Portraying Soils and Compost: Color, Form, and Pattern

Bruno Follador

"The healthy is at the same time the biologically sound and truly beautiful"

—Ehrenfried Pfeiffer

"Compost happens!" Perhaps you have seen this statement printed on t-shirts or in farm-related magazines. Each time I read this I am always left bewildered: Yes, compost happens, but *how*?

Even after surveying the vast technical literature, one might still ask: What is compost? Do I have to turn it? Should I layer everything or mix it? How do I know if it is good or not? How do I know it is ready? And did it really happen?

Ehrenfried Pfeiffer, one of the pioneer's of the bio-dynamic movement, wrote:

> There is not just one compost for everything, nor is all the organic material or waste (from the moment it arrives in the dump or compost yard, and on through all stages of fermentation and decay) yet to be defined as compost.

Pfeiffer was one of the most important and influential soil scientists of the twentieth century. A central theme of his work was the question how one evaluates the biological quality of a compost or soil beyond mere quantitative chemical analysis. Along with his colleagues, Pfeiffer strove to develop new approaches to soil and compost analysis.

Color, Form, and Pattern

Chromatography was first developed by the Russian botanist Mikhail Tsvet, and described in his fundamental publications from 1903-1906. The method, with many variations today, allows the separation of the various ingredients in a fluid mixture. For example, by applying the mixture to a special filter paper, one can observe how, due to capillary action, different elements in the mixture are "soaked up" by the paper at different rates, forming distinctive patterns.

In the 1950s Ehrenfried Pfeiffer pioneered a novel way of working with paper chromatography to assess the qualities of humus in soils or compost. This new method, known today as Pfeiffer's Round Filter Chromatography, employs filter papers treated with silver nitrate. The organic substances, such as soil or compost, are mixed together with a solution of sodium hydroxide before application to the paper. The mixture is then poured into a petri dish, and is drawn up through a wick inserted through the middle of the paper.

Consider for a moment Figures 1 and 2. Each is a chromatogram of a compost sample.

At a first encounter, the absence of numerical values might leave the viewer lost regarding the worth and quality of each compost. There are no numbers or percentages indicating amounts of organic matter, nitrogen, potassium, or other elements. Yet, we might wonder: could the particular array of forms, colors, and patterns tell us something about how the organic matter has been decomposed and transformed?

Observe each chromatogram carefully, paying attention to all the nuances of form and color. How many different "zones" can you observe in each figure? Is there a relationship between each region? Are you able to see movement or stagnation in either of the pictures? Which

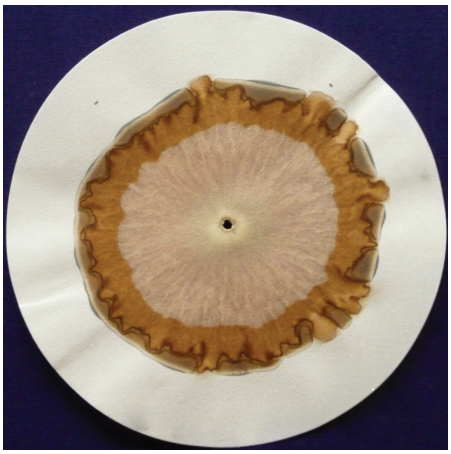

Figure 1

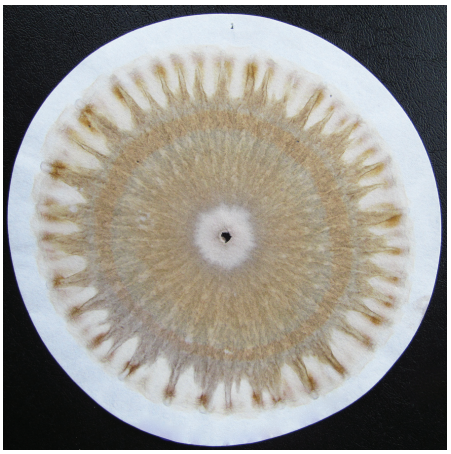

Figure 2

chromatogram seems more integral and whole? Which would you guess represents the healthiest and best compost?

