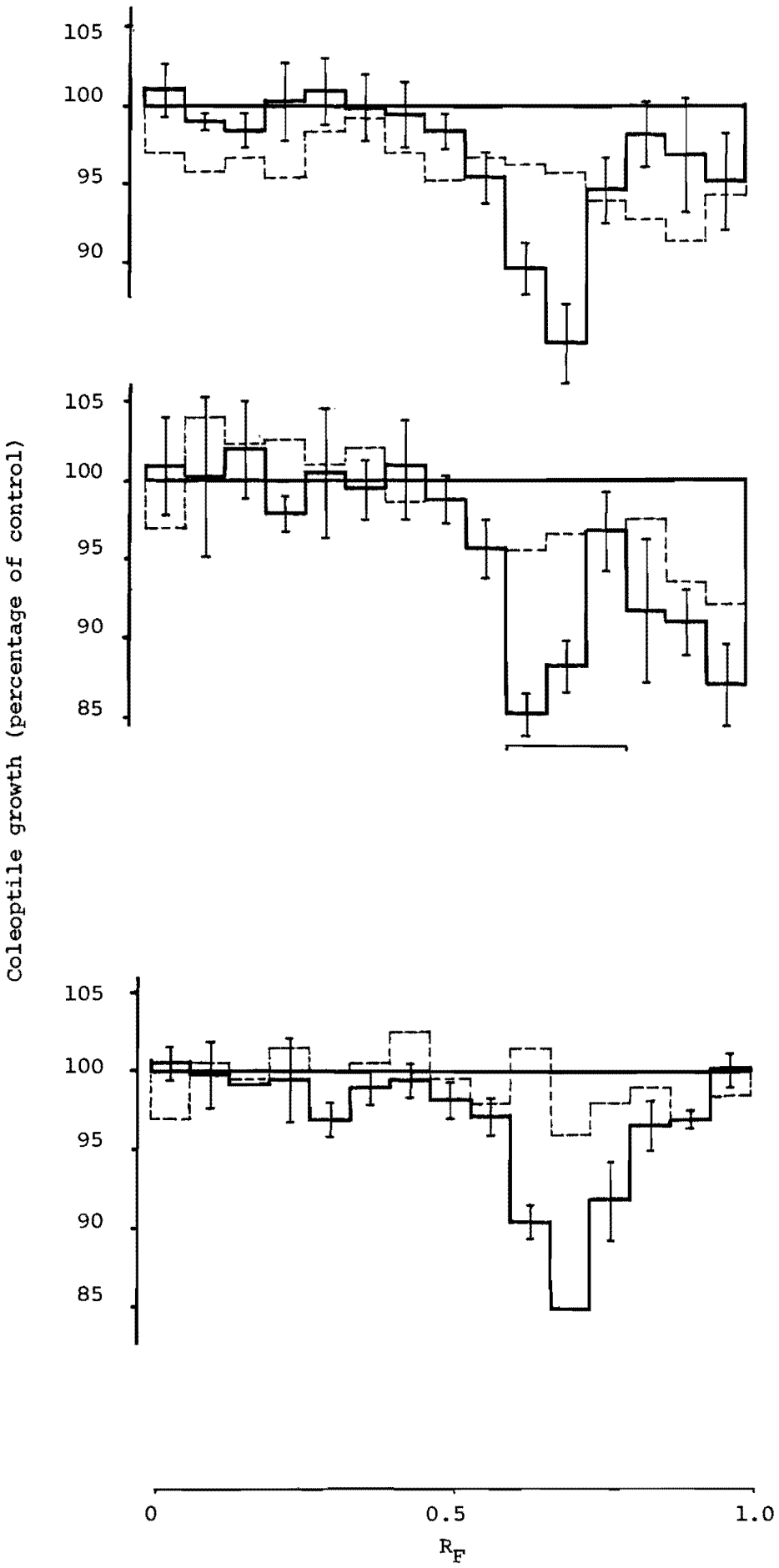

105
100
95
90
105
100
95
90
85
Coleoptile growth (percentage of control)
105
100
95
90
85
0
0.5
1.0
R_F

Figure 54. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 2 May 1978 (H3). The equivalent of 0.125 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

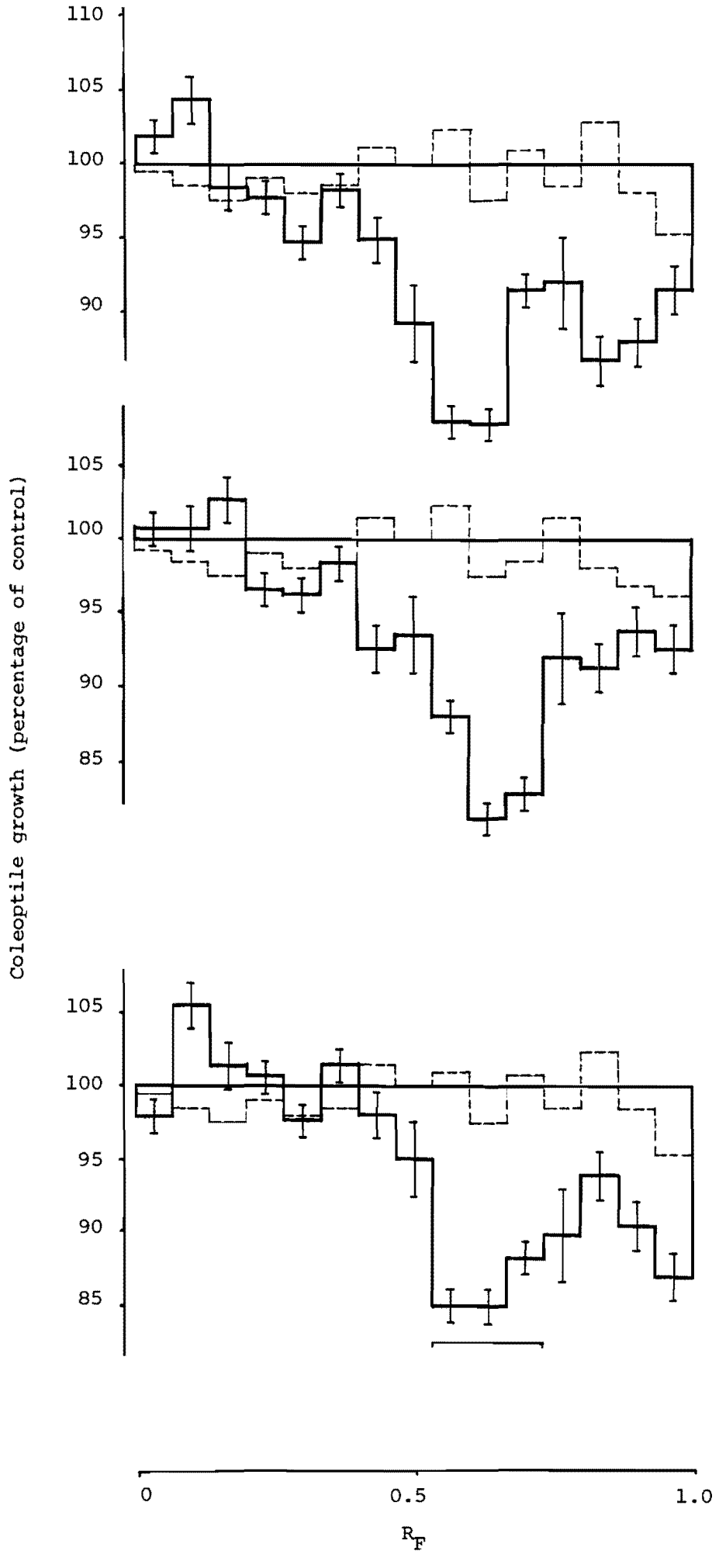

Coleoptile growth (percentage of control)
110
105
100
95
90
105
100
95
90
85
105
100
95
90
85
0
0.5
1.0
R_F

Figure 55. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 13 March 1978 (H1).
The equivalent of 0.125 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

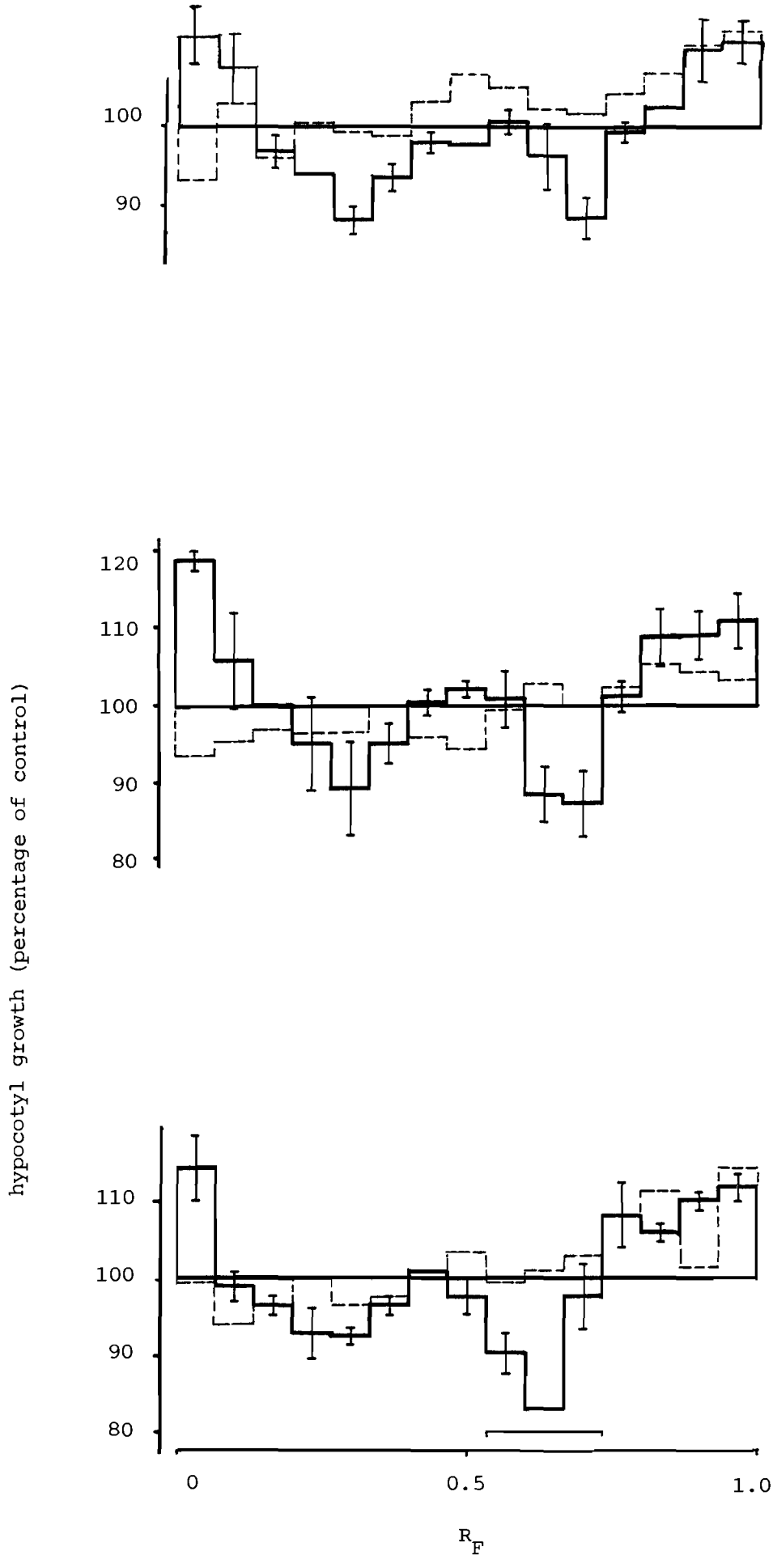

100
90
120
110
100
90
80
110
100
90
80
0
0.5
1.0
R_F
hypocotyl growth (percentage of control)

Figure 56. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 14 April 1978 (H2). The equivalent of 0.125 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

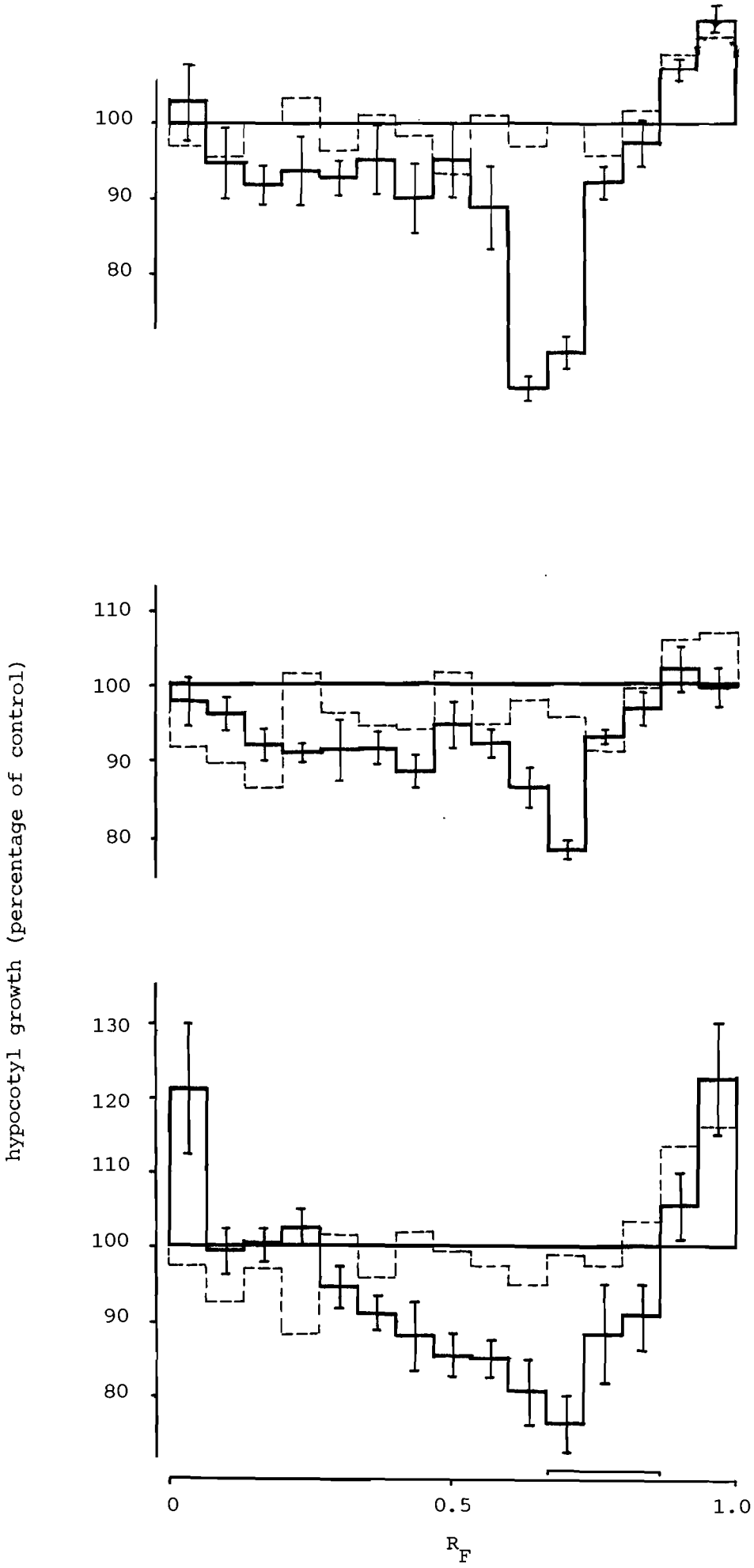

hypocotyl growth (percentage of control)
100
90
80
110
100
90
80
130
120
110
100
90
80
0
0.5
1.0
R_F

Figure 57. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 2 May 1978 (H3). The equivalent of 0.125 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

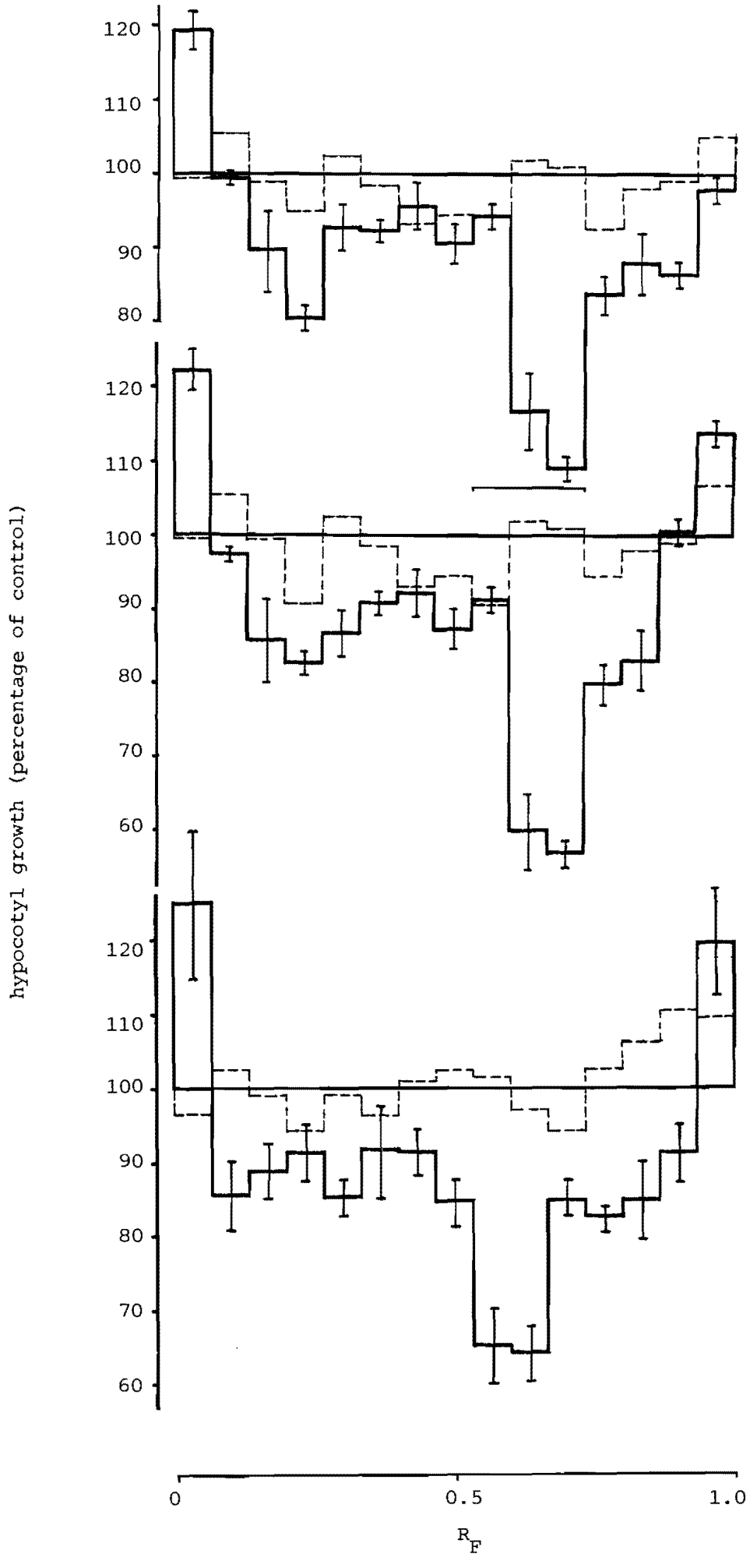

hypocotyl growth (percentage of control)
120
110
100
90
80
120
110
100
90
80
70
60
120
110
100
90
80
70
60
0
0.5
1.0
R_F

Figure 58. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 13 March 1978 (H1). The equilavent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

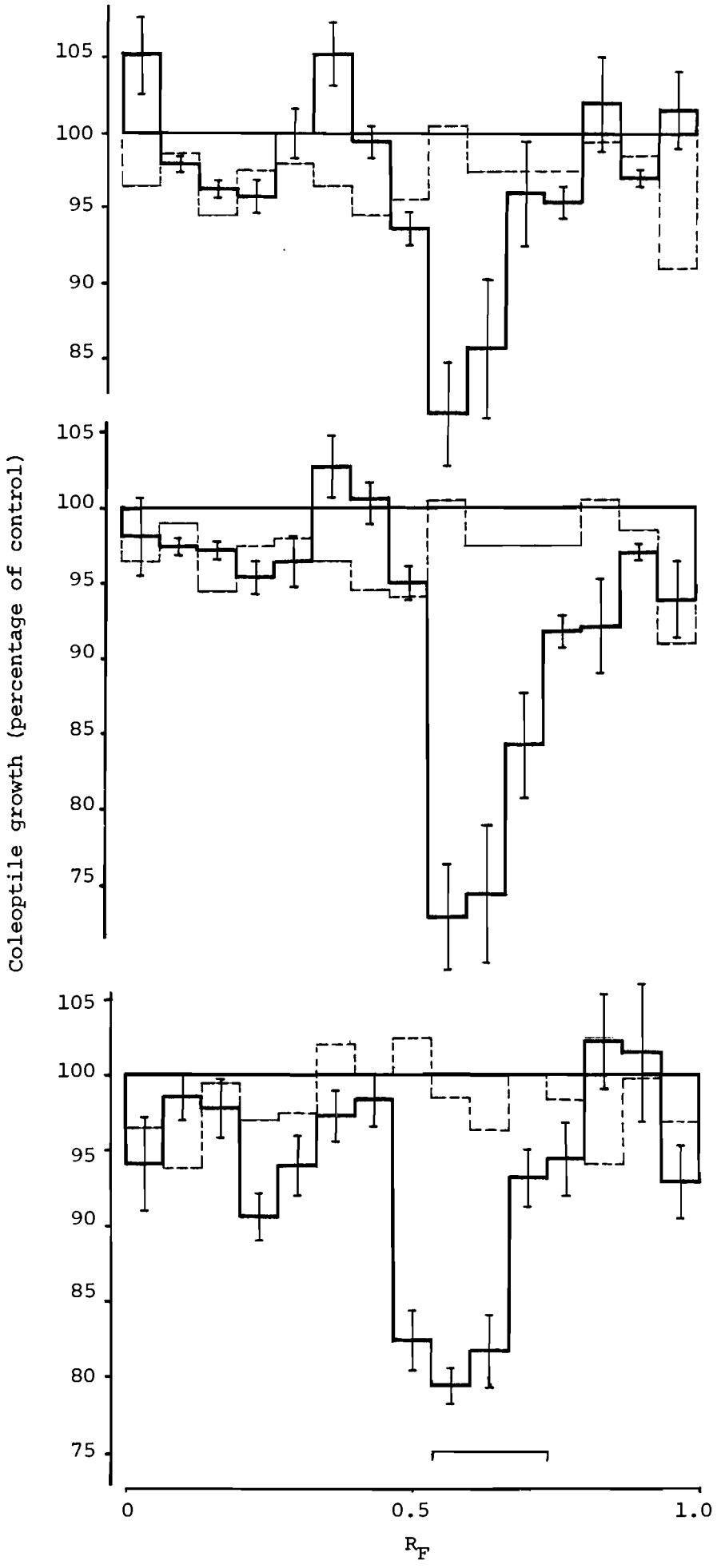

Coleoptile growth (percentage of control)
105
100
95
90
85
105
100
95
90
85
80
75
105
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 59. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 14 April 1978 (H2). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

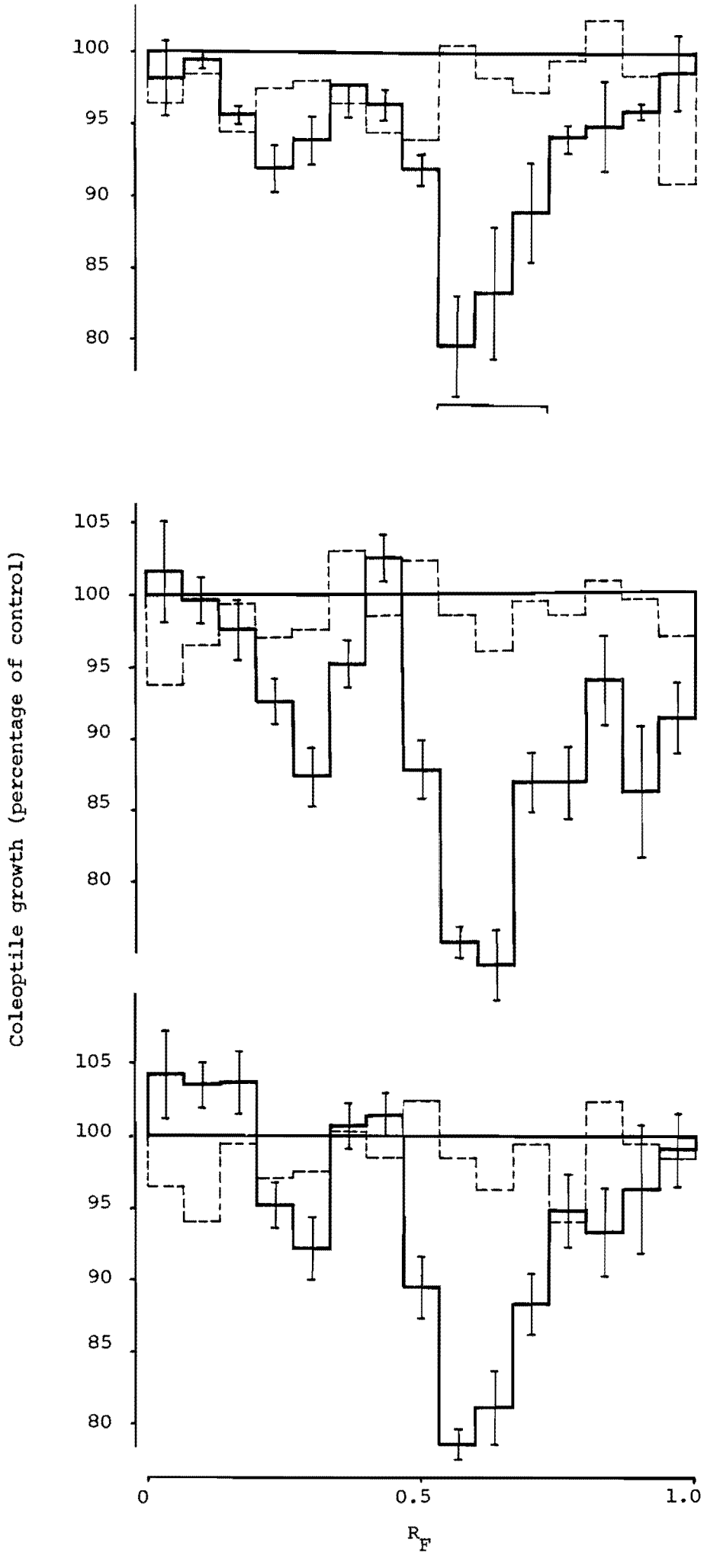

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 60. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 2 May 1978 (H3). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

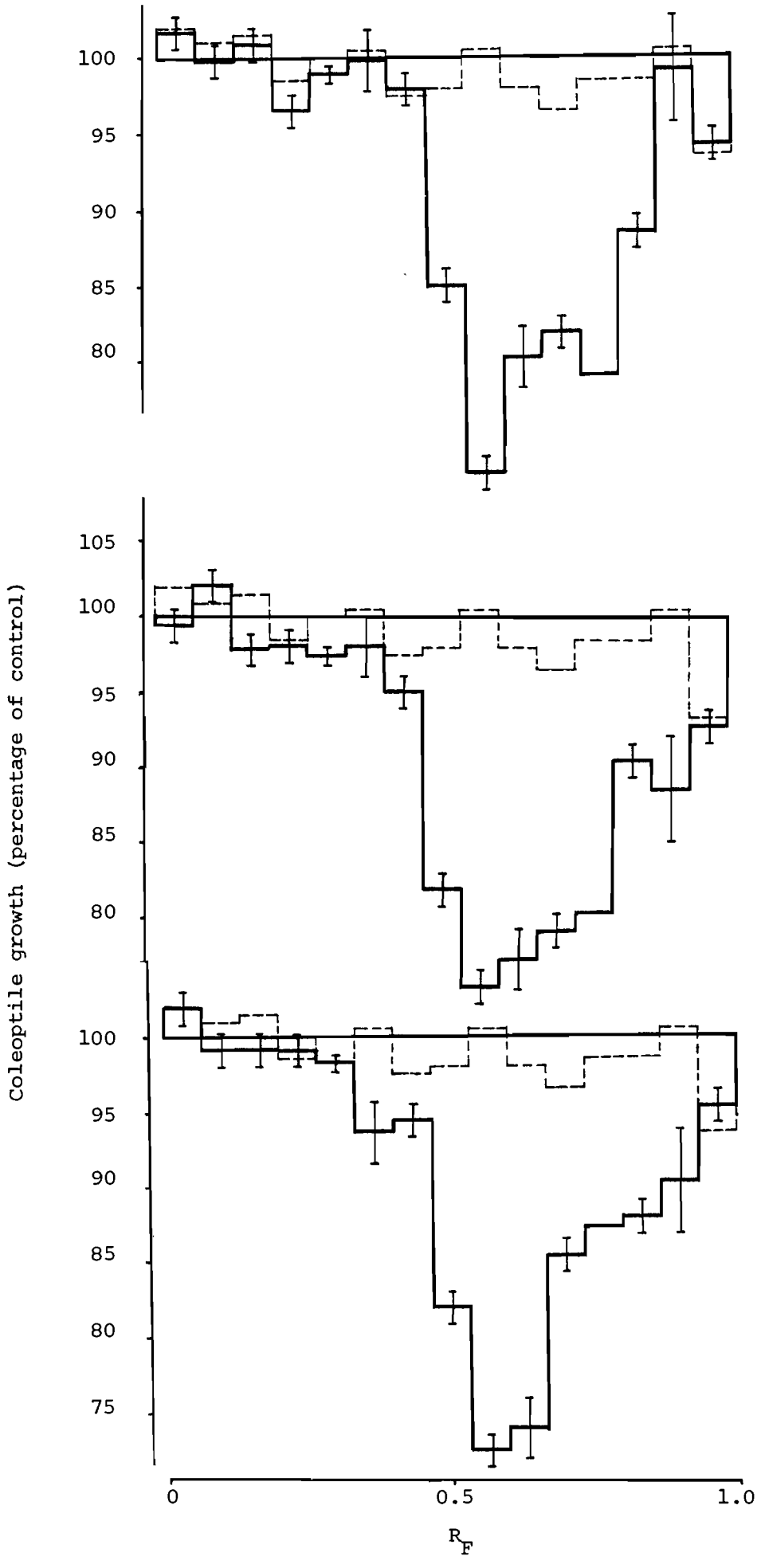

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
80
100
95
90
85
80
75
0
0.5
1.0
R_F

Figure 61. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 13 March 1978 (H1). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

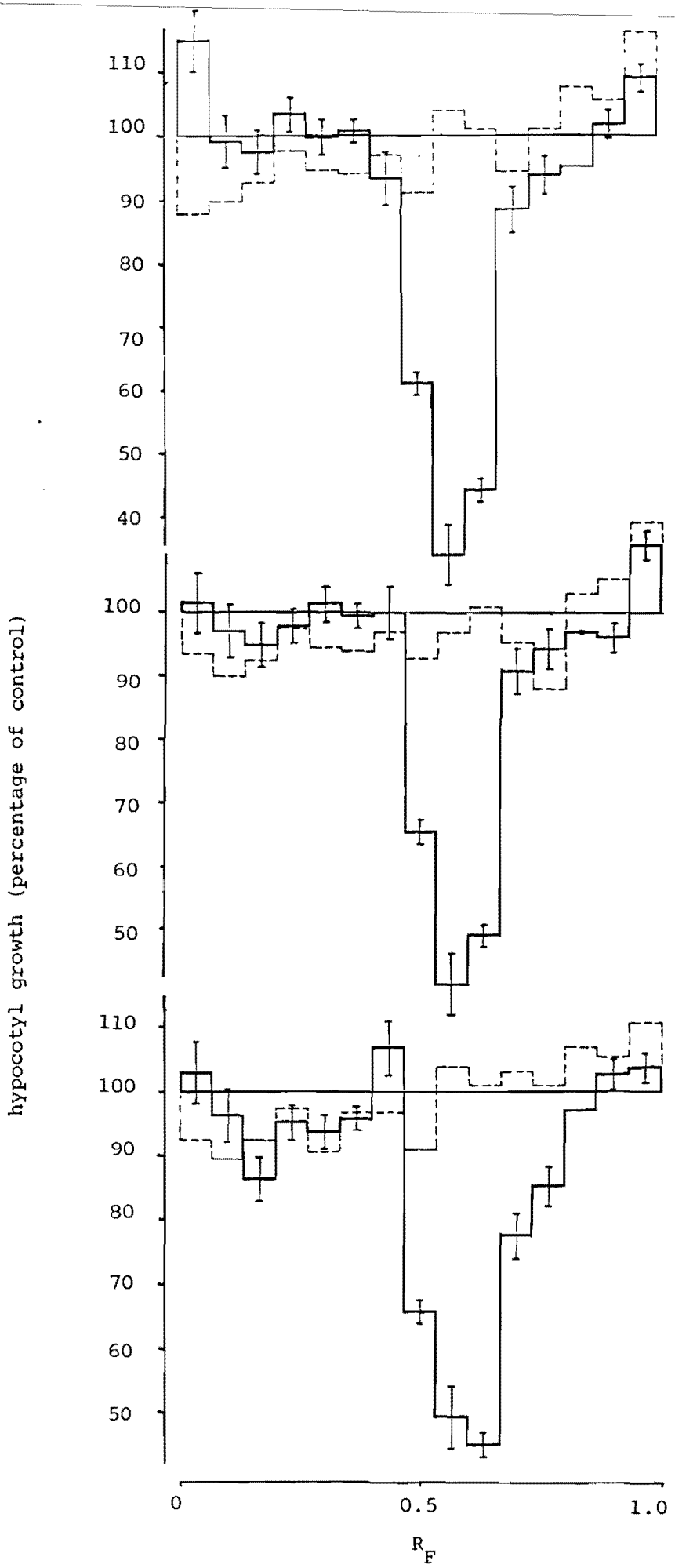

hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
40
100
90
80
70
60
50
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 62. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 14 April 1978 (H2). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

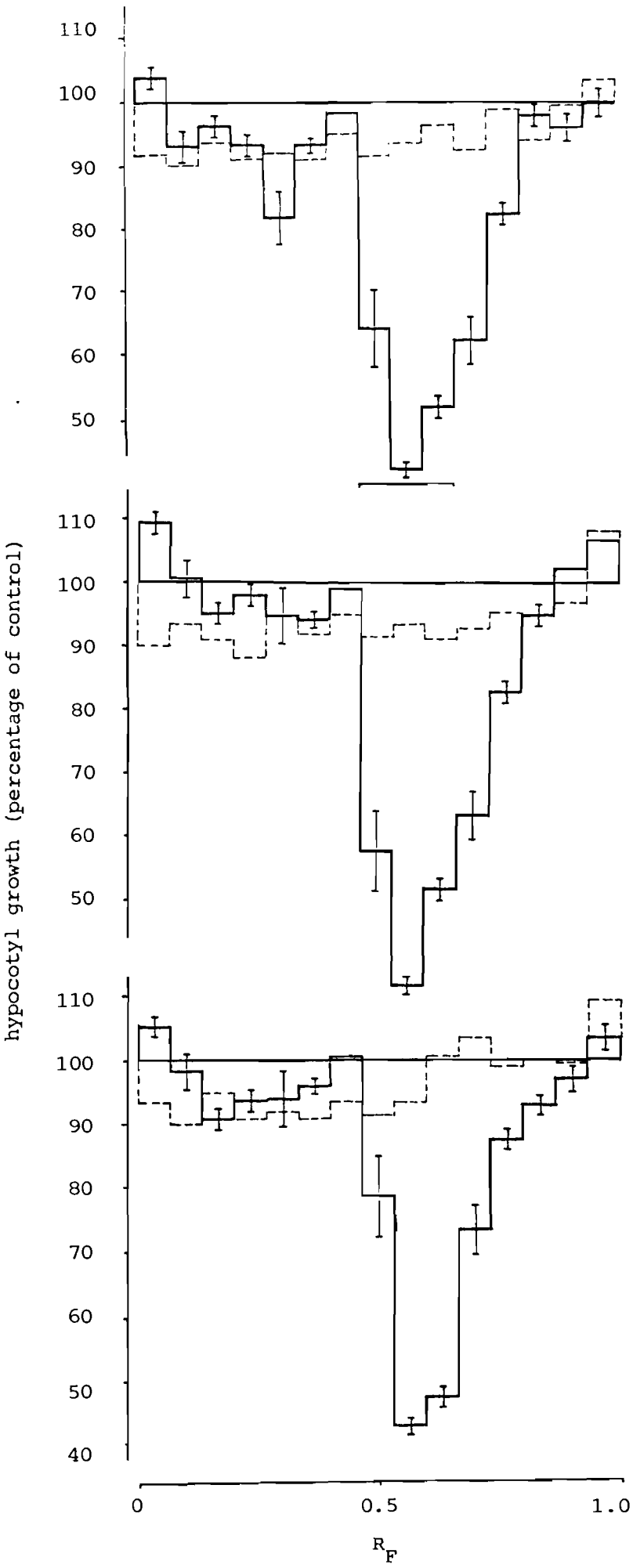

hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
110
100
90
80
70
60
50
110
100
90
80
70
60
50
40
0
0.5
1.0
R_F

Figure 63. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 2 May 1978 (H3). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

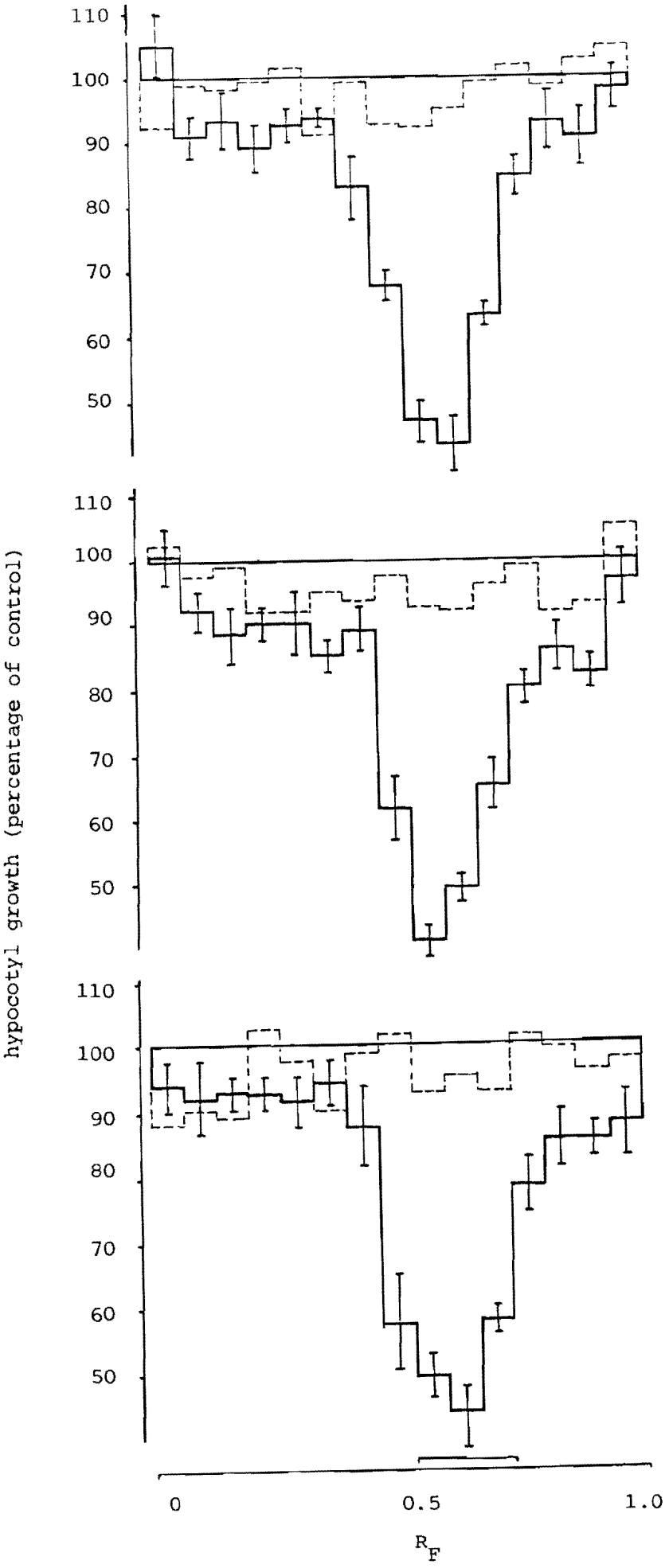

hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 64. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 g and (d) 0.30 g DW of leaf material was assayed. Other details as in figure 18.

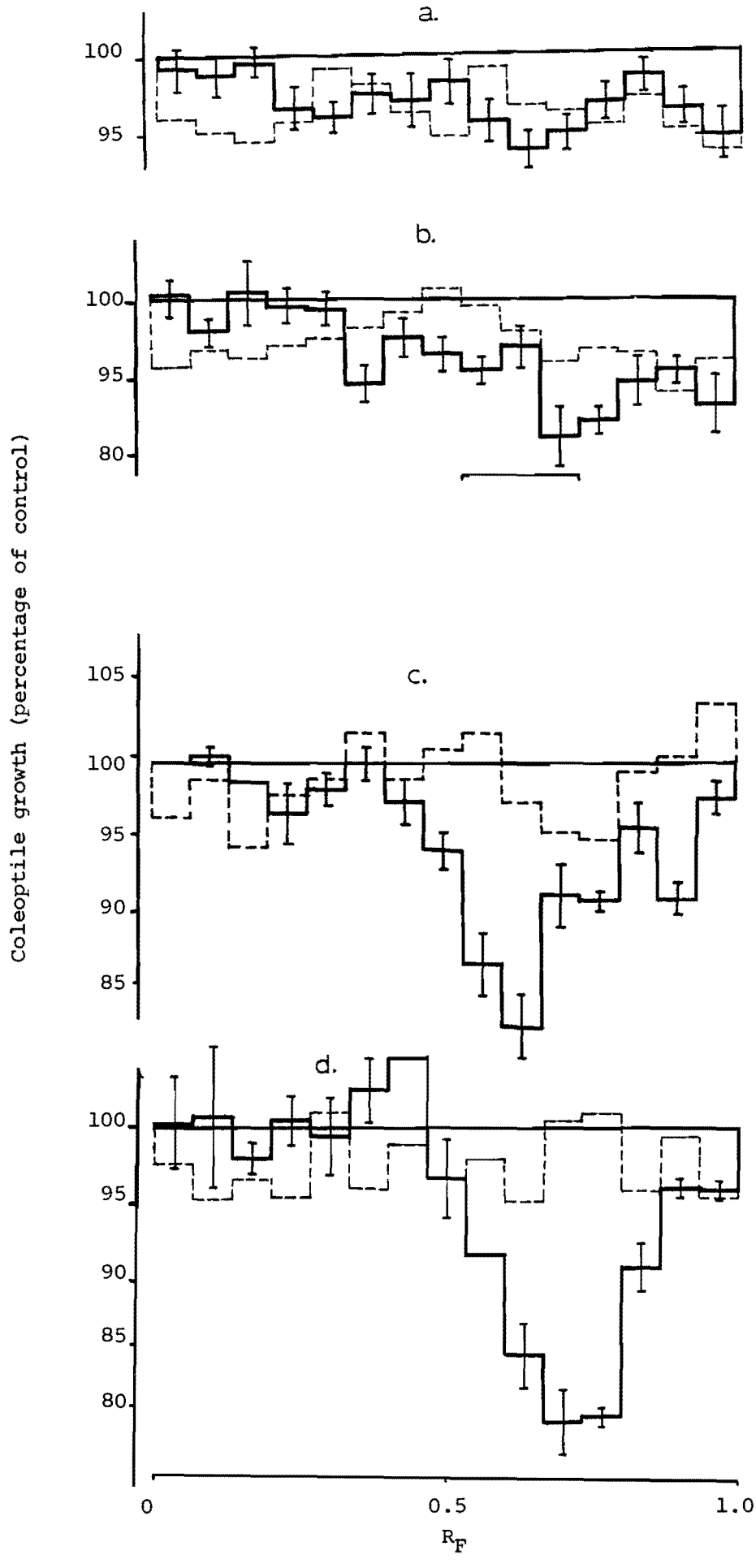

a.
100
95
b.
100
95
80
c.
105
100
95
90
85
d.
100
95
90
85
80
0
0.5
1.0
R_F
Coleoptile growth (percentage of control)

Figure 65. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 13 March 1979 (H3). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 g and (d) 0.30 g DW of leaf material was assayed. Other details as in figure 18.

