Results from the 2013 Bach Biodynamic Planting and Research Calendar

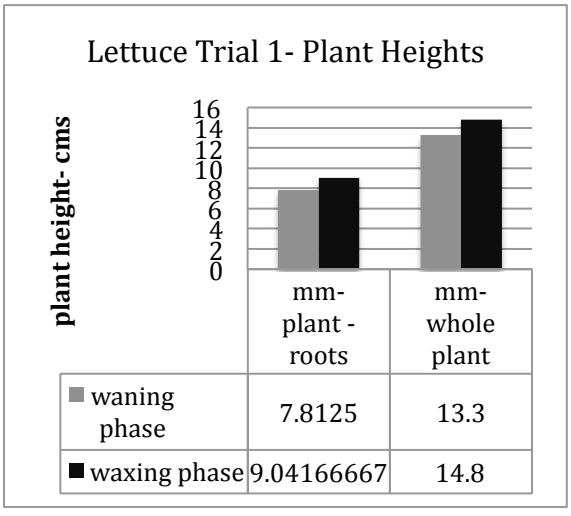
The inaugural Bach Biodynamic Planting and Research Calendar consisted of a series of planting trials that spanned the months of January through June 2013. This year's trials had the intention of comparing two different approaches to sowing using cosmic rhythms. The first of these rhythms is the synodic lunar rhythm, where Rudolf Steiner indicated in *The Agricultural Course* that the best times for sowing seeds was two days before a full moon. The second approach was that developed by Maria Thun, where the moon's passage through the constellations is used to plant various crops (root, flower, fruit, leaf). A more complete discussion of these approaches can be found in my essay *Rudolf Steiner's Indications Regarding Cosmic Influences Upon the Growth of Plants* available as a download from my website www.bachbiodynamics.com. The trials themselves presented difficulties, and as a result, some of these trials must be considered as unsuccessful. In trial one, for example, the lettuce germinated, but soon died, as there was not enough light in the windowsill to stop the plants from running, collapsing, and then dying. This was the experience for most of the small group of us conducting the trials in Vancouver who used only natural light. Artificial light from one of the researchers here in Vancouver was used, and the data from this trial is good, but not ideal, as it is only one set. In subsequent indoor trials, most of us added a grow light to help the plants along while they were indoors. Other obstacles arose in the later plant-out trials, where plants were started indoors, and then transplanted outside after 30 days. These problems were in the form of slug attacks on plants. The intention of the indoor portion of the trials was to eliminate as many variables as possible (temperature and rainfall fluctuations) so as to provide an environment where lunar influences could be studied without possible confounding factors.

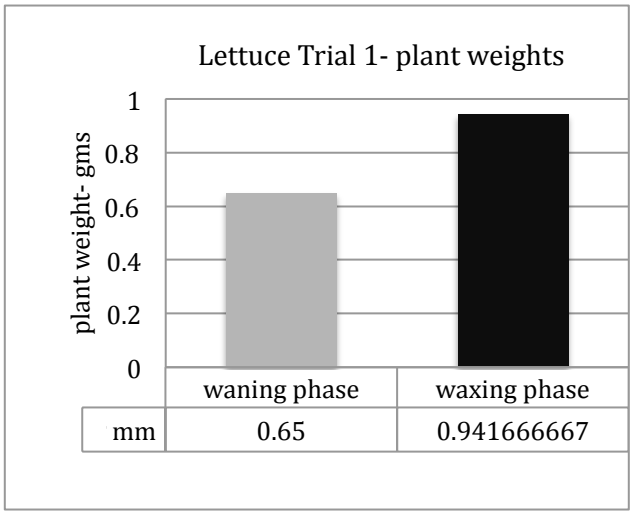
Planting trials 1 and 6 only have one set of data, meaning only one of the participants was able to grow a full set of plants for both parts of the trial. Trials 2,3,4 were carried to completion by a larger number of participants, and provide a broader range of data. Trial 5, the second of the plant-out trials, was not a success for me or any of our small Vancouver research group, because of a heavy slug infestation, which destroyed many of the transplants. My plants were almost completely wiped out in a single evening. Slugs are a large gardening problem on the damp West Coast. A discussion of how to deal with this problem will occur at the end of this paper. Despite the difficulties that were encountered, meaningful data was collected. The data from the various trials discussed has been graphed, to show comparisons between synodic (waxing-waning phase) data. The waning phase data was always planted on the corresponding trigon day. In trial 2 discussed below, for example, the radishes were planted on a root day for the waning phase, and on a non-root day for the waxing phase. In this way, the synodic and trigon lunar influences can be compared to see which would have the strongest influence. I believe that the data below shows that the strongest influence affecting plant growth is the synodic rhythm, but the anomalistic cycle, where the moon comes closest (perigee) and furthest (apogee) to the earth may also have been a factor, but more research is needed to prove this. The anomalistic month spans about 27.6 days. There were also 2 lunar eclipses that occurred close to the waxing planting days of trials 4 and 5. I believe

