July 10, 1992

RESEARCH - CROP FORMATION REPORT NO.5

Introduction:

Due to the wide range of backgrounds within the circle of individuals to whom these reports are circulated, it was decided to make summarizing comments at the onset of this document. Data supporting these conclusions are detailed in later sections. This type of format also seemed appropriate for an up-front, succinct outline of quite diverse findings originating from the latest research efforts.

Most of the samples are from current formations both within this country and the U.K. Also included are some "catch-up" samples from the 1991 formations - these were examined at odd moments during the winter months. The statistical data presented in the research sections are in a summarized form. Each sample group involves the tedious gathering of literally hundreds of measurements and microscopic observations (individual data points) and to present all of these data in a print-out form would be time consuming, costly and of interest to only a very few individuals. If more detailed information is desired contact the laboratory.

SUMMARY OF CURRENT FINDINGS:

1) Pit Expansion Energetics:- since bract tissue (very thin tissue contacting the embryo or seed) is currently being considered as a reliable criterion for crop formations, a series of experiments were carried out to learn more regarding the energetics of the cell wall pit expansion under conditions of rapid heat impulses. Normal wheat heads (from controls) were exposed to microwave energy for various time intervals. After exposure, cell wall pit diameters were determined and the data statistically analyzed.

A peak expansion of 14% occurred at 0.5 min. exposure. Longer exposures (2-4 min.) caused a significant decrease in the pit diameters due to dehydration in the microwave environment (see Fig.3 attached). Two factors may be considered from these experiments:

a) for pit expansion in the crop formations the heating must occur at a rapid rate (total exposure < 30 sec.).

b) if the bract pit expansion in a crop formation is increased over 14% relative to the control the energy input had to be greater than that of the microwave source used in these experiments; that is, as previously calculated at 1.19 J/cm^2/sec.

2) Pennsylvania Formation (Code: KS-01-5)- one of the most interesting sample sets originated in a wheat field around 6-2-92. A newly observed, circumferential or lateral crack formation on the outside radius of the upper or apical nodes in the circle samples could only be explained by a splitting of the longitudinal fibers in the epidermis of the plant stems. Wind force could not cause this effect - high probability of a rapid swelling immediately followed by a tension-bending stress.

Although externally the wheat heads appeared normal, a vary obvious difference was noted in the degree of embryo development in the circle samples compared with controls. In the circle heads the embryos were less than one-half the size of the controls (see frequency distributions of sizes in Fig.1 attached). The important factor here is that 100% of the circle plant embryos were affected. This clearly suggests that reproductive development was terminated at the time of the crop formation. The plants did not reach the lab. until 6-7 days after being noted and during this period the control plants continued to develop.

Detailed studies of the bract tissue disclosed a pit dia. enhancement in all four circle samples (all statistically significant) of between 22-34% relative to the controls. This clearly indicates the input energy of formation was considerably above the range utilized in the controlled studies discussed above.

3)Alton Priors, U.K. formed 6-3-92 (Code: KS-01-10)- spiral type formation in wheat samples. The plants arrived at the lab. (on 6-10-92) in good condition. Detailed studies of the node size ratios disclosed no significant difference between the controls and spiral samples.

These samples were in the very early stage of development and embryo comparisons were not feasible. The cell wall pit diameter measurements in the bract tissue disclosed a significant expansion in sampled sets of spiral plants, amounting to around 24% - again indicating higher energy input than applied in the microwave study. The cell wall pit size data provide the only indication of a genuine formation and the data are statistically significant.

4) Lockeridge, U.K. (Code: KS-01-14)- barley plants ("circle A and circle B") taken 6-4-92. Plants in good shape when received on 6-15-92, thus permitting detailed node ratio analyses. The only significant node ratio changes were in the upper, Node-#3 location - increase 6% relative to controls.

Because of the early growth stage the embryos could not be examined. Pit size comparisons were conducted in the epidermal tissue adjacent to the apical node. Increases in pit dia. of 7% in circle-A and 2% in circle-B were not statistically significant (note- much lower indicated energy than in the microwave test). Based on these data it is not possible to confirm that these are genuine formations.

