

Conference Presentation

## Preliminary study on force-like effects between As45x, water, and wheat seeds performed by means of the droplet evaporation method

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### Abstract

**Background:** The droplet evaporation method (DEM) is based on pattern formation in evaporating droplets. It has been shown that the local connected fractal dimension (LCFD; a complexity measure) of crystalline structures grown in evaporating droplets of wheat seed leakages depended upon whether the seeds were treated with an ultra-high dilution (UHD) or water control.<sup>1,2</sup>

In homeopathy it is usually assumed, that UHD's need to come in direct (physical) contact with the organism to be treated to exhibit their action; however, recently, it has been demonstrated on a wheat seed germination model that UHD's may influence organisms also at a distance, i.e. without any physical contact.<sup>3</sup> In this case the UHD's effectiveness decreases with increasing distance. Here we test whether DEM might serve also as a tool to study such force-like influences.

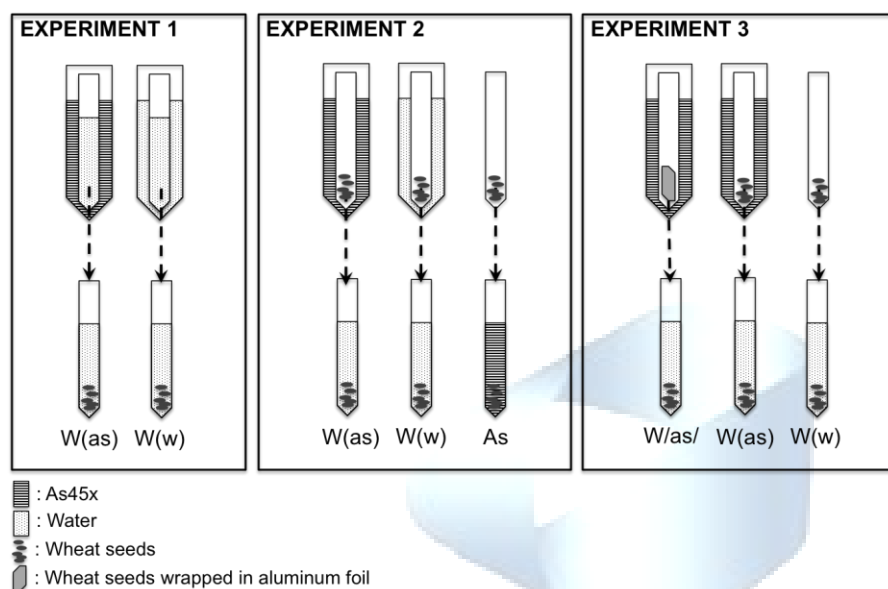
In a series of three DEM experiments (E1-3) we studied (i) force-like effects occurring between As<sub>2</sub>O<sub>3</sub> 45x treatment (As45x) and undiluted, unsuccussed, ultrapure water (W), (ii) As45x and wheat seeds, as also (iii) whether force-like effects may be shielded by means of aluminum foil, commonly applied for such purposes in homeopathic research.

**Materials and methods:** DEM experimental protocol is described in detail in [1]. For E1-3 we used wheat seeds (*Triticum aestivum*, cv. Verna) from a biodynamic farm "La Collina" in Tuscany/Italy, As45x supplied from Boiron Laboratories (Sainte-Foy-lès-Lyon, France), and W from our laboratory. As shown in Figure 1, polyethylene falcon tubes of two different sizes were combined in order to receive bilayer recipients. In E1 the inner-tubes of two bilayer recipients were filled with W and the outer-tubes with As45x or W. In E2,3 wheat seeds were put into the inner-tubes, whereas the outer-tubes were filled with As45x or W. In E3, additionally, the wheat seeds were wrapped or not into aluminum foil. All experiments were prepared in 6 replicates. The bilayer recipients were wrapped into aluminum foil and stored for 1 week (As45x containing recipients were stored separately from the others). After 1 week, in E1 five whole, undamaged wheat seeds were placed into the water in the inner-tubes; and in E2,3 the wheat seeds from the inner-tubes were placed in new test tubes filled with fresh W. Moreover, in E2 a positive control was added consisting in placing untreated wheat seeds in As45x. After 1 hour droplets from the wheat seed



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leakages were collected and placed on microscope slides (5 to 15 droplets per each replicate). The experimental thesis for each experiment are termed with W(as), W(w), As, and W/as/, as schematically explained in Figure 1. The droplets were evaporated in a thermostat at 25°C and UV light and the crystalline structures formed inside the droplet residues were photographed in dark-field in a 100x magnification. Image analysis consisted in calculating the structures LCFD by means of the ImageJ software [4] with Frac-Lac plug-in. Data was analyzed by means of the Bartlett test and 2 way ANOVA (CoStat, version 6.400).



**Figure 1:** Graphical representation of the experimental set-up's in experiments 1-3. W(as): patterns obtained from water or seeds previously placed close to As45x in the bilayer recipients; W/as/: patterns obtained from seeds previously wrapped in aluminum foil and placed close to As45x in the bilayer recipients; W(w): negative control; As: positive control. Dashed arrows indicate a time-lapse of 1 week.

**Table 1:** Mean local connected fractal dimension values of patterns obtained from the experimental theses As, W(w), W/as/, and W(as) in experiments 1-3. Different letters indicate significance at  $p < 0.005$ .

	EXPERIMENT 1			EXPERIMENT 2			EXPERIMENT 3		
	N	LCFD	SE	N	LCFD	SE	N	LCFD	SE
<b>As</b>	---	---	---	23	1.22 (a)	0.05	---	---	---
<b>W(w)</b>	37	1.43 (a)	0.03	72	1.05 (b)	0.03	75	1.33 (a)	0.03
<b>W/as/</b>	---	---	---	---	---	---	62	1.17 (b)	0.05



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W(As)	37	1.31 (b)	0.04	33	0.92 (c)	0.05	66	1.15 (b)	0.04
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**Legend:** N-number of patterns; SE-standard error.

**Results and discussion:** As shown in Table 1 in E1,2 the LCFD of W(as) and W(w) patterns significantly differed indicating that the As45x effect could be transferred on W and on seeds, in E1 and E2 respectively. For what concerns E3 there were no significant differences between W/as/ and W(as), but both these significantly differed from W(w). This result suggests that despite the shielding with aluminum foil the UHD effects passed on the wheat seeds.

**Conclusions:** Our results confirm that UHD's may pass their properties on distance on water and seeds even if they do not enter in direct contact with the receiver. Occurring of such effects should therefore be considered in research on homeopathy and preventive measures should be applied to avoid false positive or false negative results. Further experimentation is necessary to verify shielding properties of different materials against passing of UHD effects on distance with the aim to find alternative solutions to the commonly used aluminum foil. As demonstrated here DEM constitutes a suitable and quick tool for such studies.

#### References:

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**Keywords:** Droplet evaporation method; ultra-high dilutions; force like effects

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