that these also had a strong negative influence on the germination and growth of plants. More details of these influences will be given in the discussion of data for each of the trials. I would also like to say that the data given here is not and should not be considered as complete or comprehensive in any way. It is not. Any conclusions that I have drawn must still be considered as a more directed and supported hypothesis that will be carried forward in the 2014 calendar. The design and execution of the trials in this inaugural year of the calendar presented problems, which will be discussed for each of the trials here given. These problems however, provided valuable information for the design and execution of future trials, with the goal that over a longer period of time (several years at a minimum), a clearer picture of the rhythms here studied will arise. Before I begin discussing data, I would like to thank Ali Roth, Michael Roboz, and Marianne Moser, all from Vancouver, and Herzliche Grüsse, Conradin Obrecht and Benno Otto from the Goetheanum for their participation in this year's calendar. I hope that they will continue to participate in the future. Their hard work and diligence has been commendable and has added greatly to the scope of this year's research. The initials of each of the participants has been used for the research sets of the Vancouver group, while 'Got' is used for research sets from the Goetheanum.

Trial 1 (lettuce)

Waning sowing time: Jan 9th 2013 (leaf day)
Waxing sowing time: Jan 24th 2013 (flower day)
Waning phase germination: 9/12 (75%)
Waxing phase germination: 12/12 (100%)
Average germination time waning phase: 7.3 days
Average germination time waxing phase: 4.6 days
Combined size of all data sets: 21plants





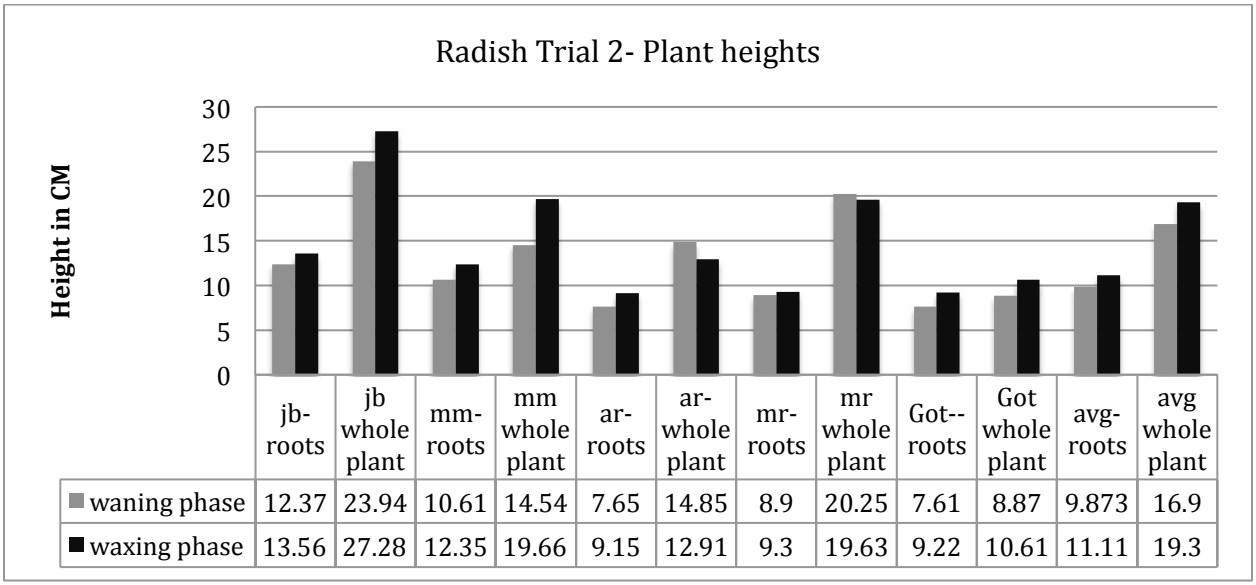
This first trial, although small, shows a pattern that will be generally consistent throughout- that of the waxing phase providing larger and heavier plants. The weight of the lettuce plants in the waxing phase (1b) of the first trial were, on average .29 grams, or

about 45% heavier that those in the waning phase (1a) of the trial.

The heights of the plants in trial one were also larger in the waxing phase than the waning phase. The waxing phase plants measuring the above ground portion only were 1.23 cm higher (15%) and for the whole plant 1.5 cm (11%) higher.
Perigee occurred one day after (Jan10th) the planting day for trial 1a. The work done by Harmut Spiess showed that perigee had a favourable influence on the growth of plants. If this is the case, as perigee moves towards the waxing phase, the yields of the plants in the waxing phase should increase in relation to the waning phase.

