Report

FIELD STUDY OF AN ENHANCEMENT EFFECT ON LETTUCE SEEDS: *Working In Adverse Conditions*

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ABSTRACT

During the years 2000-2002, research on organic farms looked at the effect of a healer on lettuce seeds. The basic hypotheses were that the healer would enhance the seeds to produce greater yield and greater health. The first year[1] found a significant result for the second hypothesis, as measured by looking at the fungal damage. The second year[2] found significant results on all the measures, greater yield, less fungal damage and less slug damage. However, doing field trials has many problems compared with doing laboratory research, weather being one of the major variables that cannot be controlled. For various reasons, in 2001 trials 6 and 7 were not planted out until long after they had become pot-bound. The delay in planting out was so great for trial 6 that the plants never grew properly, and trial 7 was harvested first as those plants grew to a point where they became big enough for sale. In 2002 the research took place on another farm and was a disaster. For various reasons up to half of the lettuce plants died in the seedling trays, and the people working on the farm became "spooked." They considered that the reason for the loss of plants was due to the research trials upsetting the delicate balance of energy needed to keep the farm running smoothly. Therefore the research was terminated after only two trials were harvested. However, in both 2001 and 2002 significant results were still found. Trials 6 & 7 in 2001 both showed first place "hits" for gross weight of lettuces in the "enhanced" (HX) condition, which, when combined with trials 1 - 5, give an average rank for gross weight of 1.92. The net weight was also significant. When each harvest is ranked, by group, on the number of lettuces produced, the HX group has mean rank of 1.79, with $t(11) = -2.75$, and two-tailed $p = 0.019$. The total yield was also significant for the HX group. The two trials in 2002 yielded nine experimental vs. control pairings. The nine "experiments" comparing net weight HX to another condition yield an average effect size (r) of 0.21 ($sd = 0.31$), which is statistically significantly greater than chance expectation. The six control experiments (NH v. controls) yield average effect size $r = -0.02$ ($sd = .26$), which is not significantly different from zero. These results suggest that a psychic healer can have a practical value for the commercial farmer. This is good news for organic farming where the lack of fungicide, pesticide and artificial fertilizer can result in a lower yield.

KEYWORDS: Parapsychology, psychic healer, large scale field trial, organic farming, lettuce seeds

INTRODUCTION

Some of the first psychic healing experiments in parapsychology involved a healer attempting to influence plant germination and growth. For a review of healing studies see Benor (2001, 2004).[3,4] For a literature review and full list of references applicable to this series of experiments study please see Roney-Dougal & Solfvin (2002).[1] The basic laboratory design from these experiments has been used for large scale field trials on organic farms in England. These have been run from 2000-2002, the first two years at Radford Mill farm in north Somerset, and in 2002 at South Farm (pseudonym) in south Somerset.

On organic farms no fungicide, pesticides or artificial fertilizers are used. This could mean that farmers have problems with pests, with fungal diseases and a lower overall yield. The basic aim of these trials was to see whether a laboratory experiment in which a healer attempted to "enhance" seed germination, health and growth of the resulting plants, would translate into a practical application for farmers by reducing pest and disease problems and enhancing yield.

At Radford Mill each trial was harvested in two separate batches one week apart, called the first and second harvests which were analyzed separately. In 2000 we found significantly less fungal growth ($F(3,24) = 3.13$, $p = 0.044$) on the plants; in 2001 average gross weight for first harvests is larger than chance expectation ($ES = .09$), though not significant ($Z = 1.47$, $p = 0.072$), but is significant for second harvests ($ES = .19$, $Z = 3.04$, $p < 0.001$). Net weight for the enhanced group is significantly greater than chance for both first ($ES = 0.16$, $Z = 2.49$, $p < 0.01$) and second harvests ($ES = .15$, $Z = 2.28$, $p = 0.011$).

Average slug damage ratings are reduced significantly for first harvests ($ES = -0.11$, Z -1.66, $p < 0.05$), and for second harvests ($ES = -0.12$, $Z = -1.82$, $p < 0.05$). Average fungal damage is statistically significantly reduced for first harvests ($ES = -0.13$, $Z = -2.11$, $p < 0.05$), but not significantly so for second harvests ($ES = -0.03$, $Z = -0.41$, p = n.s.). Overall, the effect sizes are in the "small" range, from 0.09 to 0.19 across the five plantings. However, the strength of these results is augmented by a remarkable level of consistency in direction-

ality. This is precisely the sort of consistency which can, over time, cumulate into a substantial amount, and suggests that a healer can enhance seeds sufficiently to make a commercial difference to the farm.

However, organic farms are not laboratories and conditions cannot be specified. The research has to make allowance for the needs and problems encountered in farm conditions. In 2001, two trials (trials 6 and 7) were not included in the data analysis prior to seeing the data, because the plants were not planted out in the field in time for a normal harvest to take place before the winter. These plants were however harvested by the farm so that the data could be collected, even though the plants from trial 6 were not any use for them as they were frosted before harvesting. This meant that the slug and fungal damage could not be assessed properly as the lettuces were in such bad condition. However the data was analyzed almost one year later to see whether or not the effect of the healer held up under these adverse conditions. The method and procedure for this data is identical with that in the previous two papers and so will only briefly be described here. For full details please see Roney-Dougal & Solfvin (2002 and 2003).[1,2]

In 2002, trials were run on a new farm, as the original farm wished to take a break from field trials, which cause a considerable amount of extra work. This new farm suffered a considerable loss of plants and so asked for the trials to be terminated. The design and methodology with these trials varied considerably from the previous ones because the farm grew far fewer lettuces in total, and grew a large number of different varieties. In the previous year it was noticed *post hoc* that the data from trials 2 and 3 were more significant than the other trials. In these two trials there had been a different variety of lettuces used, because the grower had suggested we use this other variety, as it would show up the effects of fungal damage more clearly than the variety we had been using. As this new farm grew many varieties, it seemed an opportunity for us to look at the effects of a healer on different varieties as a controlled experiment. JS therefore designed a program in which each of the five varieties grown would be an experimental trial, or one of the two different types of control trial, counterbalanced over 10 trials.