5) Omaha, Nebraska (Code: KS-01-18)- field grass taken 5-22-92 from an ellipsoid formation - consisted mostly of dead tissue with microorganism attack, thus preventing the tissue being used in the analysis. A search through this material revealed the presence of a very few, still green, small plants in which cell wall pit analyses were conducted (using outer epidermal tissue from the plant stems).

The pits in the formation sample were around 25% larger than either of two control samples. It appears that this is a genuine sample; however, due to the degree of uncertainty in the grass samples (plant species, temporal factors etc.) it should be placed at a relatively low level of probability (somewhere in the region of 60-70% probable).

6) Bergen, N.Y. (Code: KS-01-21)- wheat field with irregular and more rectangular formations (excellent photo's taken). It soon became evident that this was a far different sample than anything previously examined. Many detailed observations were made on this sample and in conclusion it did not disclose the key factors observed in the genuine formations, for example, there were no differences in the embryo or seed characteristics, there was, however, a deeper green color in the formation plants and finally, no difference was observed in the cell wall pit diameters when compared with the controls.

The farmer reported having troubles with his fertilizer when planting this field, with some areas receiving higher than normal doses. In a consultation with an agronomist it was confirmed that the features observed are indeed in agreement with abnormal nitrogen application. This can also cause a weakened plant which readily lodges in a high wind. This sample was important in the sense that one should be aware of this condition when collecting or examining field samples. Perhaps more

important is the fact that the cell wall pits in the bract tissue were unchanged - thus providing a check point in another type of abnormal plant development in which the cell wall pits are unaffected.

7)Lockeridge, U.K. (Code: G17-24) - seed heads from wheat collected during the 1991 season; sample "M" from a "ladder" formation and sample "N" the control, sample "K" from a circle formation and "L" the control.

Externally there were no apparent differences between the "target" samples and controls - a situation consistent with many other sample groups. In the sample-M formation 13% of the seeds were abnormal (abnormalities as described in previous reports) compared with 0% in sample-N control, and in sample-K 59% of the seeds were abnormal compared with 4% in the sample-L control. Very significant increases in the cell wall pit diameters; sample-M with a 47% increase and sample-K with a 59% increase - in fact these pit alterations are of greater magnitude than in any of the other sample sets examined. Both samples appear to have had a high energy input.

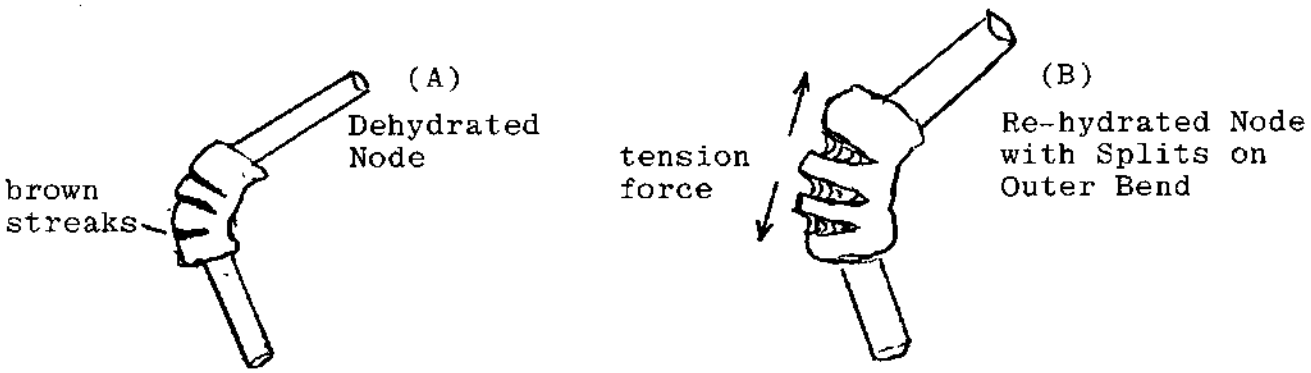
8) Wathe, Victoria, Australia (Code: G17-26)- wheat samples received at the lab. 1-8-92, and were taken from the largest of three circle formations. Externally the seed heads were of normal appearance and no malformed seeds were found. The cell wall pit diameter increase in the circle sample was 18% and statistically significant, thus indicating that this was a genuine formation.