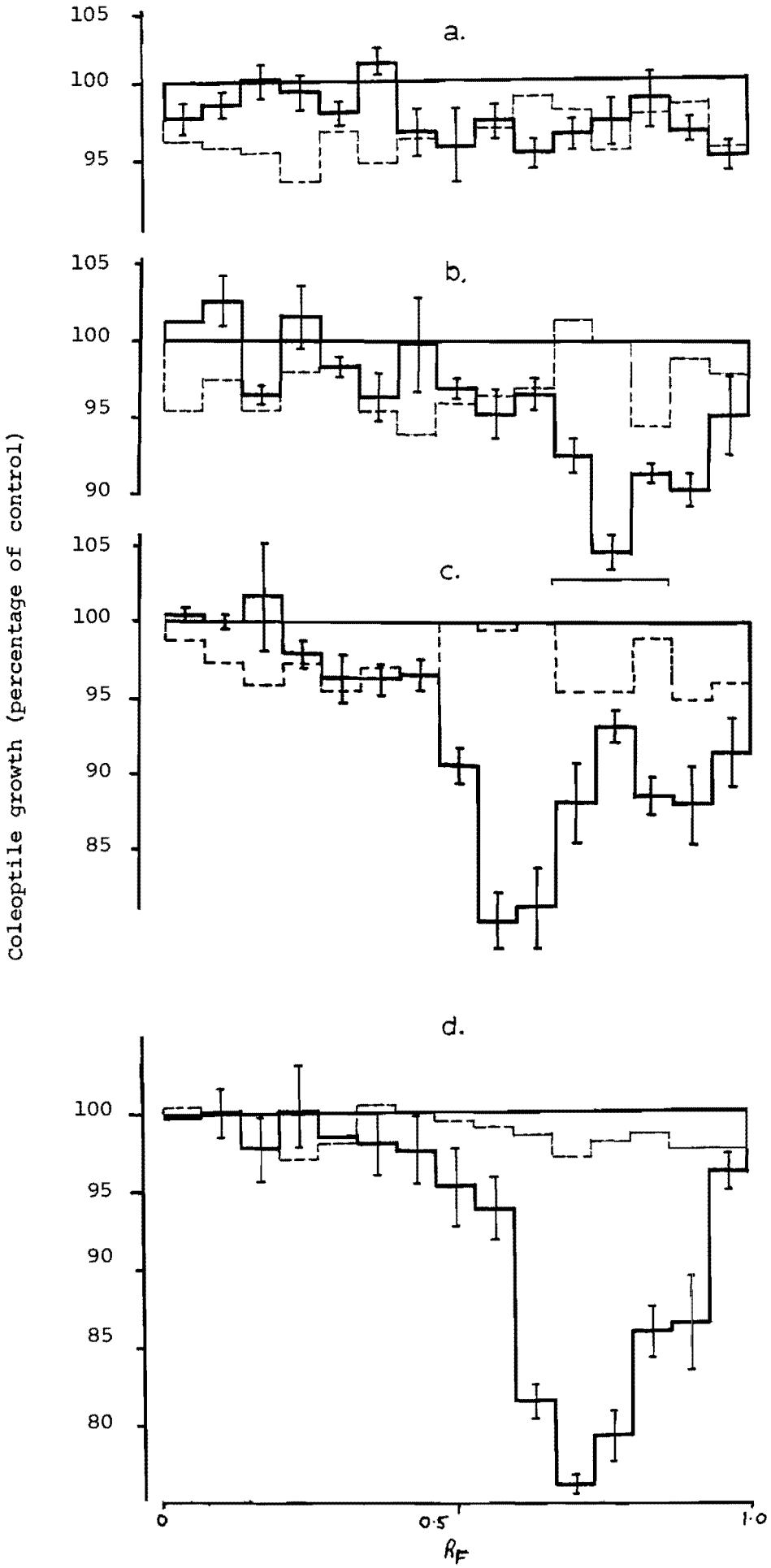

a.
b.
c.
d.
105
100
95
90
85
80
Coleoptile growth (percentage of control)
0
0·5
1·0
R_F

Figure 66. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.30 g DW of leaf material was assayed. Other details as in figure 26.

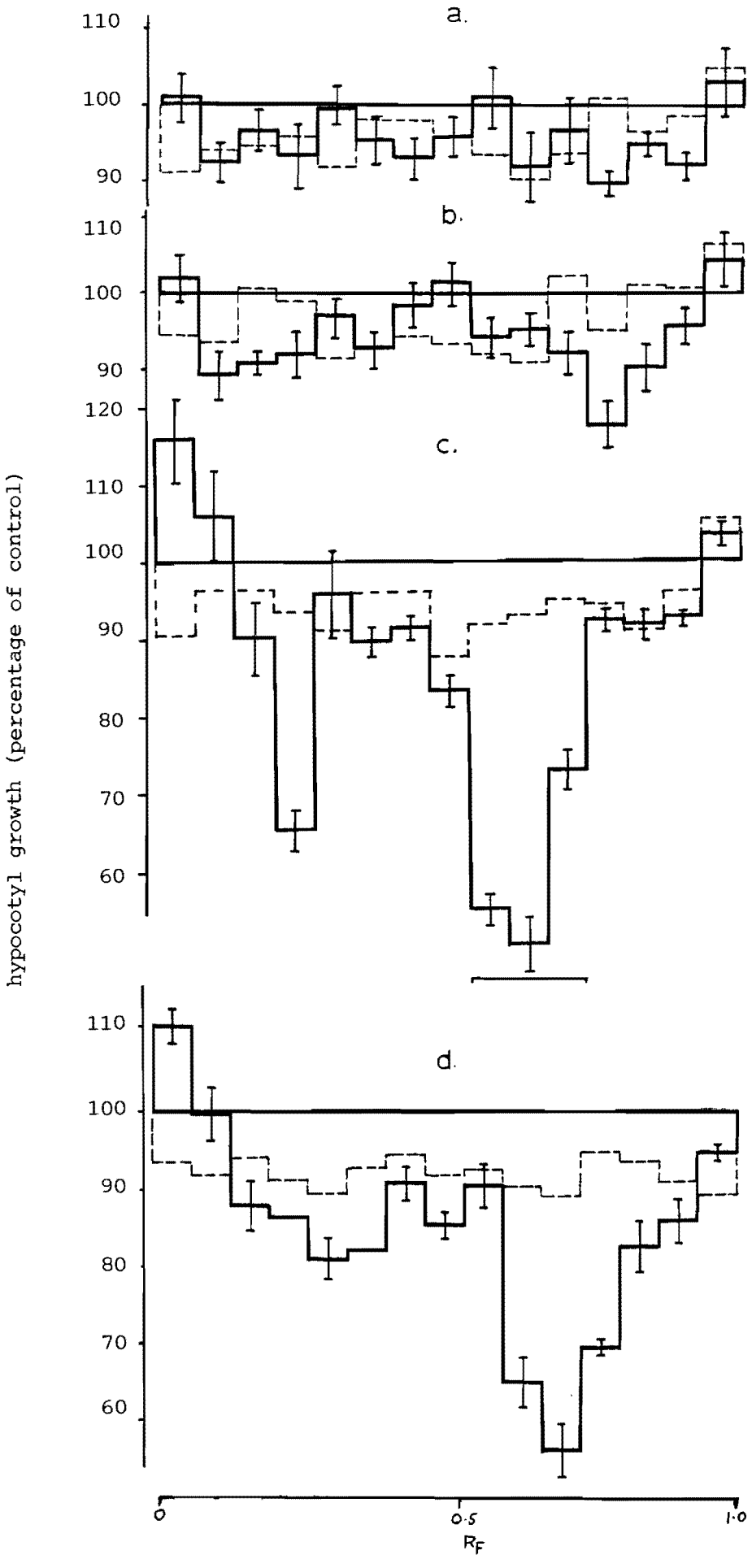

a.
b.
c.
d.
110
100
90
120
80
70
60
hypocotyl growth (percentage of control)
0
0·5
1·0
R_F

Figure 67. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.30 g DW of apical material was assayed. Other details as in figure 26.

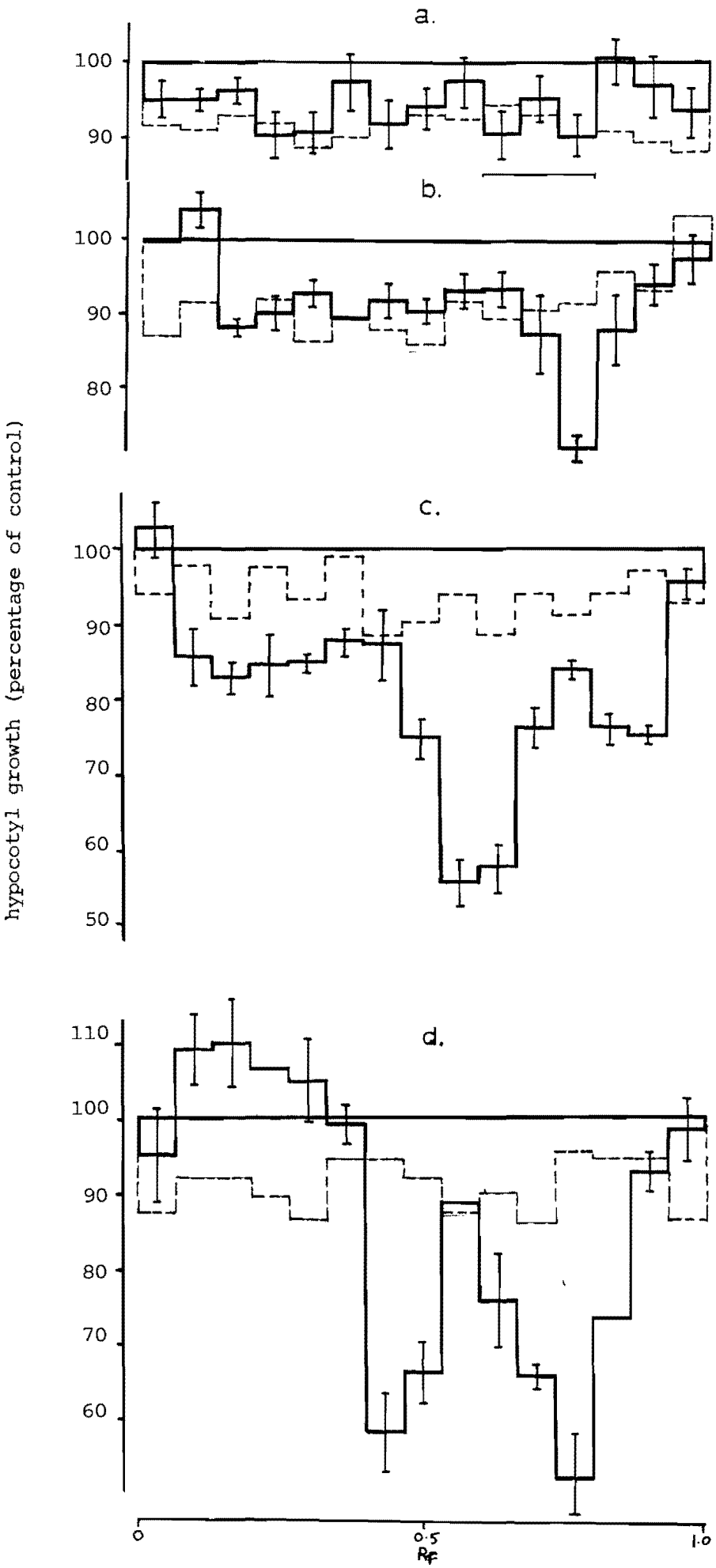

a.
b.
c.
d.
100
90
80
100
90
80
100
90
80
70
60
50
110
100
90
80
70
60
0
0.5
1.0
Rf
hypocotyl growth (percentage of control)

Figure 68. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

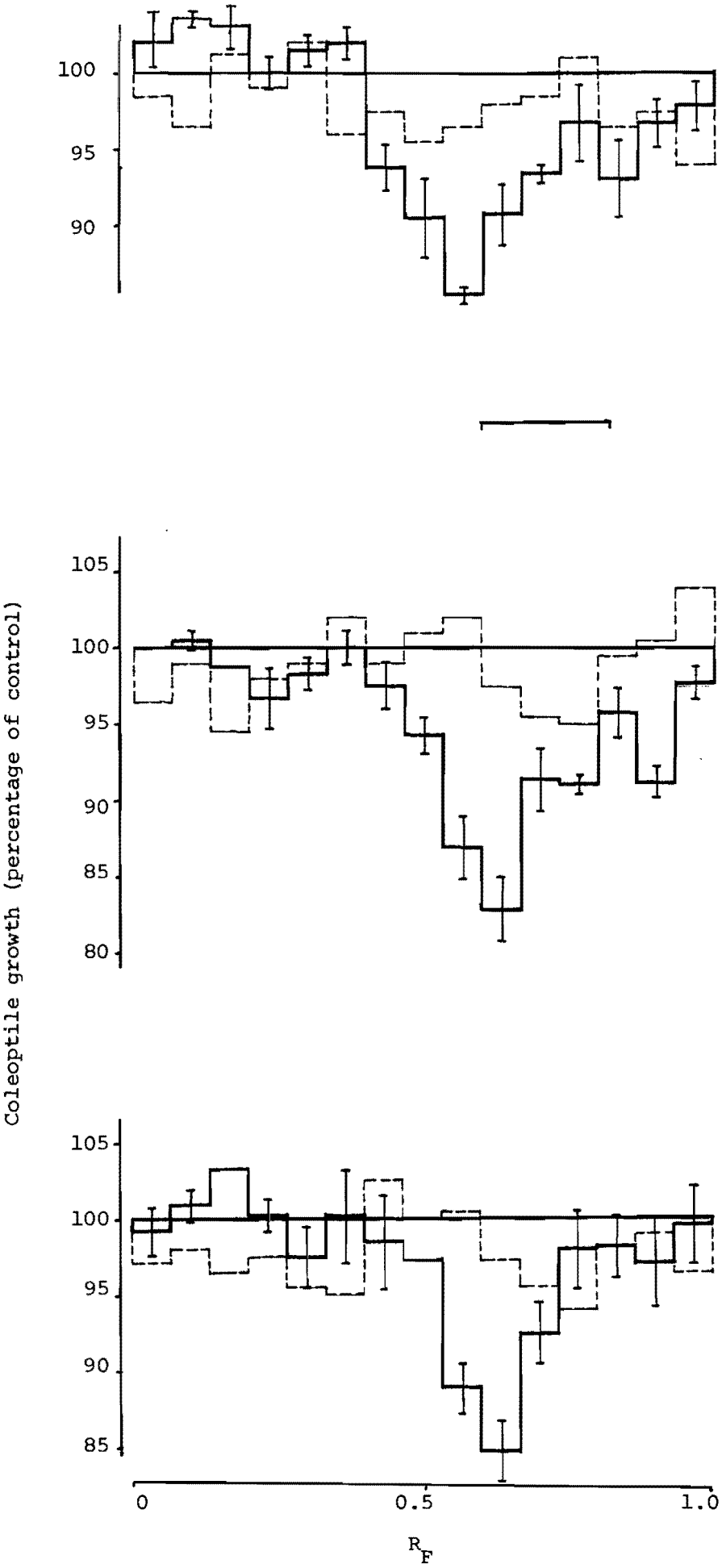

100
95
90
105
100
95
90
85
80
Coleoptile growth (percentage of control)
105
100
95
90
85
0
0.5
1.0
R_F

Figure 69. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 5 March 1979 (H2). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

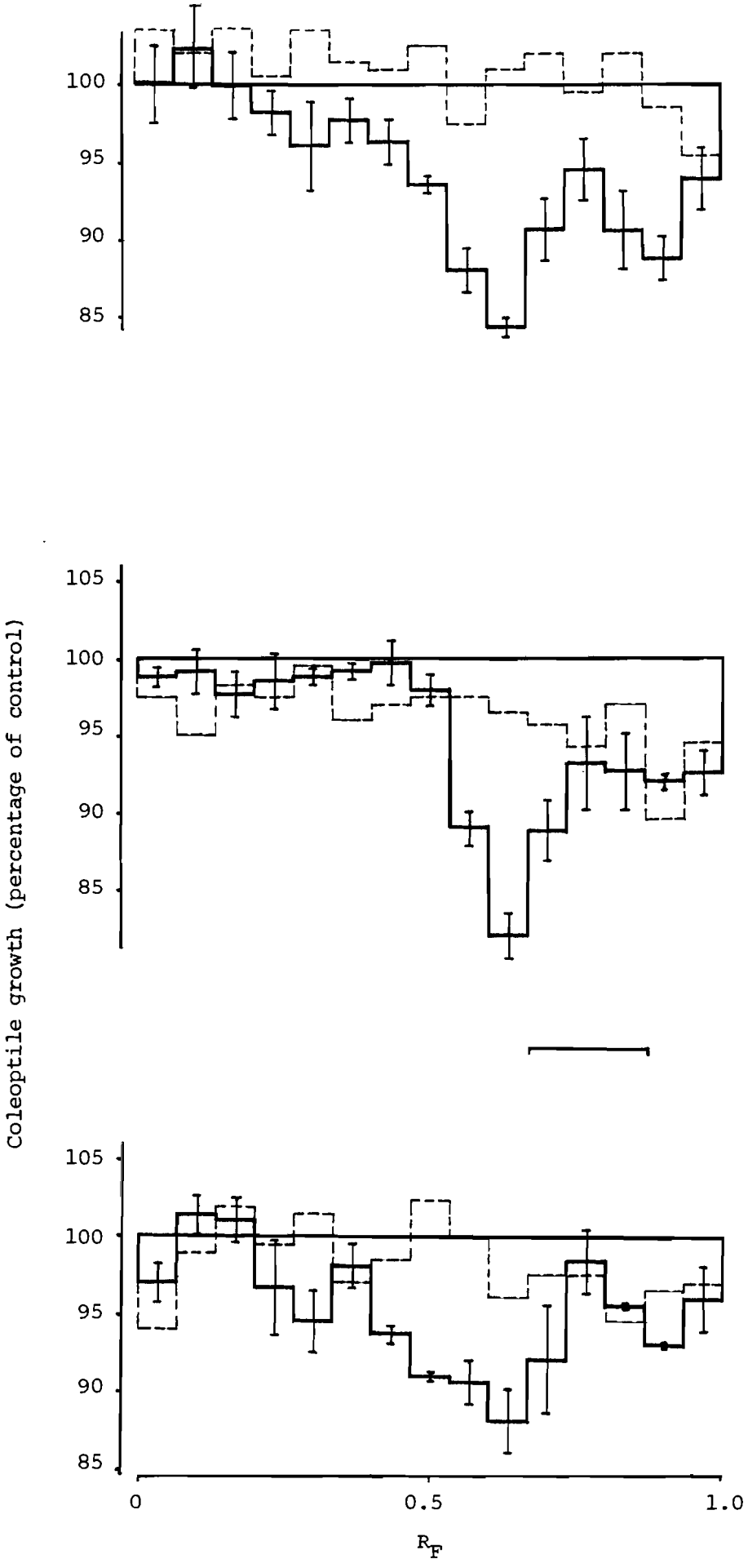

Coleoptile growth (percentage of control)
105
100
95
90
85
105
100
95
90
85
105
100
95
90
85
0
0.5
1.0
R_F

Figure 70. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

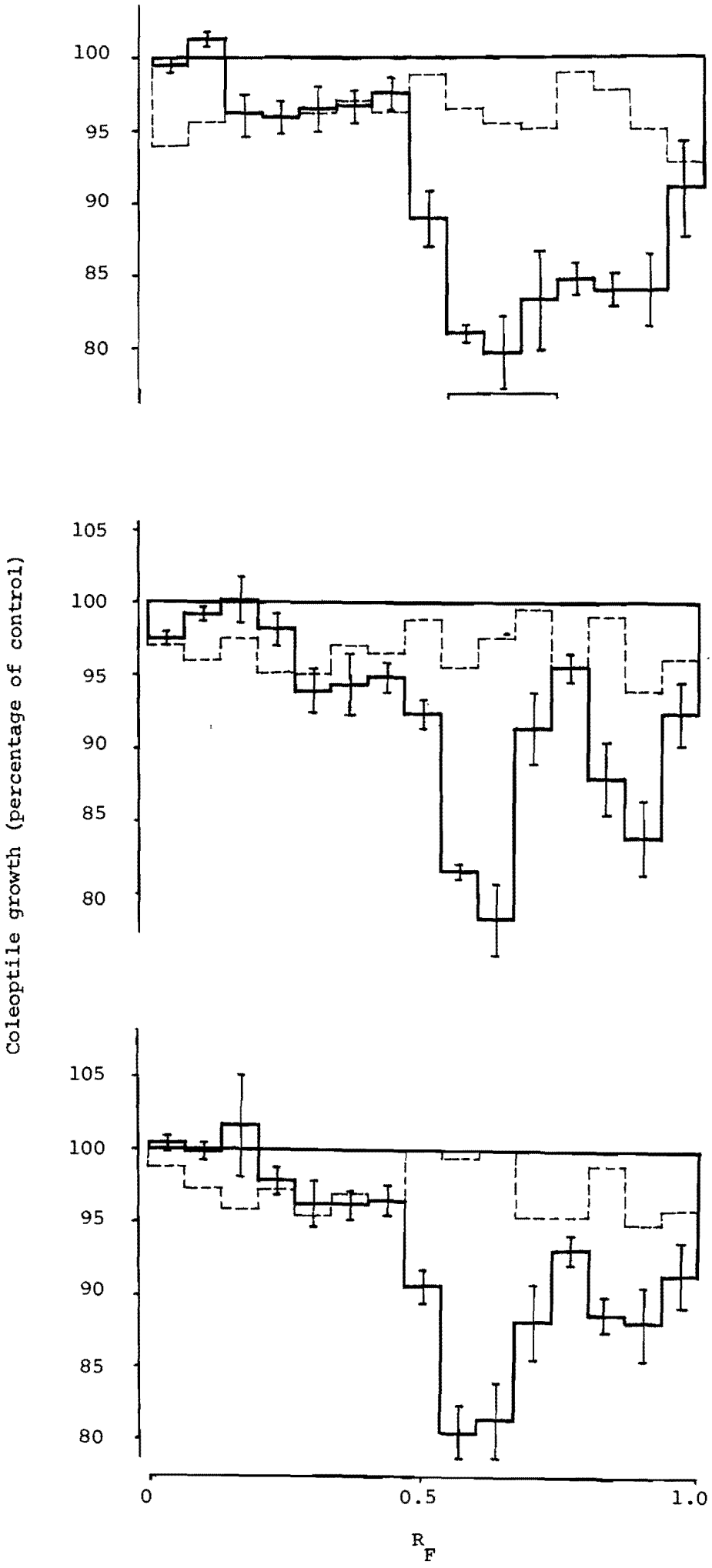

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 71. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

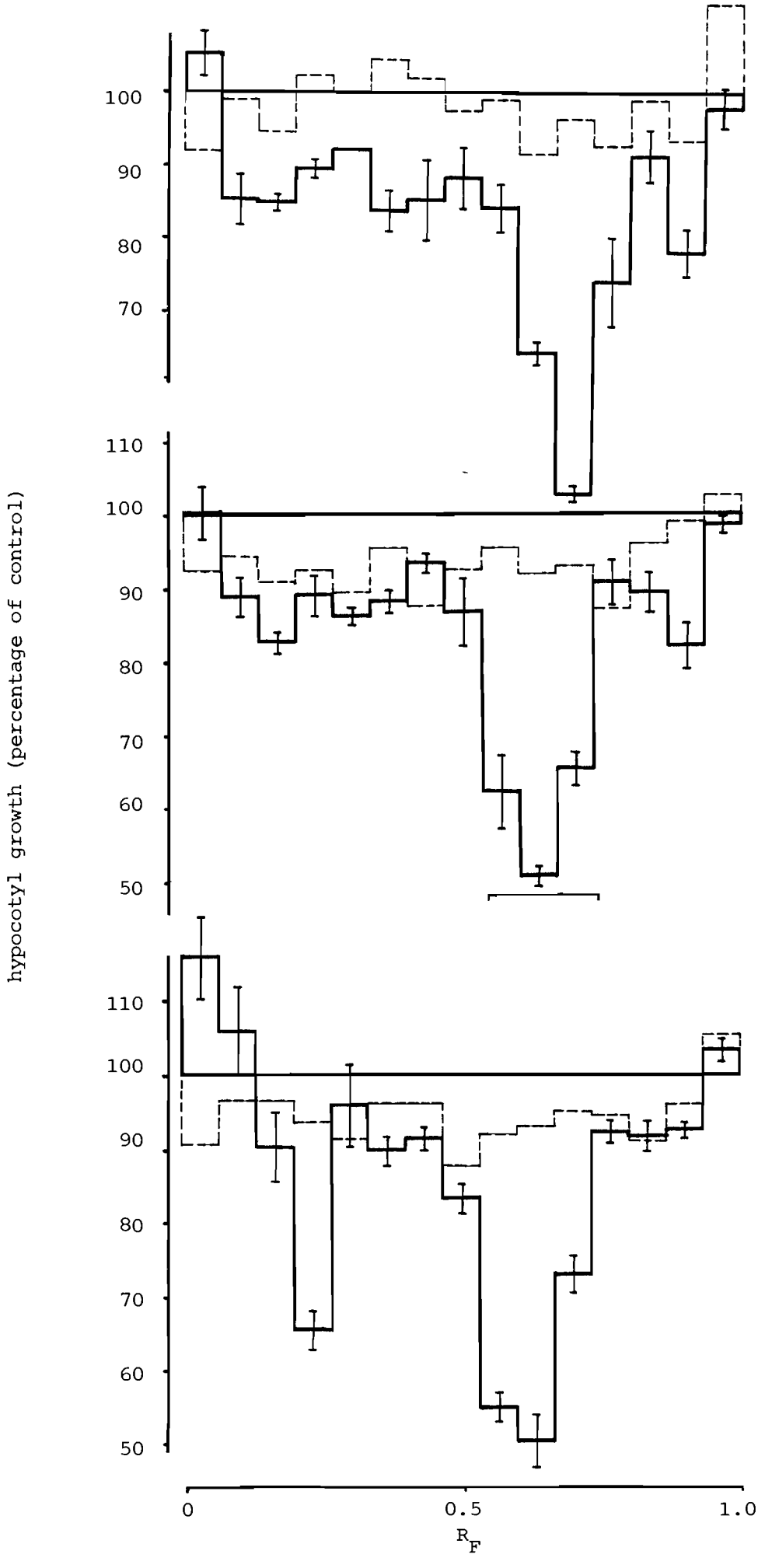

hypocotyl growth (percentage of control)
100
90
80
70
110
100
90
80
70
60
50
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 72. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 13 March 1979 (H2). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

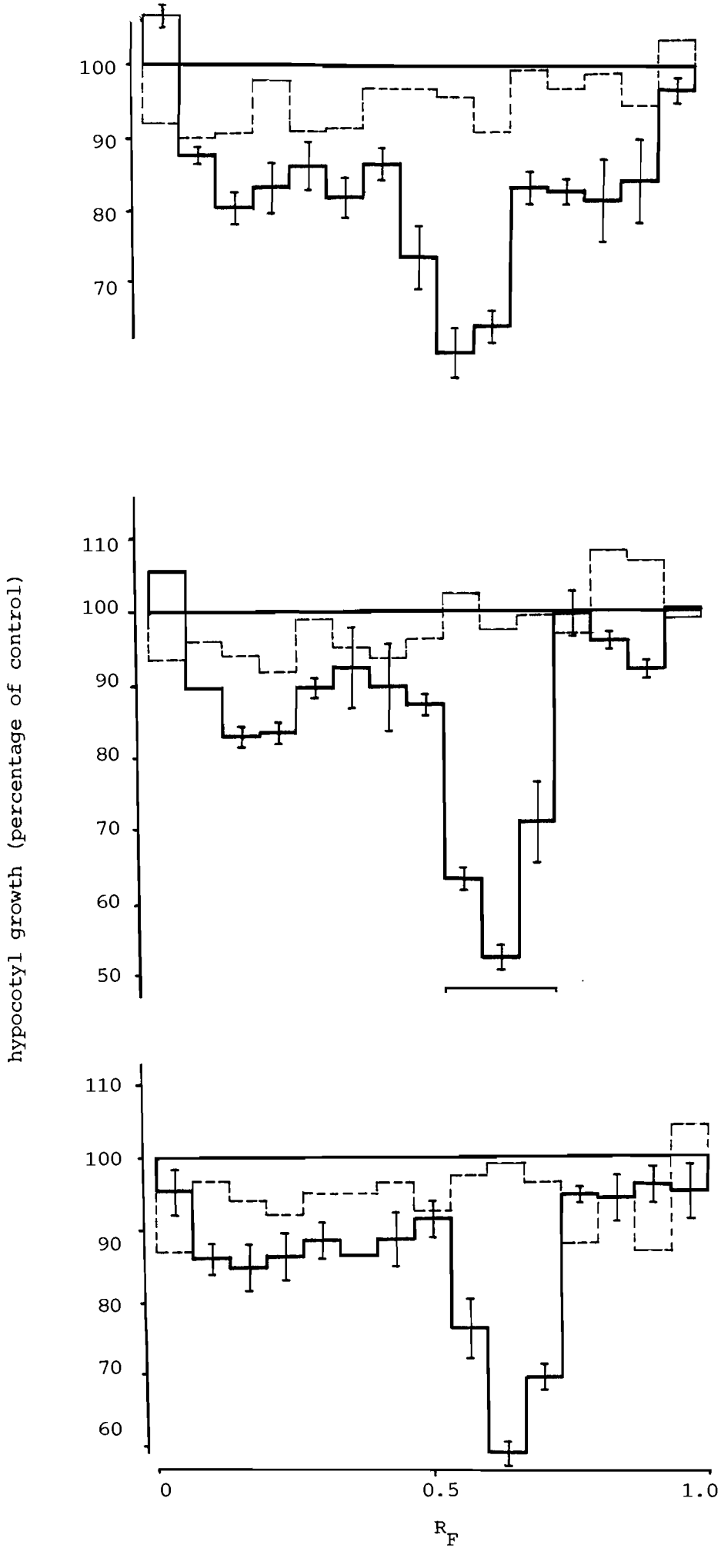

hypocotyl growth (percentage of control)
100
90
80
70
110
100
90
80
70
60
50
110
100
90
80
70
60
0
0.5
1.0
R_F

Figure 73. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

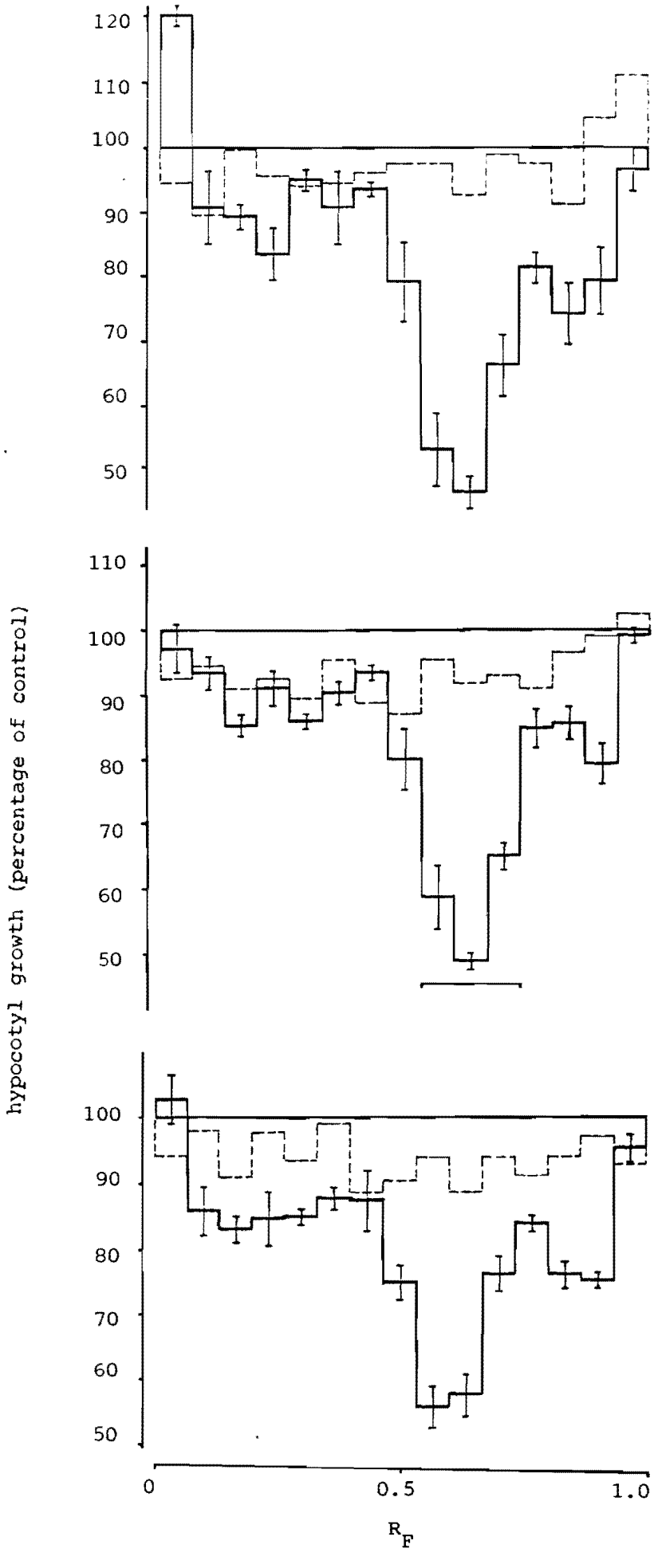

hypocotyl growth (percentage of control)
120
110
100
90
80
70
60
50
110
100
90
80
70
60
50
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 74. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

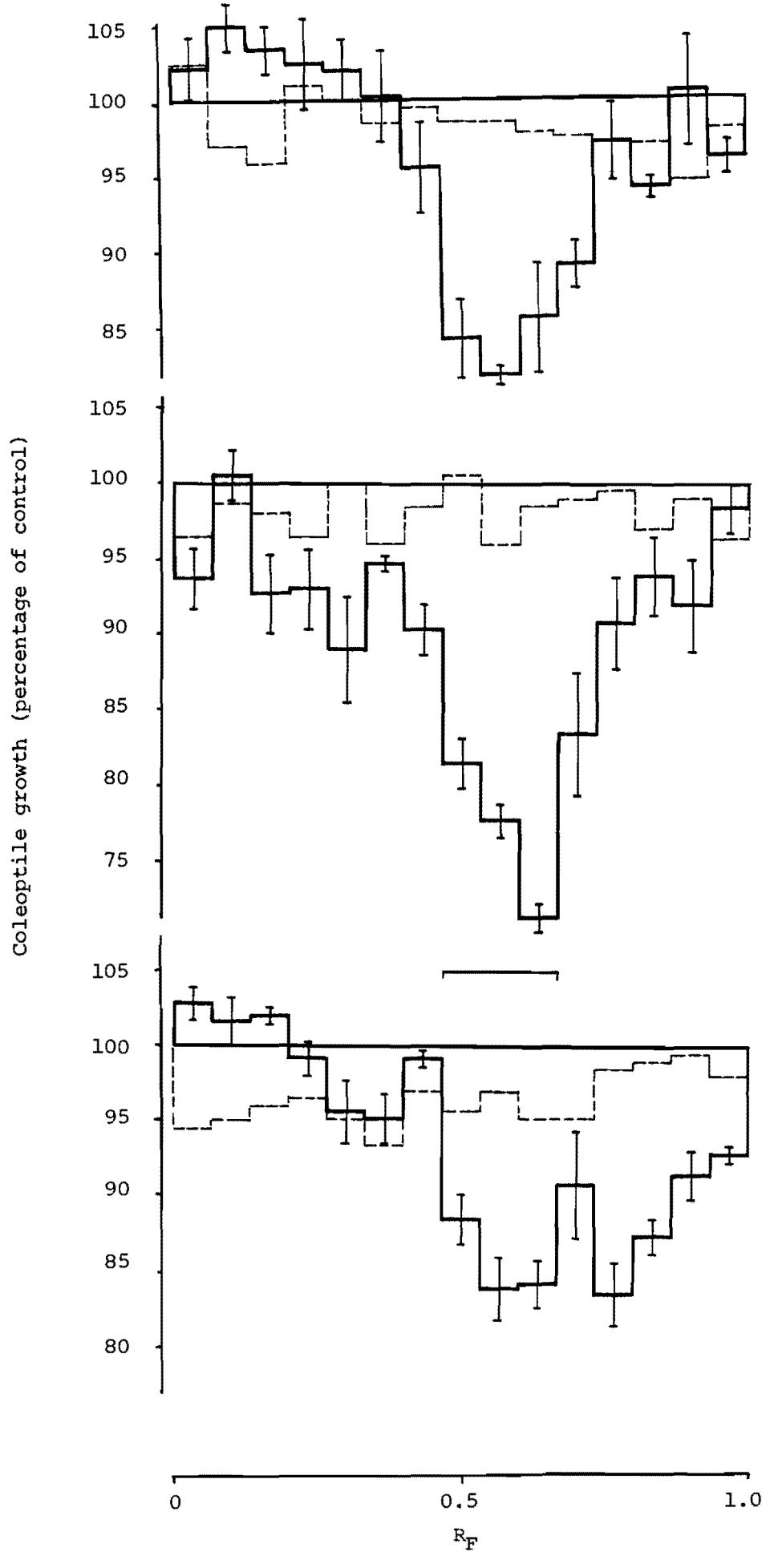

Coleoptile growth (percentage of control)
105
100
95
90
85
105
100
95
90
85
80
75
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 75. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 13 March 1979 (H2). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

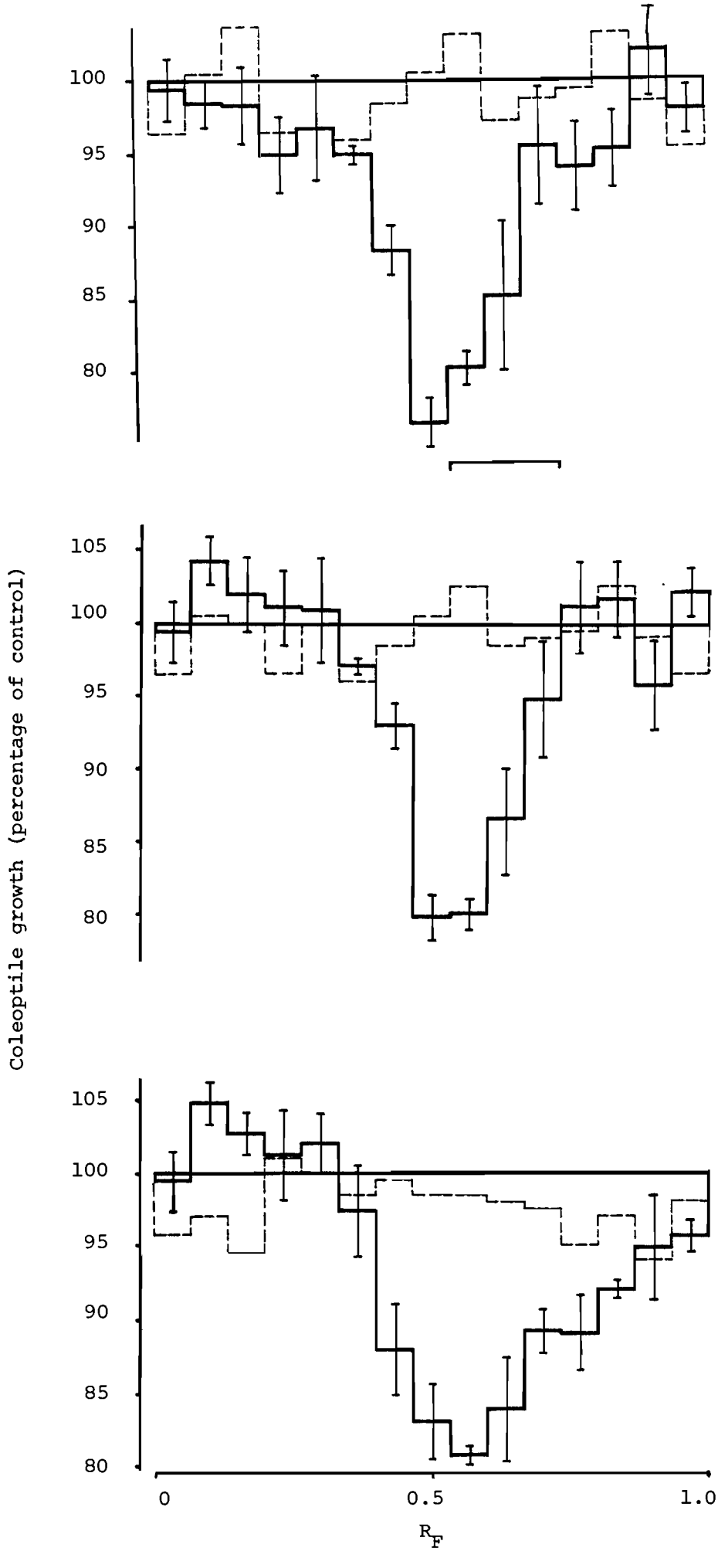

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 76. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

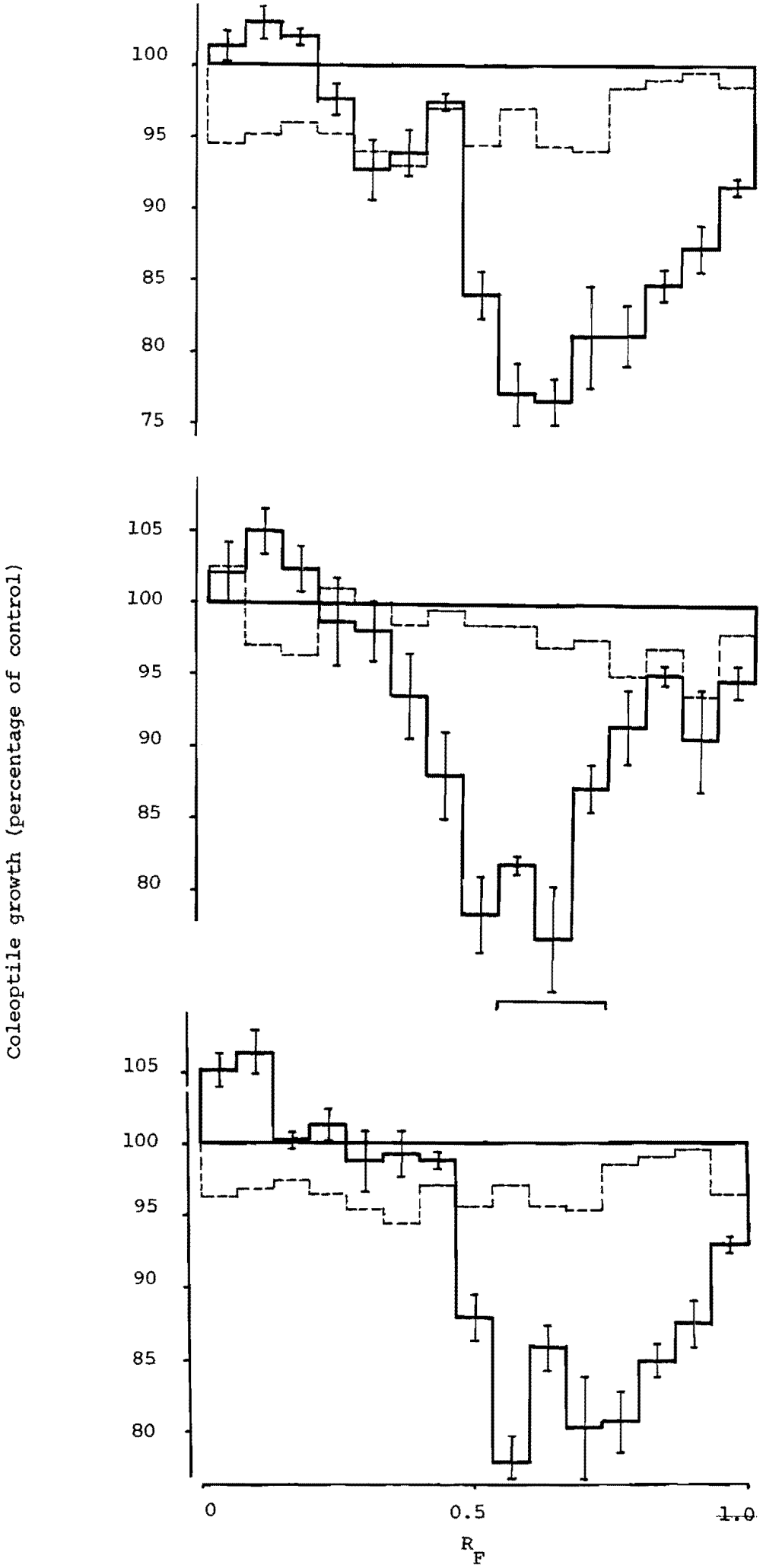

Coleoptile growth (percentage of control)
100
95
90
85
80
75
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 77. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

