Crop Formation: Great Barrington, Mass., 1995

Laboratory Code: KS-03-31

Material: Dry and mature oat stems and heads, *(Avena sativa)*

Formation: Irregular, rectangular area formed around Aug. 1-4, 1995, at Great Barrington, Mass. Entire field appeared to have random and somewhat chaotic appearing damage.

Sampled: by Ms. Nancy Talbott, on August 8, 1995.

Laboratory Results:

A total of eight sample sets were taken within the confines of the formation and four control sets (normal, upright plants) outside the formation region but in the same field. Each samples set contained ten plant stems with attached seed heads. At the time of sampling the plants had lost their chlorophyll (green color) and were approaching harvest maturity.

Recent studies of crop formations have shown that, of all the alterations discovered in crop formations, one of the most consistent and readily accessible to measurement is the stem node expansion. These measurements can be carried out under low power magnification with a mm graduated scale. The node length data from the Great Barrington plant samples were combined into a control and a formation group to provide sufficient data for frequency distribution analyses.

Since the lengths of both the apical and penultimate nodes were determined on each plant submitted, two independent analyses were conducted. The frequency distributions for the apical node position are shown in Fig.1, with the control distribution at the top and the formation data in the bottom chart. As stated in the figure caption, each "Bar#" is an interval of 0.25 mm. The mode (interval with max. number of samples) in the controls occurs at Bar#7 or at 1.75 mm (7 x 0.25), whereas in the formation data chart the mode is at Bar#9 or at 2.25 mm, node length.

In Fig.2 are the data for the penultimate node position and here we find that the modes are in exactly the same locations, with the controls at Bar#7 (1.75 mm) and the formation mode at Bar#9 (2.25 mm). Although this shift in mode position from the controls to the larger node length in the formation samples, strongly indicates a node expansion in the formation plants we still need statistical confirmation of significant

differences. This was examined by conducting what is known as a statistical "t-test", routinely utilized in the analyses of scientific data. The population of control node data were compared with the formation node data (on an unpaired basis) and these results are listed in the tables in Fig.3 for both the apical and penultimate ("Pen.)" data groups. Both sets of data show highly significant ($P<0.0005$) differences between the controls and the formation stem nodes.

In Fig.4 and Fig.5 are summarized data showing mean node lengths and variance levels in the sample populations. The overall node length change relative to the control group, is given below the bottom table in each figure.

Conclusions:

From the node length data it is quite apparent that node expansion occurred during the transient, high heating phase involved in the formation energies (see Physiologia Plantarum Vol. 92: pp. 356-363, 1994). At the apical node this expansion was +29.7%, relative to the controls and in the penultimate position +18.2%. This lower expansion at the penultimate node is in accord with other data obtained from crop formations in the USA, UK, Canada etc. The reason for this is that the lower node is at a more mature stage and the fibers are tougher and do not expand as readily as the more viscoelastic apical nodes. The degree of expansion at both node locations was highly significant when examined with statistical methods.