This paper is presented in two parts: the final two trials from 2001 at Radford Mill Farm, and the two trials harvested in 2002 at South Farm.

RADFORD MILL–METHOD

HYPOTHESES

As with the previous two years there were two primary hypotheses:

1. The "enhanced" seeds will have greater growth than the control.

2. The "enhanced" seeds will have better health than the control.

3. In addition, we looked to see if there would be differential effect on the different varieties. There was no specific hypotheses, this being exploratory, but a suggestion that different varieties would respond differently to the effect of the healer dependent on their resistance to pests and disease.

The following four outcome variables were pre-planned:

1. Growth variables: gross and net weight of the plants were measured when harvested;

2. Health variables: the plants were rated for slug and fungal damage on a five-point scale.

ENHANCEMENT PROCEDURE

For each trial, in the packing shed, in the presence of the experimenter (SRD) a person, who acted as the randomizer, was given a sealed pot of 1000 red oak lettuce seeds (Valdai). They counted 100 seeds, into each of four identical jars, making a total of 400 experimental seeds in each trial. These were then closed with a screw top lid. The randomizer was a person who knew no one who worked on the farm, and had no contact with the farm other than on the one occasion they performed the function of ensuring that the four jars of seeds were randomly ordered.

At this point nobody knew which jar would be given to the healer—all four jars were identical with no identification. One jar of seeds (HX) was given by

SRD to the healer (MP). One jar (NH) was given by SRD to the control person, who handled it exactly as MP handled his. This person claims no healing ability and mimicked the actions of MP whilst he was doing the enhancement. This person also performed this function the previous year as she lives on the farm, has no involvement in the vegetable side of the farm and was very interested in the research. Two jars (C1 & C2) were untreated controls and were taken by SRD and placed outside the door of the shed, where she stood whilst the healer performed the enhancement to make sure that there was no disturbance.

The rationale behind this was that Schwartz found that controls in the same room as the healer can be affected.[5] This was not taken into account in the preliminary experiment, and was included as a variable here, as both SRD and the healer felt it might be valid. However, as these trials were not included with the 5 previous trials no comparison can be made. This methodology suffers from a possible decision augmentation theory (DAT) problem.[6] Essentially DAT suggests that perhaps the psi happened by the randomizer putting all the best seeds in one jar and then SRD gave this jar to the healer. The methodology was amended in the design for 2002 so that this could not occur.

MP enhanced the seeds by holding his hands approximately one foot from the jar. Each enhancement lasted about five minutes. MP is a professional healer working for the National Federation of Spiritual Healers, the most respected organization of healers in Britain. SRD asked him to help with this research, and he worked with us during all of 2001 and 2002. After the enhancement, when everyone had left the shed, the randomizer assigned labels with the trial number and A, B, C or D to the four jars of seeds, which had been left on the table in the places where each person had sat. As the enhancement sessions for trials 6 and 7 were held one after the other on the same morning, there was the same randomizer for both the trials, and the randomization was done after both enhancements were complete. (For full details of the randomization procedure, please see Roney-Dougal & Solfvin, 2002).[1] Once the randomizer had labeled the jars they left them in the middle of the table for the grower to collect, left the farm and had no further contact with the farm.

Growing Procedure

The seeds were all sown by one person to ensure uniformity of sowing procedure. Trial 6 was sown on July 3rd and trial 7 on July 10th. The seeds were germinated in a dark shed. The initial growing conditions were in trays in a polytunnel, with the approximately three week old plants being placed in their trays outside where they were left until September when they were finally planted out, the final harvest being in December. SRD recorded the numbers of seeds that had germinated, the number of plants in each row, and the number that were harvested.

Harvesting Procedure

At a time determined by the grower, first of all trial 7 plants were harvested. Because these had been sown two weeks after trial 6, they had been less stressed by being left in the trays for so long, and so grew to a usable size. Trial 6 was harvested after the first frost when they could no longer be left in the field. Each lettuce was harvested by being cut at ground level. These were brought into the packing shed, and a team of five people then assessed the lettuces for health and weight. First the lettuce was assessed for fungal damage, and then for slug damage. This was recorded on a five-point scale, with 1 indicating little damage up to 5 indicating much damage. Then the lettuce was weighed to give gross weight. The outer leaves were trimmed and then they were re-weighed to obtain net weight, which was a lettuce ready for sale.

At the beginning of each harvesting session, the harvesters all independently rated a lettuce for slug and fungal damage, and then checked to see how closely their assessments matched. If there was a difference they discussed this and rated another lettuce, until agreement was reached. After all the data had been recorded and sent to JS for analysis, the randomizer revealed the codes.

RESULTS

Table I summarizes the results from Trials 6 and 7, showing the n, mean (W), standard deviation (sd), and rank for each measure: gross weight (GW), net weight (NW), slug damage (SL), fungal damage (FG), and Total Yield, by treatment condition.