RESEARCH RESULTS:

I.) Sample Set Code: KS-01-S Species: *Triticum aestivum*
Source: Pennsylvania (Montgomery county)
Collector: Jeffrey A. Vernacchio, Audubon, PA 19403
Sampling: Collected around 6-2-92; received at lab. 6-8-92
Formations: enclosed map indicates samples were taken at four apparently small dia. (10-20 ft.) circles, each separated by 100 yds. or more. Four control sets taken in an "unaffected area" of the field.

a.) Sample appearance:- although the stems were partially dehydrated the seed heads were still of normal green appearance and normal turgor. When received the heads were excised and placed under refrigeration, pending examination.
b.) Stem Node Examination:- the plants had 3-4 growth nodes per stem -

several differences were apparent in the external appearance of the nodes at the 3-4 positions on the circle plants-
(1) a pronounced elongation and lateral twist.
(2) fixed bent positions anywhere from 30 to 90 degrees from the vertical.
(3) in the dehydrated stems, the nodes (again at the 3-4 location) disclosed very apparent brown streaks which ran laterally across the outside of the "knee" in the bent node - this is depicted in diagram-A below. After re-hydration of the node these were clearly seen to be lateral cracks or splits extending completely through the outer epidermal tissue as shown in diagram-B below. This lateral splitting was observed in all four sets of circle samples and was not seen in the four sets of control samples. The formation of this type of fissure would require complex stresses in order to rupture the semi-rigid longitudinal fibers in the epidermal tissue. For example, it would require the node to be weakened and expanded from an internal force such as might be caused by transient heat energy. This would be followed by a longitudinal extension or tension stress indicated by the arrows in diagram-B. It is extremely unlikely that such forces could be generated by a wind storm.



c.) Seed Examination- although there were no differences in the outward appearance of the seed heads on the circles as compared with the controls there were striking embryo size differences. As shown in the table below the embryos in the circle samples (taken from all four sample sets) were less than one-half the size of those in their controls.

	Mean Embryo lgth. (mm)		
Sample	Ave.	s.d.	No. Examined
Controls	4.24	1.26	51
Circle Samps.	*1.86	0.71	60

*-P<0.005 (highly significant)

The data in the above table are shown in Fig.1 (attached) as population frequency distributions. This plot was made in order to more graphically demonstrate the pronounced difference in these two sample populations. For these size differences to appear, embryo development in the circle samples was abruptly terminated at the time of the formations whereas the control plants continued to develop during the 6-7 day period it took to reach the lab.

d. Bract Tissue - cell wall pit diameter.

The pit diameter data were taken in all four circle and control samples.

	Mean dia.-microns			
Sample Set	ave.	s.d.	No. Pits Examined	Dia. Change
Circle #1	2.20	0.44	30	+22.2% (P<0.05)
Control#1	1.80	0.34	30	----------
Circle#2	1.85	0.38	30	+24.2% (P<0.05)
Control#2	1.49	0.27	30	----------
Circle#3	2.12	0.45	30	+27.7% (P<0.05)
Control#3	1.66	0.31	30	----------
Circle#4	2.34	0.76	30	+33.7% (P<0.05)
Control#4	1.75	0.36	30	----------

In all four circle samples there was a significant increase in the cell wall pit diameters. It should also be noted in the above Table that the s.d. values were also of higher magnitude than in the controls - thus a higher degree of variance in the diameters. In the Circle#4 set with maximum variance and size increase, the previously described "stretch marks" were observed to have formed at the larger cell wall pits. Only sample #4 disclosed these marks in the bract tissue.

II.) Sample Set Code: KS-01-10 Species: *Triticum aestivum*(wheat)
Source: Alton Priors, Wiltshire, U.K.
Collector: Pat Delgado, U.K.
Sampling: June 3, 1992; received at lab. June 10, 1992
Formation: Enclosed sketch revealed interesting spiral formation of 13m dia.

a.) Embryo Examination - The embryos in both sample groups were at a very early stage of development and their lengths were < 2 mm. There was no apparent difference in the appearance of the embryos from the spiral plants when compared with the controls.

b.) Node Ratio Analyses - size ratios were taken at all four node locations on each plant within in each sample set and the data summarized below.