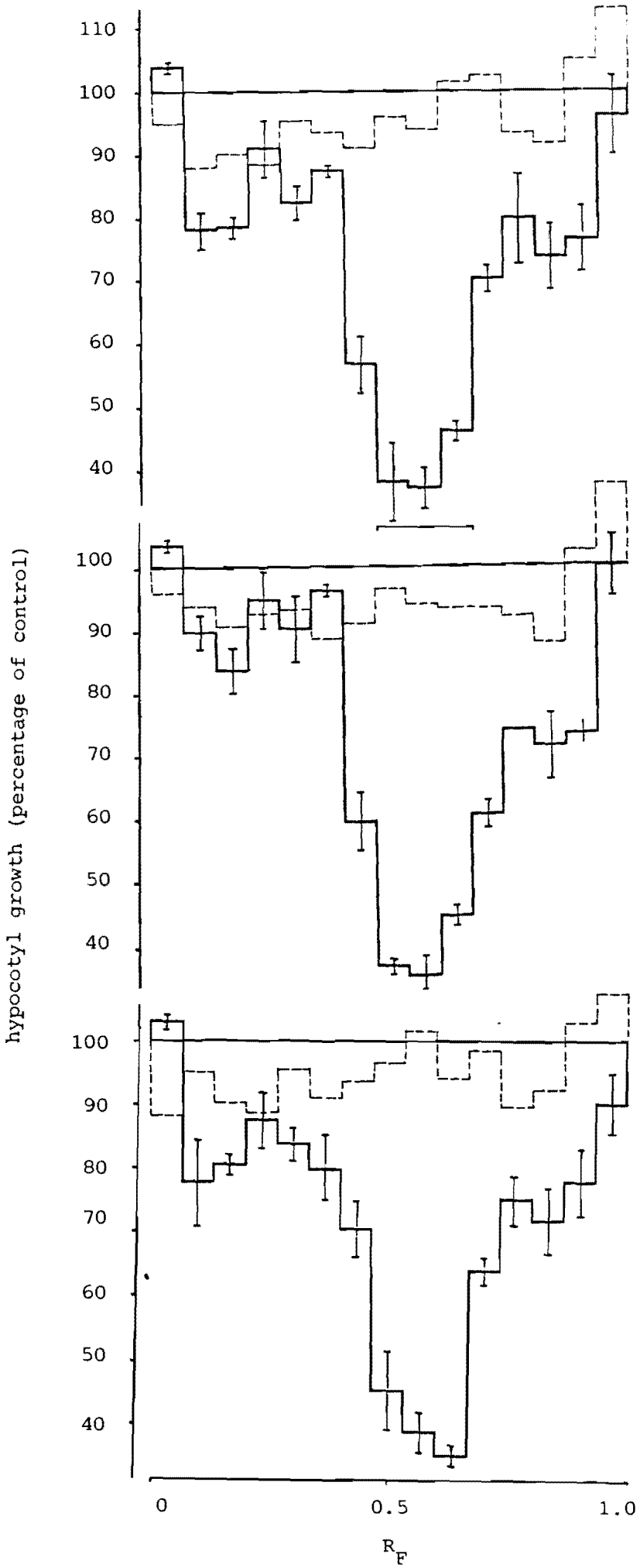

hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
40
100
90
80
70
60
50
40
100
90
80
70
60
50
40
0
0.5
1.0
R_F

Figure 78. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 13 March 1979 (H2). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

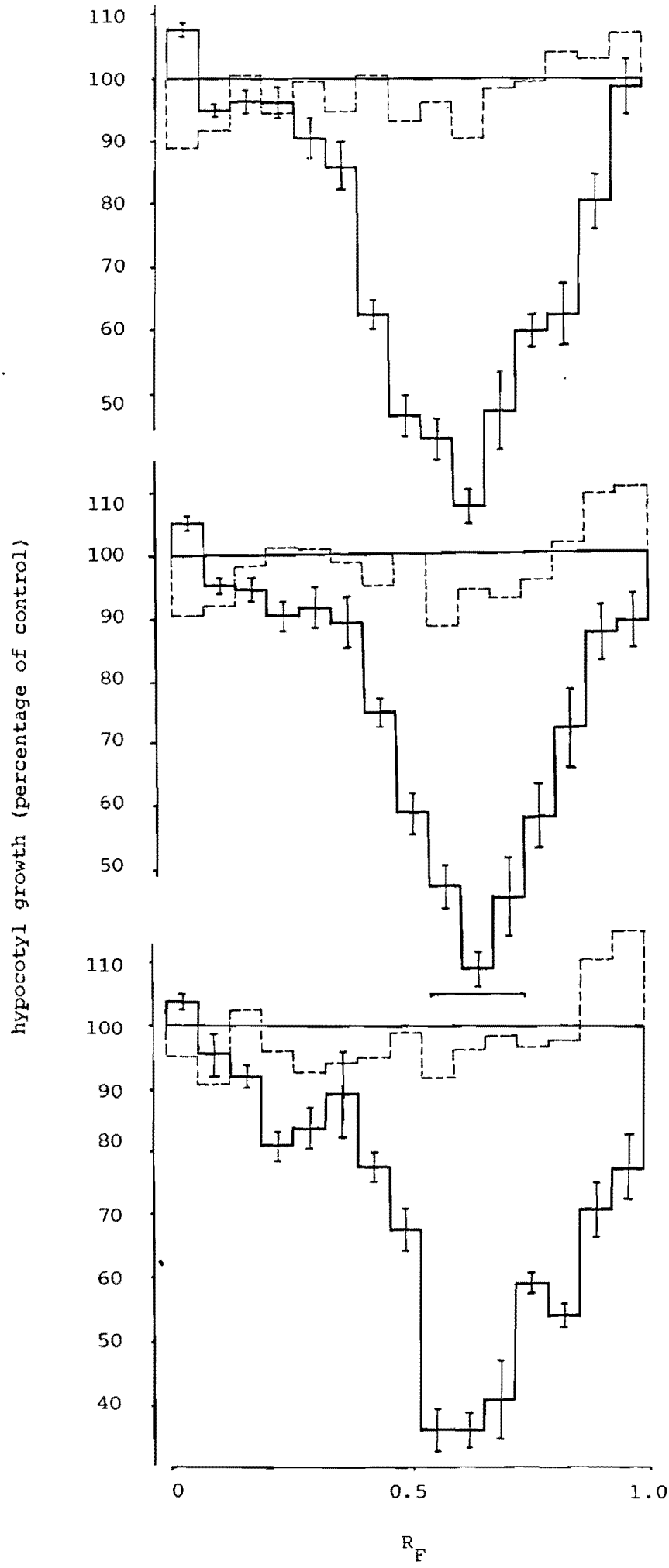

hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
110
100
90
80
70
60
50
110
100
90
80
70
60
50
40
0
0.5
1.0
R_F

Figure 79. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

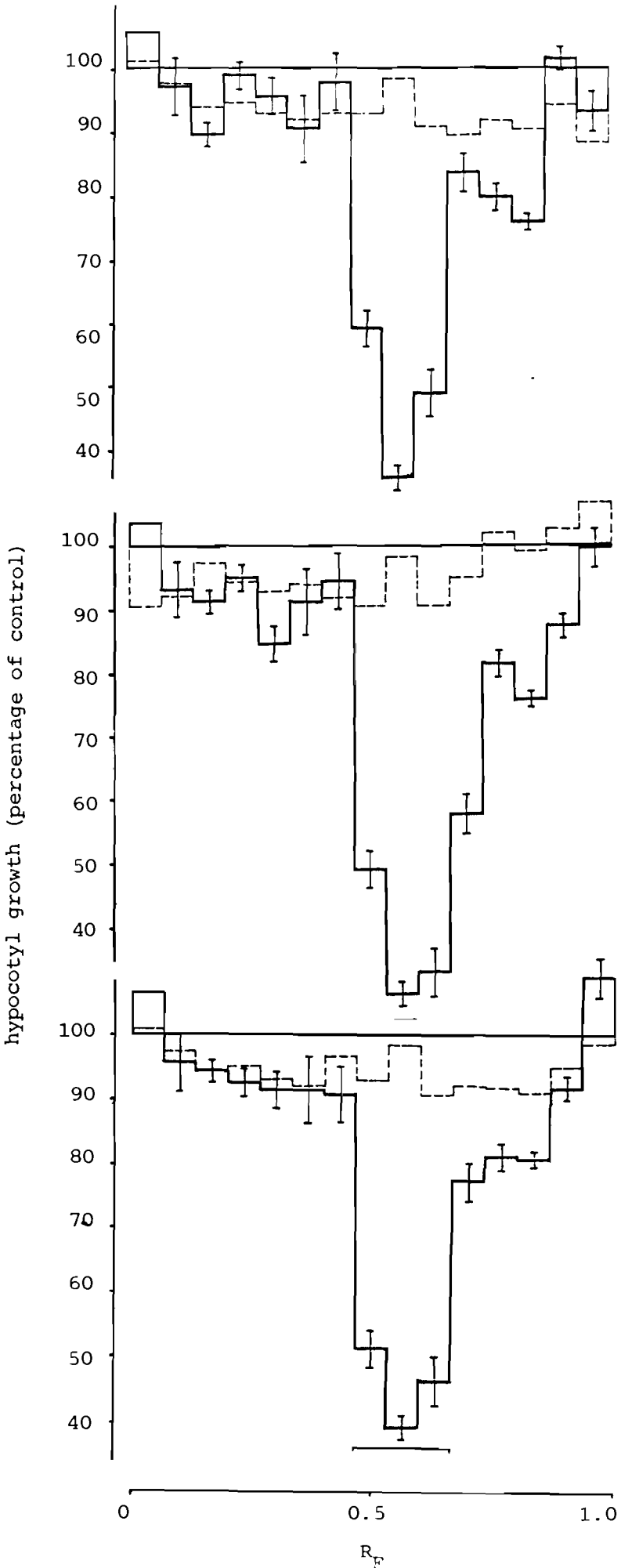

hypocotyl growth (percentage of control)
100
90
80
70
60
50
40
100
90
80
70
60
50
40
100
90
80
70
60
50
40
0
0.5
1.0
R_F

Figure 80. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of (a) 0.02, (b) 0.10, (c) 0.20 and (d) 0.35 g DW of apical material was assayed. Other details as in figure 18.

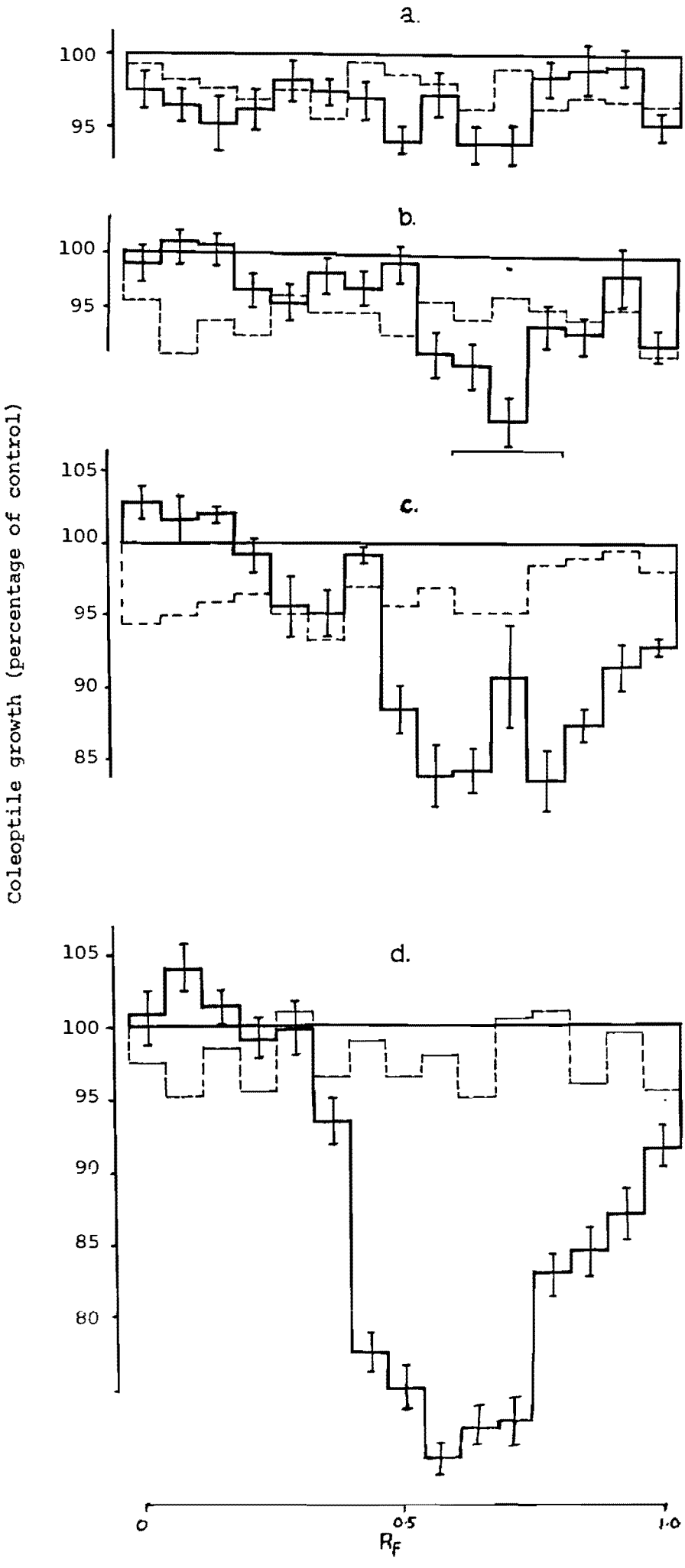

a.
b.
c.
d.
Coleoptile growth (percentage of control)
100
95
105
90
85
80
0
0·5
1·0
R_F

Figure 81. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of (a) 0.02, (b) 0.10, (c) 0.20 and (d) 0.35 g DW of apical material was assayed. Other details as in figure 18.

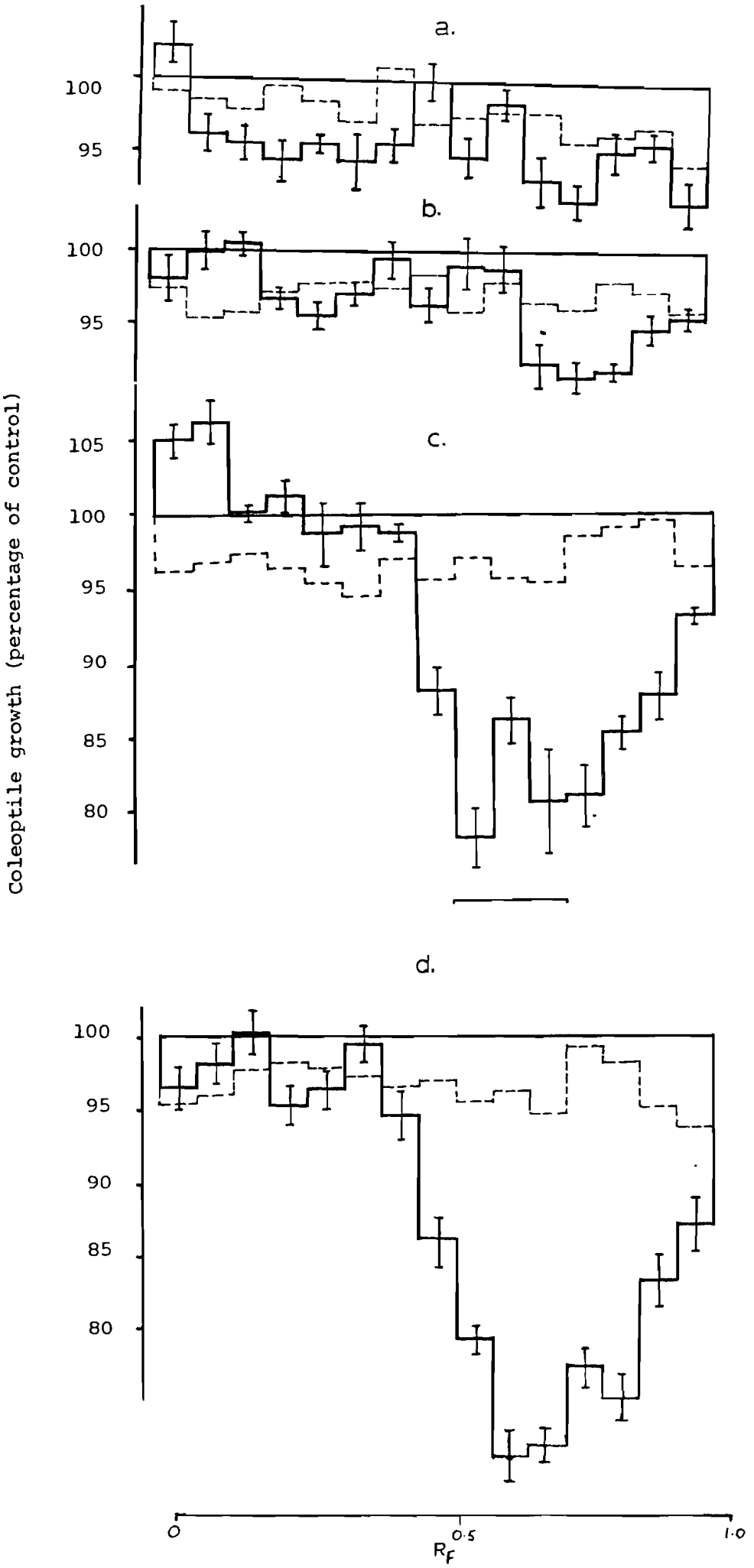

a.
b.
c.
d.
100
95
100
95
105
100
95
90
85
80
100
95
90
85
80
Coleoptile growth (percentage of control)
0
0·5
1·0
R_F

Figure 82. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 5 March 1979 (H1). The equivalent of (a) 0.02, (b) 0.10, (c) 0.20) and (d) 0.35 g DW of material was assayed. Other details as in figure 26.

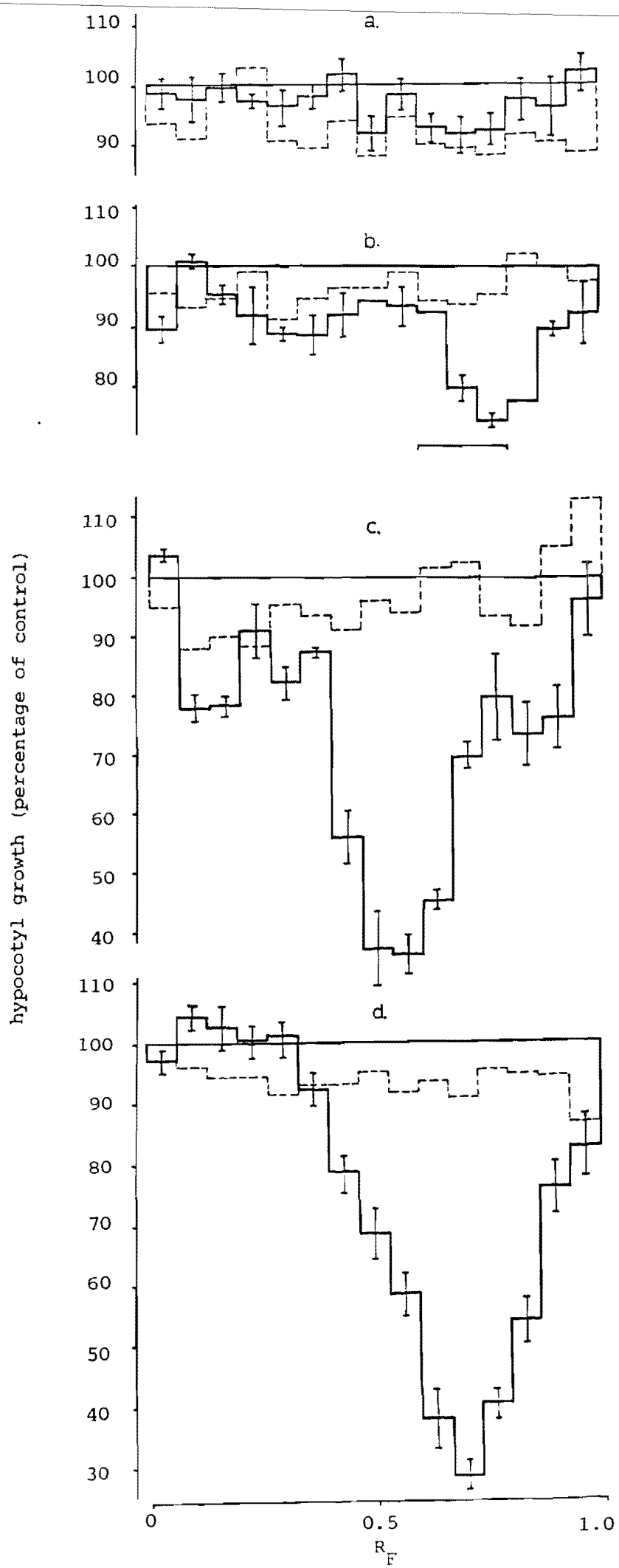

a.
b.
c.
d.
110
100
90
80
70
60
50
40
30
hypocotyl growth (percentage of control)
0
0.5
1.0
R_F

Figure 83. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from apices of *Alnus glutinosa* trees harvested on 4 April 1979 (H3). The equivalent of (a) 0.02, (b) 0.10, (c) 0.20 and (d) 0.35 g DW of apical material was assayed. Other details as in figure 26.

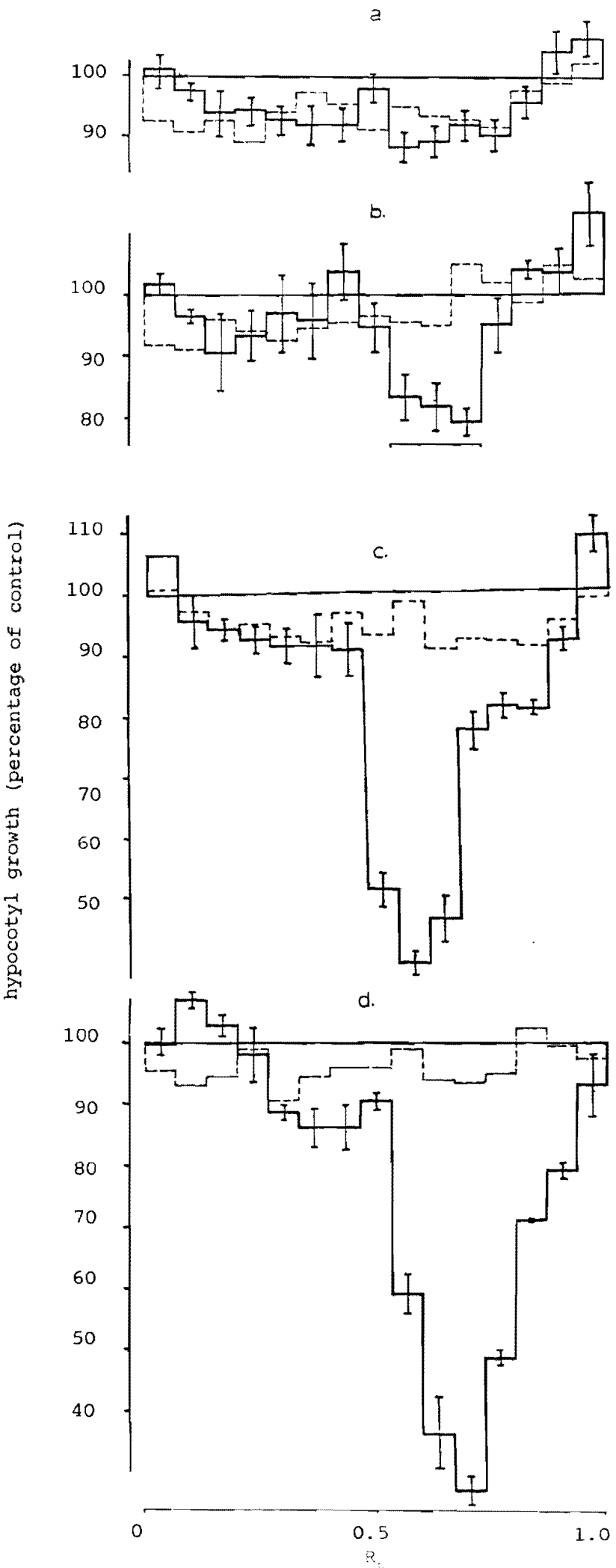

a
100
90
b.
100
90
80
hypocotyl growth (percentage of control)
110
100
90
80
70
60
50
c.
d.
100
90
80
70
60
50
40
0
0.5
1.0
R

Figure 84. Diagram of a typical chromatograph of the inhibitor β fraction of *Alnus glutinosa* apices as seen under (A) U.V. light, and (B) visible light before and after spray treatment with phenolic reagents. The inhibitor β fraction was isolated from the equivalent of 0.2 g DW of tissue. The R_F zone 0.5 to 0.9 on paper chromatographs developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) was rechromatographed using n-butanol:NH (5:1::v:v) as solvent.

(i) no spray treatment

(ii) treatment with diazotised sulphanilic acid

(iii) treatment with diazotised p-nitroaniline

(iv) treatment with 0.2% $FeCL_3$ (w:v in water)

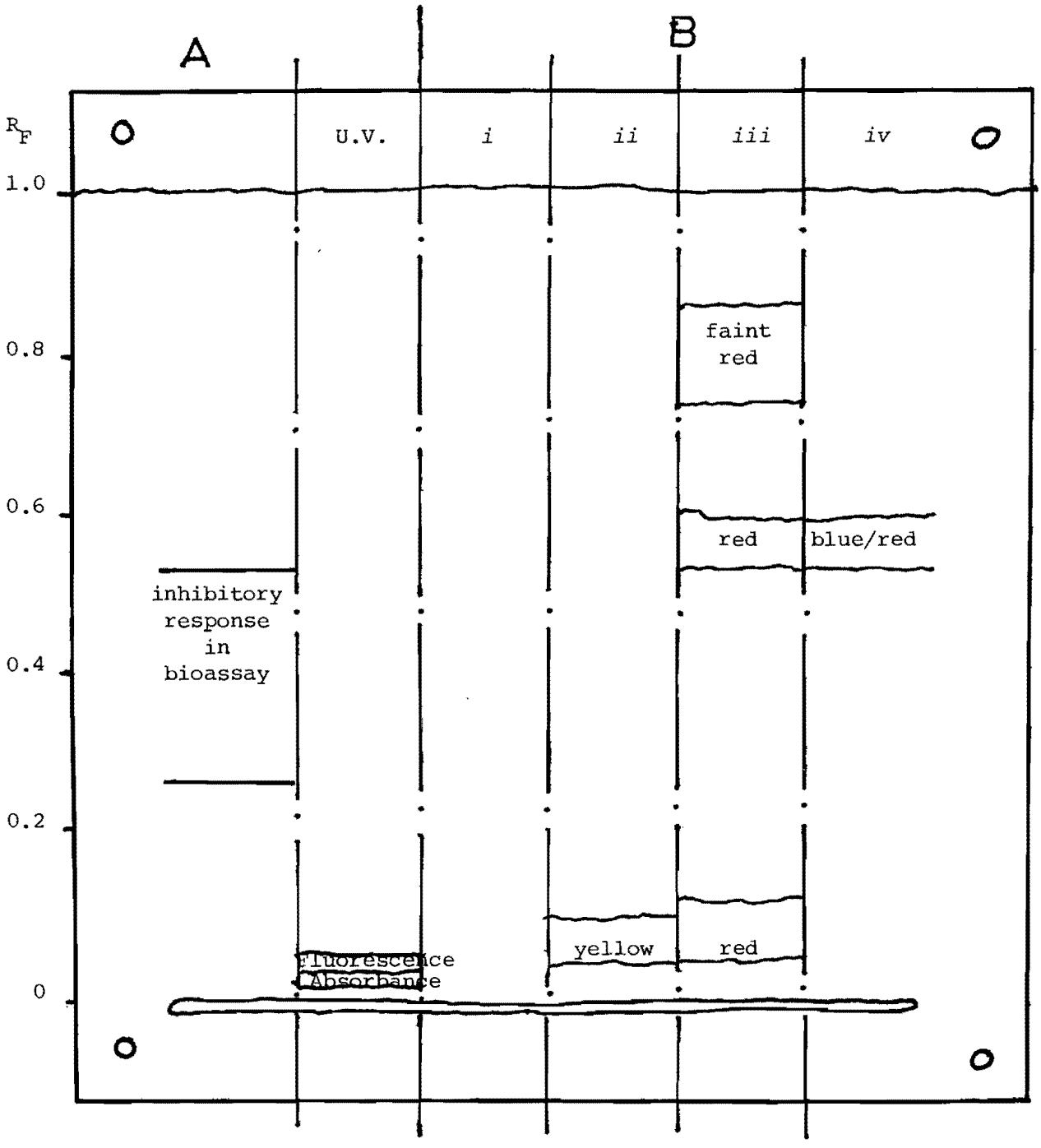

A
B
R_F
1.0
0.8
0.6
0.4
0.2
0
U.V.
i
ii
iii
iv
faint red
red
blue/red
inhibitory response in bioassay
yellow
red
Fluorescence
Absorbance

Figure 85. Wheat coleoptile section assay of the inhibitor β fraction of *Alnus glutinosa* apices harvested on (A) 13 March 1978 (H1) and (B) 2 May 1978 (H3). The inhibitor β fraction was isolated from the acidic ether-soluble fraction by paper chromatography with isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. The zone R_F 0.5 to 0.9 was rechromatographed using n-butanol:NH_3 (5:1::v:v) as solvent. The equivalent to 0.25 g DW of apical material was assayed. The solid horizontal bar indicates the R_F of authentic ABA and the broken horizontal bars indicate the positions of phenolic-like substances. Other details as in figure 18.

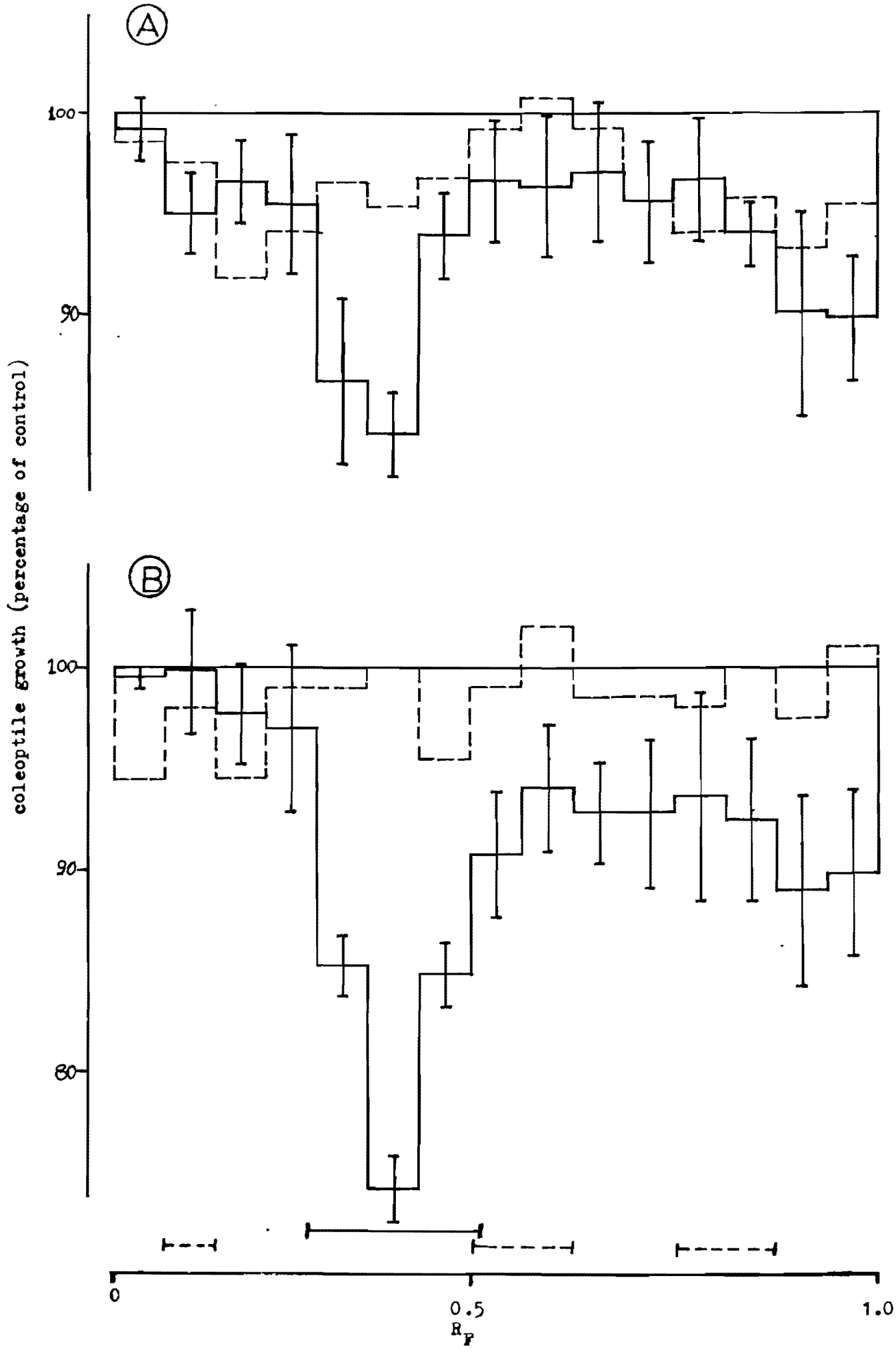

A
B
100
90
80
coleoptile growth (percentage of control)
0
0.5
1.0
R_F

Figure 86. Lettuce hypocotyl assay of the inhibitor β fraction of *Alnus glutinosa* apices harvested on (A) 13 March 1978 (H1) and (B) 2 May 1978 (H3). The inhibitor β fraction was isolated from the acidic ether-soluble fraction by paper chromatography with isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. The zone R_F 0.5 to 0.9 was rechromatographed using n-butanol:NH_3 (5:1::v:v) as solvent. The equivalent to 0.25 g DW of apical material was assayed. The solid horizontal bar indicates the R_F of authentic ABA and the broken horizontal bars indicate positions of phenolic-like substances. Other details as in figure 26.

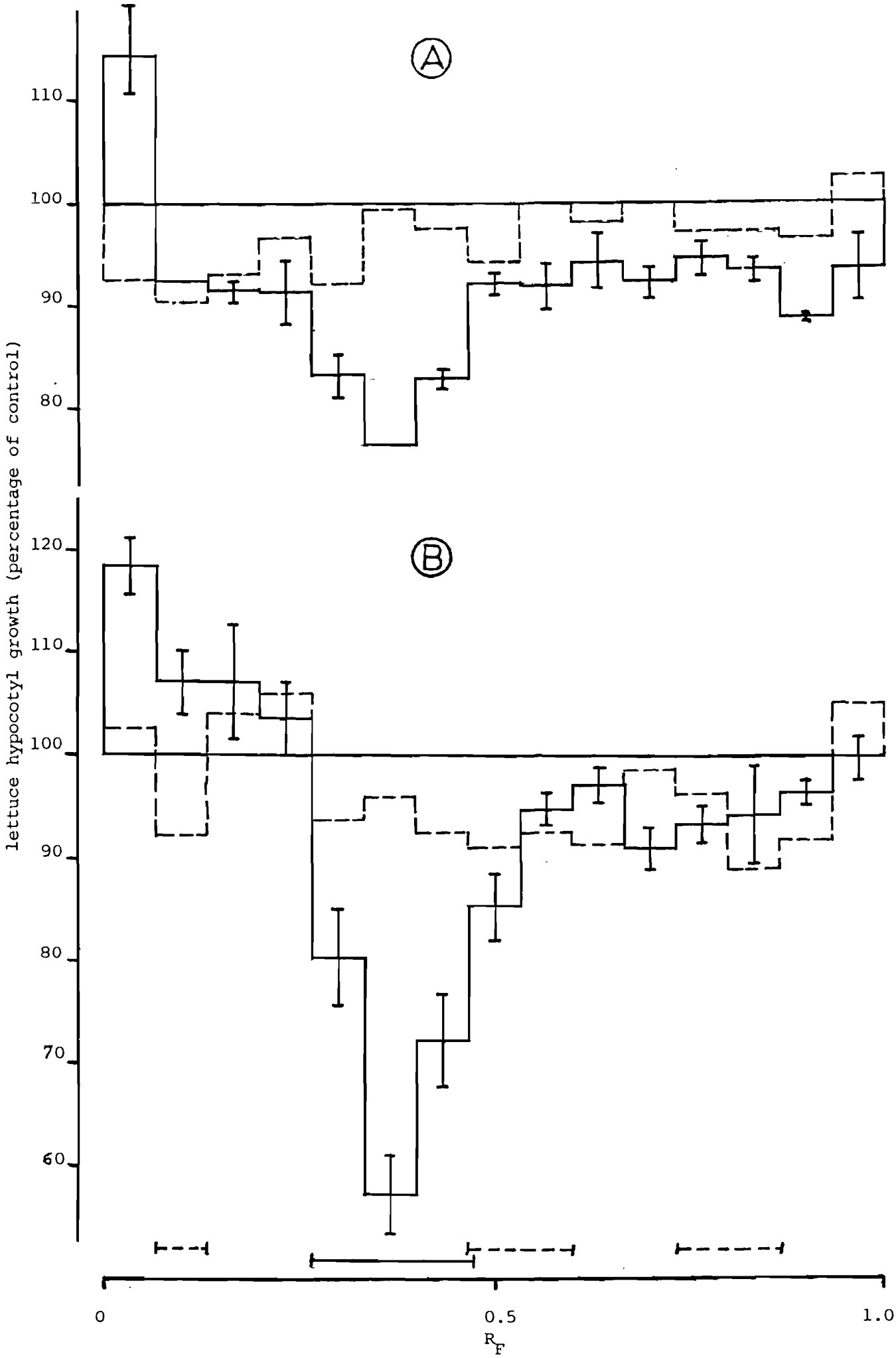

A
B
110
100
90
80
120
110
100
90
80
70
60
lettuce hypocotyl growth (percentage of control)
0
0.5
1.0
R_F

Figure 87. U.V. spectrum of (A) the main inhibitory component(s) present in acidic ether-soluble extracts of dormant *Alnus glutinosa* apices, and (B) the mixed isomers of authentic ABA. The apices were harvested on (a) 13 March 1978 (H1) and (b) 2 May 1978 (H3).

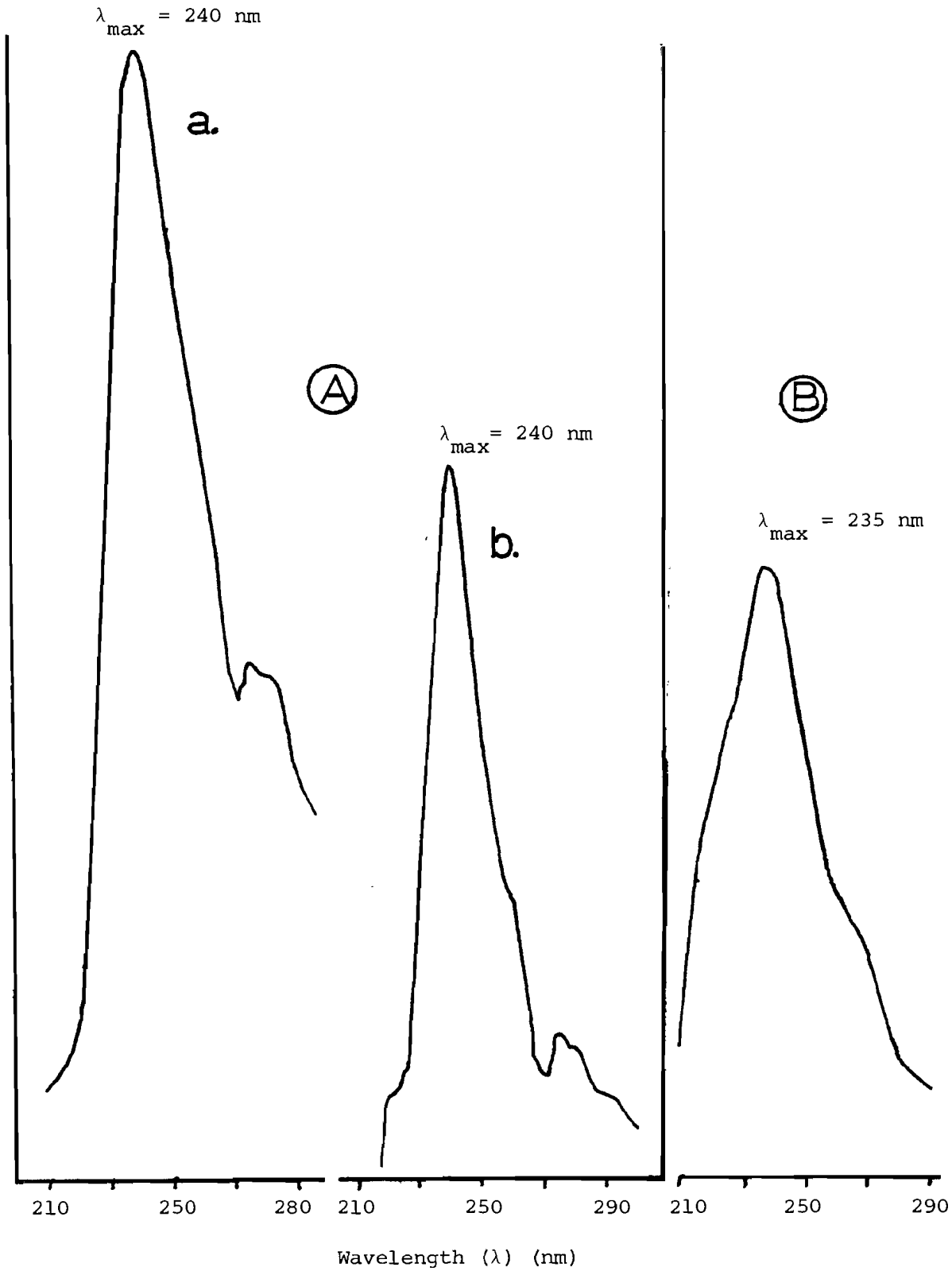

λmax = 240 nm
a.
A
λmax = 240 nm
b.
B
λmax = 235 nm
210
250
280
210
250
290
210
250
290
Wavelength (λ) (nm)

Figure 88. Gas chromatographs of the main inhibitory component(s) present in acidic ether-soluble extracts of dormant *Alnus glutinosa* apices. The chromatographs were obtained using an electron capture detector and 3% OV 17 as the stationary phase. Column and detector temperatures were 195°C and 295°C, respectively. Samples were methylated prior to chromatography. The apices were harvested on (A) 13 March 1978 (H1) and (B) 2 May 1978 (H3), and the inhibitory component(s) was isolated from the inhibitor β fraction by paper chromatography. Arrows indicate peaks corresponding with cis,trans Me-ABA and trans,trans Me-ABA.