Table I

Means, SDs, and Ranks of Outcome Measures By Group

		Group			
		HX	**NH**	**C1**	**C2**
GROSS WEIGHT (GW)					
Trial 6	*MN*	73.17	63.09	61.05	69.85
	(SD)	(17.24)	(19.44)	(14.40)	(19.94)
	Rank	**1**	**3**	**4**	**2**
Trial 7		93.94	83.50	88.79	90.92
		(22.46)	(19.64)	(19.78)	(19.04)
	Rank	**1**	**4**	**3**	**2**
SLUG DAMAGE (SL)					
Trial 6		0.75	0.57	0.40	0.66
		(1.18)	(0.88)	(0.68)	(0.84)
	Rank	**4**	**2**	**1**	**3**
Trial 7		1.62	1.12	1.38	1.32
		(0.64)	(0.71)	(0.57)	(0.68)
	Rank	**4**	**1**	**3**	**2**
FUNGUS DAMAGE (FG)					
Trial 6		3.26	3.18	3.35	2.96
		(1.07)	(1.02)	(0.98)	(1.11)
	Rank	**3**	**2**	**4**	**1**
Trial 7		2.16	2.18	2.33	2.35
		(0.67)	(0.76)	(0.72)	(0.67)
	Rank	**1**	**2**	**3**	**4**
TOTAL YIELD (TY)					
Trial 6	*(kg)*	3.030	2.590	1.970	3.034
	Rank	**2**	**3**	**4**	**1**
Trial 7	*(kg)*	6.775	5.670	6.175	6.255
	Rank	**1**	**4**	**3**	**2**

HX is the enhanced group, NH the control mimic group, and C1 & C2 the untouched controls.

Sample sizes: Trial 6; HX = 82, NH = 81, C1 = 62, C2 = 78
Trial 7; HX = 94, NH = 90, C1 = 95, C2 = 9

These two trials have insufficient data to be analyzed using the original rank analysis method.[1,2] But it is seen that the earlier trend continues—Trials 6 and 7 both showed first place "hits" for gross weight of lettuces in the "enhanced" (HX) condition, and first and second place "hits" for net weight. Adding these two trials to the first five trials reported in Roney-Dougal & Solfvin,[1,2] we found that the HX group for trials 1 - 7 was still statistically significantly more productive than the other groups, with average rank (among groups) for gross weight of 1.92 (where an average rank of 2.5 is expected by chance), which yields $t(11) = -2.24$ and two-tailed $p = .046$. The net weight was also statistically significant, with Mn rank = 1.92, $t(11) = -2.55$ and two-tailed $p = .027$.

The number of lettuces produced was also significantly increased by the healing treatment. When each harvest is ranked, by group, on the number of lettuces produced, the HX group for trials 1 - 7 has a mean rank of 1.79, with $t(11) = -2.75$, and two-tailed $p = .019$. The total yield was also significant for the HX group, which had average rank of 1.83, and $t(11) = -2.77$, for two-tailed $p = .018$.

Slug damage showed little between group variation and the HX group for trials 1 - 7 was unremarkable, just slightly larger (against the hypothesis) than chance expectation (of 2.5) with average rank of 2.58, $t(11) = 0.28$, two-tailed $p = .782$. Fungal damage was in the correct direction, with average rank of 2.13, but not significantly so ($t[11] = -1.15$, two-tailed $p = .28$).

DISCUSSION

Thus, we can conclude from this augmented data that there was indeed a clear effect of the healer's treatment on the growth of the lettuces, although not on the health parameters (resistance to slug and fungal damage) included in this research. It is particularly interesting that the positive effect on the lettuce growth endured the on-coming cold weather, being roughly the same in trials 6 & 7 as in the earlier, height-of-the-growing-season trials. Although the lettuces produced in these final two plantings were overall substantially smaller than in earlier plantings, the ones in the HX group outgrew the other groups as was the case throughout the season.

Thus, despite the adverse conditions, we still see the positive effect of enhancement on the plants in these two trials. The lack of fungal damage results for trial 6 is actually an artifact. Owing to the frost damage which the plants incurred, the assessment of fungal damage was virtually impossible, the harvesters saying that they could not distinguish whether the damage to the leaves was frost damage or fungal damage. Also because of the cold there was virtually no slug damage as slugs are not active at this time of year, and so a proper assessment could not be made for this parameter. Therefore this shows that a healer can be of assistance to a farm under normal and under adverse conditions.

SOUTH FARM–METHOD

ENHANCEMENT PROCEDURE

JS created a design in which only he knew which plants were from the enhanced seed, whereas in the previous design the randomizer had held that information. His new design also ensured that there could be no effect of intuitive data sorting (DAT). In this design there were five varieties of lettuce and each variety was divided into two parts, A and B. Therefore there are ten sets of seeds, Var. 1A, Var. 1B, Var. 2A, Var. 2B, etc., each in their own plastic bag. There were 72 seeds in each set making a total of 720 seeds in each trial.

JS gave the person, who acted as the "randomizer," codes for each trial so that each set could be placed at random into a Jiffy bag, labeled from A to J. JS also gave codes to SRD which specified which Jiffy bags would be enhanced by the healer (MP), which would receive the mimic treatment by the control person and which would be put aside with no treatment of any kind. Thus the randomizer did not know which Jiffy bags were treated and SRD, MP, and the mimic did not know which varieties were in each bag (See Appendix I for full details of the randomization process).

