November 10, 1992

RESEARCH REPORT: PINELANDIA BIOPHYSICAL LAB.

Introduction:

In this report an attempt is made to sort out and examine some of the conflicting and sometimes confusing crop circle data obtained during the 1992 season. To make some sense of what may be going on, that is in terms of the previously proposed external forces involved in the formations it was necessary to compare two quite different sample sets, both of which were obtained in England and collected by individuals within the "Argus" project. What came out of this comparative study constitutes what may be a new and more complete understanding of the crop formation energetics.

Within these comparative data analyses and presentations a new quantitative growth or Plant Development Factor Df is introduced. This factor provides a means of quantitatively evaluating a test seed population in terms of the combined germination rate and seedling growth potential. It is very simply calculated from the routine data taken on each test group, that is,

$$Df = L \times Fg$$

where L is the mean seedling length (cm) in the test population and Fg is the fraction germinated. Originally this was defined in terms of biomass, but this became confusing to some and development factor appears to be a more comfortable label.

Sample Set #1 Lab. Code: KS-01-39

PLANT MATERIAL: Wheat *Triticum aestivum*

FORMATION: formed July 16 and samples taken near Waden Hill near Arebury, UK on July 17, 992.

COLLECTED BY: project Argus - submitted by Michael Chorost

COMMENTS ON SAMPLES: a total of 10 samples were submitted and erroneously described as a "blind test" - all observations were made

before any information was made available to this laboratory. The request was made that after obtaining the pit size data, germination etc., an attempt be made to predict the location of formations versus the control sites. What was desired by the project Argus people was a quick "litmus test" to determine a genuine formation from one artificially produced. It should be pointed out that this degree of optimism was not shared by this laboratory.

LABORATORY STUDIES:

On Aug. 2, 1992 a letter was sent to M. Chorost in which the lab. data were listed, along with the predicted location sites. In this group of ten samples, five were predicted correctly. I later learned that there were five controls and five formation sets, therefore the predictions are about what would be expected by pure chance. What this immediately told us - there is no litmus test, and the situation seems to be far more complex than we surmised in the early stages of this study - although there were hints that this was the case.

One thing that was overlooked in making these predictions was the seedling development factor Df - the primary reason being, that at the time its importance was not understood. In a recent attempt to make some sense out of these rather extensive laboratory observations the following postulates were formulated:

> If cell wall pit size variations are indicative of the energy levels impinging on the plants (during crop circle formations) -then is there a correlation between the pit size changes and seed development taken from different plant sites within the formation? Furthermore, one might also expect such a relationship to be found only in the genuine crop circle material and not in the control groups.

The ten sample group had complete data sets from which the above questions could be examined. The pit size and seedling development factor Df were examined with regression analyses. In Fig.1 the seedling data from the five circle samples are plotted in the upper curve and a high degree of correlation is noted (r=0.89), whereas in the lower curve the five control samples show essentially no correlation (r=0.34). The root development factor is examined in Fig.2 and the results are very similar to those in Fig.1 (also similar correlation coefficients).

Another very important aspect to be noted in these data is the range of effects on the circle plants in relation to the controls. To emphasize the striking difference, the shaded rectangle in the upper curve in each figure covers the range of the controls in the lower curve. For example, in the upper curve in Fig.1 the computer formatted the Df values (on the abscissa) from 1-10 whereas on the lower control data the range is from 1.5-5. To summarize what the data indicate in this one sample set:

1)-both the seedling growth and the pit size variations within the circle populations lie outside the control limits.

2)-it clearly suggests that quite different rates and quantities of energy are expended at different sites within a specific formation. The sampling maps may show interesting energy distributions; however, as yet no information regarding these diagrams has been received.

3)-obviously a one sample - one control method of field testing cannot be used as a litmus test.

4)-the negative slopes of the curves in Fig.1 & 2 can be explained by differences in the duration of the exposure to the circle formation energy. The decrease in bract pit diameter with continued exposure to a heat source was demonstrated in Fig.3 of Report#5.

Sample Set #2 Lab. Code KS-01-36

SAMPLE MATERIAL: Wheat plants and heads.

FORMATION: at West Wycombe, UK on 7-12-91 and samples taken on the same date.

COLLECTED BY: Argus group, submitted by M. Chorost.

COMMENTS ON SAMPLES: About two months after the lab. work had been completed on this sample set it was learned from Monty Keen that this formation was part of the so called "Circle Making Contest" and these samples were a form of artificial lodging. Why that information was kept from this lab. is not known. This type of subterfuge only serves to make life more complicated for the researcher. This will become evident as this sample set is discussed in relation to the KS-01-39 set.