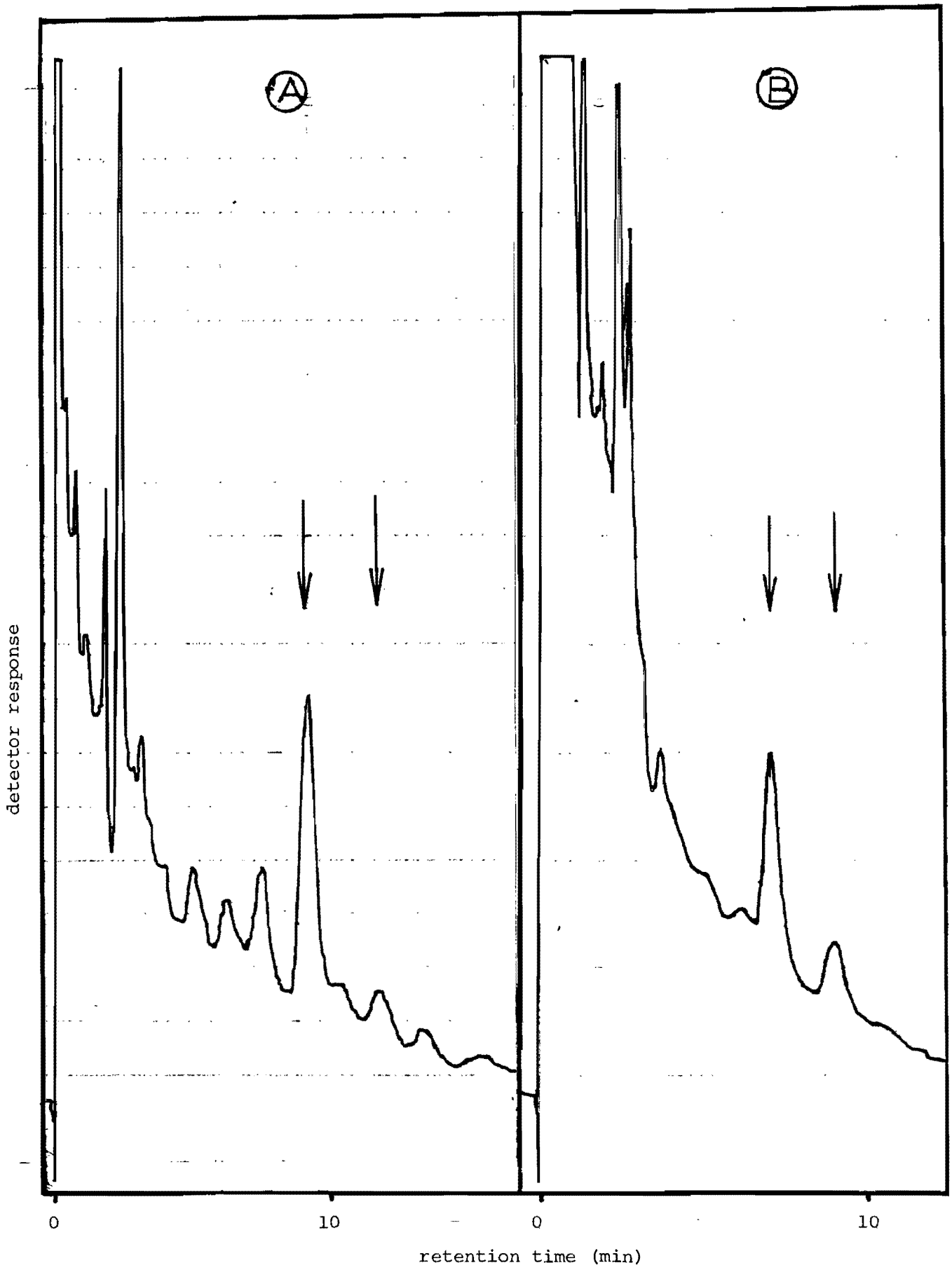

A
B
detector response
0
10
0
10
retention time (min)

Figure 89. Growth of *Alnus viridis* seedlings under 16 h (LD) and then transfer to 8 h (SD) photoperiods. Plants were maintained at 10°C night and 14°C day (equivalent to the high light intensity period). Arrow indicates the start of the SD treatment. Each value represents the percentage increase in height and is the mean of 10 replicates (LD's) or 7 replicates to day 7 and 4 replicates after day 15 of SD treatment. Each replicate consists of two plants and the vertical bars represent twice the S.E.'s of the means.

Leaves and apices were harvested from three replicates on day 0, day 7 and day 15 of SD treatment.

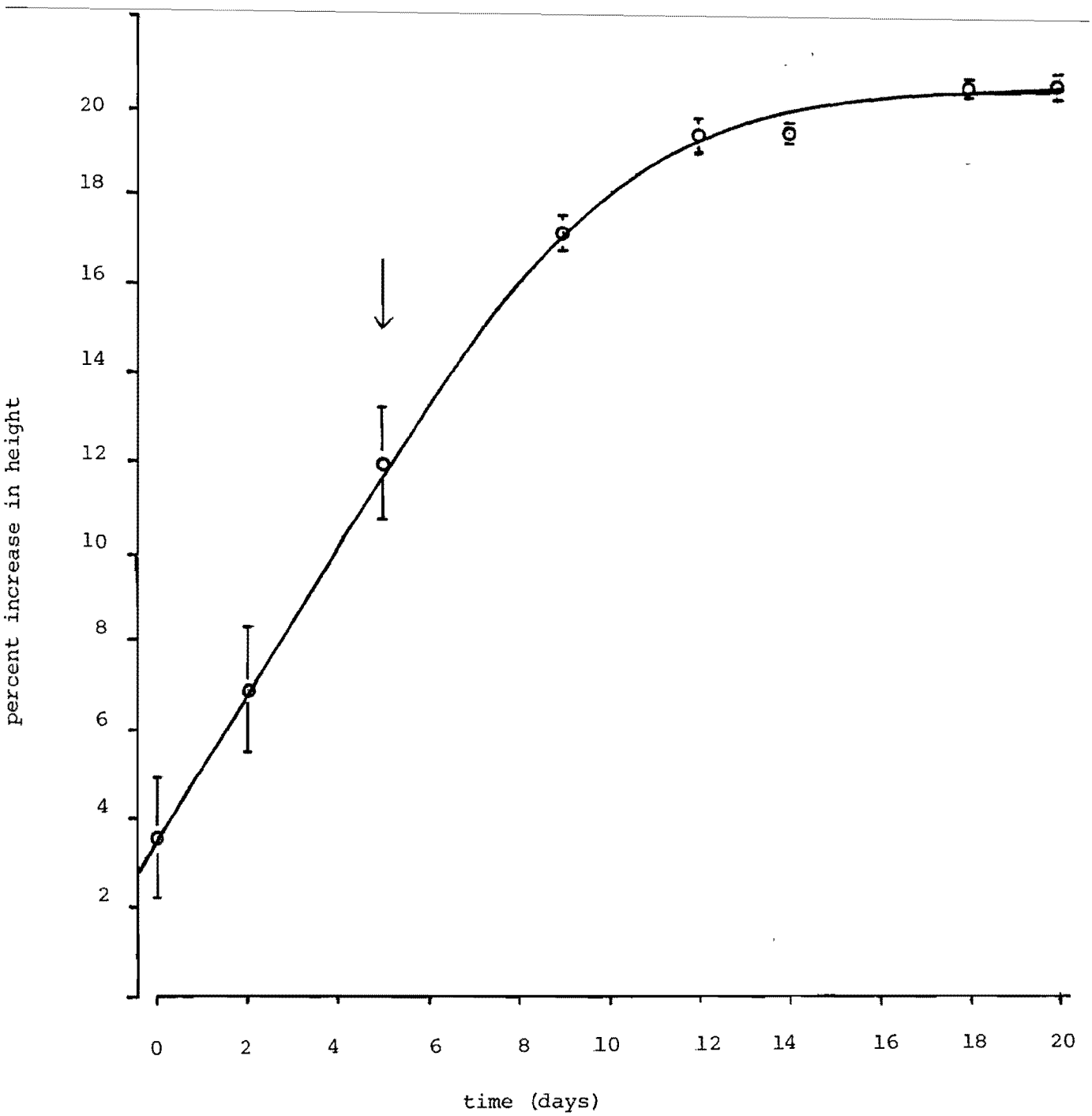

percent increase in height
20
18
16
14
12
10
8
6
4
2
0
2
4
6
8
10
12
14
16
18
20
time (days)

Figure 90. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* seedlings harvested on day 0 of SD treatment (H1). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

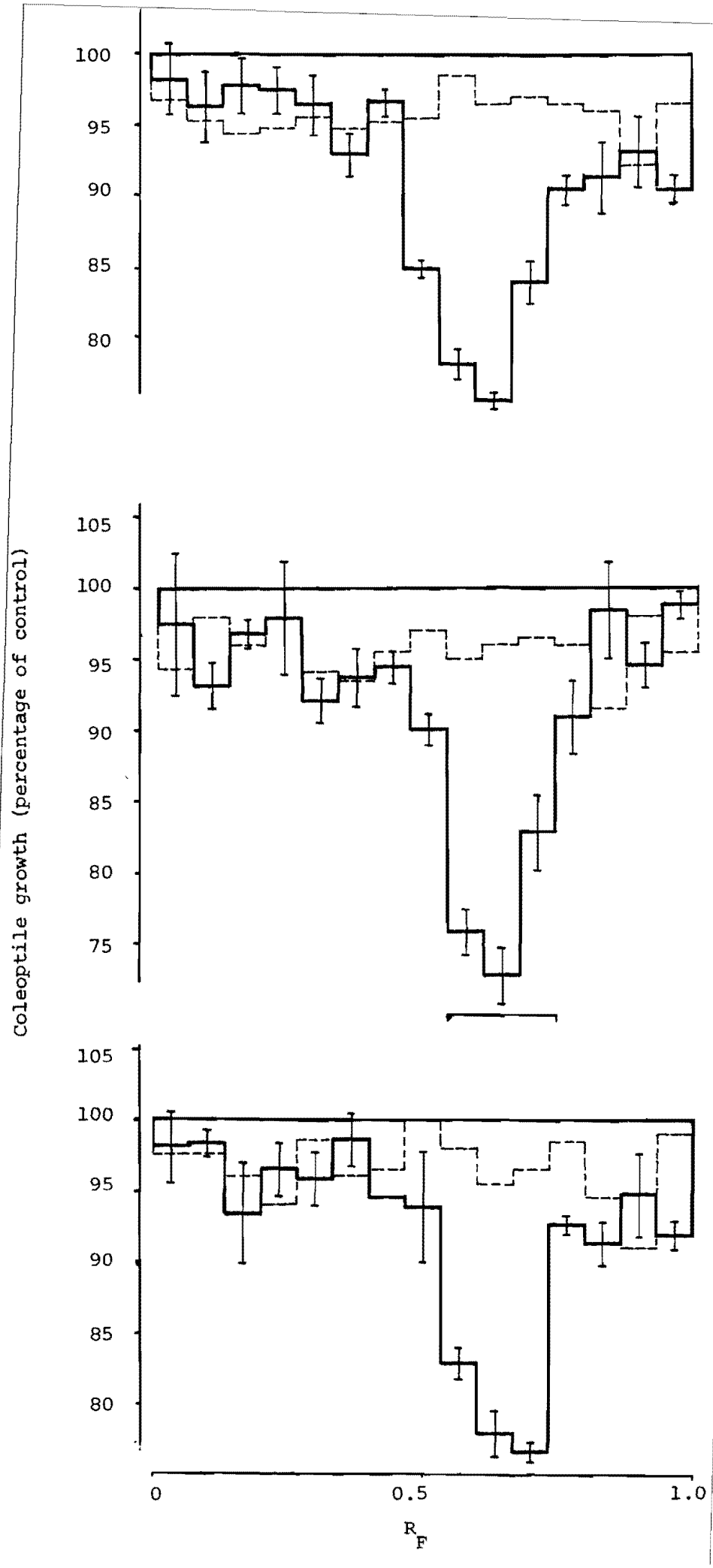

Coleoptile growth (percentage of control)
100
95
90
85
80
105
100
95
90
85
80
75
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 91. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* seedlings harvested on day 7 of SD treatment (H2). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

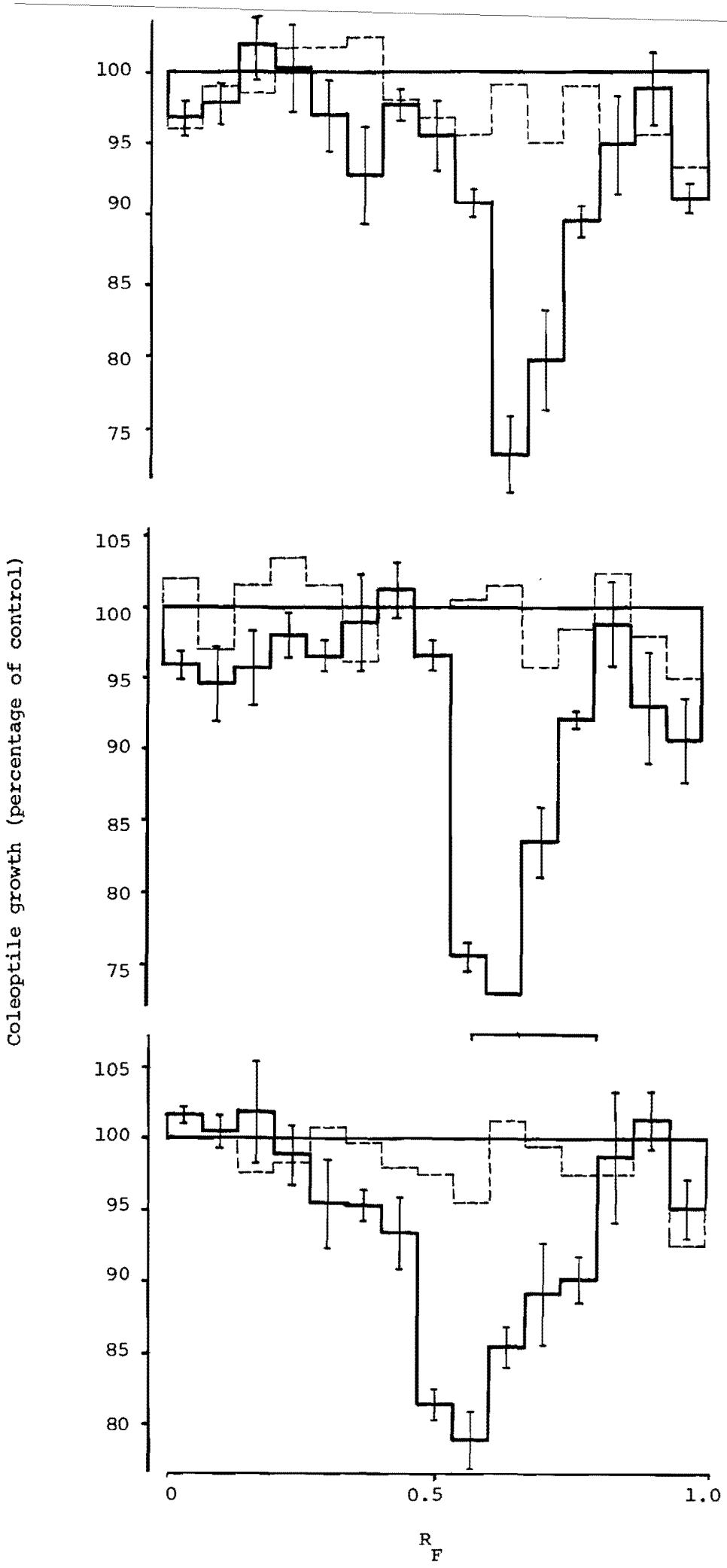

Coleoptile growth (percentage of control)
100
95
90
85
80
75
105
100
95
90
85
80
75
105
100
95
90
85
80
0
0.5
1.0
R
F

Figure 92. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* seedlings harvested on day 15 of SD treatment (H3). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

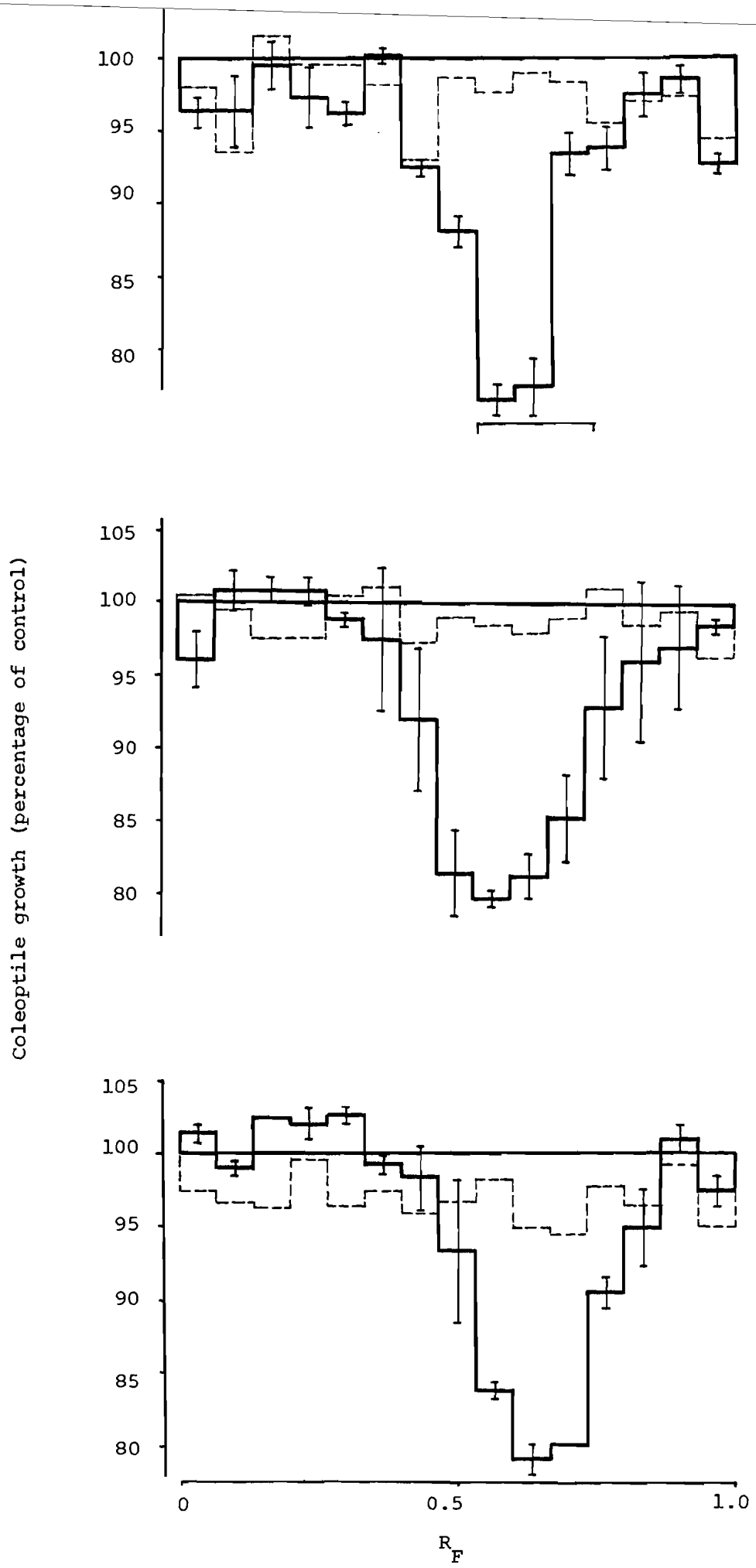

100
95
90
85
80
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F
Coleoptile growth (percentage of control)

Figure 93. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* seedlings harvested on day 0 of SD treatment (H1). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

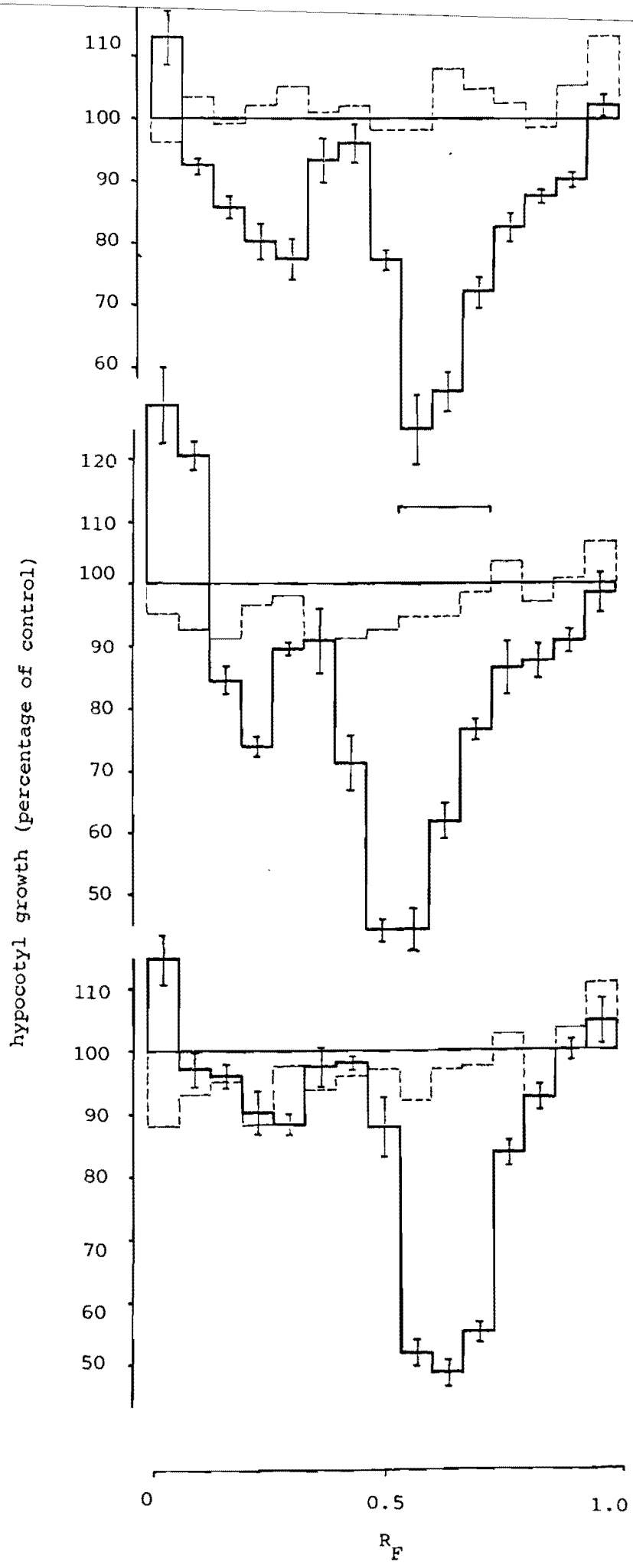

hypocotyl growth (percentage of control)
110
100
90
80
70
60
120
110
100
90
80
70
60
50
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 94. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* seedlings harvested on day 7 of SD treatement (H2). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

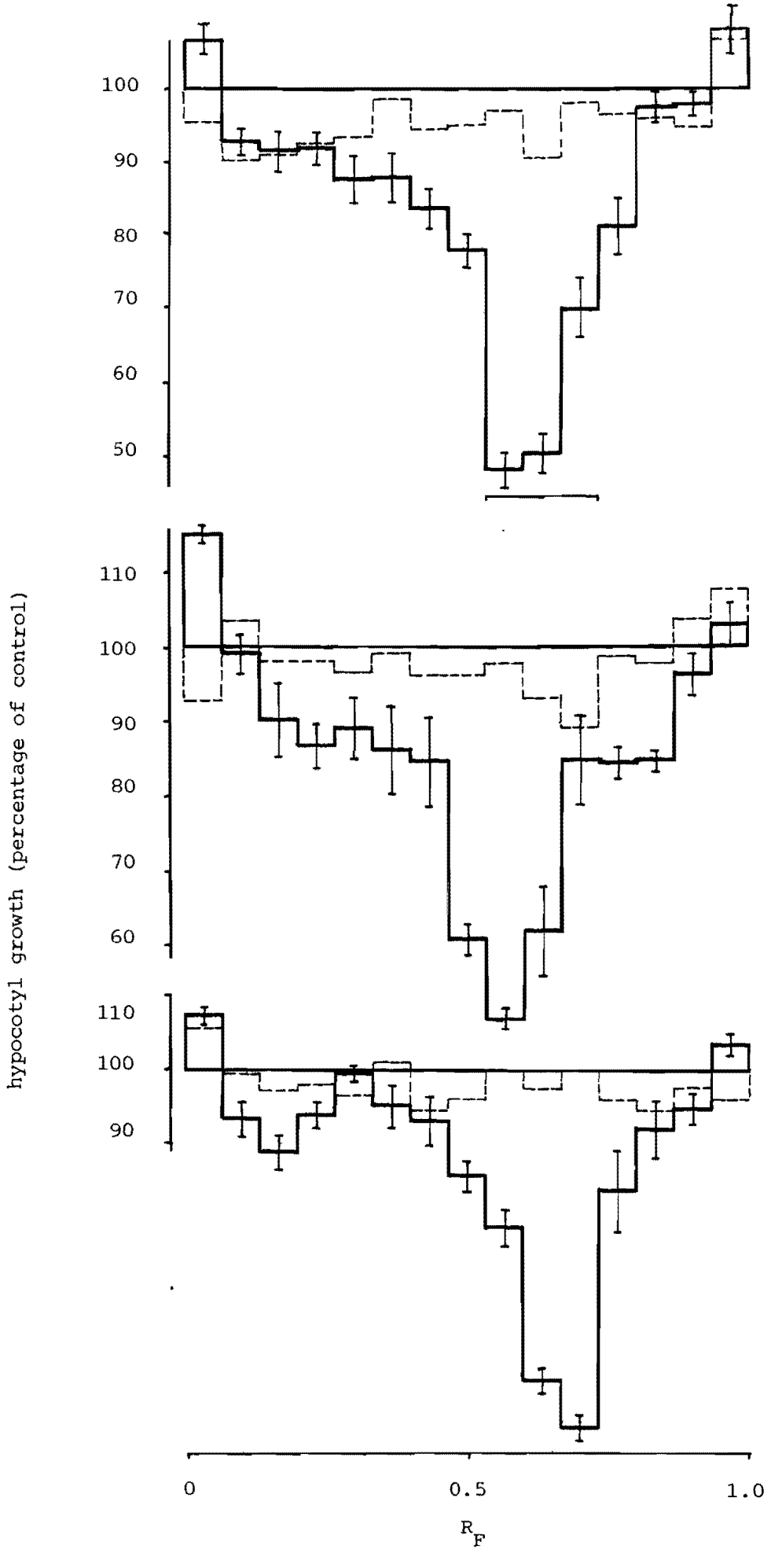

hypocotyl growth (percentage of control)
100
90
80
70
60
50
110
100
90
80
70
60
110
100
90
0
0.5
1.0
R_F

Figure 95. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from leaves of *Alnus viridis* seedlings harvested on day 15 of SD treatment (H3). The equivalent of 0.25 g DW of leaf material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

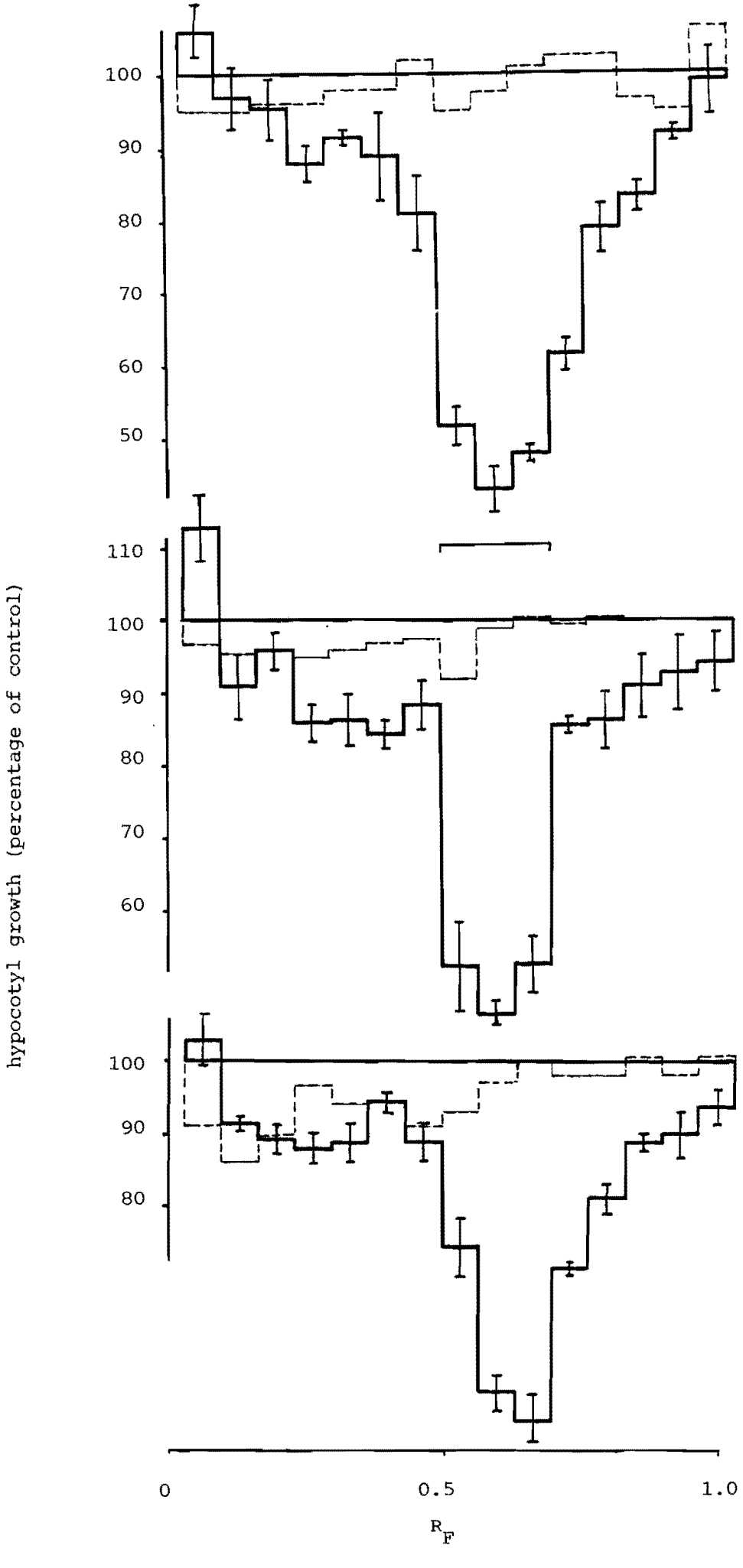

hypocotyl growth (percentage of control)
100
90
80
70
60
50
110
100
90
80
70
60
100
90
80
0
0.5
1.0
R_F

Figure 96. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus viridis* seedlings harvested on day 0 of SD treatment (H1). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.5 g DW of leaf material was assayed. Other details as in figure 18.

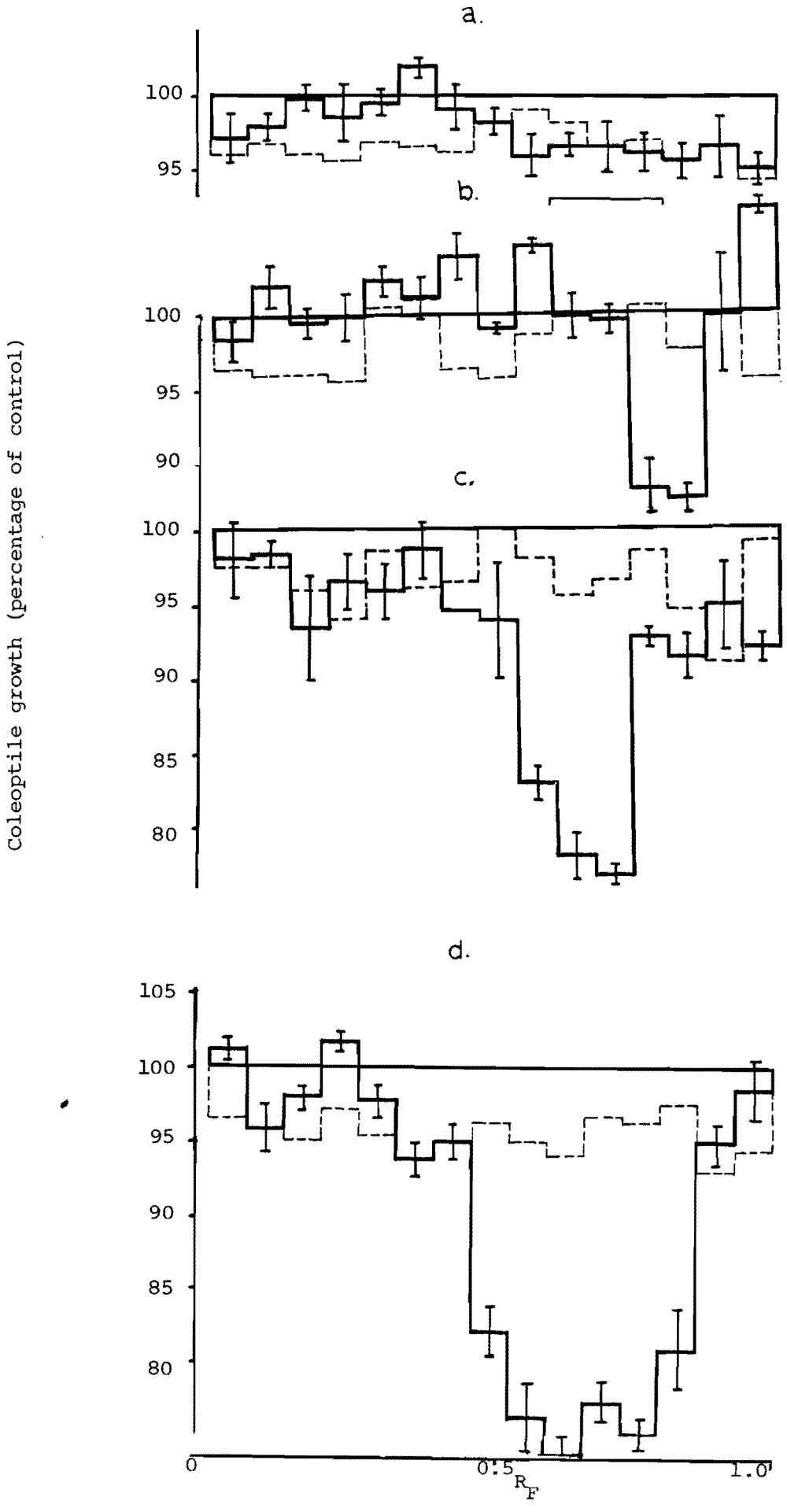

a.
b.
c.
d.
Coleoptile growth (percentage of control)
100
95
90
85
80
105
0
0·5
1·0
R_F

Figure 97. Wheat coleoptile section assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus viridis* seedlings harvested on day 15 of SD treatment (H3). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.50 g DW of leaf material was assayed. Other details as in figure 18.

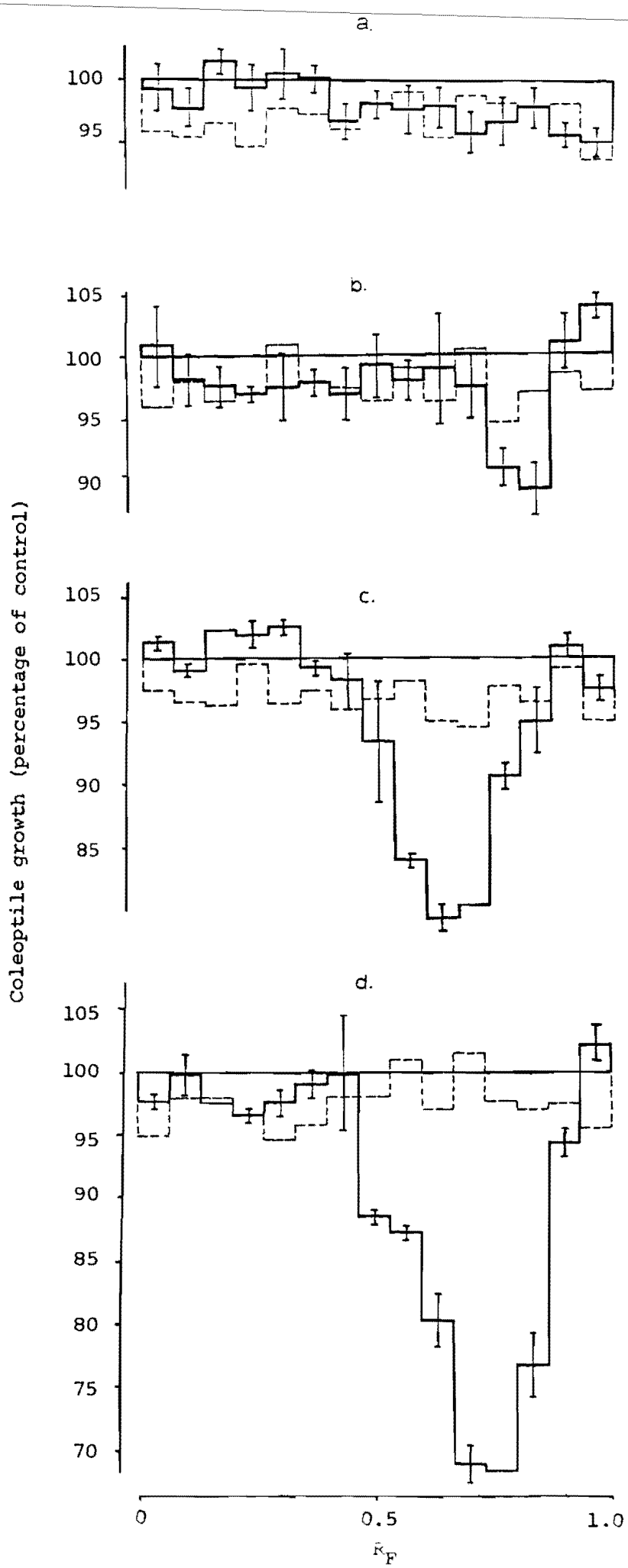

a.
100
95
b.
105
100
95
90
c.
105
100
95
90
85
d.
105
100
95
90
85
80
75
70
0
0.5
1.0
R_F
Coleoptile growth (percentage of control)

Figure 98. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus viridis* seedlings harvested on day 0 of SD treatment (H1). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.50 g DW of leaf material was assayed. Other details as in figure 26.

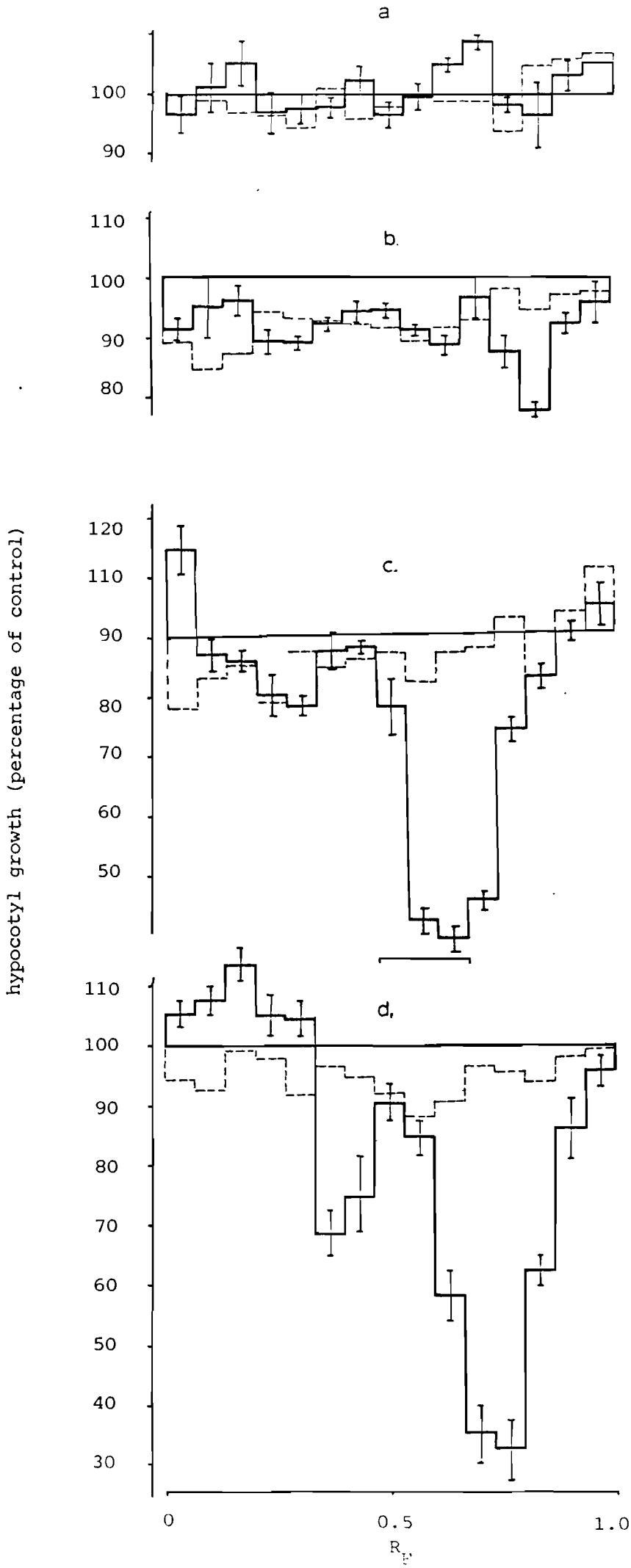

a
100
90
110
b.
100
90
80
120
110
c.
90
80
70
60
50
110
d.
100
90
80
70
60
50
40
30
hypocotyl growth (percentage of control)
0
0.5
1.0
R_F

Figure 99. Lettuce hypocotyl assay of the serial dilution of an acidic ether-soluble extract obtained from leaves of *Alnus viridis* seedlings harvested on day 15 of SD treatment (H3). The equivalent of (a) 0.025, (b) 0.125, (c) 0.25 and (d) 0.50 g DW of leaf material was assayed. Other details as in figure 26.