The enhancement procedure differed slightly from that used at Radford Mill. First, SRD went in to the packing shed to ensure that the table was clear and clean, that there was space for MP to stand at one end of the table and the

mimic to stand at the other, and that the seeds were in their plastic bags in order. She left the shed and informed the randomizer that all was ready. Next, the randomizer entered the packing shed and placed the seeds in their appropriate Jiffy bags, according to the instructions given by JS, which were in a sealed envelope. These were left on the table in the packing shed where the enhancements took place. SRD, MP, and the control person then entered the shed. SRD opened her envelope with instructions from JS and gave MP and the control their respective three Jiffy bags each, removing the remaining four from the table.

MP did his enhancement, giving each of the three Jiffy bags in each trial its own treatment, apart from the first trial when he "enhanced" all three simultaneously. He spent between two to five minutes on each bag, most bags receiving approximately three minutes, SRD timing this. The mimic focused on copying his actions, which were the same as at Radford Mill, holding his hands approximately twelve inches from the bag and angling the palm towards the bag. The control person was recruited by SRD, and was a different person for each trial. They claim no healing ability and no particular ability with plants. When all enhancements were complete the Jiffy bags were again placed in order on the table and all three people left the packing shed. The randomizer then entered, removed the plastic seed bags from the Jiffy bags and left them on the table for the grower to collect.

Growing Procedure

The seeds were all sown by one person to ensure uniformity of sowing procedure. The seeds were germinated at one end of the greenhouse. Unfortunately the person responsible for this had not worked on a farm before and was very new at the job, having worked previously in an office. She did not realize that all the seeds needed equal treatment and so some of the trays were placed underneath other trays resulting in some of the germinating seeds "bolting," which means that they grew very tall and spindly during this phase. This resulted in differing germination conditions for different sets.

The initial growing conditions were in trays in the same greenhouse, either on a shelf or on the ground, with the approximately three week old plants being placed in their trays in a different greenhouse or outside, where they were left

to harden off until they were planted out. There were problems with this phase also and this is the phase when most plants died.

A photographer who had worked with us the previous two years at Radford Mill again kept a photographic record of the seedlings in the greenhouse, and the plants growing in the fields.

The plants were planted out approximately six weeks after sowing in two rows, with varieties 1A-5A on one side, and varieties 1B-5B on the other side. Thus all plants had equal growing conditions because all plants were outside on one side and next to another lettuce plant on the other, apart from those four plants at the end of the row, e.g. trial 1 variety 1, the first two plants in a row did not have plants in front of them, and four plants from trial 2 were end row plants, making a total of six plants in the two trials to be affected.

Again there were problems here. Because of the unequal numbers of plants reaching this stage, there tended to be more of either A or B and so the variety last to be planted was often in a single row on its own, which gave unequal growing conditions. The other variety affected in this way for trials 1 and 2, was trial 2, variety 5, and not all of this trial were harvested so it is possible that no experimental plants were single-row plants. The first two trials were planted out simultaneously and, because of the very cold weather, grew very slowly so that they were badly affected by weeds.

Harvesting Procedure

At a time determined by the grower, the plants were harvested from the variety that was ready, attempting to harvest equal numbers of A and B within that variety at each time. The plants were weighed, assessed for slug and fungal damage and trimmed for packing and re-weighed as in previous years, with people who had done this procedure before.

Because of market requirements instead of one harvest each week, there were three harvest a week with smaller numbers being harvested each time, these numbers varying according to the orders received by the farm. As

there were only a few lettuces harvested on each occasion only one person did the assessments on any one trial. In all there were three harvesters (SE, SH and MA).

RESULTS

The Plant Growth Measures (weights)

In sorting out the comparison groups (A, B), the four treatment conditions (HX, NH, C1, C2), the five varieties (1-5), the three different harvesters (SH, MA, SE), and the various dates of harvesting, there were a few essential principles needed to do so. First, we had to establish the basic unit of the analysis. For this data, it is an A v. B paired comparison, for which the variety, harvester, and date of harvesting are constant. There were six (6) such comparisons in trial #1, and nine (9) in trial #2, and that's the basic data we have to work with, shown in Tables II and III. A few of the groupings provided could not be used because they included crops harvested on different days, or by different harvesters. We also lost some crop data—but very little—because a few plants here or there were harvested without an appropriate pairing.

Each one of these A v. B comparisons is itself a small experiment, with an associated t-test and p-value (in the tables). Table II shows two such "experiments" for Variety 1, and one experiment each for the other four varieties. But do note that only the first four "experiments" in Table II involve HX v. another group, thus the last two experiments in Table II are controls. Two of the four HX comparisons significantly support the hypothesis, while neither of two control comparisons (NH v. control) are in the correct direction, and are not statistically significant.

Table III shows the second trial to be even stronger—four of the five HX comparisons are in the predicted direction and three of them highly statistically significant. The one aberrant comparison (variety 3, harvested by MA on 29.7), is in the wrong direction and statistically significant. Nonetheless, the HX comparison group looks good compared to the four control experiments, of which only one is in the correct direction (NH > C1), and is also the only statistically significant one.