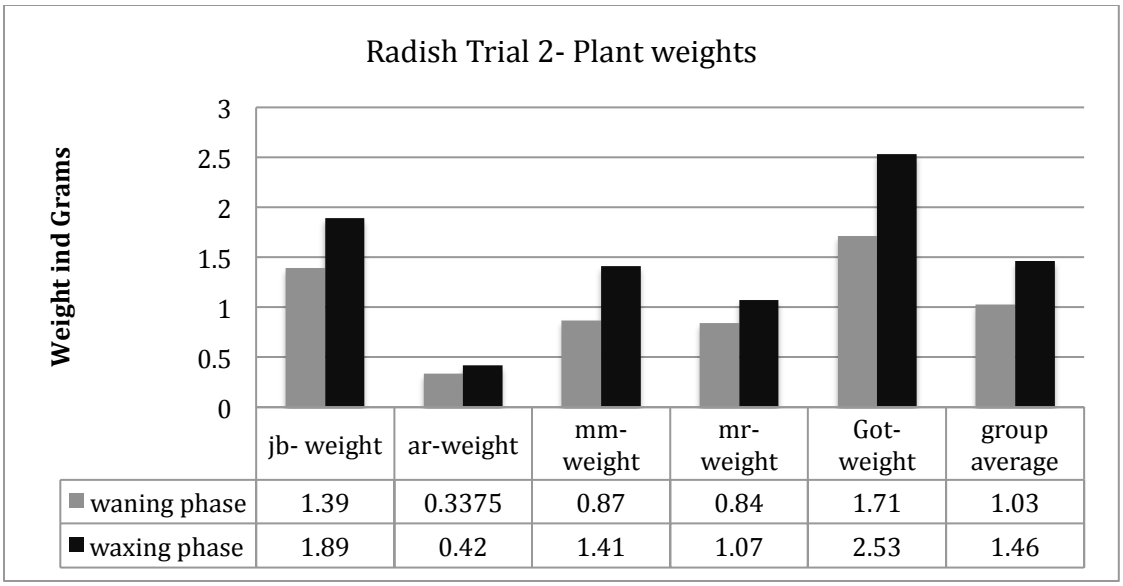
Trial 2 (radishes)

Waning sowing time: Feb 8th 2013 (root day)
Waxing sowing time: Feb 23rd 2013 (leaf day)
Waning phase germination: 52/60 (87%)
Waxing phase germination: 54/60 (90%)
Average germination time waning phase: 6.86 days
Average germination time waxing phase: 5.07 days
Combined size of all data sets: 106 plants



	jb-roots	jb whole plant	mm-roots	mm whole plant	ar-roots	ar-whole plant	mr-roots	mr whole plant	Got--roots	Got whole plant	avg-roots	avg whole plant
waning phase	12.37	23.94	10.61	14.54	7.65	14.85	8.9	20.25	7.61	8.87	9.873	16.9
waxing phase	13.56	27.28	12.35	19.66	9.15	12.91	9.3	19.63	9.22	10.61	11.11	19.3

In this trial, germination for both phases of the trial was very close (from five sets). Germination times, however, were somewhat lower for waxing phase plants (1.79 days), but this data is only from four sets (not all five sets). The average height for the whole plant was 2.4 cm higher for the waxing phase, while less roots plants were 1.24 cm longer for the waxing phase. Plants were on average .57 grams heavier for the waxing phase.



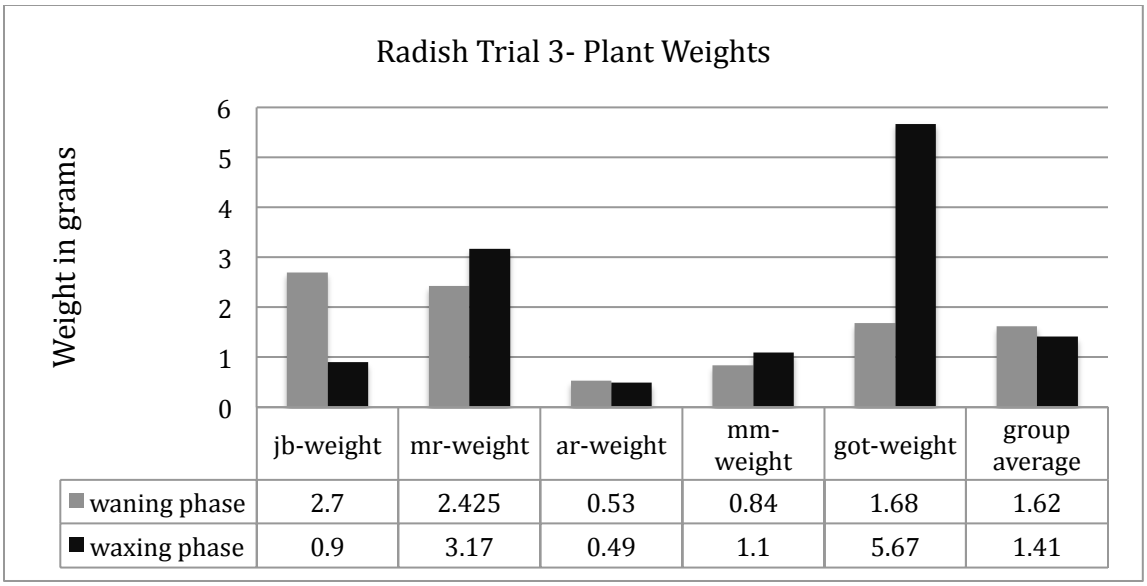
	jb- weight	ar-weight	mm-weight	mr-weight	Got-weight	group average
waning phase	1.39	0.3375	0.87	0.84	1.71	1.03
waxing phase	1.89	0.42	1.41	1.07	2.53	1.46