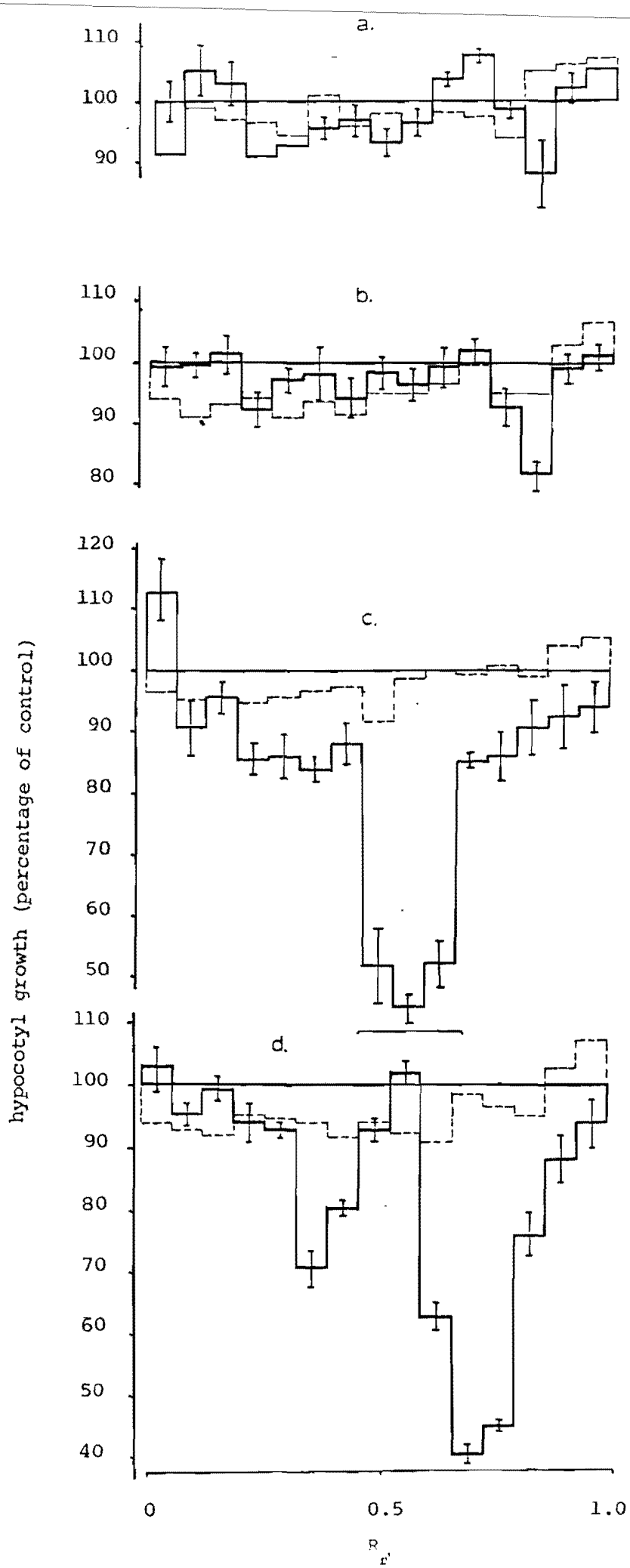

a.
b.
c.
d.
110
100
90
80
120
70
60
50
40
hypocotyl growth (percentage of control)
0
0.5
1.0
R_{fr}

Figure 100. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings harvested on day 0 of SD treatment (H1). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

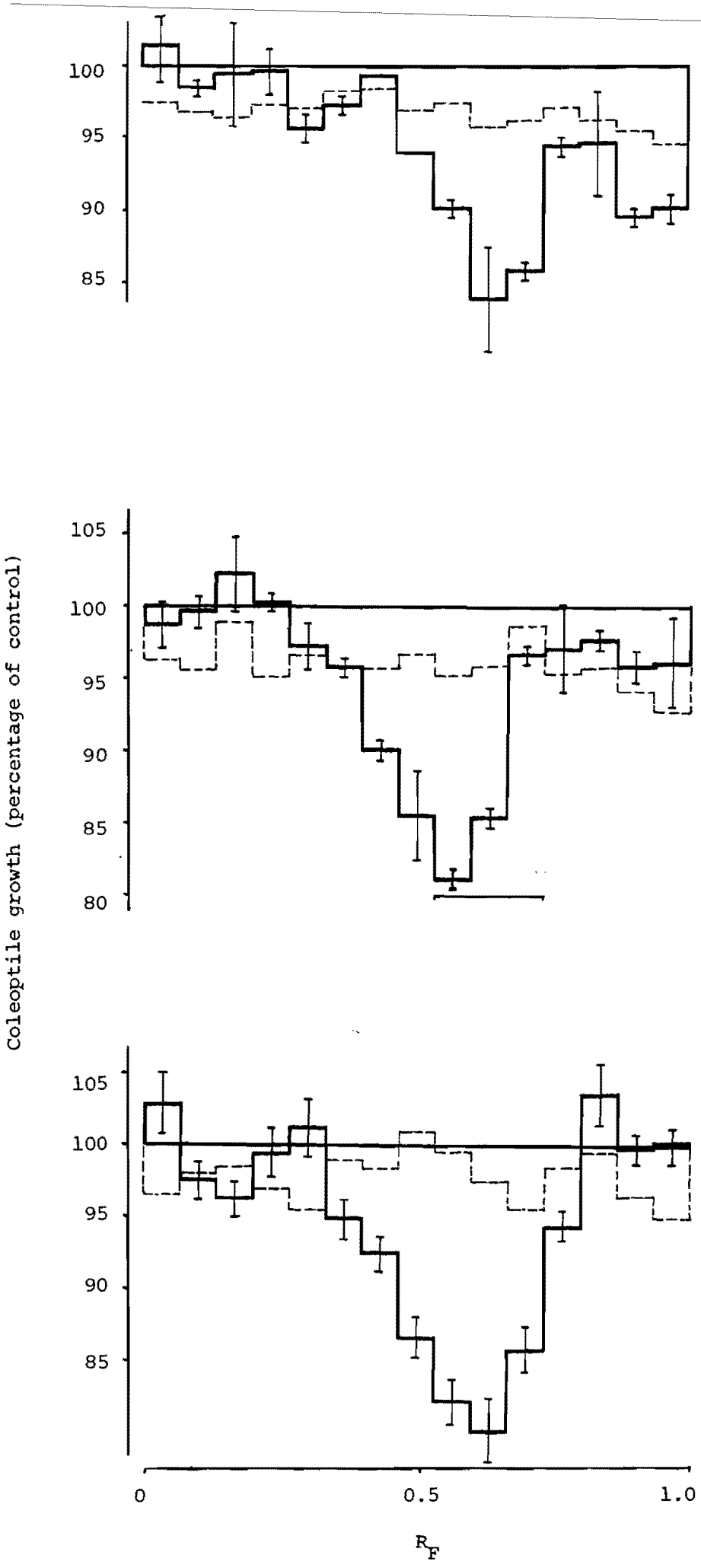

Coleoptile growth (percentage of control)
100
95
90
85
105
100
95
90
85
80
105
100
95
90
85
0
0.5
1.0
R_F

Figure 101. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings harvested on day 7 of SD treatment (H2). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

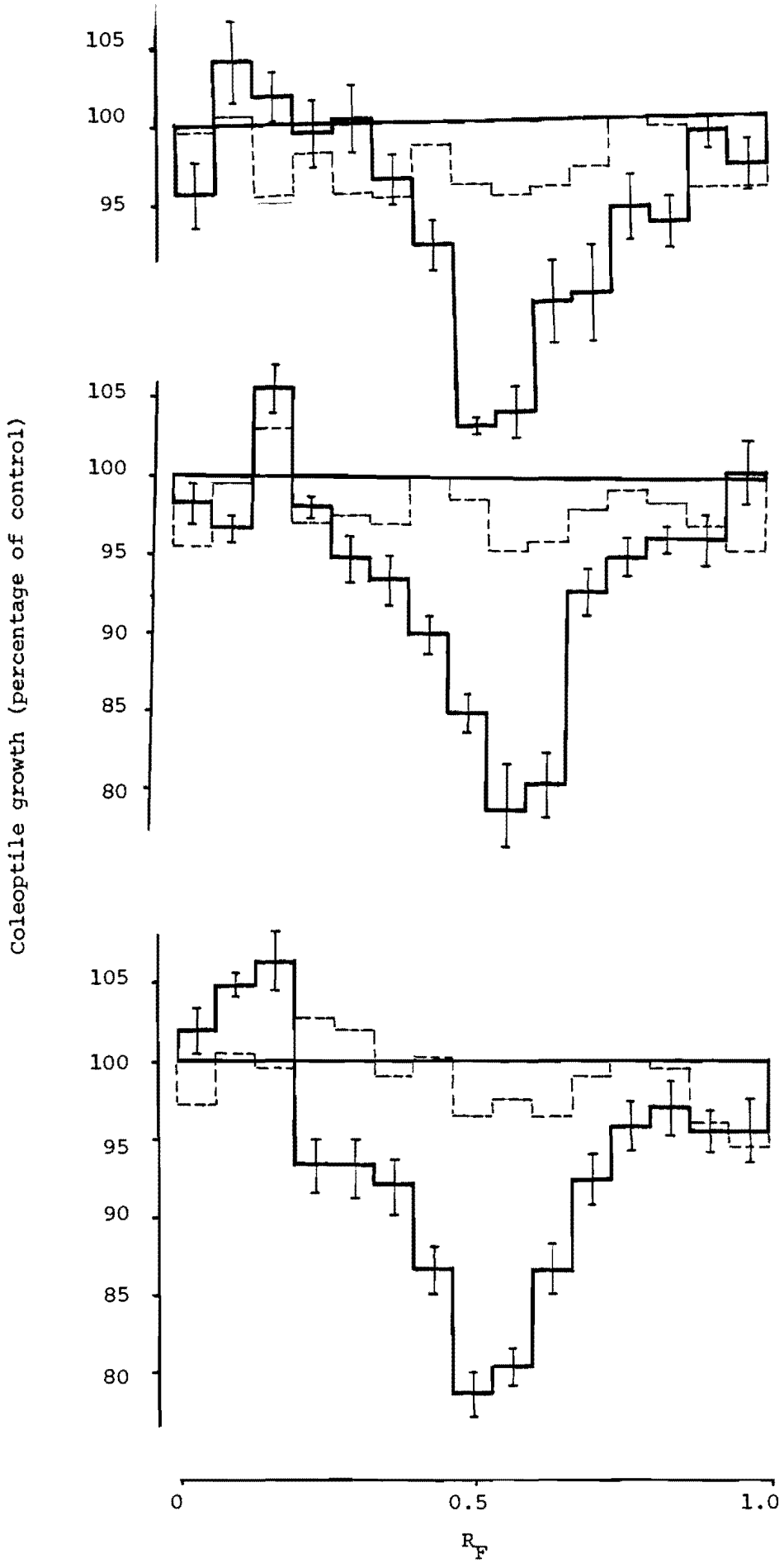

Coleoptile growth (percentage of control)
105
100
95
105
100
95
90
85
80
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 102. Wheat coleoptile section assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings harvested on day 15 of SD treatment (H3). The equivalent of 0.20 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 18.

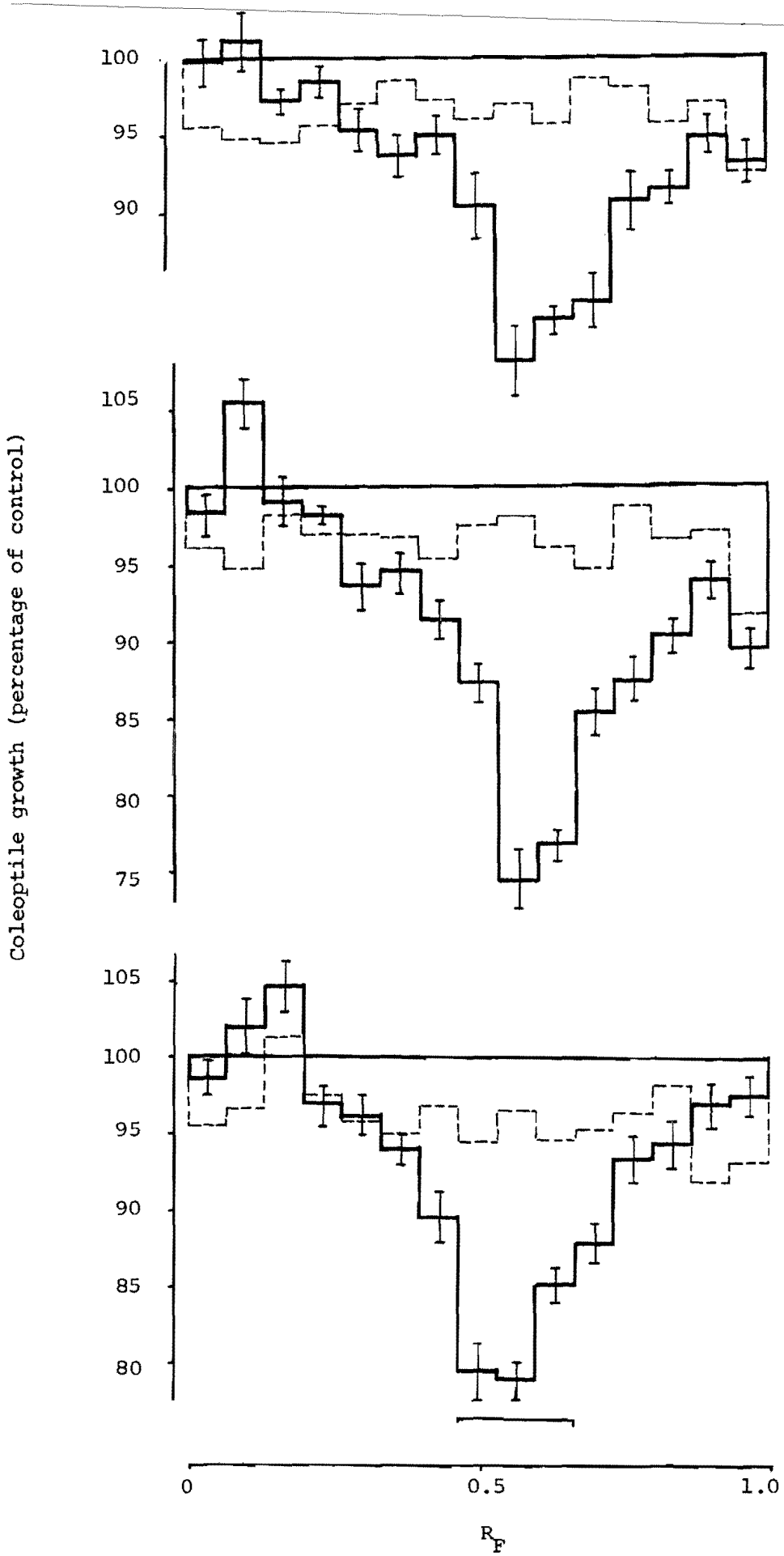

Coleoptile growth (percentage of control)
100
95
90
105
100
95
90
85
80
75
105
100
95
90
85
80
0
0.5
1.0
R_F

Figure 103. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings harvested on day 0 of SD treatment (H1). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

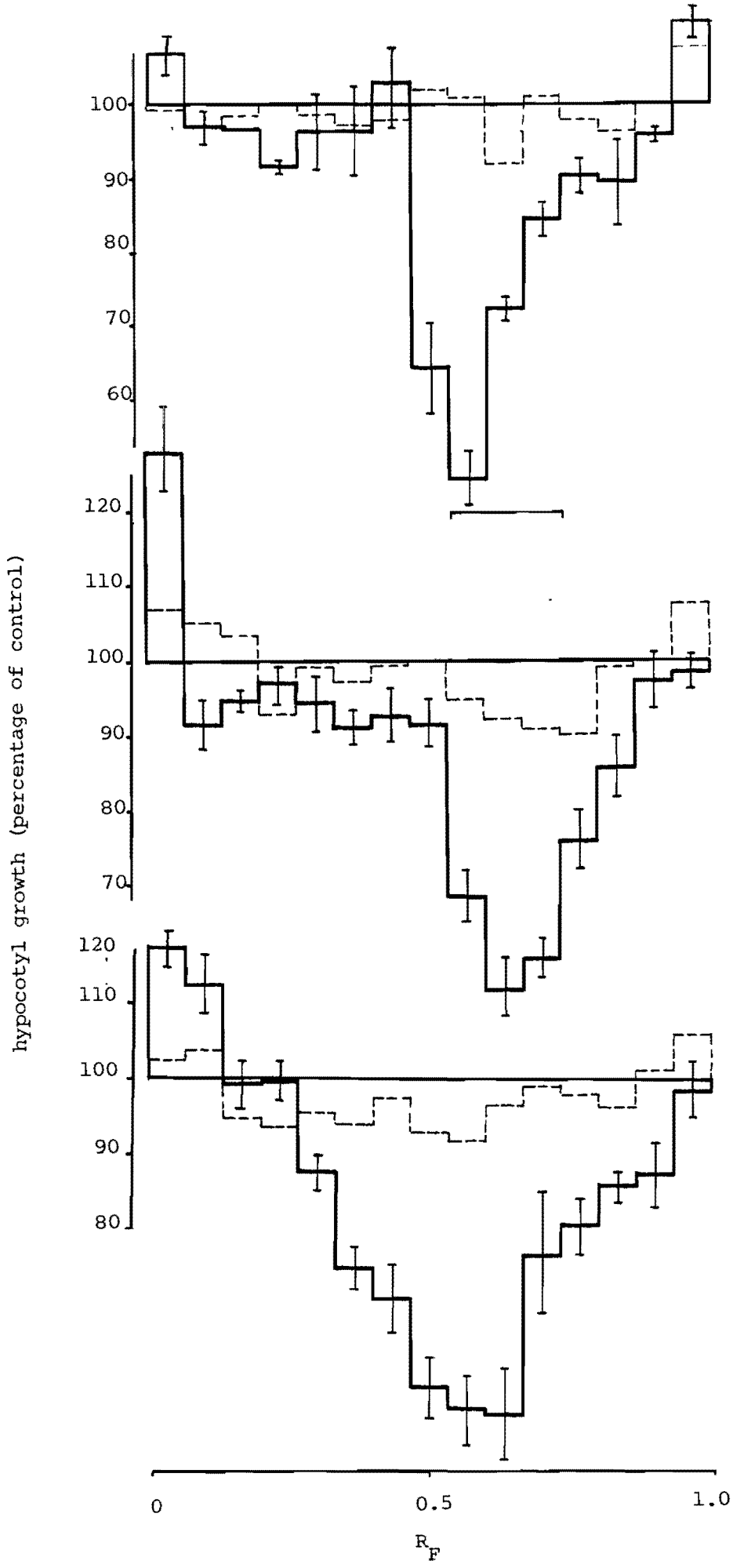

hypocotyl growth (percentage of control)
100
90
80
70
60
120
110
100
90
80
70
120
110
100
90
80
0
0.5
1.0
R_F

Figure 104. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings harvested on day 7 of SD treatment (H2). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

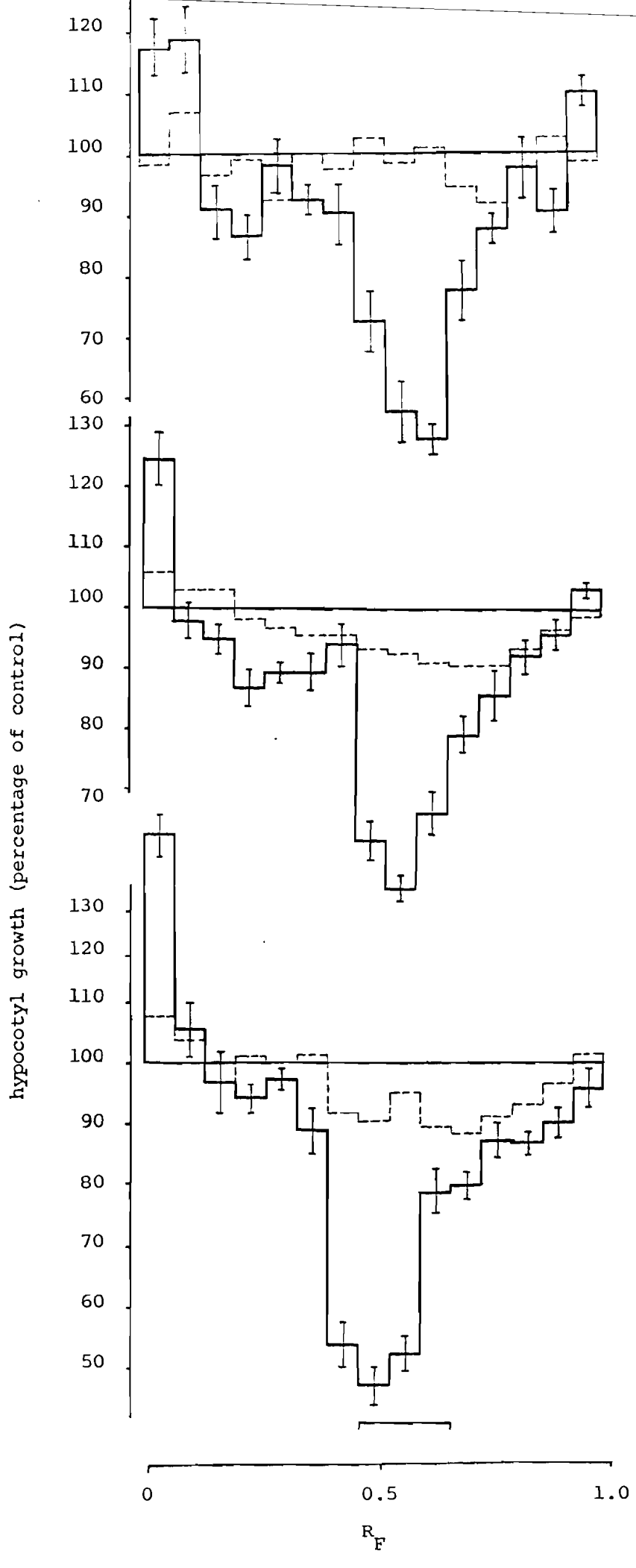

hypocotyl growth (percentage of control)
120
110
100
90
80
70
60
130
120
110
100
90
80
70
130
120
110
100
90
80
70
60
50
0
0.5
1.0
R_F

Figure 105. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings harvested on day 15 of SD treatment (H3). The equivalent of 0.2 g DW of apical material was assayed and the solvent system was isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figure 26.

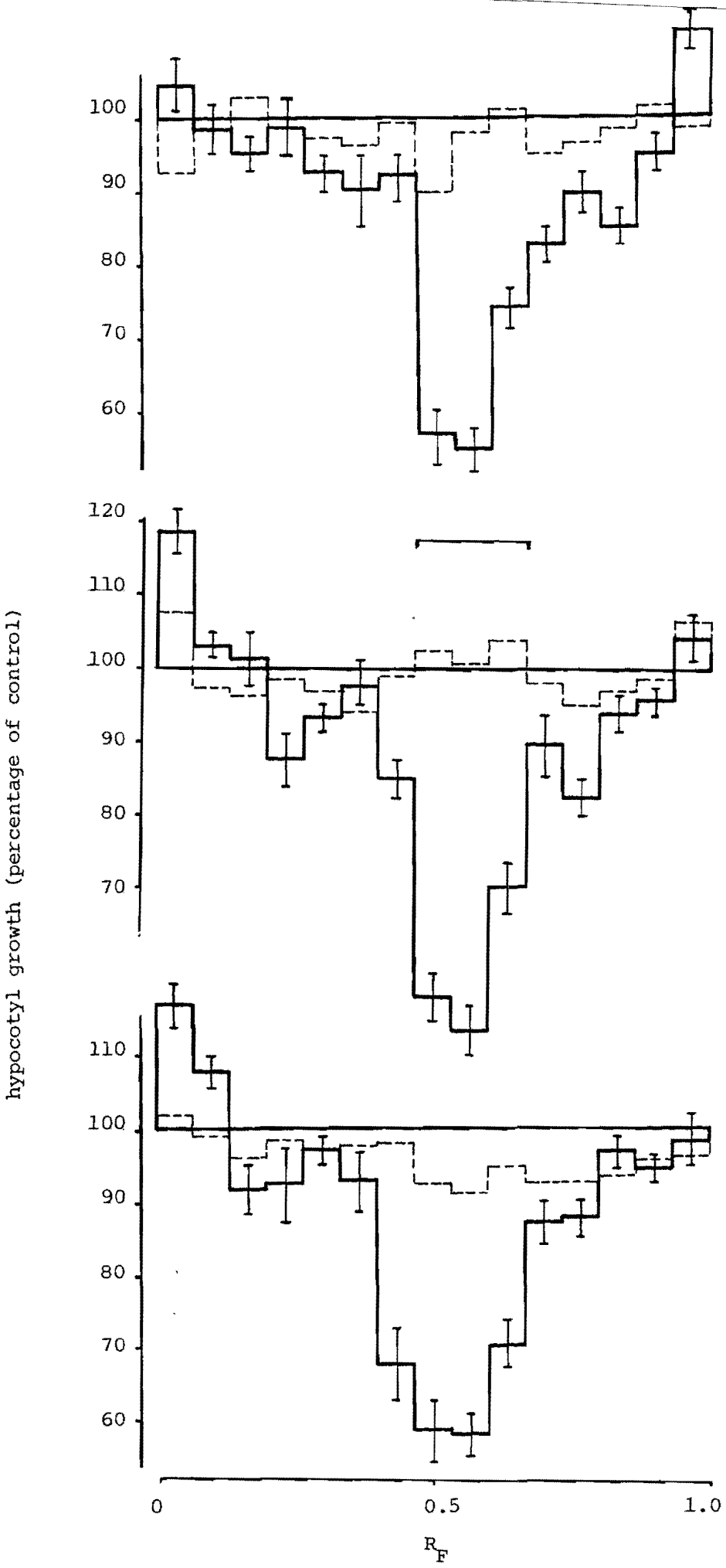

hypocotyl growth (percentage of control)
100
90
80
70
60
120
110
100
90
80
70
110
100
90
80
70
60
0
0.5
1.0
R_F

Figure 106. Lettuce hypocotyl assay of acidic ether-soluble extracts obtained from apices of *Alnus viridis* seedlings on (a) day 0 (H1), (b) day 7 (H2), and (c) day 15 (H3) of SD treatment. At each harvest date, the remainder of three replicate extracts after assays previous were combined and the equivalent of 0.14 g DW of apical material was assayed. Other details as in figure 26.

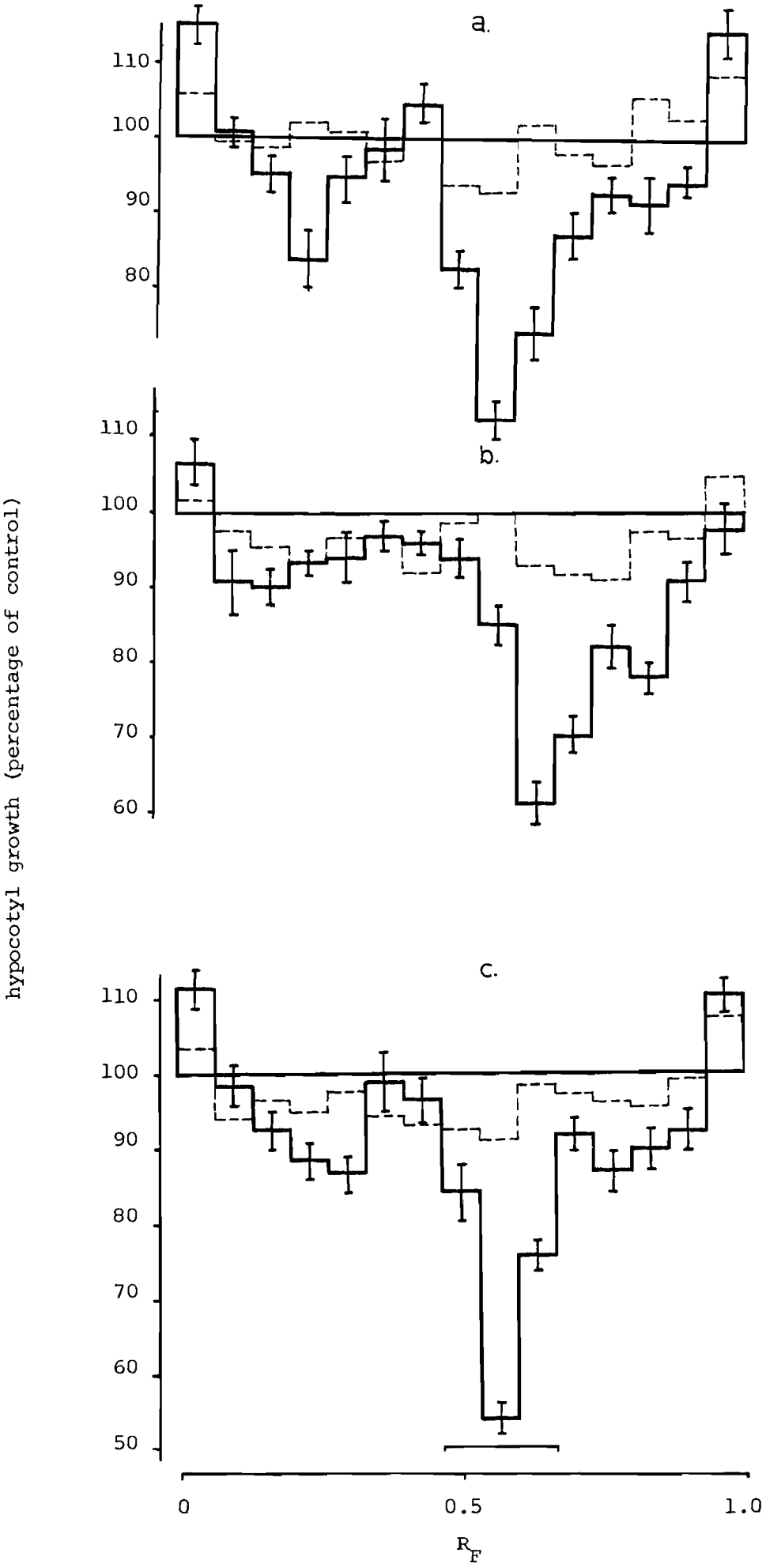

a.
b.
c.
110
100
90
80
70
60
50
hypocotyl growth (percentage of control)
0
0.5
1.0
R_F

Figure 107. Bioassay of acidic ether-soluble extracts obtained from (a,b) leaves and (c) apices of *Alnus viridis* seedlings harvested on day 28 of SD treatment (H4). Leaf extracts were assayed using (a) wheat coleoptile sections and (b) lettuce hypocotyls and the apical extract (c) using lettuce hypocotyls. The equivalent of 0.25 g DW of leaf and 0.19 g DW of apical material were assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v). Other details as in figures 18 and 26.

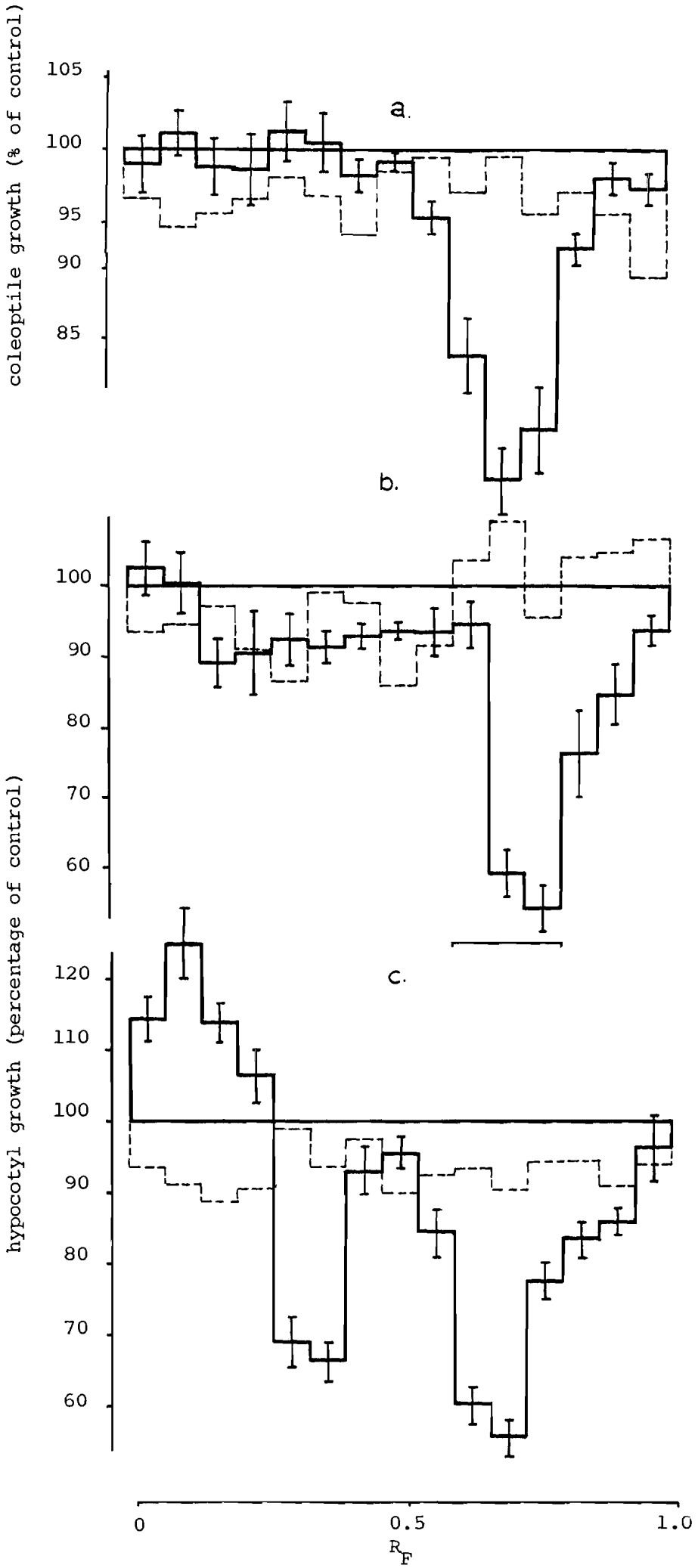

coleoptile growth (% of control)
105
100
95
90
85
a.
b.
hypocotyl growth (percentage of control)
100
90
80
70
60
120
110
100
90
80
70
60
c.
0
0.5
1.0
R_F

Figure 108. Extension growth of *Alnus viridis* seedlings with intact (●) and pruned (▲) root systems, maintained under LD's (16 h photoperiod) at 20°C. Arrows indicate the start of the treatments. The experiment was repeated three times using five plants (a, b) and six plants (c). The equivalent of approx. one-third (a and b) and one-sixth (c) of the root system was left undisturbed. The vertical bars show one S.E. above and/or below the lines.

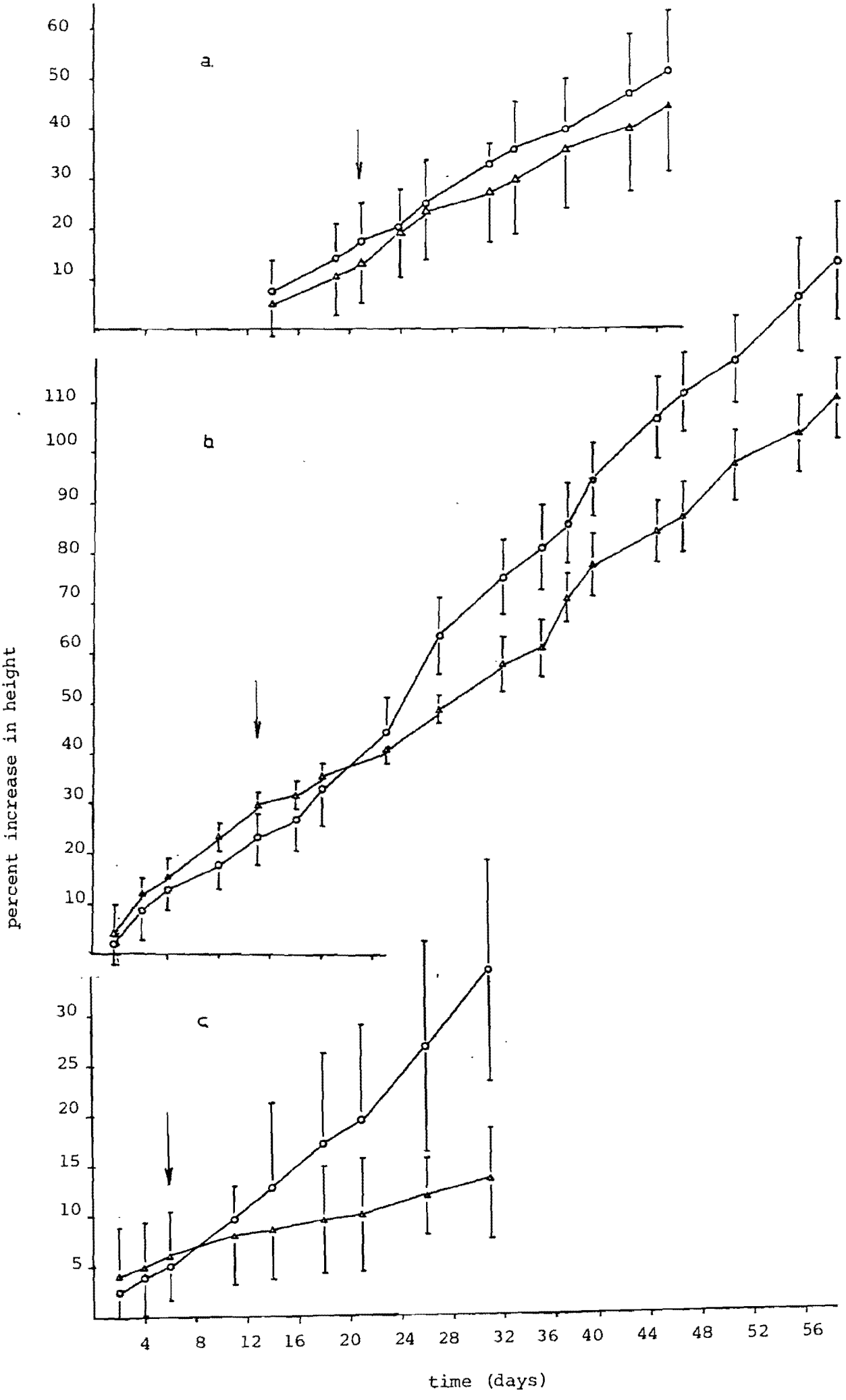

a
b
c
percent increase in height
time (days)
60
50
40
30
20
10
110
100
90
80
70
60
50
40
30
20
10
30
25
20
15
10
5
4
8
12
16
20
24
28
32
36
40
44
48
52
56

Figure 109. Effect of growth regulator application on the extension growth of *Alnus viridis* seedlings maintained under LD's (16 h photoperiod) and 14°C day (equivalent to the high light intensity period) and 10°C night temperatures. Daily spray applications of (b) ABA, (c) CCC, (d) ABA + CCC, and (e) C9 were made to the leaves and apices, and the youngest fully-expanded leaf was partially immersed in the test solution. Plants treated with water solvent (a) served as controls, and the arrows indicate the start of the treatments. Each value represents percent increase in growth and is the mean ± S.E. of three plants.

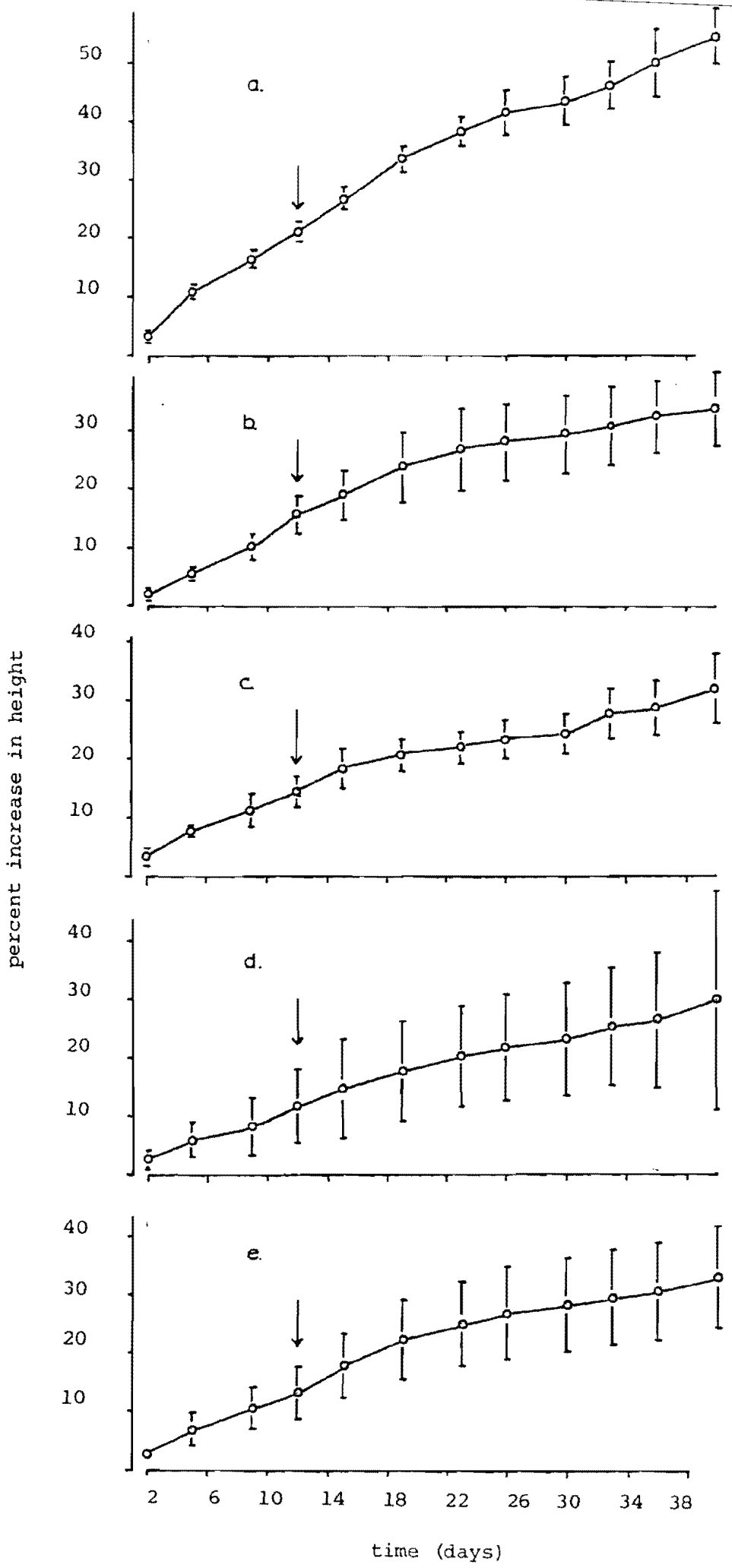

a.
b.
c.
d.
e.
50
40
30
20
10
2
6
10
14
18
22
26
30
34
38
percent increase in height
time (days)

Figure 110. Effect of growth regulator application on extension growth of *Alnus viridis* seedlings maintained under LD's (16 h photoperiod) at 20°C. Daily spray applications of ABA (△), CCC (□) and ABA + CCC (●) were made to the leaves and apices, and the youngest fully expanded leaf was partially immersed in the test solution. Plants treated with water solvent (○) served as controls, and the arrows indicate the start of the treatments. Each value represents percent increase in growth and is the mean ± S.E. of five plants.

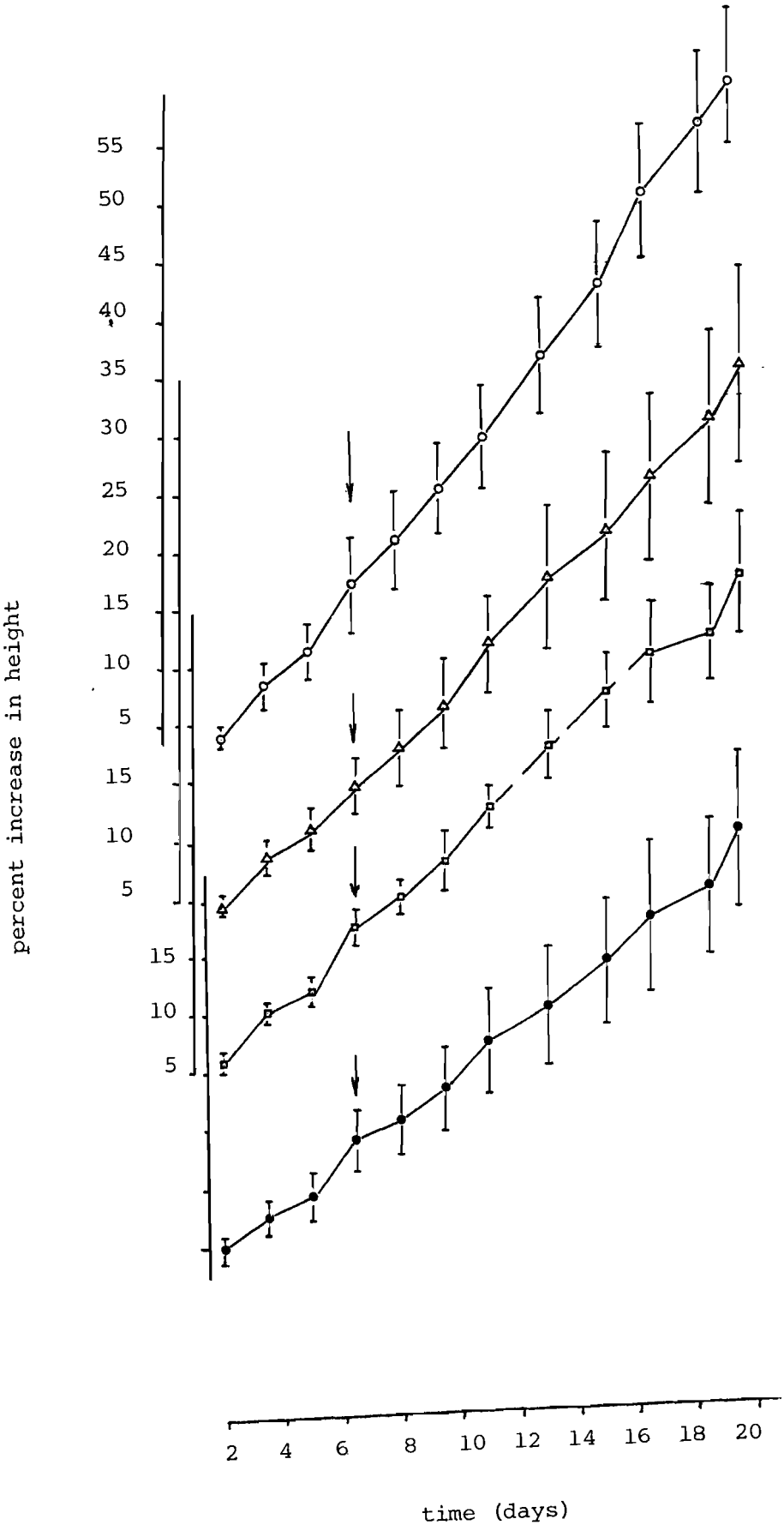

percent increase in height
55
50
45
40
35
30
25
20
15
10
5
15
10
5
15
10
5
2
4
6
8
10
12
14
16
18
20
time (days)

Figure 111. Effect of growth regulator application on the extension growth of *Alnus viridis* seedlings maintained under LD's (16 h photoperiod) at 20°C. Daily applications of (b) ABA, (c) CCC, and (d) ABA + CCC were made to the leaves and apices. Plants treated with water solvent (a) served as controls and the arrows indicate the start of the treatments. Each value represents percent increase in growth and is the mean ± S.E. of six plants.