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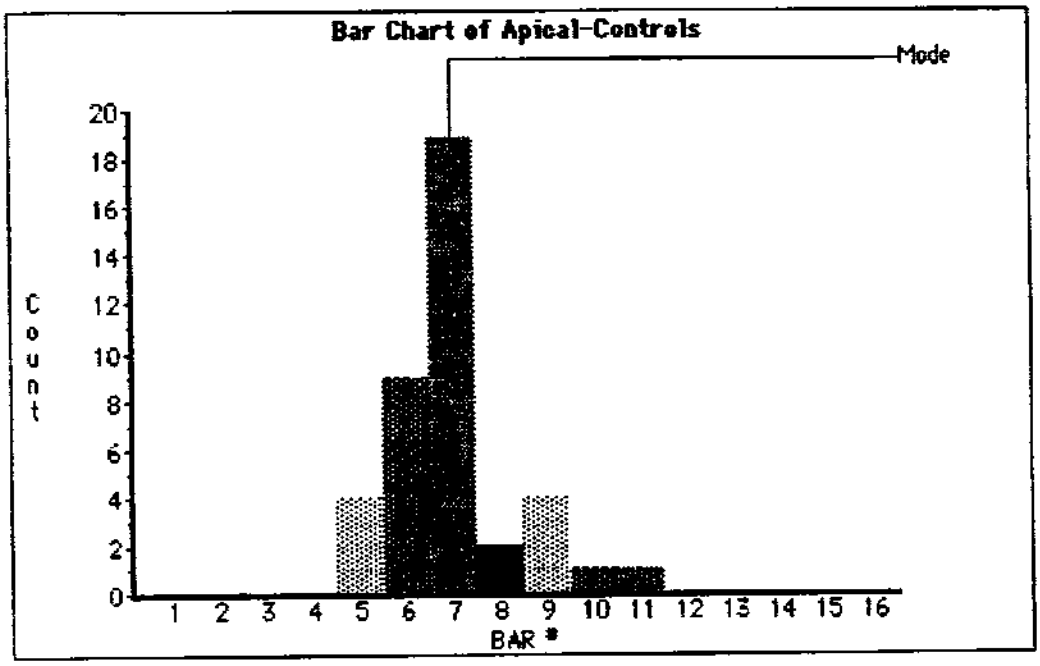
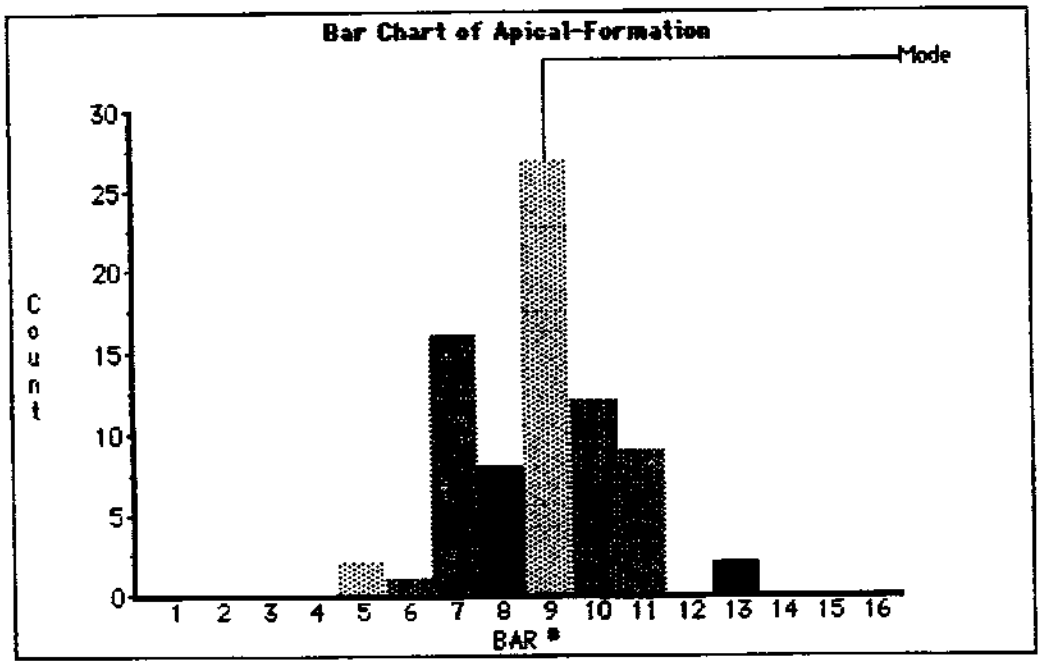
Frequency distribution study of Great Barrington, Massachusetts, crop formation samples (KS-03-31). Apex nodes; Bar#-intervals=0.25 mm.