LABORATORY STUDIES:

This sample group included ten samples with five controls taken outside the "artificial formation". Both the development factor Df and the bract pit diameters were determined in each sample set. After finding the correlations between pit diameter and seedling development in the KS-01-39 samples, these data were also examined in the same manner. It is quite apparent from the summarized results in Fig.3 that these relationships are not present in the artificial formation. Since, at that time, this was assumed to be a legitimate formation this sample set remained a real enigma.

Referring to Fig.3, it should be noted that the range of pit sizes in the artificial formation are much greater than in the controls, in fact the data show on the average a 36% increase in pit size within plants from the artificial formation. Further analysis of the data shows that by comparison the mean Df figures are essentially identical in both the control and artificial formation. This is in striking contrast with the KS-01-39 data.

After learning of the artificial formation history a number of these observations began to make some sense. First, with regard to the larger pit sizes in the artificial formation, there are two possible explanations which immediately come to mind - both of which relate to severe mechanical damage to the plant. During the mad trampling frenzy the plants were undoubtedly crushed and severely pressed down (by some mechanical gadget) to make sure they remained flattened.

1)-the plants are responding to the cutting off of the vascular system at the base of the stem by increasing cell wall pit openings, thus allowing more free flow of nutrients and transpiration exchange processes.

2)-the mechanical pressure on the seed heads would be a shear component which could cause a stretching of the cell walls and thus a pit size change.

Of the two possibilities the latter, mechanical shearing seems the more likely. In any event this artificial formation is a far cry from a natural lodging simulation and should not be so considered. In natural lodging these severe mechanical shearing forces would not be a factor. In recent crop circle analyses (reports forthcoming) in which both lodged and

normal controls were submitted, the cell wall pit and Df data from the lodged plants were identical (statistically) with those from normal upright controls. In the 1993 season this question of drastic mechanical injury and cell wall pit changes should be closely examined.

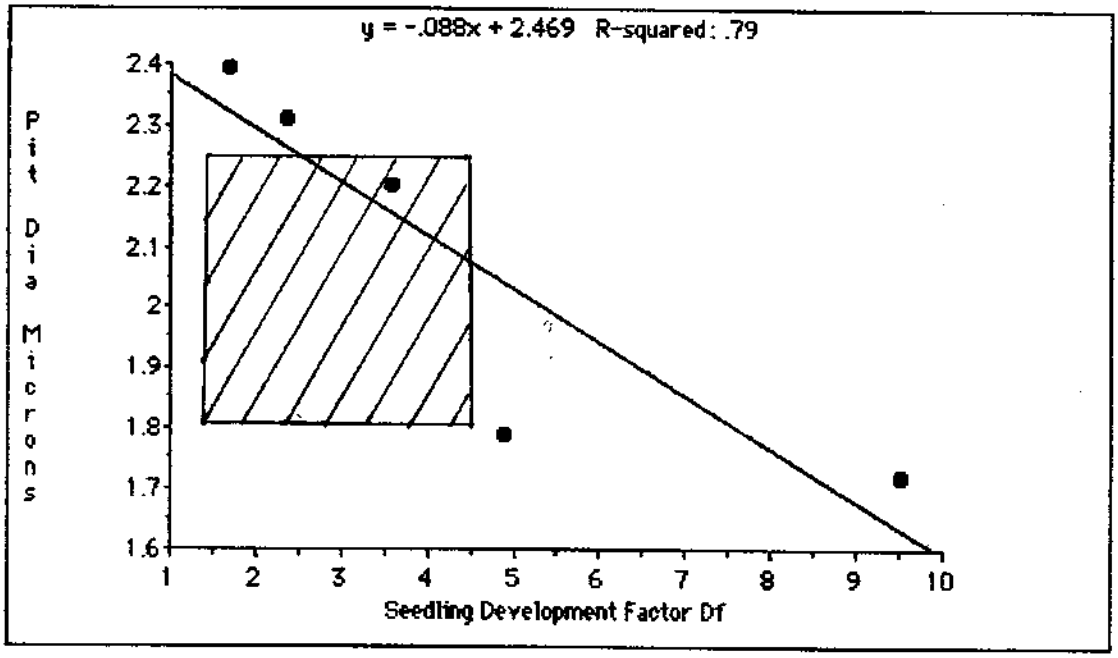
COMMENTS:

What we have seen in the comparison of these two formations with vastly different origins is the appearance of a higher magnitude of complexity in the crop circle formation mechanics. The discovery of the relationship between the bract cell wall pit diameters and the quantitatively defined development of the seedlings is important for the following reason; it is the first we have seen a relationship between anatomical alterations in somatic tissue (non-reproductive) and the growth potential in germ plasm (reproductive seeds). Also it is important to point out that this is a characteristic of genuine crop circle material and is not seen in controls or artificial formations.