	Control Set			Circle Set			
Node	ave.	s.d.	N-plants	ave.	s.d.	N-plants	Dia. Change
#1	1.169	0.035	7	1.199	0.042	6	+2.6% (N.S.)
#2	1.222	0.043	7	1.245	0.031	6	+1.9% (N.S.)
#3	1.255	0.063	7	1.277	0.053	6	+1.8% (N.S.)
#4	1.294	0.076	7	1.379	0.091	6	+6.6% (N.S.)

c.) Node Cell Structure - cell wall pits were observed in the parenchyma tissue within both the spiral and control nodes - no differences were noted. The presence of pits in the controls, which could be seen at 450X, may be due to the early development stage or to varietal differences. Based on the node and embryo examinations, no definite statements could be made regarding differences between the sample sets.

d.) Cell Wall Pit Analyses (inner bract tissue) - each set of pit dia. measurements listed below were taken from a different, randomly selected head from the control or spiral sample group - the pairing into sets is also random. The bract tissue was taken from the central region of the seed head.

Random	Control---------			Spiral Form------			
Selection	ave.	s.d.	N-pits	ave.	s.d.	N-pits	Dia. Change
#1-set	1.64	0.31	30	1.94	0.41	30	+18.3% (P<0.05)
#2-set	1.62	0.32	30	2.19	0.53	30	+35.2% (P<0.05)
#3-set	1.75	0.35	30	1.95	0.48	30	+11.4% (N.S.)
#4-set	1.58	0.29	30	2.07	0.46	30	+31.0% (P<0.05)

Three out of the four sample sets disclosed significantly higher cell wall pit diameters compared with the control selection. The main reason for the four-set repeat of this sampling procedure was the fact that one generally finds higher degrees of variance in the formation samples (as shown in the preceding examination of KS-01-5 samples). Here again we see this pattern with high significance- thus one can assign a high degree of probability for an authentic formation.

III.) Sample Set Code: KS-01-14 Species: *Hordeum vulgare*(barley)
Source: Lockeridge, Wiltshire, U.K.
Collector: Pat Delgado, U.K.
Sampling: Formed June 3/4 1992; received lab. June 15, 1992
Formation: samples from two of thirteen small circles 6-7 ft. dia.
- Pat's comments from enclosed note: "these circles are remote from the tractor or wheel lines in the field with no visible access track to them except for one circle which breaks into one of the tractor tracks. I did not take a sample from that one."

a.) Sample Appearance - the plant tissue had normal tugor with no evidence of mold build-up.

b.) Node Ratios - quantitative node evaluations conducted on 9-12 plants per sample set. These data are summarized in Fig.2 (attached) where it is quite apparent that the major effect on node size occurred at the apical regions. Although the maximum changes in the mean values were only in the 6-7 percent range the apical data were significant at P<0.05.

c.) Cell Wall Pit Examination - the bract tissue adhering to the immature seeds was very difficult to prepare - as an alternative the epidermal tissue adjacent to the apical node was used in the cell wall pit diameter measurements summarized below. No significant changes in the cell wall pit diameters.

	Pit Dia.-Microns			
Sample	ave.	s.d.	No. Examined	Dia. Change
Control	2.09	0.33	30	------
Circle-A	2.24	0.39	30	+7.2% (N.S.)
Circle-B	2.14	0.56	30	+2.4% (N.S.)

d.) Seed Germination- paper roll germinations were conducted on 30-seed test samples. Enhanced radicle and coleoptile emergence was noted in the formation samples thus indicating greater seed vigor and viability.

IV.) Sample Set Code: KS-01-18 Species: Field Grasses.

Source: On a farm near Omaha, Nebraska
Collector: Dr. John Kasher, Prof. of Physics, Univ. Neb., Omaha
Sampling: discovered May 29, 1992; samples taken June 15; received at the lab. June 20, 1992.
Formation: Ellipsoid form - originally about 50" x 36"

a) Sample Appearance - over 95% of the grass from the circle area was of a gray color. Microorganisms were present in the tissues and had almost completely broken down the cell wall fibers. A thorough search of this debris revealed the presence of two small grass plants with still green tissue.

b) Cell Wall Pit diameters - conducted with the two green plants (two sets of control plants were of normal, green color and turgor)

	Mean Pit Dia.-Microns			
Sample	ave.	s.d.	No. Pits Examined	Dia. Change
Control-bag 7	1.82	0.41	30	---------
Control-bag 8	1.90	0.33	30	---------
Ellipsoid-bag 3	2.38	0.51	30	+25% ($P<0.05$)

From the uniformity in the pit diameters within the control samples the data suggest that this is a genuine formation; however, due to the degree of uncertainty in the circle sample origins (grass species, dev. stage, temporal formation etc.) the probability is low.

