

Circle Formations: Milaca, MN, USA, 1994

Laboratory Code: KS-02-100

Plant material: Corn plant ears, *Zea mays*.

Formation: Three circles in same field, discovered around October 5, 1994, on Mr. Harold Smith's property, located about 8 mi. east of Milaca, MN. See the excellent diagram in Fig.1, prepared by Mr. Robert Schultz.

Sample Information: Two sample collections were made, one designated "R-group by Ms. Sally Rayl, of Omni Magazine and the second, designated "S-group", by Mr. Robert Schultz, 2119 Violet Lane, New Brighton, MN 55112.

Laboratory Results:

In previous studies we have found that there are two morphological factors to be examined in ears of corn, one the random pit field analyses and second the seed germination. The details of these examinations are summarized below.

1) CELL WALL PIT EXAMINATION

For this aspect of the study the tissue examined was the central parenchyma at the base of the seeds in a region exhibiting random pit fields. The larger pits in the tracheids were not examined. In the Rayl (R) collection there were 10 sample sets with two controls, and in the Schultz (S) collection there were 9 sample sets with two controls. The usual microscopic method was employed in the pit examinations. Briefly, this consists of recording the diameter of 30 randomly chosen pits from each sample, and statistically analyzing the mean, variance etc.

Vary significant alterations were observed in the size of the pits from the formations. The data clearly indicated that pit expansion took place in all three circles and the degree of the pit expansions were as severe in the satellites as in the large circle. In one S-sample taken 5 ft. outside the large circle (from standing plants) the node expansion was a significant, +29.2%; however it is not unusual to find pit size alterations at the periphery of a formation, especially, as is the case here, when the plants are in proximity with adjacent circles. This "spill over" effect suggests that the heat energy producing the pit expansion is not restricted to the regions producing the mechanical flattening. This independence of energy influence is common within chaotic systems.

In two cases where both the R and S collections were made at the same location within the formation it was interesting to note that the mean pit sizes were within the same range. These data are listed below and all values are statistically significant ($P < 0.05$) when compared with the pit sizes from the four control samples.

<u>Epicenter Large circle</u>	<u>Pit Size Change Relative to Controls</u>
Sample Set-R	-18.3%
Sample Set-S	-25.8%
<u>Epicenter West Satellite</u>	
Sample Set-R	+43.0%
Sample Set-S	+25.2%

At first glance it may be confusing to note that the pit sizes from the tissue taken from the epicenter of the large circle are significantly reduced in size, relative to the controls. As pointed out in Fig.6-A in *Physiologia Plantarum* 92: 356-363, 1994, this pit diameter reduction may take place following a significant pit expansion, if the heating is prolonged to the point of causing a dehydration of the cells and a shrinkage. The fact that the significant pit size reduction was observed in the large circle and not in the satellites, may relate to quite different energy levels and rates of energy delivery within each of the formations.

II) SEED GERMINATION

Seed germination tests were conducted and data were taken at the 4, 7, and 13 day stage of seedling growth. In general there were no highly significant differences in the growth of seeds within the formations when compared with the controls. One sample set taken at the edge of the large circle (R-group) disclosed a +21.7% ($P < 0.05$) growth increase relative to the controls. This enhanced growth effect has been observed in other crop formations including corn (see Fig.5 A and B in above reference).

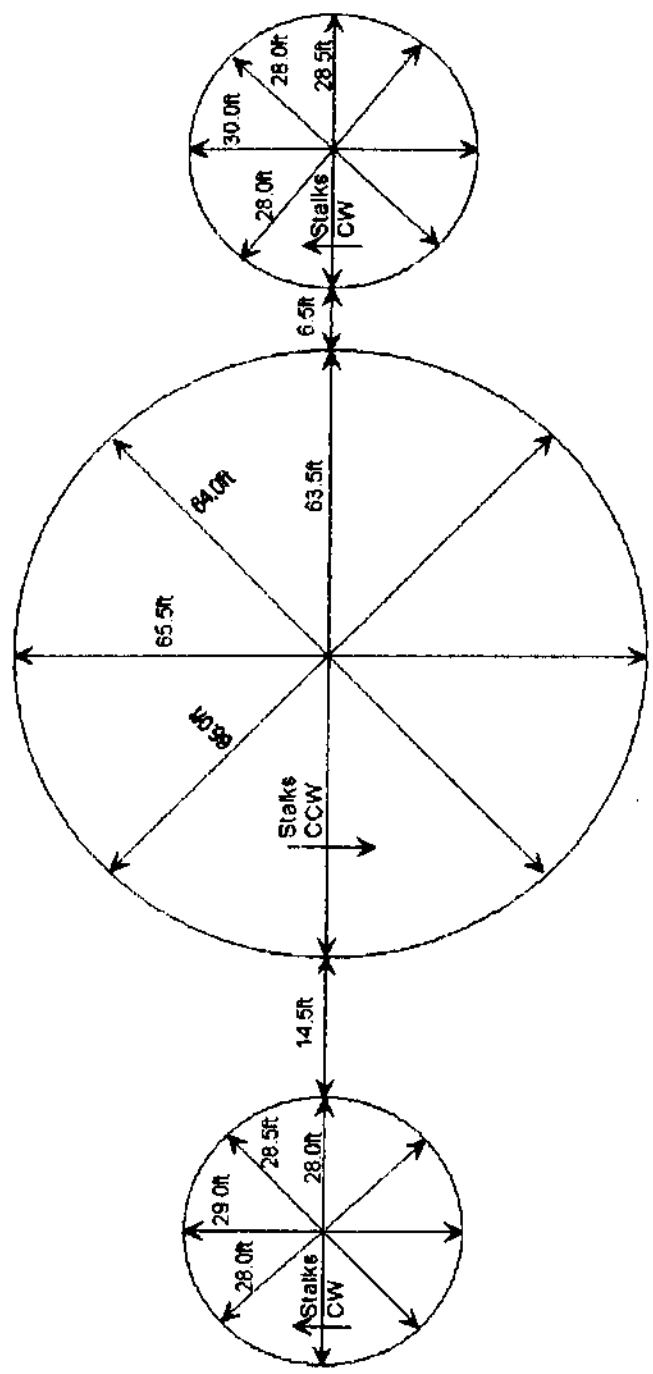
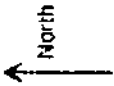
The alteration of seedling growth is entirely dependent on the stage of plant development at which the formation occurs. If major seedling growth transformations occur, then one also consistently observes very obvious changes in seed weight and external characteristics. In this group of samples there were no differences in the external appearance of the seeds.

Conclusions:

In this formation complex, the data provide very clear evidence that the rapid, thermal energy delivered within the formations was sufficient to alter the cell wall pit structures within the developing ears. These changes were consistent within two independently obtained sample sets, within matching sampling locations. The distribution of the energies throughout these circle formations appears to be very complex, a situation which is consistent with what has been documented in many other crop formations.

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CROP CIRCLES
8 miles east of
Milaca, MN 10/1/84

Drawn by R. Schultz
Scale: 1in=20ft

KS-68-100