Dr. W.C. Levengood

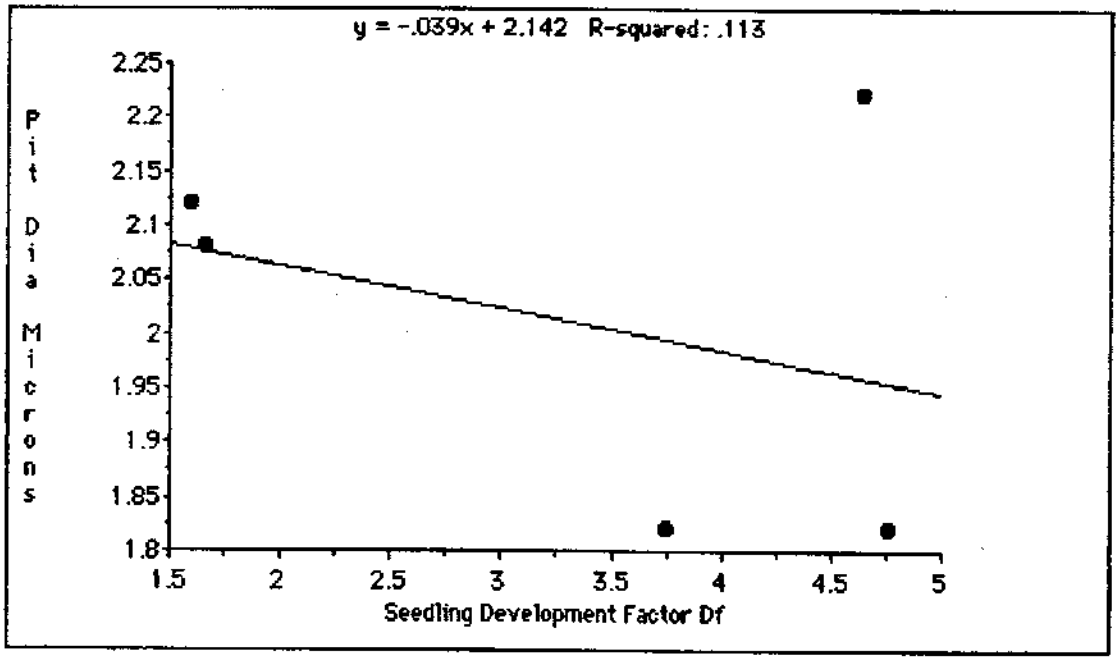
Fig.1

Relationship between cell wall pit diameter and the shoot (Df) development factor within a circle formation and its controls.