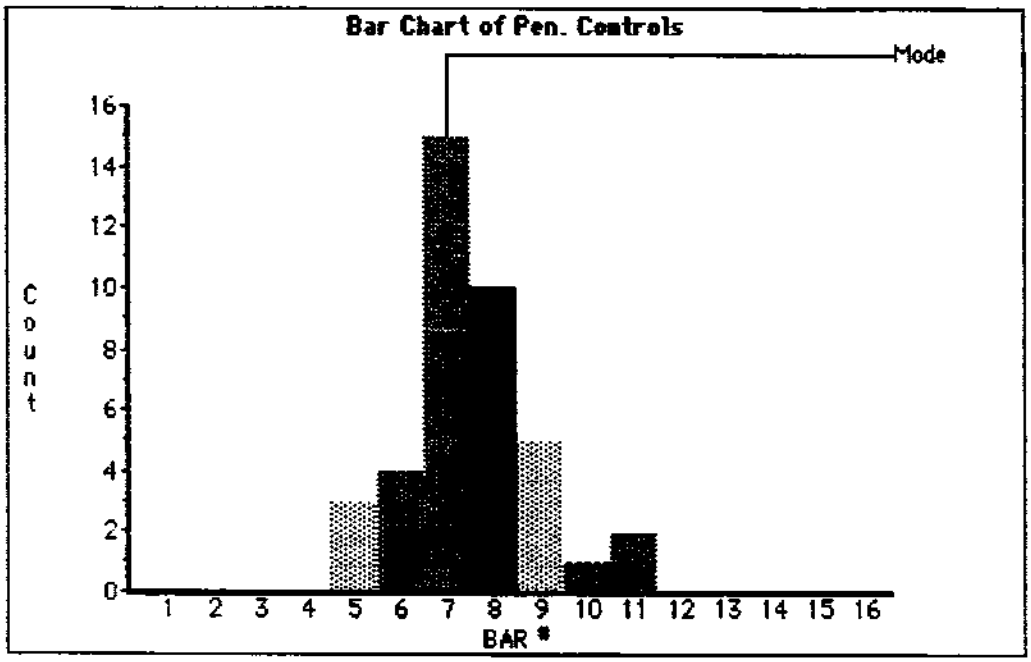
Fig.1

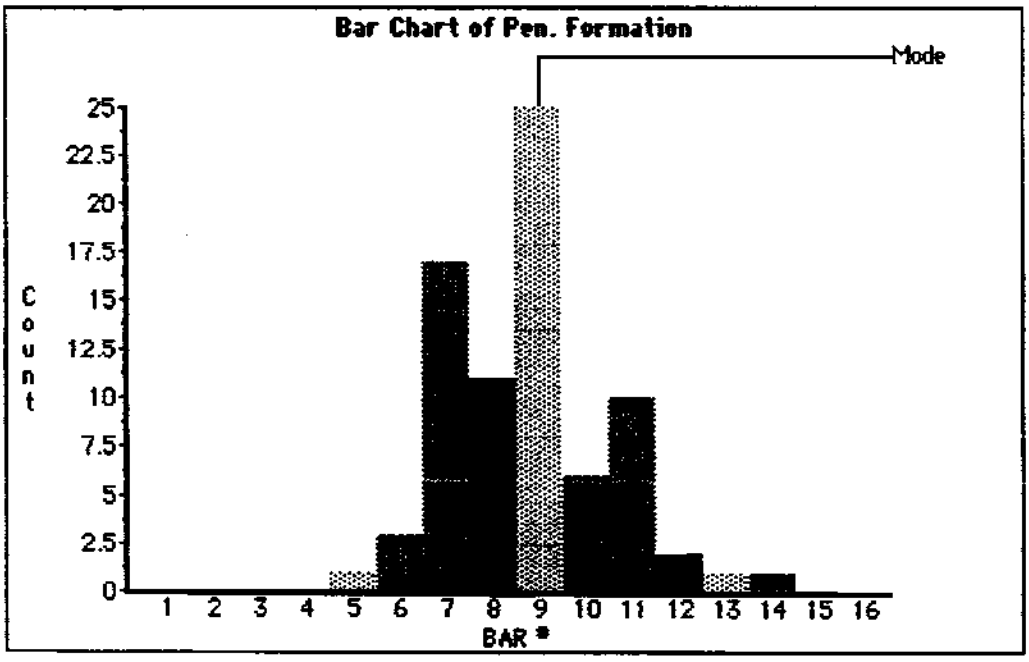




Frequency distribution study of Great Barrington, Massachusetts, crop formation samples (KS-03-31). Penultimate ("Pen.") nodes; Bar#-intervals=0.25 mm.

Fig.2





Great Barrington, Massachusetts, crop formation samples (KS-03-31).
t-test analyses for degree of significance between controls and formation node lengths.

Fig.3

Unpaired t-Test X : Apical-Controls Y : Apical-Formation

DF:	X Count:	Y Count:	Mean X:	Mean Y:	Unpaired t Value:
116	40	78	1.587	2.059	-6.129

$p \leq .0005$

Unpaired t-Test X : Pen. Controls Y : Pen. Formation

DF:	X Count:	Y Count:	Mean X:	Mean Y:	Unpaired t Value:
115	40	77	1.71	2.021	-4.071

$p \leq .0005$

Great Barrington, Massachusetts, crop formation samples (KS-03-31).
Statistical data for node length measurements.

Fig.4

Apical-Controls

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
1.587	.307	.049	.094	19.36	40
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	*** Missing:**
1.2	2.5	1.3	63.5	104.49	38
Median:	**Mode:**	**Kurtosis:**	**Skewness:**		
1.5	1.5	.989	1.134		

Apical-Formation

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
2.059	.433	.049	.188	21.053	78
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	*** Missing:**
1.1	4	2.9	160.6	345.14	0
Median:	**Mode:**	**Kurtosis:**	**Skewness:**		
2	2	4.073	1.048		

NODE EXPANSION IN FORMATION +29.7%

Great Barrington, Massachusetts, crop formation samples (KS-03-31).
Statistical data for node length measurements.

Fig.5

Pen. Controls

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
1.71	.339	.054	.115	19.811	40
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	*** Missing:**
1.1	2.5	1.4	68.4	121.44	38
Median:	**Mode:**	**Kurtosis:**	**Skewness:**		
1.7	1.5	.024	.498		

Pen. Formation

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
2.021	.416	.047	.173	20.597	77
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	*** Missing:**
1.1	3.3	2.2	155.6	327.6	1
Median:	**Mode:**	**Kurtosis:**	**Skewness:**		
2	2	.4	.538		

NODE EXPANSION IN FORMATION +18.2%