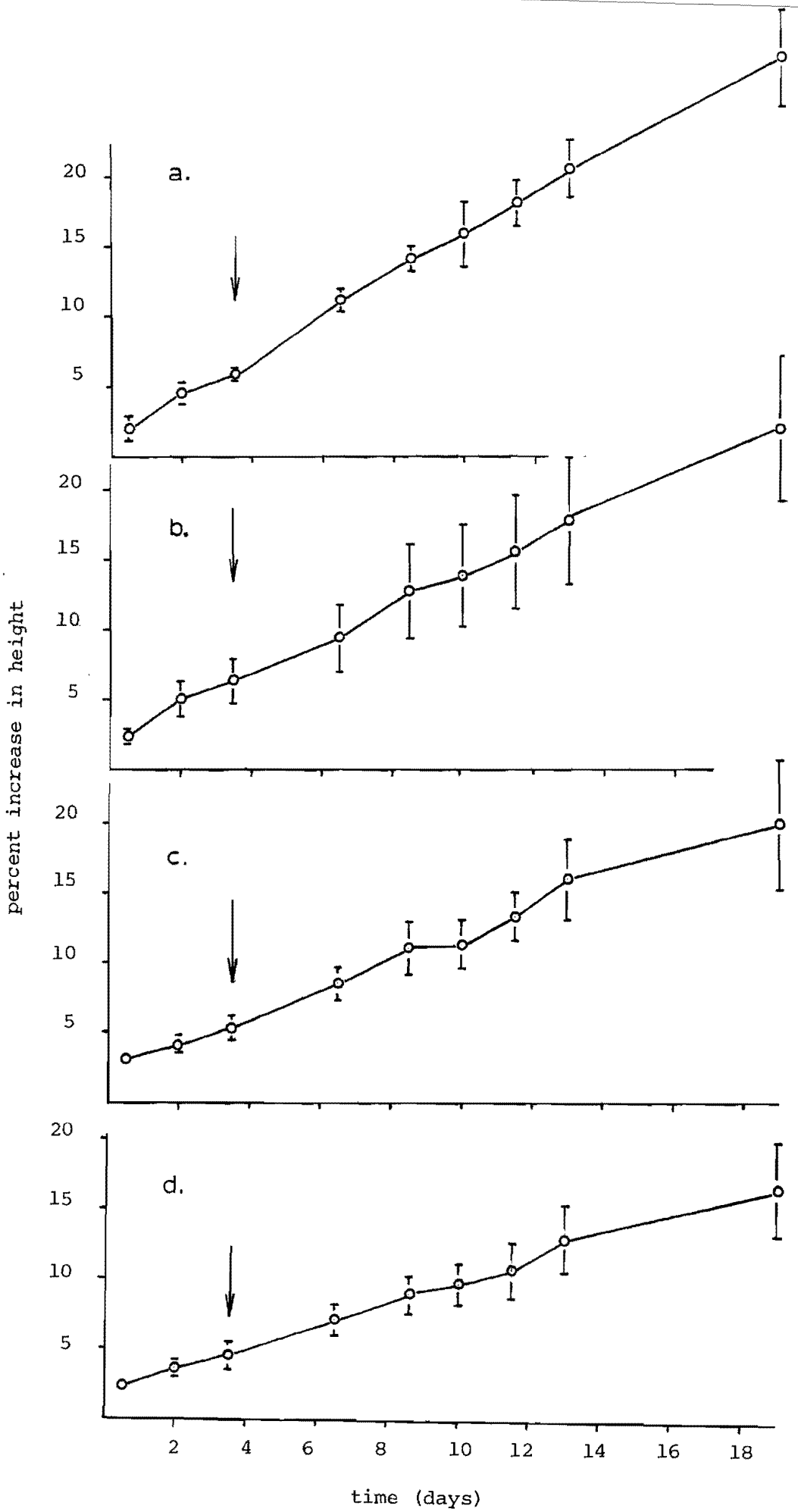

a.
b.
c.
d.
20
15
10
5
2
4
6
8
10
12
14
16
18
percent increase in height
time (days)

Figure 112. Effect of short chain fatty acid application on the extension growth of *Alnus viridis* seedlings maintained under LD's (16 h photoperiod) at 20°C. Daily spray applications of (b) C5, (c) C9, and (d) C10 were made to the leaves and apices and for the seedlings treated with C9 and C10, the youngest fully-expanded leaf was partially immersed in the test solutions. Plants treated with water solvent (a) served as controls and the arrows indicate the start of the treatments. Each value represents percent increase in growth and is the mean ± S.E. of five plants.

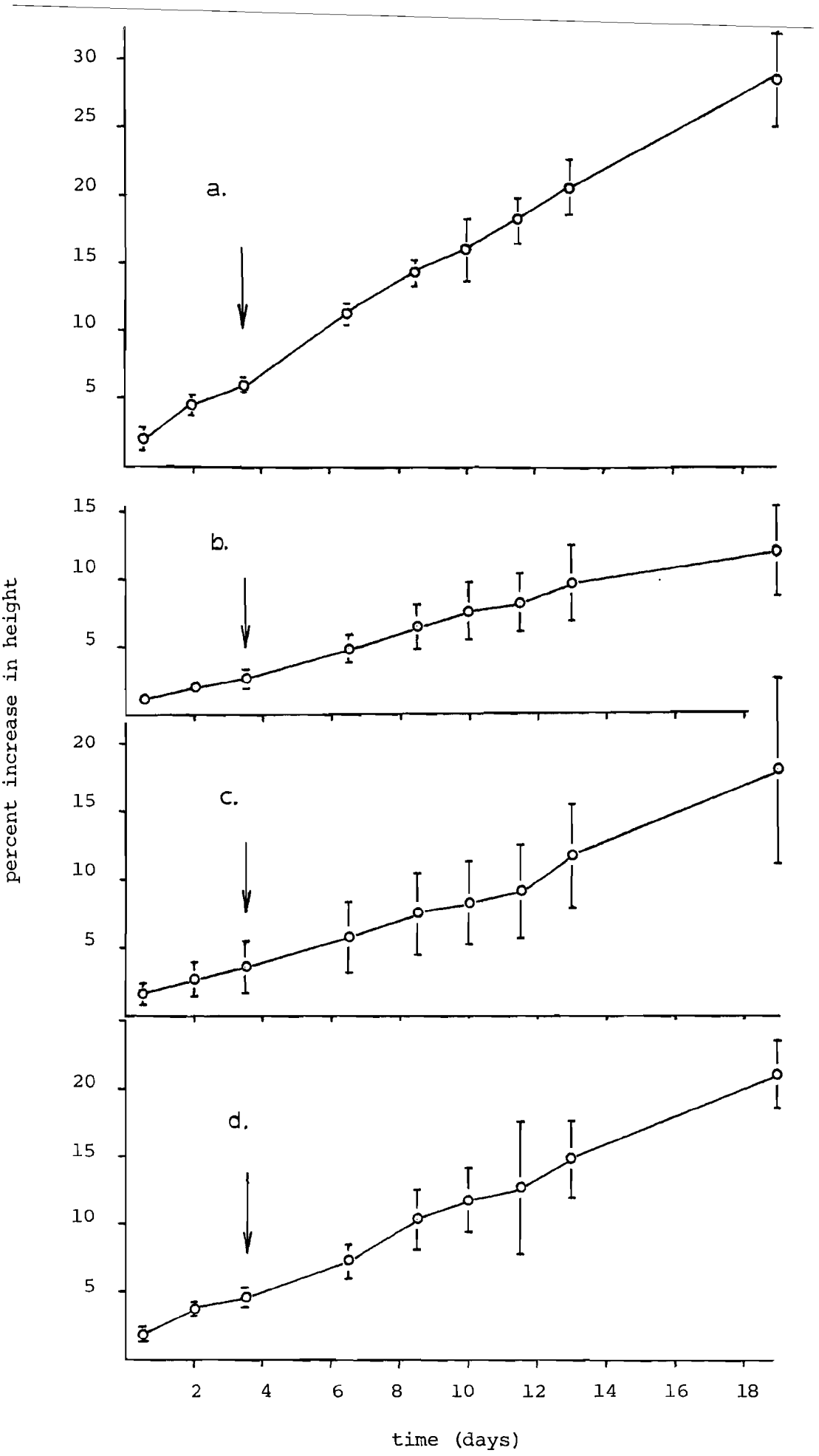
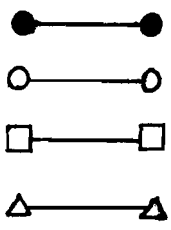

a.
b.
c.
d.
percent increase in height
time (days)
30
25
20
15
10
5
2
4
6
8
10
12
14
16
18

Figure 113. The effect on (a) bud burst and (b) the number of leaves retained after growth regulator application to the base of isolated, growing shoots of *Alnus viridis*. The values represent the number of growing buds or the number of leaves retained as a function of position on the stem with the leaves retained (●, □) or removed (○, △) at the beginning of the experiment. Each treatment comprised of 10 shoots. The number in brackets indicates the number of growing shoots which had added one or more nodes.



(+) leaves

(-) leaves

(+) leaves, ABA

(-) leaves, ABA

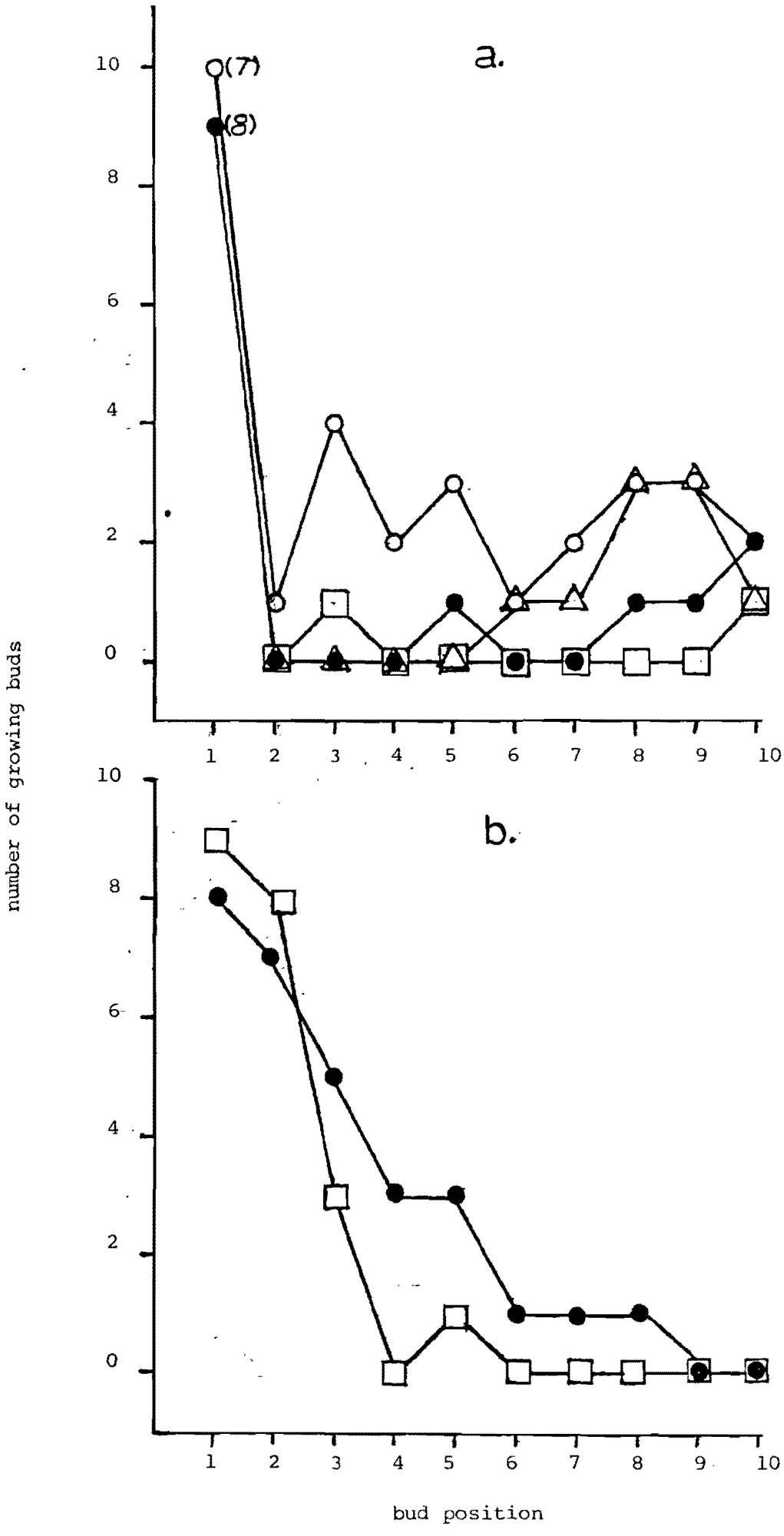
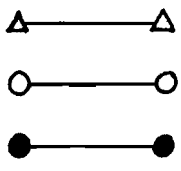

a.
(7)
(8)
b.
number of growing buds
bud position
0
2
4
6
8
10
1
2
3
4
5
6
7
8
9
10

Figure 114. The effect on bud burst of abscisic acid application to thd base of isolated dormant shoots of *Populus nigra* "Italica" (late winter harvest). The values represent the percent bud burst as a function of position on the stem. Each value is the mean of four replicates, each comprising 10 shoots. The vertical bars indicate the least significant differences at the (a) 5% and (b) 1% level.



H_2O

10^{-4}M ABA

10^{-5}M ABA

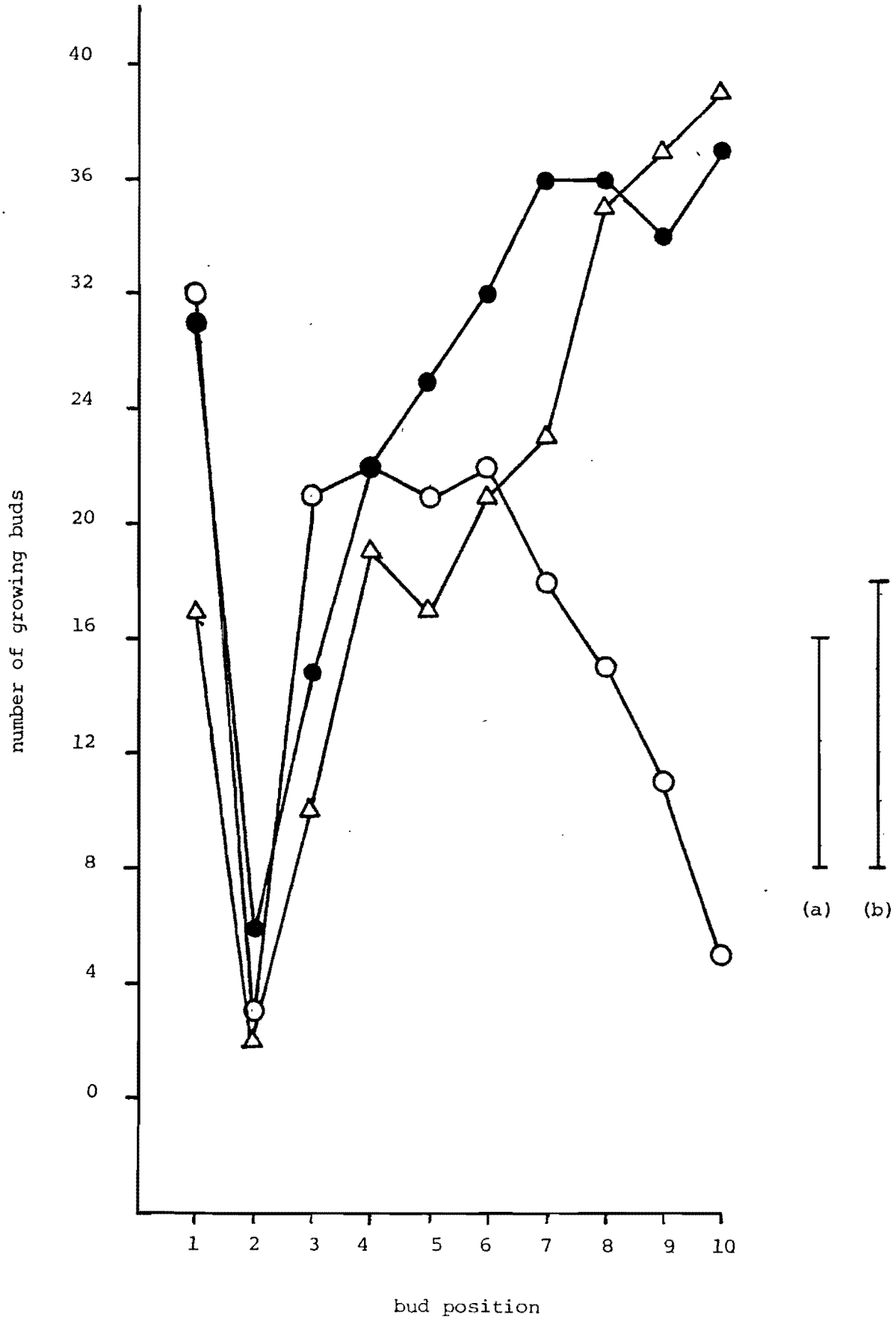
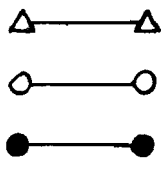

40
36
32
24
20
16
12
8
4
0
number of growing buds
1
2
3
4
5
6
7
8
9
10
bud position
(a)
(b)

Figure 115. The effect on bud burst of the growth regulator application to the base of isolated dormant shoots of *Populus nigra* "Italica" (late winter harvest). The values represent the percent bud burst as a function of position on the stem. Each value is the mean of four replicates, each comprising 10 shoots. The vertical bars indicate the least significant difference at the (a) 5% and (b) 1% level.



H_2O

10^{-3}M CCC

10^{-4}M ABA + 10^{-3}M CCC

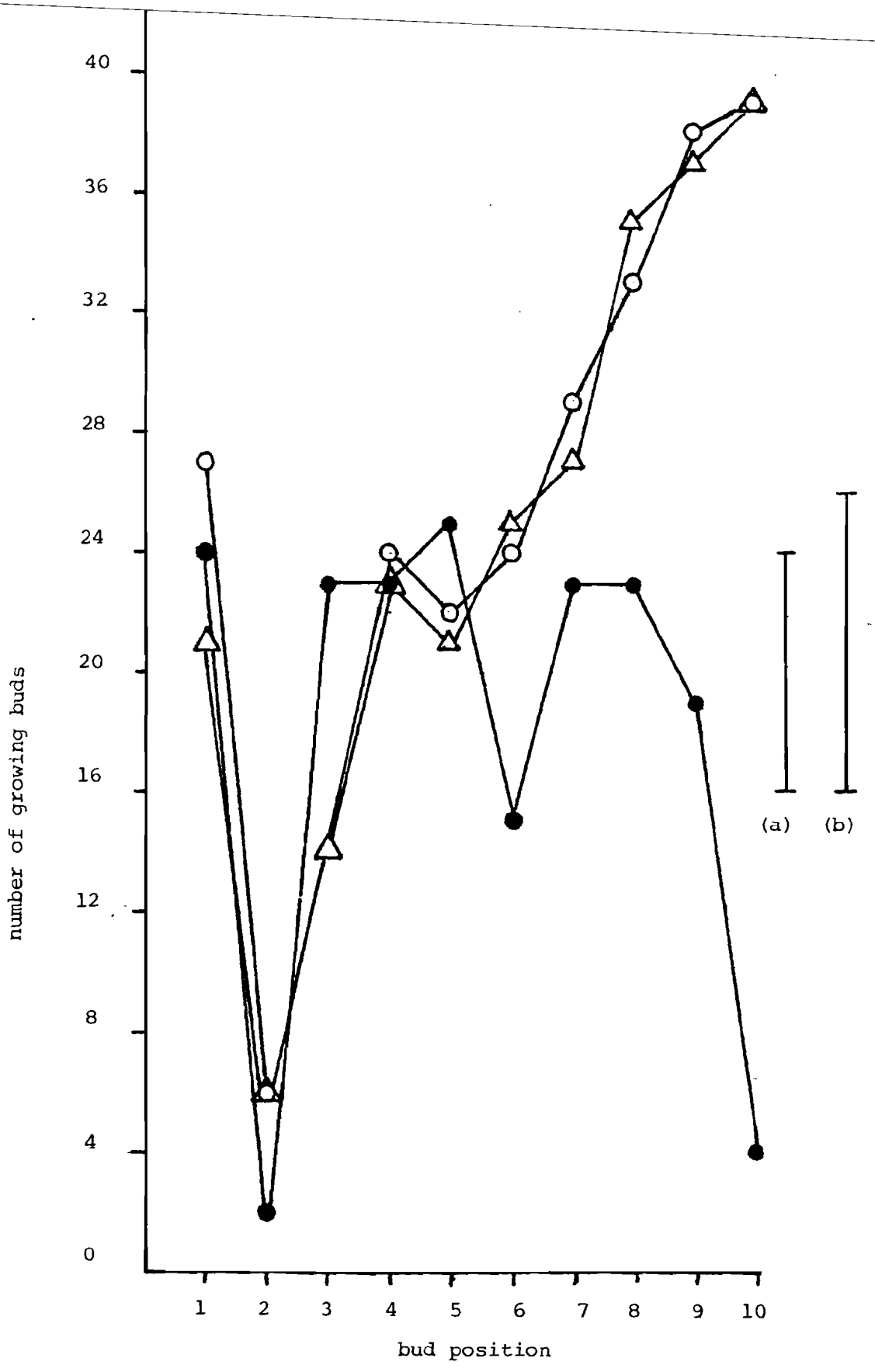
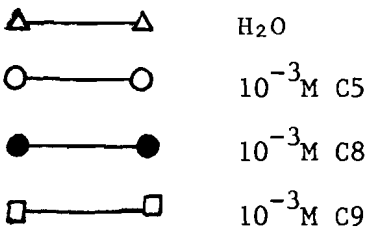

40
36
32
28
24
20
16
12
8
4
0
number of growing buds
1
2
3
4
5
6
7
8
9
10
bud position
(a)
(b)

Figure 116. The effect on bud burst of short chain fatty acid application to the base of isolated, dormant shoots of *Populus nigra* "Italica" (late winter harvest). The values represent the percent bud burst as a function of position on the stem. Each value is the mean of four replicates, each comprising 10 shoots. The vertical bars indicate the least significant difference at the (a) 5% and (b) 1% level.



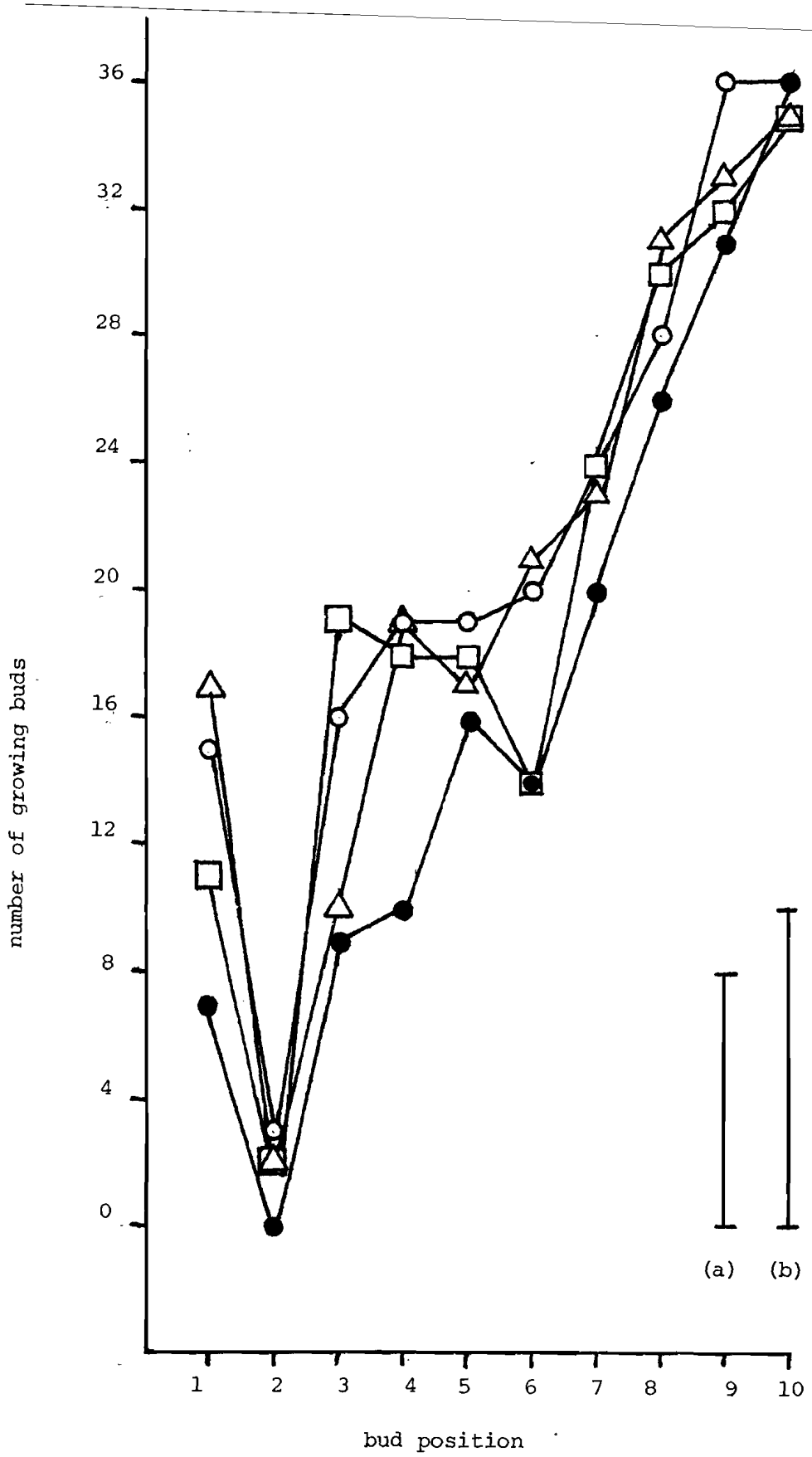
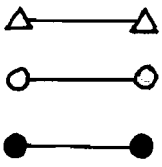

36
32
28
24
20
16
12
8
4
0
number of growing buds
1
2
3
4
5
6
7
8
9
10
bud position
(a)
(b)

Figure 117. The effect on bud burst of abscisic acid application to the base of isolated dormant shoots of *Alnus viridis* (late winter harvest). The values represent percent bud burst as a function of position on the stem. Each value is the mean of four replicates, each comprising 10 shoots. Vertical bars indicate the least significant difference at the (a) 5% and (b) 1% level.



H_2O

10^{-4}M ABA

10^{-5}M ABA

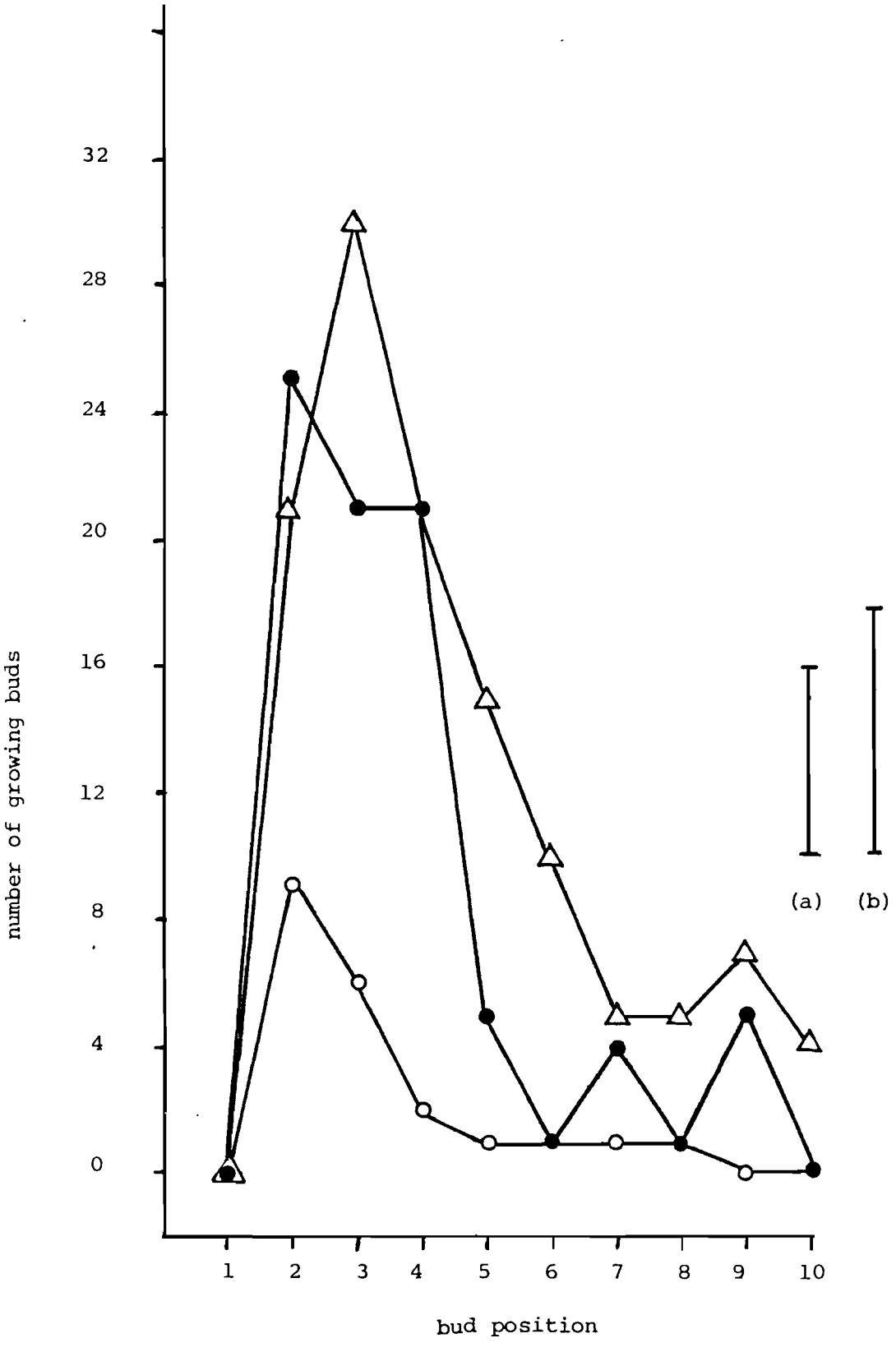
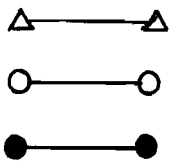

number of growing buds
32
28
24
20
16
12
8
4
0
1
2
3
4
5
6
7
8
9
10
bud position
(a)
(b)

Figure 118. The effect on bud burst of the growth regulator application to the base of isolated dormant shoots of *Alnus viridis* (late winter harvest). The values represent percent bud burst as a function of position on the stem. Each value is the mean of four replicates, each comprising 10 shoots. Vertical bars indicate the least significant difference at the (a) 5% and (b) 1% level.



H_2O

10^{-3}M CCC

10^{-4}M ABA + 10^{-3}M CCC

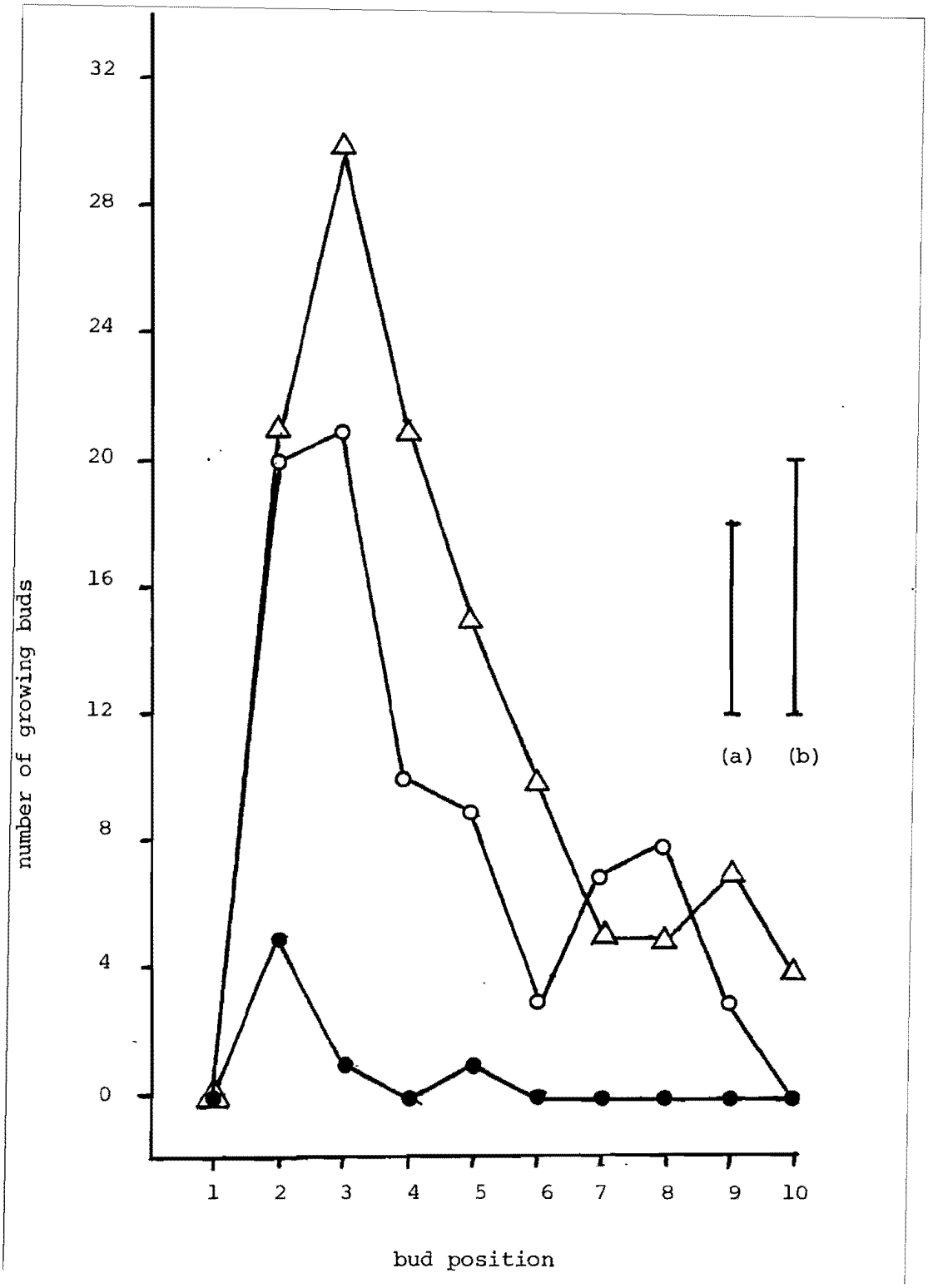
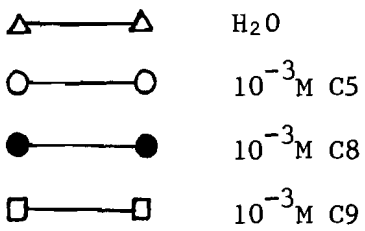

32
28
24
20
16
12
8
4
0
number of growing buds
1
2
3
4
5
6
7
8
9
10
bud position
(a)
(b)

Figure 119. The effect on bud burst of short chain fatty acid application to the base of isolated dormant shoots of *Alnus viridis* (late winter harvest). The values represent percent bud burst as a function of bud position on the stem. Each value is the mean of four replicates, each comprising 10 shoots. Vertical bars indicate the least significant difference at the (a) 5% and (b) 1% level.



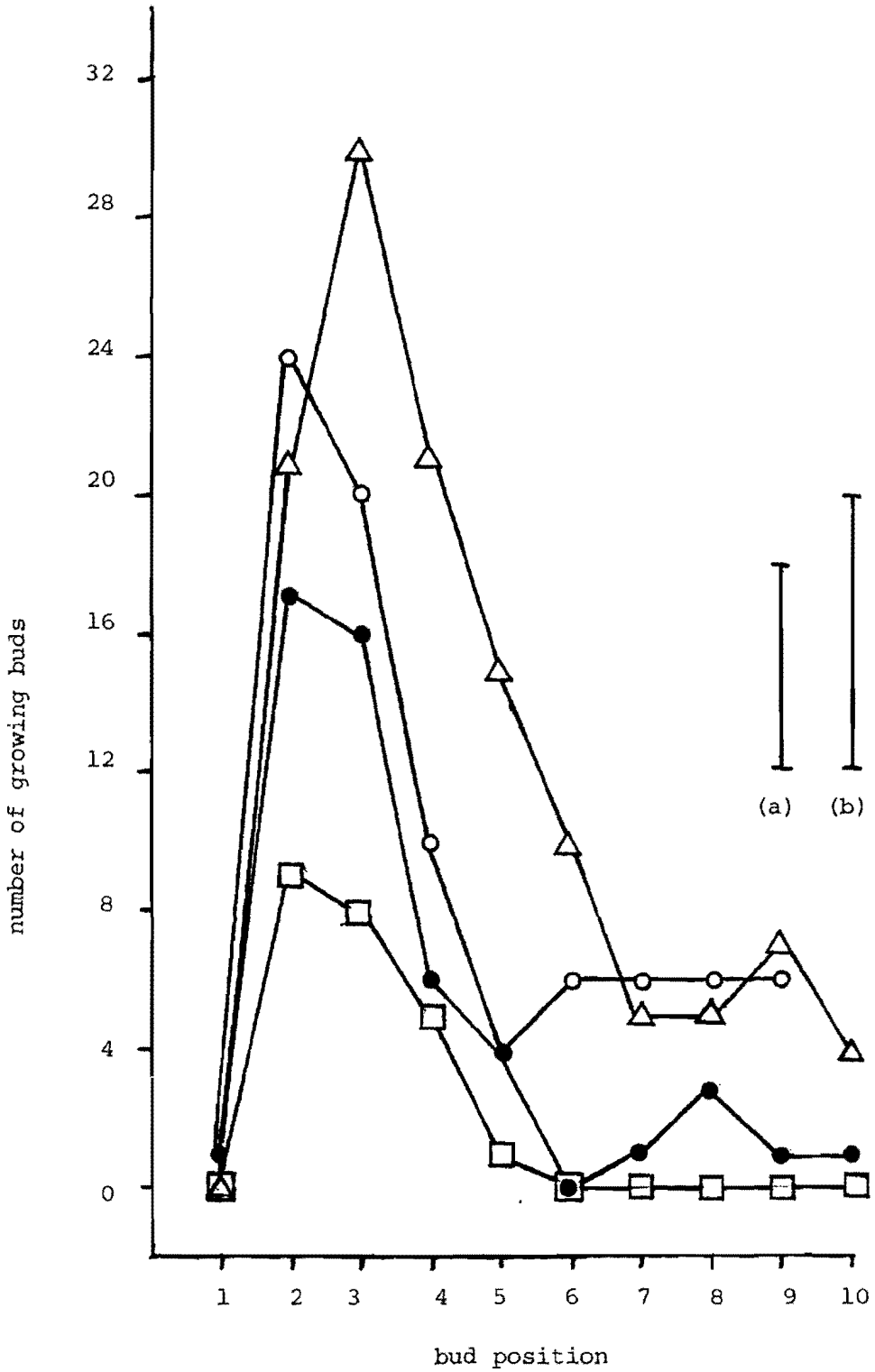
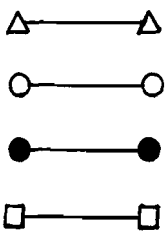

32
28
24
20
16
12
8
4
0
number of growing buds
(a)
(b)
1
2
3
4
5
6
7
8
9
10
bud position

Figure 120. The effect of growth regulator application and (a) the presence and (b) the absence of leaves on bud burst in isolated dormant shoots of *Alnus viridis* (autumn harvest). The values represent the total number of growing buds as a function of position on the stem, with the leaves removed at the beginning of the experiment. Each treatment comprised three replicates, each of 10 shoots. Growth regulators were applied to the base of the shoots. Vertical bars represent the least significant difference at the (a) 5% and (b) 1% level.



H_2O

10^{-4}M ABA

10^{-3}M CCC

10^{-4}M ABA + 10^{-3}M CCC

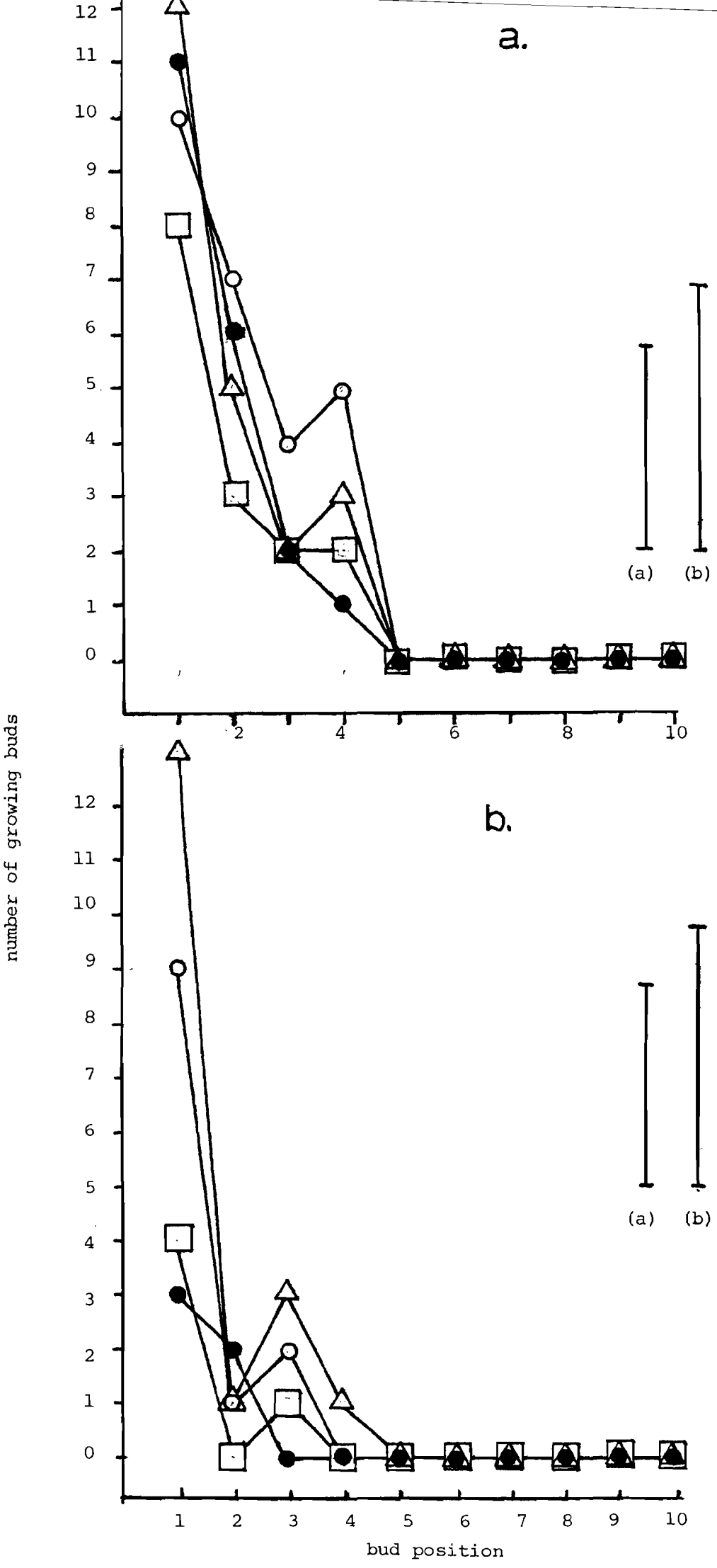
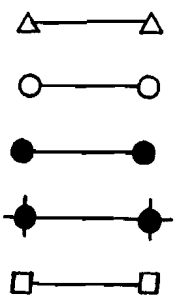

a.
b.
number of growing buds
bud position
(a)
(b)
0
1
2
3
4
5
6
7
8
9
10
11
12

Figure 121. The effect of growth regulator application and (a) the presence and (b) the absence of leaves on bud burst in isolated dormant shoots of *Salix alba/babylonica* (autumn harvest). The values represent the total number of growing buds as a function of position on the stem, with the leaves removed at the beginning of the experiment. Each treatment comprised two replicates, each of 10 shoots. Growth regulator application was to the base of the shoots.