Data from circle - 13 day seedlings, r=0.89

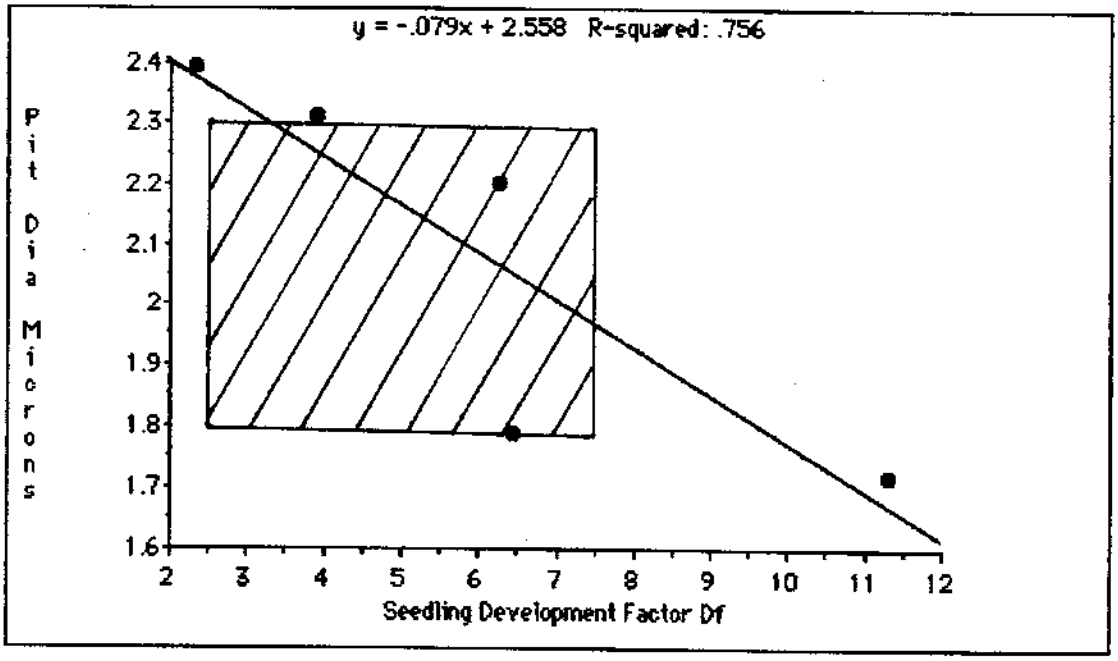
Laboratory Code: KS-01-39



Data from control plants - 13 day seedlings, r=0.34

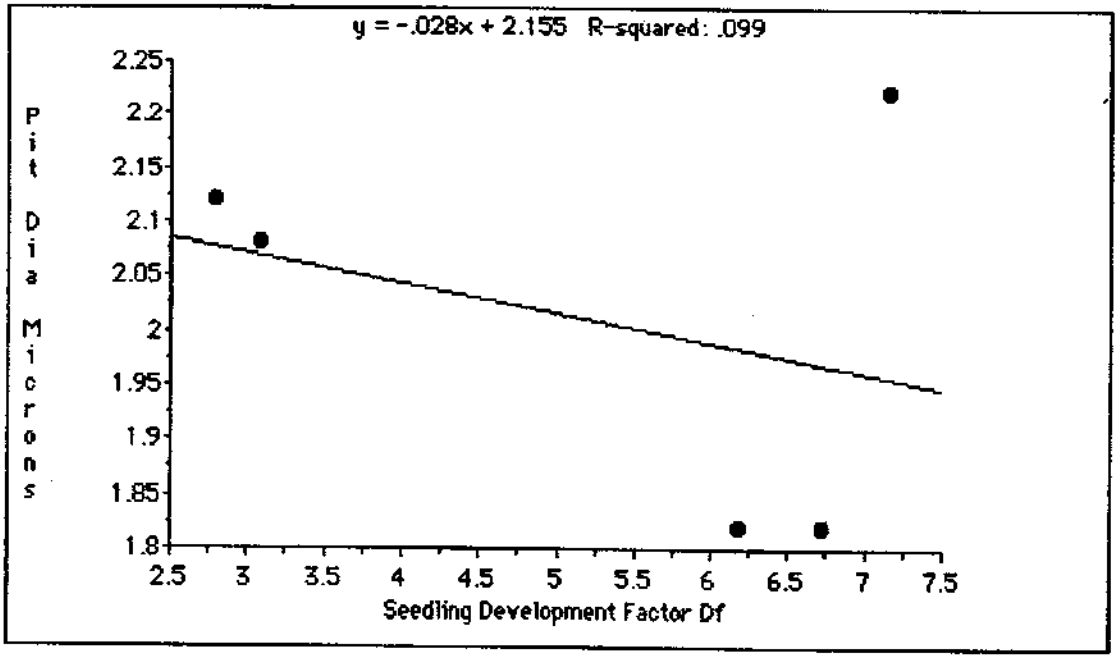
Fig.2

Relationship between cell wall pit diameter the root (Df)development factor within a circle formation and its controls.