Perigee during this phase occurred one day before the waning planting date, while apogee occurred four days before the waxing phase planting dates. Perigee moved in retrograde towards the waxing phase during the spring of 2013, and reached its closest waxing point in June, where perigee occurred on the full moon that month.

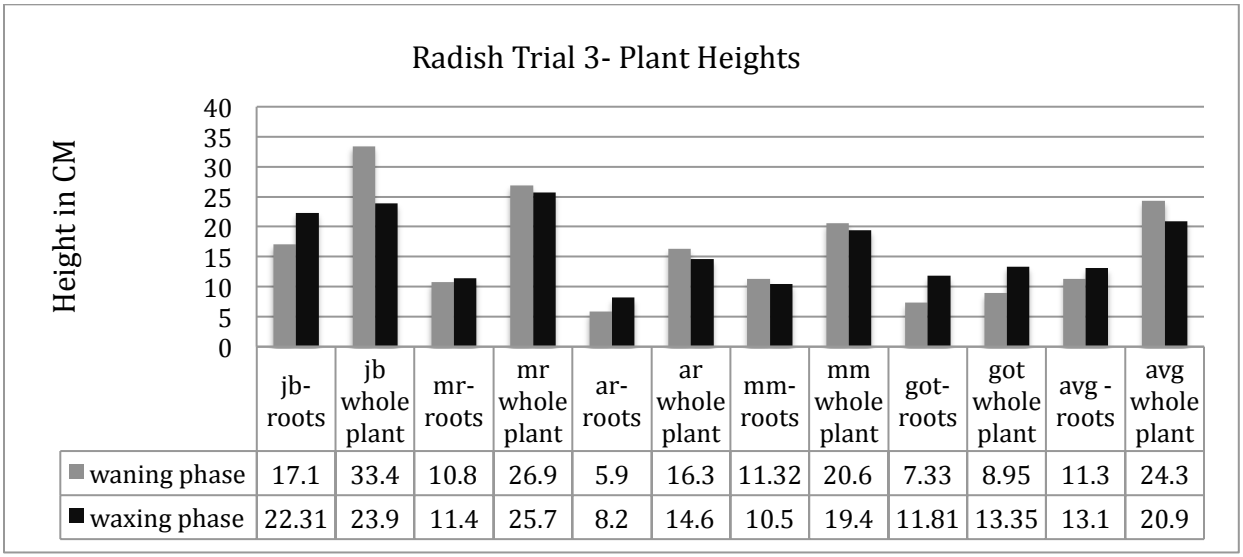
Summary of Trial 2: The waxing phase plants were larger and heavier than the waxing phase plants, and germinated more quickly. The plants were, on average 14% higher and 42% heavier in the waxing phase of trial 2.

Trial 3 (radishes)

Waning planting date: March 8th 2013 (root day)
Waxing planting date: March 25th 2013 (fruit day)
Waning phase germination: 55/60 (92%)
Waxing phase germination: 56/60 (93%)
Average germination time waning phase: 4.43 days
Average germination time waxing phase: 4.24 days
Combined size of all data sets: 111 plants



	jb-weight	mr-weight	ar-weight	mm-weight	got-weight	group average
waning phase	2.7	2.425	0.53	0.84	1.68	1.62
waxing phase	0.9	3.17	0.49	1.1	5.67	1.41



	jb-roots	jb whole plant	mr-roots	mr whole plant	ar-roots	ar whole plant	mm-roots	mm whole plant	got-roots	got whole plant	avg - roots	avg whole plant
waning phase	17.1	33.4	10.8	26.9	5.9	16.3	11.32	20.6	7.33	8.95	11.3	24.3
waxing phase	22.31	23.9	11.4	25.7	8.2	14.6	10.5	19.4	11.81	13.35	13.1	20.9

Data for the second set was very closely matched. Germination was slightly quicker for the waxing phase (only .2 days, instead of the 1.4 days of trial two), while plant roots were longer for the waxing phase (almost 2 cm), and plant heights were longer for the waning phase (almost 3.5 cm). Plant weight was slightly higher (by an average of .21 grams). There is one statistical aberration in the data: it is my (jb) data set. The waning weights in my set were almost 3 times higher than for the waxing set. I believe that this came about from a lack of water in this phase of my trial. I had planted many plants for my garden, which shared the same space in my small solarium. With these hundreds of plants, the research plants were not getting as much water as the plants from the waning trial. I noticed they were dry when I removed them from their cells. I have to be more careful of this in the future, and water more accurately. If I take my data out, the average weights for the waning and waxing phase are as follows:

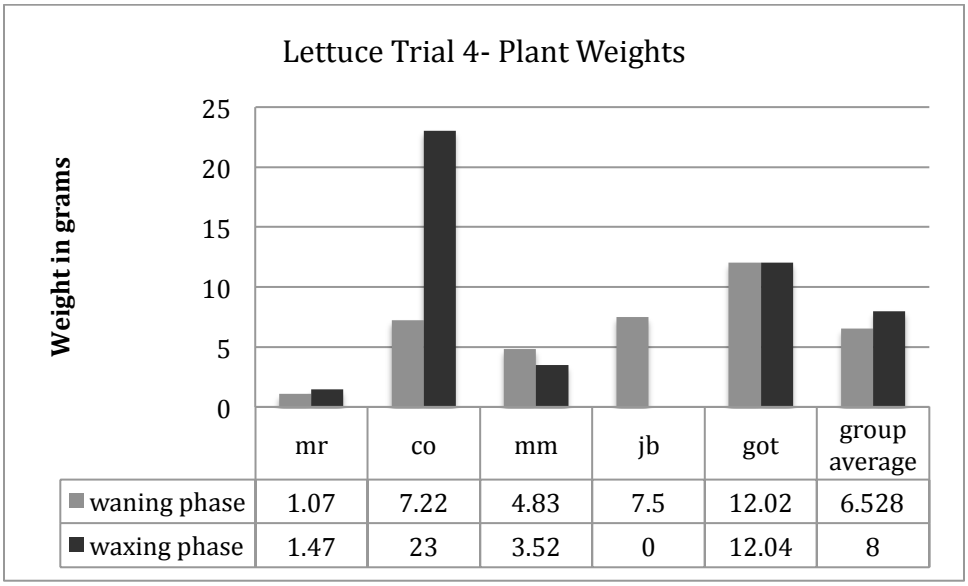
Waning phase: 1.37 grams
Waxing phase: 2.61 grams

The waxing phase plants of trial 2 were 41% heavier than the waning phase, and, less my data, the waxing phase plants were 25% heavier in trial 3. It should also be noted, however, that the AR data set also had slightly higher weights for the waning phase. In particular, the plant heights for this trial are longer for the waning phase, even with my data set removed. Perigee for this third data set was three days before the waning planting date, which may have been close to an ideal, but more research will be needed to get a clearer picture of this. It may also be that the favourable trigon day (root day) benefitted the waning plants.

Summary of Trial 3: The data in this set is much more ambiguous, and it is hard to draw clear conclusions. Mistakes may have been made.

Trial 4 (lettuce)

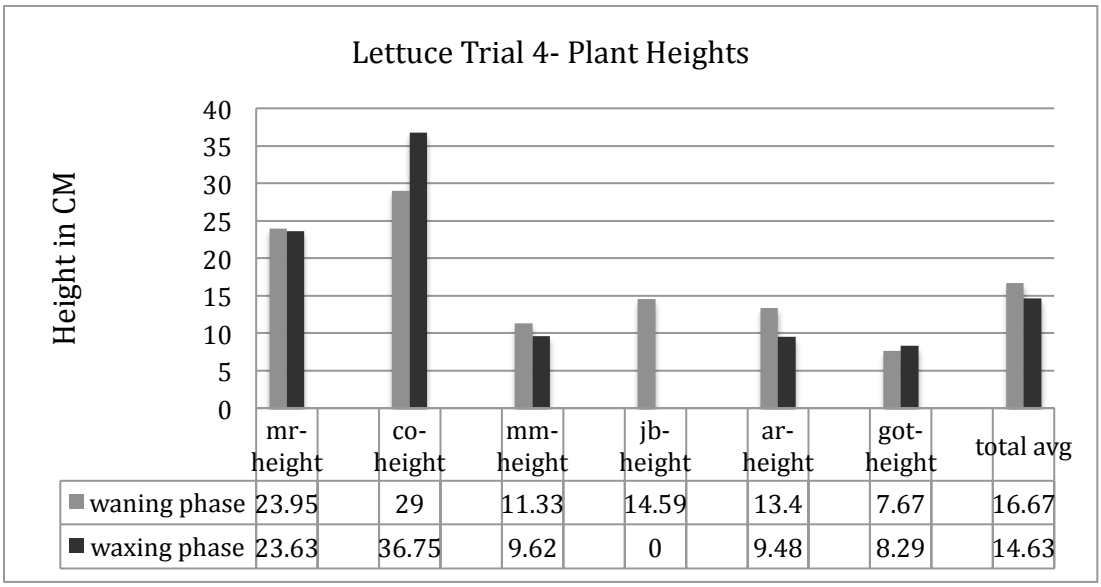
Waning planting date: April 8th (root day)
Waxing planting date: April 23rd (fruit day)
Waning phase germination: 46/60 (77%)
Waxing phase germination: 49/60 (82%)
Average germination time waning phase: 5.9 days
Average germination time waxing phase: 4.8 days
Combined size of all data sets: 95 plants



	mr	co	mm	jb	got	group average
waning phase	1.07	7.22	4.83	7.5	12.02	6.528
waxing phase	1.47	23	3.52	0	12.04	8