H_2O

10^{-4}M ABA

10^{-5}M ABA

10^{-3}M CCC

10^{-4}M ABA + 10^{-3}M CCC

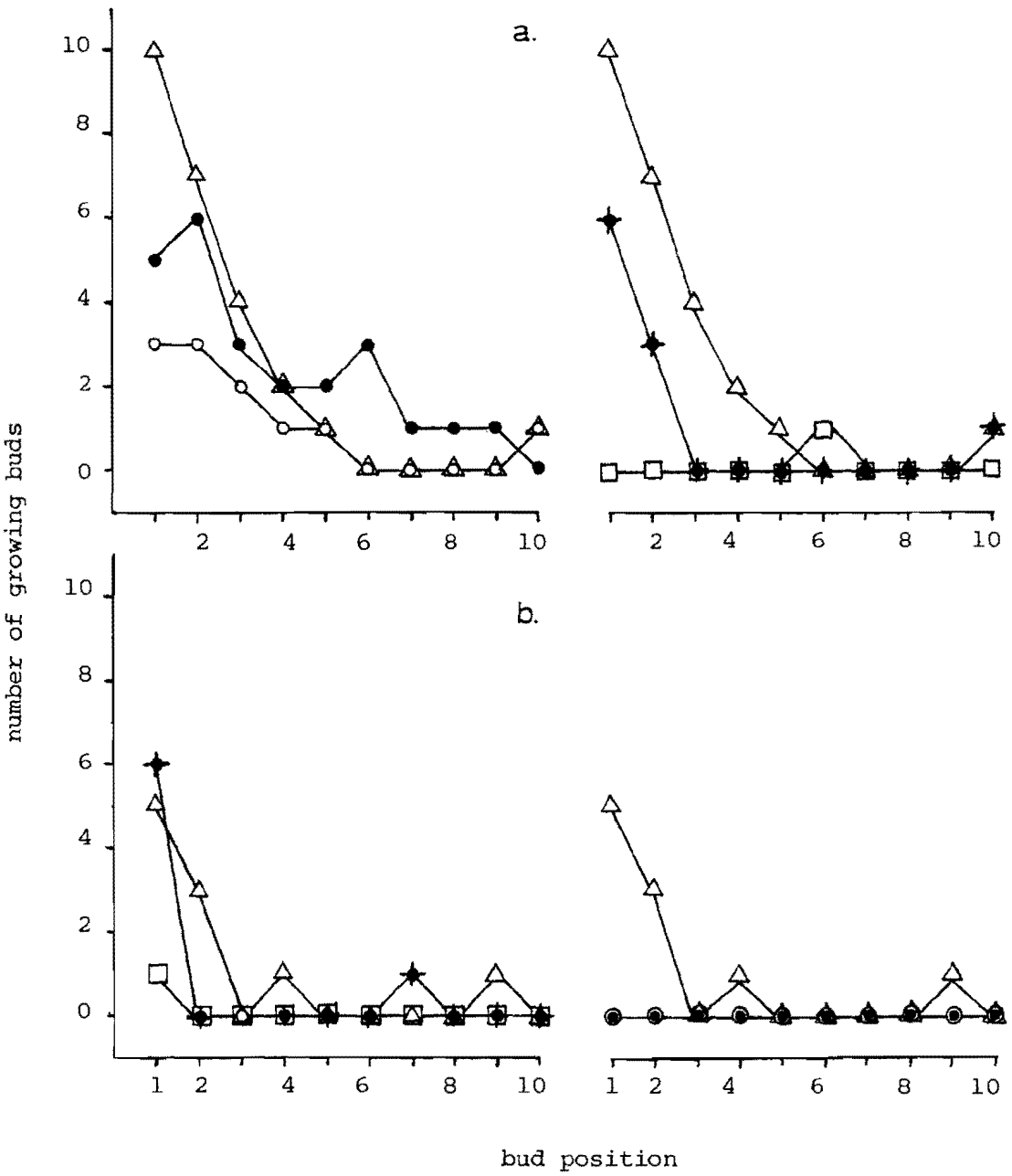
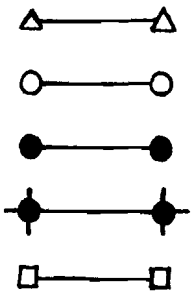

a.
b.
number of growing buds
bud position
0
2
4
6
8
10
1

Figure 122. The effect of growth regulator application and the presence of leaves at (a) basal positions and (b) apical positions on bud burst in isolated dormant shoots of *Salix alba/babylonica* (autumn harvest). The values represent the total number of growing buds as a function of position on the stem with the leaves removed at the beginning of the experiment. Growth regulator application was to the base of the shoots. Each treatment comprised two replicates each of 10 shoots.



H_2O

10^{-4}M ABA

10^{-5}M ABA

10^{-3}M CCC

10^{-4}M ABA + 10^{-3}M CCC

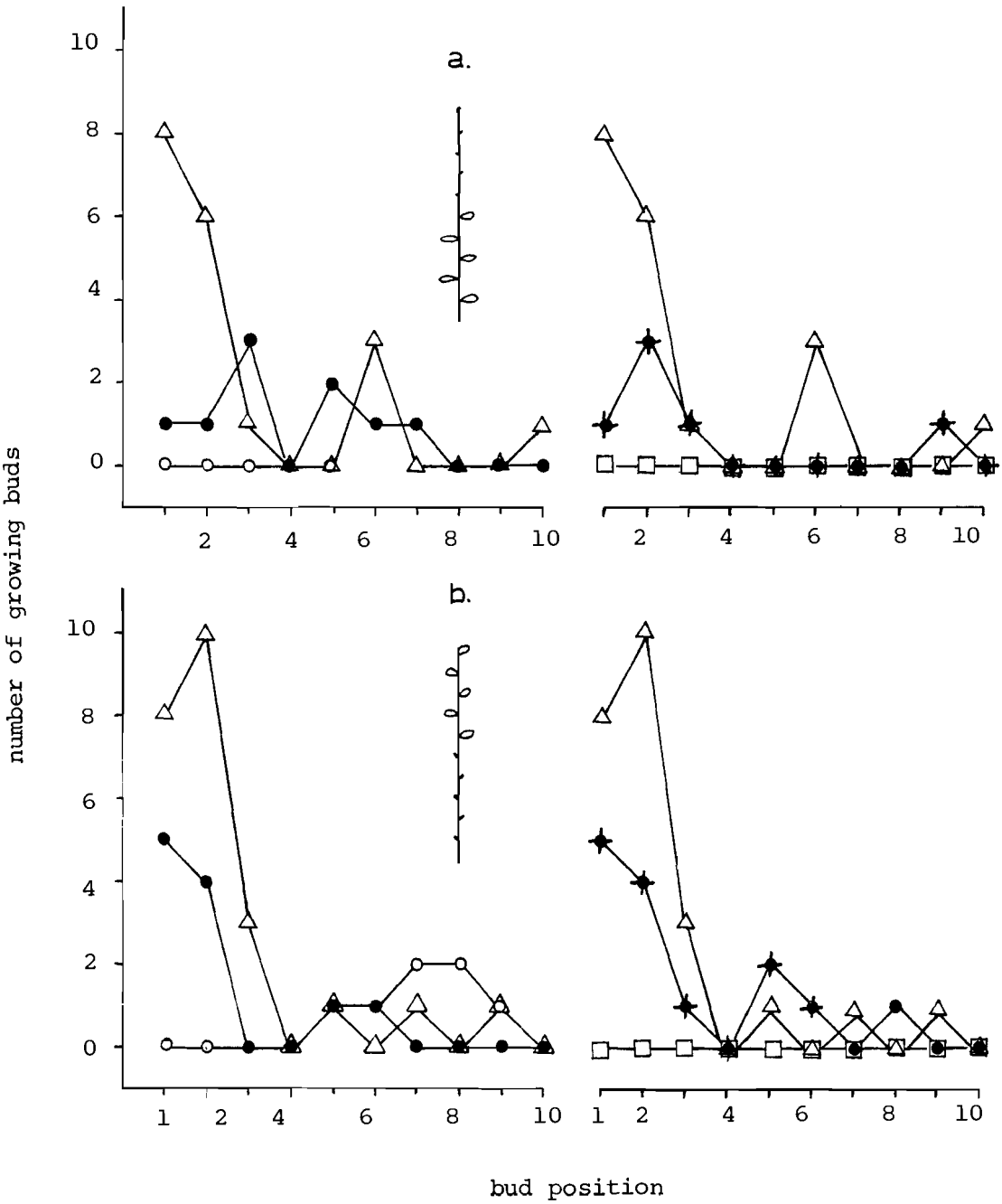
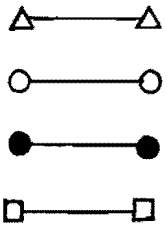

a.
b.
number of growing buds
bud position
0
2
4
6
8
10
1

Figure 123. The effect of apical dominance, growth regulator application and (a) the presence and (b) the absence of leaves on bud burst in isolated dormant shoots of *Salix alba/babylonica* (autumn harvest). The values represent the total number of growing buds as a function of position on the stem. Leaves were removed and the apical and basal sections were separated at the beginning of the experiment. Each treatment comprised two replicates, each of 10 shoots. Growth regulator application was to the base of the shoots.



H_2O

10^{-4}M ABA

10^{-3}M CCC

10^{-4}M ABA + 10^{-3}M CCC

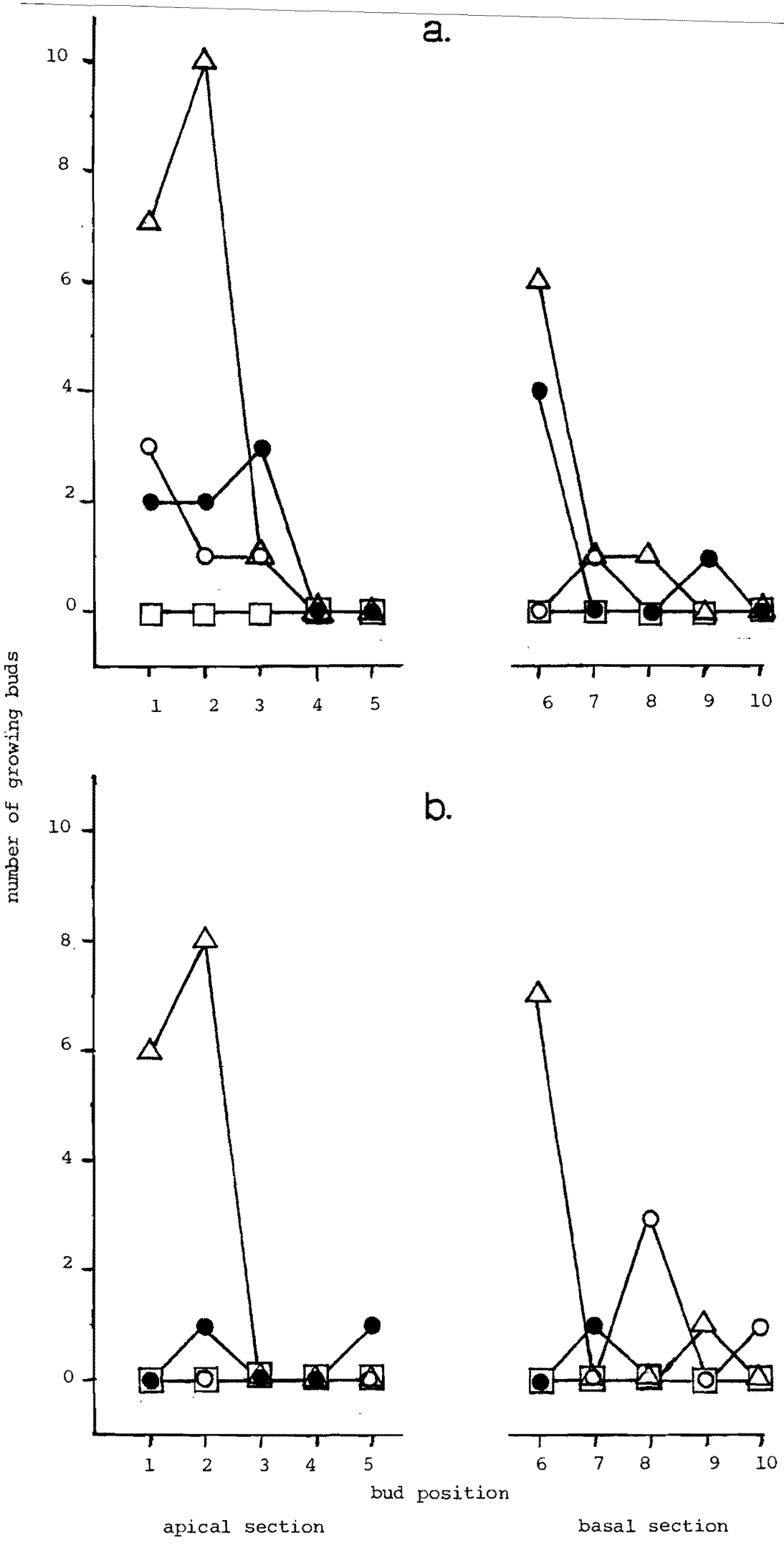
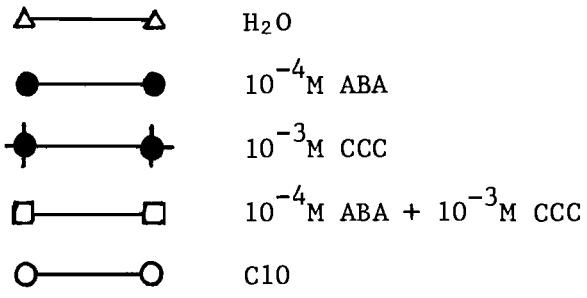

a.
b.
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
number of growing buds
bud position
apical section
basal section

Figure 124. The effect on bud burst of growth regulator application to the base of isolated dormant shoots of *Salix alba/babylonica* (autumn harvest). The values represent the total number of growing buds as a function of position on the stem. Each treatment comprised two replicates, each of 10 shoots. Leaves were removed at the beginning of the experiment.



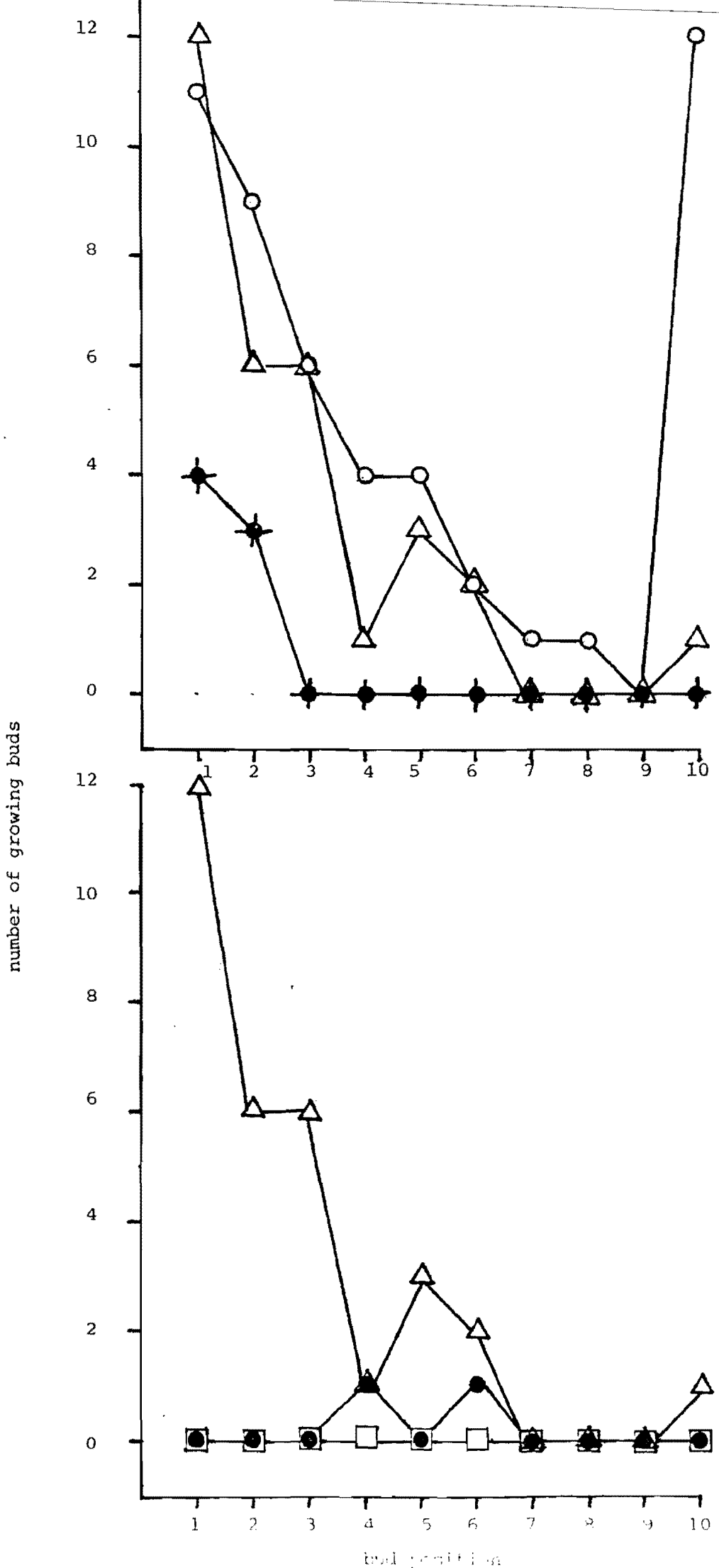

number of growing buds
0
2
4
6
8
10
12
1
2
3
4
5
6
7
8
9
10
bud position

Figure 125. In vitro *Populus yunnanensis* shoot tip assay of the serial dilution of an acidic ether-soluble extract of *Alnus glutinosa* leaves harvested on 4 April 1979 (H3). The equivalent of (a) 0.0, (b) 0.25, (c) 0.5 and (d) 1.0 g DW of leaf material was assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Each R_F section was assayed on one shoot tip and each histogram represents the mean ± S.E. of three replicate chromatographs. The column on the right represents fresh weight of shoots in the absence of a chromatography section. Number in brackets over histogram bars represents one S.E.

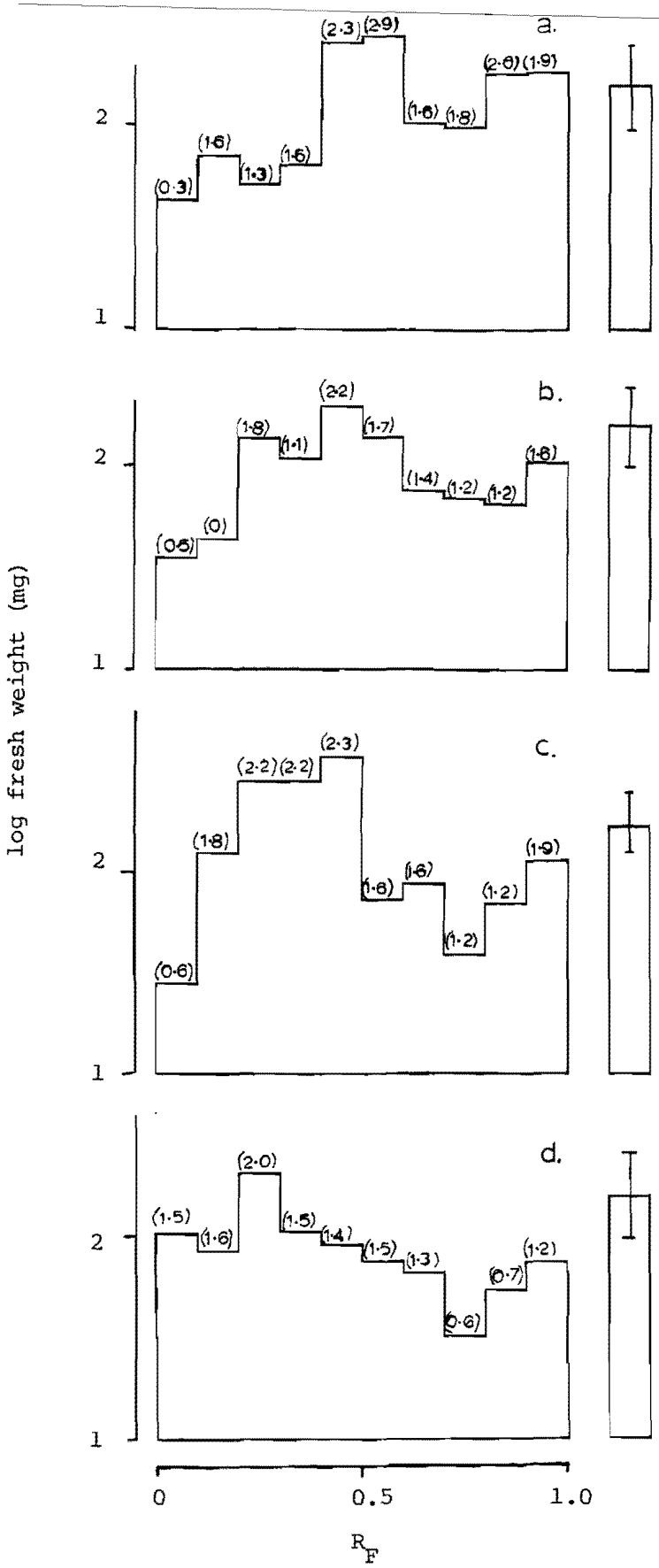

a.
b.
c.
d.
(0·3)
(1·6)
(1·3)
(1·6)
(2·3)
(2·9)
(1·6)
(1·8)
(2·6)
(1·9)
(0·5)
(0)
(1·8)
(1·1)
(2·2)
(1·7)
(1·4)
(1·2)
(1·2)
(1·8)
(0·6)
(1·8)
(2·2)
(2·2)
(2·3)
(1·8)
(1·6)
(1·2)
(1·9)
(1·5)
(1·6)
(2·0)
(1·5)
(1·4)
(1·5)
(1·3)
(0·6)
(0·7)
(1·2)
log fresh weight (mg)
2
1
0
0.5
1.0
R_F

Figure 126. In vitro *Populus yunnanensis* shoot tip assay of the serial dilution of an acidic ether-soluble extract of *Alnus glutinosa* leaves harvested on 4 April 1979 (H3). The equivalent of (a) 0.0, (b) 0.25, (c) 0.5 and (d) 1.0 g DW of leaf material was assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Vertical bars represent twice the S.E. of the mean, and the column on the right represents length of shoots in the absence of a chromatography section. Other details as in figure 125.

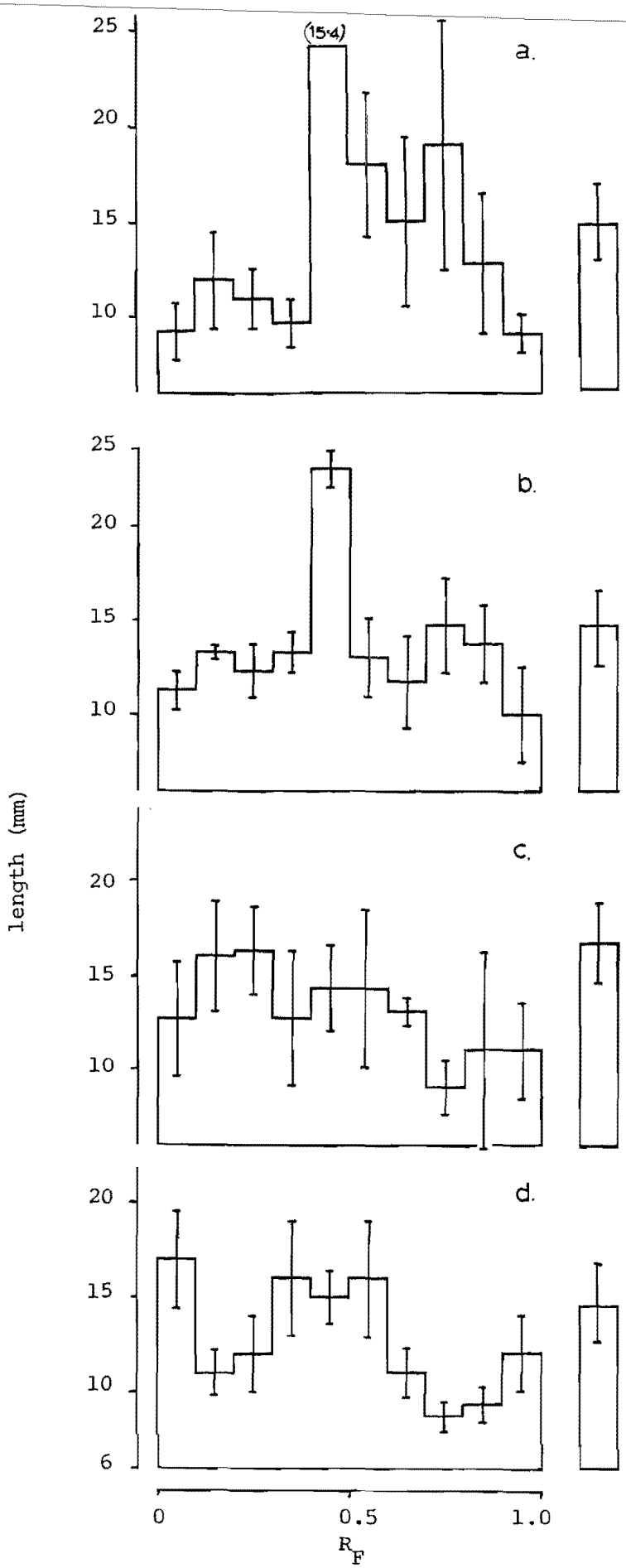

(15·4)
a.
b.
c.
d.
25
20
15
10
6
length (mm)
0
0.5
1.0
R_F

Figure 127. In vitro *Populus yunnanensis* shoot tip assay of the serial dilution of an acidic ether-soluble extract of *Alnus viridis* leaves harvested on day 7 of SD treatment (H2). The equivalent of (a) 0.0, (b) 0.25, (c) 0.5 and (d) 1.0 g DW of leaf material was assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Other details as in figure 125.

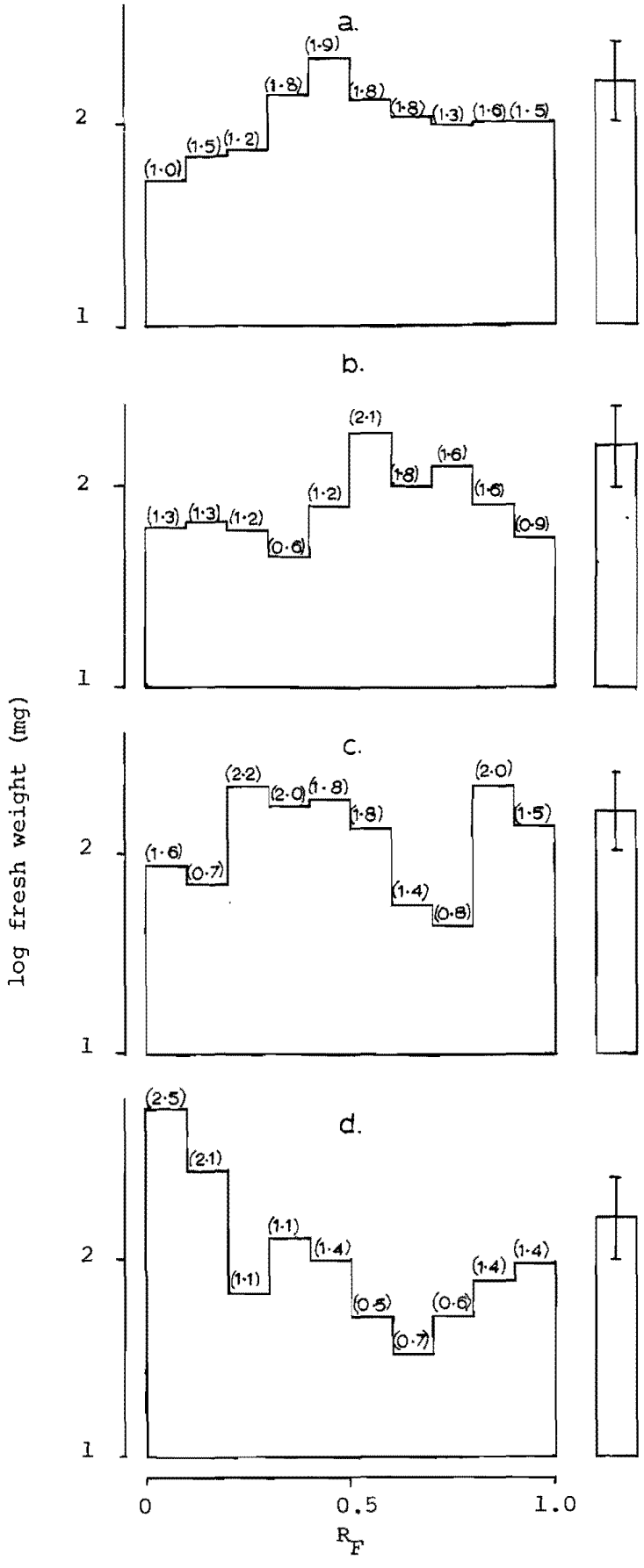

a.
(1·0)
(1·5)
(1·2)
(1·8)
(1·9)
(1·8)
(1·8)
(1·3)
(1·6)
(1·5)
b.
(1·3)
(1·3)
(1·2)
(0·6)
(1·2)
(2·1)
(1·8)
(1·6)
(1·6)
(0·9)
c.
(1·6)
(0·7)
(2·2)
(2·0)
(1·8)
(1·8)
(1·4)
(0·8)
(2·0)
(1·5)
d.
(2·5)
(2·1)
(1·1)
(1·1)
(1·4)
(0·5)
(0·7)
(0·6)
(1·4)
(1·4)
2
1
0
0.5
1.0
R_F
log fresh weight (mg)

Figure 128. In vitro *Populus yunnanensis* shoot tip assay of the serial dilution of an acidic ether-soluble extract of *Alnus viridis* leaves harvested on day 7 of SD treatment (H2). The equivalent of (a) 0.0, (b) 0.25, (c) 0.5 and (d) 1.0 g DW of leaf material was assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Other details as in figure 126.

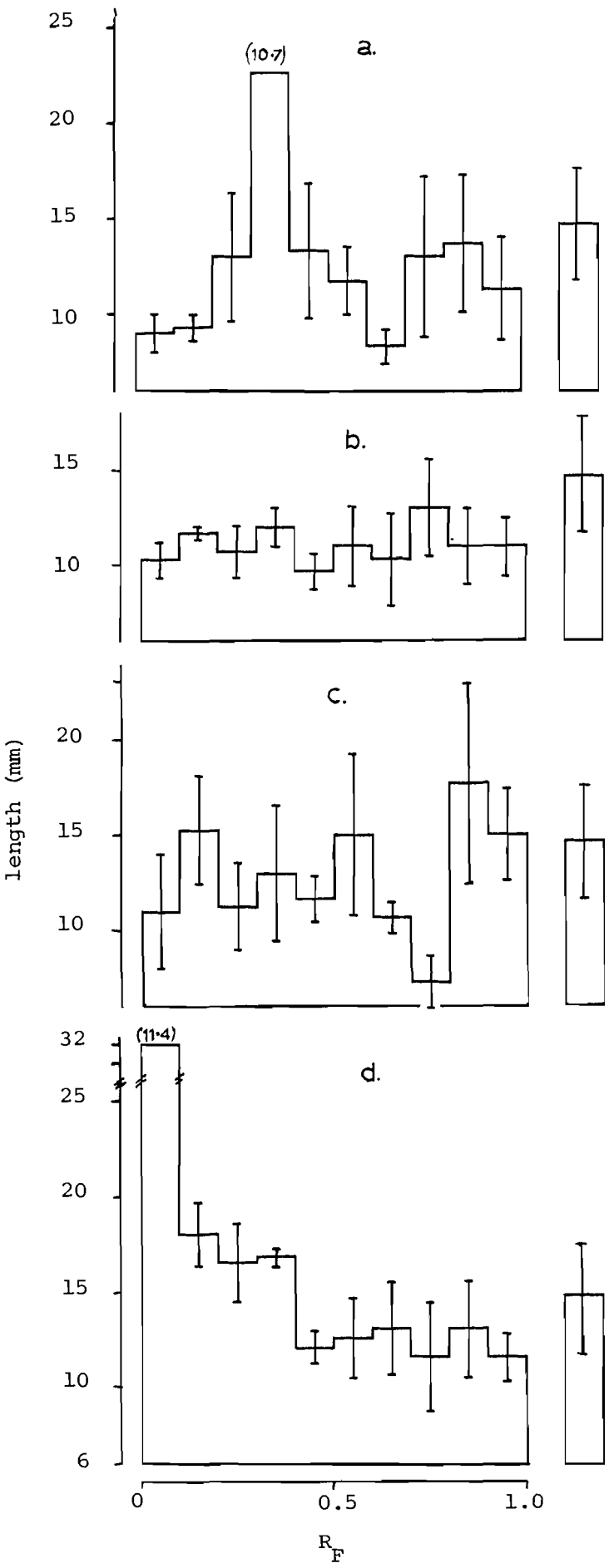

a.
(10·7)
b.
c.
d.
(11·4)
length (mm)
25
20
15
10
32
6
0
0.5
1.0
R_F

Figure 129. In vitro *Populus yunnanensis* shoot tip assay of the serial dilution of an acidic ether-soluble extract of *Alnus glutinosa* apices harvested on 4 April 1979 (H3). The equivalent of (a) 0.0, (b) 0.25, (c) 0.5 and (d) 1.0 g DW of apical material was assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Other details as in figure 125.

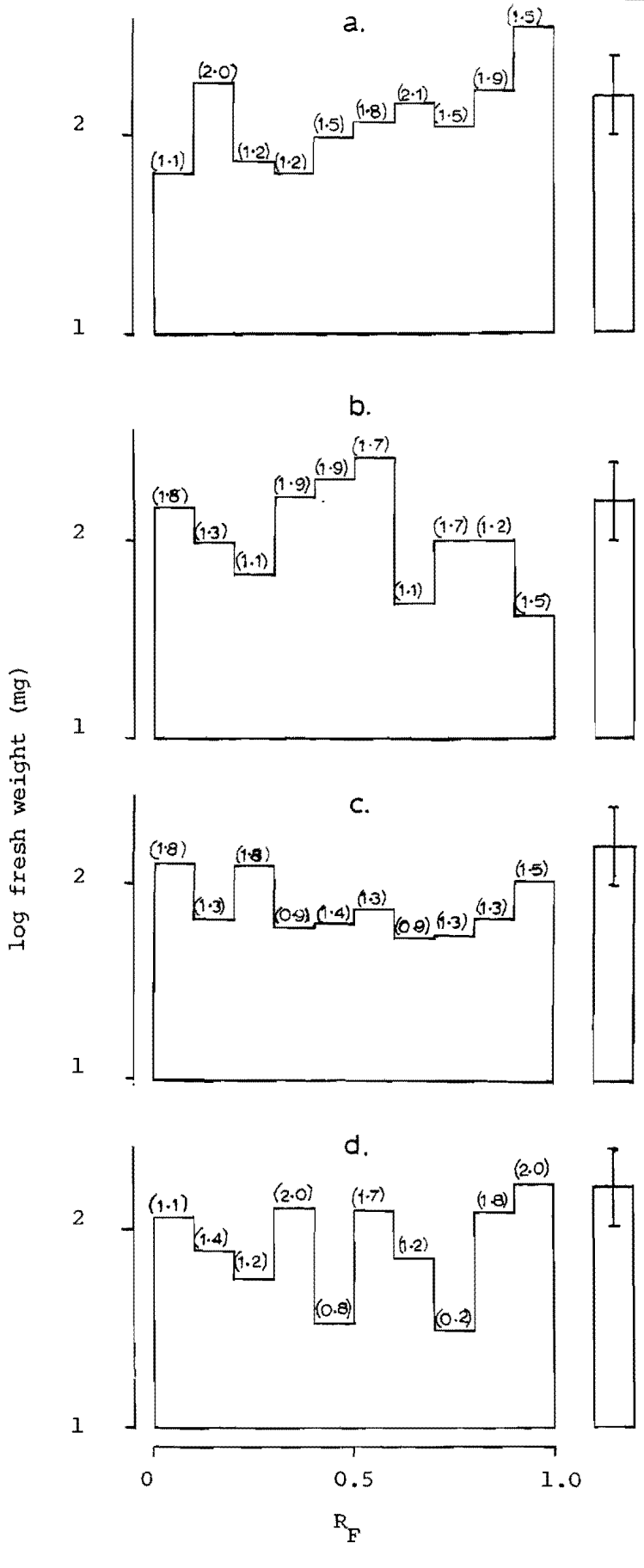

a.
(1·1)
(2·0)
(1·2)
(1·2)
(1·5)
(1·8)
(2·1)
(1·5)
(1·9)
(1·5)
b.
(1·8)
(1·3)
(1·1)
(1·9)
(1·9)
(1·7)
(1·1)
(1·7)
(1·2)
(1·5)
c.
(1·8)
(1·3)
(1·8)
(0·9)
(1·4)
(1·3)
(0·9)
(1·3)
(1·3)
(1·5)
d.
(1·1)
(1·4)
(1·2)
(2·0)
(0·8)
(1·7)
(1·2)
(0·2)
(1·8)
(2·0)
2
1
0
0.5
1.0
log fresh weight (mg)
R_F

Figure 130. In vitro *Populus yunnanensis* shoot tip assay of the serial dilution of an acidic ether-soluble extract of *Alnus glutinosa* apices harvested on 4 April 1979 (H3). The equivalent of (a) 0.0, (b) 0.25, (c) 0.5 and (d) 1.0 g DW of apical material was assayed and the chromatographs were developed in isopropanol:NH_3:H_2O (10:1:1::v:v:v) solvent. Other details as in figure 126.

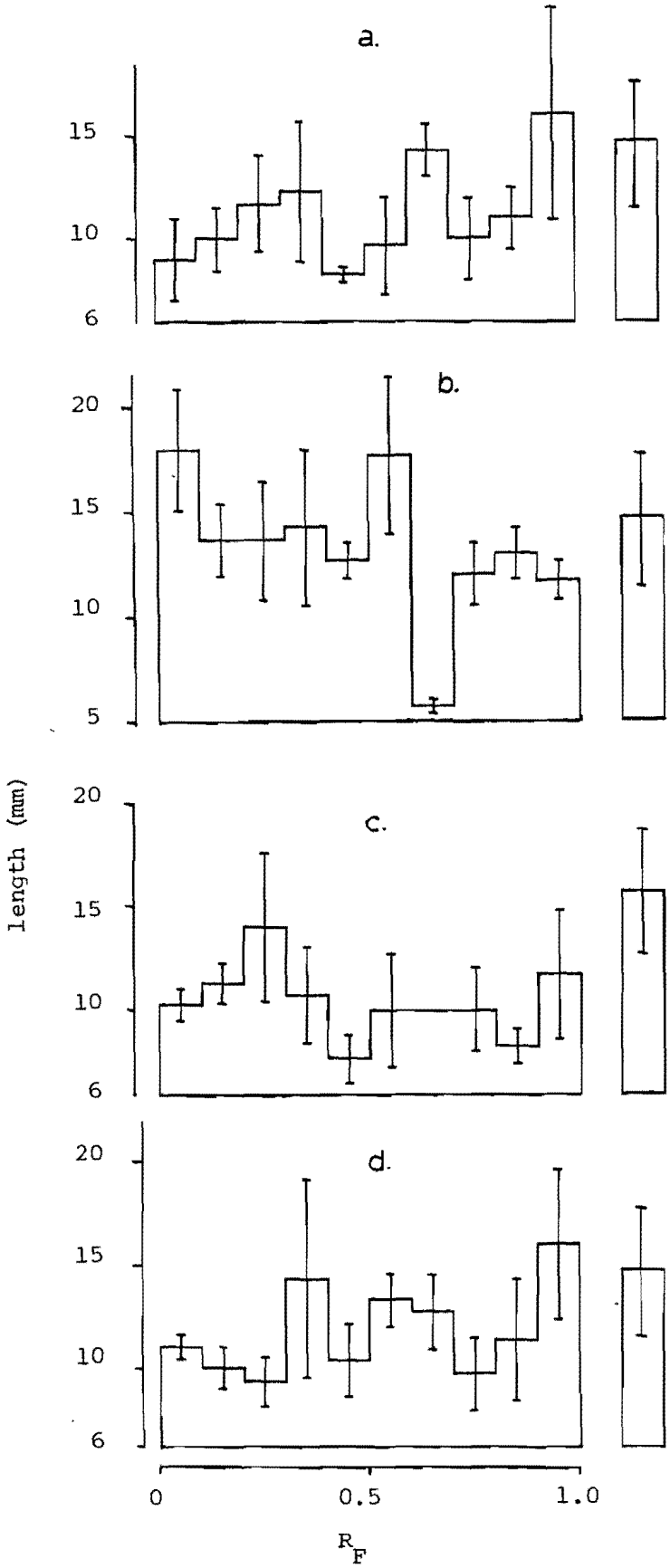

a.
15
10
6
b.
20
15
10
5
c.
20
15
10
6
d.
20
15
10
6
length (mm)
0
0.5
1.0
R_F

Figure 131. Effect of serial dilutions of crude extract on (a) fresh weight and (b) length of *Populus yunnanensis* shoots culture in vitro. Crude extract was obtained from the aqueous fraction of an 80% MeOH extract of *P. yunnanensis* shoots subjected to SD treatment. Apparently single shoots were cultured on medium 2 containing extract and were maintained under LD photoperiods at 25°C for 4 weeks. Each dilution was tested on twenty shoots and the vertical bars represent twice the S.E. of the mean.

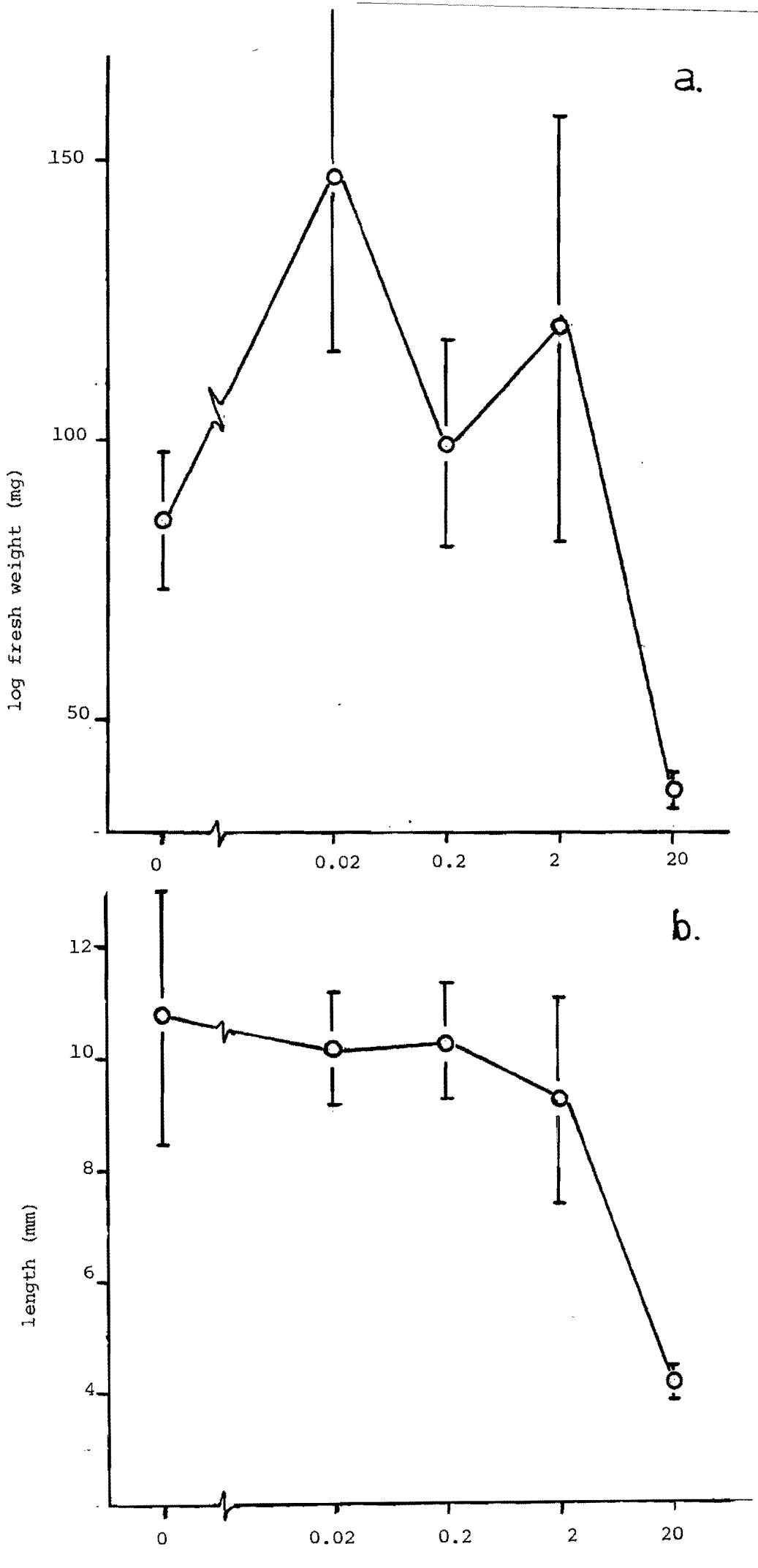

a.
150
100
50
log fresh weight (mg)
0
0.02
0.2
2
20
b.
12
10
8
6
4
length (mm)
0
0.02
0.2
2
20
[equivalent to mg DW of shoot tissue per litre]

Figure 132. Effect of serial concentrations of ABA on (a) fresh weight and (b) length of *Populus yunnanensis* shoots cultured in vitro. Apparently single shoots were cultured on medium 1 (●) or medium 2 (○, △, □, ▲, ■) containing ABA and maintained under LD (16 hour) photoperiods at 20°C for 4 weeks. The experiment was repeated five times using medium 2 and each value represents the mean ± S.E. of twenty shoots. The vertical bars show one S.E. above and/or below the lines.