V.) Sample Set Code: KS-01-21 Species: *Triticum aestivum*(wheat)

Source: Farm of Mr. Sacket near Bergen, N.Y.
Collector: Tom Nesser, N.Y.
Sampling: Formed around 6-22-92; received at lab. 6-25-92
Formation: Excellent photo's show circle-rectangular combinations with very irregular outlines. Samples submitted from three formations and controls outside formation areas.

a.) Sample Appearance - well packaged plants in excellent shape. No apparent difference between samples and controls with the exception of one important factor; the formation plants were of a much greener color, particularly at the upper internode position. This deeper color had not been seen in previous formation samples.

b.) Node Examinations - detailed analyses were conducted in the Circle-#1 sample set. Node ratio summary as follows:

	Control-#1			Formation-#1			
Node	ave.	s.d.	N-plants	ave.	s.d.	N-plants	Ratio Change
1	1.076	0.052	10	1.180	0.058	9	+9.7% (N.S.)
2	1.135	0.063	10	1.311	0.054	9	+15.5 (P<0.05)
3	1.221	0.051	10	1.312	0.054	9	+7.4 (P<0.05)
4	1.269	0.042	10	1.417	0.099	9	+11.7 (P<0.05)

At the apical node-4 position a significant bending took place in the formation samples - relative to the vertical the mean bend in the controls 5.7 deg. (s.d. 1.8, N=11 plants) and in the formation plants a mean of 20.8 deg. (s.d. 2.8, N=14 plants). In addition the apical nodes were significantly elongated in the formation samples.

c.) Cell Wall Pit Dia. in Bract Tissue - No significant changes in the pit diameters as shown in the following table;

	Mean Pit Dia.-Microns			
Sample	ave.	s.d.	No. Examined	Dia. Change
Control #1	2.12	0.48	30	--------
Formation #1	1.95	0.37	30	-8% (N.S.)

d.) Seed Examination - the seeds in both sample groups were still in the green stage, but were well filled out with endosperm. No differences observed between controls and formation plants.

In a phone conversation with Tom Nesser it was pointed out that Mr. Sacket made the comment that his mechanical fertilizer equipment was not working properly and these areas of downed plants could have been caused by excessive nitrogen application. In consultation with an agronomist associate - all of the characteristics noted in these plants could be accounted for by excessive nitrogen - the weakened stems, the enlarged, bent nodes and particularly the deeper green color are typical of this problem.

The one quantitative observation that sets this sample group apart from those in which outside forces are suspected, is the cell wall pit diameters in the bract tissue. Also it should be noted that there is no consistent increase in the node ratio values with increasing node number, as was noted for example in the KS-01-14 sample set (see Fig. 2). Taken as a whole, there were enough differences in these sample sets to clearly suggest that the formations were not produced by comparable forces.

VI.) Energy Experiments - Cell Wall Pits (ref. KS-01-26)

In the original experiments conducted for the purpose of examining the influence of rapidly induced, high intensity heat inputs on the cell wall pit expansion, the observations were made in parenchyma tissue within normal stem nodes in wheat. Since recent observations indicate the inner bract sheath (contacting the seed) is a more reliable and consistent indicator of cell alterations brought about by external forces, their response to these rapid energy inputs was examined in a quantitative manner.

Wheat heads from control plants in the N.Y. sample set (KS-01-21) were exposed to the microwave heating for various time intervals. Following the exposures the cell wall pit diameters were determined in the same manner as applied in the circle analyses. As shown in Fig.3 the maximum expansion occurred at the 0.5 min. exposure, amounting to a 14% increase ($P<0.05$). At a 1-min. exposure there is a slight drop in the expansion effect and at the 2-4 min. intervals there is a significant decrease in the pit diameters relative to the 0-min. exposure control point. This decrease in mean pit diameter at the longer exposure intervals can be attributed to tissue dehydration produced by the microwave heating. These data again suggest that the heat input in the circle formations must occur very rapidly.