Table II

Trial 1—Net Weights MN (SD) by Group and Variety

Lettuce Variety	Harvester	GROUP HX	NH	C1	C2	*t*-test
1	MA	223.5 (82.5)	-- --	215.7 (78.3)	--	$t(54) = 0.36$
1	SE	203.2 (72.8)	-- --	150.7 (63.3)	--	$t(46) = 2.67^{**}$
2	SH	275.1 (86.9)	-- --	-- --	313.1 (131.6)	$t(18) = -0.68$
3	SH	326.6 (91.7)	252.6 (84.6)	--	--	$t(31) = 2.18^{*}$
4	SH	--	244.2 (103.0)	278.2 (96.7)	--	$t(50) = -1.06$
5	SH	--	144.7 (68.3)	-- --	146.1 (62.2)	$t(40) = -0.07$

$^{*}p = 0.05$ $^{**}p = 0.01$

HX is enhanced group, NH the mimic control group, and C1 & C2 the untouched controls. MA, SE, and SH are the harvesters.

In order to summarize these it's easier to use ONLY the net weight parameter, since gross and net weight are strongly correlated. Net weight and slug/fungal damage are correlated because they determine how much has to be cut off. We utilize "effect size" (r) instead of t-test significance levels. The simplest summary is the overall test of the question, "Did the healer's enhancement treatment work?" The simple answer is YES: The nine "experiments" comparing HX to another condition yield an average effect size (r) of 0.21 ($sd = 0.31$), which is statistically significantly greater than chance expectation ($t(8)$ 1.97, $p = 0.042$, one-tailed). The six control experiments (NH v. controls) yield average effect size $r = -0.02$ ($sd = 0.26$), which is not significantly different from zero ($t(5) = -0.20$, $p = 0.43$, one-tailed).

Table III

Trial 2—Net Weights MN (SD) by Group by Variety

Lettuce Variety	Harvester	GROUP HX	NH	C1	C2	*t*-test
1	SE	175.7	—	89.8	—	$t(13) = 2.77^{*}$
		(68.2)	—	(51.9)	—	
1	MA	111.1	—	70.8	—	$t(92) = 4.18^{***}$
		(49.8)	—	(42.1)	—	
2	SH	233.1	—	—	222.3	$t(70) = 1.10$
		(45.2)	—	—	(37.2)	
2	MA	296.5	—	—	234.9	$t(53) = 3.53^{***}$
		(65.3)	—	—	(64.3)	
3	MA	129.1	193.5	—	—	$t(62) = -2.97^{**}$
		(62.2)	(105.8)			
4	SE	—	366.1	350.5	—	$t(53) = 0.57$
		—	(112.6)	(90.6)		
4	SE	—	424.1	307.3	—	$t(32) = 3.03^{**}$
		—	(129.1)	(92.4)		
4	SH	—	491.0	543.1	—	$t(25) = -1.33$
		—	(120.9)	(54.8)		
5	SH	—	350.1	—	371.9	$t(67) = -0.82$
		—	(111.8)	—	(106.6)	

$^{*}p = 0.05$
$^{**}p = 0.01$
$^{***}p = .001$

HX is enhanced group, NH the mimic control group, and C1 & C2 the untouched controls. MA, SE, and SH are the harvesters.

In some ways, the most interesting questions are about the portion of the overall effects that can be attributed to the lettuce variety or the person who harvested it. To survey this, we lay out the effect sizes of the nine HX comparison trials into a three (variety) by three (harvester) array, as shown in Table IV.

Table IV
Effect Sizes by Harvester and Variety

	SH		MA		SE		AVE.
	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2	
VAR 1	--	--	0.05	0.40	0.37	0.61	0.36
VAR 2	-0.16	0.13	--	0.44	--	--	0.14
VAR 3	0.37	--	--	-0.35	--	--	0.01
AVE	**0.12**		**0.14**		**0.49**		

Had we continued data collection as planned through the season, all of the varieties would have been represented, but since we only have what we have, *no inferences or conclusions can be drawn from the data.* At best, these may suggest hypotheses for future study. No statistical analyses are valid with these data so none are provided.

The analysis of the slug and fungus damage data is far more complicated, as can be seen from Tables V and VI. No obvious pattern emerges. Using the same approach as described above for the growth (wt.) data, the summed effect sizes for the experiments do not show any significance effects for slug or fungus damage. For the nine experiments comparing HX with another group, the average effect size is r = -0.01 (sd = 0.23), which is not significantly different from zero ($t(8)$ = -0.14, p = 0.554, one-tailed). Similarly for the control experiments (NH v. controls) the average effect size is 0.04 (sd = 0.11) which does not differ significantly from zero ($t(5)$ = 0.78, p = 0.236, one-tailed).

For fungus damage, the nine HX comparisons averaged r = -0.02 (sd = 0.27) which doesn't differ significantly from zero ($t(8)$ = -0.17, p = 0.567, one-tailed). The control experiments with fungus damage averaged r = 0.08 (sd = 0.30) which is not significantly different from zero ($t(5)$ = 0.64, p = 0.277, one-tailed).

Table V

Trial I—Slug and Fungus Damage Ratings by Group and Variety

Lettuce Variety	Harvester	GROUP HX	NH	C1	C2	*t*-test
SLUG DAMAGE MN (SD)						
1	MA	1.05	-	0.57		$t(54) = -2.93^{**}$
		(0.64)	-	(0.59)		
1	SE	0.13	--	0.14		$t(46) = 0.13$
		(0.22)	--	(0.27)		
2	SH	2.31	--	--	2.31	$t(19) = -0.02$
		(0.59)	--	--	(0.66)	
3	SH	2.04	2.25	--	--	$t(31) = 1.23$
		(0.42)	(0.49)			
4	SH	--	1.83	1.70	--	$t(50) = -0.95$
		--	(0.33)	(0.45)		
5	SH	--	1.77	--	1.88	$t(40) = 0.46$
		--	(0.83)	--	(0.78)	
FUNGUS DAMAGE						
1	MA	2.71	--	2.04		$t(54) = 2.02^{*}$
		(1.07)	--	(1.42)		
1	SE	0.83	--	2.04		$t(46) = 4.61^{**}$
		(0.63)	--	(1.10)		
2	SH	1.88	--	--	1.81	$t(19) = -0.18$
		(0.69)	--	--	(0.88)	
3	SH	1.67	1.80	--	--	$t(31) = 0.62$
		(0.54)	(0.54)			
4	SH	--	1.38	168	--	$t(50) = 2.27^{*}$
		--	(0.48)	(0.40)		
5	SH	--	0.94	--	0.80	$t(40) = -0.57$
		--	(0.90)	--	(0.71)	