Most viewers will probably have picked Figure 2. And, based on a wide range of separate assessments, it turns out that this is indeed the compost with the best quality. It is not so easy, however, to explain the relation between these separate assessments and the qualitative—one might even say "aesthetic"—features of the chromatogram.

But these qualitative features—form, color, and pattern—*are* related to objective aspects of the soil or compost sample. Various studies make clear how the different nutrients, organic substances, and humus fractions are separated by the capillary action of the paper. In "reading" the chromatogram, one necessarily pays attention to these details. This makes it all the more interesting when one notes how qualitative judgments cohere with, and add to, the information conveyed by the more abstract and "drier" analyses of the chromatographic image. When most reliable and comprehensive, however, these judgments are not casually arrived at. They arise only from a great deal of experience, and from attention to the entire context of the farm and its cultural practices. And, of course, direct observation of the soils and compost piles plays an essential role.

I would like to suggest, then, that the chromatogram can become a valuable tool in conjunction with a broad, contextual analysis of the health and fertility of a farm or garden.

Reading the Chromatogram

Let's ask ourselves how we might read these two chromatograms qualitatively, reserving judgment about the objective significance of our conclusions.

There is, clearly enough, a striking difference between the two chromatograms shown. In the figure at left we can observe a dark, grayish outer ring enclosing everything else. Directly inside it, there is a thicker, irregular, brown, and, we might want to say, "unharmonious" ring, about an inch thick. Occupying most of the figure is a large violet disc, with a smaller disc at the very center of the image. There is little interaction between these different zones, apart from the protuberances erupting from the brown ring into the outer, grayish belt. None of the regions is "relating" to the others. The figure as a whole gives the impression of stagnation.

The second figure looks rather like the iris of an eye. One senses in the whole a movement radiating centrifugally all the way out to the edge of the filter paper. Instead of a dark ring enclosing everything else, we find an open, light-beige outer circle. Spike-like formations interpenetrate this outer layer, and at the tip of each "spear" there are brown spots. These "spurs" correspond to the brown ring of the first figure. The inner main disc has brownish hues, instead of violet, and is filled with feather-like radiations. Unlike in Figure 1, each region harmoniously relates to and interpenetrates the other. The picture gives a sense of movement, development, and harmony.

Figure 1 represents an anaerobic and stagnated compost of very poor quality, while Figure 2 is a sample from an excellent humified compost.

I have shown chromatograms, at times a series of twelve samples, to groups as large as sixty people. Surprisingly enough, the majority of participants have always been able to identify the compost with the highest biological value, based on a qualitative assessment of the chromatographic images—this despite the fact that, in most cases, no one had had any previous experience with this particular method.

Chromatography offers a fresh and engaging possibility for farmers and gardeners to learn more about the biological processes taking place in their compost piles and fields.

A farmer once told me that, after having observed the chromatogram of his compost pile, he was able to better understand how to mix his piles and when to turn them. The picture *did not explain* what was wrong. But by *engaging* with the movement and patterns of the chromatogram in relation to the life of his pile, he was able to "see" what needed doing.

Ehrenfried Pfeiffer's groundbreaking work was to develop a pictorial method for *portraying* biological processes. Certainly there is a danger of using this method mechanically, analyzing images by looking only for the presence or absence of the most obvious forms and colors. But I hope to have at least hinted at the possibility that a sensitive, qualitative attention to the chromatogram might lead one to a fruitful engagement with the boundless contextual factors bearing on the health and fertility of soils, and on the processes by which "compost happens."

Since the fall of 2014, as part of the Living Soils project, The Nature Institute has established a small laboratory for employing Pfeiffer's Chromatography in support of research, workshops, and consultations.

Bibliography

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