Data from circle - 13 day seedlings, r=0.87

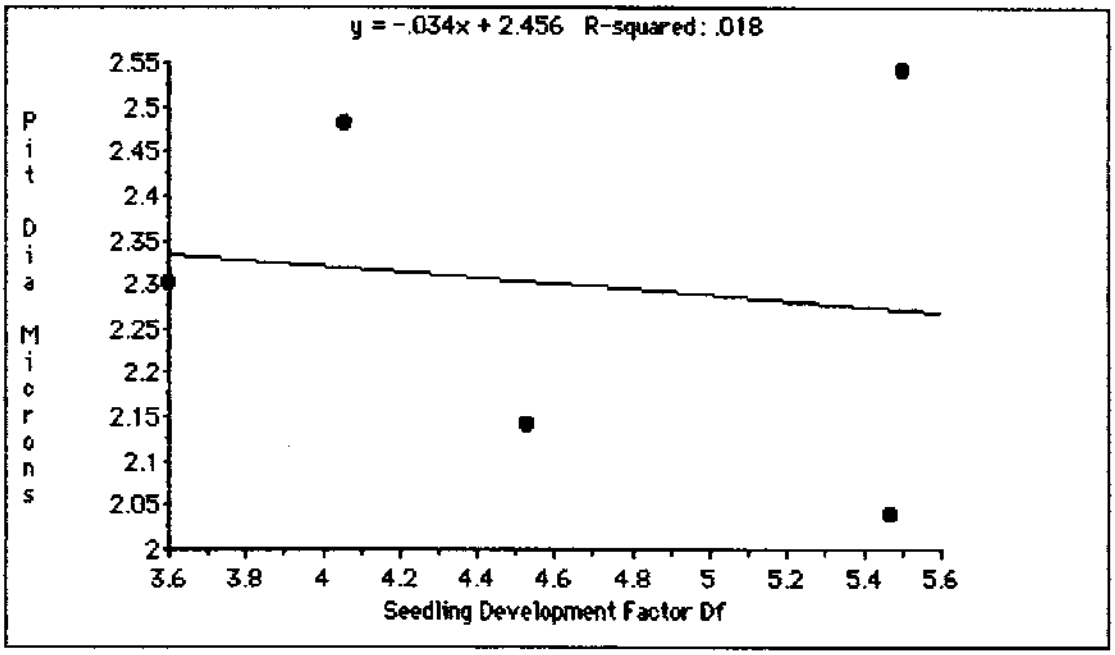
Laboratory Code: KS-01-39



Data from control plants - 13 day seedlings, r=0.31

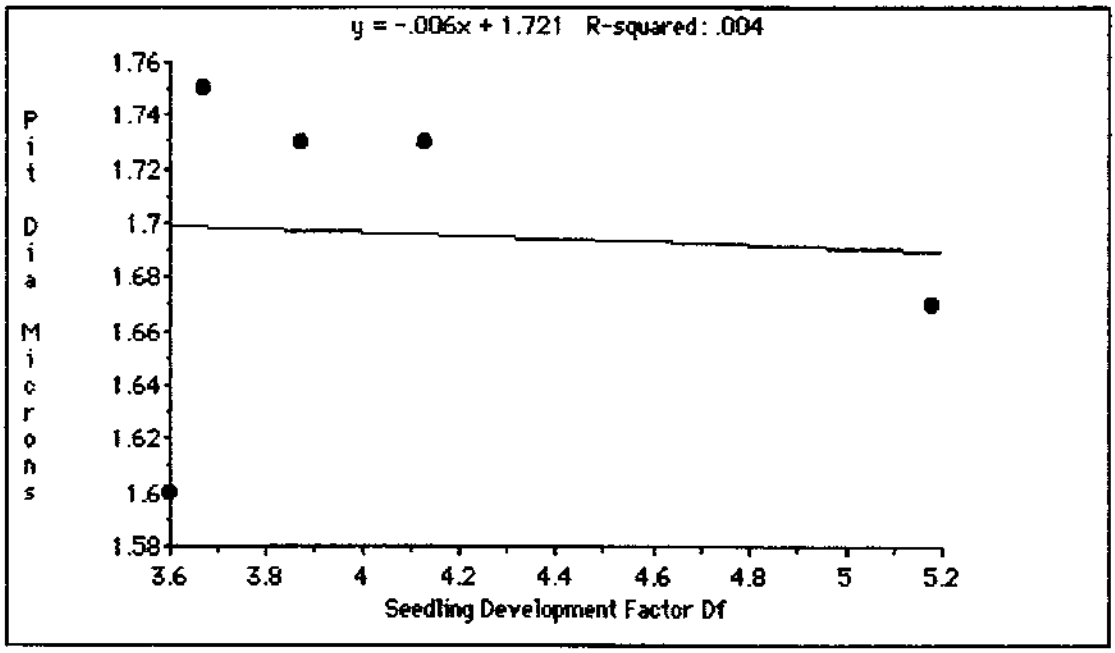
Fig.3

Relationship between cell wall pit diameter and development factor in an "artificial formation" and their controls.



Data From Artificial Formation (13 day shoots, r=0.13)

Lab. Code: KS-01-36



Data from Control Plants (13 day shoots, r=0.06)