$^{*}p = 0.05$ $^{**}p = 0.01$ $^{***}p = .001$

HX is enhanced group, NH the mimic control group, and C1 & C2 the untouched controls. AM, SE, and SH are the harvesters.
Positive *t*-values are in the direction of the hypothesis.

Table VI

Trial 2a - Slug Damage Ratings by Group and Variety

Lettuce Variety Harvester		RX	NH	C1	C2	*t*-test
SLUG DAMAGE MN (SD)						
1	MA	0.66	--	0.14		$t(92) = -3.59^{***}$
		(0.88)	--	(0.35)		
1	SE	0.57	--	0.75		$t(13) = 0.95$
		(0.45)	--	(0.27)		
2	SH	2.15	--	--	2.21	$t(70) = 0.33$
		(0.64)	--	--	(0.77)	
2	MA	2.22	--	--	2.14	$t(53) = 0.64$
		(0.35)	--	--	(0.54)	
3	MA	1.59	1.82	--	--	$t(62) = 1.50$
		(0.57)	(0.53)			
4	SE	--	2.55	2.46	--	$t(54) = -0.53$
		--	(0.77)	(0.45)		
4	SE	--	2.50	2.62	--	$t(32) = 0.66$
		--	(0.59)	(0.45)		
4	SH	--	1.75	1.82	--	$t(25) = 0.54$
		--	(0.32)	(0.34)		
5	SH	--	2.35	--	2.47	$t(67) = 0.97$
		--	(0.55)	--	(0.45)	

$^{***}p = .001$

DISCUSSION

Once again the growth of the plants was significantly increased when the seed had been "enhanced" by the healer, despite the difficulties experienced by the farm and the research team. This corroborates the previous findings.[1,2]

The more complicated findings with regard to health of the plants as measured by slug and fungus damage is to be understood in the light of working with

Table VI (continued)

Trial 2b - Fungus Damage Ratings by Group and Variety

Lettuce Variety	Harvester	GROUP RX	NH	C1	C2	*t*-test
FUNGUS DAMAGE MN (SD)						
1	MA	3.28	--	3.14	--	$t(92) = 0.44$
		(1.34)	--	(1.66)		
1	SE	1.57	--	1.44	--	$t(13) = 0.37$
		(0.45)	--	(0.86)		
2	SH	1.58	--	--	1.43	$t(70) = -0.75$
		(0.91)	--	--	(0.82)	
2	MA	2.57	--	--	1.88	$t(53) = -3.05^{**}$
		(0.68)	--	--	(0.99)	
3	MA	1.87	1.53	--	--	$t(62) = -1.45$
		(0.77)	(1.01)			
4	SE	--	1.43	2.21	--	$t(54) = 3.60^{***}$
		--	(0.73)	(0.90)		
4	SE	--	1.50	1.68	--	$t(32) = 0.88$
		--	(0.64)	(0.53)		
4	SH	--	0.75	0.46	--	$t(25) = -2.10^{*}$
		--	(0.41)	(0.27)		
5	SH	--	0.85	--	0.88	$t(67) = 0.30$
		--	(0.46)	--	(0.58)	

* $p = 0.05$ ** $p = 0.01$ ***$p = .001$

NM, SE, and SH are the harvesters. HX is enhanced group, NH the mimic control group, and C1 & C2 the untouched controls.

Positive *t*-values are in the direction of the hypothesis.

seven different varieties. Some of the varieties in trial 1 are not the same as in trial 2, and the different varieties have different properties with regard to susceptibility to fungal damage. Had we been able to continue the harvests

for all seven trials then we would have been able to look at the effect of the healer with regard to these breeding traits as originally planned. There are three varieties which are the same in both trials, namely vars. 1, 3 & 4 (Frisby, Red salad bowl and Mikola). Information from the NIAB (National Institute for Agricultural Botany) and the seed company (Enzazaden) as regards the different fungal susceptibilities of the different varieties shows that there is considerable variation.[7,8] As it is, the lack of data means that we could not see whether there was a differential effect of the healer on the different varieties.

Farmer's Assessment of the Bad Growth of the Crop

At the end of May the grower expressed great concern that the germination rate was very bad. She stated that the people working on the farm were really troubled about it and thought that it was something to do with the research. She was concerned that there were no plants growing outside of the experiment: a control of the controls so to speak. By the third week in June it was decided to only run 7 trials.

In the third week in July, the grower talked again about how "spooked" they all were, and that one of the people working on the farm said he "had never seen anything like it before." During the next week the grower talked with other farmers who offered various "psychic" or "energy" reasons for the problem. The following week the grower decided to terminate the experiment. Thus the assessment of the people working on the farm about the crop failure was that it was due to an "energy" or psychic effect, caused by the team of people coming on to the farm to do the research upsetting the delicate balance of energy on the farm and so affecting the germination of the lettuce seed.