This trial presented some inconsistent data, part of which may be explained by the lunar eclipse that occurred on April 25th. Also, the trial weights of MR were taken after 30

days, not after the maturity of the plants, as explained in the calendar. I have included them here, as I believe they are of use. There are two Goetheanum data sets here, CO and Got. My data set (JB) presented the first anomaly I would like to point out. I had terrible waxing phase germination (1/12), and feel that this may have been because I planted in the evening (I planted in the morning for all of the other trials). I do not think that the evening planting in itself caused the poor germination, but that the impending lunar eclipse, which was, at the time I planted (8 pm PST), only 41 hours away may have had a very negative impact on germination. The other participants here in Vancouver all planted in the morning, which gave the plants a longer period to germinate (somewhere in the area of 12 hours), and this may have given the seeds enough time not to be so adversely affected by the eclipse. The PST time zone is one of the most westerly time zones on earth, so the eclipse here happened closer in relation to the planting date of April 23rd. The time of the eclipse in Vancouver was 12:57 pm in the afternoon on April 25th, while in Switzerland, the eclipse occurred at 9:57 pm in the evening (and was therefore visible, where in Vancouver it was not). This, assuming the Goetheanum planting occurred in the morning, would have given the seeds an extra 9 hours to germinate, making their planting time somewhere around 60-65 hours before the lunar eclipse, almost a full day more than my evening plantings. From this, I hypothesise that there is a time before (and I would also assume after) when planting near a lunar eclipse should not occur. From this very limited and hypothetical example, I would place that no-sowing bubble somewhere in the area of 48 hours. I will study this in greater detail in later issues of the calendar. I would also like to point out that the Goetheanum planting weights are anomalistic, with the CO waxing numbers almost double the weights of the other Got data set. I have no explanation for this, but will inquire.



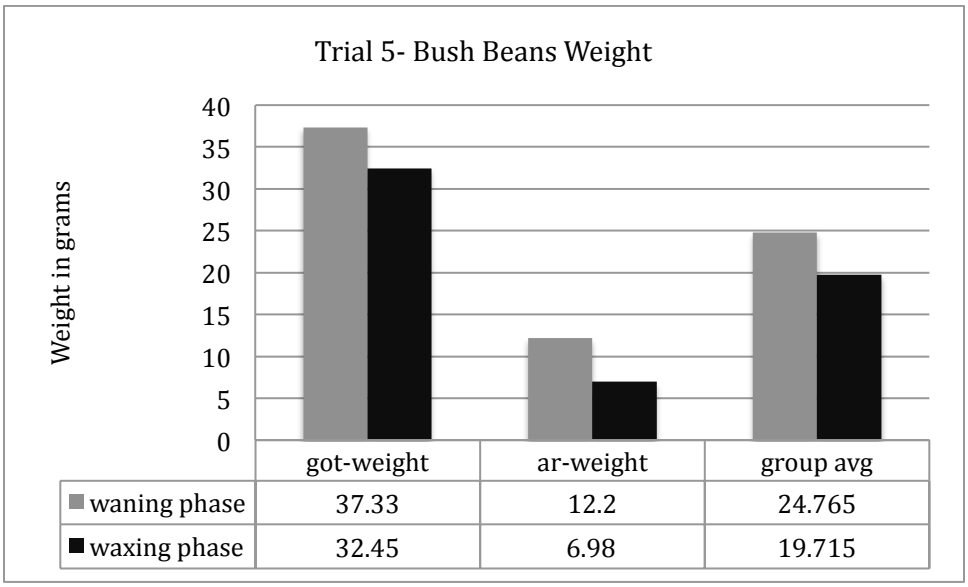
The averages from the Vancouver group are mixed. MR was heavier during the waxing phase (37%), while MM was heavier during the waning phase (37%). The data from the Goetheanum was also mixed, with CO having much higher plant weights during the

waxing phase (218%) while the weights for the GOT set were almost exactly the same. Interestingly, the plant heights for most of the data here are closer than the plant weights. For example, MR's plant height was only 1.4% higher than the waxing phase, MM only 18% for the waning phase, and CO only 27% higher for the waxing phase.

Summary of Trial 4: The data here tentatively suggests a lunar eclipse may have had a negative effect on plant germination and development. Rudolf Steiner spoke in the *Agricultural Course* of how the forces of the Sun are transformed and reflected back to the Earth: "It is the rays of the Sun which are thus *reflected*, but of course the Moon permeates them with its own forces. They come to the Earth as Lunar forces…" (p. 109)[1]. It follows that if the rays of the sun are blocked from reaching the moon (by the earth in the case of a lunar eclipse), that the moon would not be able to transform these forces and send them to the earth as the forces of germination and growth.