VII.) Sample Set Code: G17-24 Species: *Triticum aestivum*

Source: Samples K & L, Maisley Farm; M & N, Alton Barnes; U.K. (1991)
Collector: Michael Chorost, Duke University
Sampling: K & L, 7-10-91, M & N 7-13-91
Formations: K & L, circle formations; M & N "ladder formation"

a.) Seed examination - in sample-K from the circle, 59% of the seeds were malformed compared with 4% in the samp.-L controls. In the M-ladder formation 13% of the seeds were malformed compare with 0% in the controls. Based on previous sampling, both sets have a relatively high degree of malformed seeds in the formation plants.

b.) Cell Wall Pit Examination - these measurements are summarized below.

	Pit Dia.-Microns			
Sample	ave.	s.d.	No. Pits	Dia. Change
K-inner circle	2.14	0.62	30	+52% (P<0.05)
L-control	1.41	0.37	30	----------
M-ladder form	2.28	0.78	30	+47% (P<0.05)
N-control	1.56	0.46	30	----------

The pit diameter increases seen here are some of the highest observed and definitely indicate the formations are produced by external energy inputs.

VIII.) Sample Set Code: G17-26 Species: *Triticum aestivum*

Source: Wathe, Victoria, Australia
Collector: Colin Andrews, U.K.
Sampling: Letter dated 1-8-92; received at lab. 1-28-92
Formations: Three circles - two with two rings and one with three.

a.) Seed Examination - heads on both sample groups of normal appearance. No malformed seeds were found in either sample set.

b.) Cell Wall Pit Examination - data below for random sampling in bract tissues. Circle sample from largest formation.

	Pit Dia.-Microns			
Sample	ave.	s.d.	No. Pits	Dia. Change
Control	1.41	0.31	30	----------
Inside Circle	1.67	0.56	30	+18% (P<0.05)

Laterally elongated pits ("stretch marks") were observed in the circle sample - this pit elongation was not observed in the controls.

c.) Seed Germination - paper roll germ., 20 seeds/roll.

	Two Day Radicle Length - cm		
Sample	ave.	s.d.	No. germinated
Control	1.33	0.83	16
Inside Circle	2.28	1.16	12

These data indicate a higher germination potential in the seeds from the circle formation.

RESEARCH RELATED FOOTNOTES:

1.) Polyembryony - a misconception:

During the detailed examinations of the embryo regions in the current sample sets it was noted that the developing anthers, still within the glumes (before anthesis), were very similar to the shrunken structures observed in the previously designated "polyembryony" effect in the initially examined circle sample sets from the 1990 crop season, taken from wheat heads in which the seeds had dehydrated to the normal quiescent state by the time they reached the lab. in early 1992.

A detailed examination of these original structures (G16-103) revealed the presence of an attached filament, characteristic of the anther-supporting element. In normal development the anthers are extruded out of the glume and after anthesis, shrink and drop off the plant. In normal appearing, mature seed heads one does not expect to find the anthers still present in 100% of the glumes.

The important point here is that these original sample sets which became somewhat of an enigma in the context of later findings, can now

be fit into the total emerging pattern within the research program. As in the Pennsylvania samples discussed above (KS-01-5), development ceased at the time of the circle formations (both original sample sets). The data from these early sample sets as well as a number of others subsequently examined, clearly indicate the presence of energy sources capable of terminating the plant embryogenesis, altering stem nodes and the cell structure of internal tissues without producing total plant necrosis or obvious, gross external damage.

II.) External Carbonization of Circle Plants:

In previous reports two samples have been described as having external characteristics resembling a charring or carbonization of the plant tissue. Since I did not have facilities in my laboratory to confirm this condition the samples were sent off to Ms. Cassandra McDonough at Texas A&M University where SEM (Scanning Electron Microscope) studies were conducted.