Independent Assessments of Possible Causes of Bad Growth of Plants

In parapsychology it is really important to look at all the possible reasons why something has occurred before accepting a psychic hypothesis. This is essential in the case of South farm where there was such a dramatic loss of plants whilst they were in the trays, of an order rarely seen in psychical research. Accordingly

SRD consulted two organic crop research organizations, the Organic Advisory Service and the Henry Doubleday Research Association, keeping the identity of the farm confidential, and asked them if they would be able to help with information regarding problems with lettuce germination and growth. The raw data, concerning numbers of plants germinated, planted out and harvested, and photographs of the plants in trays and in the field, were sent to them. The Organic Advisory Service[9] gave a full report (see Appendix 2) the main points of which are as follows:

- The first point to note is that the independent consultants consider that the actual germination of the seeds was within the normal range that one expects for lettuces.

- The second point is the possibility of a heater in the greenhouse affecting the plants. The weather at that time was unseasonably cold and wet and it is possible that a heater was being used at night, though it was not noticeably in use during the day. At no time did SRD notice that the greenhouse was hot, so this possibility seems a less likely factor.

- The third point is that of inconsistency in watering. This had already been noticed by SRD and was something she had discussed with the person in charge of sowing the seeds. It was explained that the hose did not have a sprinkler, so that it was very difficult to give equal water to the plants and some got waterlogged whilst others were left dry. The photographs show this unequal watering very clearly.

- The fourth point is that most of the failure occurred whilst in the greenhouse after germination and before planting out. Though there was also loss after planting out, it is considered to be in the acceptable range. The report mentions that seedlings that have survived the stress of over- or under-watering may not develop well afterwards, and this point needs to be taken into consideration also.

Unfortunately, as remarked by the grower, the whole of the lettuce crop was used in the research, and this meant that there was no outside control as there had been at Radford Mill, where the research lettuces were only a small part of the overall crop. Thus, whilst the farmer's assessment that the

problem was due to a new group of people upsetting the "energy" on the farm, there are several other possibilities that need to be considered before this psychic reason for the loss of lettuces can be considered the valid option. It is possible that the farmer's assessment is an example of "fear of psi" manifesting.

CONCLUSION

For three years field trials have been run on organic farms in England in which a healer has directly enhanced the seed of the lettuce crop. Every year significant results have occurred. This paper shows that, even under adverse conditions, the effect of the healer is noticeable. As organic farming is becoming more and more viable and popular, the possibility of a healer working with seed companies to boost production is certainly to be considered.

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Appendix I
Details of Design and Randomization Procedure for Merricks Farm

JS designed the randomization procedures, materials, codes, and instructions. All randomizations were accomplished using the pseudo random routine (RAND) in Microsoft Excel (MS Office 98) which was refreshed between 20-25 times dependent upon the number of "heads" showing with the flip of five coins (0 heads = 20, 1 head = 21, etc.).

Five different varieties of lettuce were designated for planting at the cooperating farm. Therefore two containers of seeds of each variety, or ten containers with 72 seeds each (720 seeds total), were prepared to begin each trial. These were labeled Var1-A, Var1-B, Var2-A, etc., and were arranged in a row on a table in the treatment room. The designated "randomizer" came into the room, alone, and placed these containers into other opaque containers labeled A through J according to specific set of "randomization codes" supplied by JS for this particular trial, and then left the room. The treatment team now entered the treatment room, including SRD, the healer (MP), and a nonhealer control person. SRD consulted her set of "treatment codes" (supplied by JS) for this trial to move three of the lettered containers to the healer's side of the table and three other containers to the nonhealer's side of the table. The healer conducted the enhancement procedure on the containers supplied to him while the nonhealer mimicked the healer's activities with the containers supplied to him while SRD observed. Upon completion, SRD returned the containers into their original positions and the treatment team left the area. The randomizer then returned, removed the outer containers and replaced the containers back into their original positions (Var1-A, Var1-B, Var2-A. etc.) and left the area. The seeds in the ten containers were then placed in trays for germinating, beginning the growing phase of the trial.

JS prepared the instructions, randomizations, and codings prior to the beginning of trial 1, sending all of this to the "randomizer" via email as a 10-page document before the study commenced. The randomizer printed the document and then destroyed the electronic file. Each page represented a single trial, with "randomizer codes" on the top half of the page and "treatment codes" on the bottom half of page. A two letter identifier (e.g., LH) was printed on the top and bottom halves to designate the trial. The randomizer cut each page in half and inserted the top half into a small envelope labeled "randomizer codes" and the bottom half into a small envelope labeled "treatment codes", marked both envelopes with the common trial designation, and sealed them both securely. The ten sealed small envelopes containing "treatment codes" were then delivered to SRD.

The ten "randomizer codes" envelopes were inserted into ten larger envelopes which had been prepared with a copy of an instruction sheet affixed by staples to the outside and another instruction sheet inside. The outside instruction sheet gave step-by-step instructions for the randomizer upon arriving at the farm on the day when treatment was to be conducted and the inside instruction sheet provided step-by-step instructions for when the randomizer entered the treatment room. As each small envelope was inserted into one of the larger ones, the trial designation was noted and written clearly on the outside of the larger envelope, which was then securely sealed.