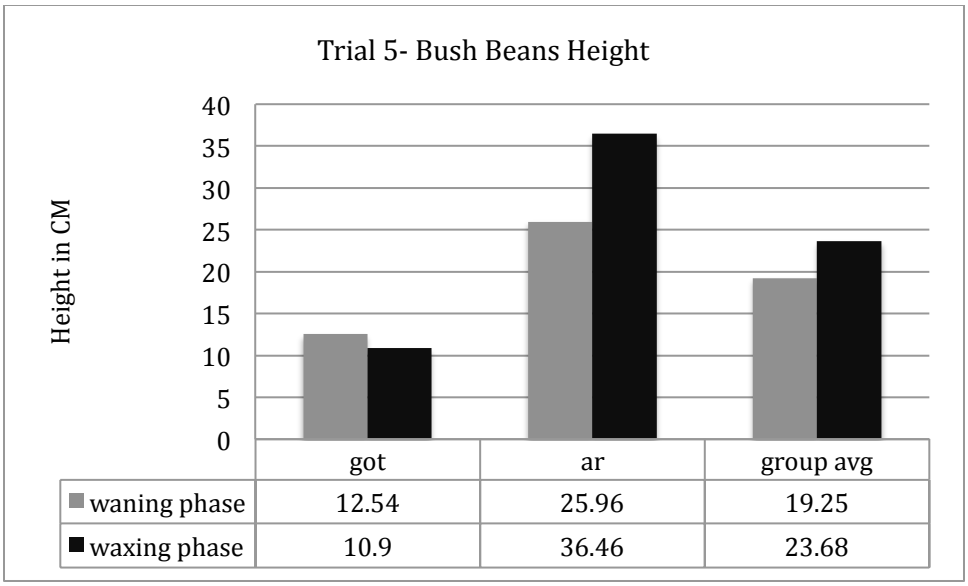
Trial 5 (bush beans)

Waning planting date: May 6th (fruit day)
Waxing planting date: May 22nd (root day)
Waning phase germination: 24/24 (100%)
Waxing phase germination: 23/24 (96%)
Average germination time waning phase: 7.8 days
Average germination time waxing phase: 8.91 days
Combined size of all data sets: 47 plants



	got-weight	ar-weight	group avg
waning phase	37.33	12.2	24.765
waxing phase	32.45	6.98	19.715

[1] Steiner, R. (2004). Agricultural Course, The Birth of the Biodynamic Method. Eight Lectures given in Koberwitz, Silesia, between 7 and 16 June 1924. Rudolf Steiner press.



	got	ar	group avg
waning phase	12.54	25.96	19.25
waxing phase	10.9	36.46	23.68

Trial 5: Only two useable data sets were obtained from trial 5. This was from a trial done by the Goetheanum and one done in Vancouver by AR. I can say that I personally had better waning phase germination 11/12 (4.1 days germination) versus waxing phase 4/12 (4 days germination), but the plants when planted out were almost all badly damaged or destroyed by slugs, making the data from the set unusable. This was also the experience of others in the Vancouver group. Both of the weight averages for this trial were higher for the waning phase, the Goetheanum's being 15% heavier during the waning phase, and AR's being 75% heavier. These averages are the total weight of pods harvested per plant. An anomaly occurred with AR's plant heights, which were strangely higher for the waxing phase, even though the yields were heavier for the waning phase.

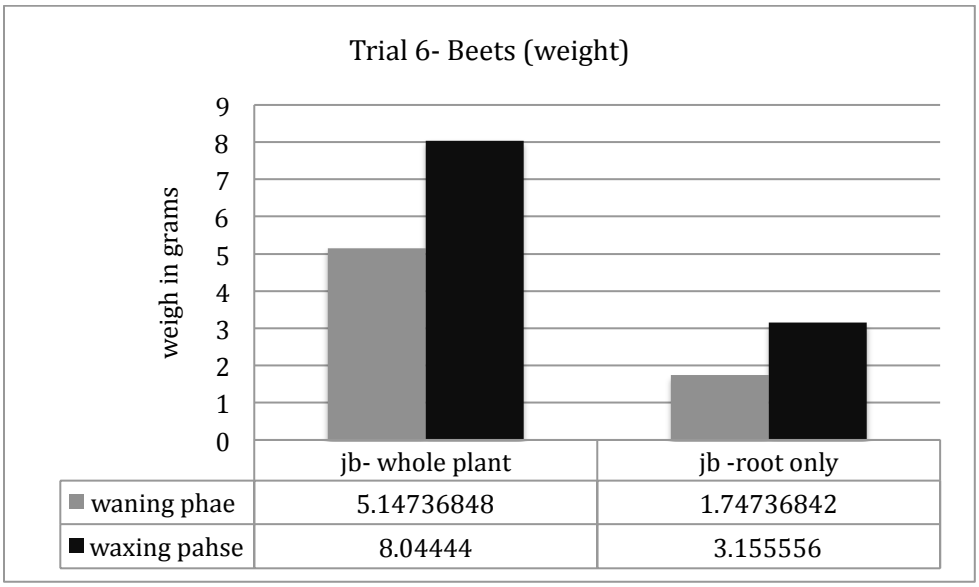
Summary of Trial 5: The lunar eclipse may have prevented waxing seeds from germinating in the data set I conducted. The Goetheanum data set germinated well, but the waxing plants were not as tall and yielded less than the waning set. The lunar eclipse would have, as stated above, been nearer to my morning planting time in Vancouver, and could explain the lower germination rates. The Goetheanum trial, again assuming a morning planting, would have been further (somewhere around 9 hours) away from the eclipse, giving the seeds more time to germinate properly, but having said this, AR had good germination for both sets. I hypothesis that the eclipse affected the overall growth of the plants, giving the smaller yields of the waxing phase, but the data is ambiguous. This will be researched more fully around future eclipses.