The SEM results confirmed that the blackened grass sample (G16-120) was indeed an external charring from rapid heating. The second sample of wheat heads (G16-135) turned out to be a black fungus which was only seen on the circle samples and at the upper or bearded end of the glumes. The concentration of the fungus at the upper portion of the wheat heads may be accounted for by the suggested rapid heating. As the heating occurred, internal cellular pressure developed and exudate (intercellular liquid) was forced out of the seeds, where in the vapor form it condensed at the upper, open end of the glumes. Being rich in proteinaceous compounds it provided an ideal "broth" for the fungal growth.

III.) Energetics of Cell Wall Pit Enhancement:

The following calculations are presented for the purpose of providing an order of magnitude comparison between the energy necessary to produce cell wall pit enhancement and the energy the plant would receive under natural solar heating.

1) in the original microwave experiments the energy output was in the range of 1.91 $J/cm^2/sec$.

2) the energy received by a typical stem node (in wheat) with a cross section of about 0.35 cm^2 is 0.67 J/sec.

3) the solar flux energy over the entire spectrum is 1.4×10^6 ergs/cm^2/sec., (erg = 1×10^{-7} J): Total Solar Flux = 0.14 J/cm^2/sec.

4) by no means all of the solar radiation is available for heat. From Infrared physics we find that only about 1/3 of the total solar output is thermal energy. Actually it may be less than this in plant material, due to a strong reflectance in the green segment of the spectrum.

5) in any event we will take the 1/3 value and this gives the energy available for heating the stem nodes as; $0.14 \times 1/3 = 0.047$ J/cm^2/sec. This is the maximum energy of heating in a stem node due to solar radiation.

6) from above we find that the ratio of energy necessary for cell wall pit enhancement to that available from solar heating is;

$$1.91/0.047 = 40.6$$

7) in other words the solar flux is only 1/40th the energy necessary to produce the cell wall pit enhancement.

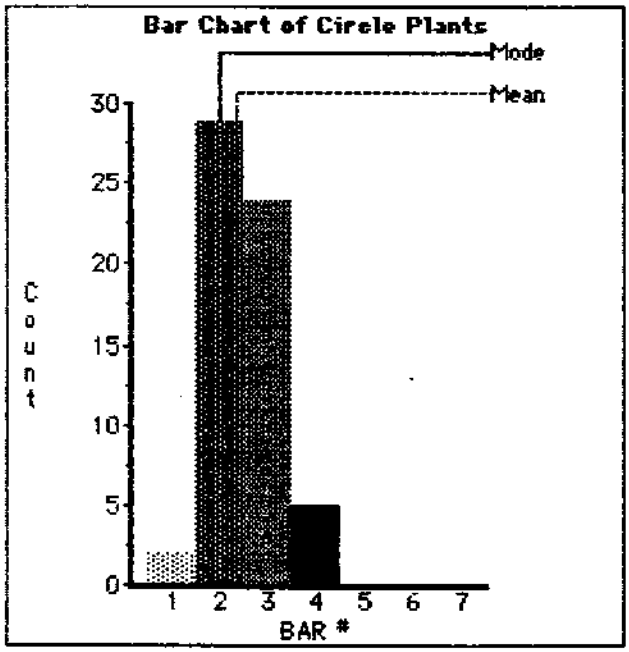
Studies are also currently under way to examine the possibility that by knowing the relative increase in the cell wall pit diameter in a circle sample we can obtain some idea of the level of energy input. A series of papers by Prof. Ortega at the University of Colorado, dealing with the theoretical aspects of plant cell wall elasticity, will be utilized in this study.

Dr. W.C. Levengood
Pinelandia Biophysical Lab.

Fig.1 Total Embryo Size Reduction in a Crop Formation

Frequency Distribution of embryo lengths in Crop Circle plants.