"Randomizer codes" simply assigned the ten containers (Var1-A, Var1-B, Var2-A, etc.) to be placed in an outer container labeled with the letters A through J on the basis of equal likelihood. No attempt was made to balance the use of the outer containers across the anticipated ten weeks of the season. The randomization of the "treatment codes" was constrained to maintain a balanced design. On any trial, the two containers of one of the five seed varieties would be randomly assigned to HX and C1; another variety would be assigned to HX and C2; another to NH and C1; another to NH and C2; another to HX and NH. But across the ten trials that were planned, each variety would be assigned to each of those five comparisons exactly twice, balancing the design.

Appendix II

The Organic Advisory Service Farm Report

Adviser: Roger Hitchings

INTRODUCTION

This report is being written in response to a request for information on the problems of lettuce growing. Some information is available but the report will attempt to comment on all the possible reasons why performance has been poor. The different stages will be covered in turn.

REPORT

SEEDS AND GERMINATION. Germination appears to have been fairly good for most of the sowings so it does not appear that there is any problem with the quality of the seed. Commercially available seed has to comply with EU germination and cleanliness regulations. Self saved seed or seed without provenance can give rise to problems of poor germination.

Trial 3 is the one that shows the poorest germination and one reason for this is that the seeds may have become too hot—lettuce exhibits thermodormancy and germination drops off sharply as the temperature rises to 25° C and above. I notice that there is an oil-filled radiator in one of the photographs and that the pattern of poor germination follows a line in the 3A/3B tray—this could be consistent with localized heating from a heater under the bench.

Over-watering can also give rise to poor germination as the seeds are effectively suffocated by waterlogged compost. The opposite situation of dryness might be the problem in Trial 3—the photograph shows dry compost in parts of the trays. Germinating seeds and seedlings are very fragile and cannot survive dry conditions for very long. Seedlings that survive wetness or dryness may not flourish because of the associated stress.

GROWING ON. Most losses appear to have occurred in the time between germination and planting out. As noted above seedlings that were stressed during germination and establishment may suffer and die during this period even if conditions are optimal. They may be more susceptible to diseases such as downy mildew and grey mould—along with damping-off these fungal problems can cause problems when conditions are damp and humid, where hygiene is poor (unwashed trays & pots, dirty tools, etc.) and where seedlings are damaged.

It is also important to use a suitable growing medium and to maintain a growing environment that does not experience wild swings in temperature and humidity —good light levels are also important. Regular watering on a little and often basis is the preferred regime, and this should be done early enough in the afternoon or early evening in order to allow the leaves to dry before nightfall.

PLANTING OUT. In most cases there does not seem to have been too many problems once the lettuce are planted out. The photograph of a double row of young lettuce shows the outer leaves slightly yellow—this could be that the plants were running out of nutrients in the tray or that they have received a shock (cold night temperatures, wind scorch, dry soil) when planted out. That said the colour of the inner leaves is good showing that they have established fairly well.

Other problems at planting out include leatherjackets (I have seen devastation in early iceberg lettuce crops), mildew (can be a problem though it is more likely in the later season when autumn dampness sets in), rabbits and slugs. I cannot see anything in the photographs to suggest whether these have been an actual problem. Weeds can be a problem in the latter stages

and you clearly had a healthy weed population in Trials 1 & 2. Base-rot, root aphid and viruses are all potential problems but again the numbers do not suggest anything serious.

ACTIONS

- Always use good quality seed and do not sow more than 5mm deep—ensure the growing medium is always moist but not waterlogged.
- Temperature should be maintained between 12 and 20 degrees Celsius—if anything aim low rather than high to avoid thermodormancy.
- At the same time ensure there is adequate ventilation to avoid localized humidity.
- Lettuce is often raised in peat blocks (as opposed to module trays) for better root development and less chance of water-logging.
- Always use a known product for the growing medium.
- Avoid over-packing the trays with compost—this can restrict good root development.
- Consider the use of a liquid seaweed spray during the growing on period.
- Any heating used should be applied as evenly as possible.
- Total hygiene should be the norm and this includes the trays, bread trays, tools, benches and the house themselves.
- Ensure that watering is even and regular—avoid drying-out and water-logging.
- Water plants in well at planting out even if ongoing irrigation is not intended.

CONCLUSION

The plants that survived appear to have grown well and in many of the photographs the colour is good suggesting that nutrient supply has not been a problem. A few problems appear to have been encountered after planting out but these are in the 'acceptable losses' category in general—if you plan any further trials keep a few plants back at planting to fill in any early gaps (standard practice in NIAB trials). It is the period from germination to planting out when most of the problems have occurred. I have attempted to identify possible reasons for this but I cannot be definitive in the absence of a site visit. I have listed a number of action points above that should be part of any well-managed operation. I hope that this has been of assistance—if you wish to briefly discuss any of the points raised I am available on the above number. If further advisory input is required please contact Andrew Trump on 01488 657600 in the first instance. [15 February 2003]

DISCLAIMER: *In undertaking this work, The Organic Advisory Service has based its advice on the figures and information provided by the client or its representatives, the responsibility for which rests with the Client. The Organic Advisory Service has taken reasonable steps to ensure that the advice offered is accurate and applicable to the client's circumstances. No liability shall lie with The Organic Advisory Service in respect of any disclosure made of this advice and acceptance of this advice shall constitute an indemnity from the client to The Organic Advisory Service. It should be noted that the client is responsible for contacting where appropriate any relevant Government departments (e.g. DEFRA [MAFF] and the Intervention Board) to ensure that its individual situation in respect of points of law or procedure is ascertained and it is advisable that written replies are obtained to all queries.*

It does not look like there is a significant difference between treatments A and B.

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