Trial 6- Beets

Waning planting date: June 6th (root day)
Waxing planting date: June 21st (flower/leaf day)
Waning phase germination: N/A
Waxing phase germination: N/A
Average germination time waning phase: N/A

Average germination time waxing phase: N/A
Combined size of all data sets: 37 plants

The only data set available for this trial was mine. Others in the trial were on holidays and had commitments that did not allow them to see this trial through to its conclusion. The germination data is not available for this trial, as I learned that each beet seed is not a single seed, but rather cluster of several seeds. Because of this, I had 18 plants in the waxing phase and 19 plants in the waning phase, from 12 seeds planted in each trial. I do not know how many seeds were in each of the seedpods, and therefore cannot provide accurate germination numbers. I also found that the seeds from each pod germinated at different rates, and got confused as plants kept coming up where I though I had just planted one seed. Because of this, I do not feel I could provide accurate germination data as to the length of time for each seed to germinate. Having said this, I did weigh the whole plants and then the roots from each of the sets.



For the waxing phase, the whole plant was, on average 2.9 grams, or 56% heavier than for the waning phase, while the roots were 1.4 grams, or 81% heavier, also for the waxing phase. This also coincides with Spiess' finding that perigee had a positive effect on the growth of many plants, as perigee in this phase occurred on the day as the full moon. There was no lunar eclipse during this trial to impede the full force of the waxing moon at perigee for this trial. The difference in plant weights in this trial was the largest found of all the trials, further supporting the hypothesis that perigee, as well as the waxing moon are the most significant factors affecting the growth of plants.

Summary of trial 6: This trial supports the hypothesis that the most important cosmic factors affecting growth are the synodic and anomalistic lunar cycles, but because it was only one small set of data, cannot be considered as anything more than an indication for future research.

Conclusions and Future Directions

This year's inaugural calendar provided enough data to further pursue the hypothesis that the waxing phase is the best time to plant (specifically two days before a full moon), but much more work needs to be done before this can definitively established. Apogee and perigee, as well as lunar eclipses also seem to have a pronounced affect on the growth of plants, and this will again be studied through research trials in future editions of the calendar. Trigons, at this point, do not seem to significantly affect the growth of plants, but this too is not yet definitive, and will be the subject of further research. For example, planting trial three presented ambiguous data, which may have been the result of perigee being at a very favourable time in relation to the waning cycle, or of the favourable trigon for that planting time.

Lessons learned from this year's calendar will also guide the planting scheme for the 2014 calendar. Winter plantings will be abandoned, as the light at this time of year is not strong enough to support good growth without adding artificial light. Measures to combat garden pests, in particular slugs, have to be in place. I constructed some raised beds with concrete walls and a slug moat, which should help deter slugs. Daily evening slug patrols will also be conducted. Beets will not be used for trials as they do not give reliable germination data, due to the fact that one 'seed' is not actually a seed but a conglomeration of seeds, varying in number. Next year's calendar will consist of plantings, all outdoor, probably in the months of April, May and June although more may be added if there are interesting events happening. Planting will also be for three consecutive days, again around new and full moon dates, and again studying the corresponding trigon. Apogee and perigee plantings will also occur during these months. Gathering meaningful data for apogee and perigee will take several years, as the synodic cycle will also affect data. For example, to ascertain the affect of perigee, data should be gathered for perigee in both the waning and waxing aspects of the synodic cycle, and this can only be done over several years. I also hope that more people will participate in next year's calendar, and that the Goetheanum will again also be able to take part. The more diverse the sources of data, the more reliable will be the conclusions drawn from it.

Any comments and thoughts are appreciated and can be sent to me at jbbach1@yahoo.ca. The 2014 calendar will be available late October-early November at www.bachbiodynamics.com. It is a free download.

Thank-you,

John Bach