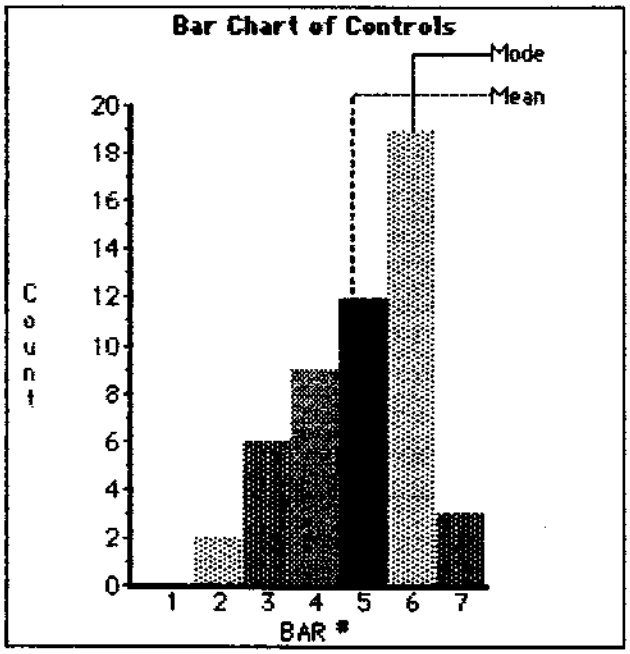
(Code: KS-01-5)



"Bar#"= embryo length-mm

Frequency Distribution of embryo lengths in Control plants.

(Code: KS-01-5)



"Bar#"= embryo length-mm

Fig.2 Node Ratio Changes in Two Circle Formations Within the Same Field

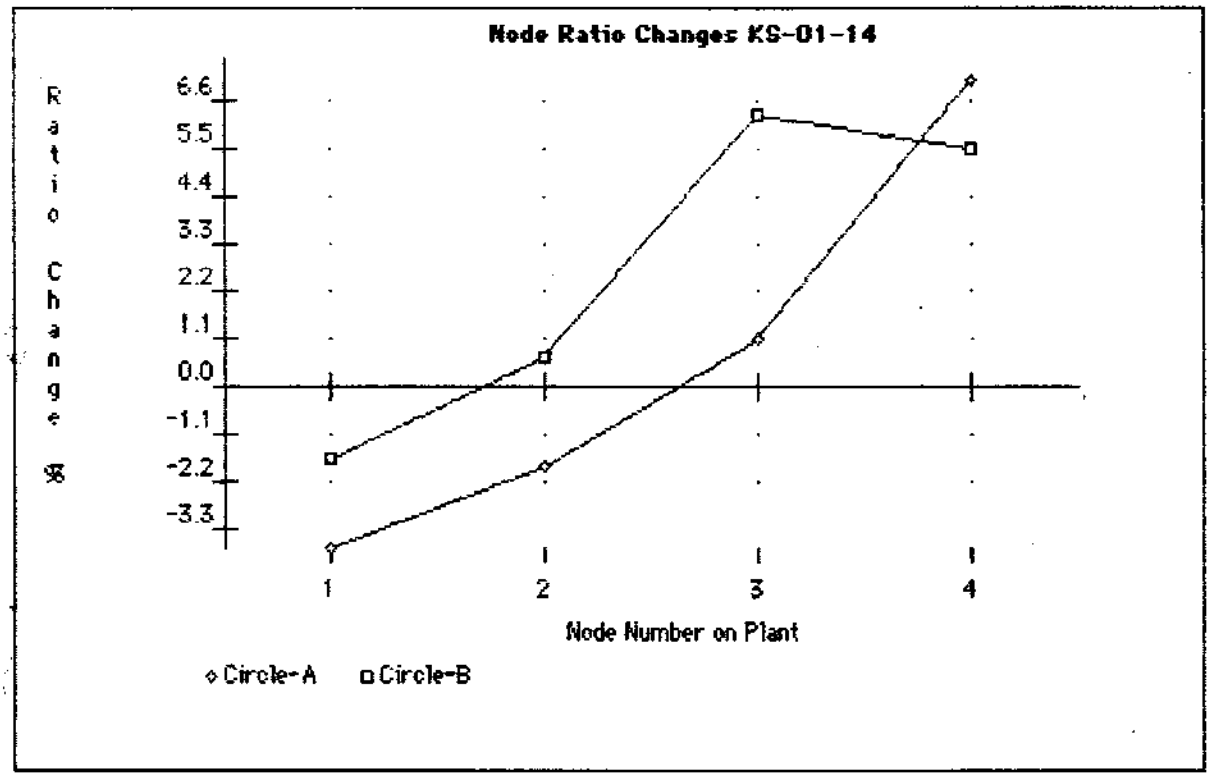


Fig.3 Cell Wall Pit Diameter Changes in Microwave Heated Bract Tissue