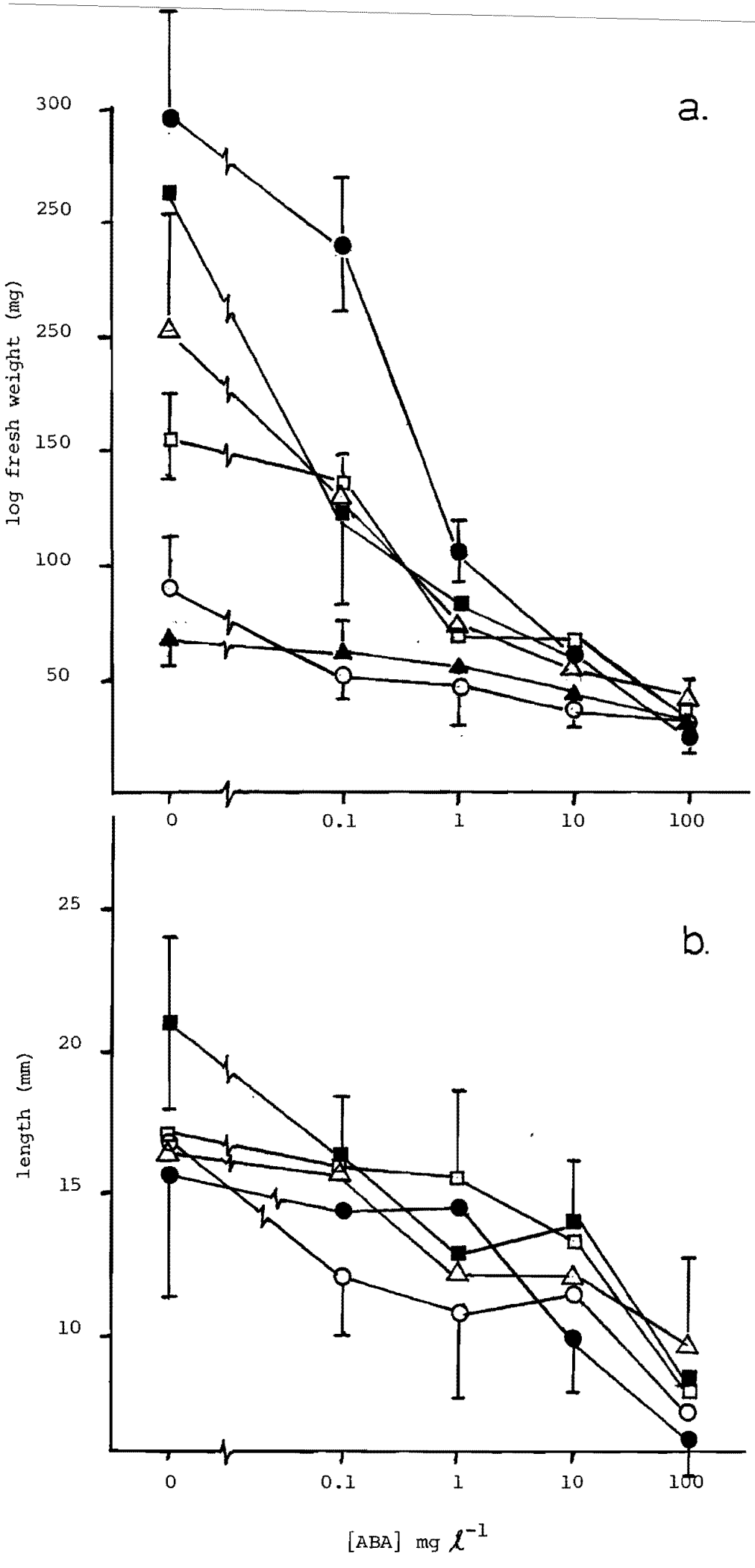

a.
log fresh weight (mg)
300
250
250
150
100
50
0
0.1
1
10
100
b.
length (mm)
25
20
15
10
0
0.1
1
10
100
[ABA] mg ℓ^{-1}

Figure 133. U.V. spectra of (a) abscisic acid in EtoAc and (b) aqueous ABA before and after autoclaving. The mixed isomers of authentic ABA were added to the solution containing inorganic and organic nutrients and re-extracted into EtoAc at pH 3. The aqueous solution was made up with the mixed isomers of ABA. λ_{max} was 248 nm.

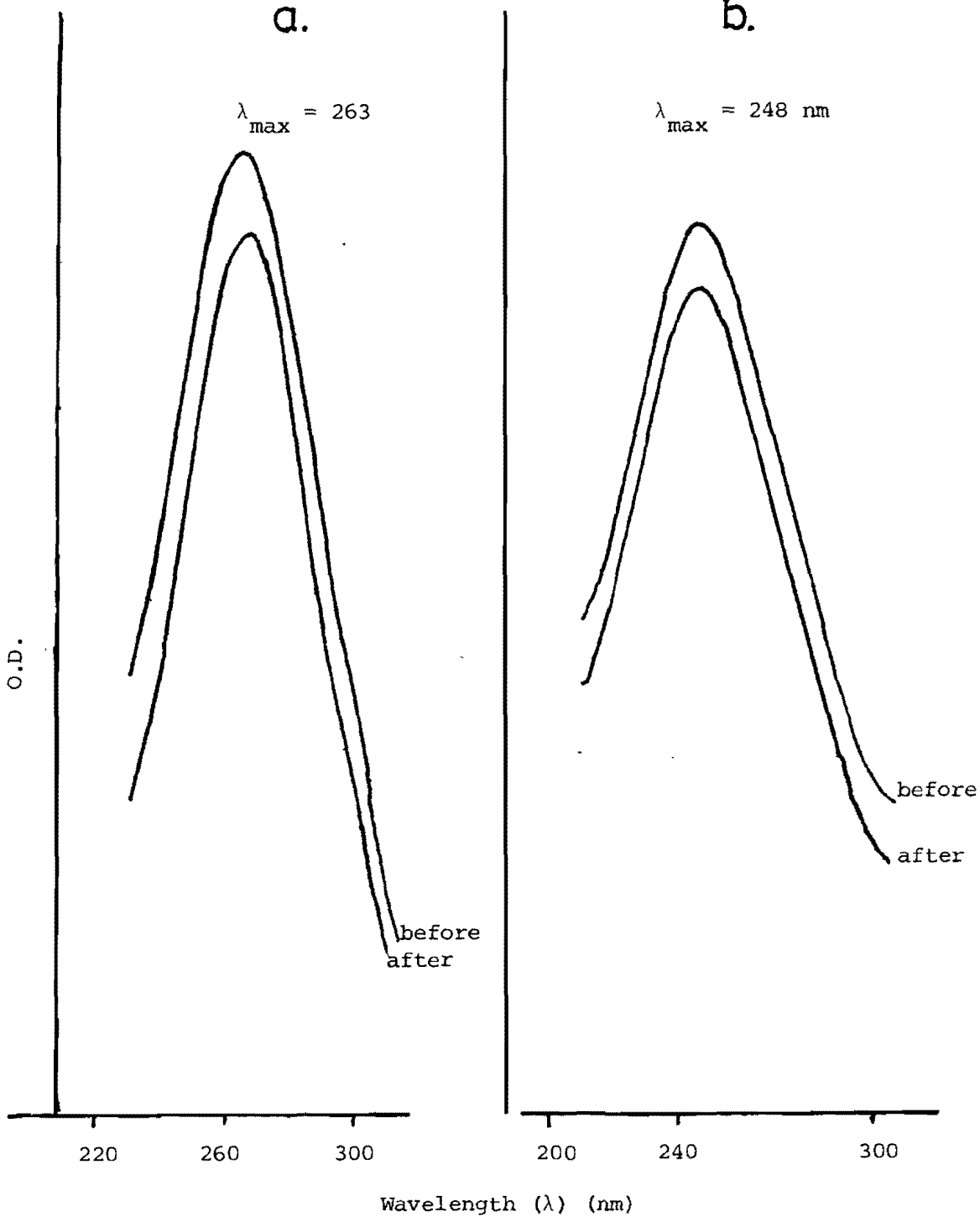

a.
b.
λ_{max} = 263
λ_{max} = 248 nm
O.D.
before
after
before
after
220
260
300
200
240
300
Wavelength (λ) (nm)

Figure 134. Effect of serial concentrations of AMO 1618 on (a) fresh weight and (b) length of *Populus yunnanensis* shoots cultured in vitro. Apparently single shoots were cultured on medium 2 containing AMO 1618 and maintained under LD photoperiods at 25°C for 4 weeks. The experiment was repeated twice and each value represents the mean ± S.E. of twenty shoots. The vertical bars show one S.E. above and/or below the lines.

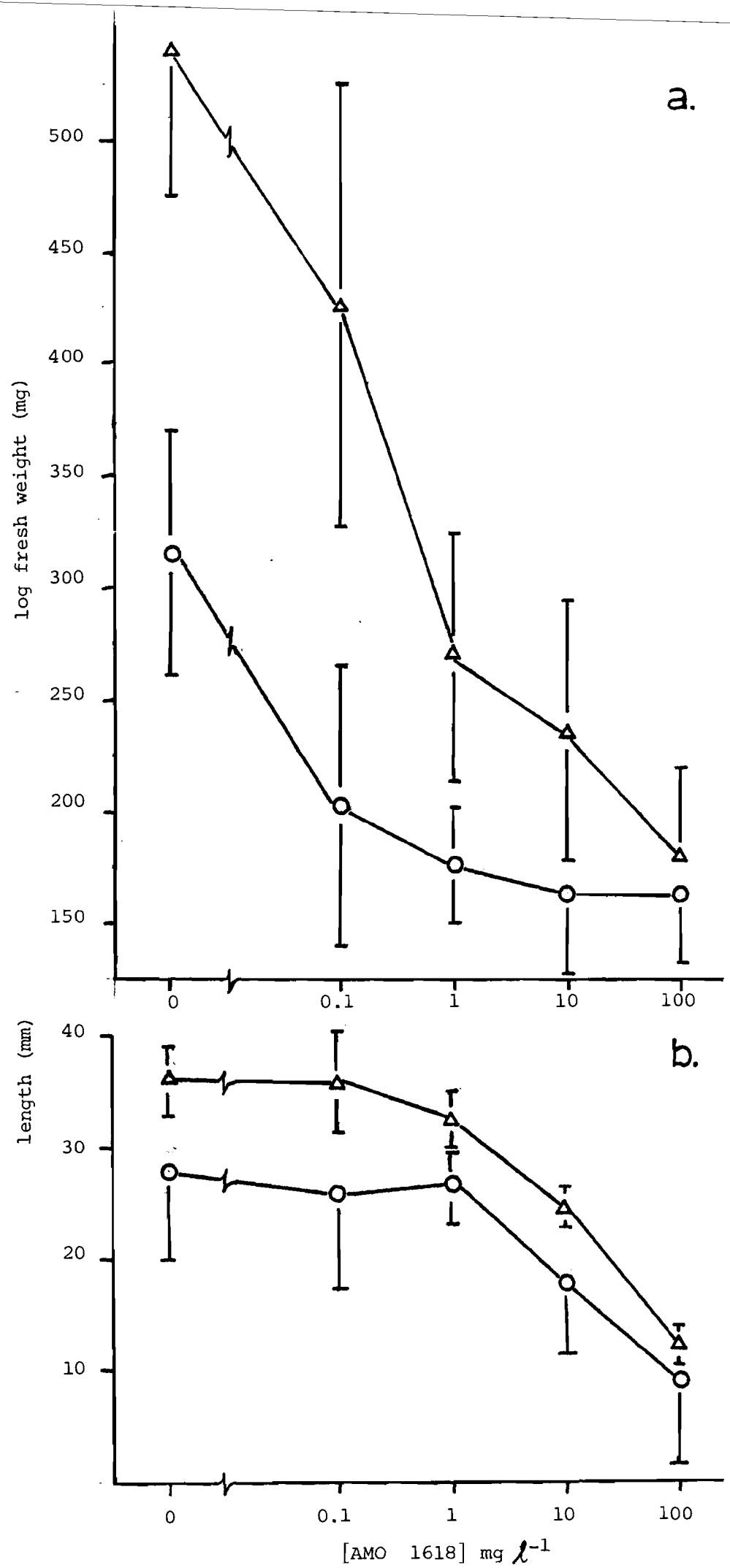

a.
log fresh weight (mg)
500
450
400
350
300
250
200
150
0
0.1
1
10
100
b.
length (mm)
40
30
20
10
0
0.1
1
10
100
[AMO 1618] mg l^{-1}

Figure 135. Effect of serial concentrations of ABA + AMO 1618 on (a) fresh weight and (b) length of *Populus yunnanensis* shoots cultured in vitro. Apparently single shoots were cultured on medium 2 containing ABA + AMO 1618 and maintained under LD photoperiods at 25°C for 4 weeks. The experiment was repeated twice and each value represents the mean ± S.E. of twenty shoots. The vertical bars show one S.E. above and/or below the lines.

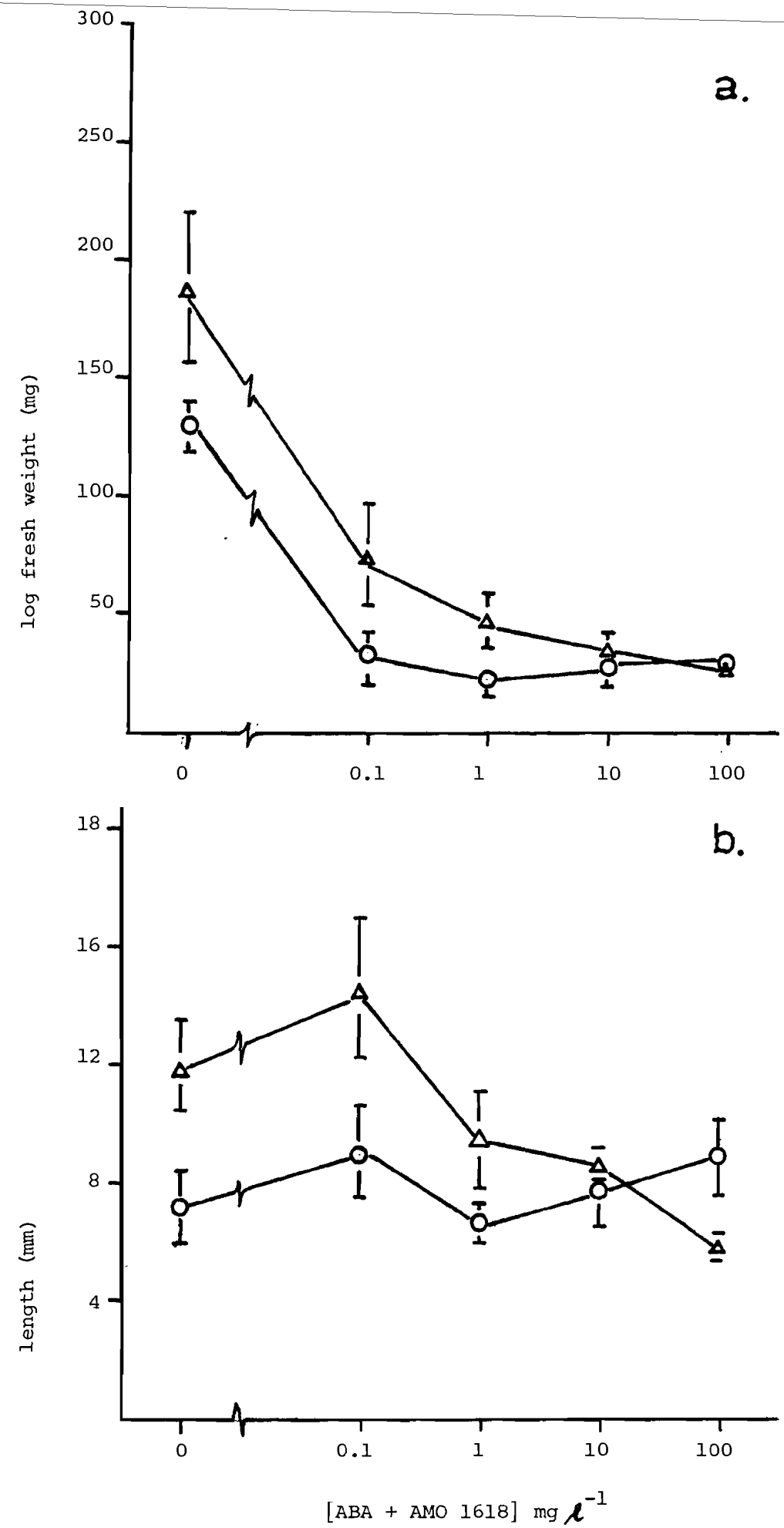

a.
300
250
200
150
100
50
log fresh weight (mg)
0
0.1
1
10
100
b.
18
16
12
8
4
length (mm)
0
0.1
1
10
100
[ABA + AMO 1618] mg ℓ^{-1}

Figure 136. Effect of serial concentrations of GA_3 on (a) fresh weight and (b) length of *Populus yunnanensis* shoots cultured in vitro. Apparently single shoots were cultured on medium 2 containing GA_3 and maintained under LD photoperiods at $25^{o}C$ for 4 weeks. The experiment was repeated twice and each value represents the mean ± S.E. of twenty shoots. The vertical bars show one S.E. above and/or below the lines.

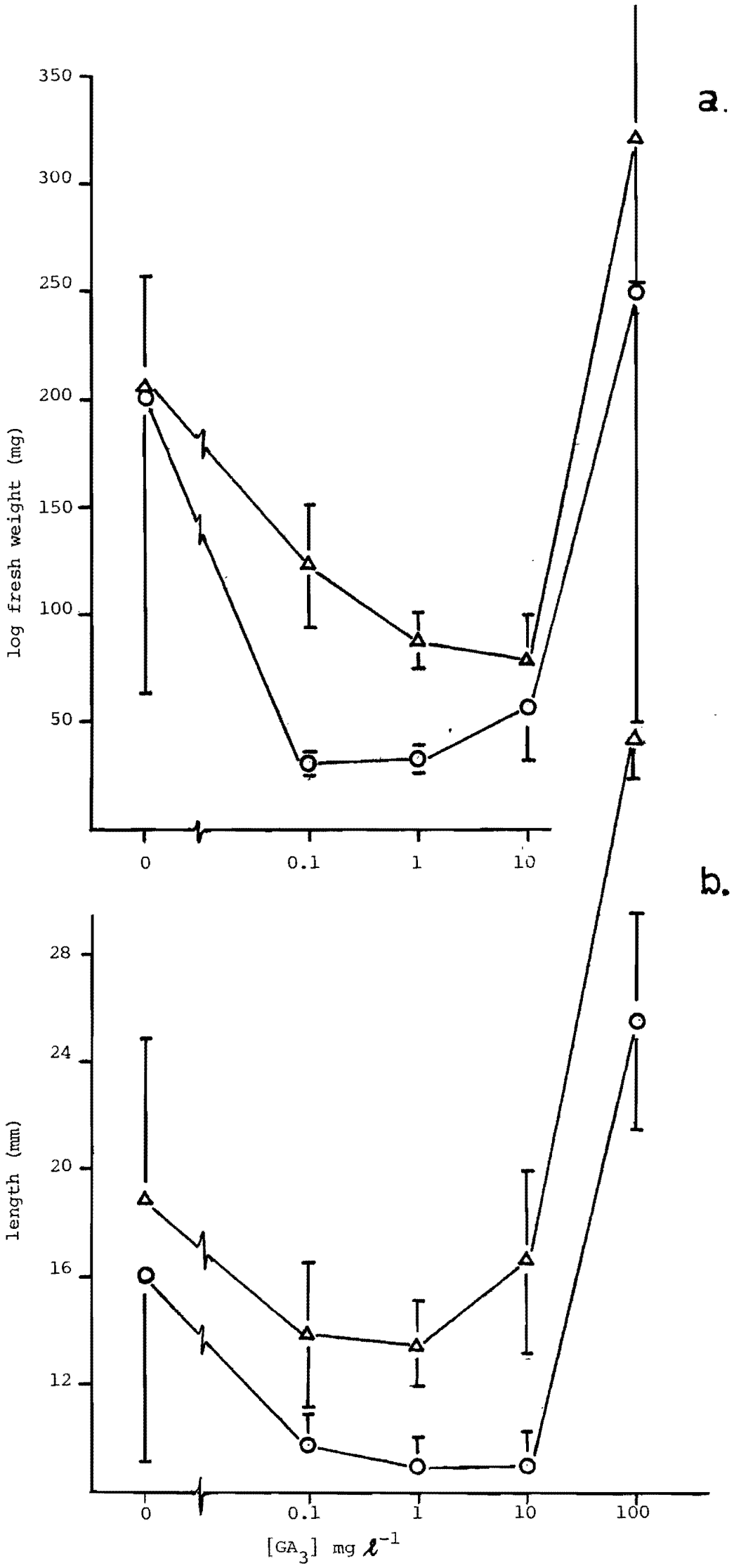

a.
b.
log fresh weight (mg)
length (mm)
350
300
250
200
150
100
50
28
24
20
16
12
0
0.1
1
10
100
[GA3] mg ℓ-1

Figure 137. Effect of serial concentrations of C5 on (a) fresh weight and (b) length of *Populus yunnanensis* shoots cultured in vitro. Apparently single shoots were cultured on medium 2 containing C5 and maintained under LD photoperiods at 25°C for 4 weeks. The experiment was repeated twice and each value represents the mean ± S.E. of twenty shoots. The vertical bars show one S.E. above and/or below the lines.

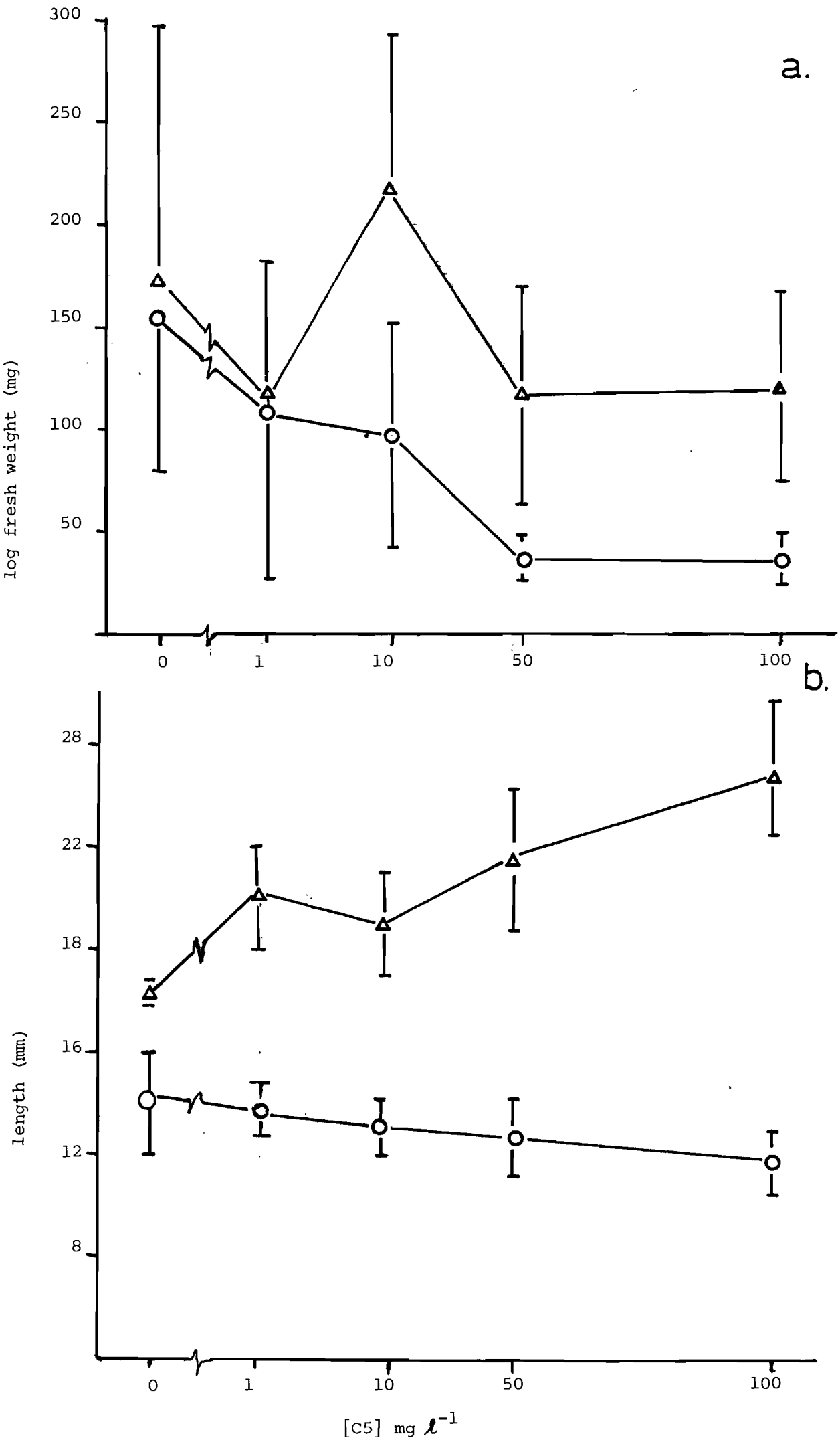

a.
log fresh weight (mg)
300
250
200
150
100
50
0
1
10
50
100
b.
length (mm)
28
22
18
16
12
8
0
1
10
50
100
[C5] mg ℓ^{-1}

Figure 138. Effect of serial concentrations of C10 on (a) fresh weight and (b) length of *Populus yunnanensis* shoots cultured in vitro. Apparently single shoots were cultured on medium 2 containing C10 and maintained under LD photoperiods at 20°C for 4 weeks. The experiment was repeated twice and each value represents the mean ± S.E. of twenty shoots. The vertical bars show one S.E. above and/or below the lines.

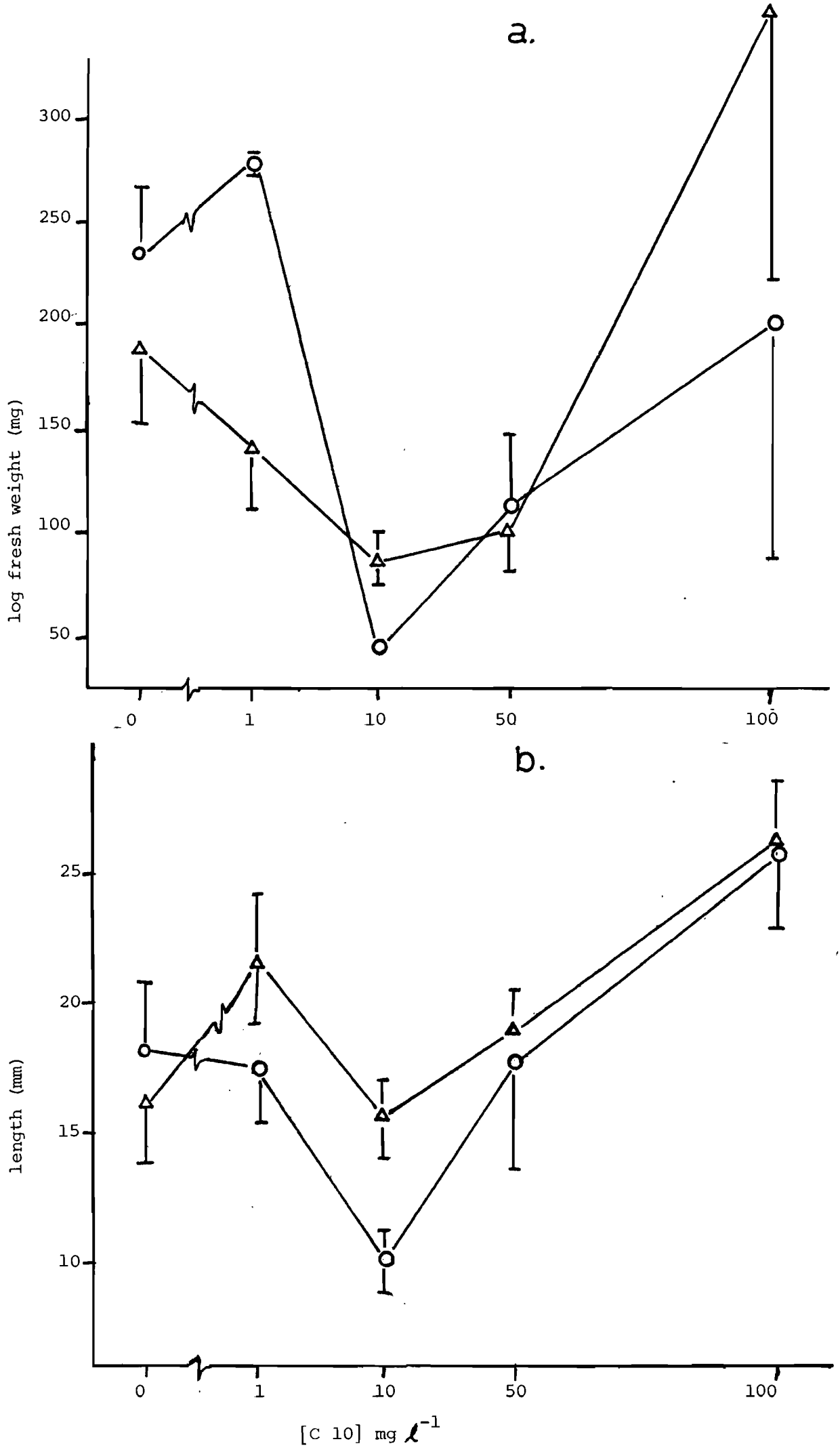
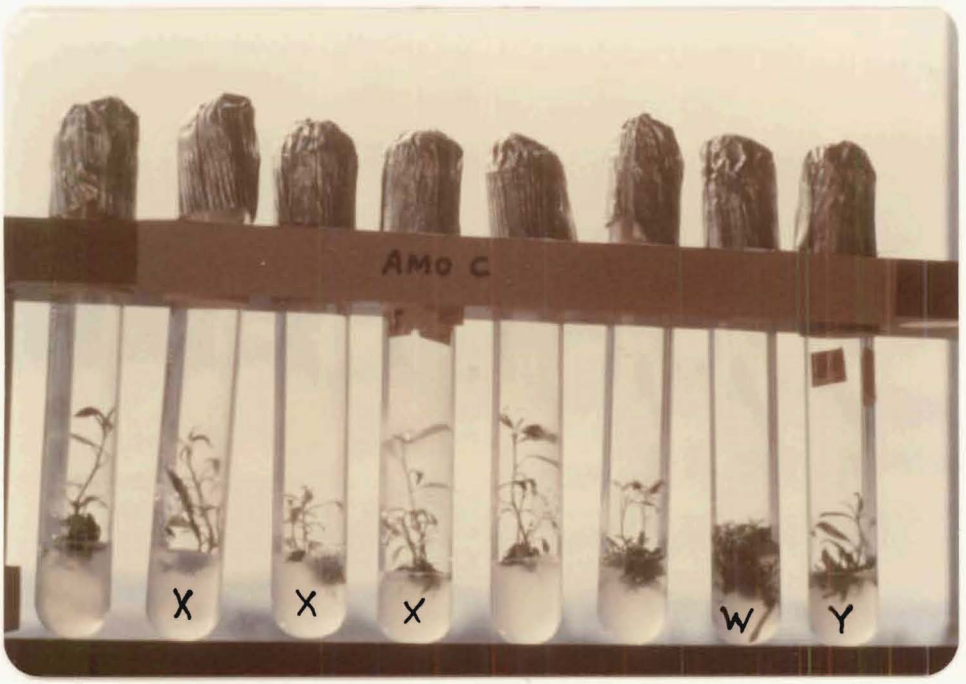

a.
log fresh weight (mg)
300
250
200
150
100
50
0
1
10
50
100
b.
length (mm)
25
20
15
10
0
1
10
50
100
[C 10] mg ℓ^{-1}

Plate 1. Growth of *Populus yunnanensis* shoots in vitro. Shoots were cultured on medium 2 and maintained under LD's (16 h photoperiod) at 25°C.


ABA NI C
Y
W


AMO C
X
X
X
W
Y

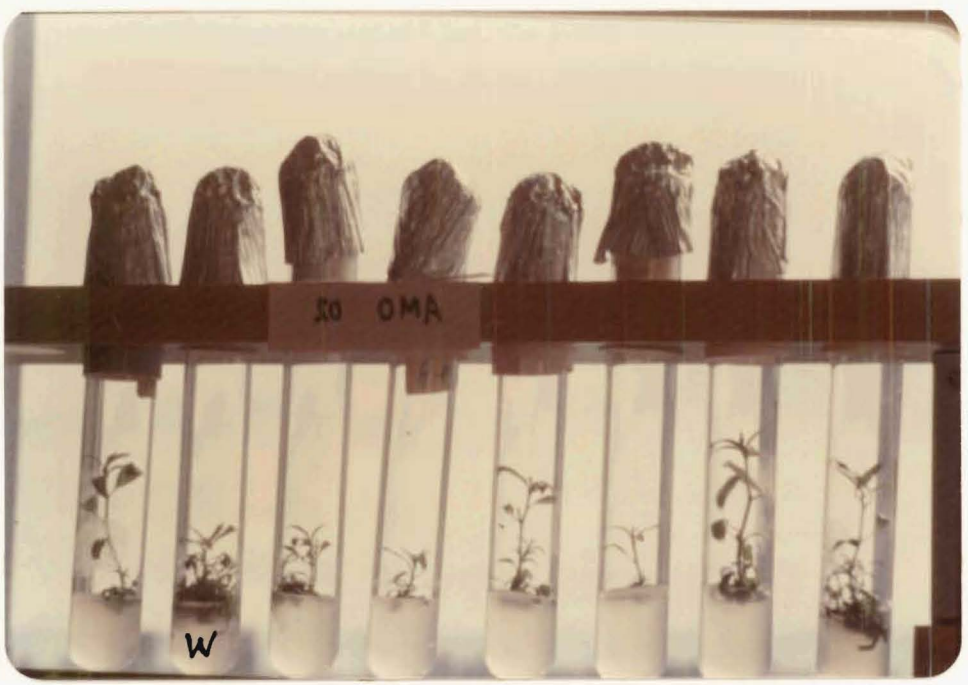
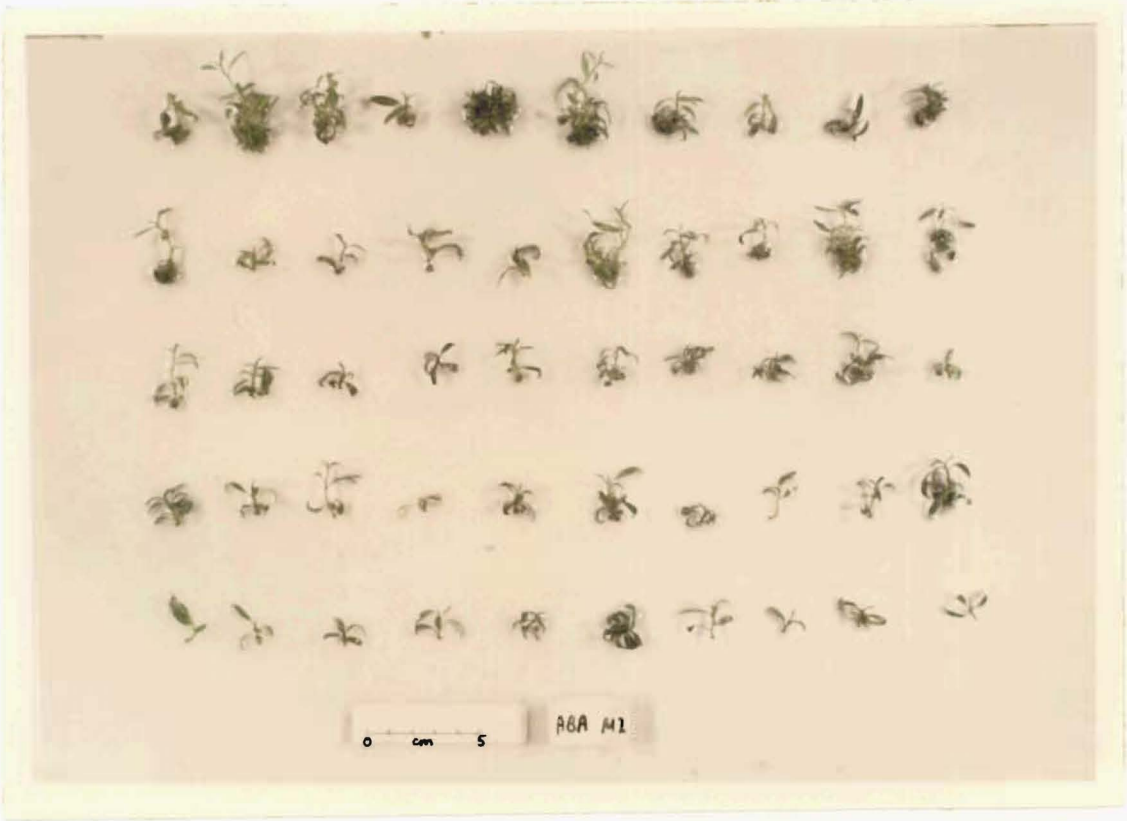

ZO OMA
W

Plate 2A. Apical region of a *Populus yunnanensis* shoot cultured in vitro and maintained under LD's at 20°C. Note the new emerging leaf at the apex.

Plate 2B. Apical region of a *Populus yunnanensis* shoot cultured in vitro after 21 days of transfer from LD's to SD's. Note the cessation of extension growth resulting in the suppression of internodes and the absence of new leaves at the apex.

Plate 3. Effect of serial concentrations of ABA on the growth of *Populus yunnanensis* shoots cultured in vitro. Shoots were cultured on medium 2 plus ABA and maintained under LD's at 25°C.

Plate 4. Effect of serial concentrations of AMO 1618 on the growth of *Populus yunnanensis* shoots cultured in vitro.


conc.
mg l^{-1}
0
0·01
0·1
1
10
0 cm 5
ABA M1

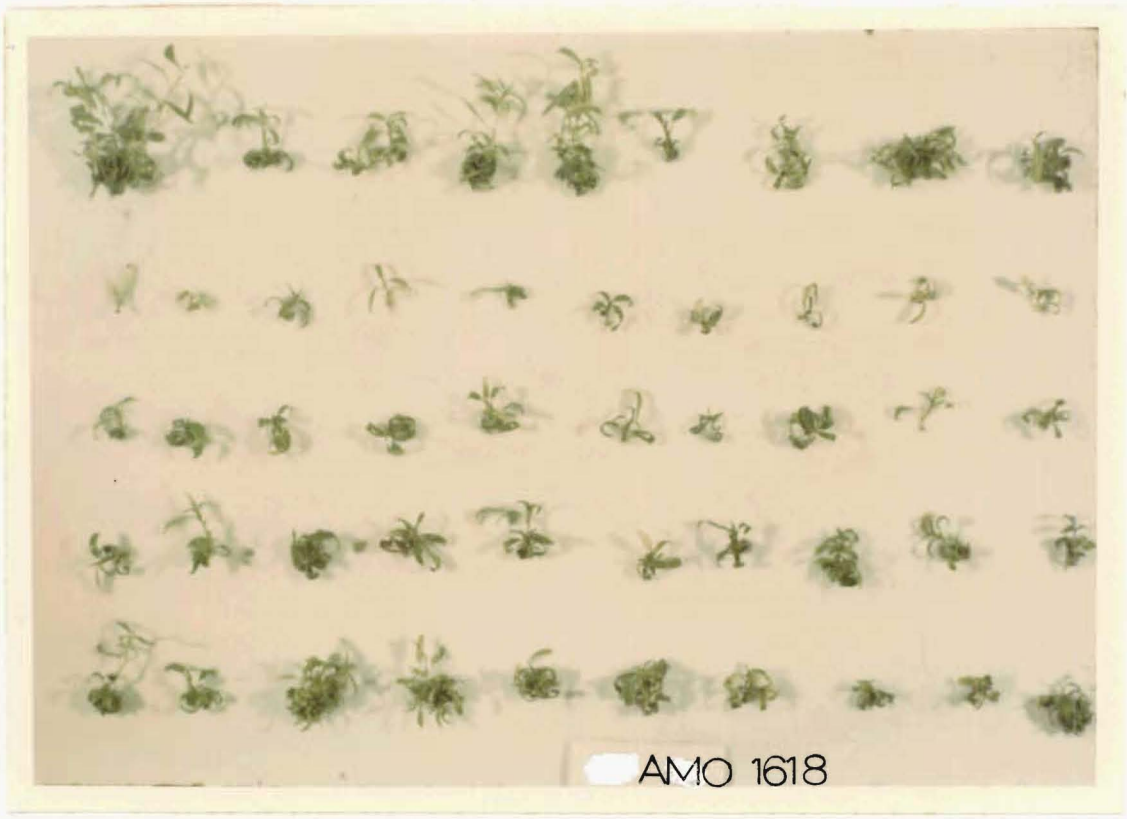

conc.
mg l^{-1}
0
0·01
0·1
1
10
AMO 1618

Plate 5. Effect of serial concentrations of ABA + AMO 1618 on the growth of *Populus yunnanensis* shoots cultured in vitro.

Plate 6. Effect of serial concentrations of GA_3 on the growth of *Populus yunnanensis* shoots cultured in vitro.

ABA+AMO 1618

conc. mg l^{-1}

0

10

1

0·1

0·01

conc. mg l^{-1}

0

0·01

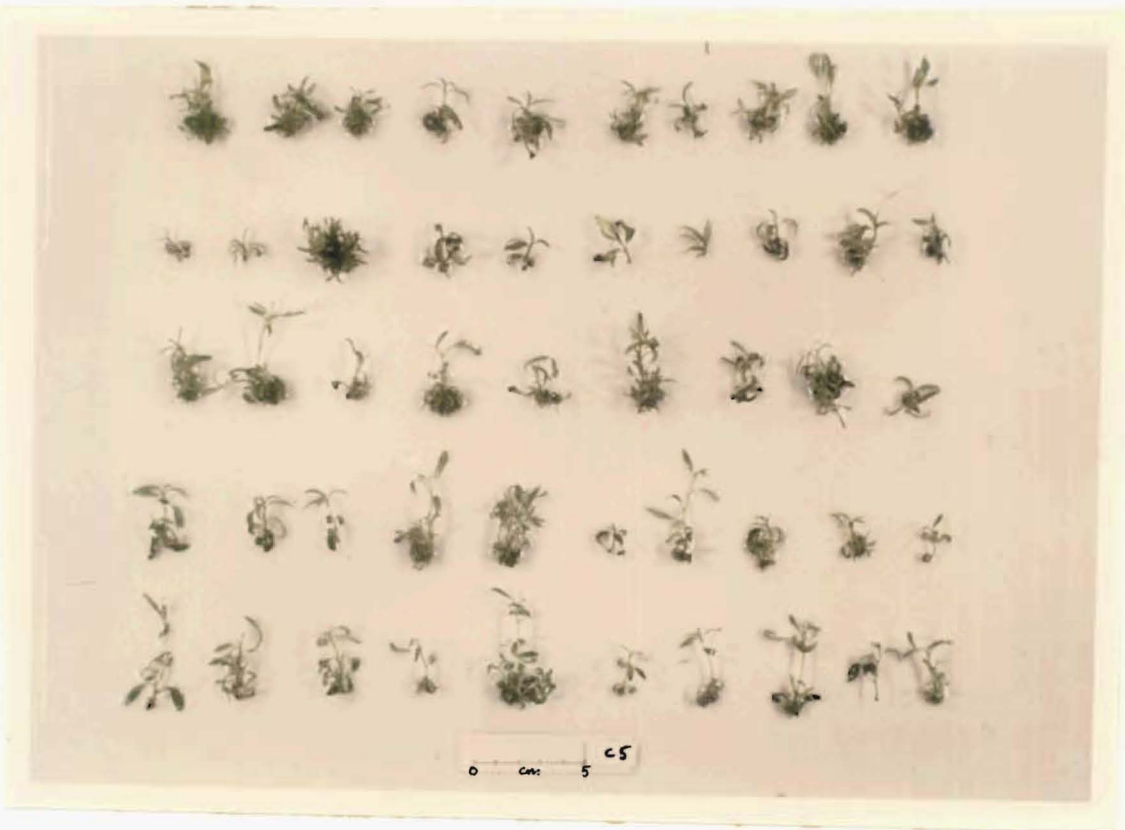
0·1

1

10

Plate 7. Effect of serial concentrations of C5 on the growth of *Populus yunnanensis* shoots cultured in vitro.

Plate 8. Effect of serial concentrations of C10 on the growth of *Populus yunnanensis* shoots cultured in vitro.


conc.
mg l-1
0
100
50
10
1
0 cm 5
C5


conc.
mg l-1
0
1
10
50
100
C 10